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Using the AS/400 as an IPX Router

July 1997

IBM

International Technical Support Organization
Raleigh Center

International Technical Support Organization

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Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix B, "Special Notices" on page 321.

First Edition (July 1997)

This edition applies to Operating System/400 Version 3, Release 7 (Program 5716-SS1) and Version 3, Release 2 (Program 5763-SS1).

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Contents

Preface

This redbook will help you become familiar with and then configure the AS/400 IPX router support. In addition to providing a configuration overview and configuration scenarios, the book includes an overview of IPX and the other Novell NetWare protocol stack components. The configuration scenarios included will prove useful as samples or examples for those setting up the AS/400 IPX router support. The example configurations cover:

- IPX routing between AS/400 LAN interfaces
- IPX routing between AS/400s via X.25 SVC, X.25 PVC or frame relay
- IPX routing between an AS/400 and an IBM 2210 multiprotocol router via frame relay
- IPX routing between an AS/400 and a Novell multiprotocol router via X.25 SVC or frame relay

As reference information, the book also includes sample communications traces. The book covers OS/400 V3R7 and V3R2 (the software releases at which the IPX router support was added).

The Team That Wrote This Redbook

This redbook was produced by a team of specialists from around the world working at the Systems Management and Networking ITSO Center, Raleigh.

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Chapter 1. Introduction

In this book we describe the use of the AS/400 as an IPX router. The IPX router capability was added at OS/400 V3R2 (CISC) and V3R7 (RISC). The support was also available for V3R1 via a non-chargeable feature (Network Extensions). IPX is the network protocol used by Novell NetWare. The AS/400 IPX router support allows a NetWare client to communicate with a NetWare server via an AS/400. This IPX router capability can be used locally or remotely. Locally the support can be used to route IPX data from one LAN interface to another. Remotely the support can be used to route IPX data between AS/400s via a wide area network (WAN) connection. This wide area network capability can also be used between an AS/400 and a non-AS/400 IPX router (for example, between an AS/400 and an IBM 2210 or between an AS/400 and a Novell MPR router). Although not covered in this book, the AS/400 can also be a Novell server via use of the Integrated PC Server.

The following manuals and redbooks provide useful backup material:

- *IBM 2210 Nways Multiprotocol Description and Configuration Scenarios*, SG24-4446
- *AS/400 Advanced Series Internetwork Packet Exchange Support Version 3*, SC41-3400
- *NetWare, the Professional Reference third edition* by Karanjit Siyan
- *OS/400 Integration for Novell NetWare Version 3*, SC41-3124-00
- *AS/400 AnyNet Scenarios*, SG24-2531

In this chapter we introduce the technologies that we will be using in the book. First we give an overview of LAN (local area network) and WAN (wide area network) technologies, we then provide a little more detail on the AS/400 IPX support.

1.1 Local Area Network (LAN) Introduction

What is a LAN?

As the words imply, a local area network (LAN) is a network structure used to interconnect devices within the same locality. This may be within the same building or it may be over a wider area, for example, a campus. A LAN is typically used as a mechanism to allow users to share computing resources, for example, printer sharing via a print server or file sharing via a file server.

Why use a LAN?

Some of the reasons for using a LAN rather than another mechanism are:

- International standard
- Multiprotocol
- High speed (10, 16 or 100 Mbps)
- Support for heterogeneous cabling systems
- Multiple topologies

International standards exist for LANs, for example IEEE 802.3 for Ethernet and IEEE 802.5 for token-ring.

LANs are multiprotocol allowing devices to communicate with each other using different protocols concurrently. For example, one user might be using NetBIOS or IPX to access a file server while another user is using TCP/IP or SNA to access a host.

LANs operate at high speeds typically offering more bandwidth than is available via, for example, a modem connection. Typically an Ethernet LAN operates at 10 Mbps and a token-ring LAN operates at 16 Mbps. 100 Mbps is available via fast Ethernet or FDDI LAN technologies.

A LAN may be comprised of multiple different cabling system types providing heterogeneous connectivity. Some of the cabling system types supported are UTP (unshielded twisted pair), STP (shielded twisted pair) and coaxial cable.

Multiple topology types are supported for interconnecting the devices. Devices may be connected via a bus, a ring, a star or a ring on a star such as the token-ring LAN implementation.

The following figure illustrates a simple LAN being used to connect PC clients to a file server, AS/400, RS/6000 and a printer.

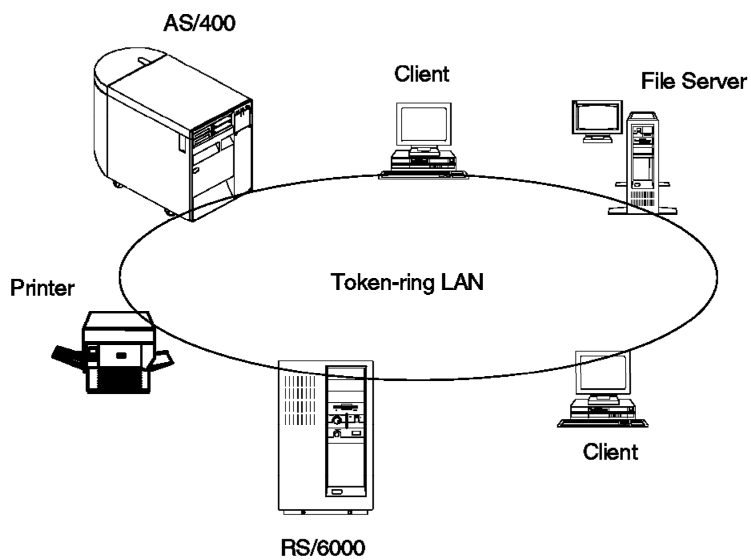

Figure 1. A Simple Token-Ring LAN

1.1.1 LAN Technologies

Currently there are a lot of different LAN technologies on the market. These different LAN technologies offer different speeds, different topologies and use different cabling system types.

The following are the current LAN technologies:

- Ethernet
- Token-ring
- FDDI (fiber distributed data interface)
- Fast Ethernet
- ATM (asynchronous transfer mode)

An Ethernet LAN uses an access method called CSMA/CD (Carrier Sense Multiple Access/Collision Detection). The station detects whether the bus is free first before sending the data. If there is no one occupying the bus, it immediately sends the data. Otherwise, it waits until the bus is free. If a collision occurs, the sending stations stop transmitting data immediately. The stations wait for a random amount of time before they start transmitting again. An Ethernet LAN supports a shared bandwidth of 10 Mbps.

A token-ring LAN uses a method of token passing. A station with data to transmit waits for a free token to arrive. When a free token arrives, the station changes the token into a frame, appends the data to it and transmits the frame. If the destination is active, it copies the frame and sets the ″frame copied″ and ″address recognized″ bits, providing MAC level acknowledgement to the sending station. The sending station then removes the frame from the ring and releases a new token onto the ring. With a 16 Mbps token-ring LAN, it is possible for the sending station to release a token immediately after transmitting the frame trailer, regardless of whether or not the frame header information has returned. This is called early token release and tends to reduce the amount of idle time. The token-passing protocol provides an extensive set of inherent fault isolation and error recovery functions. A token-ring LAN supports a shared bandwidth of 4 Mbps or 16 Mbps.

Currently, Ethernet and token-ring are the most popular LAN implementations.

An FDDI LAN also uses a token-passing protocol in which each station has a chance to transmit data when a token passes. A station can decide how many frames it will transmit using an algorithm which permits bandwidth allocation. FDDI permits a station to transmit multiple frames without releasing the token. An FDDI LAN supports a shared bandwidth of 100 Mbps. An FDDI LAN is frequently used for the backbone network because of its high speed and because an FDDI device adapter is more expensive than an Ethernet or token-ring adapter.

Fast Ethernet is an enhancement of the Ethernet LAN technology. This new technology is gaining popularity because of the higher bandwidth (100 Mbps) available.

The above LAN technologies use bandwidth sharing. The LAN bandwidth available is shared by all active nodes.

Another communication technology is currently being tested called asynchronous transfer mode (ATM). The ATM technology addresses the demand for high-speed, high-bandwidth networks that enable data, voice, video, image, and multimedia applications to run on the network either locally or remotely. ATM supports speeds of 25, 100 and 155 Mbps.

1.1.2 LAN Components

A LAN is comprised of hardware and software. The hardware involved typically might be a network interface card (NIC) in each device, and a concentrator or hub and cables to link the devices (via the NIC in each) to the concentrator or hub. The software involved is a network operating system (NOS). Examples of NOSs are IBM Server for OS/2 Warp, Novell NetWare, Banyan Vines, Microsoft LAN Manager, Windows NT, etc. The main purpose of the NOS is to be a server. In a LAN we have at least one server and one or many clients. To enable the clients to access the server, the clients normally run a PC operating system such as DOS (disk operating system), OS/2 or Windows and client software. Different NOSs may use different network protocols. For example, Novell NetWare uses IPX and IBM Server for OS/2 Warp uses NetBIOS or TCP/IP.

The following figure illustrates the physical connections in a PC LAN. We can see that the file server and clients are each connected via a network interface card and cables to the hub or concentrator. The server is running a network operating system and the clients a PC operating system and client software.

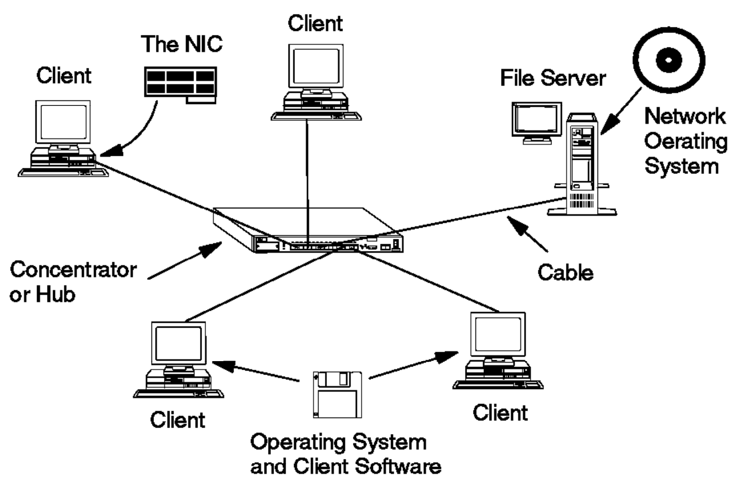

Figure 2. A Simple Physical LAN Configuration

1.2 Internetworking

In the above section we discussed LANs in the concept of that served by a single hub or concentrator. This single LAN segment can be interconnected with other LAN segments to create a larger logical LAN to serve, for example, a building or campus. These interconnected LAN segments may be of different physical types, for example, a mixture of token-ring and Ethernet segments. They may also be running at different speeds.

Why do we have to segment a large LAN into several smaller LANs?

For the following reasons:

- There is a limit to the number of nodes that can be connected to a single LAN segment. For example, a token-ring LAN supports 256 nodes (PCs) per segment and an Ethernet LAN supports 1024 nodes per segment.
- We may want to run individual LAN segments at different speeds. For example, we might have one token-ring LAN segment running at 4 Mbps and another running at 16 Mbps.
- We may have a mixture of token-ring and Ethernet LANs.
- Specific requirements rather than technical requirements. Frequently, different departments within an organization will want their own LAN segments rather than share a LAN segment.
- Performance. The bandwidth available is a shared bandwidth. The more users (nodes) on a LAN segment, the slower the throughput.
- LAN broadcasts. Some network operating systems are very ″chatty″ in that they periodically send frames to all nodes on the LAN. By segmenting the LAN we can limit these broadcasts.

Note: In the LAN environment, there are many terms used that have the same meaning or vice versa. The term segment means an island. In a token-ring network this may be referred to as a ring, in an Ethernet network this may be referred to as a collision domain.

To gain a better understanding of LAN-to-LAN communications, let′s discuss the OSI model.

1.2.1 The Open Systems Interconnection (OSI) Model

The OSI model proposes a seven-layer structure for communications. The following figure shows the function provided by each of these layers.

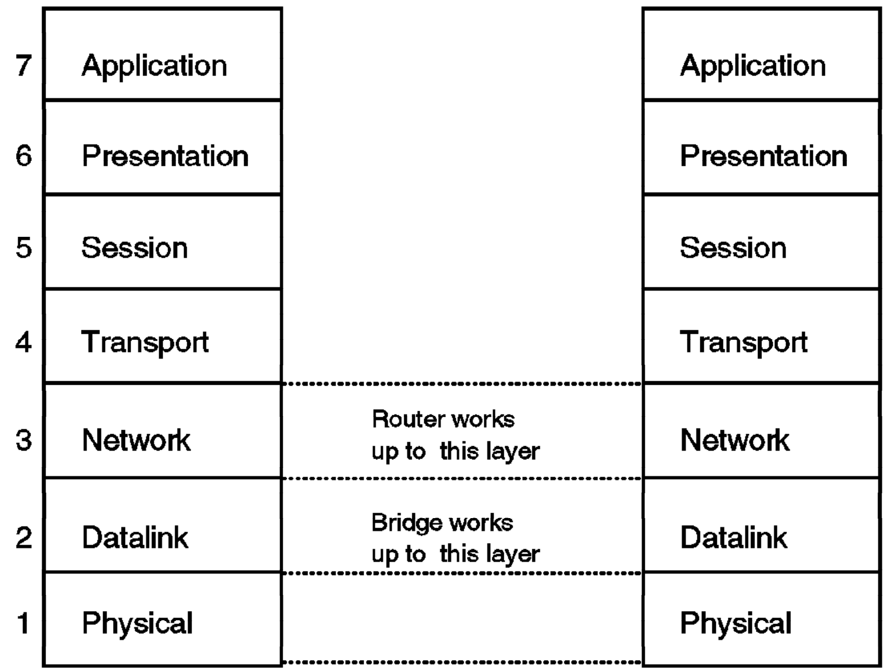

Figure 3. The OSI Model

Two or more LAN segments can be integrated into a single logical LAN in different ways. The options available are:

- Bridging
- Routing
- Switching

In Figure 3 we can see the OSI model layer at which each of these operate. In the following we discuss each of these.

1.2.2 Bridging

A bridge is a device that connects two or more LAN segments together. Using the OSI model, a bridge operates up to the data link layer (layer 2). A bridge functions by accepting data frames from each connected network and then deciding whether to forward each frame based on the MAC header contained in the frame. Bridges can be used to link two or more homogeneous networks. The term homogenous means that the connected networks use the same bridging method and media types. Current bridges also allow communication between non-homogeneous networks, for example, the IBM 8229 bridge supports token-ring to Ethernet communications.

Bridge categories:

- Simple bridge

A simple bridge consists of two or more linked network interfaces connecting LAN segments. A simple bridge interconnects separate LANs by relaying data frames between the separate MAC (Media Access Control) entities of the bridged LANs.

- Complex bridge

  A complex bridge carries out more sophisticated functions. These functions may include the bridge maintaining status information on the other bridges. This information includes the communication path cost as well as the number of hops required to reach each connected network.

  Complex bridges can also modify frames and recognize and transmit packets from different LAN technologies (such as token-ring and Ethernet). This is sometimes referred to as a translational bridge.

- Local bridge

  A local bridge provides connections between several LAN segments in the same geographical area.

- Remote bridge

  A remote bridge connects multiple LAN segments in different geographical areas.

Bridging Methods:

- Transparent bridges (Ethernet environment)

  The transparent bridge is commonly known as a spanning tree bridge (STB). The term transparent refers to the fact that the bridge silently forwards non-local traffic to attached LANs in a way that is transparent or unseen to the user. The applications at each node do not know about the presence of the bridge. The bridge learns about the nodes connected to each of its interfaces by monitoring the frames passing each of its interfaces.

- Source routing bridges (token-ring environment)

  Source routing is a method of forwarding frames through a bridged network in which the source station identifies the route that the frame will follow. In a distributed routing scheme, routing tables in each bridge determine the path that data takes through the network.

- Translation bridges (token-ring to Ethernet)

  The above two bridging technologies are incompatible with each other. Some of the differences are in bit ordering, packet size, acknowledgment bits, access method and bridging technology. A translation bridge, as the name implies, translates from one LAN type to the other allowing data to pass between an Ethernet LAN and a token-ring LAN.

- Source route transparent bridge

  A source route transparent (SRT) bridge is a MAC layer bridge that performs source routing when frames with routing information are received and performs transparent bridging when frames are received without routing information.

The following figure illustrates a simple bridge scenario.

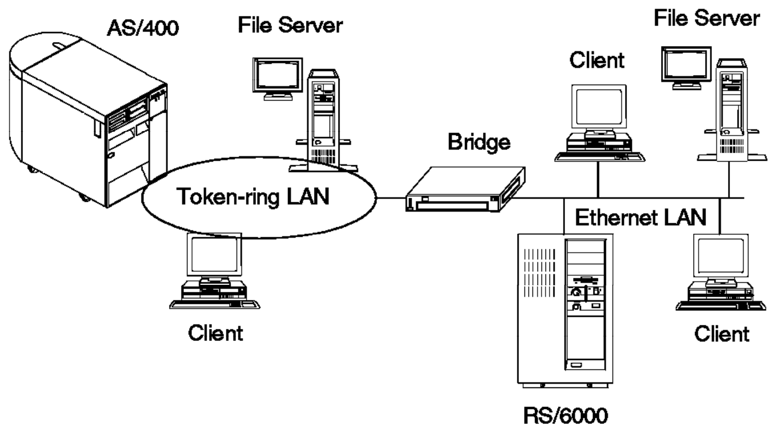

Figure 4. Token-ring to Ethernet LAN Bridging

Bridges can also be used to interconnect LAN segments via a higher-speed backbone as in shown in the following figure.

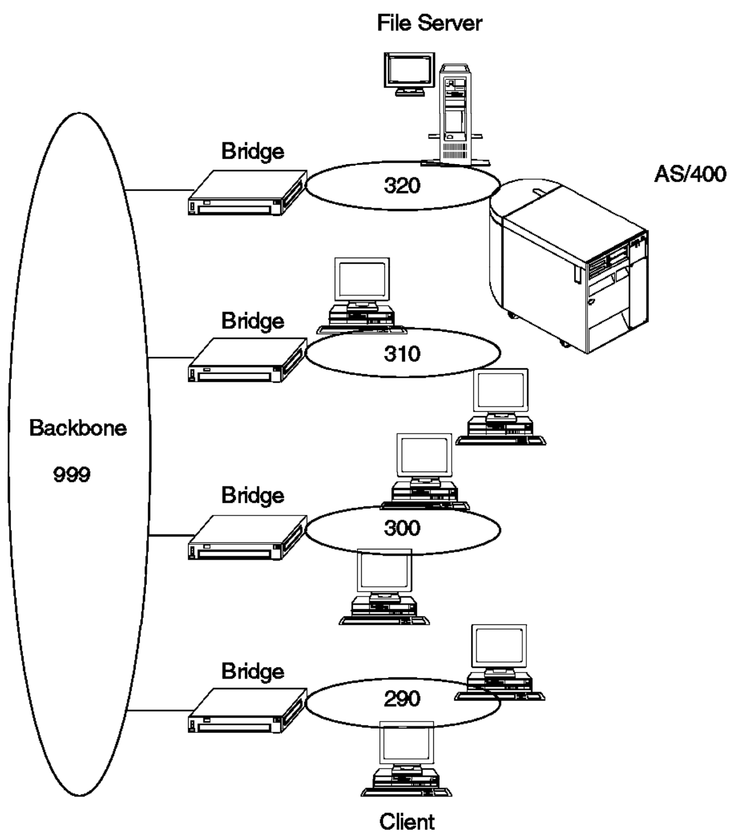

Figure 5. A Backbone LAN Scenario

A client in LAN segment 290 reaches the AS/400 in segment 320 via the backbone LAN segment 999.

1.2.3 Routing

A router is also able to connect LAN segments together. On the OSI model, a router operates up to the network layer (layer 3). A router operates independent of the physical media and physical media protocols. A packet may travel from a token-ring network to Ethernet network over X.25 network before reaching the final destination. This is possible because the router is using the node addresses located in the network header.

Routing technology is more complicated than bridging, but it is more sophisticated. A router can control whether a protocol is passed or not, prevent broadcast storms and select the best communications path.

A router can connect to more than one LAN local or remotely. Routers support multiple protocols. For protocols that are not routable (those that do not have an address at the network layer), for example, SNA and NetBIOS, a function such as data link switching is provided.

1.2.4 Switching

The objective of the above technologies is to integrate the LANs into a single big (logical) LAN, a switch also provides this function.

A LAN switch works much like a multiport bridge. Each port on a switch provides dedicated bandwidth for the network or device that is connected to it. The following are several switch features:

- Full-duplex

  A switch can provide a full-duplex connection between the switch and a device effectively doubling the bandwidth available for that device as well as providing dedicated bandwidth for the device. Typically this would be used to a file server. This full-duplex capability can also be used between switches.

- Piping

  Another interesting feature of switch technology is piping. With piping we parallelize two or more connections together. In an Ethernet network (which supports 10 Mbps) this would give us 20 Mbps bandwidth if we parallel two links and 40 Mbps if full duplex was enabled.

- Adaptive Cut-Through

  Rather than use store and forward, a switch is able to pass packets without waiting for the whole frame to be received.

- Filtering

  An address filter in the switch provides the ability to filter or inhibit frames at port entry.

The following figure illustrates LAN connections using a switch.

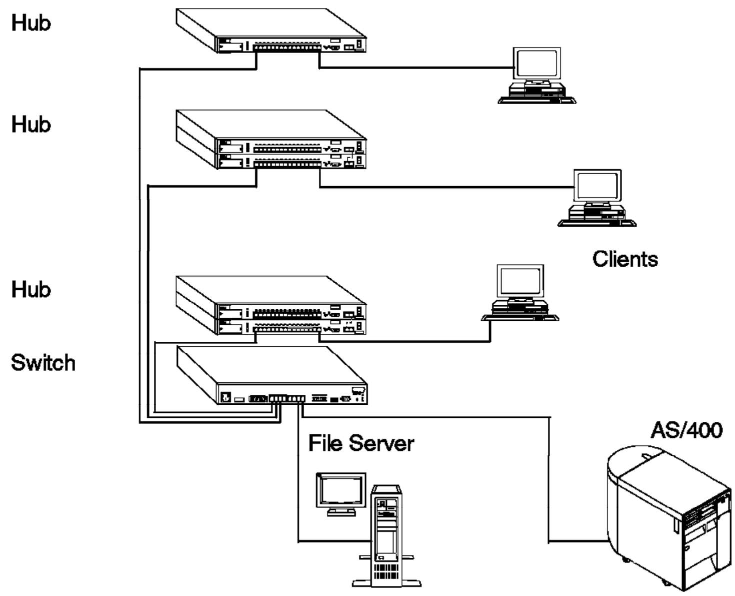

Figure 6. LAN to LAN Bridging using a Switch

The above figure illustrates five LAN segments interconnected via hubs and a switch. The server and AS/400 have their own dedicated LAN segments. The figures also illustrates a backbone implementation using a switch.

1.3 Wide Area Networking (WAN) Introduction

We have seen above how individual LAN segments can be interconnected via bridges, routers or switches to form large (maybe campus-wide) logical LANs. To allow communications between LAN devices at sites remote from each other, these logical LANs can be interconnected by wide area network (WAN) connections. In addition, a WAN can be used to interconnect individual devices or hosts (or a device to a host).

What is a WAN?

A WAN is an interconnection of two or more LANs (or computing devices) via a public or private communications link.

The communication link may be via a Public Switch Telephone Network (PSTN), Integrated Service Digital Network (ISDN), private network or any other link service.

How do we establish a WAN?

Typically we might establish a WAN in one of two ways. Either we connect the remote sites via a computing device (for example, via an IBM S/390 host or an AS/400) or we connect the remote sites via a networking device (for example, via an IBM 2210 router).

In Figure 7 a WAN has been used to connect remote sites via IBM computing devices.

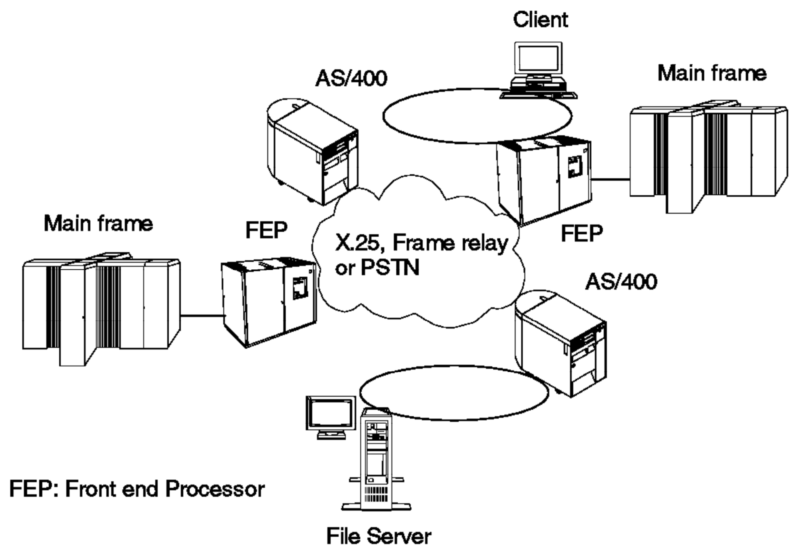

Figure 7. An SNA Network

In Figure 8 a WAN has been used to connect remote LANs at remote sites via IBM 2210 routers.

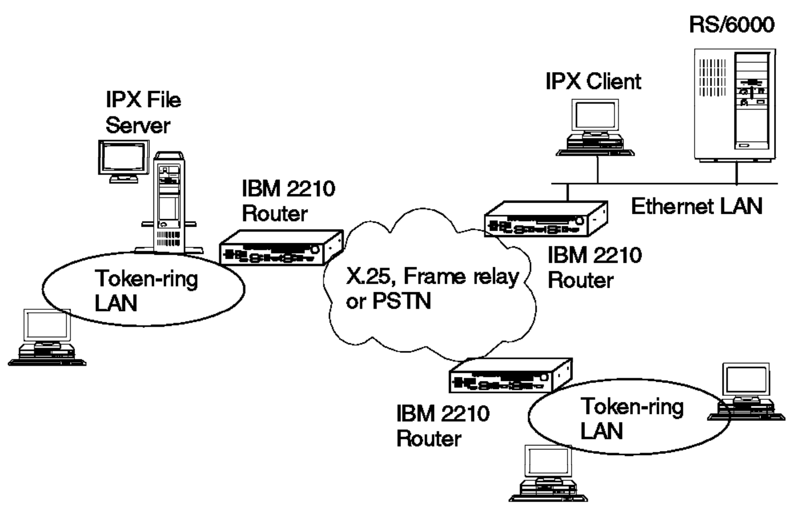

Figure 8. A Multiprotocol Wide Area Network

We can see that Figure 7 and Figure 8 use different mechanisms to connect to the WAN. In Figure 7 the hosts (or FEPs providing communication functions for the hosts) provide the LAN/WAN gateways, whereas in Figure 8 the routers provide the LAN/WAN gateways.

What does it mean?

Refer to Figure 7 on page 11, in pure SNA environment, the only protocol that can be used is an SNA protocol (for example, APPC (advanced program to program communications)) this would prevent NetBIOS or TCP/IP being used between the client and the file server. However, in the multiprotocol example (Figure 8 on page 11) any protocol can be used, hence allowing, for example, IPX to be used between the IPX client and IPX file server shown.

1.3.1 WAN Infrastructure

In the previous sections we have discussed LAN infrastructures. In this section we will look at WAN infrastructures. There are many different WAN infrastructures, here we will concentrate on those supported by the AS/400 IPX router capability. These are frame relay and X.25.

1.3.2 Frame Relay

Frame relay provides the best features of circuit-switched and packet-switched networks:

- As in circuit switching, frame relay transports traffic of different protocols at a guaranteed bandwidth.
- As in packet switching, frame relay provides line consolidation and statistical multiplexing by allowing a physical line to carry traffic to various destinations.

Frame relay is called fast packet because error correction is performed by end stations rather than at every hop within the network.

Frame relay enforces permanent virtual circuit (PVC) rates, and provides guaranteed bandwidth for each virtual circuit. This prevents any one user from consuming all the bandwidth. At the same time, it allows any unused bandwidth to be shared by the active users based on committed information rate (CIR) standards. If bandwidth is available on the frame relay network, the network will attempt to queue the data. If a packet cannot be delivered based on the CIR, the packet is discarded.

If a network includes several locations connected to each other in a fully meshed network, frame relay can help consolidate those lines and reduce costs. Cost savings can come both from reduced line costs from the carrier and reduced hardware equipment costs.

Frame relay communication enables the multiplexing of two or more virtual circuits on a single physical circuit. Think of a virtual circuit as an electronic pipe between locations. Data flowing through terminals and workstations can communicate through that pipe.

Frame relay allows workstations in small offices to reach multiple locations simultaneously over a single communications line into a frame relay network. The virtual circuits (up to 200 per line) are identified by data link control identifiers (DLCIs), provided by the frame relay service provider.

A frame relay network may be public (PTT owned) or private. Typically a frame relay network supports speeds up to 2.048 Mbps.

1.3.3 X.25

As in frame relay, X.25 enables multiplexing of two or more logical links on a single physical link. In X.25, these logical links are called virtual circuits.

Virtual circuits are addressed using a logical channel number, which is defined by a concatenation of a logical channel group number and a logical channel number. Logical channel numbers can be assigned:

- Temporarily, when a call is made into the network.
- Permanently, by a network administrator at the time of the subscription to the X.25 service.

Switched virtual circuits (SVCs) are temporary logical connections that are established between two DTEs by a call setup procedure. The connection is released when the call is cleared (disconnected) by one of the DTEs or the X.25 network. SVCs are analogous to dial-up (switched) lines on a telephone network.

Permanent virtual circuits (PVCs) are logical connections that are established between two DTEs by permanently assigning a logical channel to the PVC at each DTE/DCE interface. The number of the logical channel assigned can be different at each end of the PVC. PVCs are analogous to leased lines on a telephone network.

As with a frame relay network, an X.25 network may also be PTT or privately owned. In today′s way of thinking, an X.25 network provides for relatively low-speed network connections (typically up to 64 Kbps).

1.4 AS/400 as an IPX Router

In the previous section we have seen that LAN-to-LAN connections can be made using either bridges, routers or a switch. These are the most common internetworking implementations for a multiprotocol network. With the availability of IPX routing on the AS/400, the AS/400 can also be used to interconnect LANs for the transport of IPX. These LANs may be local (connected to the same AS/400) or they may be remote (connected to different AS/400s).

The following sections provide information on the IPX routing capabilities of AS/400.

1.4.1 Local IPX Routing

The AS/400 can route IPX between the following LAN types locally:

- Token-ring to token-ring LAN
- Token-ring to Ethernet LAN
- Ethernet to Ethernet LAN

The following figure illustrates local IPX routing via an AS/400.

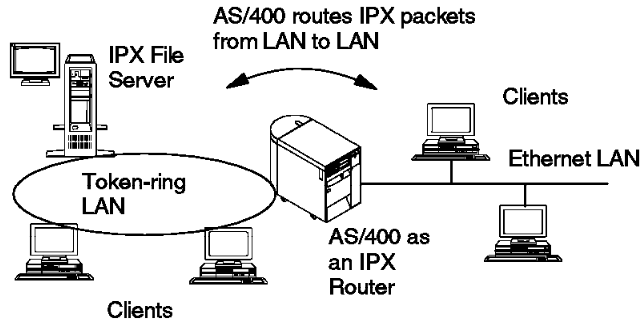

Figure 9. Local IPX Routing via an AS/400

Novell clients on the Ethernet LAN can use IPX to reach the Novell file server on the token-ring LAN via the AS/400.

1.4.2 IPX Routing over Wide Area Network

The AS/400 also supports either token-ring or Ethernet routing over an X.25 or frame relay network. The following figure illustrates remote IPX routing via two AS/400s over an X.25 or frame relay Network.

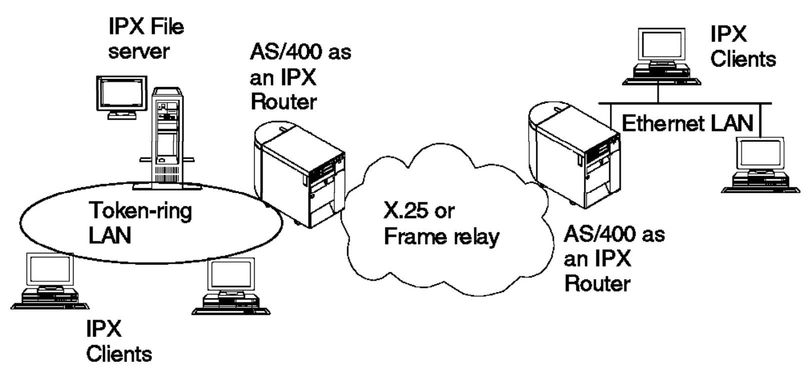

Figure 10. Remote IPX Routing via Two AS/400s

Novell clients on the Ethernet LAN can use IPX to reach the Novell file server on the token-ring LAN via the two AS/400s.

1.4.3 Interconnection with Other Routers

IPX routing between an AS/400 and another IPX router is also supported. The following figure illustrates remote IPX routing between an AS/400 and an IBM 2210 Router.

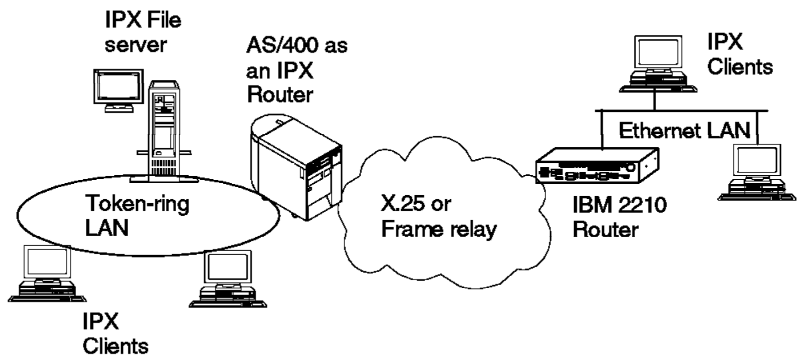

Figure 11. IPX Routing via an AS/400 and an IBM 2210 Router

Novell clients on the Ethernet LAN can use IPX to reach the Novell file server on the token-ring LAN via the IBM 2210 and AS/400.

1.4.4 Benefits

Using the AS/400′s IPX routing capability offers the following benefits:

- Local routing
  - No external box is required to integrate the LANs.
  - No external box to manage.
  - No additional skills (for example, router skills) required.
- Routing over a WAN
  - A single WAN connection can be used for SNA, TCP/IP and IPX.
  - No external boxes are required.
  - No external boxes to manage.
  - No additional skills (for example, router skills) required.

Chapter 2. The NetWare Protocol Stack

In this chapter we look at protocols that make up the Novell NetWare protocol stack. We also compare these protocols to the OSI model.

2.1 The OSI Model

Today all vendors compare their propriety, industry standard, or international standard protocol implementations against the Open Systems Interconnection (OSI) reference model.

The OSI model is broken down into seven functional layers. Each layer corresponds to a set of services and protocols which provide mutually agreed rules for the exchange of information.

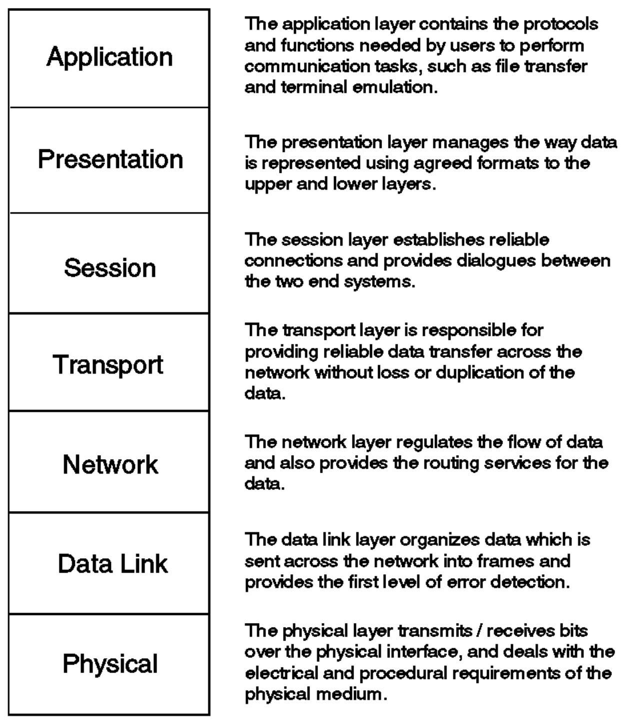

Figure 12. The OSI Model

2.2 The Novell NetWare Protocol Stack

The main components of the Novell NetWare protocol stack are NCP, SPX and IPX. Of these SPX and IPX are based on Xerox′s XNS protocol suite. NetWare Core Protocol (NCP) was developed by Novell to support NetWare services. The Service Advertising Protocol (SAP) is used by NetWare to advertise various NetWare services to the network.

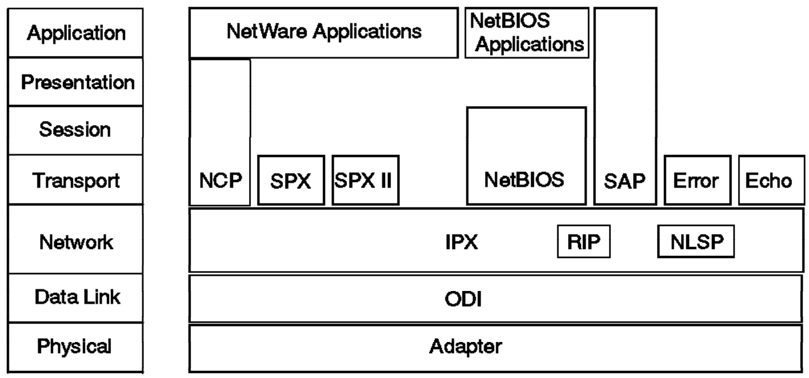

Figure 13. Novell NetWare Protocol Stack

OS/400 V3R2 and V3R7 support Internetwork Packet eXchange (IPX), Sequenced Packet eXchange (SPX), Routing Information Protocol (RIP), Service Advertising Protocol (SAP), NetWare Link Services Protocol (NLSP) and IPX WAN Version 2 (IW2). The February 1997 OS/400 enhancements include support for SPX II.

2.3 Open Data-Link Interface (ODI)

Novell′s ODI standard provides the function of the OSI data link layer. The purpose of the ODI is to allow single or multiple network protocol drivers to use single or multiple adapter drivers. Network protocol drivers, such as IPX/SPX, are written to the ODI standard and are physical media and protocol independent.

2.4 Internetwork Packet Exchange (IPX)

The IPX protocol is a network layer protocol that provides connectionless datagram services on top of the data link protocols such as Ethernet and token-ring. The use of the term connectionless implies that prior to data transmission, no control packets are sent to establish the connection. Information is sent by breaking it into packets and sending each packet with complete source and destination information per packet. No guarantees are made about the successful arrival of the packet (called a datagram); that function must be provided by an upper-layer protocol such as SPX or NCP.

Figure 14 illustrates the structure of an IPX packet.

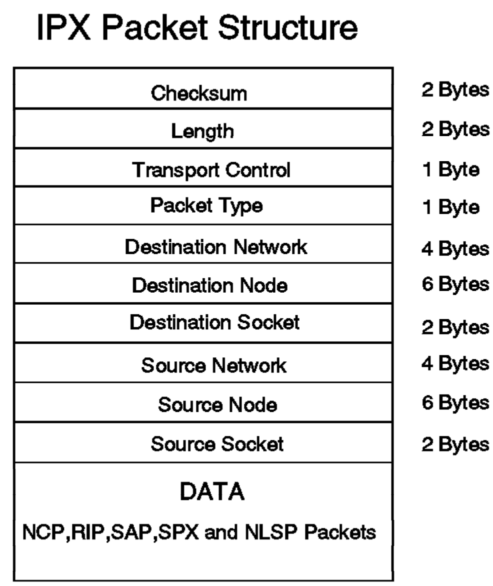

Figure 14. IPX Packet Structure

Checksum The checksum field can be used to place a CRC (Cyclic Redundancy Check) on the header information.

Length The length field represents the length of the IPX packet, including packet header fields but excluding LAN frame fields.

Transport Control The transport control field shows the number of routers that the IPX packet has passed through on its current network trip. This field is also known as the hop count field.

Packet Type The packet type field identifies the type of higher-layer protocol (and therefore packet) that is encapsulated in the IPX packet.

Destination Network The destination network field represents the intended destination network address for the IPX packet.

Destination Node The destination node field represents the specific node (workstation/sever or router) address within the intended destination address for the IPX packet.

Destination Socket The destination socket field represents the type of process within the destination node to which the IPX packet is directed for operation.

Source Network The source network field is the network address from which the IPX packet has been transmitted.

Source Node The source node field is the node (workstation) address within the source network address that has transmitted the packet onto the network.

Source Socket The source socket field identifies the process within the sending node that generated the IPX packet.

The Destination Network, Destination Node and Destination Socket fields uniquely identify a process in the destination node. The same applies for the Source Network, Source Node and Source Socket fields.

The destination network number of an IPX packet is used to determine if the packet should be sent locally or to a local router. All nodes on the same physical network must have the same IPX network number. If the destination network number is the same as the local network number, the IPX packet is sent directly to the destination node. If the destination network is *different* from the local network number, and this is the *first* time an IPX packet is being sent to that network, a route request packet is sent via RIP to determine the route. The reply will contain the network address of a locally attached router capable of reaching the destination network.

2.5 Sequence Packet Exchange (SPX)

The SPX protocol is a transport layer protocol that provides connection-oriented services on top of the connectionless IPX protocol. SPX is used when a reliable virtual-circuit connection is needed between two stations. The SPX protocol takes care of flow control and sequencing issues to ensure that packets arrive in the right order.

Prior to data transmission, SPX control packets are sent to establish a connection, and a connection ID is associated for that virtual circuit. At the end of the data transmission, an explicit control packet is sent to break down the connection. SPX uses an acknowledgment scheme to make sure that packets arrive at the destination. Lost packets are re-sent, and the sequence number field is used to keep track of packets so that they arrive in the correct order and are not duplicated.

2.5.1 Sequence Packet Exchange II (SPX II)

SPX II was introduced by Novell in 1993 to improve performance over a connection-oriented IPX/SPX environment. The main improvements are:

- Larger packet sizes
- Window algorithm for flow control
- Orderly connection release

SPX II has the capability to negotiate larger packet sizes than SPX (SPX is limited to 576 bytes including SPX and IPX header). This is achieved by using additional bits defined in the connection control field of the SPX II packet.

The implementation of a true windowing algorithm improves SPX packet throughput, thus reducing the load on the network. Windowing means that a number of packets may be sent over the network before an acknowledgment must be sent by the receiving station.

SPX II provides a facility that allows a connection to a partner to be released without losing data. This is achieved by both partners negotiating the ″Orderly Release Request″, and only when both partners have transmitted and received all data will the connection be closed. Figure 15 illustrates the structure of an SPX (or SPX II) packet.

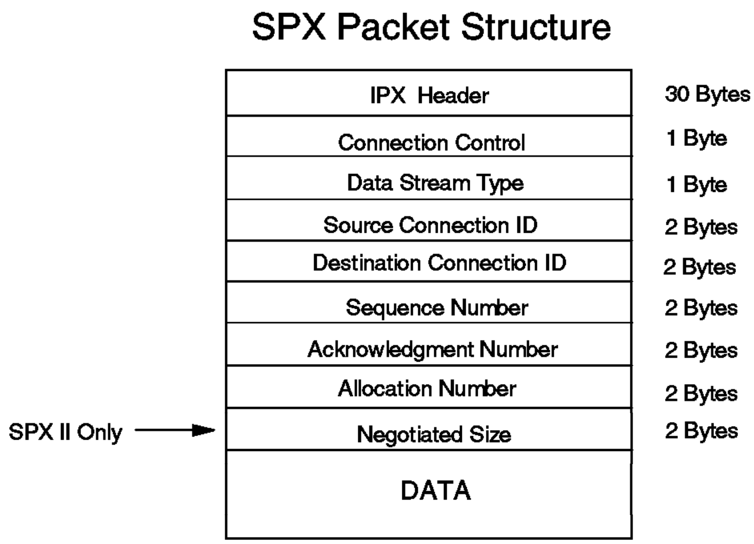

Figure 15. SPX and SPX II Packet Structure

Connection Control The connection control field is used to control the flow of data between the source and destination NetWare nodes. The field indicates whether an acknowledgment is required or whether it is a system packet or end of message.

Data Stream Type The data stream type specifies the type of packet contained within the SPX data field.

Source ID The source ID field contains the specific virtual connection identification for the source node that is controlling the SPX session.

Destination ID The destination ID field contains the actual destination virtual connection identifier for the destination node communicating at the IPX layer.

Sequence Number Although the packets should arrive in sequential order, the sequence number field recovers them in case they don′t arrive in order.

Acknowledgment Number The acknowledgment number field indicates the sequence number of the next packet SPX expects to receive.

Allocation Number The allocation number indicates the number of available packet receive buffers in the destination and source workstation IDs. Flow is controlled through this field.

Negotiated Size This field is present only in SPX II. It indicates the largest packet size that can be received or sent over an established link.

2.6 NetWare Core Protocol (NCP)

The NCP protocol is implemented in both the workstation (client) and the server. In the workstation, NCP is in the NetWare shell and is limited to issuing requests to an NCP server. The NetWare server (NCP server) contains a full implementation of NCP that can execute or process requests for NCP services. Figure 16 illustrates the structure of an NCP packet.

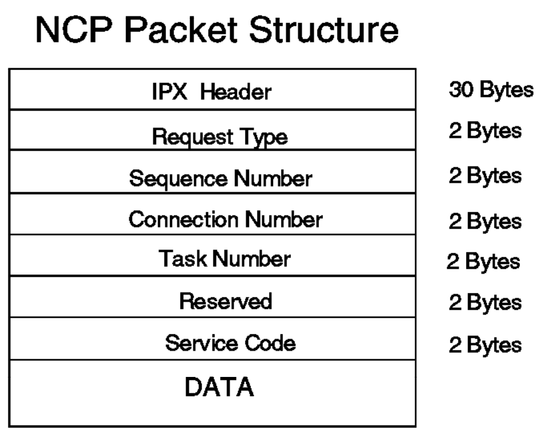

Figure 16. NCP Packet Structure

Request Type Indicates the type of NCP request. Examples of request types are create service connection, logout, and end of Job.

Sequence Number Is used as a transaction ID field and identifies an NCP request and its corresponding response.

Connection Number Is assigned for every session established with a file server. The connection number allows the file server to keep track of clients making requests.

Task Number Indicates what task the workstation is requesting. The file server assigns a task number to each workstation operation.

Service Code Further identifies the request from the workstation.

2.7 Routing Information Protocol (RIP)

IPX uses the routing information protocol (RIP) to exchange routing information on a NetWare internetwork. NetWare routers uses RIP to create and maintain a routing table. The routing table contains information on the networks reachable through the router.

Note: The RIP used by NetWare is different from the RIP used by IP.

The routing table will contain the following information for each network:

- Network number

  The network number is the number of the IPX network that the table entry relates to.

- Number of hops to the network

  The number of hops indicates the number of routers that must be crossed to reach the network.

- Number of ticks to the network

  The number of ticks is an estimate of the time required to reach the network (where one tick is approximately 1/18 of a second).

- Interface through which the network is reached

  The interface indicates through which of the router′s interfaces this network is reachable.

- Address of the next hop router

  The address of the next hop indicates the address of the router that is the next hop to the indicated network.

  Note: If the network is directly connected to this router, this field will be blank.

- Aging timer

  The aging timer is used to ensure that the information kept is current.

To build and maintain the routing table, RIP packets are exchanged between routers.

When the router is first initialized, it will place the network numbers of its directly connected networks into its routing table. It will be then broadcast a RIP packet on each of its directly connected networks to inform routers on those networks of the networks it is making available.

The router will then broadcast a RIP request on each directly connected network, requesting information about all other networks available. All routers on those directly connected networks respond with the information from their routing tables. The router then adds this information to its routing table and broadcasts to the directly connected networks a new RIP packet containing the newly learned information.

Note

The router uses a split-horizon algorithm that prevents it sending information about routes learnt back to the network interface that it learnt those routes from. The algorithm ensures that when a router broadcasts to a locally connected network, it does not include any information about other networks that it received from that locally connected network.

The router will now periodically broadcast RIP packets containing information in its routing table, to its directly connected networks. A configurable parameter, called the RIP update interval, determines the interval between these broadcasts.

The router also broadcasts a RIP packet when it detects a network change, such as when one of its directly connected networks goes down. In this case, the packet informs the other routers that all networks accessible through the failed network are now unreachable. It does this by by setting the hop count for those networks to 16 (a network is considered unreachable if the number of hops is 16).

A RIP packet will also be sent, informing the other routers that a network is unreachable, when the aging timer for the network expires. The timer expires if the router has not received any information for that network in a specified time.

In addition to the above, RIP is also used between a Novell client and routers in the network. For example, the client will use RIP to locate a route to a server.

Figure 17 illustrates the structure of a RIP packet.

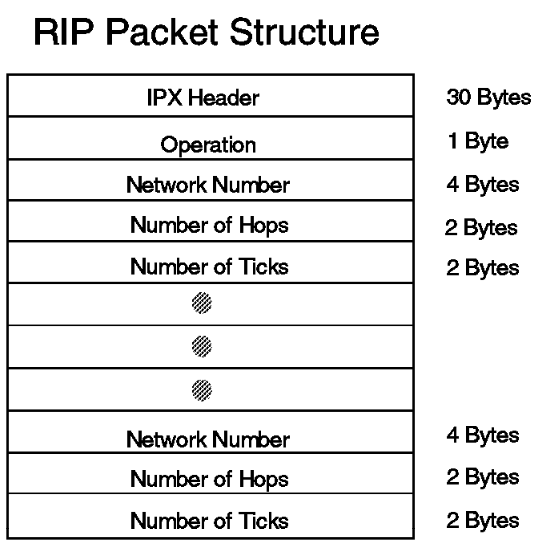

Figure 17. RIP Packet Structure

Operation This field indicates whether the packet is a request (1) or a response (2).

Network Number This field indicates the network number reached via this RIP entry.

Number of Hops This field indicates the number of routers that must be passed to reach this network.

Number of Ticks A tick is a measurement of time (1/18 of a second equals one tick) and indicates how long it would take for a packet to reach this network.

Hops and ticks are used for route selection. The route with the least number of hops is chosen. If two routes have the same number of hops, the route with the least ticks is chosen.

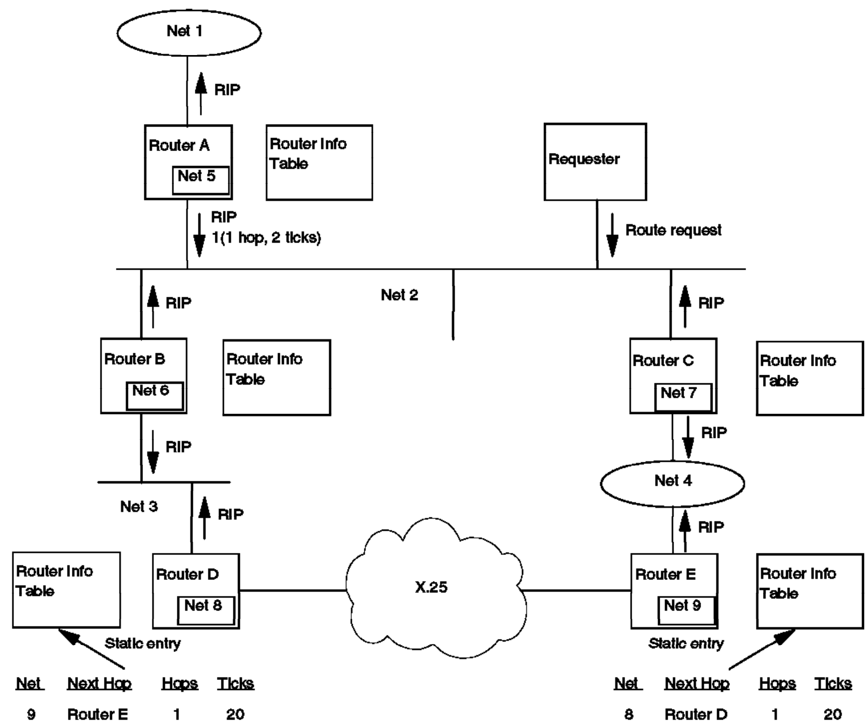

Figure 18. RIP Table Update

Figure 18 shows the following:

Router A sending a RIP broadcast indicating that it has a connection to Network 1, that the network is one hop away (via itself), and that the tick count is two.

Router D has a *static* route to Network 9 via the on demand X.25 link. On demand means the link is established only when there is data to send.

Router E has the reverse of router D.

RIP broadcasts do not pass through routers. They are used to calculate the routers RIP table. This table is then broadcast at the router's next RIP broadcast interval. The information is broadcast to all connected networks.

An alternative to using RIP would be to implement NLSP (NetWare Link State Protocol). NLSP is an improvement over RIP in that it does not need to broadcast its routing table every 60 seconds. See 2.10, "NetWare Link Services Protocol (NLSP)" on page 30 for an overview of NLSP.

To prevent the on-demand link being brought up every time (60 seconds) when router D or E need to do a RIP broadcast, RIP is disabled on these ports and a static route is created manually. A static route is an entry in the router′s routing table that has been manually defined by the network administrator. The static route must define the next hop (router) needed to obtain access to a specific IPX network. A static route is not sent out as part of a RIP or NLSP packet. The static route table entry in router E would be similar to that shown in Table 1.

Table 1. Static Route Example from Router E

Interface	Remote Network	Next Hop	Number of Hops	Number of Ticks
X.25	8	Router D	1	20

The dynamic route table entries in router D would be similar to the those shown in Table 2

Table 2. RIP Table from Router D

Network Number	Next Hop	Hops to Network	Ticks to Network
3	None	0	1
2	Router B	2	3
1	Router B	4	6
4	Router B	4	7

Note: The above table is an example only. There are other fields that can appear in the routing table, including NIC (network interface card), aging timer, etc.

Network Number, Number of Hops and Number of Ticks: These are learned by the router if it is participating in RIP or NLSP exchanges with other routers. In a static environment they will have to be manually defined. Because router D is participating in RIP exchanges with the other routers, all the entries in this RIP table have been learned.

2.8 Service Advertising Protocol (SAP)

IPX uses the Service Advertising Protocol (SAP) to exchange information about available services on the network. Service-providing nodes, such as file servers and print server, use SAP to advertise their services and addresses. Routers use SAP to create and maintain a database of services available on the internetwork. This allows clients to determine what services are available, and to obtain the addresses of the servers where they can access those services. This is important, as clients cannot access a file server unless they know the server′s address.

The database maintained by the router is commonly called the Server Information Table. It contains the following information for each server:

- Server name

The server name is the name assigned to the server.

- Server address

  The server address is a combination of network address, the node address and the socket address for the server.

- Server type

  The server type indicates the type of server this entry represents.

- Hops to server

  The hops to server indicates the number of routers that must be crossed to reach the server.

- Interface through which the information was received

  The router interface through which this SAP information was received.

- Aging timer

  The aging timer is used to ensure that the information kept is current.

To build and maintain the server information tables, SAP packets are exchanged between router and servers.

When a router is first initialized, it broadcasts a general SAP request on all of its directly connected networks, requesting information about available servers on the internetwork. SAP agents on those directly connected networks will respond with information about the services available, and the router will place that information in its server information table. The router then sends a SAP packet to its directly connected networks, containing the newly learned information.

The router will now periodically broadcast SAP packets containing all the information in its server information table to its directly connected networks. A configurable parameter, called the SAP update interval, determines the interval between these broadcasts.

The router will also broadcast a SAP packet when it detects a network change, such as one of its directly connected networks going down. In this case, the packet informs the other routers that all servers accessible through the failed network are now unreachable. It does this by setting the hop count for those servers to 16.

When a router receives a SAP packet indicating a network change, it will update its server information table and it will inform other routers on its directly connected networks of the changes.

A SAP packet will also be sent, informing other routers that a server is unreachable, when the aging timer for the server expires. The timer expires if the router has not received any information for that server in a specified time.

In addition to the above, SAP is also used between a Novell client and a Novell server. For example, the client will locate a server via a SAP get-nearest-server request.

Figure 19 illustrates the structure of a SAP packet.

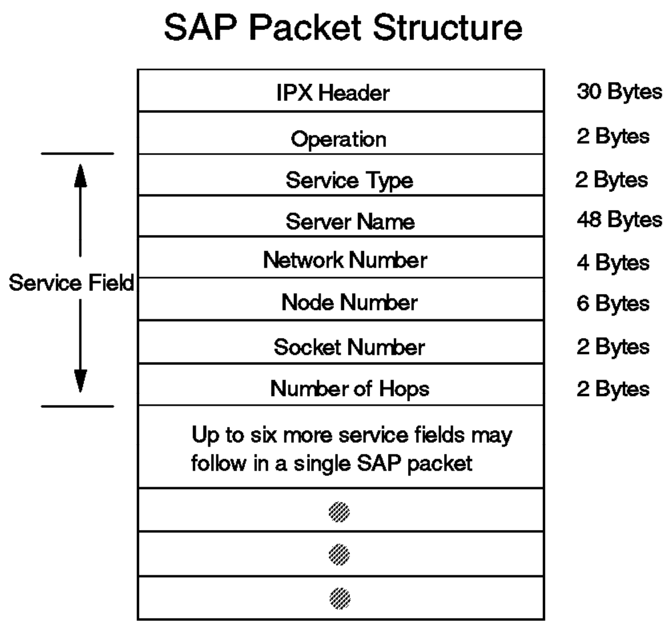

Figure 19. SAP Packet Structure

Operation packet type
: This field indicates whether the packet is a get nearest server request (3), get nearest server response (4), standard server request (1) or a standard server response (2).

Service Type
: The service type field identifies the type of server. The service type can be file server, specific job server, print server or backup server.

Server Name
: This field contains the name of the server.

Network Number
: The network number field indicates the network on which the server is located.

Node Number
: The node number field indicates the specific node of the server.

Socket Number
: The socket number identifies the server process on the node.

Number of Hops
: The number of routers that must be passed through to reach the server.

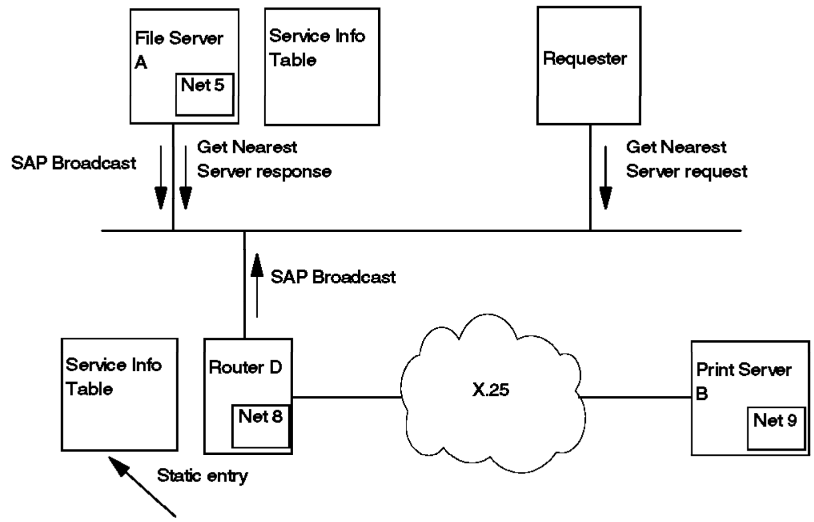

Figure 20. SAP Broadcasting

The above diagram shows a requester starting to establish a connection to a server. The requester sends a ″Get Nearest Server″ request in a SAP packet with a broadcast IPX node number of FFFFFFFFFFFF. The server responds to this request with a get nearest server response and provides the IPX network number and the IPX node number of the nearest server in the response. SAP packets are also used to build the service information tables. An example of a service information table is as shown in Table 3.

Table 3. An Example of a Service Information Table

Server Name	**Server Address (Net:Node:Socket)**	**Server Type**	**Hops to Server**
File Server A	XXXXXXXX:000000000001:0451	4	2
Print Server B	XXXXXXXX:000000000001:8060	6	4

Notes:

1. XXXXXXXX is the internal IPX network number of the server/router. Like all IPX network numbers, it is 4 bytes long.
2. The above table is an example only. There are other fields that can appear in the service table, including NIC (network interface card), aging timer, etc.

The Server Address field is made up of three parts: the server′s internal network number (XXXXXXXX), the node address (000000000001) and the socket number. The socket number defines the higher-layer protocol to which the packet should be passed. In the case of the file server, socket number 0451 addresses the higher-layer NCP protocol. Some well-known socket numbers are:

0451 NCP

8046 VMS

805A SQL

8060 Print Server

8104 Remote Console

2.9 Get Nearest Server Request Handling

As part of the login sequence, a NetWare client will issue a get nearest server request SAP broadcast.

When a router receives a get nearest server request, it should first check to see if any servers of the type requested reside on the same network as the requesting station. If that is the case, then the router should not respond to the get nearest server request as the server will do so itself. If no server exists locally to the requester, then the router should respond with the nearest server of type requested. The criteria used to determine the nearest server are:

1. Select the server with the best route as determined by the routing table.
2. If multiple servers exist with equally good routes, select the server that also has the least number of hops as determined from the server information table.

See 4.6, “NetWare Login Sequence” on page 54 for further information on the NetWare login sequence.

2.10 NetWare Link Services Protocol (NLSP)

This section gives an overview of Novell′s NLSP. We do not discuss the technicalities of NLSP in great depth. For more details please refer to *NLSP Specifications V1.0*, available from Novell Netwire

NLSP is Novell′s link-state routing protocol for IPX, which has been developed to address the limitations of RIP and SAP. Unlike the RIP and SAP protocols, NLSP does not send out broadcast messages every 60 seconds (a broadcast is sent only when a change in the network is detected). This reduction of broadcasts may not be significantly noticed in a pure LAN environment, but in a complex LAN/WAN environment this can result in a substantial reduction in network overhead.

Because NLSP is downwardly compatible, NLSP can co-exist in the same network with RIP and SAP. This allows for a smooth migration from a RIP/SAP network to an NLSP network. NLSP is available on Version 3.11 networks and above.

For those familiar with routing in TCP/IP, NLSP can be roughly compared to OSPF. NLSP is based on the OSI IS-IS (Intermediate System to Intermediate System) link state routing protocol.

NLSP uses terms unique to link state routing. Some of these terms are:

Adjacency - A router′s immediate neighbor.

Area - A collection of networks all having the same area address.

Designated Router (DR) - A router that is elected to represent all other routers on a LAN segment.

Domain - In NLSP sometimes referred to as a routing domain; a collection of areas connected by level 2 routers.

Level 1 Routing - The interaction of routers within the same area.

Level 2 Routing - Routing between areas to form a routing domain controlled by a single administrative entity.

Level 3 Routing - Routing between routing domains controlled by different administrative entities (communications between different companies).

Link - The physical connection between two adjacent routers.

Link State Packet (LSP) - A packet that lists the router′s neighbors and attached networks.

NLSP and its predecessor RIP/SAP have three main tasks:

1. Learn routes and services
2. Route selection
3. Maintaining route and services information

2.10.1 Learning Routes in NLSP

When an NLSP router starts and enters a network, it must learn about the network before it can forward packets. NLSP achieves this in various steps:

- Learning Neighbors (adjacent).

  The NLSP router when starting up learns about other NLSP routers by exchanging HELLO packets with its neighbors. It will then periodically exchange HELLO packets to ensure each router′s adjacency database is accurate. The adjacency database includes the following information:

  – System Identification (ID).

    This is a number that includes the internal IPX address of the source router.

  – Priority.

    The priority is a value used by routers to select who the designated router (DR) will be (discussed later).

  – MAC Address.

    The adjacent router′s MAC address.

  – Holding Time.

    How long before expecting another HELLO packet from the adjacent router. If a packet does not arrive from that router within the holding time, consider that router ″not available″.

- Electing a Designated Router.

  Each LAN in an NLSP network will have its own designated router (DR). The DR is elected using the priority value that is included in the HELLO packet. The router with the highest value becomes the DR. If there is more than one router with this value, then the router with the highest MAC address becomes the DR.

  The DR has special responsibilities in the network, so selecting the most reliable and powerful router is recommended. The DR responsibilities include:

- Creating a pseudonode
- Managing the database synchronization process
- Receiving and translating information from RIP/SAP routers

Creating a Psuedonode: Once each router has created its adjacency database and the DR has been elected, the routers must then create their *link state databases*. The link state database is a router's view of the network topology. As all the routers in an NLSP network must have an identical link state database and to reduce the size of the LSP packets, the DR creates a psuedonode. The psuedonode is a fictitious node that all routers on the network connect to. Using the psuedonode, each of the routers represents itself as being directly connected only to the pseudonode. The pseudonode then represents itself as being connected to all the routers on the LAN.

Once a router adds an entry to its link state packet representing its connection to the psuedonode, it is ready to exchange this information with all routers in the network. To exchange link state information, each router sends LSPs.

An LSP includes information about the links a router is connected to, the services that the router offers, and management information. The pseudonode also exchanges LSPs with information about other services on the network, such as printers.

Once all routers have finished exchanging LSPs, each router should have an identical link state database. Using the entries in the link state database, each router is able to build a map, or graph structure, of the entire network.

2.10.2 Route Selection

When the router has a map of the network, it is ready to select the best route to a given network. NLSP routers keep routing information in a forwarding database. This database serves the same function as the RIP routing table and has the following characteristics:

- The forwarding database is the result of a calculation made on the link state database.
- It is kept separate from the link state database.
- Route selection is based on calculating a cost metric, not hops or ticks. Cost is a number assigned to each interface. The best route is defined as the route with the lowest cost.

2.10.3 Maintaining Route and Service Information

The DR is responsible for verifying that the routers it represents are synchronized with the same link state database. To achieve this the DR sends out a Complete Sequence Number Packet (CSNP). This packet contains a summary of all the entries the DR has in its link state database.

Upon receipt of the CSNP, a router compares it with its own link state database. If there is an entry in the CSNP that the router does not have, or a newer entry, the router sends a partial sequence number packet (PS NP) back to the DR requesting the new information. When the DR receives this packet, it then broadcasts an LSP that contains the new information.

If the information in the CSNP is the same as the router′s link state database, then the router does nothing. If some of the information in the CSNP is older than the routers, the router marks the LSPs and broadcasts them.

2.10.4 A Summary of Distance Vector and Link State Routing

NLSP is a link state protocol whereas RIP is a distance vector protocol. Table 4 provides a comparison between these two routing methods.

Table 4. Comparison of Distance Vector and Link State Routing

Distance Vector	Link State
Learning Routes	
Upon startup, router sends request for routes.	Upon startup, router sends discovery (hello) packet to neighbors.
Router receives the entire routing table from each directly connected neighbors and builds its own routing table.	Router receives route information from every router in the network and builds its own routing table.
Selecting Routes	
The criteria used to select the best path is distance. To determine distance, a metric based on ticks is used. A tick refers to 1/18th of a second.	The criteria used to select the best path is a numeric value referred to as a cost. A cost is assigned to each router interface. The costs are totaled to determine the distance from one network to another. The path with the lowest cost is considered the best path.
Maintaining Routes	
When a router learns of a change, it updates its routing table and forwards it′s entire table at a periodic interval.	When a router learns of a change it broadcasts the change to all routers in the network, then it adds the change to its table.
To make certain that all routers have the same information, each router regularly forwards its entire routing table to its immediate neighbors. Since each router shares its information with its neighbor each router receives second hand information.	Any time a router learns of a change, it forwards the change to all routers in the network. This results in each router receiving firsthand information from the source router detecting the change.

2.10.5 NLSP Packet Structure

Figure 21 illustrates the structure of an NLSP packet.

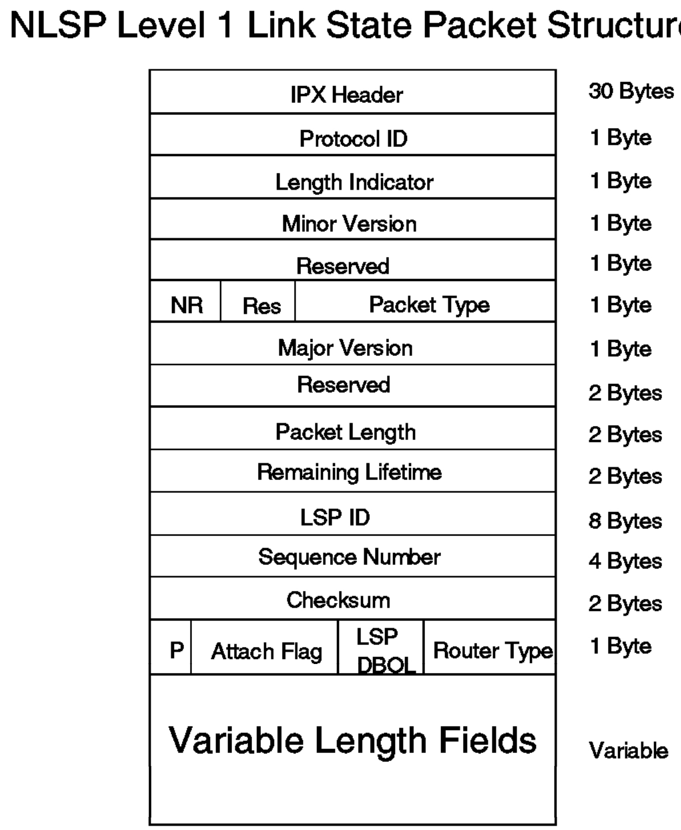

Figure 21. NLSP Level 1 Link State Packet Structure

Protocol ID This equals Hex 83, which identifies the NLSP routing layer.

Length Indicator The number of bytes in the fixed portion of the header (up to and including the router type field).

Minor Version Equals ″1″

N.R. Non-routing Server (1 bit) When this field contains ″1″, the system has more than one network interface, but does not forward traffic from one network segment to the other.

Res (2 bits) Ignored on receipt.

Packet Type (5 bits) Set to 18.

Major Version Equals ″1″

Packet Length The entire length of the packet in bytes including the fixed portion of the NLSP header.

Remaining Lifetime
The number of seconds before this LSP is considered to expire.

LSP ID
This field is in three parts:

- Source ID.

  The system ID of the router that originated the LSP (6 bytes).

- Pseudonode ID.

  Is a unique (for this source ID) number designating this pseudonode. If zero, this is a non-pseudonode LSP (1 byte).

- LSP Number.

  If an LSP is too large to send, the source fragments the packet and assigns numbers in an ascending order (1 byte).

Sequence Number
The sequence number of the entire LSP.

Checksum
The checksum of the LSP contents from the source ID (first part of the LSP ID) to the end.

P (1 bit)
Set to zero to indicate that this router does not support partition repair.

Attached Flag (4 bits)
Indicates whether this router can provide a path to other routing areas:

- Zero means no other routing areas can be reached.
- One means, yes, other routing areas can be reached.
- Other values are reserved.

LSPDBOL (1 bit)
Set to "1" when the LSP database is overloaded.

Router Type
Level 1 router equals "1", level 2 router equals "2" and level 3 router equals "3". All other values are reserved.

Variable Length Fields
A series of optional fields. The contents of the most important ones are as follows.

Management Information: Figure 22 illustrates the NLSP variable field management information. These fields contain information about the router that originated the LSP.

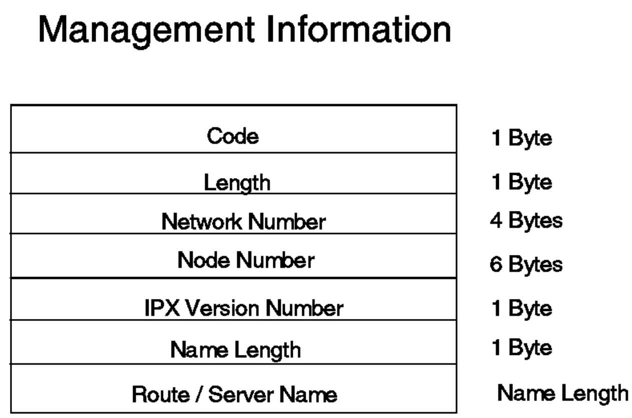

Figure 22. NLSP Management Information Packet Structure

Code
: This equals Hex C1 for management information.

Length
: Length of management information.

Network Number
: The internal IPX network number of the router generating the LSP (Link State Packet).

Node Number
: The internal IPX node number of the router generating the LSP.

IPX Version
: The IPX version number = ″1″.

Name Length
: Length of the router/server name field. Zero if none is present.

Router/Server Name
: The name identifying the router originating the LSP.

Link Information: Figure 23 illustrates the NLSP variable field link information. This field may have several occurrences, once for each link.

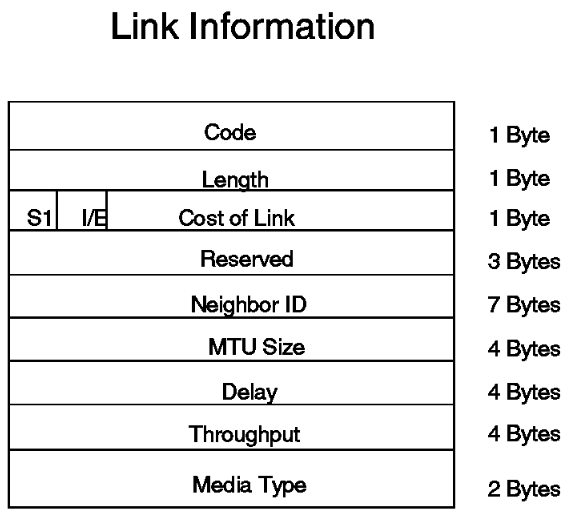

Figure 23. NLSP Link Information Packet Structure

Code This equals Hex C2 for link information.

Length Length of link information.

S1 (1 bit) Equals zero if cost is present.

I/E (1 bit) Internal/External. If zero indicates that the cost is an internal metric.

Cost of link The cost of the link to the listed neighbor.

Neighbor ID The neighboring routers system ID plus one byte of zeros.

MTU Size The maximum number of bytes that can be transmitted on this link by the originating router. This includes the IPX header but not the data link headers.

Delay The time (in microseconds) it takes to transmit one byte of data (excluding protocol headers) to a destination.

Throughput The amount of data (in bits) that can flow through the media and be received at the other side in one second, if there is no other traffic using the interface.

Media Type A code identifying the type of circuit. The most significant bit is one for WAN media and zero for all others.

Services Information: Figure 24 illustrates the NLSP variable field services information. This field may have several occurrences, once for each service being advertised via the SAP protocol.

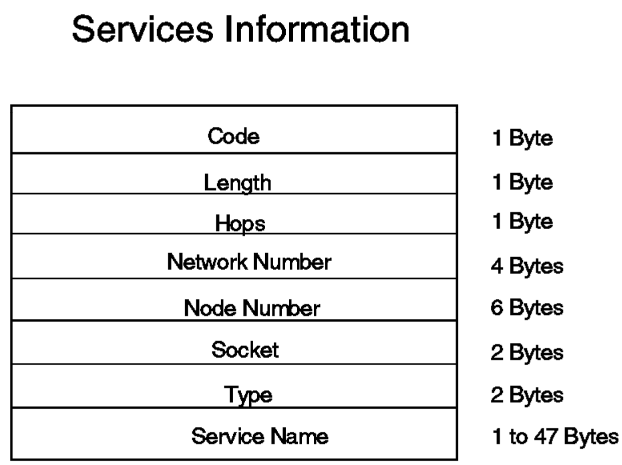

Figure 24. NLSP Service Information Packet Structure

Code
This equals Hex C3 for services information.

Length
Can be between 16 to 62 bytes.

Hops
The number of hops to reach the service.

Network Number, Node Number and Socket
The IPX network address where the service is available.

Type
The type of service available.

Service Name
The name of the service, the length of this field is determined by the type of service.

2.11 CSNP (Complete Sequence Number Packet)

A CSNP packet is sent periodically to NLSP routers on a LAN. Figure 25 illustrates the structure of a CSNP packet.

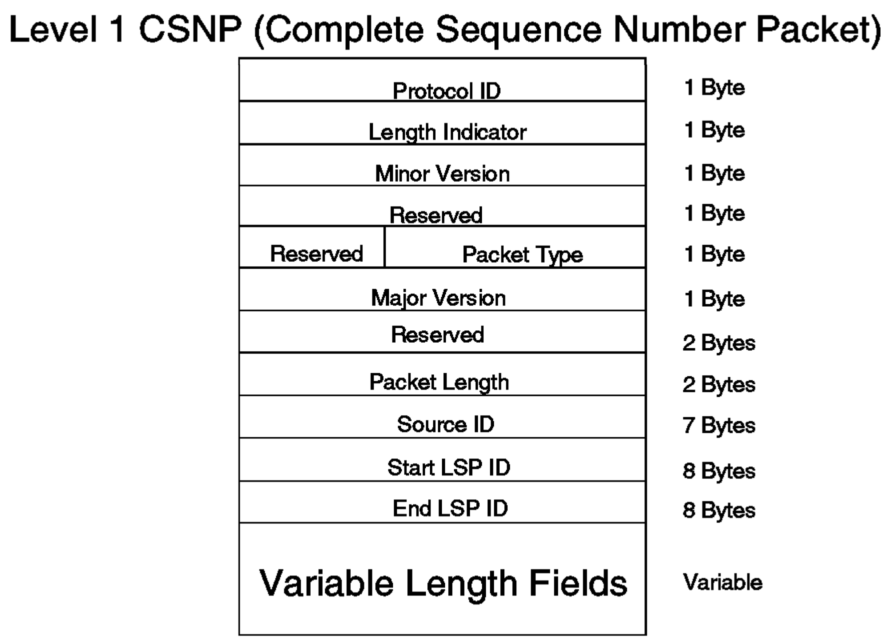

Figure 25. CSNP Packet Structure

Protocol ID	This equals Hex 83 for a CSNP packet.
Length Indicator	Number of bytes in the fixed portion up to and including the END LSP ID field.
Minor Version	Set to ″1″.
Reserved	Set to ″0″.
Reserved (3 bits)	Set to″0″.
Packet Type (5 bits)	Set to ″24″.
Major Version	Set to ″1″.
Reserved	Set to ″0″ (ignored on receipt).
Packet Length	Complete length of the packet including the fixed portion.
Source ID	The six byte system ID of the sending router followed by one byte of zero.
Start LSP ID/End LSP ID	The first and last LSPs in the range covered by this CSNP. Each is composed of three parts: • Source ID.

The system ID of the router originating the LSP (six Bytes).

- Pseudonode ID.

  Zero if this is a non-psuedonode LSP. Otherwise it is a unique number for the above source ID designating this psuedonode (one byte).

- LSP Number.

  If the LSP has been fragmented by the sender, then this identifies the sequential part of the LSP (one byte).

Variable Length Fields A series of optional fields, each of which have the following parts:

- Code. Equals ″9″ (one byte).
- Length. Variable
- Value. A list of LSP entries sorted in ascending order.

2.12 LSP (Link State Protocol) Entries

A LSP packet is used to notify the NSLP routers of a change in the network. Figure 26 illustrates the structure of an LSP entry.

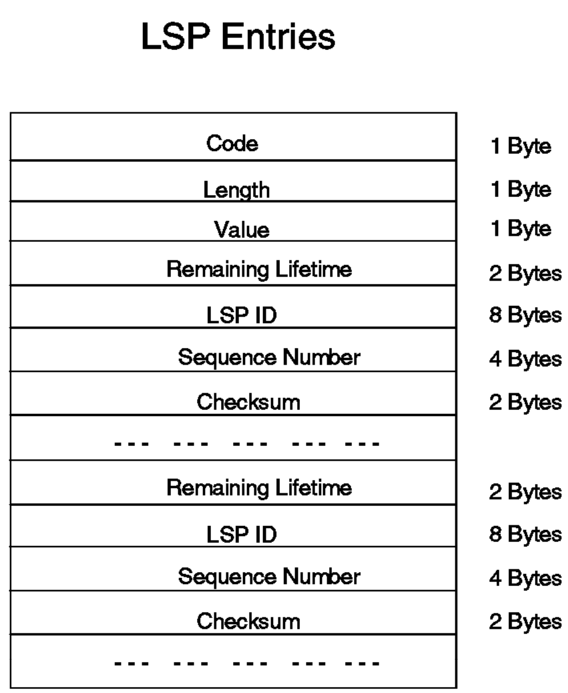

Figure 26. LSP Entries

Code: This equals Hex 09.

Length: This equals 16 times the number of following LSP entries.

Value: A list of LSP entries sorted by LSP ID.

Remaining Lifetime: The number of seconds before the LSP expires.

LSP ID: Uniquely identifies the LSP.

Sequence Number: The sequence number of the LSP.

Checksum: The checksum reported in the indicated LSP.

2.13 IPX WAN

The IPXWAN is a protocol used to exchange necessary information between routers prior to exchanging standard IPX routing information over serial links.

Every IPXWAN router has a primary network number. This is an IPX network number that uniquely identifies the router within the internetwork.

Every IPXWAN router also has a router name. This is a symbolic name for the router. It is useful for network management, as it identifies the router more easily.

An IPXWAN link has the concept of link master and a link slave. The roles of master and slave are decided upon when the IPXWAN connection is established.

To initiate the IPXWAN connection, both routers start to send timer request packets. This is started as soon as the link has been established. They will continue to send timer request packets at 20-second intervals until a response is received or a timeout occurs. The timeout is a configurable value and should allow sufficient time for the call setup. If the timeout does occur, the router should issue a disconnect and retry the link at a later time. The delay between issuing the disconnect and retrying is also configurable.

When a router receives the timer request, the router with the lowest primary network number must reply with a timer response. (The timer request packet contains the primary network number of the sender.) By sending response, this router will become the slave.

The master becomes responsible for defining the IPX network number that is to be used for the serial link between the routers, and for calculating the RIP transport time that is to be advertised in RIP packets.

The master now sends an information request packet containing the network number, the transport time and its router name to the slave. The slave replies with the information response packet, containing the same information, replacing the primary network number and router name with its own.

Once the information request has been received by the slave, and the information response has been received by the master, normal IPX, RIP and SAP can be exchanged.

2.14 IPX WAN Version 2 (IW2)

As its name implies, IW2 is the successor to the IPX WAN protocol. IPX WAN specified how to route RIP and SAP protocols over a PPP or X.25 link. IW2 adds additional routing protocols, NLSP, Unnumbered RIP, on-demand, and client-router. Two additional media types are also included, frame relay and IP relay. Figure 27 illustrates the structure of an IW2 packet.

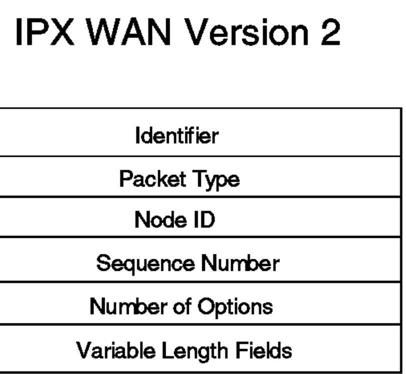

Figure 27. IPX WAN Version 2

Identifier A value of Hex 5741534D indicates a packet from the IPX WAN protocol.

Packet Type Identifies a specific type of IW2 packet:

- 0 = timer request
- 1 = timer response
- 2 = information request
- 3 = information response
- 4 = throughput request
- 5 = throughput response
- 6 = delay request
- 7 = delay response
- FF = NAK

Node ID The internal network number of the sending router. Unless this is a timer request packet, then the following exceptions can occur:

- If a client is initially connecting, then this field is set to zero.
- If a client is reconnecting to a router, then this field is set to all ones.
- If the router cannot assign a network number to the link, then this field is set to

zero and the internal network number is placed in the Extended Node ID option.

Sequence Number
This field starts with zero for each request packet type and then increments by one for each retry of that packet type.

Number of Options
Indicates how many options are present in the variable length fields.

Variable Length Fields
A series of optional fields to exchange the following types of information:

- Routing Type.

  RIP, NLSP, Unnumbered RIP, static routing and client router connection.
- RIP/SAP information exchange
- NLSP Information
- NLSP Raw Data
- Extended Node ID
- Node Number
- Compression

2.15 Error and Echo Protocols

The error protocol is used for internal error handling and maintenance. For example, if an application sends an IPX packet to a destination and that destination is unreachable at that time, an error packet will be returned.

The echo protocol is used if an application needs to test connectivity to a specific node. If a node receives an echo packet, it will simply return it to the sending address.

Chapter 3. Novell′s Multiprotocol Router

The NetWare Multiprotocol Router (MPR) V3 products provide both multiprotocol routing and source route bridging services using standard PC-compatible hardware. This allows systems on separate LAN segments to communicate even when the LAN types are dissimilar. It routes IPX, IP and Appletalk using the following data-link protocols: Ethernet, Fast Ethernet, token-ring, Arcnet, local talk and FDDI. It also supports source route bridging for token-ring segments. NetWare Link/PPP is included as standard and is Novell′s implementation of the IETF (Internet Engineering Task Force) Point-to-Point Protocol (PPP). This enables point-to-point high-speed transmission of data over synchronous dedicated communications media (leased lines) or asynchronous/synchronous switched communications media at speeds up to E1 (2048 Mbps).

Novell′s MPR can be installed on an existing 3.12 or 4.X server, but careful consideration must be given to the impact of installing MPR on an existing server. The *MPR Installation and Basic Configuration Guide* details the software and hardware requirements, but don′t forget the possible impact on users of the server. If the server is already heavily loaded, then installing MPR on a dedicated PC is preferable, to allow this MPR comes with a 3.12 and 4.1 runtime (two-user) license. This allows the customer to create a dedicated server and then install MPR on that server.

MPR comprises two base products and two optional add-on products.

3.1.1 MPR Base Products

Both of the base products can provide all of the above connectivity and protocol options. The only differences are:

NetWare Enterprise Router V3.0 software is intended to be installed for corporate-wide networks. This software can be used to connect an unlimited number of LANs (depending on the slots available in the PC) and can have up to 16 WAN connections.

NetWare BranchLink Router is intended to be installed in the remote branch office. This software can support an unlimited number of LANs (again depending on the number of slots available) and up to two WAN connections.

3.1.2 MPR Additional Add-on Products

WAN Extensions V3.0 An optional feature that is installed on top of one of the base products to allow access to X.25 and frame relay Networks. WAN Extensions consists of two software components: NetWare Link/X.25 and NetWare Link/Frame Relay.

SNA Extensions V3.0 This optional package provides IPX, IP and Appletalk routing over an SNA network and connectivity for SNA and NetWare devices over an IP or IPX network. SNA Extensions also consists of two software components: NetWare Link/SNA and NetWare/DLSw.

Chapter 4. Novell NetWare Networks

In this chapter we look at the structure of a Novell NetWare network. We start with a simple network, then look at more complex examples. We also have a look (via some simple traces) at the sequence of events that leads up to the session establishment between a client and a Novell server.

4.1 Introduction

A Novell NetWare network comprises a server or servers sharing resources with a collection of clients. NetWare servers are memory intensive. A server would therefore normally be a quite substantially sized PC, not only in processing power but also in disk and memory capacity.

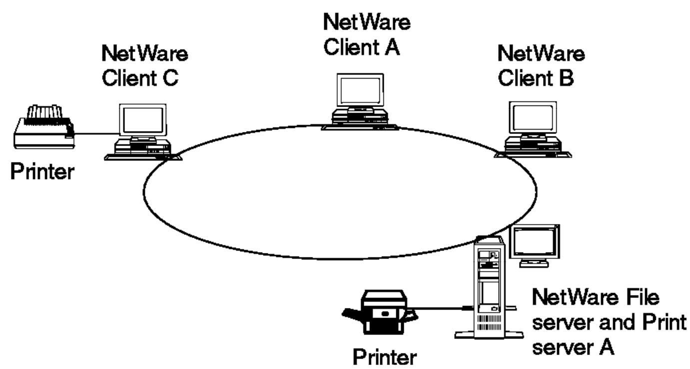

Figure 28. Novell Server and Clients

Novell NetWare is a LAN based network operating system. Traditionally its strengths have been in file and print sharing, although it can also be used as an application or database server. A Novell NetWare network comprises a collection of clients (workstations) and either a server or servers. The client base can be DOS, OS/2, Windows, Windows 95 , Macintosh, UNIX or Windows NT. The server needs some form of operating system to initially load the Novell NetWare operating system (sometimes abbreviated to NOS). These platforms are DOS, OS/2 and UNIX.

As mentioned in Chapter 2, "The NetWare Protocol Stack" on page 17, Novell networking is based around IPX packets transporting the various upper-layer protocols. As we saw in Chapter 2, "The NetWare Protocol Stack" on page 17, each IPX packet contains a three-part address (network number, node number and a socket number).

Why do we need an IPX address?

In Novell networks, clients and servers communicate with each other at the IPX packet level. This is a connectionless protocol so each packet must contain all the necessary information to enable the packet to be delivered. To allow connectivity, each client or server must have a unique address on the network. This address is made up of three parts:

Network This defines a logical LAN segment in the network.

Node This defines the device within the specific network.

Socket Is an application entry or exit point on this node.

As we will not be investigating how applications are used, for the remainder of this chapter we mainly concentrate on the node and network portions of the IPX network address.

Every server/router has at least two IPX network numbers, an internal number and an external number, on the IPX network. The internal number must be different from other internal and external network numbers. Internal network numbers were introduced in NetWare 3.0 to overcome routing problems encountered in previous releases of NetWare. The external number is linked to the Network Interface Card (NIC) when the server/router system is loaded. Unlike the internal number, this number must be the same on all servers/routers connected at the data link (layer 2) or lower of the OSI model. These include the following:

- Servers/routers on the same physical LAN segment.
- Servers/routers connected by LAN repeaters (mainly Ethernet).
- Servers/routers on the same logical LAN segment such as:
  - Servers/routers connected by local bridges.
  - Servers/routers connected by split bridges.

The internal network number defines a logical internal network that uniquely identifies the NCP processor in a particular server. This processor is the heart of the server and is used for all file/print service requests.

The external network number identifies a logical network to which a group of stations can be attached. Both the internal and external network numbers are primarily used for routing the IPX packets. The server/router will have an internal table showing how to reach the various networks.

If there is a requirement for the IPX network to be connected to another company′s IPX or an IPX internetwork the network numbers used must be unique. To ensure that all the network numbers are unique, Novell provides a registry service. See 5.2.1.1, “Register IPX Network Number” on page 60 for more information.

4.2 Single LAN Novell NetWare Network

First let′s first look at a very simple Novell NetWare network where all the devices are connected to a single physical LAN segment.

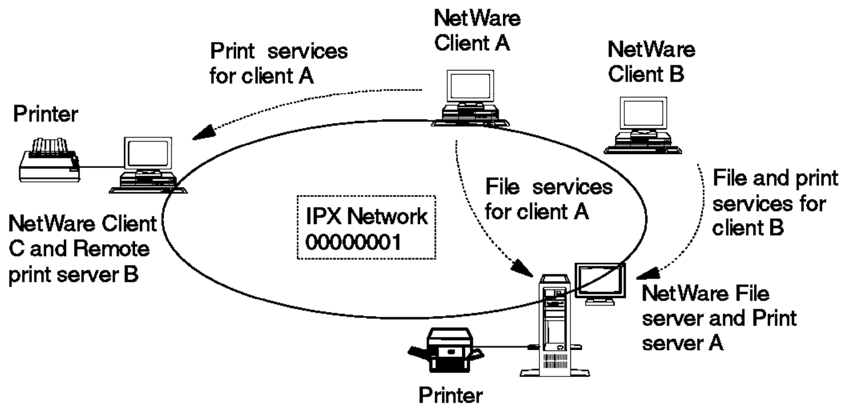

Figure 29. Single LAN NetWare Network

This is probably still the most common Novell NetWare environment and is suitable where there is no requirement for remote access to the Novell server.

In the above environment the NetWare server is providing file server services for all the clients and print server services for client B. Client C is providing remote printer services for client A.

In the above single-segment network, all the devices would use the same external network number. The NetWare servers would also have internal network numbers. These would be different from each other and different from the external network number.

In the above network, NetWare file server A may, for example, have the IPX network addresses shown in Table 5.

Table 5. Single IPX Server

Server Name	Internal Network Number	External LAN Network Number	Node Number
Server A	C024E800	00000001	4000E2BB0003

Server Name This is configured when the server network operating software is installed. This name should be something meaningful, for example the company name, department name, etc.

Internal Network Number This is also configured during installation. This number can be manually decided or be randomly generated by the installation process.

External Network Number This *must* be manually entered, and care taken to ensure it matches any previously generated external network numbers on the same LAN segment.

Node Number This defaults to the MAC address of the device.

4.3 A Bridged Novell NetWare Network

In the above example the network was comprised of a single LAN segment. In this example we look at a bridged network example. The bridge provides the connection between two LAN segments.

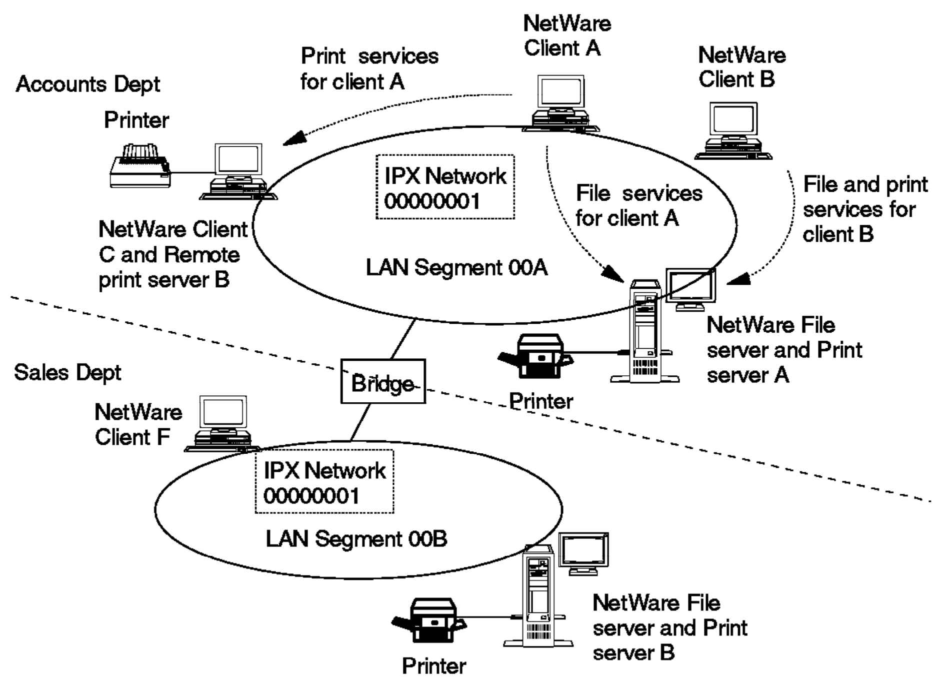

Figure 30. Bridged LAN NetWare Network

In this bridged network there are two servers, one in LAN segment 00A and the other in LAN segment 00B. All clients in both departments require access to both servers. As this is a *Bridged* LAN, both servers must use the same external IPX network number, but have unique internal IPX network numbers.

In the above network, the NetWare servers may, for example, have the IPX network addresses shown in Table 6.

Table 6. Multiple IPX Servers

Server	**Internal Network Number**	**External LAN Network Number**	**Node Number**
Server A	C024E800	00000001	4000E2BB0003
Server B	E21BA661	00000001	4000E2C10001

4.4 LAN/WAN Novell NetWare Network

Now let′s look at a network where two LAN segments are remote from each other but are connected via a wide area network (WAN) to allow users at one location to access NetWare resources at the other.

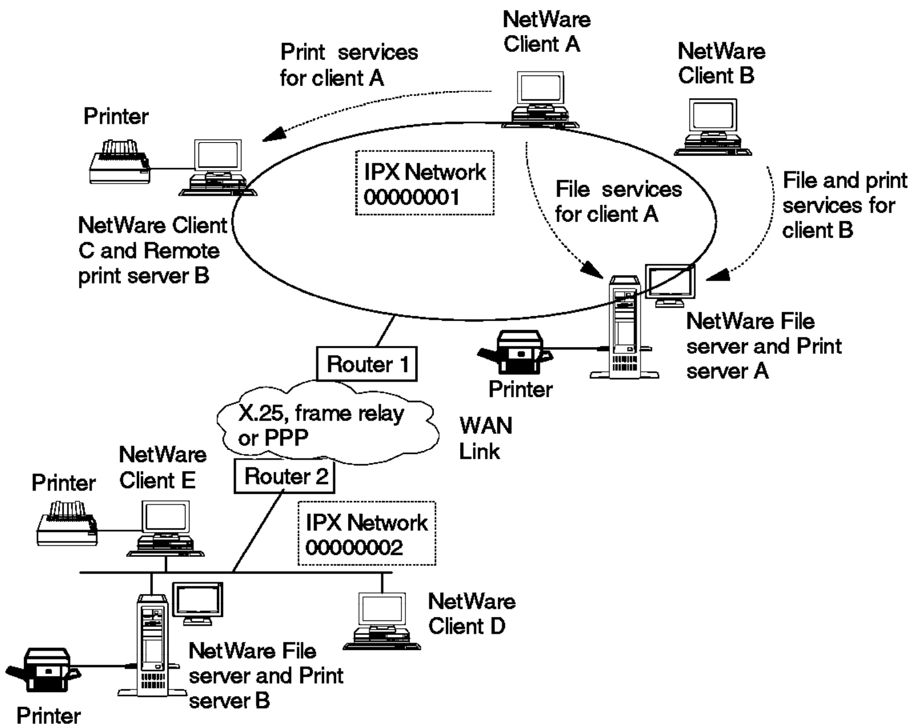

Figure 31. LAN/WAN NetWare Network

In this network, we have a single remote site requiring access to the host site. This may be for a variety of reasons, for example:

- Remote access to the AS/400 (host) for interactive sessions.
- Remote access to the host site Novell NetWare server.

In this network, we are using IPX routers for the link to the remote site. One of the main reasons to use routers and not bridges (as shown in the previous example) is to prevent unwanted traffic (such as all routes broadcasts) flowing over the WAN link.

We have shown the common protocols used (X.25, frame relay and PPP) to connect routers over a WAN. However, these are not the only methods used. Please refer to the specific router documentation for a complete list. If routers 1 and 2 were AS/400s, the WAN protocols supported are X.25 and frame relay. The IBM 2210 and 6611 routers can participate in all of the shown protocols, plus many more.

IPX has an address at OSI layer 3 (network) and is therefore capable of being routed natively.

Note that, unlike in the previous bridged network example, in this NetWare network example each of the LAN segments has a unique network number. The IPX routers will route the traffic between these two networks.

In the above network, the NetWare servers and routers may, for example, have the IPX network addresses shown in Table 7.

Table 7. Multiple IPX Servers and Routers

Server or Router	Internal IPX Network Number	LAN IPX Network Number	Node Number
Server A	C024E800	00000001	4000E2BB0003
Server B	E21BA661	00000002	080001033FC1
Router 1		00000001	4000E1CC0001
Router 2		00000002	080001034FA2

In the above example the routers do not have internal network numbers. This is true for the IBM 2210 and 6611 routers. If, however, these routers were AS/400s then they would have internal network numbers.

4.5 Complex Novell NetWare Network

Lastly we look at a more complex NetWare network. In this network example we have multiple networks connected by IPX routers.

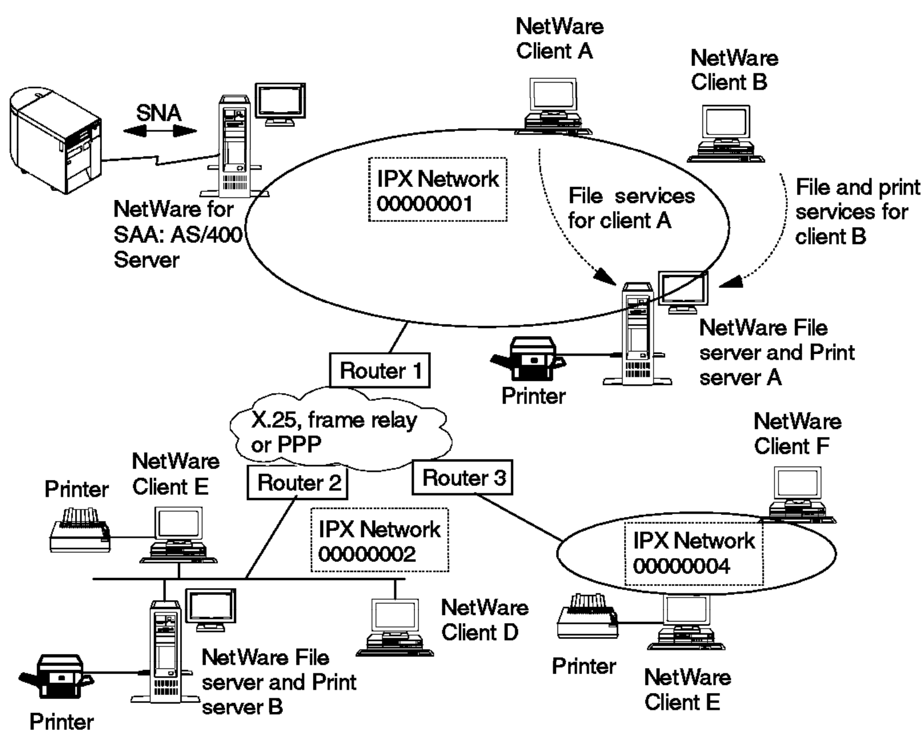

Figure 32. Complex NetWare Network

In this network, we have multiple Novell servers. One of these servers is running NetWare for SAA to give the NetWare users access to Client Access/400 functions on the AS/400.

NetWare for SAA AS/400 edition is a set of NetWare Loadable Modules (NLMs). This allows NetWare for SAA to run on an existing NetWare server. If, however, the current servers have no spare capacity to allow for this, then NetWare for SAA AS/400 edition is shipped with a NetWare runtime license to allow it to run on a dedicated server. NetWare for SAA AS/400 edition can support multiple concurrent AS/400 connections from a single server over token-ring, Ethernet, SDLC and QLLC/X.25 data links. NetWare for SAA AS/400 edition includes two PC router programs: NetWare AS/400 Router for DOS and NS/Router for Microsoft Windows. These two programs support standard IBM Client Access/400 applications as well as other vendors workstation applications for AS/400 access.

In this network it is possible for:

- Any client on IPX network 1 to access servers on its own network and networks 2 and 4. These clients may also have concurrent access to the SNA host via the NetWare for SAA server.
- Any client on IPX network 2 to access servers on its own network and networks 1 and 4. These clients may also have concurrent access to the SNA host via the NetWare for SAA server.
- Any client on IPX network 4 to access servers on its own network and networks 1 and 2. These clients may also have concurrent access to the SNA host via the NetWare for SAA server.

  In the above network, the NetWare servers and routers may, for example, have the IPX network addresses shown in Table 8.

Table 8. Multiple IPX Servers

Server or Router	**Internal IPX Network Number**	**LAN IPX Network Number**	**Node Number**
Server A	C024E800	00000001	4000E2BB0003
Server B	E21BA661	00000002	080001033FC1
NetWare for SAA server	A2500764	00000001	4000E2AA0004
Router 1		00000001	4000E1CC0001
Router 2		00000002	080001034FA2
Router 3		00000004	4000E1CA0003

4.6 NetWare Login Sequence

For a client to be able to access the services of a server, it must first establish a connection to the server. To give you an example of this process, the main steps for a DOS/Windows client are:

1. The client STARTNET.BAT batch file (normally located in a subdirectory called NWCLIENT and pointed to by AUTOEXEC.BAT) would normally load the following:
    a. Link Support Layer (LSL.COM)
    b. A LAN driver (In our case we were using TOKENCS.COM for the token-ring PCMCIA adapter and PCMDMCS.COM for the Ethernet 10 base 2 PCMCIA adapter)
    c. The IPX Interface (IPXODI.COM)
    d. ROUTE.COM (this step is required if the client is source route bridged to the server)
2. Establish Link. This is achieved by running VLM.EXE (NetWare 3.12 and higher) or NETX.EXE (NetWare 3.11). The following steps now take place:
    a. The client sends a get nearest service request in a SAP packet.
    b. The nearest server or router replies with a nearest server response SAP packet. This packet includes the internal IPX network number of the server.
    c. The client then sends a RIP packet requesting routing information to the server′s internal network number.
    d. The nearest server or router replies with a RIP packet containing the complete IPX network address (network/node/socket) of the router that can locate a route to this server.
    e. From here, the upper-layer NCP protocols take over to complete the attachment of the client to the server.

On the NetWare server a process called *track on* can be used to trace this connection process. Figure 33 is a screen capture from a server to illustrate this. In the screen capture a NetWare client with MAC address 4000755CD02 is establishing a connection with NetWare server NW41. This screen is taken from server NW41. This screen is accessed from the server System Console by entering the command Track On.

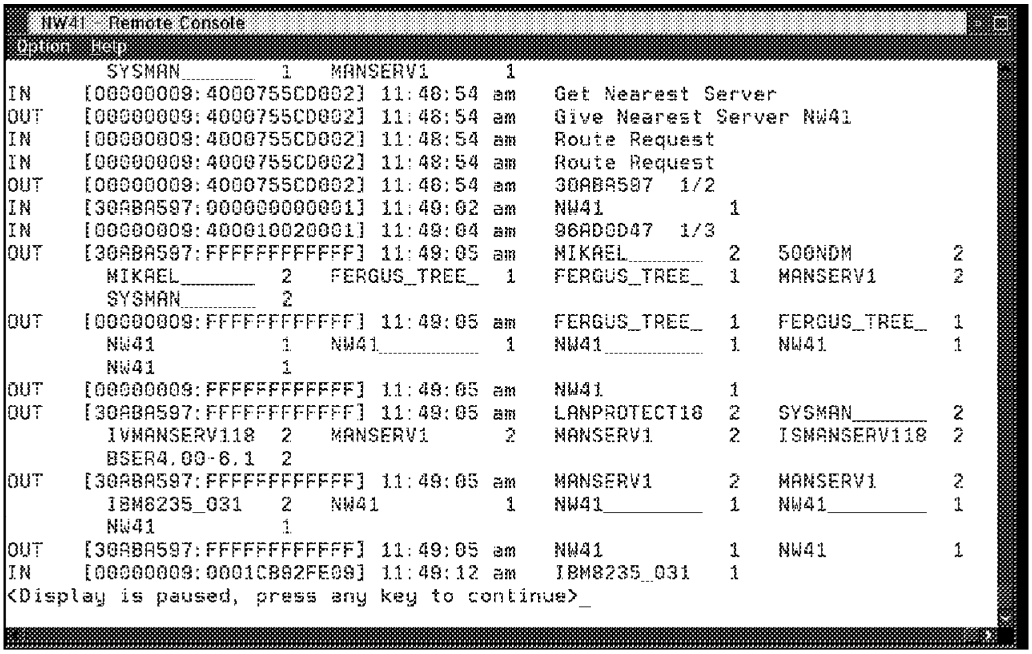

Figure 33. NetWare Track On Display

From this screen we can see:

- A get nearest server request coming from (IN) the client at node ID 4000755CD002 on network 9 (00000009).
- The server responds (OUT) with a nearest server response (give nearest server) and the server name NW41.
- The client now requests (IN) a route to NW41 (Route Request).
- The server responds (OUT) to the route request with its MAC address indicating that it has a connection to NW41 (internal network number 30ABA507).
- The connection is now established and the higher layer protocol (NCP) now takes over.

Note: In Appendix A, "Communication Traces" on page 271 we have included an IBM DatagLANce Network Analyzer trace taken of the same login procedure. This trace shows all the protocol packets including some of the NCP protocol packets.

Chapter 5. AS/400 IPX support

OS/400 V3R2 (CISC) and V3R7 (RISC) provide support for the following NetWare protocol suite protocols:

- Internetwork Packet eXchange (IPX)
- Sequenced Packet eXchange (SPX)
- Routing Information Protocol (RIP)
- Service Advertising Protocol (SAP)
- NetWare Link Services Protocol (NLSP)

IPX router support is included in the base operating system of these releases. IPX router support was also available for OS/400 V3R1 via Network Extensions (5733-SA1).

February 1997 V3R7 Enhancements

Although not covered in this book, the AS/400 IPX router support was enhanced in February 1997 to include the following:

- Support for SPX II

5.1 Introduction to IPX Protocols on the AS/400

Network protocols are sets of rules that control the communication and transfer of data between two or more devices in a communications system.

IPX consists of a layered structure of protocols that range from low-level hardware-dependent programs, to middle-level transport and network layer services. Each IPX layer provides services to the layer above it and uses the services provided by the layer below it.

Note: The topics that follow discuss only those protocols that are available on the AS/400.

Figure 34 shows the relationship between the IPX protocols within the IPX layered architecture as implemented on the AS/400.

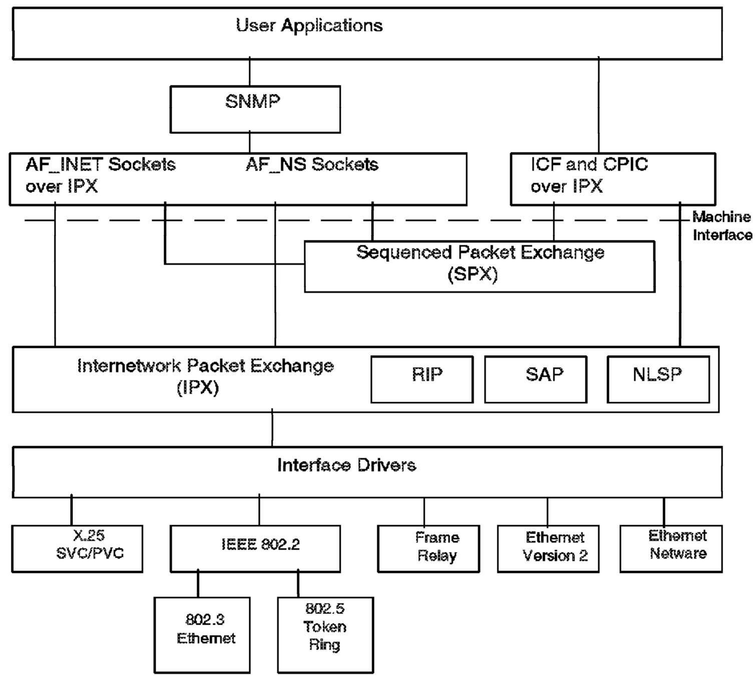

Figure 34. IPX Support on AS/400

5.1.1 Upper Protocol Layers

The AS/400 IPX router function is independent of the upper IPX protocol layers. In addition to the IPX router function, IPX APIs are provided.

The sockets interface is an API that allows customers the ability to write applications directly to different protocol stacks. Sockets allow unrelated processes to exchange data locally and over networks. On the AS/400 system, the sockets interface can be used to write applications directly to the SPX and IPX protocols. It provides access to Service Advertising Protocol (SAP) functions and access to NLSP and RIP routing information. Sockets operate over the IPX support using an address family of NS (AF_NS). The sockets interface can also be used by AF_INET applications via AnyNet/400.

5.1.2 Transport Protocol Layer

The Sequenced Packet Exchange (SPX) protocol and the Multiprotocol Transport Networking architecture (MPTN) provides transport services for IPX support. MPTN on the AS/400 is known as, and provided through, AnyNet/400. AnyNet/400 support is included with the OS/400 licensed program. AnyNet/400 support for IPX provides:

- APPC over IPX

  The APPC over IPX support allows APPC applications written for CPI-Communications and ICF APIs to communicate between systems in an

IPX network. Both systems running the APPC applications (for example, STRPASTHR) must have APPC over IPX support.

- AF_INET Sockets over IPX

  The AF_INET Sockets over IPX support allows sockets applications to communicate between systems in an IPX network. Both systems running the AF_INET applications must have AF_INET over IPX support.

Additional information on AnyNet/400 support for IPX can be found in *AS/400 AnyNet Scenarios*, SG24-2531.

5.1.3 Network Protocol Layer

The internetwork package exchange (IPX) protocol is the most important protocol in this layer because IPX is the base protocol of the NetWare protocol suite. All other NetWare protocols are carried inside an IPX packet. Routing information protocol (RIP), service advertising protocol (SAP) and NetWare link services protocol (NLSP) are the other network layer protocols.

5.1.4 Lower Layer Protocols

IPX relies on the network hardware or the media access protocols to perform the services of the data link layer and the physical layer.

5.2 AS/400 IPX Configuration Terms

When configuring IPX on the AS/400, the following terms are used:

- IPX Network Address
- IPX Node Address
- IPX Circuit
- IPX Circuit Route
- IPX Circuit Service

Here we give a short description of each of these terms.

5.2.1 IPX Network Address

For LANs, an IPX network is defined as running on a unique source service access point (SSAP). Multiple IPX networks (each with a different SSAP) can run over a single LAN.

For WANs, OS/400 IPX support uses data link connection identifiers (DLCIs) when running over frame relay, and logical channel identifiers (SVCs or PVCs) when running over X.25.

Note: Multiple DLCIs (or SVCs/PVCs) can share a single WAN connection. Each of these may be running a different protocol. We can therefore potentially have SNA, TCP/IP and IPX using a WAN connection concurrently. Each protocol would be allocated a separate DLCI or SVC/PVC.

In addition to an external IPX network address, the AS/400 IPX router function also has an internal IPX network address. These external and internal network addresses must be different and unique within the IPX internetwork.

5.2.1.1 Register IPX Network Number

If now, or at any time in the future, you want to connect your IPX network to another IPX network or internetwork, you must ensure that all internal and external network addresses in the connected internetwork are unique. Novell provides the Novell Registry service to assign and track IPX network addresses and organization names. Such a registry allows participating organizations to share data between interconnected IPX networks without name and IPX address conflicts.

The Novell Network Registry assigns contiguous blocks of IPX addresses that are unique to your organization.

To reserve a block of IPX addresses:

- Call +1-408-321-1506
- FAX +1-408-956-0463
- Send Internet e-mail to registry@novell.com

Note: If your IPX network will *never* be connected to another IPX network, you can select any IPX network numbers for your internal and external networks providing they are unique within your network.

5.2.1.2 Netware on the Integrated PC Server (FSIOP)

When NetWare is installed on the AS/400 integrated PC server, that support also has an internal network number. The AS/400 IPX router communicates with NetWare on the integrated PC server in a peer-to-peer relationship. The integrated PC server NetWare provides routing to the networks it is attached to; the AS/400 acts as a router between this and other IOPs.

5.2.2 IPX Node Address

Network connections are assigned an address that must be unique in an IPX network. This address is known as the node address. Like most IPX routers (and servers), the AS/400 uses its MAC address (LAN adapter address) as its node address. The node address associated with its internal network address is 000000000001. The AS/400 is therefore known by two addresses: its external network address and MAC address, and by its internal network address and a node address of 000000000001.

5.2.3 IPX Circuit

An IPX circuit on the AS/400 is a logical representation of a path for IPX communication. Up to 255 circuits can be configured on one system.

- For a LAN, it defines the path or point of attachment from the IPX protocol layer to the IPX network.
- For a WAN, it defines the path from the IPX protocol layer to a remote IPX node or system.

Circuits are not physical objects. Each circuit is associated with a line description. The line description describes the physical connection from the AS/400 to the network. The circuit defines the logical path from IPX layer to the line description.

5.2.4 IPX Circuit Route and Circuit Service Entries

IPX uses route and service table entries to locate resources in the network. In most cases these tables will be dynamically built and maintained via RIP/SAP/NLSP. If there is a requirement to not have these flows (for example, when using IPX over a switched connection) the route and service tables can be built and maintained manually. On the AS/400 this is via circuit route and circuit service entries.

Chapter 6. IPX Support Installation

In this chapter we look at the installation of IPX on the AS/400 and the adapters supported.

IPX router support is part of the base OS/400 V3R2 (CICS) and V3R7 (RISC) and as such there are no unique installation instructions. Optionally, NetWare server support may also be installed on an AS/400 (on an Integrated PC adapter).

6.1 Hardware Supported

For OS/400 V3R1, IPX router support is available via the Network Extensions (5733-SA1) optional feature.

AS/400 IPX router support is supported on any AS/400 model. The following I/O adapters are supported:

- 2617 Ethernet adapter
- 2619 Token-ring adapter
- 2666 Frame relay adapter
- Any IOP that supports X.25 will support IPX
- Any Integrated PC Server LAN adapter will support IPX

Chapter 7. AS/400 IPX Configuration Overview

In this chapter we give an overview of all the AS/400 IPX configuration objects and the parameters associated with each of these.

7.1 AS/400 IPX Configuration Objects

Although it is not always necessary to configure all of these, the following AS/400 IPX configuration objects exist:

- IPX Description
- IPX Circuit
- IPX Circuit route
- IPX Circuit service

An IPX description is always required and defines global (system-wide) IPX configuration values. For example, the internal IPX network number associated with the AS/400.

An IPX circuit is required for each IOP over which IPX is to be used. Configuration values associated with the network to which this IOP attaches are defined here, for example, the external network number associated with this network. Each IPX circuit is associated with a line description representing the IOP over which IPX is to be used.

IPX circuit routes can optionally be defined when there is a requirement to define static routes. Each circuit route is associated with a specific IPX circuit and defines an IPX network that can be reached via the IOP associated with that circuit.

IPX circuit services can optionally be defined when there is a requirement to define static services. Each circuit service is associated with a specific IPX circuit and defines an IPX service that can be reached via the IOP associated with that circuit.

7.2 AS/400 IPX Configuration Steps

AS/400 IPX router support can be configured either via menu options or via CL commands. To access the IPX configuration menu, enter the command `CFGIPX`.

V3R1

For V3R1 the IPX configuration menu is accessed via the command GO CFGIPX.

Note

Your user profile must have *IOSYSCFG special authority.

```
CFGIPX                          Configure IPX
                                                          System:   RALYAS4A
Select one of the following:

  Configure IPX
     1. Configure IPX circuits
     2. Work with IPX descriptions
     3. Work with IPX status

  Configure AnyNet/400 over IPX
    10. Work with IP over IPX interfaces
    11. Work with IP over IPX routes
    12. Work with IP over IPX addresses

    20. Work with SNA over IPX locations




Selection or command
===>

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 35. IPX Configuration Main Menu

7.2.1 IPX Description

An IPX description is a required configuration object and defines global (system-wide) IPX configuration values. Multiple IPX descriptions can be created but only one can be active at any one time. You might, for example, define multiple IPX descriptions each with different values. An IPX description becomes active when the STRIPX command is entered against that description name.

```
CFGIPX                          Configure IPX
                                                            System:   RALYAS4A
Select one of the following:

  Configure IPX
     1. Configure IPX circuits
     2. Work with IPX descriptions
     3. Work with IPX status

  Configure AnyNet/400 over IPX
    10. Work with IP over IPX interfaces
    11. Work with IP over IPX routes
    12. Work with IP over IPX addresses

    20. Work with SNA over IPX locations




Selection or command
===> 2

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 36. IPX Configuration Main Menu

To create an IPX description, select option 2 (Work with IPX descriptions).

```
                          Work with IPX Descriptions
                                                            System:   RALYAS4A
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   7=Rename
  9=Retrieve Source

        IPX
Opt     Desc           Text
 1
        QDCIPX1        This IPXD is IBM Supplied
        QDCIPX2        This IPXD is IBM Supplied


                                                                        Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
```

Figure 37. Work IPX Descriptions

To create an IPX description, select option 1.

```
                         Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . .                 Name
 IPX internal network number  . .                 00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP         *NLSP, *RIP
 IPX router name  . . . . . . . .   *NONE

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . .   *BLANK



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 38. Create IPX Description

IPX description

Specifies the name of the IPX description object being created. This name will be used later to start the IPX router on AS/400.

Tip

Use the system name for your IPX description name.

IPX internal network number

This is the internal network number for this AS/400. All IPX network numbers (internal or external) must be unique. Consult your network administrator for the internal network number to be used. If *RANDOM is used, the AS/400 will randomly generate an IPX network number.

Note: If the randomly generated IPX network number is identical to an already existing IPX network number accessible from this AS/400 system, unpredictable results can occur.

IPX routing protocol

Specifies whether this IPX description supports RIP routing and SAP packet processing (RIP/SAP) only, or NLSP with RIP/SAP compatibility. If your network supports NLSP or has NLSP-enabled routers, then you should specify *NLSP. Specifying *NLSP also gives you RIP/SAP compatibility. This means that the AS/400 NLSP router can interoperate on a network that uses RIP and SAP packets. If your network only supports RIP routing and SAP packet processing, and does not contain any NLSP enabled routers, you should specify *RIP.

Note: Specifying NLSP or RIP here defines whether NLSP can be used globally by the AS/400. Specifying NLSP or RIP in the IPX circuit defines whether NLSP can be used in that circuit. If RIP is specified globally (in the IPX description), then NLSP can not be used in any circuit.

Tip

The NetWare link services protocol (NLSP) is used by IPX routers to share their routing information with other devices on the network. NLSP is a link state routing protocol. NLSP provides better performance, scalability, reliability, and management of network traffic than the route information protocol (RIP) and the service advertising protocol (SAP).

IPX router name

The IPX router name parameter value is the readable, textual, symbolic name of the IPX router enabled by this IPX description. Using a symbolic name for the router is useful for network management purposes.

IPX maximum datagram size

Specifies the default maximum size of IPX data that can be contained in a single IPX packet. This maximum also applies to the SPX protocol since SPX data is sent in IPX packets.

Notes:

This parameter is important because there is no end-to-end negotiation of maximum datagram size. There may be intermediate hops in a route to the destination system that has a smaller maximum datagram size than the links that are directly attached to the AS/400 system.

This value is used in conjunction with the DFTMAXDTG parameter of the circuit used for sending the IPX packet and with the maximum datagram size parameter in the SAP definition of the line description object associated with the circuit, to determine the actual maximum IPX packet size that will be sent on a physical line.

This value is also used by the initial open on a socket to determine the size of the data to send on this socket, since at the socket open timeframe, there is no circuit associated with the socket.

This parameter is not used when the AS/400 is being used as a router. It is used to determine the maximum allowed datagram when an AS/400 sockets-based application is sending data over IPX (when the AS/400 is the source of the packet). If the AS/400 is routing, the important parameters that effect its ability to route packets on a particular circuit are the maximum datagram size in the IPX circuit and the maximum frame size in the associated line description.

Attention

The Add IPX circuit (ADDIPXCCT) command has a DFTMAXDTG parameter that needs to be considered when setting the IPXMAXDTG parameter for an IPX description. If the IPX description's IPXMAXDTG value is larger than the value of the IPX circuit's DFTMAXDTG value on a circuit chosen for the IPX connection, then the sending of the data will fail and the user will be requested to provide a smaller packet size that can fit on the circuit. Therefore, coordination of values is required between the DFTMAXDTG size on a circuit and the IPXMAXDTG value on an IPX description.

The default maximum datagram size value is 576 and the maximum datagram size that can be used is 65535 bytes.

Press F10 (additional parameters).

```
                       Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . .                    Name
 IPX internal network number  . .                    00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP            *NLSP, *RIP
 IPX router name  . . . . . . . .   *NONE

 IPX maximum datagram size  . . .   576              576-65535
 Text 'description' . . . . . . .   *BLANK


                           Additional Parameters

 IPX packet forwarding  . . . . .   *YES             *YES, *NO
 IPX hop count  . . . . . . . . .   64               8-127
 SPX maximum sessions . . . . . .   1000             100-9999
 SPX watchdog abort timeout . . .   30000            30000-3000000
 SPX watchdog verify timeout  . .   3000             556-300000
                                                                        More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 39. Create IPX Description (Additional Parameters)

IPX packet forwarding

The IPX packet forwarding parameter value controls the forwarding of IPX packets, including routing and service advertising packets, from one network to another. It specifies whether the IPX layer will act as a router or not. Setting this value to *NO will ensure that no IPX packets are forwarded and no services are advertised between any networks known to the AS/400 system. The AS/400 system can still operate as a server and client, but not as a router.

Tip

This parameter enables or disables the AS/400 IPX router function.

IPX hop count
The IPX hop count limit parameter value sets the hop count limit for outgoing IPX packets. The hop count limit is the maximum number of hops (routers) a packet can pass through before being discarded. The IPX hop count limit can be any number ranging from 8 through 127.

SPX maximum sessions
Specifies the maximum number of SPX connections that can be concurrently established.

SPX watchdog abort timeout
Specifies, in milliseconds, the SPX watchdog abort timeout value which is the amount of time that must elapse without receiving a packet on a connection before SPX will do a unilateral end of the connection.

SPX watchdog verify timeout
Specifies, in milliseconds, the SPX watchdog verify timeout value. This value is the amount of time that SPX support waits between packet transmissions before sending a connection *keep-alive* packet. A keep-alive packet is a packet sent to the remote system of a connection to inform that remote system that this side of the connection (the sender′s side) is still active or alive. It is also referred to as an ″I am here″ packet. This packet does not request the receiving side to respond with an acknowledgement packet.

Press Page Down (additional parameters on next screen).

```
                       Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 SPX are you there timeout  . . .   6000          556-600000
 SPX default retry count  . . . .   10            1-255
 LAN hello  . . . . . . . . . . .   20            1-600
 WAN hello  . . . . . . . . . . .   20            1-600
 Designated router interval . . .   10            1-100
 Holding time multiplier  . . . .   3             2-20
 Log protocol errors  . . . . . .   *NO           *NO, *YES
 Authority  . . . . . . . . . . .   *LIBCRTAUT    Name, *LIBCRTAUT, *CHANGE...




 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 40. Create IPX Description (Additional Parameters Next Screen)

SPX are you there timeout
Specifies, in milliseconds, the SPX are-you-there timeout value which is the time that SPX waits for a packet from the connection. If no packet arrives in the specified time, SPX will send an are-you-there packet. The SPX are-you-there time out is also known as the SPX listen time out. Sending an are-you-there packet should cause an acknowledgement to be received from the remote destination if the connection is still active.

SPX default retry count
Specifies the SPX default retry count value which is the number of times the SPX support attempts to resend a packet. If the number of retries is exceeded, then the connection is ended.

LAN hello Specifies, in seconds, the interval at which NetWare Link Services Protocol (NLSP) Hello packets are sent on local area network (LAN) circuits when this system is not the designated router. For simplicity, the term local area network refers to any network that supports the broadcast transmission method. The designated router is the NLSP router responsible for exchanges of link state information on behalf of all other NLSP routers on the same LAN. The LAN Hello interval value is used for all LAN circuits that have the Enable for NLSP (ENBNLSP) parameter equal to *YES. A low LAN Hello interval value allows NLSP to quickly determine when a router is no longer available. A high LAN Hello interval value results in less network traffic, but requires a longer period of time for NLSP to recognize when a router is no longer available.

WAN hello
Specifies, in seconds, the interval at which NetWare Link Services Protocol (NLSP) Hello packets are sent on wide area network (WAN) circuits. For simplicity, the term wide area network refers to any network that does not support the broadcast transmission method. The WAN Hello interval value is used for all WAN circuits that have the Enable for NLSP (ENBNLSP) parameter equal to *YES. A low WAN Hello interval value allows NLSP to quickly determine when a router is no longer available. A high WAN Hello interval value results in less network traffic, but requires a longer period of time for NLSP to recognize when a router is no longer available.

Designated router interval
Specifies, in seconds, the interval at which NetWare Link Services Protocol (NLSP) Hello packets are sent on circuits for which this system is the designated router. The designated router is the NLSP router responsible for exchanges of link state information on behalf of all other NLSP routers on the same LAN. The designated router Hello interval value is used for all LAN circuits that have the Enable for NLSP (ENBNLSP) parameter equal to *YES. A low value allows NLSP to quickly determine when a router is no longer available. A high value results in less network traffic, but requires a longer period of time for NLSP to recognize when a router is no longer available.

Holding time multiplier
Specifies the holding time multiplier value used when sending NetWare Link Services Protocol (NLSP) Hello packets on a circuit. This value is used for both LAN and WAN circuits that have the Enable for NLSP (ENBNLSP) parameter equal to *YES. This value is multiplied by the current Hello interval to calculate the holding time. The current Hello interval is either the IPX description′s LAN Hello, WAN Hello or designated router interval depending on whether the circuit is a LAN or WAN and whether the AS/400 is the designated router. The holding time is the time that a neighboring system considers this system active if the neighboring system does not receive another Hello packet.

Log protocol errors
Specifies whether or not to log protocol errors that occur during processing of IPX data. These errors are not necessarily APARable conditions. This parameter should be used when error conditions require the logging of IPX data in order to determine network problems. The data is logged in the system error log. This error log is available by using the STRSST command and selecting option 1.

Authority Specifies the authority given to users who do not have specific authority to the IPX description, who are not on an authorization list, and whose user group has no specific authority to the IPX description.

7.2.1.1 IPX Description CL Command

The CL command CRTIPXD can also be used to create an IPX description.

7.2.2 IPX Circuit

A circuit must defined for each line description over which IPX routing will be used.

Tip

An IPX circuit is a logical representation of a path for IPX communication. Circuits are not physical objects. Each circuit is associated with a line description. The line description describes the physical connection from the AS/400 to the network. The circuit defines the logical path from the IPX protocol layer to the line. A line description is a shared configuration object; a previously created line description can be used be used for IPX also.

```
CFGIPX                          Configure IPX
                                                            System:   RALYAS4A
Select one of the following:

  Configure IPX
     1. Configure IPX circuits
     2. Work with IPX descriptions
     3. Work with IPX status

  Configure AnyNet/400 over IPX
    10. Work with IP over IPX interfaces
    11. Work with IP over IPX routes
    12. Work with IP over IPX addresses

    20. Work with SNA over IPX locations




Selection or command
===> 1

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 41. IPX Configuration Main Menu

To configure an IPX circuit, select option 1 (Configure IPX Circuits).

```
                              Configure IPX Circuits
                                                                System:   RALYAS4A
 Select one of the following:

      1. Work with IPX circuits
      2. Work with IPX circuit routes
      3. Work with IPX circuit services




 Selection or command
 ===> 1

 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 42. Configure IPX Circuits

Then select option 1 (Work with IPX circuits).

```
                              Work with IPX Circuits
                                                                System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                Line        Line          Circuit
 Opt    Name                Description    Type          Status
 1


                                                                            Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 43. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                         Add IPX Circuit (ADDIPXCCT)

Type choices, press Enter.

Circuit name . . . . . . . . . .
Line description . . . . . . . .                 Name
IPX network number . . . . . . .                 00000001-FFFFFFFD
Frame type . . . . . . . . . . .   *SSAP         *SSAP, *SNAP, *ETHV2, *ETHNTW
X.25 PVC logical channel id  . .   '   '         001-FFF
X.25 SVC network address . . . .   ' '
X.25 SVC call type . . . . . . .   *DEMAND       *DEMAND, *PERM
X.25 SVC reverse charge  . . . .   *NONE         *NONE, *REQUEST, *ACCEPT...
X.25 SVC idle circuit timeout  .   60            0-600
X.25 default packet size:
  Transmit packet size . . . . .   *LIND         *LIND, 64, 128, 256, 512...
  Receive packet size  . . . . .   *LIND         *LIND, *TRANSMIT, 64, 128...
X.25 default window size:
  Transmit window size . . . . .   *LIND         1-15, *LIND
  Receive window size  . . . . .   *LIND         1-15, *LIND, *TRANSMIT
Enable for NLSP  . . . . . . . .   *YES          *YES, *NO
                                                                      More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 44. Add IPX Circuit

Circuit name

Specifies the name of the IPX circuit being added. The circuit name must be unique.

> **Tip**
>
> Use the Line description name for the Circuit name.

Line description

Specifies the name of the line description associated with the circuit. IPX is supported over token-ring, Ethernet (using an Ethernet standard value of 802.3, Version 2, or *ALL), frame relay and X.25. There can be multiple circuits defined per line description. However, in most cases, there will be one circuit for a LAN type line description.

Note: See 6.1, "Hardware Supported" on page 63 for which LAN/WAN adapters are supported.

IPX network number

This parameter defines the *external* network number for this LAN/WAN connection. Consult your network administrator to determine the value to be used.

> **Attention**
>
> If there are devices on the network that are broadcasting the wrong network number, the IPX circuit won't start. You can check the Novell Server system console for messages relating to this.

Frame type

Specifies the type of LAN framing that is used by the circuit being added. The framing type is controlled by the source service access points (SSAP) of the line description being used by the circuit. Only one IPX network number can be specified for a specific SSAP per line description. This parameter is valid only for LAN type line descriptions. All devices communicating on this LAN MUST use the same frame type. Consult your network administrator to determine the value the be used.

Attention

If you are using *SSAP as the frame type for IPX communications, the ′E0′X SSAP cannot be defined in the token-ring or Ethernet line description. If the ′EO′X SSAP is defined in the line description, activation of the circuit will fail.

X.25 PVC logical channel id
Specifies the permanent virtual circuit (PVC) that is to be used by IPX. The logical channel must have been previously defined in the X.25 line description.

X.25 SVC network address
Specifies the X.25 network address of the data terminal equipment (DTE) that is associated with the remote X.25 system or network that supports IPX over X.25. This is the remote system′s DTE address. The user can specify a decimal number up to 17 digits in length.

X.25 SVC call type
Specifies either an on-demand or a permanent X.25 SVC connection call.

On-demand SVC circuit. The SVC connection is established only when there is data to transfer to the remote destination. It is active for the duration of the data transfer plus the idle timeout value. The SVC connection is ended whenever the connection has not had any data for longer than the idle virtual circuit timeout (IDLVCTTIMO) parameter value.

Note: Static routes and services must be configured for SVC on-demand circuits, using the Add Circuit Route (ADDCCTRTE) and the Add Circuit Service (ADDCCTSRV) commands.

Permanent SVC circuit. The SVC connection is set up for data transfer when the circuit is activated. It is active for as long as the circuit is active. A permanent SVC is ended when the circuit is ended.

Note: You can use permanent SVC circuits if you don′t have PVCs defined in the X.25 network and still want a permanent connection.

X.25 SVC reverse charge
Specifies the type of X.25 SVC reverse charging that should occur for this circuit and whether reverse charges are accepted or requested on an X.25 remote system basis.

X.25 SVC idle circuit timeout
Specifies the X.25 SVC idle virtual circuit timeout for SVC on-demand circuits. This is the duration (in seconds) that IPX waits before clearing an idle X.25 virtual circuit. Clearing an idle virtual circuit frees resources on the network. IPX automatically reestablishes virtual circuits when required to send or receive data.

X.25 default packet size
Specifies the default X.25 packet size to be used. If *LIND is specified, the packet size in the line description will be used and the

AS/400 will not specify a packet size in the call request packet. The line description default packet size must therefore match the X.25 network default packet size.

X.25 default window size

Specifies the default X.25 packet window size to be used. If *LIND is specified, the window size in the line description will be used and the AS/400 will not specify a window size in the call request packet. The line description default window size must therefore match the X.25 network default window size.

Enable for NLSP

Specifies whether or not this circuit is enabled for NetWare Link Services Protocol (NLSP) processing.

Note: If a value of *RIP is specified for the IPX routing protocol (IPXRTGPCL) parameter on the IPX description that is active when this circuit is active, then the circuit's ENBNLSP parameter value is not used.

Tip

If NLSP is supported by the remote IPX router, then NLSP is preferred to RIP/SAP for WAN connections.

Press Page Down (additional parameters on next screen).

```
                          Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 MAC channel for NLSP . . . . . .   *BROADCAST    *BROADCAST, *MULTICAST
 Router priority for NLSP . . . .   44            0-127
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC
 Enable for IW2 . . . . . . . . .   *YES          *YES, *NO
 IW2 timer request retries  . . .   16            1-256, *NOMAX
 IW2 timer request interval . . .   20            1-60

                           Additional Parameters

 Default maximum datagram size  .   *LIND         576-16388, *LIND
 Throughput . . . . . . . . . . .   *CALC         300-4294967295, *CALC
 Delay time . . . . . . . . . . .   *CALC         1-5000000, *CALC
 Automatic start  . . . . . . . .   *YES          *YES, *NO
 RIP state  . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
 RIP update interval  . . . . . .   60            30-300000
 RIP age multiplier . . . . . . .   4             1-10
                                                                      More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 45. Add IPX Circuit (Additional Parameters Next Screen)

MAC channel for NLSP

Specifies whether broadcast or multicast capabilities are supported for NLSP on this circuit. This parameter is valid only when ENBNLSP(*YES) is specified and is valid only for LANs.

Note:

Broadcast is a transmission method where all devices on the LAN receive the transmitted packets.

Multicast is a transmission method where packets are sent to a special multicast address and only those systems listening for that address accept the packet. Using multicasting allows for reduced load on systems not listening for the multicast address. Use of the multicast transmission method requires all NLSP routers on the LAN to be configured for multicast, otherwise the broadcast transmission method is used.

When multicast addressing is specified for a circuit, the associated line description must have the correct multicast address enabled. The following table describes the commands and parameters that can be used to enable the correct multicast address for an existing line description:

Media	Command	Parameter	Value
Ethernet	CHGLINETH	GRPADDR	09001BFFFFFF
Token-ring	CHGLINTRN	FCNADR	C00010000000

The default is broadcast since some older systems do not support multicasting capabilities.

Router priority for NLSP

Specifies the priority assigned to this router for the NLSP designated router election process. The designated router is the NLSP router responsible for exchanges of link state information on behalf of all other NLSP routers on the same LAN. The value specified here is a priority level value. The router with the highest priority is elected as the designated router in the LAN. You should set the priority high for the most stable router with enough memory to process NLSP routing information in your LAN. Valid values range from 0 through 127.

Cost override for NLSP

Specifies the cost associated with the circuit. This value is used by NLSP to help determine the network paths over which IPX packets are forwarded. A lower value means less cost associated with that circuit and a better chance that the circuit will be selected.

Note: The default value of *CALC means that the cost override for this circuit is based on the circuit line description′s line type and line medium′s throughput.

Enable for IW2

The Enable for IPX WAN Version 2 (IW2) parameter specifies whether or not the IW2 negotiations for a wide area network (WAN) are enabled for this circuit.

Note: IW2 is the protocol used by Novell to exchange necessary router-to-router information prior to exchanging standard IPX routing information and traffic over WAN data links, such as X.25 and frame relay networks. Part of the IW2 exchange includes the negotiation of the IPX network and node numbers to be assigned to the WAN circuit.

Tip

Some systems may not support IW2 negotiations. In order to interoperate with these systems, set the ENBIW2 parameter value to *NO. However, because the IW2 exchange is not performed when ENBIW2 is set to *NO, an IPX network number (IPXNETNBR) must be specified so it can be assigned to the circuit. The system will generate an associated node number that consists of the specified network number followed by two bytes of binary zeroes. For example, an IPXNETNBR of 10045D08 would result in the generation of 10045D080000 for the IPX node number.

IW2 timer request retries
Specifies the number of IW2 timer requests IPX will attempt to transmit while waiting for a timer response from the remote router.

IW2 timer request interval
Specifies the number of seconds between the transmission of each IW2 timer request.

Default maximum datagram size
Specifies the maximum IPX packet size that can be sent over this circuit. This value includes the count of bytes up to and including the IPX header but not the LLC or MAC level header or trailer. This maximum also applies to the SPX protocol since SPX data is sent in IPX packets. The DFTMAXDTG parameter value will be used in conjunction with the line description′s SSAP′s maximum frame size parameter value to determine the actual maximum packet size that will be sent on a particular line. The minimum value allowed is 576.

Notes:

This parameter is important because there is no end-to-end negotiation of maximum datagram size in IPX processing, and there may be intermediate hops in the path to a destination system that have a smaller maximum datagram size than the directly attached links to the AS/400 system.

The IPX description has an IPXMAXDTG parameter that needs to be considered when setting this parameter value. The IPX description′s IPXMAXDTG parameter value is used by the initial open of a socket (when using the sockets application programming interface (API)) to determine the size of the data to transmit. At socket open time, the actual circuit that the data will be transmitted on is not known. Also, the user might be doing an internal socket-to-socket process that never goes out on a circuit. If the IPX description IPXMAXDTG value is larger than the value of the DFTMAXDTG value on the circuit chosen for the connection, then the sending of the data will fail and the user will be requested to provide a smaller packet size that can fit on the circuit. Therefore, ensure that you coordinate the values between the DFTMAXDTG size on the circuit(s) and the IPXMAXDTG value on the IPX description which will be active when the circuit(s) is used.

If *LIND is specified, the maximum datagram size value will be equal to the largest amount of data that can be transmitted on the line based on the line description′s frame size minus the length of the LLC and MAC headers.

Throughput
Specifies the total amount of useful information (in bits per second) processed or communicated during a specific time period. NLSP uses the throughput and delay values to calculate the number of ticks for a path to a destination network when communicating with a routing information protocol (RIP) router. The number of ticks is used to help determine the best route to a destination network. Throughput is most commonly used for WAN networks.

Note: The default value of *CALC means that the throughput value is based on the line type of the line description specified on the LIND parameter. For a token-ring line, the value is determined from the token-ring′s line speed parameter. For Ethernet lines, the throughput value is 10 Mbps. For WAN type lines, the throughput value is calculated during the IPX WAN Version 2 (IW2) negotiations. This includes frame relay and X.25 line types.

Delay time
Specifies the time, in milliseconds, it takes to send a byte of information from one system to another. NLSP uses the delay and throughput values to calculate the number of ticks for a path to a destination network when communicating with a routing information protocol (RIP) router.

Note: The default value of *CALC means that the delay value is based on the line type of the line description specified on the LIND parameter. For a LAN-type line the delay value will be 100 milliseconds. This includes token-ring and Ethernet line types. For WAN-type lines the delay value will be determined during the IPX WAN Version 2 exchange (IW2), including frame relay and X.25 line types.

Automatic start
Specifies whether the circuit is automatically started by Start IPX (STRIPX) command processing.

RIP state Specifies whether the routing information protocol (RIP) is used on this circuit.

Note:

If you want to minimize the non-productive data on a network, then *RIPSTATE can be set to *OFF. However, if *OFF is used, then static routes (ADDCCTRTE) must be defined.

*AUTO initially disables the transmission of RIP broadcasts but automatically enables RIP routing if non-NLSP devices are operating on the network. This value allows the network to eliminate RIP processing once all routers and servers in the network are running NLSP.

RIP update interval
Specifies, in seconds, the RIP periodic update interval.

Note: The RIP periodic update interval determines the interval at which RIP packets are transmitted through this circuit. Each router on this circuit′s network must use the same update interval value. NetWare servers use a RIP update interval of 1 minute. If, therefore, there are NetWare servers on this circuit, then a value of 60 should be used.

RIP age multiplier
Specifies the number to multiply the RIP update interval (RIPUPDITV) parameter value by, to determine the amount of time a RIP packet′s routing information should be held before it is discarded from the routing information table. The default is 4. Therefore, using the default values, a RIP entry will be kept for 240 seconds before being discarded or ″aging out″ if no RIP update is received.

Press Page Down (additional parameters on next screen).

```
                          Add IPX Circuit (ADDIPXCCT)

Type choices, press Enter.

SAP state . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
SAP update interval  . . . . . .   60            30-300000
SAP age multiplier . . . . . . .   4             1-10













                                                                         Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 46. Add IPX Circuit (Additional Parameters Next Screen)

SAP state Specifies whether the Service Advertising Protocol (SAP) is used on this circuit.

If you want to minimize the non-productive data on a network, then *SAPSTATE can be set to *OFF. However, if *OFF is used, then static service entries (ADDCCTSRV) must be defined.

*AUTO disables the transmission of SAP broadcasts but automatically enables SAP broadcasts if non-NLSP devices are operating on the network. *AUTO allows the network to eliminate SAP processing once all routers and servers in the network are running NLSP.

SAP update interval
Specifies, in seconds, the SAP periodic update interval.

Note: The SAP periodic update interval determines the interval at which SAP advertisement packets are transmitted through this circuit. Each router on this circuit′s network must use the same update interval value. NetWare servers use a SAP update interval of 1 minute. Therefore, if there are NetWare servers on this circuit, then a value of 60 should be used.

SAP age multiplier
Specifies how many to multiply the SAPUPDITV parameter value by to determine the amount of time a SAP packet′s information should be held before it is discarded. The default is 4. Therefore, using the default values, a SAP entry is kept for 240 seconds before being discarded or ″aging out″ if no SAP update is received on this circuit.

7.2.2.1 IPX Circuit CL Command

The CL command CRTIPXCCT can also be used to create an IPX circuit.

7.2.3 IPX Circuit Route

An IPX circuit route defines a static route. Static routes are required when there is no exchange (via RIP or NLSP) of IPX routing information. Exchange of IPX routing information is enabled/disabled via the IPX circuit RIP state parameter. Exchange of IPX routing information is normally enabled for LAN interfaces but (to reduce unnecessary link initialization and link traffic) may be disabled for WAN interfaces.

```
                         Configure IPX Circuits
                                                         System:   RALYAS4A
Select one of the following:

     1. Work with IPX circuits
     2. Work with IPX circuit routes
     3. Work with IPX circuit services




Selection or command
===> 2

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 47. Configure IPX Circuits

To create an IPX circuit route, select option 2 (Work with IPX circuit routes) from the Configure IPX Circuits menu.

```
                        Work with Circuit Routes
                                                         System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display

       Circuit                Remote       Number     Number     Next Hop
Opt    Name                   Network     of Hops    of Ticks    Node Address
 1
```

Figure 48. Work with Circuit Routes

To add an IPX circuit route, select option 1.

```
                        Add Circuit Route (ADDCCTRTE)

 Type choices, press Enter.

 Circuit name . . . . . . . . . .
 Remote IPX network number  . . .                 00000001-FFFFFFFE
 Number of hops . . . . . . . . .   1             1-127
 Number of ticks  . . . . . . . .   1             1-32767
 Next hop node address  . . . . .   *NONE         000000000001-FFFFFFFFFFFF...




 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 49. Add Circuit Route

Circuit name

Specifies the unique name of the circuit for which this static route is being added. The circuit is usually an X.25 SVC on-demand type circuit. The static route is only associated with this circuit. The circuit must have been previously configured using the Add IPX Circuit (ADDIPXCCT) CL command or by selecting option 1 from the with the Work with IPX Circuits menu.

Remote IPX network number

Specifies the remote IPX network number or system that this route connects to.

Number of hops

Specifies the number of hops to the remote network. The number of hops is equal to the number of routers that are crossed in order to reach the network or system specified on the RMTNETNBR parameter.

Note: The number of hops must be less than or equal to the IPXHOPCNT parameter value associated with the active local AS/400 IPX description. If the number of hops for this route is greater than the number of hops specified in the IPX description that is active at the time this route is trying to be used, then this route is not used.

Number of ticks

Specifies the number of ticks needed to reach the destination network identified by the RMTNETNBR parameter.

Note:

A tick is equal to 1/18th of a second. The maximum value allowed is 32767 ticks which equals approximately 30 minutes.

If two routes have the same hop count, then the route with the lowest tick count is the preferred route.

Next hop node address

Specifies the node address of the system in the LAN to which packets destined for the remote destination IPX network (as identified by the RMTNETNBR parameter value) are sent. If the remote network is reached via a router in the local LAN, then this parameter specifies the node address of that router. For a circuit route associated with a WAN, use the default value of *NONE.

7.2.3.1 IPX Circuit Route CL Command

The CL command ADDCCTRTE can also be used to create an IPX circuit route.

7.2.4 IPX Circuit Service

We need to add IPX circuit services for static routes only. Static services are required when there is no exchange (via SAP or NLSP) of IPX services information. Exchange of IPX services information is enabled/disabled via the IPX circuit SAP state parameter. Exchange of IPX services information is normally enabled for LAN interfaces but (to reduce unnecessary link initialization and link traffic) may be disabled for WAN interfaces.

```
                           Configure IPX Circuits
                                                            System:   RALYAS4A
Select one of the following:

     1. Work with IPX circuits
     2. Work with IPX circuit routes
     3. Work with IPX circuit services




Selection or command
===> 3

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 50. Configure IPX Circuits

To create an IPX circuit service, select option 3 (Work with IPX circuit services) from the Configure IPX Circuits menu.

```
                         Work with Circuit Services
                                                            System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display

        Circuit                Service                Service         Remote
Opt     Name                   Name                   Type            Network
 1



                                                                        Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 51. Work with Circuit Services

To add an IPX circuit service, select option 1.

```
                      Add Circuit Service (ADDCCTSRV)

 Type choices, press Enter.

 Circuit name . . . . . . . . . .
 Service name . . . . . . . . . . > '                  '

 Service type . . . . . . . . . .              0000-FFFF, *ADVPRTSVR...
 Remote IPX network number  . . .              00000001-FFFFFFFE
 Remote IPX node address  . . . .              000000000001-FFFFFFFFFFFE
 Remote socket address  . . . . .              0001-FFFF
 Number of hops . . . . . . . . .   1          1-127



                                                                    Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 52. Add Circuit Service

Circuit name

Specifies the unique name of the circuit for which this static route is being added. The circuit is usually an X.25 SVC on-demand type circuit. The static service is only associated with this circuit. The circuit must have been previously configured using the Add IPX Circuit (ADDIPXCCT) CL command or by selecting option 1 from the with the Work with IPX Circuits display.

Service name

Specifies the name of the service available on the remote system.

Note: This name is used locally only, for example, ′File Server in HQ′.

Service type

Specifies the type of service available on the remote system. A set of special values are allowed including *PRTQ and *FILESVR that represent the well-known server type values. Users can also enter a variable 2-byte hexadecimal value. The hexadecimal values 0000 to 8000 and FFFF are reserved.

Any of the following special values and their hexadecimal values are valid:

- *ADVPRTSVR: An advertising print server type is available. The hexadecimal value of 0047 is used.
- *ARCHIVEQ: An archive queue type is available. The hexadecimal value of 0008 is used.
- *ARCHIVESVR: An archive server type is available. The hexadecimal value of 0009 is used.
- *FILESVR: A file server type is available. The hexadecimal value of 0004 is used.
- *JOBQ: A job queue type is available. The hexadecimal value of 000A is used.
- *JOBSVR: A job server type is available. The hexadecimal value of 0005 is used.

- *PRTQ: A print queue server type is available. The hexadecimal value of 0003 is used.
- *PRTSVR: A print server type is available. The hexadecimal value of 0007 is used.
- *RMTBRGSVR: A remote bridge server type is available. The hexadecimal value of 0024 is used.

Other Service types are:

- BTRIEVE Server ′004B′X
- 386 NetWare ′0107′X
- NetWare Management ′0237′X
- Time Synchronization ′026B′X

Note: For more information about other service types refer to the Novell documentation or the Novell Netwire (http://netwire.novell.com/).

Remote IPX network number
Specifies the remote IPX network number via which the service is available. The remote IPX network number is usually the internal IPX network number of the remote server. The remote IPX network number is a 4-byte hexadecimal number ranging from 00000001 through FFFFFFFE. A route must exist to this network, for example, a route defined via the ADDCCTRTE command.

Remote IPX node address
Specifies the node address where the service resides. If this service is available on a NetWare 3.x or 4.x server or router, then the service IPX node address should be equal to a value of 1. If the server or router does not have an internal network number, such as a NetWare 2 file server, then specify the network interface card (NIC) or medium access control (MAC) address of the server′s adapter for the service IPX node address.

Remote socket address
Specifies the socket on which this service listens for incoming requests. This is the socket found on the remote system. For example, for file services, the standard socket address is ′0451′X. The range of values allowed for the service socket address is ′0001′X to ′FFFF′X.

Other well-known sockets are:

- NCP ′0451′X
- VMS ′8046′X
- BTRIEVE ′8058′X
- BTRIEVE ′8059′X
- SQL ′805A′X
- SQL ′805B′X
- Print Server ′8060′X
- Rlogin ′8063′X
- Remote Console ′8104′X
- Print Server ′811E′X

Note: For more information about well-known sockets refer to the Novell documentation or the Novell Netwire (http://netwire.novell.com/).

Number of hops

Specifies the number of hops to the remote network. The number of hops is equal to the number of routers that are crossed in order to reach the network or system specified on the RMTNETNBR parameter.

7.2.4.1 IPX Circuit Service CL Command

The CL command ADDCCTSRV can also be used to create an IPX circuit service.

Chapter 8. Scenario 1. IPX Routing between AS/400 LAN Interfaces

In this simple scenario we use an AS/400 as an IPX router between a token-ring LAN and an Ethernet LAN.

Since we are simply routing over LANs, we use RIP/SAP rather than NLSP or static routes.

Only three configuration objects are required for this example. First we create an IPX description then we add IPX circuits for the token-ring and Ethernet LANs. Although we show the creation of Ethernet and token-ring line descriptions, in most cases these will already exist.

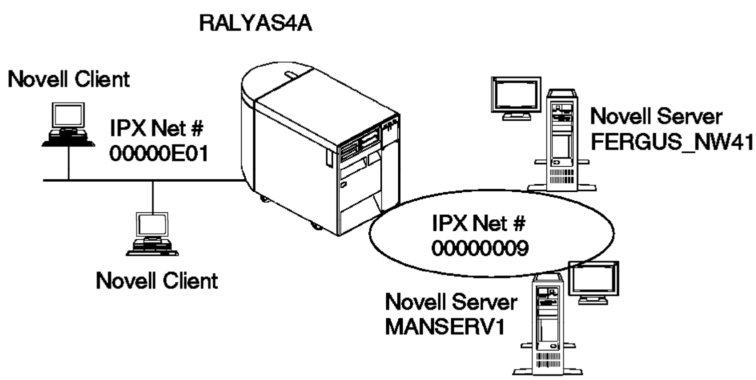

Figure 53. Environment for Scenario 1

8.1 What Information Do We Need before We Start?

Table 9 (Page 1 of 2). Scenario 1 - Information Needed.

	Whom/Where	Ethernet	Token-Ring	RALYAS4A
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN221	LIN191	N/A
LAN Routing Protocol	Network Administrator	RIP	RIP	N/A
LAN Frame-type	Network Administrator	SSAP	SSAP	N/A
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	RANDOM
LAN IPX Network Number	Network Administrator	00000E01	00000009	N/A
LAN Speed	Network Administrator	N/A	4 Mb	N/A

Table 9 (Page 2 of 2). Scenario 1 - Information Needed.

	Whom/Where	**Ethernet**	**Token-Ring**	**RALYAS4A**
IPX Router Name	Network Administrator	N/A	N/A	Router_1

8.2 RALYAS4A Configuration

For this scenario we have to create the following configuration objects on RALYAS4A:

- Ethernet line description
- Token-ring line description
- IPX description
- IPX circuit for Ethernet interface
- IPX circuit for token-ring interface

8.2.1 Ethernet Line Description

To create the Ethernet line description, enter the command CRTLINETH and press F4.

Tip

An existing Ethernet line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x′E0′ has not been defined and that the Ethernet standard is *ALL in the line description.

```
                    Create Line Desc (Ethernet) (CRTLINETH)

 Type choices, press Enter.

 Line description . . . . . . . . > ETH2617A      Name
 Resource name  . . . . . . . . . > LIN221        Name, *NWID, *NWS
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Vary on wait . . . . . . . . . .   *NOWAIT       *NOWAIT, 15-180 (1 second)
 Local adapter address  . . . . .   *ADPT         020000000000-7EFFFFFFFFFF...
 Exchange identifier  . . . . . .   *SYSGEN       05600000-056FFFFF, *SYSGEN
 Ethernet standard  . . . . . . .   *ALL          *ETHV2, *IEEE802
 SSAP list:
   Source service access point  .   *SYSGEN       02-FE, *SYSGEN
   SSAP maximum frame . . . . . .                 *MAXFRAME, 265-1496, 265...
   SSAP type  . . . . . . . . . .                 *CALC, *NONSNA, *SNA, *HPR
                + for more values
 Text 'description' . . . . . . . > 'Ethernet Line #2617'



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
```

Figure 54. Create Ethernet Line Description

The important parameters in an Ethernet line description for IPX are:

Line description Specifies the unique name of the Ethernet line description.

Resource name Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the Ethernet adapter you want to use.

Ethernet standard This value *must* be *ALL when the line is used for an Ethernet NetWare protocol network. This is the default.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x′E0′ to be used by IPX is not specified here. See frame type in the IPX circuit.

8.2.2 Token-Ring Line Description

To create the token-ring line description, enter the command CRTLINTRN and press F4.

Tip

An existing token-ring line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x′E0′ has not been defined in the line description.

```
                 Create Line Desc (Token-Ring) (CRTLINTRN)

 Type choices, press Enter.

 Line description . . . . . . . . > TRN2619A     Name
 Resource name  . . . . . . . . . > LIN191       Name, *NWID, *NWSD
 Online at IPL  . . . . . . . . .   *YES         *YES, *NO
 Vary on wait . . . . . . . . . .   *NOWAIT      *NOWAIT, 15-180 (1 second)
 Maximum controllers  . . . . . .   40           1-256
 Line speed . . . . . . . . . . .   4M           4M, 16M, *NWI
 Maximum frame size . . . . . . .   1994         265-16393, 265, 521, 1033...
 Local adapter address  . . . . .   400010020001  400000000000-7FFFFFFFFFFF...
 Exchange identifier  . . . . . .   *SYSGEN      05600000-056FFFFF, *SYSGEN
 SSAP list:
   Source service access point  .   *SYSGEN      02-FE, *SYSGEN
   SSAP maximum frame . . . . . .                *MAXFRAME, 265-16393
   SSAP type  . . . . . . . . . .                *CALC, *NONSNA, *SNA, *HPR
               + for more values
 Text ′description′ . . . . . . . > ′4M Token-ring line LIN191′

                                                                   Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
```

Figure 55. Create Token-Ring Line Description

The important parameters in a token-ring line description for IPX are:

Line description Specifies the unique name of the token-ring line description.

Resource name Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the token-ring adapter you want to use.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type.

The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x′E0′ to be used by IPX is not specified here. See frame type in the IPX circuit.

8.2.3 IPX Configuration

To access the Configure IPX menu, enter the command CFGIPX (Configure IPX).

Attention

Your user profile must have the *IOSYSCFG special authority in order to configure the IPX support.

```
CFGIPX                          Configure IPX
                                                            System:   RALYAS4A
Select one of the following:

  Configure IPX
     1. Configure IPX circuits
     2. Work with IPX descriptions
     3. Work with IPX status

  Configure AnyNet/400 over IPX
    10. Work with IP over IPX interfaces
    11. Work with IP over IPX routes
    12. Work with IP over IPX addresses

    20. Work with SNA over IPX locations




Selection or command
===>

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 56. IPX Configuration Main Menu

8.2.3.1 IPX Description

To create the IPX description, select option 2 (Work with IPX descriptions) from the IPX configuration main menu.

```
                         Work with IPX Descriptions
                                                         System:   RALYAS4A
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   7=Rename
  9=Retrieve Source

        IPX
Opt     Desc           Text
 1      RALYAS4A
        QDCIPX1        This IPXD is IBM Supplied
        QDCIPX2        This IPXD is IBM Supplied



                                                                     Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
```

Figure 57. Work with IPX Descriptions

Then select option 1.

```
                      Create IPX Description (CRTIPXD)

Type choices, press Enter.

IPX description  . . . . . . . . > RALYAS4A      Name
IPX internal network number  . .   *RANDOM       00000001-FFFFFFFE, *RANDOM
IPX routing protocol . . . . . . > *RIP          *NLSP, *RIP
IPX router name  . . . . . . . . > ROUTER_1

IPX maximum datagram size  . . .   576           576-65535
Text 'description' . . . . . . . > 'IPX Description for RALYAS4A'




                                                                     Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

Figure 58. Create IPX Description

The important parameters in an IPX description are:

IPX description We use the system name for the IPX description name.

IPX internal network number
We use a randomly generated IPX internal network number.

IPX routing protocol Over a LAN it is normal to use RIP/SAP rather than NLSP or define static routes and services.

IPX router name We have chosen to use the name Router_1 for this IPX router.

Press F10 for additional parameters.

```
                      Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > RALYAS4A      Name
 IPX internal network number  . . > *RANDOM       00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *RIP          *NLSP, *RIP
 IPX router name  . . . . . . . . > ROUTER_1

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . . > 'IPX Description for RALYAS4A'


                          Additional Parameters

 IPX packet forwarding  . . . . .   *YES          *YES, *NO
 IPX hop count  . . . . . . . . .   64            8-127
 SPX maximum sessions . . . . . .   1000          100-9999
 SPX watchdog abort timeout . . .   120000        30000-3000000
 SPX watchdog verify timeout  . .   30000         556-300000
                                                                  More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 59. Create IPX Description (Additional Parameters)

IPX packet forwarding

Be sure this value is *YES if you want to use the AS/400 as an IPX router. *YES is the default.

Press Page Down (additional parameters on next screen).

```
                      Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 SPX are you there timeout  . . .   60000         556-600000
 SPX default retry count  . . . .   10            1-255
 LAN hello  . . . . . . . . . . .   20            1-600
 WAN hello  . . . . . . . . . . .   20            1-600
 Designated router interval . . .   10            1-100
 Holding time multiplier  . . . .   3             2-20
 Log protocol errors  . . . . . .   *NO           *NO, *YES
 Authority  . . . . . . . . . . .   *LIBCRTAUT    Name, *LIBCRTAUT, *CHANGE...



                                                                   Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 60. Create IPX Description (Additional Parameters Next Screen)

CL Command

The above IPX description could also have been created by entering:

```
CRTIPXD IPXD(RALYAS4A)
          IPXNETNBR(*RANDOM)
          IPXRTGPCL(*RIP)
          IPXRTRNAME(ROUTER_1)
          TEXT('IPX Description for RALYAS4A')
```

8.2.3.2 IPX Circuits

To create IPX circuits for the Ethernet and token-ring network interfaces, select option 1 (Configure IPX circuits) from the IPX configuration main menu followed by option 1 (Work with IPX circuits).

```
                            Work with IPX Circuits
                                                           System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

      Circuit                  Line        Line          Circuit
 Opt  Name                  Description    Type          Status
 1    ETH2617A



                                                                       Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 61. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                          Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > ETH2617A
 Line description . . . . . . . . > ETH2617A      Name
 IPX network number . . . . . . . > E01           00000001-FFFFFFFD
 Frame type . . . . . . . . . . .   *SSAP         *SSAP, *SNAP, *ETHV2, *ETHNTW
 Enable for NLSP  . . . . . . .  >  *NO           *YES, *NO
 MAC channel for NLSP . . . . . .   *BROADCAST    *BROADCAST, *MULTICAST
 Router priority for NLSP . . . .   44            0-127
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC



                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 62. Add IPX Circuit for the Ethernet Network Interface

The important parameters in an IPX circuit for the Ethernet interface are:

Circuit name We use the line description name for the circuit name.

Line description The Ethernet line description created above.

IPX network number The network number associated with the Ethernet LAN segment.

Frame type The frame type to be used on this LAN segment.

Enable for NLSP We only use RIP and SAP.

Next we create an IPX circuit for the token-ring network interface.

```
                              Work with IPX Circuits
                                                          System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   7=Display associated services
  8=Display associated routes   9=Start     10=End

       Circuit                 Line        Line          Circuit
Opt    Name                 Description    Type          Status
1      TRN2619A
       ETH2617A             ETH2617A       *ETHLAN       Inactive


                                                                      Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 63. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                          Add IPX Circuit (ADDIPXCCT)

Type choices, press Enter.

Circuit name . . . . . . . . . . > TRN2619A
Line description . . . . . . . . > TRN2619A      Name
IPX network number . . . . . . . > 9             00000001-FFFFFFFD
Frame type . . . . . . . . . . .   *SSAP         *SSAP, *SNAP, *ETHV2, *ETHNTW
Enable for NLSP  . . . . . . . >   *NO           *YES, *NO
MAC channel for NLSP . . . . . .   *BROADCAST    *BROADCAST, *MULTICAST
Router priority for NLSP . . . .   44            0-127
Cost override for NLSP . . . . .   *CALC         1-63, *CALC



                                                                      Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

Figure 64. Add IPX Circuit for Token-Ring

The important parameters in an IPX circuit for the token-ring interface are:

Circuit name We use the line description name for the circuit name.

Line description The token-ring line description created above.

IPX network number The network number associated with the token-ring LAN segment.

Frame type The frame type to be used on this LAN segment.

Enable for NLSP We only use RIP and SAP.

CL Command

The above IPX circuits could also have been created by entering:

```
ADDIPXCCT CCTNAME(ETH2617A) LIND(ETH2617A)
IPXNETNBR(00000E01) ENBNLSP(*NO)

ADDIPXCCT CCTNAME(TRN2619A) LIND(TRN2619A)
IPXNETNBR(00000009) ENBNLSP(*NO)
```

Note

Since we have configured the circuits to allow RIP and SAP to flow, we do not have to configure IPX circuit routes or IPX circuit services.

8.3 Starting and Verifying the IPX Router Support

Before we can start the IPX support on the AS/400, we have to vary on the Ethernet and token-ring line descriptions. We can do this by entering the following commands:

```
VRYCFG CFGOBJ(ETH2617A) CFGTYPE(*LIN) STATUS(*ON)
VRYCFG CFGOBJ(TRN2619A) CFGTYPE(*LIN) STATUS(*ON)
```

8.3.1 Starting IPX

To start IPX using the IPX description we created above, enter the following command:

```
STRIPX RALYAS4A
```

Starting the AS/400 IPX support creates a *NET controller and an *NET device description.

Tip

The *NET controller is also used by the AS/400 TCP/IP support if this is also configured on the system.

8.3.2 Verifying the IPX Configuration

To verify that the line descriptions have become active and that the *NET controller and device descriptions have been created and are also active, use the command WRKCFGSTS. For example, if we enter the command WRKCFGSTS *LIN ETH2617A on RALYAS4A, we see the panel shown in Figure 65 on page 98.

```
                        Work with Configuration Status                RALYAS4A
                                                            03/18/97  15:51:29
Position to  . . . . .               Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description       Status                -------------Job--------------
     ETH2617A          ACTIVE
       ETH26NET        ACTIVE
         ETH26IPX      ACTIVE                QIPX        QSYS        008054







                                                                       Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 65. Work with Configuration Status

Tip

STRIPX starts all IPX circuits that have AUTOSTART set to *YES.

The QIPX application job runs in the QSYSWRK subsystem and uses the QSYS/QZSPJOB job description. To display the job, enter the command `WRKACTJOB SBS(QSYSWRK)`.

```
                            Work with Active Jobs                     RALYAS4A
                                                            03/18/97  15:52:52
CPU %:     .8     Elapsed time:   00:19:34     Active jobs:   61

Type options, press Enter.
  2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
  8=Work with spooled files   13=Disconnect ...

Opt  Subsystem/Job  User        Type  CPU %  Function        Status
     QSYSWRK        QSYS        SBS      .0                   DEQW
       QAPPCIPX     QSYS        BCH      .0                   TIMW
       QAPPCTCP     QSYS        BCH      .0  PGM-QZPAIJOB     TIMW
       QIPX         QSYS        BCH      .0                   DEQW
       QSNMPSA      QTCP        BCH      .0  PGM-QNMSARTR     DEQW
       QTCPIP       QTCP        BCH      .0                   DEQW
       QTFTP04283   QTCP        BCH      .0                   DEQW
       QTFTP04486   QTCP        BCH      .0                   DEQW
       QTFTP04769   QTCP        BCH      .0                   TIMW
                                                                      More...
Parameters or command
===>
F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
```

Figure 66. Work with Active Jobs

To verify that the IPX circuits have started, select option 3 (Work with IPX status) from the IPX configuration main menu.

```
                          Work with IPX Status
                                                          System:   RALYAS4A
 Select one of the following:

      1. Work with IPX circuit status
      2. Display IPX route information
      3. Display IPX service information
      4. Work with IPX/SPX connection status
      5. Display active IPX description




 Selection or command
 ===> 1

 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 67. Work with IPX Circuit Status

Then select option 1 (Work with IPX circuit status).

```
                       Work with IPX Circuit Status
                                                          System:   RALYAS4A
Type options, press Enter.
  5=Display details   7=Display associated services
  8=Display associated routes   9=Start   10=End
  12=Work with configuration status

       Circuit                 Line        Line          Circuit
Opt    Name                 Description    Type          Status
       ETH2617A             ETH2617A       *ELAN         Active
       TRN2619A             TRN2619A       *TRLAN        Active










                                                                       Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 68. Work with IPX Circuit Status Screen

Here you can see that both the circuits have become active. Both circuits were started automatically because we accepted the default of *YES for Automatic start in the IPX circuits.

Now let′s look at the IPX RIP table on the AS/400.

```
                              Work with IPX Status
                                                        System:   RALYAS4A
 Select one of the following:

      1. Work with IPX circuit status
      2. Display IPX route information
      3. Display IPX service information
      4. Work with IPX/SPX connection status
      5. Display active IPX description




 Selection or command
 ===> 2

 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 69. Display IPX Routing Information

Select option 2 (Display IPX route information) from the work with IPX Status menu.

```
                        Display IPX Route Information
                                                        System:   RALYAS4A
Type options, press Enter.
  5=Display details

        Remote        Number      Number      Next Hop          Route
Opt     Network      of Hops     of Ticks     Node Address      Source
        00000009         0            1       *NONE             *CCT
        00000E01         0            1       *NONE             *CCT
        30AA0F92         1            2       400052005240      *RIP
        31ECF1DD         1            2       08005A0D2860      *RIP
        A0CF7707         0            1       000000000001      *LOCAL









                                                                    Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 70. Display IPX Route Information Screen

This display shows the IPX routing information from the different networks.

Remote Network The remote network number. This may be an external network number or an internal network number.

00000009 This is the network attached to the AS/400's token-ring network interface. *CCT indicates that the network is defined in an IPX circuit.

00000E01
This is the network attached to the AS/400′s Ethernet network interface. *CCT indicates that the network is defined in an IPX circuit.

A0CF7707
This is the AS/400′s internal network number as indicated by *LOCAL for route source. This is the number that was randomly generated.

30AA0F92 and 31ECF1DD
These are the internal network numbers of servers on the respective networks. The MAC addresses of these servers are shown under Next Hop Node Address. These network numbers were located via RIP broadcasts.

Number of Hops
The number of hops necessary to reach the remote network. The number of hops is equal to the number of routers that are crossed in order to reach the network or system.

Number of Ticks
The number of ticks needed to reach the remote network. The number of ticks value is used to weight a route. If there is more than one route to a remote network and both have the same hop count, then the route with the least ticks is chosen.

Tip

A tick is defined as 1/18 of a second. The time that a packet takes to go to an IPX node and be returned as a response is measured in terms of ticks.

Next Hop Node Address
The IPX node address of the next hop. The next hop node address is usually the LAN adapter MAC address. The node address associated with an internal network address is 000000000001.

Route Source
The source from which knowledge of this route was obtained:

- *CCT (Circuit) - The route was generated from a locally defined circuit.
- *CFG (Configuration) - The route was configured using the add circuit route (ADDCCTRTE) CL command.
- *NLSP - The route was discovered via NLSP.
- *RIP - The route was discovered via RIP.

Now let′s look at the IPX SAP table on the AS/400.

```
                          Work with IPX Status
                                                        System:   RALYAS4A
 Select one of the following:

      1. Work with IPX circuit status
      2. Display IPX route information
      3. Display IPX service information
      4. Work with IPX/SPX connection status
      5. Display active IPX description




 Selection or command
 ===> 3

 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 71. Display IPX Service Information

Select option 3 (Display IPX service information) from the work with IPX Status menu.

```
                       Display IPX Service Information
                                                        System:   RALYAS4A
Type options, press Enter.
  5=Display details

       Service              Service        Remote      Hops to    Service
Opt    name                 Type           Network     Service    Source
       FERGUS_NW41          *FILESVR       31ECF1DD       1       *SAP
       MANSERV1             *FILESVR       30AA0F92       1       *SAP
       BSER4.00-6.10_30A>   004B           30AA0F92       1       *SAP
       ISMANSERV11841501>   0102           30AA0F92       1       *SAP
       IVMANSERV11841501>   0102           30AA0F92       1       *SAP
       LANPROTECT1841501>   0102           30AA0F92       1       *SAP
       FERGUS_NW41          0107           31ECF1DD       1       *SAP
       MANSERV1             0107           30AA0F92       1       *SAP
       FERGUS_NW41______>   0115           31ECF1DD       1       *SAP
       FERGUS_NW41          0130           31ECF1DD       1       *SAP
       FERGUS_NW41_TREE_>   026B           31ECF1DD       1       *SAP
       SYSMAN___________>   026B           30AA0F92       1       *SAP
       FERGUS_NW41_TREE_>   0278           31ECF1DD       1       *SAP
       SYSMAN___________>   0278           30AA0F92       1       *SAP
                                                                   More...
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 72. Display IPX Service Information Screen

This display shows the IPX service information from servers on the networks.

Service name Shows the name of the service available on the remote system.

Service Type Shows the type of the service available on the remote system. The service type is a 2-byte hexadecimal value. The hexadecimal values 0000 to 8000 and FFFF are reserved.

Any of the following special values and their hexadecimal values are valid:

- *FILESVR: A file server type is available. The hexadecimal value of 0004 is used.
- 004B: BTRIEVE server.
- 0107: 386 server.
- 0237: NetWare management.
- 026B: Time synchronization.

Remote Network Shows the remote IPX network number via which the service is available. There should be a corresponding route table entry for this remote network.

Tip

The remote IPX network number is usually the internal IPX network number of the remote server.

Hops to Service Shows the number of hops to reach the service on the remote system.

Service Source Shows the source from which knowledge of this service was obtained:

- *LOCAL - This is a locally known service.
- *CFG (Configuration) - The service was configured using the add circuit service (ADDCCTSRV) CL command.
- *NLSP - The service was discovered via NLSP.
- *SAP - The service was discovered via SAP.

From the IPX routing and service information above we can see, for example, that two file servers exist in the network:

- A NetWare file server with the name FERGUS_NW41 located at node number 08005A48816B with an internal network number of 31ECF1DD.
- A NetWare file server with the name MANSERV1 located at node number 400052005240 with an internal network number of 30AA0F92.

We can also see that both are one hop away from the AS/400. This means that they are on the same LAN as the AS/400 and two ticks are needed to reach each.

The server entries in the table allows the AS/400 to respond to a GET NEAREST SERVER query from the Novell client.

As a final verification step we verified a successful login to a NetWare server from a NetWare client.

8.3.3 Ending IPX

We can end an individual IPX circuit either from the Work with IPX Circuit Status menu or by using the command ENDIPXCCT.

We can end the AS/400 IPX router by using the ENDIPX command.

Attention

No confirmation display is shown when the ENDIPX command is entered. The ENDIPX command *immediately* ends all IPX processing on the AS/400.

Chapter 9. Scenario 2. IPX Routing between AS/400s via an On-Demand X.25 SVC Connection

In this scenario we use the AS/400′s IPX router capability over an X.25 SVC (switched virtual circuit) WAN connection. We use dial-on-demand so that the switched connection is only established when we have data to send. Because we are using on-demand, we have to define static RIP and SAP tables entries. However, rather than turn RIP/SAP/NLSP off completely for the WAN connection, we allow these to flow when the connection is established. With on-demand, only data (not RIP, SAP or NLSP) will establish the connection. We also show how the AS/400′s X.25 interface can be used for SNA, TCP/IP and IPX concurrently. X.25 provides a relatively low-speed (up to 64 Kbps) connection.

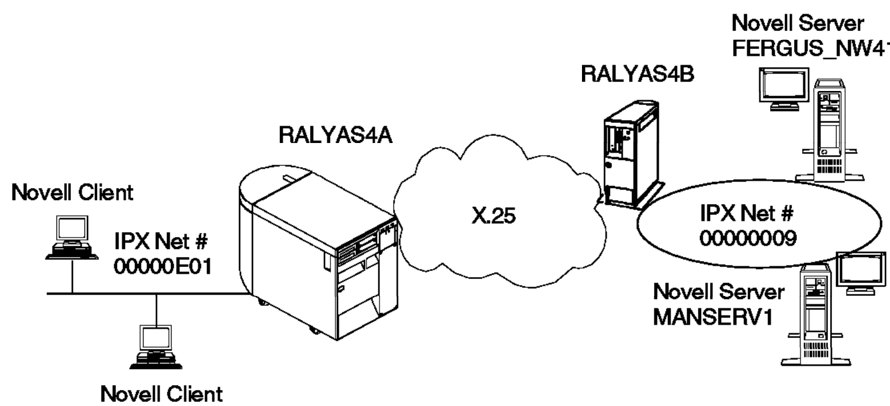

Figure 73. Environment for Scenario 2

9.1 What Information Do We Need before We Start?

Table 10 (Page 1 of 2). RALYAS4A - Information Needed.

	Whom/Where	Ethernet	WAN/X.25	RALYAS4A
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000E01	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	N/A	N/A	N/A
SVC Logical Channel	X.25 Provider	N/A	004	N/A
WAN Speed	X.25 Provider	N/A	9600	N/A

Table 10 (Page 2 of 2). RALYAS4A - Information Needed.

	Whom/Where	**Ethernet**	**WAN/X.25**	**RALYAS4A**
X.25 Network Address	X.25 Provider	N/A	101100205	N/A
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN221	LIN072	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_1
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	96AD0D47

Table 11. RALYAS4B - Information Needed.

	Whom/Where	**Token-ring**	**WAN/X.25**	**RALYAS4B**
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000009	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	4 Mb	N/A	N/A
SVC Logical Channel	X.25 Provider	N/A	003	N/A
WAN Speed	X.25 Provider	N/A	9600	N/A
X.25 Network Address	X.25 Provider	N/A	101100201	N/A
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN101	LIN182	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_2
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	76AD0117

9.2 RALYAS4A Configuration

For this scenario we have to create the following configuration objects on RALYAS4A:

- Ethernet line description
- X.25 line description
- IPX description
- IPX circuit for Ethernet interface
- IPX circuit for X.25 interface
- IPX circuit routes

IPX circuit service

9.2.1 Ethernet Line Description

To create the Ethernet line description, enter the following command:

```
CRTLINETH LIND(ETH2617A)
          RSRCNAME(LIN221)
          TEXT('Ethernet LAN LIN221')
```

Tip

An existing Ethernet line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x'E0' has not been defined and that the Ethernet standard is *ALL in the line description.

The important parameters in an Ethernet line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the Ethernet adapter you want to use.

Ethernet standard (ETHSTD)
This value *must* be *ALL when the line is used for an Ethernet NetWare protocol network. This is the default.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x'E0' to be used by IPX is not specified here. See frame type in the IPX circuit.

9.2.2 X.25 Line Description

To create the X.25 line description, enter the following command:

```
CRTLINX25 LIND(X25LINE_A)
          RSRCNAME(LIN072)
          LGLCHLE((004 *SVCBOTH))
          NETADR(101100205)
          CNNINIT(*LOCAL)
          MAXFRAME(4096)
          MAXPKTSIZE(4096)
          TEXT('X.25 line to RALYAS4B via X.25 NET')
```

The important parameters in an X.25 line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the communications adapter you want to use.

X.25 logical channels (LGLCHLE)
Specify here the X.25 logical channels as per your X.25 network provider subscription.

X.25 network address (NETADR)
Specify here the X.25 network address as per your X.25 network provider subscription.

Connection initiation (CNNINIT)
This parameter determines who initiates the X.25 connection. This parameter is network-dependant. This parameter does not determine who initiates the X.25 call.

Maximum frame size (MAXFRAME)
This parameter sets the maximum frame size supported by the X.25 connection.

Maximum packet size (MAXPKTSIZE)
This parameter sets the maximum packet size supported by the X.25 connection. Setting this value at 4096 allows us to use a packet size of up to 4096. The packet size we use is set in the X.25 IPX circuit.

Default packet size (DFTPKTSIZE) and default window size (DFTWDWSIZE).
These parameters are also network dependant. The default packet and window sizes should match the network defaults. The AS/400 defaults are a packet size of 128 with a window size of 2. These values are frequently also the network defaults as was the case with the network we were using.

Tip

An X.25 line description is a shared resource. Had we configured more logical channels, the above line description could also have been used for SNA and TCP/IP. When in use, each protocol would use a logical channel. A logical channel can only be used to a single remote location. Concurrent sessions (SNA, TCP/IP or IPX) to multiple remote locations would therefore require multiple logical channels.

9.2.3 IPX Configuration

To access the Configure IPX menu, enter the command `CFGIPX` (Configure IPX).

Attention

Your user profile must have the *IOSYSCFG special authority in order to configure the IPX support.

```
CFGIPX                          Configure IPX
                                                            System:   RALYAS4A
Select one of the following:

  Configure IPX
     1. Configure IPX circuits
     2. Work with IPX descriptions
     3. Work with IPX status

  Configure AnyNet/400 over IPX
    10. Work with IP over IPX interfaces
    11. Work with IP over IPX routes
    12. Work with IP over IPX addresses

    20. Work with SNA over IPX locations




Selection or command
===>

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 74. IPX Configuration Main Menu

9.2.3.1 IPX Description

To create the IPX description, select option 2 (Work with IPX Descriptions) from the IPX configuration main menu.

```
                          Work with IPX Descriptions
                                                            System:   RALYAS4A
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   7=Rename
  9=Retrieve Source

        IPX
Opt     Desc           Text
 1      RALYAS4A
        QDCIPX1        This IPXD is IBM Supplied
        QDCIPX2        This IPXD is IBM Supplied


                                                                        Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
```

Figure 75. Work with IPX Descriptions

Then select option 1.

```
                       Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > RALYAS4A      Name
 IPX internal network number  . . > 96AD0D47      00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP         *NLSP, *RIP
 IPX router name  . . . . . . . . > ROUTER_1

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . . > 'IPX Description for RALYAS4A'



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 76. Create IPX Description

The important parameters in an IPX description are:

IPX description We use the system name for the IPX description name.

IPX internal network number
The IPX network number used for the AS/400's internal network number must be unique to all other network numbers (internal and external) in this IPX internetwork.

IPX routing protocol We use *DEMAND for the X.25 IPX circuit so that the connection is only established for data. However, when the connection has been established (by data), specifying *NLSP here and in the X.25 IPX circuit (ENBNLSP(*YES)) allows *NLSP to be used over the X.25 connection. We specify ENBNLSP(*NO) in the LAN IPX circuit.

IPX router name We have chosen to use the name Router_1 for this IPX router.

Press F10 for additional parameters.

```
                        Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > RALYAS4A      Name
 IPX internal network number  . . > 96AD0D47      00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP         *NLSP, *RIP
 IPX router name  . . . . . . . . > ROUTER_1

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . . > 'IPX Description for RALYAS4A'


                            Additional Parameters

 IPX packet forwarding  . . . . .   *YES          *YES, *NO
 IPX hop count  . . . . . . . . .   64            8-127
 SPX maximum sessions . . . . . .   1000          100-9999
 SPX watchdog abort timeout . . .   120000        30000-3000000
 SPX watchdog verify timeout  . .   30000         556-300000
                                                                       More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 77. Create IPX Description (Additional Parameters)

IPX packet forwarding

Be sure this value is *YES if you want to use the AS/400 as an IPX Router. *YES is the default.

Press Page Down (additional parameters on next screen).

```
                        Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 SPX are you there timeout  . . .   60000         556-600000
 SPX default retry count  . . . .   10            1-255
 LAN hello  . . . . . . . . . . .   20            1-600
 WAN hello  . . . . . . . . . . .   20            1-600
 Designated router interval . . .   10            1-100
 Holding time multiplier  . . . .   3             2-20
 Log protocol errors  . . . . . .   *NO           *NO, *YES
 Authority  . . . . . . . . . . .   *LIBCRTAUT    Name, *LIBCRTAUT, *CHANGE...



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 78. Create IPX Description (Additional Parameters Next Screen)

CL Command

The above IPX description could also have been created by entering:

```
CRTIPXD IPXD(RALYAS4A)
          IPXNETNBR(96AD0D47)
          IPXRTRNAME(ROUTER_1)
          TEXT('IPX Description for RALYAS4A')
```

9.2.3.2 IPX Circuits

To create IPX circuits for the Ethernet and X.25 network interfaces, select option 1 (Configure IPX circuits) from the IPX configuration main menu followed by option 1 (Work with IPX circuits).

```
                          Work with IPX Circuits
                                                           System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                  Line        Line          Circuit
 Opt    Name                  Description    Type          Status
 1      ETH2617A


                                                                        Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 79. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                         Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > ETH2617A
 Line description . . . . . . . . > ETH2617A      Name
 IPX network number . . . . . . . > E01           00000001-FFFFFFFD
 Frame type . . . . . . . . . . .   *SSAP         *SSAP, *SNAP, *ETHV2, *ETHNTW
 Enable for NLSP  . . . . . . . .>  *NO           *YES, *NO
 MAC channel for NLSP . . . . . .   *BROADCAST    *BROADCAST, *MULTICAST
 Router priority for NLSP . . . .   44            0-127
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 80. Add IPX Circuit for the Ethernet Network Interface

The important parameters in an IPX circuit for Ethernet are:

Circuit name We use the line description name for the circuit name.

Line description The Ethernet line description created above.

IPX network number The network number associated with the Ethernet LAN segment.

Frame type The frame type to be used on this LAN segment.

Enable for NLSP We only use RIP and SAP.

CL Command

The above IPX circuit could also have been created by entering:

```
ADDIPXCCT CCTNAME(ETH2617A) LIND(ETH2617A)
IPXNETNBR(00000E01) ENBNLSP(*NO)
```

Next we create an IPX circuit for the X.25 network interface.

```
                           Work with IPX Circuits
                                                          System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                   Line        Line          Circuit
 Opt    Name                   Description    Type          Status
 1      X25SVC_A
        ETH2617A               ETH2617A       *ETHLAN       Inactive



                                                                      Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 81. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                         Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > X25SVC_A
 Line description . . . . . . . . > X25LINE_A     Name
 X.25 PVC logical channel id  . .                 001-FFF
 X.25 SVC network address . . . . > 101100201
 X.25 SVC call type . . . . . . .   *DEMAND       *DEMAND, *PERM
 X.25 SVC reverse charge  . . . .   *NONE         *NONE, *REQUEST, *ACCEPT...
 X.25 SVC idle circuit timeout  .   60            1-600
 X.25 default packet size:
   Transmit packet size . . . . . > 4096          *LIND, 64, 128, 256, 512...
   Receive packet size  . . . . . > *TRANSMIT     *LIND, *TRANSMIT, 64, 128...
 X.25 default window size:
   Transmit window size . . . . . > 7             1-15, *LIND
   Receive window size  . . . . . > *TRANSMIT     1-15, *LIND, *TRANSMIT
 Enable for NLSP  . . . . . . . .   *YES          *YES, *NO
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC
 Enable for IW2 . . . . . . . . .   *YES          *YES, *NO
                                                                       More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 82. Add IPX Circuit for X.25 SVC

The important parameters in an IPX circuit for X.25 are:

Circuit name Specifies the name of the IPX circuit being added.

Line description The X.25 line description created above.

X.25 SVC network address This is the remote system's X.25 network address.

X.25 SVC call type This circuit is to be an on-demand SVC circuit. The SVC connection is only be established when there is data to transfer to the remote destination. It is active for the duration of the data transfer plus the idle timeout value. This is the default value.

X.25 SVC idle circuit timeout This is the length of time the connection is held up following the end of data transmission.

X.25 default packet size and default window size
Providing the network is reliable, increasing the packet and window sizes used improves data throughput. We have specified here the maximum values supported by the X.25 network we were using. When higher values are specified here than in the X.25 line description default packet and window sizes, the AS/400 requests the values specified here in the CALL REQUEST packet.

Press Page Down (additional parameters on next screen).

```
                           Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 IW2 timer request retries  . . .   16            1-256, *NOMAX
 IW2 timer request interval . . .   20            1-60

                            Additional Parameters

 Default maximum datagram size  .   *LIND         576-16388, *LIND
 Throughput . . . . . . . . . . .   *CALC         300-4294967295, *CALC
 Delay time . . . . . . . . . . .   *CALC         1-5000000, *CALC
 Automatic start  . . . . . . . .   *YES          *YES, *NO
 RIP state  . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
 RIP update interval  . . . . . .   60            30-300000
 RIP age multiplier . . . . . . .   4             1-10
 SAP state  . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
 SAP update interval  . . . . . .   60            30-300000
 SAP age multiplier . . . . . . .   4             1-10

                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 83. Add IPX Circuit for X.25 SVC (Next Screen)

RIP state and SAP state Setting X.25 SVC call type to *DEMAND causes the switched connection to only be established when there is data to send. Having these two values set to *AUTO (rather than *OFF) allows RIP and SAP to be exchanged when the connection has been established for data.

CL Command

The above IPX circuit could also have been created by entering:

```
ADDIPXCCT CCTNAME(X25SVC_A)
LIND(X25LINE_A) SVCNETADR(101100201)
SVCTYPE(*DEMAND) DFTPKTSIZE(4096 *TRANSMIT)
DFTWDWSIZE(7 *TRANSMIT)
```

9.2.3.3 IPX Circuit Routes

With the X.25 IPX circuit set to *DEMAND the switched connection is not to be established for RIP or SAP. The AS/400s do not, therefore, automatically learn about the networks available via the remote router. Therefore we must configure static RIP table entries (circuit routes). To create IPX circuit routes, select option 1 (Configure IPX circuits) from the IPX configuration main menu followed by option 2 (Work with IPX circuit routes).

```
                         Work with Circuit Routes
                                                          System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display

        Circuit                 Remote       Number      Number     Next Hop
 Opt    Name                    Network     of Hops    of Ticks    Node Address

        X25SVC_A                31ECF1DD       2           30      *NONE
        X25SVC_A                76AD0117       1           30      *NONE




  F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 84. Work with Circuit Routes

We used option 1 (Add) to add the following routes for circuit X25SVC_A:

Remote Network

31ECF1DD
: This is the internal network number of the Novell server the Novell client will login to.

76AD0117
: This is the internal IPX network number of the remote IPX router, in this case the AS/400 RALYAS4B. This route entry is not required for successful operation of the scenario but it allows us to verify the connection via an IPXPING between the AS/400s.

CL Command

The above IPX circuit routes could also have been created by entering:

```
ADDCCTRTE CCTNAME(X25SVC_A)
RMTNETNBR(31ECF1DD) NBRHOP(2) NBRTICK(30)
ADDCCTRTE CCTNAME(X25SVC_A)
RMTNETNBR(76AD0117) NBRHOP(1) NBRTICK(30)
```

9.2.3.4 IPX Circuit Services

With the X.25 IPX circuit set to *DEMAND the switched connection is not to be established for RIP or SAP. The AS/400s do not, therefore, automatically learn about the services available via the remote router. Therefore we must configure a static SAP table entry (circuit service). To create IPX circuit services, select option 1 (Configure IPX circuits) from the IPX configuration main menu followed by option 3 (Work with IPX circuit services).

```
                         Add Circuit Service (ADDCCTSRV)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > X25SVC_A
 Service name . . . . . . . . . . > 'FERGUS_NW41       '

 Service type . . . . . . . . . . > *FILESVR      0000-FFFF, *ADVPRTSVR...
 Remote IPX network number  . . .   31ECF1DD      00000001-FFFFFFFE
 Remote IPX node address  . . . .   1             000000000001-FFFFFFFFFFFE
 Remote socket address  . . . . .   0451          0001-FFFF
 Number of hops . . . . . . . . .   1             1-127








                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 85. Work with Circuit Services

We used option 1 (Add) to add the following service for circuit X25SVC_A:

Service Name

NW41 Here we define a static SAP table entry for the NetWare server the client will login to. The server (FERGUS_NW41) is a file server and has an internal network number 31ECF1DD. In Figure 84 on page 116 we configured a circuit route for this network number.

CL Command

The above IPX circuit service could also have been created by entering:

```
ADDCCTSRV CCTNAME(X25SVC_A)
              SRVNAME('FERGUS_NW41')
              SRVTYPE(*FILESVR)
              RMTNETNBR(31ECF1DD)
              RMTNDEADR(1)
              RMTSCKADR(0451)
```

9.3 RALYAS4B Configuration

For this scenario we have to create the following configuration objects on RALYAS4B:

- Token-ring line description
- X.25 line description
- IPX description
- IPX circuit for token-ring interface

IPX circuit for X.25 interface

IPX circuit routes

9.3.1 Token-Ring Line Description

To create the Ethernet line description, enter the following command:

```
CRTLINTRN LIND(TRN2619B)
             RSRCNAME(LIN101)
             LINESPEED(4M)
             TEXT('4M Token-Ring')
```

Tip

An existing token-ring line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x'E0' has not be defined in the line description.

The important parameters in a token-ring line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the token-ring adapter you want to use.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x'E0' to be used by IPX is not specified here. See frame type in the IPX circuit.

9.3.2 X.25 Line Description

To create the X.25 line description, enter the following command:

```
CRTLINX25 LIND(X25LINE_B)
             RSRCNAME(LIN182)
             LGLCHLE((003 *SVCBOTH))
             NETADR(101100201)
             CNNINIT(*LOCAL)
             MAXFRAME(4096)
             MAXPKTSIZE(4096)
             TEXT('X.25 line to RALYAS4A via X.25 NET')
```

9.3.3 IPX Configuration

To access the Configure IPX menu, enter the command CFGIPX (Configure IPX).

```
CFGIPX                          Configure IPX
                                                            System:   RALYAS4B
Select one of the following:

  Configure IPX
     1. Configure IPX circuits
     2. Work with IPX descriptions
     3. Work with IPX status

  Configure AnyNet/400 over IPX
    10. Work with IP over IPX interfaces
    11. Work with IP over IPX routes
    12. Work with IP over IPX addresses

    20. Work with SNA over IPX locations




Selection or command
===>

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 86. IPX Configuration Main Menu

9.3.3.1 IPX Description

To create the IPX description, select option 2 (Work with IPX Descriptions) from the IPX configuration main menu.

```
                          Work with IPX Descriptions
                                                            System:   RALYAS4B
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   7=Rename
  9=Retrieve Source

        IPX
Opt     Desc           Text
 1      RALYAS4B
        QDCIPX1        This IPXD is IBM Supplied
        QDCIPX2        This IPXD is IBM Supplied


                                                                        Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
```

Figure 87. Work with IPX Descriptions

Then select option 1.

```
                          Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > RALYAS4B      Name
 IPX internal network number  . . > 76AD0117       00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP         *NLSP, *RIP
 IPX router name  . . . . . . . . > ROUTER_2

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . . > 'IPX Description for RALYAS4B'



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 88. Create IPX Description

Press F10 for additional parameters.

```
                          Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > RALYAS4B      Name
 IPX internal network number  . . > 76AD0117       00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP         *NLSP, *RIP
 IPX router name  . . . . . . . . > ROUTER_2

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . . > 'IPX Description for RALYAS4B'


                           Additional Parameters

 IPX packet forwarding  . . . . .   *YES          *YES, *NO
 IPX hop count  . . . . . . . . .   64            8-127
 SPX maximum sessions . . . . . .   1000          100-9999
 SPX watchdog abort timeout . . .   120000        30000-3000000
 SPX watchdog verify timeout  . .   30000         556-300000
                                                                       More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 89. Create IPX Description (Additional Parameters)

Press Page Down (additional parameters on next screen).

```
                         Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 SPX are you there timeout  . . .   6000          556-600000
 SPX default retry count  . . . .   10            1-255
 LAN hello  . . . . . . . . . . .   20            1-600
 WAN hello  . . . . . . . . . . .   20            1-600
 Designated router interval . . .   10            1-100
 Holding time multiplier  . . . .   3             2-20
 Log protocol errors  . . . . . .   *NO           *NO, *YES
 Authority  . . . . . . . . . . .   *LIBCRTAUT    Name, *LIBCRTAUT, *CHANGE...



                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 90. Create IPX Description (Additional Parameters Next Screen)

CL Command

The above IPX description could also have been created by entering:

```
CRTIPXD IPXD(RALYAS4B)
          IPXNETNBR(76AD0117)
          IPXRTRNAME(ROUTER_2)
          Text('IPX Description for RALYAS4B')
```

9.3.3.2 IPX Circuits

To create IPX circuits for the token-ring and X.25 network interfaces, select option 1 (Configure IPX circuits) from the IPX configuration main menu followed by option 1 (Work with IPX circuits).

```
                              Work with IPX Circuits
                                                             System:   RALYAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                  Line        Line          Circuit
 Opt    Name                  Description    Type          Status
 1      TRN2619B


                                                                       Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 91. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                          Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > TRN2619B
 Line description . . . . . . . . > TRN2619B      Name
 IPX network number . . . . . . >   9             00000001-FFFFFFFD
 Frame type . . . . . . . . . . .   *SSAP         *SSAP, *SNAP, *ETHV2, *ETHNTW
 Enable for NLSP  . . . . . . . . > *NO           *YES, *NO
 MAC channel for NLSP . . . . . .   *BROADCAST    *BROADCAST, *MULTICAST
 Router priority for NLSP . . . .   44            0-127
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 92. Add IPX Circuit for the Token-Ring Interface

The important parameters in an IPX circuit for the token-ring interface are:

Circuit name We use the line description name for the circuit name.

Line description The token-ring line description created above.

IPX network number The network number associated with the token-ring LAN segment.

Enable for NLSP We only use RIP and SAP.

CL Command

The above IPX circuit could also have been created by entering:

```
ADDIPXCCT CCTNAME(TRN2619B) LIND(TRN2619B)
IPXNETNBR(00000009) ENBNLSP(*NO)
```

Next we create an IPX circuit for the X.25 network interface.

```
                            Work with IPX Circuits
                                                           System:   RALYAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                  Line        Line          Circuit
 Opt    Name                  Description    Type          Status
 1      X25SVC_B
        TRN2619B              TRN2619B       *TRNLAN      Inactive


                                                                         Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 93. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                       Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > X25SVC_B
 Line description . . . . . . . . > X25LINE_B     Name
 X.25 PVC logical channel id  . .                 001-FFF
 X.25 SVC network address . . . . > 101100205
 X.25 SVC call type . . . . . . .   *DEMAND       *DEMAND, *PERM
 X.25 SVC reverse charge  . . . .   *NONE         *NONE, *REQUEST, *ACCEPT...
 X.25 SVC idle circuit timeout  .   60            1-600
 X.25 default packet size:
   Transmit packet size . . . . . > 4096          *LIND, 64, 128, 256, 512...
   Receive packet size  . . . . . > *TRANSMIT     *LIND, *TRANSMIT, 64, 128...
 X.25 default window size:
   Transmit window size . . . . . > 7             1-15, *LIND
   Receive window size  . . . . . > *TRANSMIT     1-15, *LIND, *TRANSMIT
 Enable for NLSP  . . . . . . . .   *YES          *YES, *NO
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC
 Enable for IW2 . . . . . . . . .   *YES          *YES, *NO
                                                                       More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 94. Add IPX Circuit for X.25 SVC

Press Page Down (additional parameters on next screen).

```
                       Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 IW2 timer request retries  . . .   16            1-256, *NOMAX
 IW2 timer request interval . . .   20            1-60

                          Additional Parameters

 Default maximum datagram size  .   *LIND         576-16388, *LIND
 Throughput . . . . . . . . . . .   *CALC         300-4294967295, *CALC
 Delay time . . . . . . . . . . .   *CALC         1-5000000, *CALC
 Automatic start  . . . . . . . .   *YES          *YES, *NO
 RIP state  . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
 RIP update interval  . . . . . .   60            30-300000
 RIP age multiplier . . . . . . .   4             1-10
 SAP state  . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
 SAP update interval  . . . . . .   60            30-300000
 SAP age multiplier . . . . . . .   4             1-10

                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 95. Add IPX Circuit for X.25 SVC (Next Screen)

CL Command

The above IPX circuit could also have been created by entering:

```
ADDIPXCCT CCTNAME(X25SVC_B) LIND(X25LINE_B)
SVCNETADR(101100205)
SVCTYPE(*DEMAND) DFTPKTSIZE(4096 *TRANSMIT)
DFTWDWSIZE(7 *TRANSMIT)
```

9.3.3.3 IPX Circuit Routes

With the X.25 IPX circuit set to *DEMAND the switched connection is not be established for RIP or SAP. The AS/400s do not, therefore, automatically learn about the networks available via the remote router. Therefore we must configure static RIP table entries (circuit routes). To create IPX circuit routes, select option 1 (Configure IPX circuits) from the IPX configuration main menu followed by option 2 (Work with IPX circuit routes).

```
                           Work with Circuit Routes
                                                             System:   RALYAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display

        Circuit               Remote       Number     Number     Next Hop
 Opt    Name                  Network     of Hops    of Ticks    Node Address

        X25SVC_B              00000E01       2           30      *NONE
        X25SVC_B              96AD0D47       1           30      *NONE



  F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 96. Work with Circuit Routes

We used option 1 (Add) to add the following routes for circuit X25SVC_B:

Remote Network

00000E01
: This is the external network number of the network the Novell client is attached to. This route entry is required for the server to be able to find a route back to the client.

96AD0D47
: This is the Internal IPX network number of the remote IPX router, in this case the AS/400 RALYAS4A.

  This route entry is not required for the successful operation of the scenario but it allows us to verify the connection via an IPXPING between the AS/400s.

CL Command

The above IPX circuit routes could also have been created by entering:

```
ADDCCTRTE CCTNAME(X25SVC_B) RMTNETNBR(00000E01)
NBRHOP(2) NBRTICK(30)
ADDCCTRTE CCTNAME(X25SVC_B) RMTNETNBR(96AD0D47)
NBRHOP(1) NBRTICK(30)
```

9.3.3.4 IPX Circuit Services

Since there are no servers on the RALYAS4A network, no circuit service entries are required on RALYAS4B.

9.4 Starting and Verifying the IPX Router Support

Before we can start the IPX support on the AS/400, we have to vary on the line descriptions being used by the IPX circuits. We can do this by entering the following commands:

- RALYAS4A

  ```
  VRYCFG CFGOBJ(ETH2617A) CFGTYPE(*LIN) STATUS(*ON)
  VRYCFG CFGOBJ(X25LINE_A) CFGTYPE(*LIN) STATUS(*ON)
  ```

- RALYAS4B

  ```
  VRYCFG CFGOBJ(TRN2619B) CFGTYPE(*LIN) STATUS(*ON)
  VRYCFG CFGOBJ(X25LINE_B) CFGTYPE(*LIN) STATUS(*ON)
  ```

9.4.1 Starting IPX

To start IPX using the IPX descriptions we created above, enter the following commands:

- RALYAS4A

  ```
  STRIPX RALYAS4A
  ```

- RALYAS4B

  ```
  STRIPX RALYAS4B
  ```

Starting the AS/400 IPX support creates a *NET controller and an *NET device description.

Tip

The *NET controller is also used by the AS/400 TCP/IP support if this is also configured on the system.

9.4.2 Verifying the IPX Configuration

To verify that the line descriptions have become active and that the *NET controller and device descriptions have been created and are also active, use the command WRKCFGSTS. For example, if we enter the command `WRKCFGSTS *LIN X25LINE_A` on RALYAS4A, we would see the panel shown in Figure 97 on page 126.

```
                    Work with Configuration Status                RALYAS4A
                                                       03/19/97  12:55:41
Position to  . . . . .             Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description       Status                -------------Job--------------
     X25LINE_A         ACTIVE
       X25LINET        ACTIVE
         X25LIIPX      ACTIVE                QIPX        QSYS        008105







                                                                       Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 97. WRKCFGSTS X25 Line RALYAS4A

From Figure 97 we can see that the IPX network controller (*NET) has become active with the QIPX job.

Tip

STRIPX will start all IPX Circuits that have AUTOSTART set to *YES.

The QIPX application job runs in the QSYSWRK subsystem and uses the QSYS/QZSPJOB job description. To display the job, enter the command WRKACTJOB SBS(QSYSWRK).

```
                             Work with Active Jobs                    RALYAS4A
                                                            03/19/97  13:00:34
CPU %:     .0     Elapsed time:   00:00:00     Active jobs:   44

Type options, press Enter.
  2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
  8=Work with spooled files   13=Disconnect ...

Opt  Subsystem/Job  User        Type  CPU %  Function        Status
     QSYSWRK        QSYS        SBS      .0                   DEQW
       QAPPCIPX     QSYS        BCH      .0                   TIMW
       QIPX         QSYS        BCH      .0                   DEQW







                                                                        Bottom
Parameters or command
===>
F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
F12=Cancel   F23=More options   F24=More keys
```

Figure 98. Work with Active Jobs

To verify that the IPX circuits have started, select option 3 (Work with IPX status) from the IPX configuration main menu.

```
                              Work with IPX Status
                                                        System:   RALYAS4A
 Select one of the following:

      1. Work with IPX circuit status
      2. Display IPX route information
      3. Display IPX service information
      4. Work with IPX/SPX connection status
      5. Display active IPX description




 Selection or command
 ===> 1

 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 99. Work with IPX Circuit Status

Then select option 1 (Work with IPX circuit status).

```
                          Work with IPX Circuit Status
                                                            System:   RALYAS4A
 Type options, press Enter.
   5=Display details   7=Display associated services
   8=Display associated routes   9=Start   10=End
   12=Work with configuration status

        Circuit                  Line        Line          Circuit
 Opt    Name                  Description    Type          Status
        ETH2617A              ETH2617A       *ELAN         Active
        X25SVC_A              X25LINE_A      *X25          Waiting

                                                                        Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 100. Work with IPX Circuit Status Screen

In Figure 100 we can see that the LAN circuit has become active but the X.25 circuit is in a waiting state. Both circuits were started automatically because we accepted the default of *YES for Automatic start in the IPX circuits. However, because we configured the X.25 circuit for *DEMAND, instead of going to an active state it has instead gone to a waiting state. It stays in a waiting state until a connection is established for data transfer.

Now let's look at the IPX RIP table on the AS/400.

```
                              Work with IPX Status
                                                            System:   RALYAS4A
 Select one of the following:

      1. Work with IPX circuit status
      2. Display IPX route information
      3. Display IPX service information
      4. Work with IPX/SPX connection status
      5. Display active IPX description

 Selection or command
 ===> 2

 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 101. Display IPX Routing Information

Select option 2 (Display IPX route information) from the Work with IPX Status menu.

```
                        Display IPX Route Information
                                                            System:   RALYAS4A
Type options, press Enter.
  5=Display details

        Remote        Number      Number      Next Hop         Route
Opt     Network       of Hops     of Ticks    Node Address     Source
        00000E01         0            1       *NONE            *CCT
        31ECF1DD         2           30       *NONE            *CFG
        76AD0117         1           30       *NONE            *CFG
        96AD0D47         0            1       000000000001     *LOCAL

                                                                      Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 102. Display IPX Route Information

This display shows the following IPX routing information from the different networks:

Remote Network
The remote network number. This may be an external network number or an internal network number.

00000E01
This is the network attached to the AS/400's Ethernet network interface. *CCT indicates that the network is defined in an IPX circuit.

31ECF1DD and 76AD0117
These entries represent the two manually entered routes as indicated by *CFG.

96AD0D47
This is the AS/400's internal network number as indicated by *LOCAL for route source.

Number of Hops
The number of hops necessary to reach the remote network. The number of hops is equal to the number of routers that are crossed in order to reach the network or system.

Number of Ticks
The number of ticks needed to reach the remote network. The Number of Ticks value is used to weight a route. If there is more than one route to a remote network and both have the same hop count then the route with the least ticks is chosen.

Tip

A tick is defined as 1/18 of a second. The time that a packet takes to go to an IPX node and be returned as a response is measured in terms of ticks.

Next Hop Node Address
The IPX node address of the next hop. The next hop node address is usually the LAN adapter MAC address.

Route Source
The source from which knowledge of this route was obtained:

- *CCT (Circuit) - The route was generated from a locally defined circuit.
- *CFG (Configuration) - The route was configured using the Add Circuit Route (ADDCCTRTE) CL command.
- *NLSP - The route was discovered via NLSP.
- *RIP - The route was discovered via RIP.

Because we have configured *AUTO for RIP state in the X.25 IPX circuit (rather than *OFF), the table is be updated (via NLSP) when the connection to RALYAS4B is established for data transfer (for example when the client requires a connection with the server). However, these new entries are deleted when the connection is ended.

Now let′s look at the IPX SAP table on the AS/400.

```
                            Work with IPX Status
                                                              System:   RALYAS4A
 Select one of the following:

      1. Work with IPX circuit status
      2. Display IPX route information
      3. Display IPX service information
      4. Work with IPX/SPX connection status
      5. Display active IPX description




 Selection or command
 ===> 3

 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 103. Display IPX Service Information

Select option 3 (Display IPX service information) from the Work with IPX Status menu.

```
                    Display IPX Service Information
                                                       System:   RALYAS4A
Type options, press Enter.
  5=Display details

      Service              Service       Remote      Hops to    Service
Opt   name                 Type          Network     Service    Source
      FERGUS_NW41          *FILESVR      31ECF1DD       1       *CFG




                                                                  Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 104. Display IPX Service Information Screen

There are no service table entries reported by SAP. Clients on this network can only reach the file server with internal IPX network number 31ECF1DD. This service table entry allows the AS/400 to respond to a GET NEAREST SERVER query from the Novell client. Because we have configured *AUTO for SAP state in the X.25 IPX circuit (rather than *OFF), the table is be updated (via SAP) when the connection to RALYAS4B is established for data transfer (for example when the client requires a connection with the server). However, these new entries are deleted when the connection is ended.

We can now verify the connection with the IPXPING command. IPXPING is very similar to TCP/IP PING. Here we ping RALYAS4B′s internal IPX network address from RALYAS4A.

```
                          Verify IPX Connection (IPXPING)

 Type choices, press Enter.

 Remote IPX network number  . . . > 76AD0117      00000001-FFFFFFFD
 Remote IPX node address  . . . . > 1             000000000001-FFFFFFFFFFFE...

                             Additional Parameters

 Message mode . . . . . . . . . .   *VERBOSE      *VERBOSE, *QUIET
 Packet length (in bytes) . . . .   256           8-65495
 Number of packets  . . . . . . .   5             1-999
 Wait time (in seconds) . . . . . > 5             1-120



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 105. Verify IPX Connection

```
                              Display All Messages
                                                            System:   RALYAS4A
Job . . :   QPADEV0002    User . . :   MICK         Number . . . :   008109

3 > IPXPING RMTNETNBR(76AD0117) RMTNDEADR(1) WAITTIME(5)
    Verifying connection to remote system at network number 76AD0117, node
      address 000000000001.
    No response from remote system within 5 seconds for connection
      verification 1.
    Connection verification 2 took .584 seconds.  1 successful connection
      verifications.
    Connection verification 3 took .330 seconds.  2 successful connection
      verifications.
    Response received after time limit.
    Connection verification 4 took .304 seconds.  3 successful connection
      verifications.
    Connection verification 5 took .290 seconds.  4 successful connection
      verifications.
    Round-trip (in milliseconds) min/avg/max = 290/377/584
    Connection verification statistics: 4 of 5 successful (80 %).
                                                                       More...
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F17=Top   F18=Bottom
```

Figure 106. Verify IPX Connection Joblog

As a final verification step we verified a successful login to a NetWare server from a NetWare client.

9.4.3 Ending IPX

We can end an individual IPX circuit either from the Work with IPX Circuit Status menu or by using the command ENDIPXCCT.

We can end the AS/400 IPX router by using the ENDIPX command.

Attention

No confirmation display is shown when the ENDIPX command is entered. The ENDIPX command *immediately* ends all IPX processing on the AS/400.

Chapter 10. Scenario 3. IPX Routing between AS/400s via an X.25 PVC Connection

In this scenario we use the AS/400′s IPX router capability over an X.25 PVC (permanent virtual circuit) WAN connection. Since the connection is permanent and not switched, we allow RIP and SAP to be exchanged over the connection. However, since both routers (the two AS/400s) support NLSP, we use this in preference to standard RIP/SAP. For a WAN connection, NLSP is more efficient than RIP/SAP. We also show how the AS/400′s X.25 interface can be used for SNA, TCP/IP and IPX concurrently. X.25 provides a relatively low speed (up to 64 Kbps) connection. While normally used via an X.25 network, X.25 can be used in a point-to-point mode with one system acting as a DCE (DCE *YES in line description).

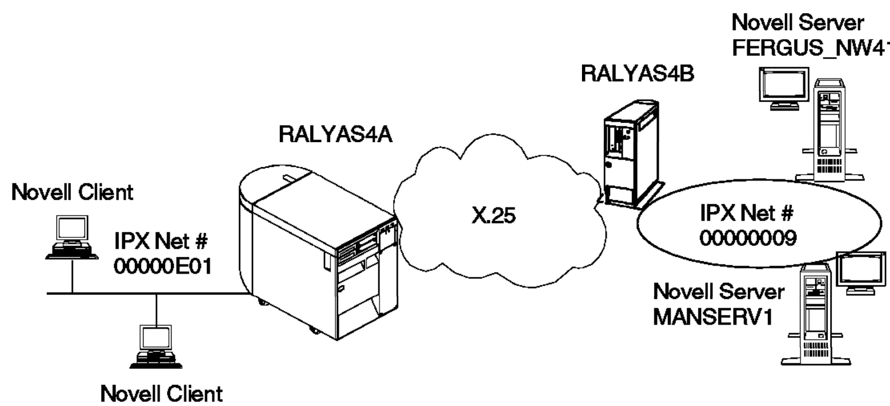

Figure 107. Environment for Scenario 3

10.1 What Information Do We Need before We Start?

Table 12 (Page 1 of 2). RALYAS4A - Information Needed				
	Whom/Where	**Ethernet**	**WAN/X.25**	**RALYAS4A**
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000E01	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	N/A	N/A	N/A
PVC Logical Channel	X.25 Provider	N/A	001	N/A
WAN Speed	X.25 Provider	N/A	9600	N/A

Table 12 (Page 2 of 2). RALYAS4A - Information Needed

	Whom/Where	Ethernet	WAN/X.25	RALYAS4A
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN221	LIN072	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_1
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	96AD0D47

Table 13. RALYAS4B - Information Needed

	Whom/Where	Token-Ring	WAN/X.25	RALYAS4B
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000009	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	4 Mb	N/A	N/A
PVC Logical Channel	X.25 Provider	N/A	001	N/A
WAN Speed	X.25 Provider	N/A	9600	N/A
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN101	LIN182	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_2
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	76AD0117

10.2 RALYAS4A Configuration

For this scenario we have to create the following configuration objects on RALYAS4A:

- Ethernet line description
- X.25 line description
- IPX description
- IPX circuit for Ethernet interface
- IPX circuit for X.25 interface

10.2.1 Ethernet Line Description

To create the Ethernet line description, enter the following command:

```
CRTLINETH LIND(ETH2617A)
          RSRCNAME(LIN221)
          TEXT('Ethernet LAN LIN221')
```

Tip

An existing Ethernet line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x′E0′ has not be defined and that the Ethernet standard is *ALL in the line description.

The important parameters in an Ethernet line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the Ethernet adapter you want to use.

Ethernet standard (ETHSTD)
This value *must* be *ALL when the line is used for an Ethernet NetWare protocol network. This is the default.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x′E0′ to be used by IPX is not specified here. See frame type in the IPX circuit.

10.2.2 X.25 Line Description

To create the X.25 line description, enter the following command:

```
CRTLINX25 LIND(X25LINE_A)
          RSRCNAME(LIN072)
          LGLCHLE((001 *PVC))
          NETADR(101100205)
          CNNINIT(*LOCAL)
          MAXFRAME(4096)
          MAXPKTSIZE(4096)
          TEXT('X.25 line to RALYAS4B via X.25 NET')
```

The important parameters in an X.25 line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the communications adapter you want to use.

X.25 logical channels (LGLCHLE)
Specify here the X.25 logical channels as per your X.25 network provider subscription.

Connection initiation (CNNINIT)
This parameter determines who initiates the X.25 connection. This parameter is network-dependant. This parameter does not determine who initiates the X.25 call.

Maximum frame size (MAXFRAME)
This parameter sets the maximum frame size supported by the X.25 connection.

Maximum packet size (MAXPKTSIZE)
This parameter sets the maximum packet size supported by the X.25 connection. Setting this value at 4096 allows us to use a packet size of up to 4096. The packet size requested is set in the X.25 IPX circuit.

Default packet size (DFTPKTSIZE) and default window size (DFTWDWSIZE)
These parameters are also network-dependant. The default packet and window sizes should match the network defaults. The AS/400 defaults are a packet size of 128 with a window size of 2; these values are frequently also the network defaults as was the case with the network we were using.

Tip

An X.25 line description is a shared resource. Had we configured more logical channels, the above line description could also have been used for SNA and TCP/IP. When in use, each protocol would use a logical channel. A logical channel can only be used to a single remote location. Concurrent sessions (SNA, TCP/IP or IPX) to multiple remote locations would therefore require multiple logical channels.

10.2.3 IPX Configuration

To access the Configure IPX menu, enter the command `CFGIPX` (Configure IPX).

Attention

Your user profile must have the *IOSYSCFG special authority in order to configure the IPX support.

```
CFGIPX                          Configure IPX
                                                            System:   RALYAS4A
Select one of the following:

  Configure IPX
     1. Configure IPX circuits
     2. Work with IPX descriptions
     3. Work with IPX status

  Configure AnyNet/400 over IPX
    10. Work with IP over IPX interfaces
    11. Work with IP over IPX routes
    12. Work with IP over IPX addresses

    20. Work with SNA over IPX locations




Selection or command
===>

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 108. IPX Configuration Main Menu

10.2.3.1 IPX Description

To create the IPX description, select option 2 (Work with IPX Descriptions) from the IPX configuration main menu.

```
                          Work with IPX Descriptions
                                                            System:   RALYAS4A
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   7=Rename
  9=Retrieve Source

        IPX
Opt     Desc           Text
 1      RALYAS4A
        QDCIPX1        This IPXD is IBM Supplied
        QDCIPX2        This IPXD is IBM Supplied



                                                                        Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
```

Figure 109. Work with IPX Descriptions

Then select option 1.

```
                     Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > RALYAS4A      Name
 IPX internal network number  . . > 96AD0D47     00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP      *NLSP, *RIP
 IPX router name  . . . . . . . . > ROUTER_1

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . . > 'IPX Description for RALYAS4A'



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 110. Create IPX Description

The important parameters in an IPX description:

IPX description We use the system name for the IPX description name.

IPX internal network number The IPX network number used for the AS/400's internal network number must be unique to all other network numbers (internal and external) in this IPX internetwork.

IPX routing protocol In this configuration we use RIP over the LAN connections and NLSP over the WAN connection. In the IPX circuit for the LAN we specify *RIP.

IPX router name We have chosen to use the name Router_1 for this IPX router.

Press F10 for additional parameters.

```
                         Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > RALYAS4A      Name
 IPX internal network number  . . > 96AD0D47     00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP         *NLSP, *RIP
 IPX router name  . . . . . . . . > ROUTER_1

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . . > 'IPX Description for RALYAS4A'


                             Additional Parameters

 IPX packet forwarding  . . . . .   *YES          *YES, *NO
 IPX hop count  . . . . . . . . .   64            8-127
 SPX maximum sessions . . . . . .   1000          100-9999
 SPX watchdog abort timeout . . .   120000        30000-3000000
 SPX watchdog verify timeout  . .   30000         556-300000
                                                                      More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 111. Create IPX Description (Additional Parameters)

IPX packet forwarding

Be sure this value is *YES if you want to use the AS/400 as an IPX Router. *YES is the default.

Press Page Down (additional parameters on next screen).

```
                         Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 SPX are you there timeout  . . .   60000         556-600000
 SPX default retry count  . . . .   10            1-255
 LAN hello  . . . . . . . . . . .   20            1-600
 WAN hello  . . . . . . . . . . .   20            1-600
 Designated router interval . . .   10            1-100
 Holding time multiplier  . . . .   3             2-20
 Log protocol errors  . . . . . .   *NO           *NO, *YES
 Authority  . . . . . . . . . . .   *LIBCRTAUT    Name, *LIBCRTAUT, *CHANGE...



                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 112. Create IPX Description (Additional Parameters Next Screen)

CL Command

The above IPX description could also have been created by entering:

```
CRTIPXD IPXD(RALYAS4A)
          IPXNETNBR(96AD0D47)
          IPXRTRNAME(ROUTER_1)
          TEXT('IPX Description for RALYAS4A')
```

10.2.3.2 IPX Circuits

To create IPX circuits for the Ethernet and X.25 network interfaces, select option 1 (Configure IPX circuits) from the IPX configuration main menu followed by option 1 (Work with IPX circuits).

```
                          Work with IPX Circuits
                                                          System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                  Line        Line          Circuit
 Opt    Name                  Description    Type          Status
 1      ETH2617A


                                                                      Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 113. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                         Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > ETH2617A
 Line description . . . . . . . . > ETH2617A      Name
 IPX network number . . . . . . . > E01           00000001-FFFFFFFD
 Frame type . . . . . . . . . . .   *SSAP         *SSAP, *SNAP, *ETHV2, *ETHNTW
 Enable for NLSP  . . . . . . . .>  *NO           *YES, *NO
 MAC channel for NLSP . . . . . .   *BROADCAST    *BROADCAST, *MULTICAST
 Router priority for NLSP . . . .   44            0-127
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC



                                                                      Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 114. Add IPX Circuit for the Ethernet Network Interface

The important parameters in an IPX circuit for Ethernet are:

Circuit name We use the line description name for the circuit name.

Line description The Ethernet line description created above.

IPX network number The network number associated with the Ethernet LAN segment.

Frame type The frame type to be used on this LAN segment.

Enable for NLSP We only use RIP and SAP on the LAN interface.

CL Command

The above IPX circuit could also have been created by entering:

```
ADDIPXCCT CCTNAME(ETH2617A) LIND(ETH2617A)
IPXNETNBR(00000E01) ENBNLSP(*NO)
```

Next we create an IPX circuit for the X.25 network interface.

```
                             Work with IPX Circuits
                                                            System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                Line        Line          Circuit
 Opt    Name                Description    Type          Status
 1      X25PVC_A
        ETH2617A            ETH2617A       *ETHLAN       Inactive



                                                                        Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 115. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                          Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > X25PVC_A
 Line description . . . . . . . . > X25LINE_A     Name
 X.25 PVC logical channel id  . . > 001           001-FFF
 X.25 SVC network address . . . .   ' '
 X.25 SVC call type . . . . . . .   *DEMAND       *DEMAND, *PERM
 X.25 SVC reverse charge  . . . .   *NONE         *NONE, *REQUEST, *ACCEPT...
 X.25 SVC idle circuit timeout  .   60            1-600
 X.25 default packet size:
   Transmit packet size . . . . . > 4096          *LIND, 64, 128, 256, 512...
   Receive packet size  . . . . . > *TRANSMIT     *LIND, *TRANSMIT, 64, 128...
 X.25 default window size:
   Transmit window size . . . . . > 7             1-15, *LIND
   Receive window size  . . . . . > *TRANSMIT     1-15, *LIND, *TRANSMIT
 Enable for NLSP  . . . . . . . .   *YES          *YES, *NO
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC
 Enable for IW2 . . . . . . . . .   *YES          *YES, *NO
                                                                      More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 116. Add IPX Circuit for X.25 PVC

The important parameters in an IPX circuit for X.25 are:

Circuit name
Specifies the name of the IPX circuit being added.

Line description
The X.25 line description created above.

X.25 PVC logical channel id
This is PVC logical channel to the remote system to be used for IPX.

X.25 default packet size and default window size
Providing the network is reliable, increasing the packet and window sizes used improves data throughput. We have specified here the maximum values supported by the X.25 network we were using.

Enable for NLSP
We use NLSP over the WAN. *YES is the default.

Press Page Down (additional parameters on next screen).

```
                          Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 IW2 timer request retries  . . .   16            1-256, *NOMAX
 IW2 timer request interval . . .   20            1-60

                           Additional Parameters

 Default maximum datagram size  .   *LIND         576-16388, *LIND
 Throughput . . . . . . . . . . .   *CALC         300-4294967295, *CALC
 Delay time . . . . . . . . . . .   *CALC         1-5000000, *CALC
 Automatic start  . . . . . . . .   *YES          *YES, *NO
 RIP state  . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
 RIP update interval  . . . . . .   60            30-300000
 RIP age multiplier . . . . . . .   4             1-10
 SAP state  . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
 SAP update interval  . . . . . .   60            30-300000
 SAP age multiplier . . . . . . .   4             1-10

                                                                  Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 117. Add IPX Circuit for X.25 PVC (Next Screen)

RIP State and SAP State With these values set to *AUTO, the local system negotiates the routing and service protocols to be used with the remote system. This negotiation process first tries NLSP. Since the AS/400 supports NLSP, this is the protocol that will be used over the WAN.

CL Command

The above IPX circuit could also have been created by entering:

```
ADDIPXCCT CCTNAME(X25PVC_A) LIND(X25LINE_A) PVCLGLCHLI(001)
DFTPKTSIZE(4096 *TRANSMIT) DFTWDWSIZE(7 *TRANSMIT)
```

Note

Since we have configured the circuits to allow RIP and SAP to flow (via NLSP), we do not have to configure IPX circuit routes or IPX circuit services.

10.3 RALYAS4B Configuration

For this scenario we have to create the following configuration objects on RALYAS4B:

- Token-ring line description
- X.25 line description
- IPX description
- IPX circuit for token-ring interface
- IPX circuit for X.25 interface

10.3.1 Token-Ring Line Description

To create the token-ring line description, enter the following command:

```
CRTLINTRN LIND(TRN2619B)
             RSRCNAME(LIN101)
             LINESPEED(4M)
             TEXT('4M Token-Ring')
```

Tip

An existing token-ring line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x′E0′ has not be defined in the line description.

The important parameters in a token-ring line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the token-ring adapter you want to use.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x′E0′ to be used by IPX is not specified here. See frame type in the IPX circuit.

10.3.2 X.25 Line Description

To create the X.25 line description, enter the following command:

```
CRTLINX25 LIND(X25LINE_B)
             RSRCNAME(LIN182)
             LGLCHLE((001 *PVC))
             NETADR(101100201)
             CNNINIT(*LOCAL)
             MAXFRAME(4096)
             MAXPKTSIZE(4096)
             TEXT('X.25 line to RALYAS4A via X.25 NET')
```

10.3.3 IPX Configuration

To access the Configure IPX menu, enter the command CFGIPX (Configure IPX).

Attention

Your user profile must have the *IOSYSCFG special authority in order to configure the IPX support.

```
CFGIPX                          Configure IPX
                                                            System:   RALYAS4B
Select one of the following:

  Configure IPX
     1. Configure IPX circuits
     2. Work with IPX descriptions
     3. Work with IPX status

  Configure AnyNet/400 over IPX
    10. Work with IP over IPX interfaces
    11. Work with IP over IPX routes
    12. Work with IP over IPX addresses

    20. Work with SNA over IPX locations




Selection or command
===>

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 118. IPX Configuration Main Menu

10.3.3.1 IPX Description

To create the IPX description, select option 2 (Work with IPX Descriptions) from the IPX configuration main menu.

```
                          Work with IPX Descriptions
                                                            System:   RALYAS4B
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   7=Rename
  9=Retrieve Source

        IPX
Opt     Desc           Text
 1      RALYAS4B
        QDCIPX1        This IPXD is IBM Supplied
        QDCIPX2        This IPXD is IBM Supplied


                                                                        Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
```

Figure 119. Work with IPX Descriptions

Then select option 1.

```
                        Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > RALYAS4B      Name
 IPX internal network number  . . > 76AD0117       00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP      *NLSP, *RIP
 IPX router name  . . . . . . . . > ROUTER_2

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . . > 'IPX Description for RALYAS4B'



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 120. Create IPX Description

Press F10 for additional parameters.

```
                        Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > RALYAS4B      Name
 IPX internal network number  . . > 76AD0117       00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *NLSP         *NLSP, *RIP
 IPX router name  . . . . . . . . > ROUTER_2

 IPX maximum datagram size  . . .   576           576-65535
 Text 'description' . . . . . . . > 'IPX Description for RALYAS4B'


                            Additional Parameters

 IPX packet forwarding  . . . . .   *YES          *YES, *NO
 IPX hop count  . . . . . . . . .   64            8-127
 SPX maximum sessions . . . . . .   1000          100-9999
 SPX watchdog abort timeout . . .   120000        30000-3000000
 SPX watchdog verify timeout  . .   30000         556-300000
                                                                        More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 121. Create IPX Description (Additional Parameters)

Press Page Down (additional parameters on next screen).

```
                        Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 SPX are you there timeout  . . .   60000         556-600000
 SPX default retry count  . . . .   10            1-255
 LAN hello  . . . . . . . . . . .   20            1-600
 WAN hello  . . . . . . . . . . .   20            1-600
 Designated router interval . . .   10            1-100
 Holding time multiplier  . . . .   3             2-20
 Log protocol errors  . . . . . .   *NO           *NO, *YES
 Authority  . . . . . . . . . . .   *LIBCRTAUT    Name, *LIBCRTAUT, *CHANGE...



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 122. Create IPX Description (Additional Parameters Next Screen)

CL Command

The above IPX description could also have been created by entering:

```
CRTIPXD IPXD(RALYAS4B)
            IPXNETNBR(76AD0117)
            IPXRTRNAME(ROUTER_2)
            Text('IPX Description for RALYAS4B')
```

10.3.3.2 IPX Circuits

To create IPX circuits for the token-ring and X.25 network interfaces, select option 1 (Configure IPX circuits) from the IPX configuration main menu followed by option 1 (Work with IPX circuits).

```
                             Work with IPX Circuits
                                                          System:   RALYAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                  Line        Line          Circuit
 Opt    Name                  Description    Type          Status
 1      TRN2619B



                                                                         Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 123. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                          Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > TRN2619B
 Line description . . . . . . . . > TRN2619B   Name
 IPX network number . . . . . . >   9             00000001-FFFFFFFD
 Frame type . . . . . . . . . . .   *SSAP         *SSAP, *SNAP, *ETHV2, *ETHNTW
 Enable for NLSP  . . . . . . . .>  *NO           *YES, *NO
 MAC channel for NLSP . . . . . .   *BROADCAST    *BROADCAST, *MULTICAST
 Router priority for NLSP . . . .   44            0-127
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 124. Add IPX Circuit for the Token-Ring network Interface

The important parameters in an IPX circuit for the token-ring interface are:

Circuit name We use the line description name for the circuit name.

Line description The token-ring line description created above.

IPX network number The network number associated with the token-ring LAN segment.

Enable for NLSP We only use RIP and SAP.

CL Command

The above IPX circuit could also have been created by entering:

```
ADDIPXCCT CCTNAME(TRN2619B) LIND(TRN2619B)
IPXNETNBR(00000009) ENBNLSP(*NO)
```

Next we create an IPX circuit for the X.25 network interface.

```
                           Work with IPX Circuits
                                                           System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                  Line        Line          Circuit
 Opt    Name                  Description    Type          Status
 1      X25PVC_B
        TRN2619B              TRN2619B       *TRNLAN      Inactive



                                                                         Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 125. Work with IPX Circuits

To add an IPX circuit, select option 1.

```
                          Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > X25PVC_B
 Line description . . . . . . . . > X25LINE_B     Name
 X.25 PVC logical channel id  . . > 001           001-FFF
 X.25 SVC network address . . . .   ' '
 X.25 SVC call type . . . . . . .   *DEMAND       *DEMAND, *PERM
 X.25 SVC reverse charge  . . . .   *NONE         *NONE, *REQUEST, *ACCEPT...
 X.25 SVC idle circuit timeout  .   60            1-600
 X.25 default packet size:
   Transmit packet size . . . . . > 4096          *LIND, 64, 128, 256, 512...
   Receive packet size  . . . . . > *TRANSMIT     *LIND, *TRANSMIT, 64, 128...
 X.25 default window size:
   Transmit window size . . . . . > 7             1-15, *LIND
   Receive window size  . . . . . > *TRANSMIT     1-15, *LIND, *TRANSMIT
 Enable for NLSP  . . . . . . . .   *YES          *YES, *NO
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC
 Enable for IW2 . . . . . . . . .   *YES          *YES, *NO
                                                                       More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 126. Add IPX Circuit for X.25 PVC

Press Page Down (additional parameters on next screen).

```
                          Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 IW2 timer request retries  . . .   16            1-256, *NOMAX
 IW2 timer request interval . . .   20            1-60

                           Additional Parameters

 Default maximum datagram size  .   *LIND         576-16388, *LIND
 Throughput . . . . . . . . . . .   *CALC         300-4294967295, *CALC
 Delay time . . . . . . . . . . .   *CALC         1-5000000, *CALC
 Automatic start  . . . . . . . .   *YES          *YES, *NO
 RIP state  . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
 RIP update interval  . . . . . .   60            30-300000
 RIP age multiplier . . . . . . .   4             1-10
 SAP state  . . . . . . . . . . .   *AUTO         *ON, *OFF, *AUTO
 SAP update interval  . . . . . .   60            30-300000
 SAP age multiplier . . . . . . .   4             1-10

                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 127. Add IPX Circuit for X.25 PVC (Next Screen)

CL Command

The above IPX circuit could also have been created by entering:

```
ADDIPXCCT CCTNAME(X25PVC_B) LIND(X25LINE_B) PVCLGLCHLI(001)
DFTPKTSIZE(4096 *TRANSMIT) DFTWDWSIZE(7 *TRANSMIT)
```

Note

Since we have configured the circuits to allow RIP and SAP to flow (via NLSP), we do not have to configure IPX circuit routes or IPX circuit services.

10.4 Starting and Verifying the IPX Router Support

Before we can start the IPX support on the AS/400, we have to vary on the line descriptions being used by the IPX circuits. We can do this by entering the following commands:

- RALYAS4A

  ```
  VRYCFG CFGOBJ(ETH2617A) CFGTYPE(*LIN) STATUS(*ON)
  VRYCFG CFGOBJ(X25LINE_A) CFGTYPE(*LIN) STATUS(*ON)
  ```

- RALYAS4B

  ```
  VRYCFG CFGOBJ(TRN2619B) CFGTYPE(*LIN) STATUS(*ON)
  VRYCFG CFGOBJ(X25LINE_B) CFGTYPE(*LIN) STATUS(*ON)
  ```

10.4.1 Starting IPX

To start IPX using the IPX descriptions we created above, enter the following commands:

- RALYAS4A

  ```
  STRIPX RALYAS4A
  ```

- RALYAS4B

  ```
  STRIPX RALYAS4B
  ```

Starting the AS/400 IPX Support creates a *NET controller and an *NET device description.

Tip

The *NET controller is also be used by the AS/400 TCP/IP support if this is configured on the system.

10.4.2 Verifying the IPX Configuration

To verify that the line descriptions have become active and that the *NET controller and device descriptions have been created and are also active, use the command WRKCFGSTS. For example, if we enter the command WRKCFGSTS *LIN X25LIN_A on RALYAS4A, we see the panel shown in Figure 128 on page 153.

```
                      Work with Configuration Status                RALYAS4A
                                                           03/19/97  16:14:46
Position to  . . . . .              Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description      Status               -------------Job--------------
     X25LINE_A        ACTIVE
       X25LINET       ACTIVE
         X25LIIPX     ACTIVE               QIPX        QSYS        008119







                                                                      Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 128. WRKCFGSTS X25 Line RALYAS4A

From Figure 128 we can see that the IPX network controller (*NET) has become active with the QIPX job.

Tip

STRIPX starts all IPX Circuits that have AUTOSTART set to *YES.

The QIPX application job runs in the QSYSWRK subsystem and uses the QSYS/QZSPJOB job description. To display the job, enter the command `WRKACTJOB SBS(QSYSWRK)`.

```
                          Work with Active Jobs                    RALYAS4A
                                                          03/19/97  16:15:28
CPU %:     .0     Elapsed time:   00:00:00     Active jobs:   44

Type options, press Enter.
  2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
  8=Work with spooled files   13=Disconnect ...

Opt  Subsystem/Job  User        Type  CPU %  Function        Status
     QSYSWRK        QSYS        SBS      .0                   DEQW
       QAPPCIPX     QSYS        BCH      .0                   TIMW
       QIPX         QSYS        BCH      .0                   DEQW







                                                                      Bottom
Parameters or command
===>
F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
F12=Cancel   F23=More options   F24=More keys
```

Figure 129. Work with Active Jobs

To verify that the IPX circuits have started, select option 3 (Work with IPX status) from the IPX configuration main menu.

```
                             Work with IPX Status
                                                          System:   RALYAS4A
 Select one of the following:

      1. Work with IPX circuit status
      2. Display IPX route information
      3. Display IPX service information
      4. Work with IPX/SPX connection status
      5. Display active IPX description




 Selection or command
 ===> 1

 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 130. Work with IPX Circuit Status

Then select option 1 (Work with IPX circuit status).

```
                         Work with IPX Circuit Status
                                                            System:   RALYAS4A
Type options, press Enter.
  5=Display details   7=Display associated services
  8=Display associated routes   9=Start   10=End
  12=Work with configuration status

       Circuit                    Line        Line          Circuit
Opt    Name                   Description    Type          Status
       ETH2617A               ETH2617A       *ELAN         Active
       X25PVC_A               X25LINE_A      *X25          Active










                                                                        Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 131. Work with IPX Circuit Status Screen

Here you can see that the LAN and WAN circuits have become active. Both circuits were started automatically because we accepted the default of *YES for Automatic start in the IPX circuits.

Now let's look at the IPX RIP table on the AS/400.

```
                              Work with IPX Status
                                                            System:   RALYAS4A
 Select one of the following:

      1. Work with IPX circuit status
      2. Display IPX route information
      3. Display IPX service information
      4. Work with IPX/SPX connection status
      5. Display active IPX description




 Selection or command
 ===> 2

 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 132. Display IPX Routing Information

Select option 2 (Display IPX route information) from the Work with IPX Status menu.

```
                         Display IPX Route Information
                                                             System:   RALYAS4A
Type options, press Enter.
  5=Display details

        Remote        Number      Number       Next Hop          Route
Opt     Network      of Hops     of Ticks      Node Address      Source
        00000009         1           35        *NONE             *NLSP
        00000E01         0            1        *NONE             *CCT
        30AA0F92         2           36        *NONE             *RIP
        31ECF1DD         2           36        *NONE             *RIP
        76AD0117         1           35        *NONE             *NLSP
        96AD0D47         0            1        000000000001      *LOCAL










                                                                        Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 133. Display IPX Route Information

This display shows the IPX routing information from the different networks.

Remote Network The remote network number. This may be an external network number or an internal network number.

00000E01 This is the network attached to the AS/400's token-ring network interface. *CCT indicates that the network is defined in an IPX circuit.

00000009 This is the network number associated with the remote system's LAN interface. The route information was propagated to this system via NLSP.

30AA0F92 and 31ECF1DD
These network numbers are associated with NetWare servers attached to the same LAN as the remote system. The route information was propagated to this system via NLSP.

96AD0D47 This is the internal network number of this system.

76AD0117 This is the internal network number of the remote system. The route information was propagated to this system via NLSP.

Number of Hops The number of hops necessary to reach the remote network. The number of hops is equal to the number of routers that are crossed in order to reach the network or system.

Number of Ticks The number of ticks needed to reach the remote network. The number of ticks value is used to weight a route. If there is more than one route to a remote network and both have the same hop count then the route with the least ticks is chosen.

Tip

A tick is defined as 1/18 of a second. The time that a packet takes to go to an IPX node and be returned as a response is measured in terms of ticks.

Next Hop Node Address
The IPX node address of the next hop. The next hop node address is usually the LAN adapter MAC address.

Route Source
The source from which knowledge of this route was obtained:

- *CCT (Circuit) - The route was generated from a locally defined circuit.
- *CFG (Configuration) - The route was configured using the add circuit route (ADDCCTRTE) CL command.
- *NLSP - The route was discovered via NLSP.
- *RIP - The route was discovered via RIP.

Now let's look at the IPX SAP table on the AS/400.

```
                              Work with IPX Status
                                                             System:   RALYAS4A
Select one of the following:

     1. Work with IPX circuit status
     2. Display IPX route information
     3. Display IPX service information
     4. Work with IPX/SPX connection status
     5. Display active IPX description




Selection or command
===> 3

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 134. Display IPX Service Information

Select option 3 (Display IPX service information) from the Work with IPX Status menu.

```
                         Display IPX Service Information
                                                              System:   RALYAS4A
 Type options, press Enter.
   5=Display details

        Service                Service        Remote       Hops to     Service
 Opt    name                   Type           Network      Service     Source
        FERGUS_NW41            *FILESVR       31ECF1DD        2        *SAP
        MANSERV1               *FILESVR       30AA0F92        2        *SAP
        BSER4.00-6.10_30A>     004B           30AA0F92        2        *SAP
        ISMANSERV11841501>     0102           30AA0F92        2        *SAP
        IVMANSERV11841501>     0102           30AA0F92        2        *SAP
        LANPROTECT1841501>     0102           30AA0F92        2        *SAP
        FERGUS_NW41            0107           31ECF1DD        2        *SAP
        MANSERV1               0107           30AA0F92        2        *SAP
        FERGUS_NW41______>     0115           31ECF1DD        2        *SAP
        FERGUS_NW41            0130           31ECF1DD        2        *SAP
        FERGUS_NW41_TREE_>     026B           31ECF1DD        2        *SAP
        SYSMAN___________>     026B           30AA0F92        2        *SAP
        FERGUS_NW41_TREE_>     0278           31ECF1DD        2        *SAP
        SYSMAN___________>     0278           30AA0F92        2        *SAP
                                                                          More...
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 135. Display IPX Service Information Screen

This display shows the IPX service information from servers on the networks.

Service name Shows the name of the service available on the remote system.

Service Type Shows the type of the service available on the remote system. The service type is a 2-byte hexadecimal value. The hexadecimal values 0000 to 8000 and FFFF are reserved.

Any of the following special values and their hexadecimal values are valid:

- *FILESVR: A file server type is available. The hexadecimal value of 0004 is used.
- 004B: BTRIEVE Server
- 0107: 386 Server
- 0237: NetWare Management
- 026B: Time Synchronization

Remote Network Shows the remote IPX network number or system that this service connects to.

Tip

The remote IPX network number is usually the internal IPX network number of the remote server.

Hops to Service Shows the number of hops to reach the service on the remote system.

Service Source Shows the source from which knowledge of this service was obtained:

- *LOCAL - This is a locally known service.
- *CFG (Configuration) - The service was configured using the add circuit service (ADDCCTSRV) CL command.
- *NLSP - The service was discovered via NLSP.
- *SAP - The service was discovered via SAP.

From the IPX routing and service information above we can see, for example, that two file servers exist in the network:

- A NetWare file server with the name MANSERV1 with an internal network number of 30AA0F92
- A NetWare file server with the name FERGUS_NW41 with an internal network number of 31ECF1DD

We can also see that both are two hops away from this AS/400.

The server entries in the table allows the AS/400 to respond to a GET NEAREST SERVER query from the Novell client.

We can now verify the connection with the IPXPING command. IPXPING is very similar to TCP/IP PING. Here we ping RALYAS4B′s internal IPX network address from RALYAS4A.

```
                         Verify IPX Connection (IPXPING)

 Type choices, press Enter.

 Remote IPX network number  . . . > 76AD0117      00000001-FFFFFFFD
 Remote IPX node address  . . . . > 1             000000000001-FFFFFFFFFFFE...

                            Additional Parameters

 Message mode . . . . . . . . . .   *VERBOSE      *VERBOSE, *QUIET
 Packet length (in bytes) . . . .   256           8-65495
 Number of packets  . . . . . . .   5             1-999
 Wait time (in seconds) . . . . . > 5             1-120



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 136. Verify IPX Connection

```
                           Display All Messages
                                                      System:   RALYAS4A
Job . . :   QPADEV0002    User . . :   MICK         Number . . . :   008125

5 > IPXPING RMTNETNBR(76AD0117) RMTNDEADR(1) WAITTIME(5)
    Verifying connection to remote system at network number 76AD0117, node
      address 000000000001.
    Connection verification 1 took .307 seconds.  1 successful connection
      verifications.
    Connection verification 2 took .285 seconds.  2 successful connection
      verifications.
    Connection verification 3 took .285 seconds.  3 successful connection
      verifications.
    Connection verification 4 took .287 seconds.  4 successful connection
      verifications.
    Connection verification 5 took .284 seconds.  5 successful connection
      verifications.
    Round-trip (in milliseconds) min/avg/max = 284/289/307
    Connection verification statistics: 5 of 5 successful (100 %).
                                                                   More...
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F17=Top   F18=Bottom
```

Figure 137. Verify IPX Connection Joblog

As a final verification step we verified a successful login to a NetWare server from a NetWare client.

10.4.3 Ending IPX

We can end an individual IPX circuit either from the Work with IPX Circuit Status menu or by using the command ENDIPXCCT.

We can end the AS/400 IPX router by using the ENDIPX command.

Attention

No confirmation display is shown when the ENDIPX command is entered. The ENDIPX command *immediately* ends all IPX processing on the AS/400.

Chapter 11. Scenario 4. IPX Routing between AS/400s via a Frame Relay Connection

In this scenario we use the AS/400′s IPX router capability over a frame relay connection. Since the connection is permanent and not switched, we allow RIP and SAP to be exchanged over the connection. However, since both routers (the two AS/400s) support NLSP, we use this in preference to standard RIP/SAP. For a WAN connection, NLSP is more efficient than RIP/SAP. We also show how the AS/400′s frame relay interface can be used for SNA, TCP/IP and IPX concurrently. Frame relay offers a relatively high speed (up to 2.048 Mbps) connection. While normally used via a frame relay network, frame relay can be used in a point-to-point mode with one system acting as a frame handler (by specifying *FH in the frame relay network interface).

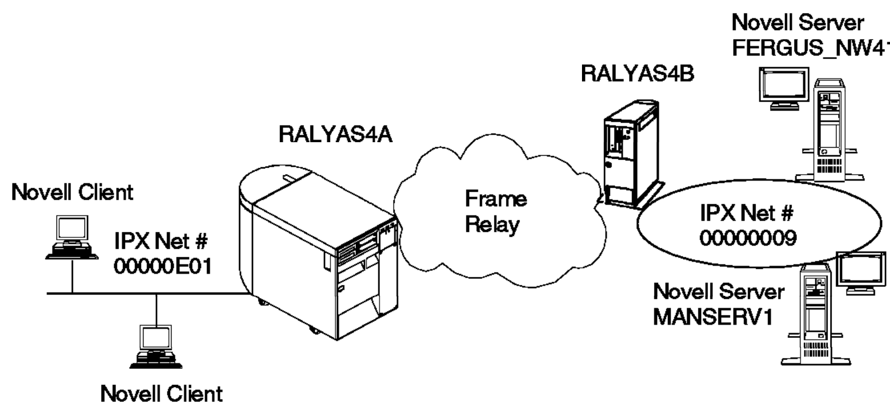

Figure 138. Environment for Scenario 4

11.1 What Information Do We Need before We Start?

Table 14 (Page 1 of 2). RALYAS4A - Information Needed.

	Whom/Where	Ethernet	WAN/Frame relay	RALYAS4A
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000E01	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	N/A	N/A	N/A
FR DLCI	FR Provider	N/A	333	N/A
WAN Speed	FR Provider	N/A	256 Kbps	N/A

Table 14 (Page 2 of 2). RALYAS4A - Information Needed.				
	Whom/Where	**Ethernet**	**WAN/Frame relay**	**RALYAS4A**
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN221	LIN111	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_1
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	96AD0D47

Table 15. RALYAS4B - Information Needed.				
	Whom/Where	**Token-Ring**	**WAN/Frame relay**	**RALYAS4B**
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000009	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	4 Mb	N/A	N/A
FR DLCI	FR Provider	N/A	333	N/A
WAN Speed	FR Provider	N/A	256 Kbps	N/A
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN101	LIN191	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_2
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	760D0117

11.2 RALYAS4A Configuration

For this scenario we have to create the following configuration objects on RALYAS4A:

- Ethernet line description
- Frame relay interface description
- Frame relay line description
- IPX description
- IPX circuit for Ethernet interface
- IPX circuit for frame relay interface

11.2.1 Ethernet Line Description

To create the Ethernet line description, enter the following command:

```
CRTLINETH LIND(ETH2617A)
             RSRCNAME(LIN221)
             TEXT('Ethernet LAN LIN221')
```

Tip

An existing Ethernet line description can be used - there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x′E0′ has not be defined and that the Ethernet standard is *ALL in the line description.

The important parameters in an Ethernet line description for IPX are:

Line description (LIND)
Specifies the uniquely name of the Ethernet line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the Ethernet adapter you want to use.

Ethernet standard (ETHSTD)
This value *must* be *ALL when the line is used for an Ethernet NetWare protocol network. This is the default.

Source service access point (SSAP)
Specifies the SSAP information , including an SSAP value, a maximum frame size , and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x′E0′ to be used by IPX is not specified here. See frame type in the IPX circuit.

11.2.2 Frame Relay Network Interface

To create the frame relay network interface, enter the following command:

```
CRTNWIFR NWID(FR_IPX_A)
            RSRCNAME(LIN111)
            INTERFACE(*V35)
            LINESPEED(256000)
            TEXT('Frame Relay NWI Description RALYAS4A')
```

The important parameters in a frame relay network interface for IPX are:

Network interface description (NWID)
Specifies the unique name of the frame relay interface.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the communications adapter you want to use.

Line speed (LINESPEED)
Specify here the line speed of the frame relay interface as per your frame relay network provider subscription.

11.2.3 Frame Relay Line Description

To create the frame relay line description, enter the following command:

```
CRTLINFR LIND(FR_IPX_A)
            NWI(FR_IPX_A)
            NWIDLCI(333)
            LINKSPEED(256000)
            TEXT('Frame Relay Line Description RALYAS4A')
```

The important parameters in a frame relay line description for IPX are:

Line description (LIND)
The unique name for this line description.

Network interface (NWI)
The network interface that this line description is to be associated with.

Link speed (LINKSPEED)
Specify here the link speed of the frame relay line as per your frame relay network provider subscription.

Tip

A frame relay interface is a shared resource. We could add additional line descriptions to be used for SNA and TCP/IP. A DLCI can only be used to a single remote location. Concurrent sessions (SNA, TCP/IP or IPX) to multiple remote locations would therefore require multiple DLCIs.

11.2.4 IPX Configuration

In this configuration example we create the IPX configuration via CL commands.

11.2.4.1 IPX Description

To create the IPX description, enter the following command:

```
CRTIPXD IPXD(RALYAS4A)
           IPXNETNBR(96AD0D47)
           IPXRTRNAME(ROUTER_1)
           Text('IPX Description for RALYAS4A')
```

The important parameters in an IPX description are:

IPX description (IPXD)
We use the system name for the IPX description name.

IPX internal network number (IPXNETNBR)
The IPX network number used for the AS/400's internal network number must be unique to all other network numbers (internal and external) in this IPX network.

IPX routing protocol (IPXRTGPCL)
In this configuration we use RIP over the LAN connections and NLSP over the WAN connection. In the IPX circuit for the LAN we specify *RIP.

IPX router name (IPXRTRNAME)
We have chosen to use the name Router_1 for this IPX router.

11.2.4.2 IPX Circuits

To create the IPX circuits for the Ethernet and frame relay interfaces, enter the following commands:

```
ADDIPXCCT CCTNAME(ETH2617A) LIND(ETH2617A) IPXNETNBR(00000E01) ENBNLSP(*NO)
ADDIPXCCT CCTNAME(FR_IPX_A) LIND(FR_IPX_A)
```

The important parameters in an IPX circuit for Ethernet are:

Circuit name (CCTNAME)
We use the line description name for the circuit name.

Line description (LIND)
The line description created above.

IPX network number (IPXNETNBR)
For Ethernet interface circuit this is the network number associated with the Ethernet LAN segment.

Enable for NLSP (ENBNLSP)
For the Ethernet interface circuit we only use RIP and SAP and hence have disabled NLSP.

The important parameters in an IPX circuit for frame relay are:

Circuit name (CCTNAME)
We use the line description name for the circuit name.

Line description (LIND)
The line description created above.

Enable for NLSP (ENBNLSP)
For the frame relay interface circuit we use NLSP. This is the default.

Note

Since we have configured the circuits to allow RIP and SAP to flow (via NLSP), we do not have to configure IPX circuit routes or IPX circuit services.

11.3 RALYAS4B Configuration

For this scenario we have to create the following configuration objects on RALYAS4B:

- Token-ring line description
- Frame relay interface description
- Frame relay line description
- IPX description
- IPX circuit for token-ring interface
- IPX circuit for frame relay interface

11.3.1 Token-Ring Line Description

To create the token-ring line description, enter the following command:

```
CRTLINTRN LIND(TRN2619B)
              RSRCNAME(LIN101)
              LINESPEED(4M)
              TEXT('4M Token-Ring')
```

Tip

An existing token-ring line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x′E0′ has not be defined in the line description.

The important parameters in a token-ring line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the token-ring adapter you want to use.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x′E0′ to be used by IPX is not specified here. See frame type in the IPX circuit.

11.3.2 Frame Relay Network Interface

To create the frame relay network interface, enter the following command:

```
CRTNWIFR NWID(FR_IPX_B)
             RSRCNAME(LIN191)
             INTERFACE(*V35)
             LINESPEED(256000)
             TEXT('Frame Relay NWI Description RALYAS4B')
```

11.3.3 Frame Relay Line Description

To create the frame relay line description, enter the following command:

```
CRTLINFR LIND(FR_IPX_B)
             NWI(FR_IPX_B)
             NWIDLCI(333)
             LINKSPEED(256000)
             TEXT('Frame Relay Line Description RALYAS4B')
```

11.3.4 IPX Configuration

In this configuration example we create the IPX configuration via CL commands.

11.3.4.1 IPX Description

To create the IPX description, enter the following command:

```
CRTIPXD IPXD(RALYAS4B)
          IPXNETNBR(76AD0117)
          IPXRTRNAME(ROUTER_2)
          Text('IPX Description for RALYAS4B')
```

11.3.4.2 IPX Circuits

To create the IPX circuits for the token-ring and frame relay interfaces, enter the following commands:

```
ADDIPXCCT CCTNAME(TRN2619B) LIND(TRN2619B) IPXNETNBR(00000009) ENBNLSP(*NO)
ADDIPXCCT CCTNAME(FR_IPX_B) LIND(FR_IPX_B)
```

The important parameters in an IPX circuit for the token-ring interface are:

Circuit name We use the line description name for the circuit name.

Line description The token-ring line description created above.

IPX network number The network number associated with the token-ring LAN segment.

Enable for NLSP We only use RIP and SAP.

> **Note**
>
> Since we have configured the circuits to allow RIP and SAP to flow (via NLSP), we do not have to configure IPX circuit routes or IPX circuit services.

11.4 Starting and Verifying the IPX Router Support

Before we can start the IPX support on the AS/400, we have to vary on the network interface and line descriptions being used by the IPX circuits. We can do this by entering the following commands:

- RALYAS4A

```
VRYCFG CFGOBJ(ETH2617A) CFGTYPE(*LIN) STATUS(*ON)
VRYCFG CFGOBJ(FR_IPX_A) CFGTYPE(*NWI) STATUS(*ON)
VRYCFG CFGOBJ(FR_IPX_A) CFGTYPE(*LIN) STATUS(*ON)
```

- RALYAS4B

```
VRYCFG CFGOBJ(TRN2619B) CFGTYPE(*LIN) STATUS(*ON)
VRYCFG CFGOBJ(FR_IPX_B) CFGTYPE(*NWI) STATUS(*ON)
VRYCFG CFGOBJ(FR_IPX_B) CFGTYPE(*LIN) STATUS(*ON)
```

11.4.1 Starting IPX

To start IPX using the IPX descriptions we created above, enter the following commands:

- RALYAS4A

```
STRIPX RALYAS4A
```

- RALYAS4B

```
STRIPX RALYAS4B
```

Starting the AS/400 IPX Support creates a *NET controller and an *NET device description.

Tip

The *NET controller is also used by the AS/400 TCP/IP support if this is also configured on the system.

11.4.2 Verifying the IPX Configuration

To verify that the network interface and line description have become active and that the *NET controller and device descriptions have been created and are also active, use the command WRKCFGSTS. For example, if we enter the command WRKCFGSTS *NWI FR_IPX_ A on RALYAS4A, we see the panel shown in Figure 139.

```
                        Work with Configuration Status                RALYAS4A
                                                              03/20/97  10:57:48
Position to  . . . . .               Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description       Status                -------------Job--------------
     FR_IPX_A          ACTIVE
       FR_IPX_A        ACTIVE
         FR_IPNET      ACTIVE
           FR_IPIPX    ACTIVE                QIPX        QSYS        008170






                                                                         Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 139. Work with Configuration Status

From Figure 139 we can see that the IPX network controller (*NET) has become active with the IPX job.

To verify that the IPX circuits have become active, use the WRKIPXSTS command. For example, if we enter the command WRKIPXSTS OPTION(*CCT) on RALYAS4B, we see the panel shown in Figure 140 on page 169.

```
                         Work with IPX Circuit Status
                                                           System:   RALYAS4B
Type options, press Enter.
  5=Display details   7=Display associated services
  8=Display associated routes   9=Start   10=End
  12=Work with configuration status

       Circuit                  Line        Line          Circuit
Opt    Name                  Description    Type          Status
       FR_IPX_B              FR_IPX_B       *FR           Active
       TRN2619B              TRN2619B       *TRLAN        Active

                                                                       Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 140. Work with IPX Circuit Status

Here you can see that the LAN and WAN circuits have become active. Both circuits were started automatically because we accepted the default of *YES for Automatic start in the IPX circuits.

To verify that the IPX routes have been propagated between the routers, we can use the command WRKIPXSTS. For example, if we enter the command WRKIPXSTS OPTION(*RTE) on RALYAS4A, we see the panel shown in Figure 141.

```
                        Display IPX Route Information
                                                           System:   RALYAS4A
Type options, press Enter.
  5=Display details

        Remote        Number      Number       Next Hop         Route
Opt     Network      of Hops     of Ticks     Node Address     Source
        00000009        1            13       *NONE            *NLSP
        00000E01        0             1       *NONE            *CCT
        30AA0F92        2            14       *NONE            *RIP
        31ECF1DD        2            14       *NONE            *RIP
        53914BBA        2            14       *NONE            *RIP
        76AD0117        1            13       *NONE            *NLSP
        96AD0D47        0             1       000000000001     *LOCAL
        E46366AE        2            36       *NONE            *RIP

                                                                       Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 141. Display IPX Route Information

To verify that the IPX services information has been propagated between the routers, we can use the command WRKIPXSTS. For example, if we enter the command WRKIPXSTS OPTION(*SRV) on RALYAS4A, we see the panel shown in Figure 142 on page 170.

```
                       Display IPX Service Information
                                                           System:   RALYAS4A
Type options, press Enter.
  5=Display details

       Service              Service       Remote      Hops to    Service
Opt    name                 Type          Network     Service    Source
       FERGUS_NW41          *FILESVR      31ECF1DD       2       *SAP
       MANSERV1             *FILESVR      30AA0F92       2       *SAP
       NW41SERV             *FILESVR      53914BBA       2       *SAP
       BSER4.00-6.10_30A>   004B          30AA0F92       2       *SAP
       BSER4.00-6.10_539>   004B          53914BBA       2       *SAP
       ISMANSERV11841501>   0102          30AA0F92       2       *SAP
       ISNW41SERV0787289>   0102          53914BBA       2       *SAP
       IVMANSERV11841501>   0102          30AA0F92       2       *SAP
       IVNW41SERV0787289>   0102          53914BBA       2       *SAP
       LANPROTECT1841501>   0102          30AA0F92       2       *SAP
       LDPNVIRUS_PROTECT>   0102          53914BBA       2       *SAP
       FERGUS_NW41          0107          31ECF1DD       2       *SAP
       MANSERV1             0107          30AA0F92       2       *SAP
       NW41SERV             0107          53914BBA       2       *SAP
                                                                     More...
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 142. Display IPX Service Information Screen

We can now verify the connection with the IPXPING command. IPXPING is very similar to TCP/IP PING. Here we ping RALYAS4B's internal IPX network address from RALYAS4A.

```
                          Verify IPX Connection (IPXPING)

 Type choices, press Enter.

 Remote IPX network number  . . . > 76AD0117      00000001-FFFFFFFD
 Remote IPX node address  . . . . > 1             000000000001-FFFFFFFFFFFE...

                             Additional Parameters

 Message mode . . . . . . . . . .   *VERBOSE      *VERBOSE, *QUIET
 Packet length (in bytes) . . . .   256           8-65495
 Number of packets  . . . . . . .   5             1-999
 Wait time (in seconds) . . . . . > 5             1-120



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 143. Verify IPX Connection

```
                              Display All Messages
                                                         System:   RALYAS4A
Job . . :   WTR0528S01    User . . :   MICK         Number . . . :   008173

3 > IPXPING RMTNETNBR(76AD0117) RMTNDEADR(1) WAITTIME(5)
    Verifying connection to remote system at network number 76AD0117, node
      address 000000000001.
    Connection verification 1 took .122 seconds.  1 successful connection
      verifications.
    Connection verification 2 took .119 seconds.  2 successful connection
      verifications.
    Connection verification 3 took .118 seconds.  3 successful connection
      verifications.
    Connection verification 4 took .118 seconds.  4 successful connection
      verifications.
    Connection verification 5 took .118 seconds.  5 successful connection
      verifications.
    Round-trip (in milliseconds) min/avg/max = 118/119/122
    Connection verification statistics: 5 of 5 successful (100 %).
3 > dspjoblog
                                                                    More...
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F17=Top   F18=Bottom
```

Figure 144. Verify IPX Connection Joblog

As a final verification step we verified a successful login to a NetWare server from a NetWare client.

11.4.3 Ending IPX

We can end an individual IPX circuit either from the Work with IPX Circuit Status menu or by using the command ENDIPXCCT.

We can end the AS/400 IPX router by using the ENDIPX command.

Attention

No confirmation display is shown when the ENDIPX command is entered. The ENDIPX command *immediately* ends all IPX processing on the AS/400.

Chapter 12. Scenario 5. IPX Routing between an AS/400 and an IBM 2210 via a Frame Relay Connection

In this scenario we use an AS/400 (RALYAS4A) as an IPX Router to an IBM 2210 Nways Multiprotocol Router via frame relay. Frame relay offers a relatively high-speed (up to 2.048 Mbps) connection. While normally used via a frame relay network, frame relay can be used in a point-to-point mode with one system system acting as a frame handler (by specifying *FH in the AS/400 frame relay network interface). We use RIP and SAP because the IBM2210 does not support NLSP. The IBM 2210 does not support IW2 either and therefore we configure the AS/400 to allow for this also.

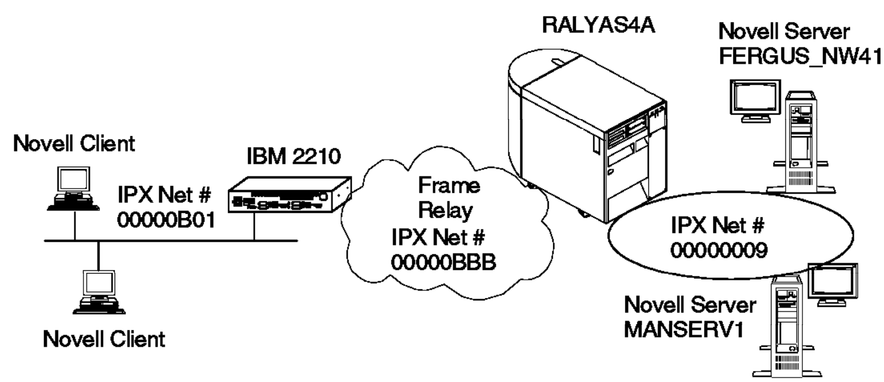

Figure 145. Environment for Scenario 5

Note that this configuration would work as above (with the Novell clients attached to the IBM 2210 and the Novell servers attached to the AS/400) or with the clients attached to the AS/400 and the servers attached to the 2210.

12.1 What Information Do We Need before We Start?

Table 16 (Page 1 of 2). RALYAS4A - Information Needed.

	Whom/Where	Token-Ring	WAN/Frame relay	RALYAS4A
Routing Protocol	Network Administrator	RIP	RIP	N/A
LAN IPX Network Number	Network Administrator	00000009	00000BBB	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	4 Mb	N/A	N/A
FR DLCI	FR Provider	N/A	333	N/A
WAN Speed	FR Provider	N/A	256 Kbps	N/A

Table 16 (Page 2 of 2). RALYAS4A - Information Needed.				
	Whom/Where	**Token-Ring**	**WAN/Frame relay**	**RALYAS4A**
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN191	LIN111	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_1
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	96AD0D47

Table 17. IBM 2210 - Information Needed.				
	Whom/Where	**Token-ring**	**WAN/Frame relay**	**IBM 2210**
Routing Protocol	Network Administrator	RIP	RIP	N/A
LAN IPX Network Number	Network Administrator	00000B01	00000BBB	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	16 Mb	N/A	N/A
FR DLCI	FR Provider	N/A	333	N/A
WAN Speed	FR Provider	N/A	256 Kbps	N/A
2210 Host number	Network Administrator	N/A	N/A	2210A

12.2 RALYAS4A Configuration

For this scenario we have to create the following configuration objects on RALYAS4A:

- Token-ring line description
- Frame relay interface description
- Frame relay line description
- IPX description
- IPX circuit for token-ring interface
- IPX circuit for frame relay interface

12.2.1 Token-Ring Line Description

To create the token-ring line description, enter the following command:

```
CRTLINTRN LIND(TRN2619A)
          RSRCNAME(LIN191)
          LINESPEED(4M)
          TEXT('4M Token-Ring')
```

Tip

An existing token-ring line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x′E0′ has not be defined in the line description.

The important parameters in a token-ring line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the token-ring adapter you want to use.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x′E0′ to be used by IPX is not specified here. See frame type in the IPX circuit.

12.2.2 Frame Relay Network Interface

To create the frame relay network interface, enter the following command:

```
CRTNWIFR NWID(FR_IPX_A)
           RSRCNAME(LIN111)
           INTERFACE(*V35)
           LINESPEED(256000)
           TEXT('Frame Relay NWI Description RALYAS4A')
```

The important parameters in a frame relay network interface for IPX are:

Network interface description (NWID)
Specifies the unique name of the frame relay interface.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the communications adapter you want to use.

Line speed (LINESPEED)
Specify here the line speed of the frame relay interface as per your frame relay network provider subscription.

12.2.3 Frame Relay Line Description

To create the frame relay line description, enter the following command:

```
CRTLINFR LIND(FR_IPX_A)
           NWI(FR_IPX_A)
           NWIDLCI(333)
           LINKSPEED(256000)
           TEXT('Frame Relay Line Description RALYAS4A')
```

The important parameters in a frame relay line description for IPX are:

Line description (LIND)
The unique name for this line description.

Network interface (NWI)
The network interface that this line description is to be associated with.

Link speed (LINKSPEED)
Specify here the link speed of the frame relay line as per your frame relay network provider subscription.

Tip

A frame relay interface is a shared resource. We could add additional line descriptions to be used for SNA and TCP/IP. A DLCI can only be used to a single remote location. Concurrent sessions (SNA, TCP/IP or IPX) to multiple remote locations would therefore require multiple DLCIs.

12.2.4 IPX Configuration

In this configuration example we create the IPX configuration via CL commands.

12.2.4.1 IPX Description

To create the IPX description, enter the following command:

```
CRTIPXD IPXD(RALYAS4A)
          IPXNETNBR(96AD0D47)
          IPXRTGPCL(*RIP)
          IPXRTRNAME(ROUTER_1)
          Text('IPX Description for RALYAS4A')
```

The important parameters in an IPX description are:

IPX description (IPXD)
We use the system name for the IPX description name.

IPX internal network number (IPXNETNBR)
The IPX network number used for the AS/400's internal network number must be unique to all other network numbers (internal and external) in this IPX network.

IPX routing protocol (IPXRTGPCL)
In this configuration we use RIP over the LAN connections and over the WAN connection.

IPX router name (IPXRTRNAME)
We have chosen to use the name Router_1 for this IPX router.

12.2.4.2 IPX Circuits

To create the IPX circuits for the token-ring and frame relay interfaces, enter the following commands:

```
ADDIPXCCT CCTNAME(TRN2619A) LIND(TRN2619A) IPXNETNBR(00000009)
ENBNLSP(*NO)
ADDIPXCCT CCTNAME(FR_IPX_A) LIND(FR_IPX_A) IPXNETNBR(00000BBB)
ENBNLSP(*NO) ENBIW2(*NO)
```

The important parameters in an IPX circuit for token-ring are:

Circuit name (CCTNAME)
We use the line description name for the circuit name.

Line description (LIND)
The line description created above.

IPX network number (IPXNETNBR)
For the token-ring interface circuit this is the network number associated with the token-ring LAN segment.

Enable for NLSP (ENBNLSP)
For the token-ring interface circuit we only use RIP and SAP and hence have disabled NLSP.

The important parameters in an IPX circuit for frame relay are:

Circuit name (CCTNAME)
We use the line description name for the circuit name.

Line description (LIND)
The line description created above.

IPX network number (IPXNETNBR)
For a connection to an IBM 2210 we cannot use IW2, therefore we need to configure a network number for the frame relay interface.

Enable for NLSP (ENBNLSP)
The 2210 does not support NLSP, therefore we have disabled NLSP for the WAN circuit.

Enable for IW2 (ENBIW2)
The IBM 2210 does not support IW2, therefore we have disabled IW2 for the WAN circuit.

Note

Since we have configured the circuits to allow RIP and SAP to flow, we do not have to configure IPX circuit routes or IPX circuit services.

12.3 2210 Configuration

The base 2210 configuration was created using ″Quick Configuration″ process.

```
Config> QCONFIG   Quick Configuration         1
Configure interfaces? > yes
Intf 0 is Ethernet
Intf 1 is WAN Frame Relay
Encapsulation for WAN 1 (PPP, Frame Relay) = [PPP] frame relay
Cable type (RS-232 modem, RS-232 direct attach, V.35 modem,
   V.35 direct attach, V.36, X.21) = [RS-232 modem] V.35 modem
Intf 2 is WAN Frame Relay
Encapsulation for WAN 2 (PPP, Frame Relay) = [PPP] PPP
Cable type (RS-232 modem, RS-232 direct attach, V.35 modem,
   V.35 direct attach, V.36, X.21) = [RS-232 modem] RS-232 modem
This is all configured device information:
Intf 0 is Ethernet, Connector (10baseT, AUI) auto-configured
Intf 1 is WAN 1 with Frame Relay Encapsulation, V.35 modem cable
Intf 2 is WAN 2 with PPP Encapsulation, RS-232 modem cable
Save this configuration? (Yes, No) = [Yes] (press enter to save)

Configure bridging? (Yes, No, Quit) = [Yes] no

Configure protocols? (Yes, No, Quit) = [Yes] yes
Configure IP? (Yes, No) = [Yes] no     2

Configure IPX? (Yes, No) = [Yes] yes
Configuring Interface 0 (Ethernet)
Configure IPX on this interface? (Yes, No): Yes
Ethernet encapsulation (frame) type? (ETHERNET_II, ETHERNET_SNAP,
    ETHERNET_8022, ETHERNET_8023): [ETHERNET_8023]  ethernet_8022
Network Number (hex) (1 - FFFFFFFE): [ ] B01
Configuring Interface 1 (WAN Frame Relay )
Configure IPX on this interface? (Yes, No) = [Yes] Yes
Network number (hex) (1 - FFFFFFFE):  [ ] BBB
Configuring Interface 2 (WAN PPP)
Configure IPX on this interface? (Yes, No) = [Yes] no
This is the information you have entered:

     Per-Interface Configuration Information

Ifc  IPX Net (hex)  Encapsulation    IPXWAN

0    B01            ETHERNET_8023    N/A
1    BBB                             N/A


Save this configuration? (Yes, No) = [Yes] (press enter to save)

IPX configuration saved

Configure DNA? (Yes, No) no
Configure booting? (Yes, No, Quit) = [Yes] no
Enable console modem control? (Yes, No, Quit) = [Yes] no
Restart the router? (Yes,No) = [Yes] (press enter to restart the router)
```

Figure 146. 2210 MRNS Quick Configuration

```
*Talk 6
Config> network 1
Frame-Relay user configuration
FR config> add permanent-virtual-circuit
Circuit-number [16]? 333  3
Committed Information Rate (CIR) in bps [64000]? 64000
Committed Burst Size (Bc) in bits [64000]? 64000
Excess Burst Size (Be) in bits [0]? 0
Assign circuit name [ ]? as400
Is circuit required for interface operation? [N] no
FR config> add protocol-address
Protocol name or number [IP]? ipx
Host number (in hex) [] 96AD0D470000    4
Circuit number [16]? 333
FR config> list all (to verify)
FR config> exit
Config> protocol ipx
IPX protocol user configuration
IPX config> set host
Host number for serial lines (in hex) []? 2210a    5
IPX config> list all (to verify)
```

Figure 147. 2210 MRNS Frame Relay Configuration

The restart command is used (from the OPCON prompt) to read and activate the 2210 configuration. Press Ctrl P to access the OPCON prompt (*). For example:

```
Config> Ctrl P
* restart
Are you sure you want to restart the gateway? (Yes or [No]): yes
```

Figure 148. 2210 MRNS Restart Confirmation

Notes:

1 When you power up a brand new IBM 2210 router that has not been configured previously, you automatically go into the QCONFIG program. This part of the configuration must always be done via the console.

2 The process of going through the steps to configure protocols and then specifying no for each interface deletes any existing interface protocol configurations. In practice, you might want to configure IP support to manage the router.

3 Since this is a point-to-point frame relay connection, the DLCI number configured here must match the DLCI configured on the AS/400.

4 As the 2210 does not support IW2 which allows IPXWAN over a frame relay link, a static route must be provided for IPX. This static route would normally point to a remote node address (48 bits long) on the frame relay network. The AS/400 does not allow the configuration of node addresses, so the AS/400 internal IPX network number is appended with four zeros (0000) to create a pseudo node number.

5 We have to configure a remote IPX host node number in the 2210 frame relay configuration.

12.4 Starting and Verifying the IPX Router Support

Before we can start the IPX support on the AS/400, we have to vary on the the network interface and line descriptions being used by the IPX circuits. We can do this by entering the following commands:

```
VRYCFG CFGOBJ(TRN2619A) CFGTYPE(*LIN) STATUS(*ON)
VRYCFG CFGOBJ(FR_IPX_A) CFGTYPE(*NWI) STATUS(*ON)
VRYCFG CFGOBJ(FR_IPX_A) CFGTYPE(*LIN) STATUS(*ON)
```

12.4.1 Starting IPX

To start IPX on the AS/400 using the IPX description we created above, enter the following command:

```
STRIPX RALYAS4A
```

Starting the AS/400 IPX Support creates a *NET controller and an *NET device description.

Tip

The *NET controller is also used by the AS/400 TCP/IP support if this is also configured on the system.

12.4.2 Verifying the IPX Configuration

To verify that the network interface and line description have become active and that the *NET controller and device descriptions have been created and are also active, use the command WRKCFGSTS. For example, if we enter the command `WRKCFGSTS *NWI FR_IPX_ A` on RALYAS4A, we see the panel shown in Figure 149.

```
                        Work with Configuration Status                RALYAS4A
                                                            03/24/97  15:15:16
Position to  . . . . .              Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description       Status                -------------Job--------------
     FR_IPX_A          ACTIVE
       FR_IPX_A        ACTIVE
         FR_IPNET      ACTIVE
           FR_IPIPX    ACTIVE                QIPX        QSYS        008477






                                                                        Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 149. Work with Configuration Status

From Figure 149 we can see that the IPX network controller (*NET) has become active with the IPX job.

To verify that the IPX circuits have become active, use the WRKIPXSTS command. For example, if we enter the command WRKIPXSTS OPTION(*CCT) on RALYAS4A, we see the panel shown in Figure 150 on page 181.

```
                          Work with IPX Circuit Status
                                                                  System:   RALYAS4A
 Type options, press Enter.
   5=Display details   7=Display associated services
   8=Display associated routes   9=Start   10=End
   12=Work with configuration status

        Circuit                  Line        Line          Circuit
 Opt    Name                  Description    Type          Status
        FR_IPX_A              FR_IPX_A       *FR           Active
        TRN2619A              TRN2619A       *TRLAN        Active










                                                                             Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 150. Work with IPX Circuit Status

Here you can see that the LAN and WAN circuits have become active. Both circuits were started automatically because we accepted the default of *YES for Automatic start in the IPX circuits.

Tip

An IPX Circuit with IPX WAN Version 2 (IW2) disabled goes active without negotiations with the remote site.

To verify that the IPX routes have been propagated between the routers, we can use the command WRKIPXSTS. For example, if we enter the command WRKIPXSTS OPTION(*RTE) on RALYAS4A, we see the panel shown in Figure 151 on page 182.

```
                         Display IPX Route Information
                                                                System:   RALYAS4A
 Type options, press Enter.
   5=Display details

         Remote        Number      Number       Next Hop          Route
 Opt     Network      of Hops     of Ticks      Node Address      Source
         00000009        0            1         *NONE             *CCT
         00000B01        1            2         00000002210A      *RIP
         30AA0F92        1            2         400052005240      *RIP
         31ECF1DD        1            2         08005A0D2860      *RIP
         33333333        1            2         400052005109      *RIP
         53914BBA        1            2         08005A0D294A      *RIP
         96AD0D47        0            1         000000000001      *LOCAL








                                                                            Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 151. Display IPX Route Information

To verify that the IPX services information has been propagated between the routers, we can use the command WRKIPXSTS. For example, if we enter the command WRKIPXSTS OPTION(*SRV) on RALYAS4A, we see the panel shown in Figure 152.

```
                        Display IPX Service Information
                                                                System:   RALYAS4A
 Type options, press Enter.
   5=Display details

        Service               Service         Remote      Hops to    Service
 Opt    name                  Type            Network     Service    Source
        FERGUS_NW41           *FILESVR        31ECF1DD       1       *SAP
        MANSERV1              *FILESVR        30AA0F92       1       *SAP
        NETW114               *FILESVR        33333333       1       *SAP
        NW41SERV              *FILESVR        53914BBA       1       *SAP
        BSER4.00-6.10_30A>    004B            30AA0F92       1       *SAP
        BSER4.00-6.10_539>    004B            53914BBA       1       *SAP
        ISMANSERV11841501>    0102            30AA0F92       1       *SAP
        ISNW41SERV0787289>    0102            53914BBA       1       *SAP
        IVMANSERV11841501>    0102            30AA0F92       1       *SAP
        IVNW41SERV0787289>    0102            53914BBA       1       *SAP
        LANPROTECT1841501>    0102            30AA0F92       1       *SAP
        LDPNVIRUS_PROTECT>    0102            53914BBA       1       *SAP
        FERGUS_NW41           0107            31ECF1DD       1       *SAP
        MANSERV1              0107            30AA0F92       1       *SAP
                                                                           More...
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 152. Display IPX Service Information Screen

To verify that the IPX routes have been propagated to the 2210, we can use the dump command to display the 2210 IPX route table.

```
IPX>dump

8 route entries used out of 128
8 net entries used out of 32

Type     Dest net Hops Delay  Age(M:S)   via Router
 Dir        B01    0     1      0: 0        B01/0000938080D0 0-Eth/0
 Dir        BBB    0     1      0: 0        BBB/00000002210A 1-FR/0
 RIP          9    1    30      0:40        BBB/96AD0D470000
 RIP   30AA0F92    2    31      0:40        BBB/96AD0D470000
 RIP   31ECF1DD    2    31      0:40        BBB/96AD0D470000
 RIP   33333333    2    31      0:40        BBB/96AD0D470000
 RIP   53914BBA    2    31      0:40        BBB/96AD0D470000
 RIP   96AD0D47    1    30      0:40        BBB/96AD0D470000
```

Figure 153. 2210 Route Table Information

To verify that the IPX services information has been propagated to the 2210, we can use the slist command to display the 2210 IPX service table.

```
IPX>slist
State Typ Service Name                  Hops   Age     Net  /   Host    / Sock
 SAP 0004 NW41SERV                        2    0:10 53914BBA/000000000001/0451
 SAP 0004 NETW114                         2    0:10 33333333/000000000001/0451
 SAP 0004 MANSERV1                        2    0:10 30AA0F92/000000000001/0451
 SAP 0004 FERGUS_NW41                     2    0:10 31ECF1DD/000000000001/0451
 SAP 004B BSER4.00-6.10_53914BBA000000000 2    0:10 53914BBA/000000000001/8059
 SAP 004B BSER4.00-6.10_30AA0F92000000000 2    0:10 30AA0F92/000000000001/8059
 SAP 0102 LDPNVIRUS_PROTECT_BA4B915315050 2    0:10 53914BBA/000000000001/4014
 SAP 0102 LANPROTECT18415018920FAA3010370 2    0:10 30AA0F92/000000000001/4010
 SAP 0102 IVNW41SERV0787289E00000020      2    0:10 53914BBA/000000000001/4015
 SAP 0102 IVMANSERV11841501800000020      2    0:10 30AA0F92/000000000001/400F
 SAP 0102 ISNW41SERV0787289E00000020      2    0:10 53914BBA/000000000001/4013
 SAP 0102 ISMANSERV11841501800000020      2    0:10 30AA0F92/000000000001/400D
 SAP 0107 NW41SERV                        2    0:10 53914BBA/000000000001/8104
 SAP 0107 MANSERV1                        2    0:10 30AA0F92/000000000001/8104
 SAP 0107 FERGUS_NW41                     2    0:10 31ECF1DD/000000000001/8104
 SAP 0115 FERGUS_NW41____________________ 2    0:10 31ECF1DD/000000000001/1F80
 SAP 0130 FERGUS_NW41                     2    0:10 31ECF1DD/000000000001/1F80
 SAP 0237 NW41SERV                        2    0:10 53914BBA/000000000001/401F
 SAP 0238 NW41SERV                        2    0:10 53914BBA/000000000001/4800
 SAP 026B SYSMAN_________________________ 2    0:10 30AA0F92/000000000001/0005
 SAP 026B NT4275R________________________ 2    0:10 53914BBA/000000000001/0005
 SAP 026B NETW114________________________ 2    0:10 33333333/000000000001/0005
 SAP 026B FERGUS_NW41_TREE_______________ 2    0:10 31ECF1DD/000000000001/0005
 SAP 0278 SYSMAN_________________________ 2    0:10 30AA0F92/000000000001/4006
 SAP 0278 NT4275R________________________ 2    0:10 53914BBA/000000000001/4006
 SAP 0278 NETW114________________________ 2    0:10 33333333/000000000001/4006
 SAP 0278 FERGUS_NW41_TREE_______________ 2    0:10 31ECF1DD/000000000001/4006
 SAP 027B NW41SERV                        2    0:10 53914BBA/000000000001/0000
 SAP 05B3 FERGUS_NW41                     2    0:10 31ECF1DD/000000000001/0000
 SAP 064E WINNT80!!!!!!!!A5569B20ABE511CE 2    0:10        9/400052005186/4008
 SAP 064E WINNT68!!!!!!!!A5569B20ABE511CE 2    0:10        9/400052005187/4008
 SAP 064E WINNT38!!!!!!!!A5569B20ABE511CE 2    0:10        9/400052005185/4008

32 entries used out of 32
```

Figure 154. 2210 Service Table Information

As a final verification step we verified a successful login to a NetWare server from a NetWare client.

12.4.3 Ending IPX

We can end an individual IPX circuit either from the Work with IPX Circuit Status menu or by using the command ENDIPXCCT.

We can end the AS/400 IPX router by using the ENDIPX command.

Attention

No confirmation display is shown when the ENDIPX command is entered. The ENDIPX command *immediately* ends all IPX processing on the AS/400.

12.5 Why No AS/400 - IBM 2210 Switched Configuration?

The AS/400 to IBM 2210 IPX router configuration above is for a non-switched connection; ideally we would have also liked to have included a configuration for an AS/400 to IBM 2210 switched configuration. However, this was not found to be practical. The AS/400 and IBM 2210 IPX router implementations are different to an extent of making this type of connection impractical. Some of the differences are as follows:

- The IBM 2210 (and IBM 6611) do not allow IPX static routes to be defined.

  As you have seen in Chapter 9, “Scenario 2. IPX Routing between AS/400s via an On-Demand X.25 SVC Connection” on page 105, the AS/400 uses static routes and services over on-demand (switched) connections. The IBM 2210 and 6611 do not provide for the definition of IPX static routes and services.

- The IBM 2210 (and IBM 6611) raise the switched connection for RIP/SAP exchanges.

  When configured for a switched connection, the IBM 2210 and 6611 routers establish the switched connection (if not already established) at predefined intervals for the exchange of RIP/SAP. The AS/400 does not establish a switched (on-demand) connection purely for RIP/SAP.

- The IBM 2210 (and IBM 6611) hold their RIP and SAP tables when the connection is down unless the aging timer expires.

  If configured for an on-demand connection that allows RIP/SAP (RIP/SAP state set to other than *OFF in the IPX circuit), the AS/400 exchanges RIP/SAP/NLSP when the switched connection is established for data. However, when the connection is subsequently dropped by the inactivity timer (X.25 SVC idle circuit timeout in IPX circuit), the AS/400 deletes routes and services discovered via the switched connection. The IBM 2210 and 6611 hold routes and services discovered via a switched connection after the idle circuit timer expires until the aging timer expires.

- The IBM 2210 (and IBM 6611) SVC idle timers are reset by RIP/SAP.

  The AS/400 SVC inactivity timer (X.25 SVC idle circuit timeout in IPX circuit) is not reset by RIP/SAP/NLSP; it is only reset by data. The IBM 2210 and 6611 inactivity timer is reset by RIP/SAP; the IBM 2210 and 6611 do not support NLSP.

- The AS/400 sends a broadcast over the link when its SVC idle timer expires to say that the routes/services available via the link are no longer available.

To tell the remote router that routes/services available via the switched connection are about to become unavailable, the AS/400 sends a broadcast over a switched connection prior to dropping the switched connection when the SVC inactivity timer expires. This causes the IBM 2210/6611 to delete the route/services entries available via the switched connection to the AS/400.

Chapter 13. Scenario 6. IPX Routing to a Novell Multiprotocol Router via a Permanent X.25 SVC Connection

In this scenario we use an AS/400 (RALYAS4A) as an IPX Router to a Novell Multiprotocol Router (MPR) over an X.25 switched (SVC) connection. The WAN connection is configured as a permanent connection; the switched connection is permanently established. Since the connection is permanently established, we allow RIP and SAP to be exchanged over the connection. However, since both routers (the AS/400 and the MPR router) support NLSP, we use this in preference to standard RIP/SAP. For a WAN connection, NLSP is more efficient than RIP/SAP. X.25 provides a relatively low-speed (up to 64 Kbps) connection.

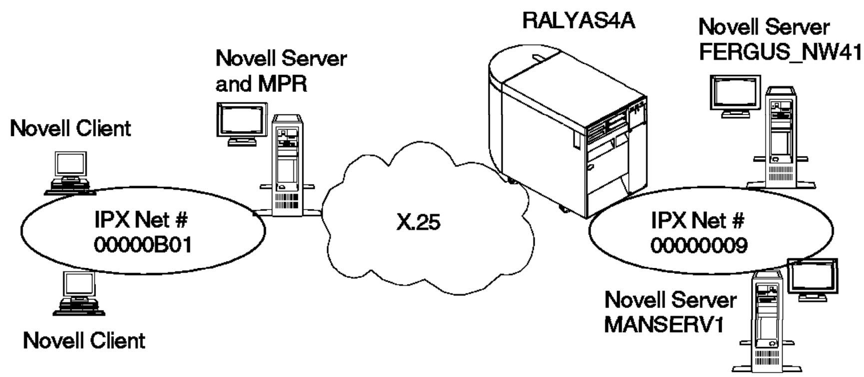

Figure 155. Environment for Scenario 6

Note that this configuration would work as above (with the Novell clients attached to the Novell MPR and the Novell servers attached to the AS/400) or with the clients attached to the AS/400 and the servers attached to the MPR (or provide access to the MPR server itself).

13.1 Novell MPR Hardware and Software Installed

The following hardware and software was installed on the Novell MPR PC.

- Hardware
  - Novell NW2000 wide area network adapter (manufactured by Eagle) and cable.
- Software
  - NetWare Multiprotocol Router 3.0
  - NetWare WAN Extensions 3.0

13.2 What Information Do We Need before We Start?

Table 18. RALYAS4A - Information Needed.

	Whom/Where	Token-Ring	WAN/X.25	RALYAS4A
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000009	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	4 Mb	N/A	N/A
SVC Logical Channel	X.25 Provider	N/A	004	N/A
WAN Speed	X.25 Provider	N/A	9600	N/A
X.25 Network Address	X.25 Provider	N/A	101100201	N/A
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN191	LIN072	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_1
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	96AD0D47

Table 19. Novell MPR - Information Needed.

	Whom/Where	Token-Ring	WAN/X.25	MPR
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000B01	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	4 Mb	N/A	N/A
SVC Logical Channel	X.25 Provider	N/A	004	N/A
WAN Speed	X.25 Provider	N/A	9600	N/A
X.25 Network Address	X.25 Provider	N/A	101100205	N/A

13.3 RALYAS4A Configuration

For this scenario we have to create the following configuration objects on RALYAS4A:

- Token-ring line description
- X.25 line description
- IPX description
- IPX circuit for token-ring interface
- IPX circuit for X.25 interface

13.3.1 Token-ring Line Description

To create the token-ring line description, enter the following command:

```
CRTLINTRN LIND(TRN2619A)
          RSRCNAME(LIN191)
          LINESPEED(4M)
          TEXT('4M Token-Ring')
```

Tip

An existing token-ring line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x'E0' has not be defined in the line description.

The important parameters in a token-ring line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the token-ring adapter you want to use.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x'E0' to be used by IPX is not specified here. See frame type in the IPX circuit.

13.3.2 X.25 Line Description

To create the X.25 line description, enter the following command:

```
CRTLINX25 LIND(X25LINE_A)
          RSRCNAME(LIN072)
          LGLCHLE((004 *SVCBOTH))
          NETADR(101100201)
          CNNINIT(*LOCAL)
          MAXFRAME(4096)
```

```
MAXPKTSIZE(4096)
TEXT('X.25 line via X.25 NET')
```

The important parameters in an X.25 line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the communications adapter you want to use.

X.25 logical channels (LGLCHLE)
Specify here the X.25 logical channels as per your X.25 network provider subscription.

X.25 network address (NETADR)
Specify here the X.25 network address as per your X.25 network provider subscription.

Connection initiation (CNNINIT)
This parameter determines who initiates the X.25 connection. This parameter is network-dependant. This parameter does not determine who initiates the X.25 call.

Maximum frame size (MAXFRAME)
This parameter sets the maximum frame size supported by the X.25 connection.

Maximum packet size (MAXPKTSIZE)
This parameter sets the maximum packet size supported by the X.25 connection. Setting this value at 4096 allows us to use a packet size of up to 4096. The packet size requested is set in the X.25 IPX circuit.

Default packet size (DFTPKTSIZE) and default window size (DFTWDWSIZE).
These parameters are also network-dependant. The default packet and window sizes should match the network defaults. The AS/400 defaults are a packet size of 128 with a window size of 2, these values are frequently also the network defaults as was the case with the network we were using.

13.3.3 IPX Configuration

In this configuration example we create the IPX configuration via CL commands.

13.3.3.1 IPX Description

To create the IPX description, enter the following command:

```
CRTIPXD IPXD(RALYAS4A)
          IPXNETNBR(96AD0D47)
          IPXRTGPCL(*RIP)
          IPXRTRNAME(ROUTER_1)
          Text('IPX Description for RALYAS4A')
```

The important parameters in an IPX description are:

IPX description (IPXD)
We use the system name for the IPX description name.

IPX internal network number (IPXNETNBR)
The IPX network number used for the AS/400′s internal network number must be unique to all other network numbers (internal and external) in this IPX network.

IPX routing protocol (IPXRTGPCL)
In this configuration we use RIP over the LAN connections and over the WAN connection.

IPX router name (IPXRTRNAME)
We have chosen to use the name Router_1 for this IPX router.

13.3.3.2 IPX Circuits

To create the IPX circuits for the token-ring and X.25 interfaces, enter the following commands:

```
ADDIPXCCT CCTNAME(TRN2619A) LIND(TRN2619A) IPXNETNBR(00000009)
ENBNLSP(*NO)
ADDIPXCCT CCTNAME(MPR_PERM) LIND(X25LINE_A) SVCNETADR(101100205)
SVCTYPE(*PERM) IDLVCTTIMO(0) DFTPKTSIZE(1024 *TRANSMIT)
DFTWDWSIZE(7 *TRANSMIT)
```

The important parameters in an IPX circuit for token-ring are:

Circuit name (CCTNAME)
We use the line description name for the circuit name.

Line description (LIND)
The line description created above.

IPX network number (IPXNETNBR)
For the token-ring interface circuit this is the network number associated with the token-ring LAN segment.

Enable for NLSP (ENBNLSP)
For the token-ring interface circuit we only use RIP and SAP and hence have disabled NLSP.

The important parameters in an IPX circuit for X.25 are:

Circuit name (CCTNAME) Specifies the name of the IPX circuit being added.

Line description (LIND) The X.25 line description created above.

X.25 SVC network address (SVCNETADR)
This is the remote system′s X.25 network address.

X.25 SVC call type (SVCTYPE) This SVC is permanently established.

X.25 default packet size and default window size (DFTPKTSIZE and DFTWDWSIZE)
Providing the network is reliable, increasing the packet and window sizes used improves data throughput. We have specified here the maximum values supported by the X.25 network we were using. When higher values are specified here than in the X.25 line description default packet and window sizes, the AS/400

	requests the values specified here in the CALL REQUEST packet.
Enable for NLSP (ENBNLSP)	For the X.25 interface circuit we use NLSP, this is the default.

Note

Since we have configured the circuits to allow RIP and SAP to flow (via NLSP), we do not have to configure IPX circuit routes or IPX circuit services.

13.4 MPR Configuration

The Novell multiprotocol router is configured as shown in the following panels. Note that the configuration process flows down the panel: we start with the top item on the main menu (Boards) and work through to Bindings.

13.4.1 Network Adapter Configuration

The Novell MPR adapter configuration is as follows.

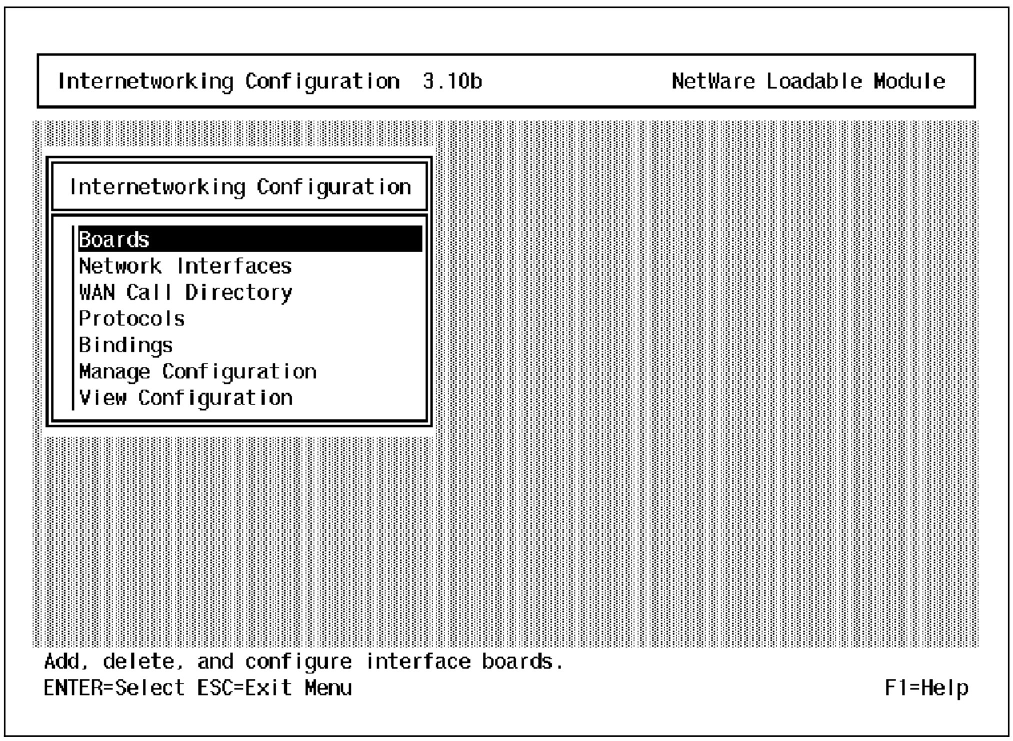

Figure 156. MPR Main Configuration Menu

Select **Boards** from the main configuration menu.

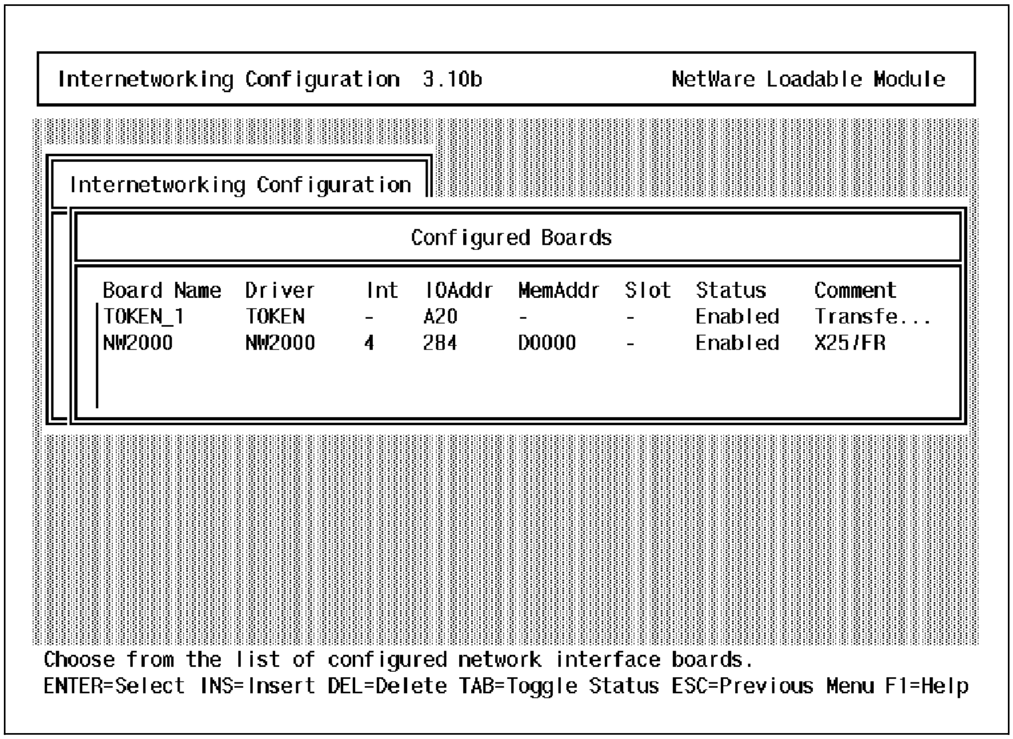

Figure 157. MPR Network Board Configuration

Figure 157 shows the installed network adapters.

13.4.2 Network Interface Configuration

The Novell MPR interface configuration is as follows.

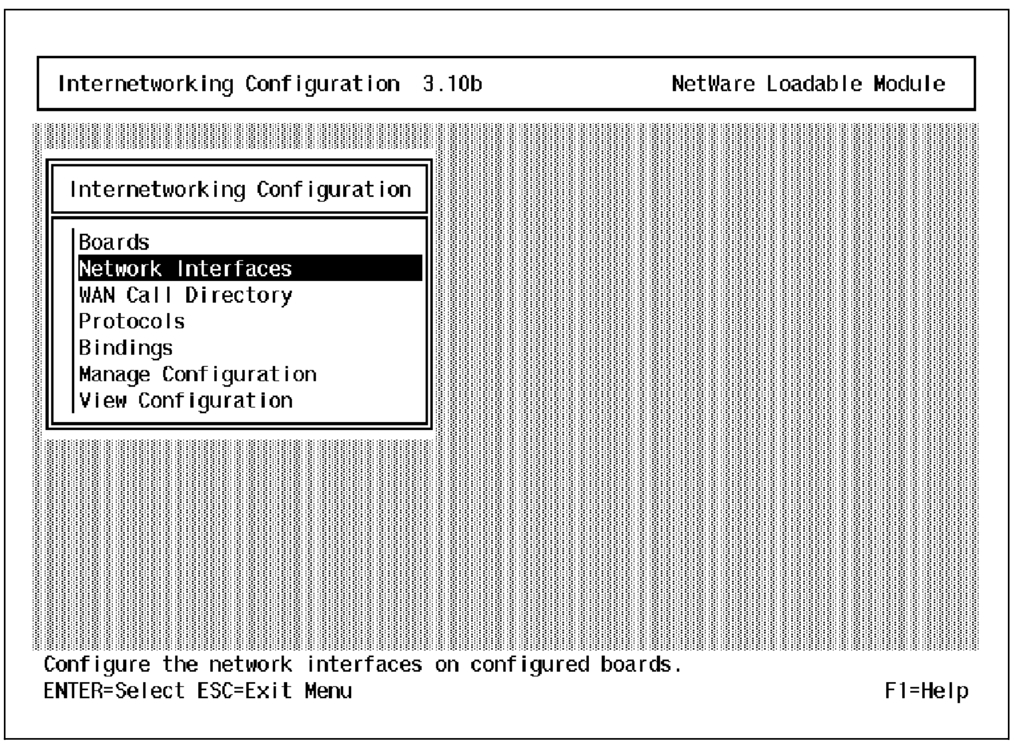

Figure 158. MPR Main Configuration Menu

Select **Network Interfaces** from the main configuration menu.

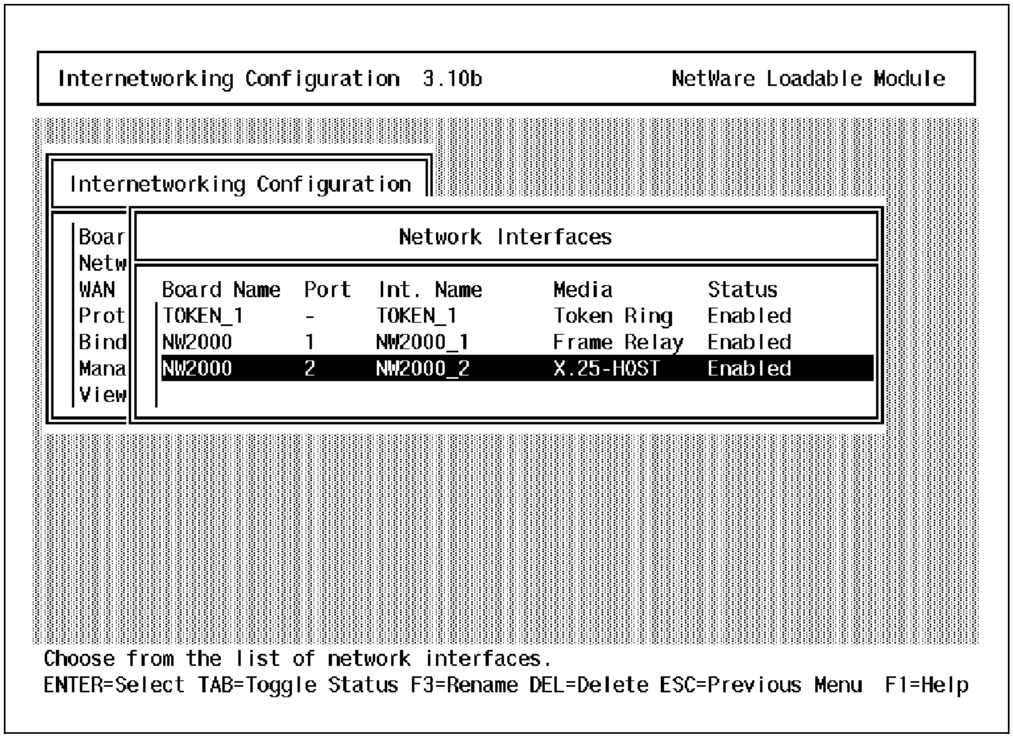

Figure 159. MPR Configured Network Interfaces

The NW2000 interface board port 2 is configured for X.25. In Figure 159 we have selected to view the parameters associated with the X.25 interface.

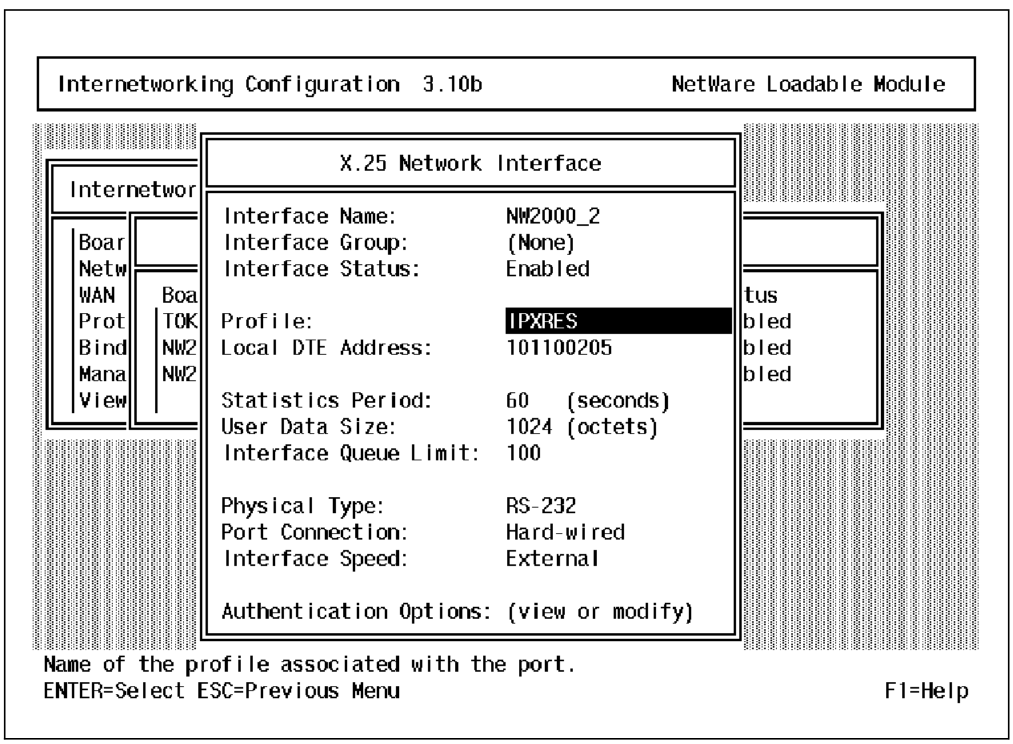

Figure 160. MPR X.25 Network Interface Configuration

Figure 160 shows the X.25 network interface parameters, for example, the local (MPR) X.25 address. We have selected to view the configuration profile (IPXRES).

```
Internetworking Configuration  3.10b            NetWare Loadable Module

                                         X.25 Profiles
 Internetwor
               Inte   Profile Name                      Profile Type
  Boar         Inte ▲ DATAPAC                           Standard
  Netw         Inte   DATEX_P                           Standard
  WAN     Boa         HONGKONG_TELEPHONE                Standard
  Prot    TOK  Prof   IBERPAC                           Standard
  Bind    NW2  Loca   INFONET                           Standard
  Mana    NW2         IPXRES                            Local
  View         Stat   ITAPAC                            Standard
               User   NIPPON_TELEPHONE_TELEGRAPH        Standard
               Inte   SINGAPORE_TELECOM                 Standard
                      TELECOM_EIREANN                   Standard
               Phys   TELEPAC                           Standard
               Port   TRANSPAC                          Standard
               Inte   USWEST                            Standard
                      US_SPRINT                         Standard
               Auth   WESPAC                            Standard
Select an entry from the list of X.25 profiles.
ENTER=Select INS=Insert DEL=Delete F2=Copy F3=Edit ESC=Exit         F1=Help
```

Figure 161. MPR X.25 Profiles

In Figure 161 we have selected to view the configuration associated with IPXRES.

```
Internetworking Configuration  3.10b            NetWare Loadable Module

                      X.25 Profile Configuration

 Profile:                             IPXRES
 Profile Type:                        Local

 Frame Level Parameters:              (view or modify)
 Packet Level Parameters:             (view or modify)
 Virtual Circuit Setup:               (view or modify)
 User Facility Setup:                 (view or modify)
 Conformance Options:                 (view or modify)

 Frame Node Type:                     DTE                   (view only)
 Packet Size (In/Out):                1024/1024             (view only)
 Frame Window Size:                   7                     (view only)
 Packet Window Size (In/Out):         7/7                   (view only)
 Number of VCs (PVC/In/Two-Way/Out):  0/0/1/0               (view only)

               Auth   WESPAC                            Standard
Select a category for this profile.
ENTER=Select ESC=Previous Menu                                       F1=Help
```

Figure 162. MPR X.25 Profile Configuration

The packet and window sizes are configured in Figure 162. The number of X.25 virtual circuits of each type (permanent, incoming, both-way and outgoing only) is also configured on this panel. We have selected to view the frame level parameters.

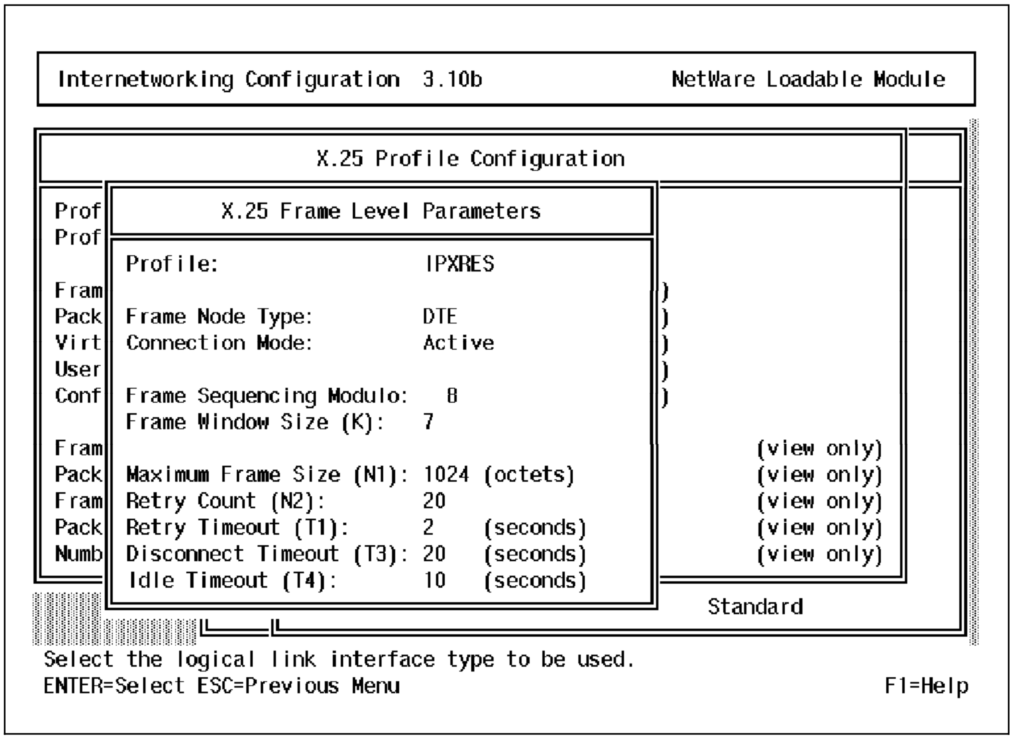

Figure 163. MPR X.25 Frame Level Parameters

Figure 163 shows the values of the X.25 frame level parameters. Next we have selected to view (via Figure 162 on page 195) the packet level parameters.

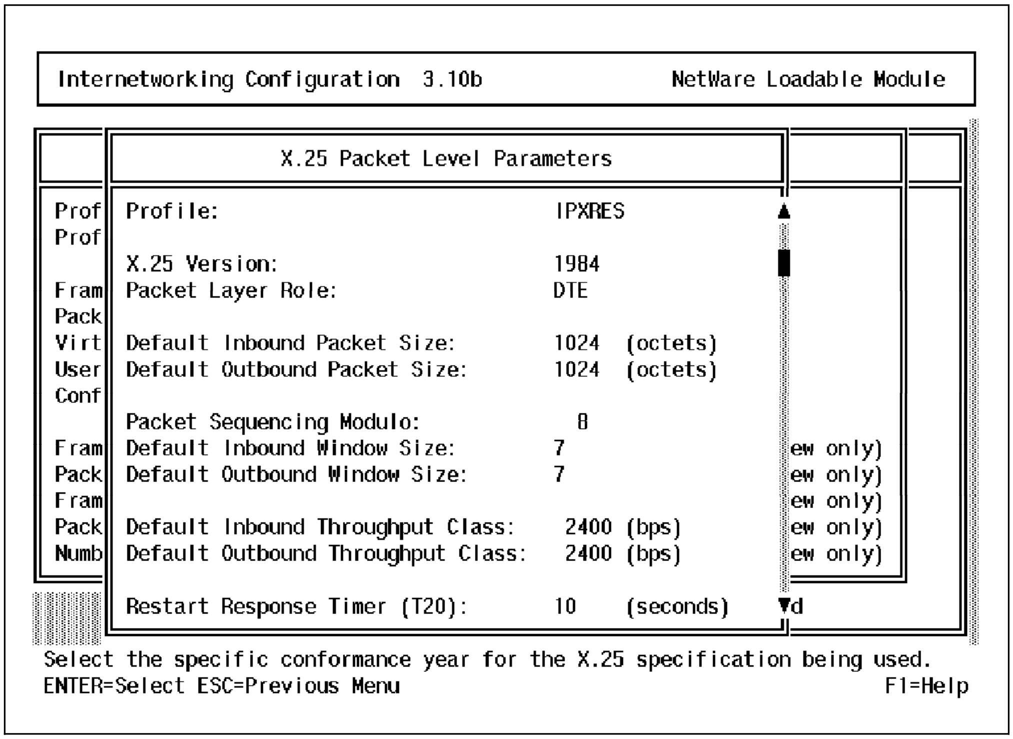

Figure 164. MPR X.25 Packet Level Parameters

Figure 164 shows the values of the X.25 packet level parameters. Next we have selected to view (via Figure 162 on page 195) the virtual circuit setup.

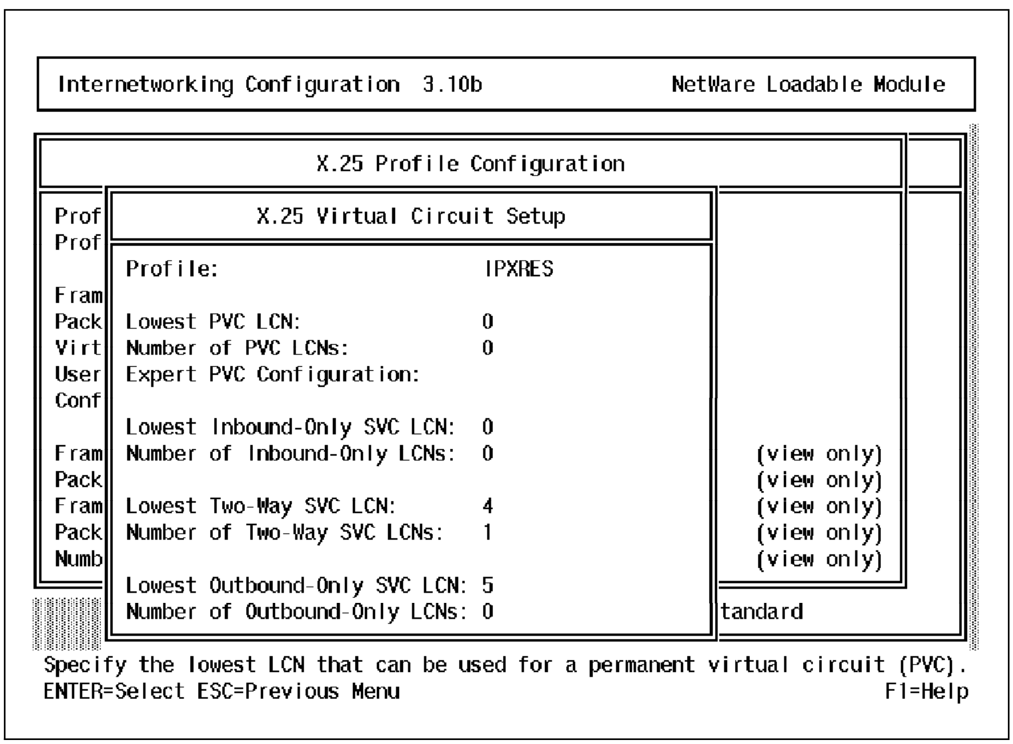

Figure 165. MPR X.25 Virtual Circuit Setup

Figure 165 shows the X.25 virtual circuits configured. We can see that a both-way SVC has been configured and that it will use logical channel 004. Next we have selected to view (via Figure 162 on page 195) the user facility setup.

```
Internetworking Configuration  3.10b            NetWare Loadable Module

                   X.25 User Facility Setup

Prof  Profile:                              IPXRES
Prof
      Allow Flow Control Negotiation:       Yes
Fram  Maximum Inbound Packet Size:          1024  (octets)
Pack  Maximum Outbound Packet Size:         1024  (octets)
Virt  Maximum Inbound Window Size:          7
User  Maximum Outbound Window Size:         7
Conf
      Allow Throughput Negotiation:         No
Fram  Maximum Inbound Throughput Class:      2400 (bps)         w only)
Pack  Maximum Outbound Throughput Class:     2400 (bps)         w only)
Fram                                                            w only)
Pack  Allow Incoming Reverse Charge Calls:  No                  w only)
Numb  Allow Closed User Group:              No                  w only)
      Allow Bilateral CUG:                  No

Select YES to allow Flow Control Negotiation.
ENTER=Select ESC=Previous Menu                                    F1=Help
```

Figure 166. MPR X.25 User Facility Setup

In Figure 166 any required X.25 user facilities are configured. Next we have selected to view (via Figure 162 on page 195) the X.25 conformance options.

```
Internetworking Configuration  3.10b            NetWare Loadable Module

                X.25 Conformance Options

Prof  Profile:                         IPXRES
Prof
      Unknown Frame Option:            No
Fram  Disconnect Answer Option:        No
Pack  Disconnect Action Option:        No
Virt  Force FRMR Option:               No
User  Force FRMR on RR:                No
Conf  T1 Action Option:                No

Fram  Call Accept Data:                No                 (view only)
Pack  D-Bit on Call Confirm:           No                 (view only)
Fram  General Diagnostic Code:         No                 (view only)
Pack  Clear Unassigned LCN:            No                 (view only)
Numb  Short Call Confirm:              No                 (view only)
      Facility Field:                  No
      Clear Long Call:                 No              tandard

Select YES to allow to send a long Clear Request packet.
ENTER=Select ESC=Previous Menu                                    F1=Help
```

Figure 167. MPR X.25 Conformance Options

In Figure 167 we can see the MPR X.25 conformance values.

13.4.3 WAN Call Directory Configuration

The Novell MPR call directory configuration is as follows.

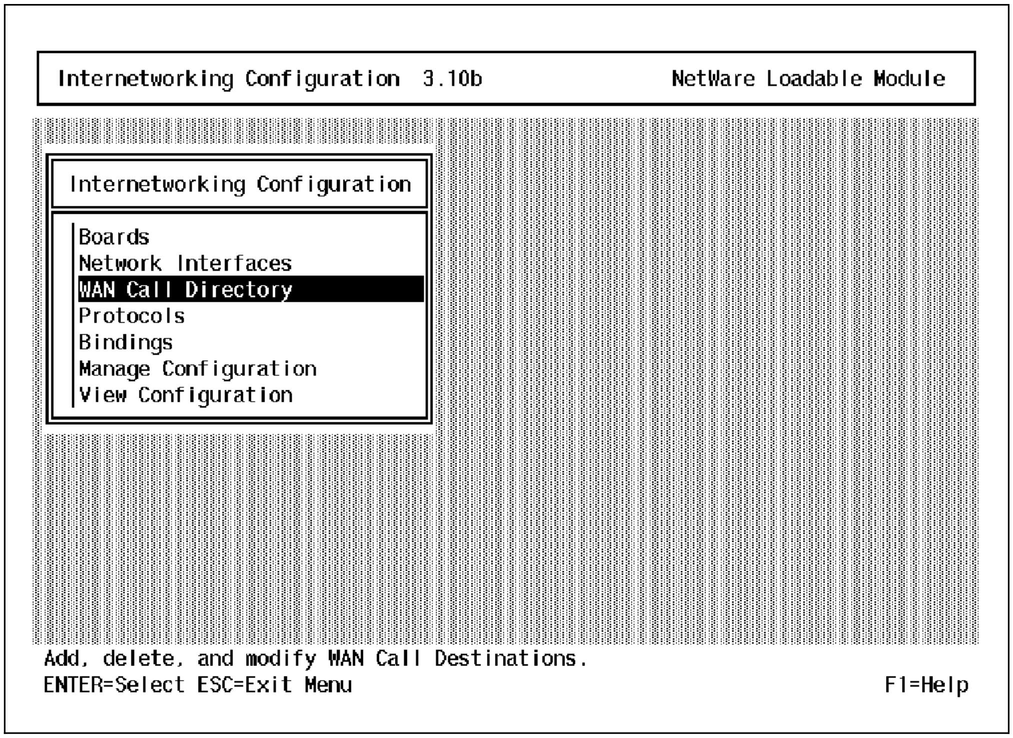

Figure 168. MPR Main Configuration Menu

Select **WAN Call Directory** from the main configuration menu.

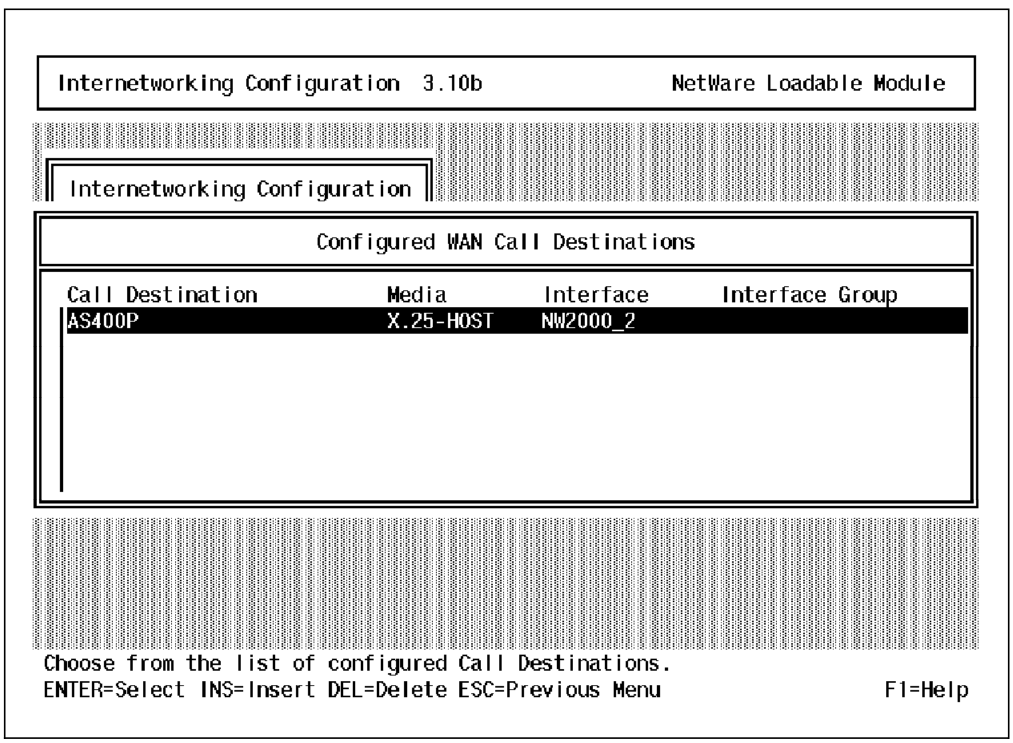

Figure 169. MPR WAN Call Destinations

A call destination of AS400P has been configured for the X.25 SVC permanent connection to the AS/400. In Figure 169 we have selected to view the configuration associated with this call destination.

```
Internetworking Configuration  3.10b          NetWare Loadable Module

                 X.25 Call Destination Configuration

Call Destination Name:      AS400P

Call Type:                     Permanent (active continuously)
Interface Group:
Interface Name:                NW2000_2
Circuit Type:                  Switched Virtual Circuit
PVC Number:
Destination DTE Address:       101100201

Retry Mode:                    Retry Self-Correcting Failures
Retry Limit Handling:          Continuous At Limit
Retry Interval Limit:          00:10:00 (HH:MM:SS)
Idle Line Timeout:

Remote System ID:             (None)
Expert Call Configuration:     (view or modify)

Specify the call type, Permanent or On Demand.
ENTER=Select ESC=Previous Menu                              F1=Help
```

Figure 170. MPR X.25 Call Destination Configuration

In Figure 170 the SVC connection is configured as a permanent connection (always established). The AS/400's X.25 address is also configured in this panel. We have selected to view the expert call configuration.

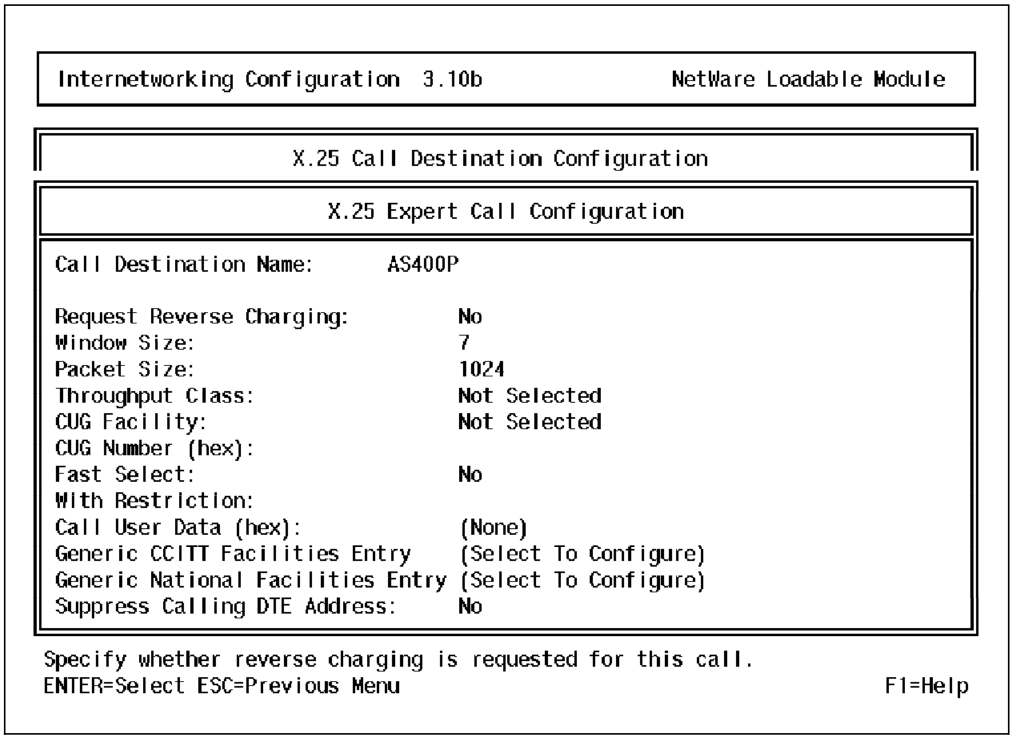

Figure 171. MPR X.25 Expert Call Configuration

In Figure 171 we can configure any special requirements for the connection to the AS/400 - reverse charge, etc.

13.4.4 Protocol Configuration

The Novell MPR protocol configuration is as follows.

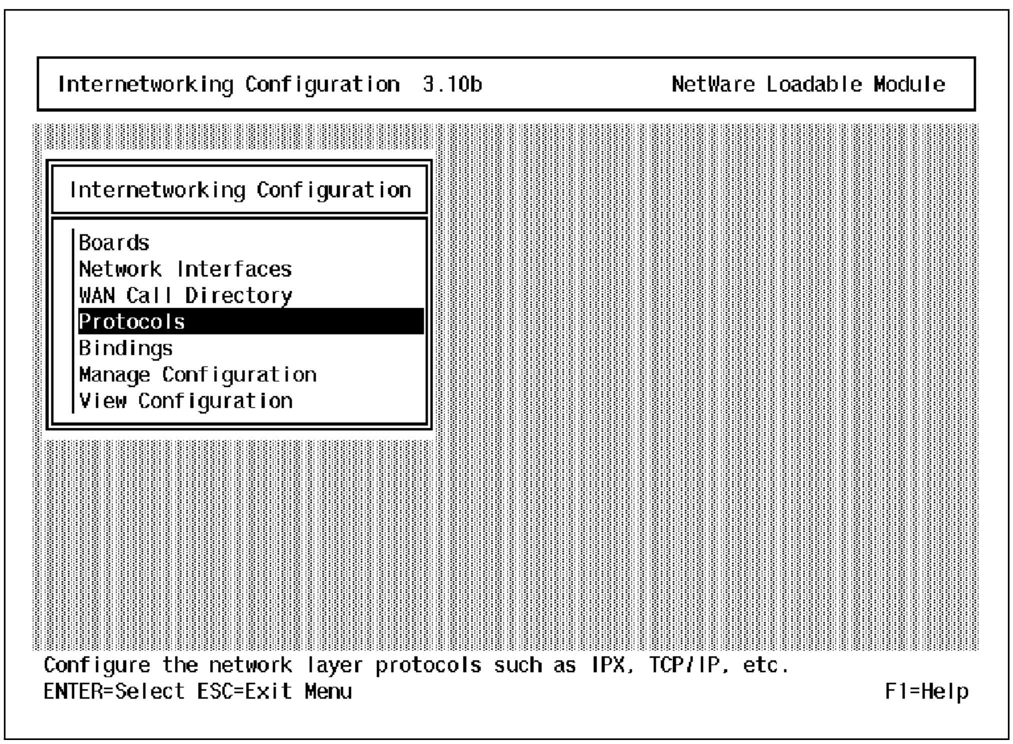

Figure 172. MPR Main Configuration Menu

Select **Protocols** from the main configuration menu.

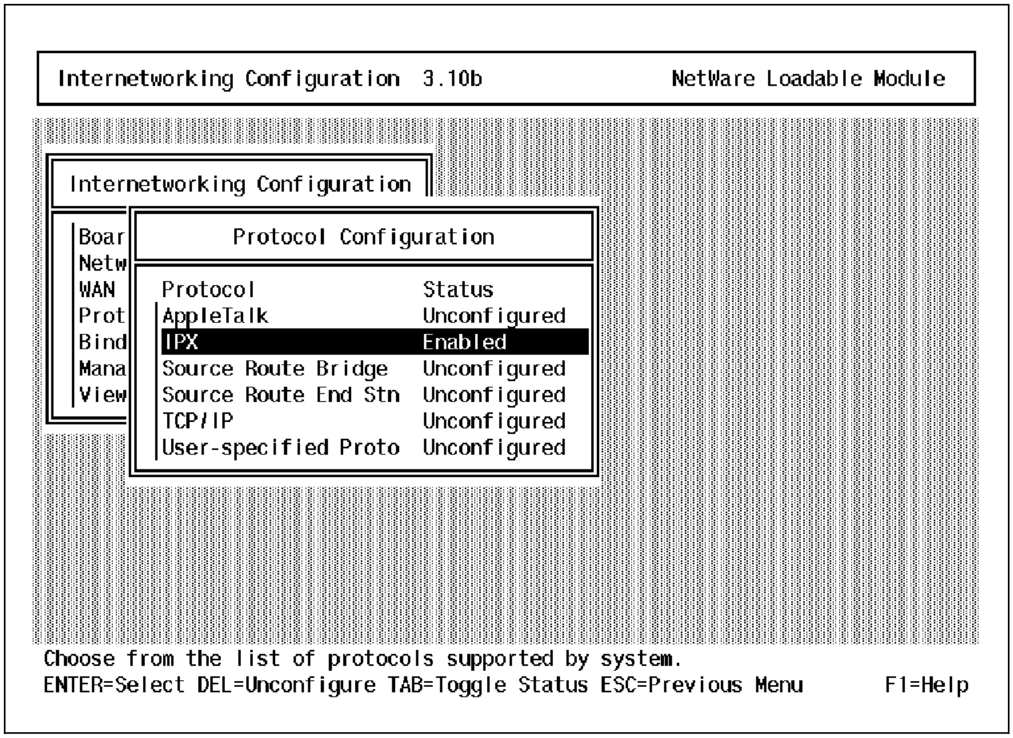

Figure 173. MPR Protocol Configuration

In Figure 173 we can see that IPX has been enabled. We have selected to view the IPX protocol configuration parameters.

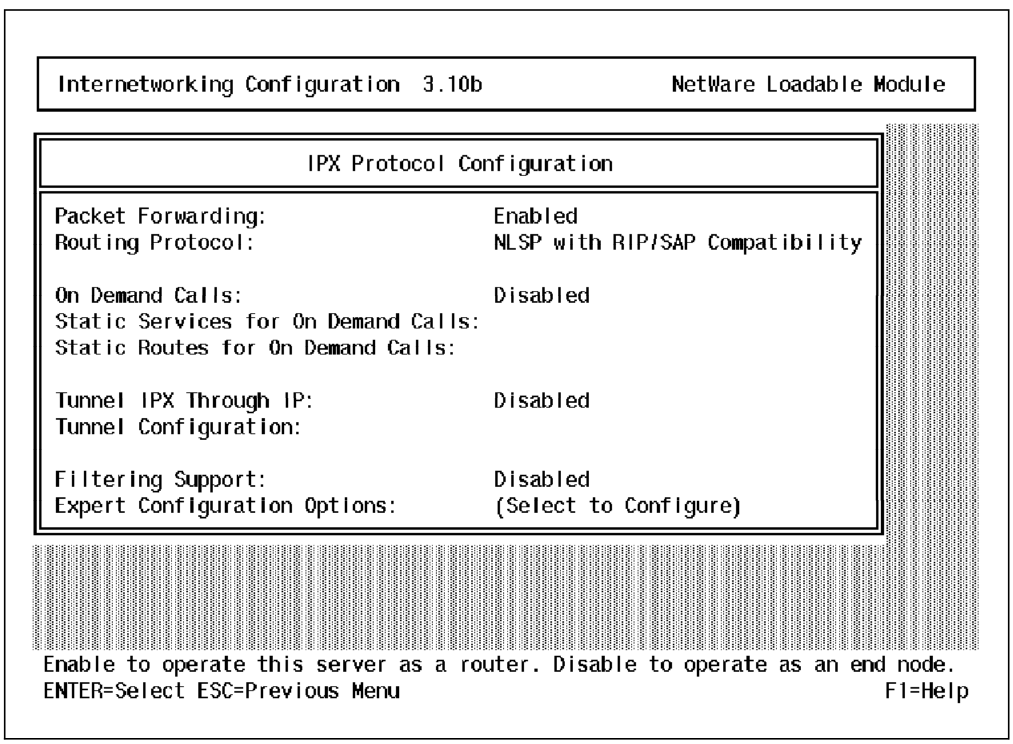

Figure 174. MPR IPX Protocol Configuration

In Figure 174 we can see that the MPR packet forwarding capability and NLSP have been enabled.

13.4.5 Bindings Configuration

The Novell MPR bindings configuration is as follows.

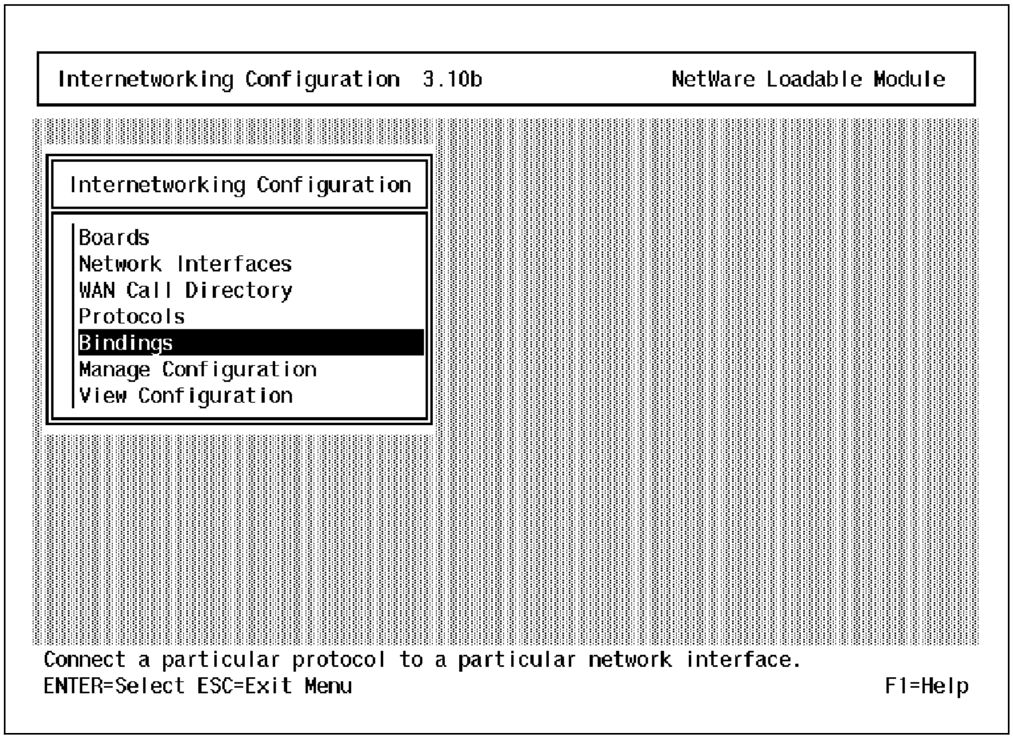

Figure 175. MPR Main Configuration Menu

Select **Bindings** from the main configuration menu.

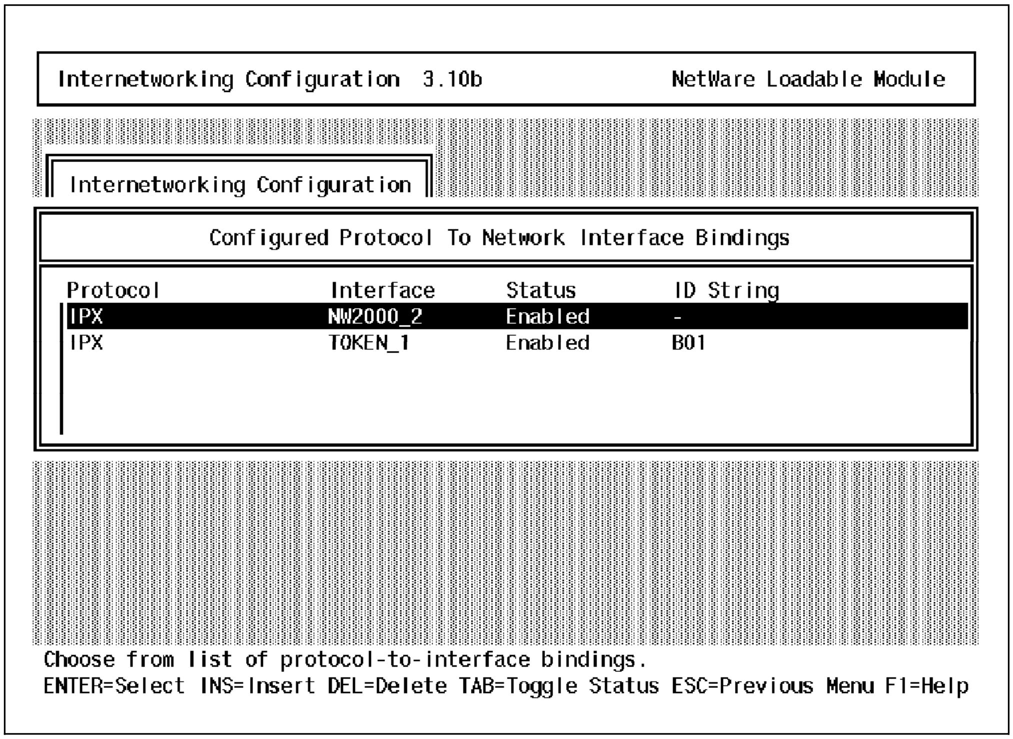

Figure 176. MPR Protocol to Interface Binding

In Figure 176 we can see that IPX has been bound to the WAN interface (NW2000_2) to be used to the AS/400. We have selected to view the configuration parameters associated with this binding.

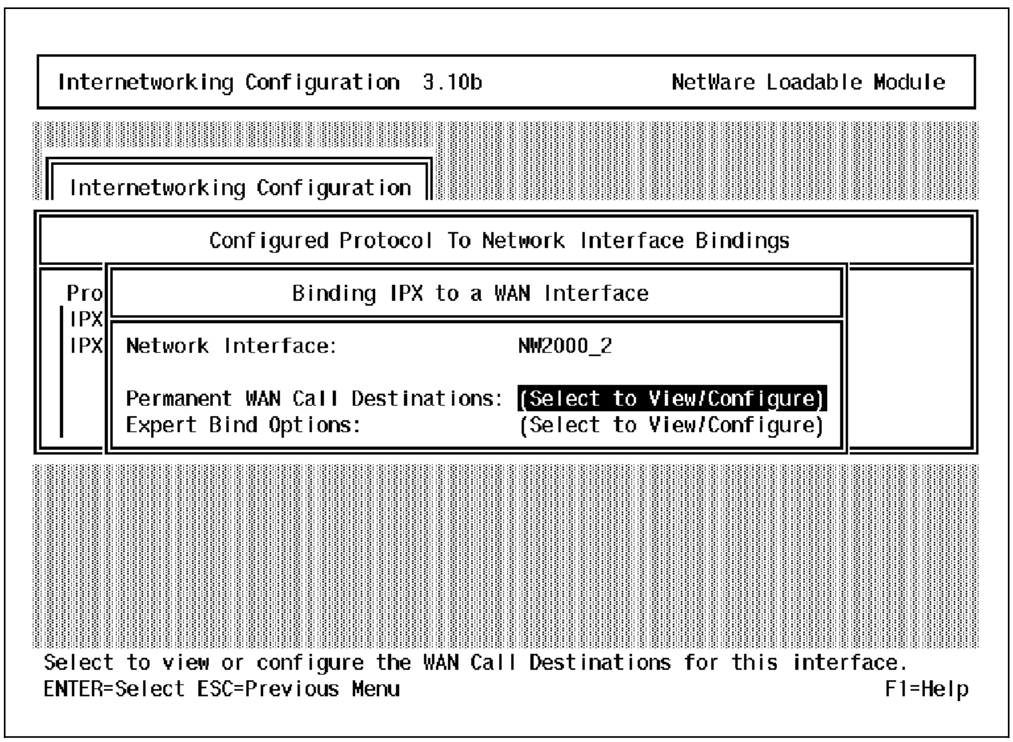

Figure 177. MPR Binding IPX to a WAN Interface

In Figure 177 we have selected to view the permanent call destinations associated with the WAN interface.

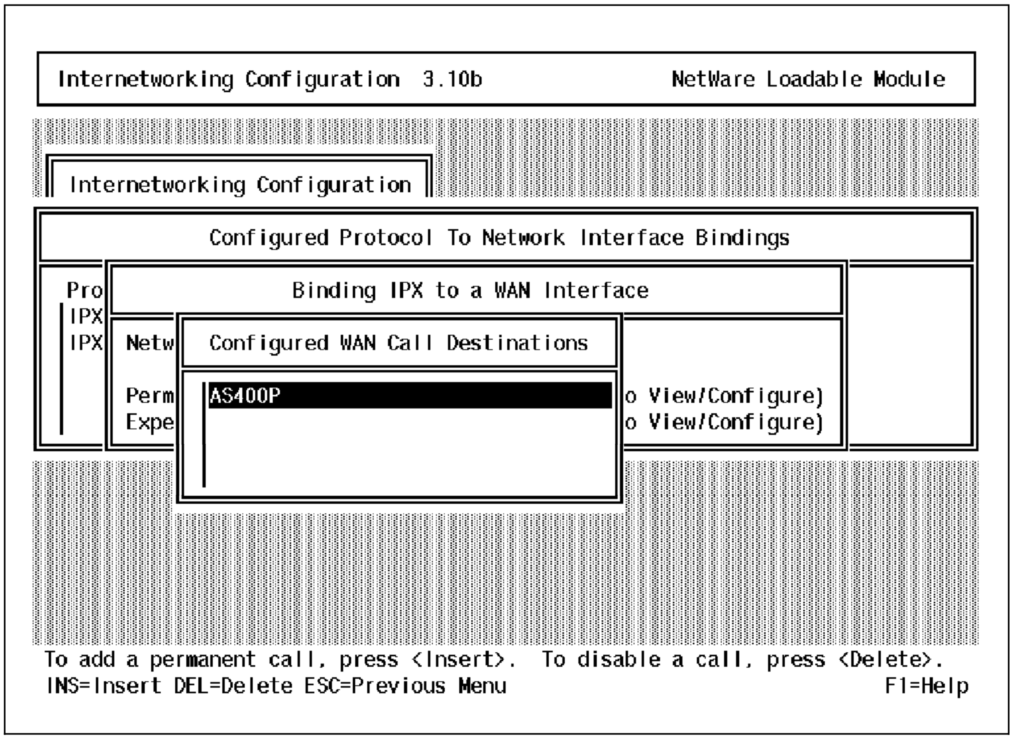

Figure 178. MPR Configured WAN Call Destinations

AS400P is the call destination name for the AS/400 connection. In Figure 178 we have selected to view the configuration parameters associated with this call destination.

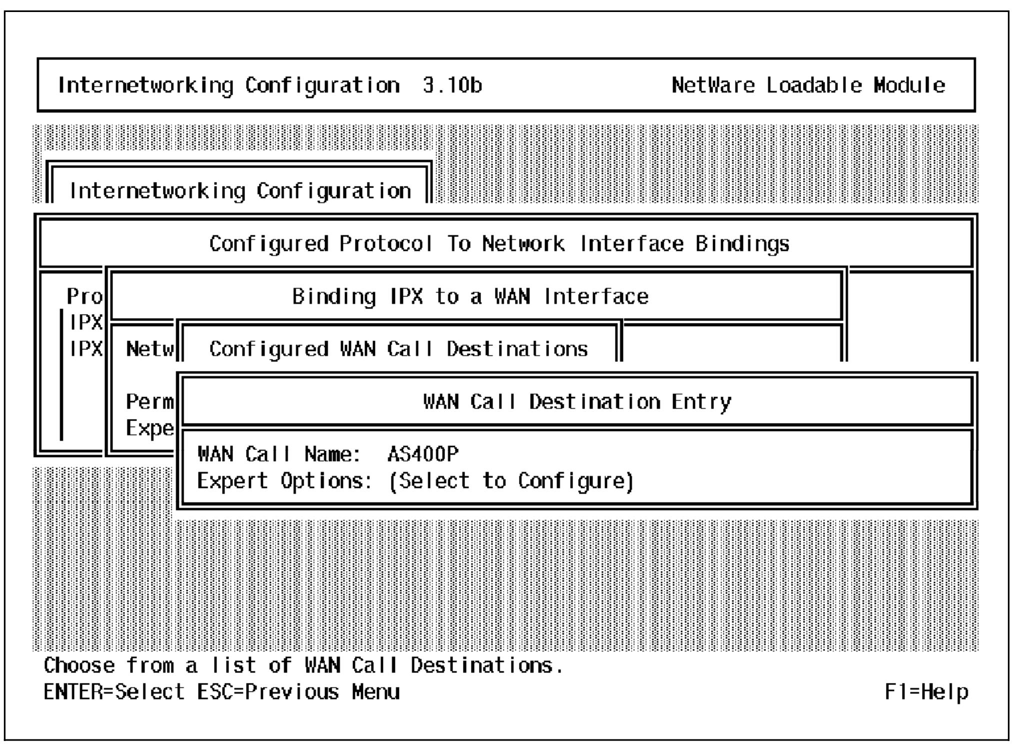

Figure 179. MPR WAN Call Destination Entry

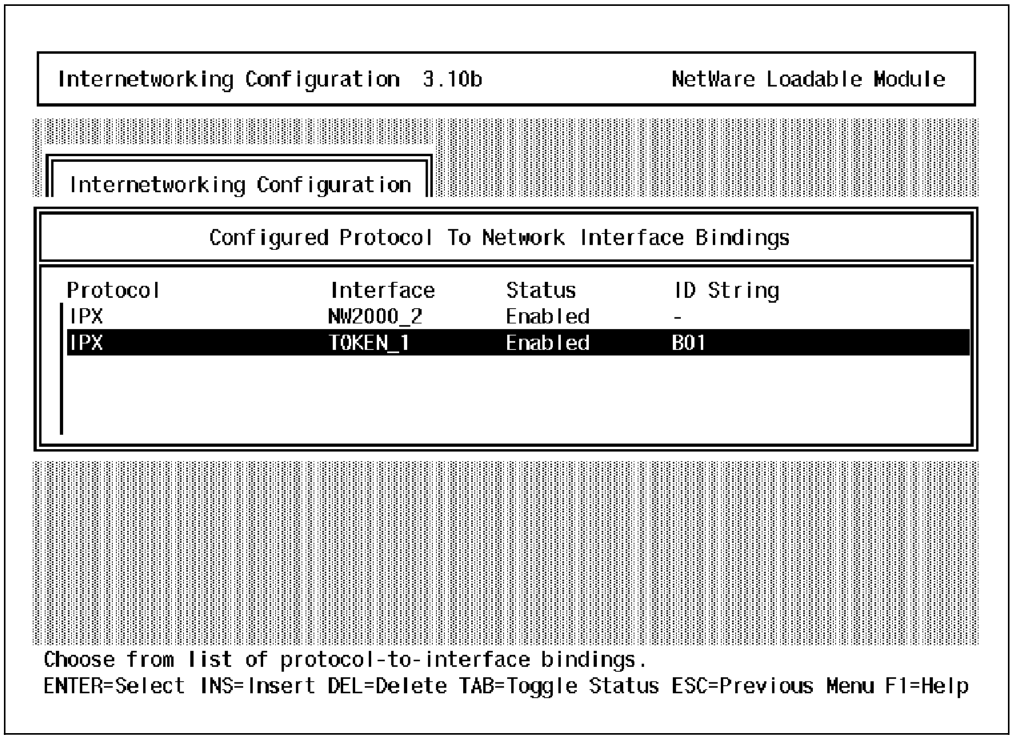

Figure 180. MPR Protocol to Interface Binding

In Figure 180 we can see that IPX has been bound to the LAN interface. We have selected to view the configuration parameters associated with this binding.

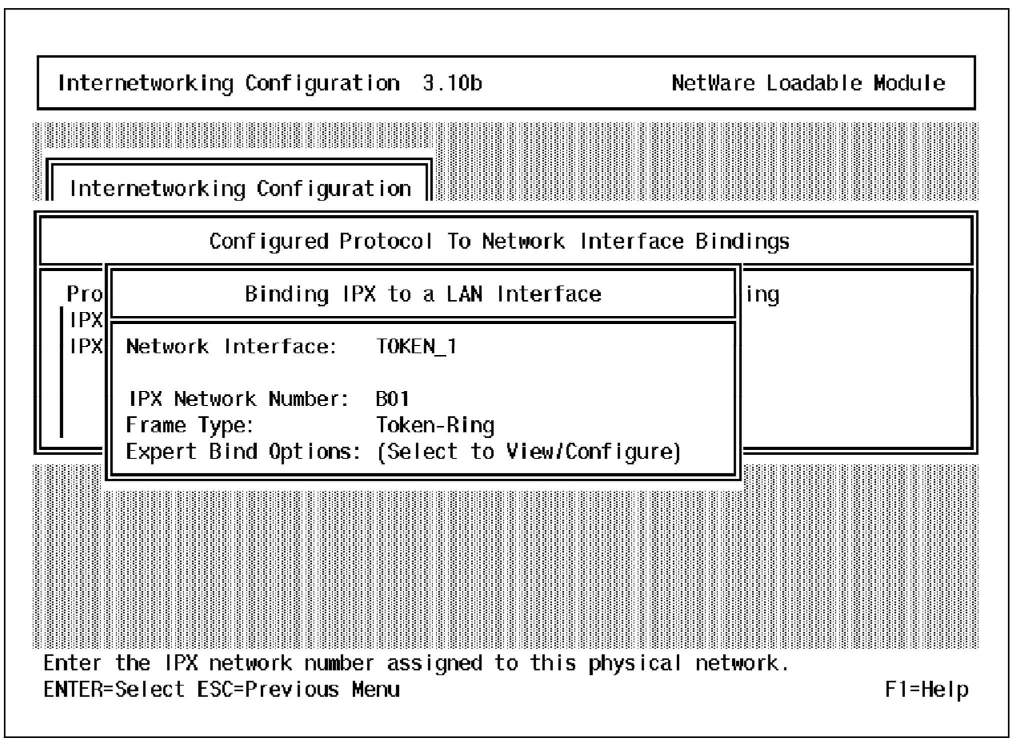

Figure 181. Binding IPX to a LAN Interface

In Figure 181 we can see details of the IPX LAN binding, for example the network number associated with this interface.

Note: The MPR settings for NLSP, RIP and SAP have been left at the defaults: NLSP=on, SAP=auto, RIP=auto.

13.5 Starting and Verifying the IPX Router Support

Before we can start the IPX support on the AS/400, we have to vary on the line descriptions being used by the IPX circuits. We can do this by entering the following commands:

```
VRYCFG CFGOBJ(TRN2619A) CFGTYPE(*LIN) STATUS(*ON)
VRYCFG CFGOBJ(X25LINE_A) CFGTYPE(*LIN) STATUS(*ON)
```

13.5.1 Starting IPX

To start IPX using the IPX descriptions we created above, enter the following commands:

```
STRIPX RALYAS4A
```

Starting the AS/400 IPX Support creates a *NET controller and an *NET device description.

13.5.2 Verifying the IPX Configuration

To verify that the line descriptions have become active and that the *NET controller and device descriptions have been created and are also active, use the command WRKCFGSTS. For example, if we enter the command WRKCFGSTS *LIN X25LINE_A on RALYAS4A, we see the panel shown in Figure 182.

```
                         Work with Configuration Status                RALYAS4A
                                                            03/21/97  12:49:49
Position to  . . . . .               Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description      Status                -------------Job--------------
     X25LINE_A        ACTIVE
       X25LINET       ACTIVE
         X25LIIPX     ACTIVE                QIPX        QSYS        008227







                                                                        Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 182. WRKCFGSTS X25 Line RALYAS4A

From Figure 182 we can see that the IPX network controller (*NET) has become active with the QIPX job.

Tip

STRIPX starts all IPX Circuits that have AUTOSTART set to *YES.

To verify that the IPX circuits have become active, use the WRKIPXSTS command. For example, if we enter the command WRKIPXSTS OPTION(*CCT) on RALYAS4A, we see the panel shown in Figure 183.

```
                          Work with IPX Circuit Status
                                                            System:   RALYAS4A
Type options, press Enter.
  5=Display details   7=Display associated services
  8=Display associated routes   9=Start   10=End
  12=Work with configuration status

       Circuit                Line        Line          Circuit
Opt    Name                Description    Type          Status
       MPR_PERM            X25LINE_A      *X25          Active
       TRN2619A            TRN2619A       *TRLAN        Active











                                                                        Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 183. Work with IPX Circuit Status

In Figure 183 we see that the LAN and WAN circuits have become active. Both circuits were started automatically because we accepted the default of *YES for Automatic start in the IPX circuits.

To verify that the IPX routes have been propagated between the routers, we can use the command WRKIPXSTS. For example, if we enter the command WRKIPXSTS OPTION(*RTE) on RALYAS4A, we see the panel shown in Figure 184 on page 209.

```
                        Display IPX Route Information
                                                                System:   RALYAS4A
Type options, press Enter.
  5=Display details

        Remote        Number      Number      Next Hop         Route
Opt     Network      of Hops     of Ticks     Node Address     Source
        00000009        0            1        *NONE            *CCT
        00000B01        1           55        *NONE            *RIP
        30AA0F92        1            2        400052005240     *RIP
        31AC7F25        1           55        *NONE            *RIP
        31ECF1DD        1            2        08005A0D2860     *RIP
        53914BBA        1            2        08005A0D294A     *RIP
        96AD0D47        0            1        000000000001     *LOCAL









                                                                          Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 184. Display IPX Route Information

To verify that the IPX services information has been propagated between the routers, we can use the command WRKIPXSTS. For example, if we enter the command WRKIPXSTS OPTION(*SRV) on RALYAS4A, we see the panel shown in Figure 185.

```
                       Display IPX Service Information
                                                                System:   RALYAS4A
Type options, press Enter.
  5=Display details

       Service                Service        Remote      Hops to    Service
Opt    name                   Type           Network     Service    Source
       FERGUS_NW41            *FILESVR       31ECF1DD       1       *SAP
       MANSERV1               *FILESVR       30AA0F92       1       *SAP
       MPR                    *FILESVR       31AC7F25       1       *SAP
       NW41SERV               *FILESVR       53914BBA       1       *SAP
       BSER4.00-6.10_30A>     004B           30AA0F92       1       *SAP
       BSER4.00-6.10_539>     004B           53914BBA       1       *SAP
       ISMANSERV11841501>     0102           30AA0F92       1       *SAP
       ISNW41SERV0787289>     0102           53914BBA       1       *SAP
       IVMANSERV11841501>     0102           30AA0F92       1       *SAP
       IVNW41SERV0787289>     0102           53914BBA       1       *SAP
       LANPROTECT1841501>     0102           30AA0F92       1       *SAP
       LDPNVIRUS_PROTECT>     0102           53914BBA       1       *SAP
       FERGUS_NW41            0107           31ECF1DD       1       *SAP
       MANSERV1               0107           30AA0F92       1       *SAP
                                                                         More...
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 185. Display IPX Service Information Screen

We can now verify the connection with the IPXPING command. IPXPING is very similar to TCP/IP PING. Here we ping the MPR's internal IPX network address from RALYAS4A.

```
                       Verify IPX Connection (IPXPING)

 Type choices, press Enter.

 Remote IPX network number  . . . > 31AC7F25      00000001-FFFFFFFD
 Remote IPX node address  . . . . > 1             000000000001-FFFFFFFFFFFE...

                            Additional Parameters

 Message mode . . . . . . . . . .   *VERBOSE      *VERBOSE, *QUIET
 Packet length (in bytes) . . . .   256           8-65495
 Number of packets  . . . . . . .   5             1-999
 Wait time (in seconds) . . . . . > 5             1-120





                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 186. Verify IPX Connection

```
                             Display All Messages
                                                       System:   RALYAS4A
Job . . :   WTRO511SO1    User . . :   MICK         Number . . . :   008232

3 > IPXPING RMTNETNBR(31AC7F25) RMTNDEADR(1) WAITTIME(5)
    Verifying connection to remote system at network number 31AC7F25, node
      address 000000000001.
    Connection verification 1 took .306 seconds.  1 successful connection
      verifications.
    Connection verification 2 took .281 seconds.  2 successful connection
      verifications.
    Connection verification 3 took .279 seconds.  3 successful connection
      verifications.
    Connection verification 4 took .279 seconds.  4 successful connection
      verifications.
    Connection verification 5 took .279 seconds.  5 successful connection
      verifications.
    Round-trip (in milliseconds) min/avg/max = 279/284/306
    Connection verification statistics: 5 of 5 successful (100 %).
                                                                     More...
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F17=Top   F18=Bottom
```

Figure 187. Verify IPX Connection Joblog

As a final verification step we verified a successful login to a NetWare server from a NetWare client.

13.5.3 Ending IPX

We can end an individual IPX circuit either from the Work with IPX Circuit Status menu or by using the command ENDIPXCCT.

We can end the AS/400 IPX router by using the ENDIPX command.

Attention

No confirmation display is shown when the ENDIPX command is entered. The ENDIPX command *immediately* ends all IPX processing on the AS/400.

Chapter 14. Scenario 7. IPX Routing to a Novell Multiprotocol Router via an On-Demand X.25 SVC Connection

In this scenario we use an AS/400 (RALYAS4A) as an IPX router to a Novell Multiprotocol Router (MPR) over an X.25 switched (SVC) connection. We use dial-on-demand such that the switched connection is only established when we have data to send. We configure the Novell MPR and AS/400 for a static connection: neither NLSP or RIP are used over the WAN. Because we are using on-demand we have to define static RIP and SAP tables entries. X.25 provides a relatively low-speed (up to 64 Kbps) connection.

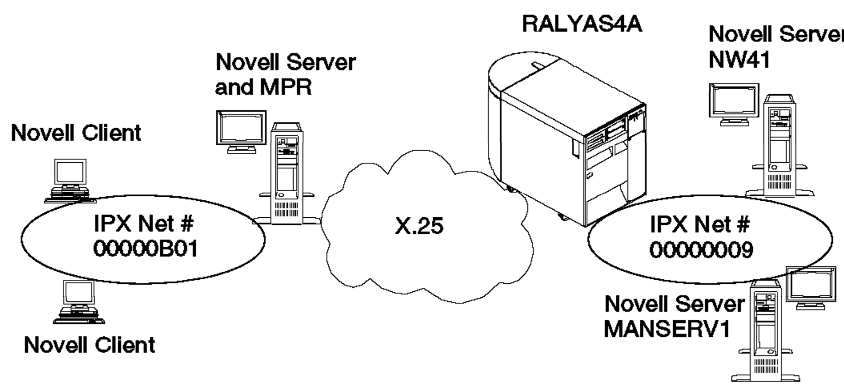

Figure 188. Environment for Scenario 7

14.1 Novell MPR Hardware and Software Installed

The following hardware and software was installed on the Novell MPR PC.

- Hardware
  - Novell NW2000 wide area network adapter (manufactured by Eagle) and cable.
- Software
  - NetWare Multiprotocol Router 3.0
  - NetWare WAN Extensions 3.0

14.2 What Information Do We Need before We Start?

Table 20. RALYAS4A - Information Needed.

	Whom/Where	Token-Ring	WAN/X.25	RALYAS4A
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000009	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	4 Mb	N/A	N/A
SVC Logical Channel	X.25 Provider	N/A	004	N/A
WAN Speed	X.25 Provider	N/A	9600	N/A
X.25 Network Address	X.25 Provider	N/A	101100201	N/A
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN191	LIN072	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_1
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	96AD0D47

Table 21. Novell MPR - Information Needed.

	Whom/Where	Token-Ring	WAN/X.25	MPR
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000B01	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	4 Mb	N/A	N/A
SVC Logical Channel	X.25 Provider	N/A	004	N/A
WAN Speed	X.25 Provider	N/A	9600	N/A
X.25 Network Address	X.25 Provider	N/A	101100205	N/A

14.3 RALYAS4A Configuration

For this scenario we have to create the following configuration objects on RALYAS4A:

- Token-ring line description
- X.25 line description
- IPX description
- IPX circuit for token-ring interface
- IPX circuit for X.25 interface
- IPX circuit routes
- IPX circuit service

14.3.1 Token-ring Line Description

To create the token-ring line description, enter the following command:

```
CRTLINTRN LIND(TRN2619A)
          RSRCNAME(LIN191)
          LINESPEED(4M)
          TEXT('4M Token-Ring')
```

Tip

An existing token-ring line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x′E0′ has not be defined in the line description.

The important parameters in a token-ring line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the token-ring adapter you want to use.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x′E0′ to be used by IPX is not specified here. See frame type in the IPX circuit.

14.3.2 X.25 Line Description

To create the X.25 line description, enter the following command:

```
CRTLINX25 LIND(X25LINE_A)
             RSRCNAME(LIN072)
             LGLCHLE((004 *SVCBOTH))
             NETADR(101100201)
             MAXFRAME(4096)
             MAXPKTSIZE(4096)
             CNNINIT(*LOCAL)
             TEXT('X.25 line via X.25 NET')
```

The important parameters in an X.25 line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the communications adapter you want to use.

X.25 logical channels (LGLCHLE)
Specify here the X.25 logical channels as per your X.25 network provider subscription.

X.25 network address (NETADR)
Specify here the X.25 network address as per your X.25 network provider subscription.

Connection initiation (CNNINIT)
This parameter determines who initiates the X.25 connection. This parameter is network-dependant. This parameter does not determine who initiates the X.25 call.

Maximum frame size (MAXFRAME)
This parameter sets the maximum frame size supported by the X.25 connection.

Maximum packet size (MAXPKTSIZE)
This parameter sets the maximum packet size supported by the X.25 connection. Setting this value at 4096 allows us to use a packet size of up to 4096. The packet size requested is set in the X.25 IPX circuit.

Default packet size (DFTPKTSIZE) and default window size (DFTWDWSIZE)
These parameters are also network-dependant. The default packet and window sizes should match the network defaults. The AS/400 defaults are a packet size of 128 with a window size of 2. These values are frequently also the network defaults as was the case with the network we were using.

14.3.3 IPX Configuration

In this configuration example we create the IPX configuration via CL commands.

14.3.3.1 IPX Description

To create the IPX description, enter the following command:

```
CRTIPXD IPXD(RALYAS4A)
          IPXNETNBR(96AD0D47)
          IPXRTGPCL(*RIP)
          IPXRTRNAME(ROUTER_1)
          Text('IPX Description for RALYAS4A')
```

The important parameters in an IPX description are:

IPX description (IPXD)
We use the system name for the IPX description name.

IPX internal network number (IPXNETNBR)
The IPX network number used for the AS/400's internal network number must be unique to all other network numbers (internal and external) in this IPX network.

IPX routing protocol (IPXRTGPCL)
In this configuration we use RIP over the LAN connections. We disable RIP, SAP and NLSP for the WAN connection.

IPX router name (IPXRTRNAME)
We have chosen to use the name Router_1 for this IPX router.

14.3.3.2 IPX Circuits

To create the IPX circuits for the token-ring and X.25 interfaces, enter the following commands:

```
ADDIPXCCT CCTNAME(TRN2619A) LIND(TRN2619A) IPXNETNBR(00000009)
ENBNLSP(*NO)
ADDIPXCCT CCTNAME(MPR_ON_DEMAND) LIND(X25LINE_A)
SVCNETADR(101100205) SVCTYPE(*DEMAND) DFTPKTSIZE(1024 *TRANSMIT)
DFTWDWSIZE(7 *TRANSMIT) ENBNLSP(*NO) RIPSTATE(*OFF) SAPSTATE(*OFF)
```

The important parameters in an IPX circuit for token-ring are:

Circuit name (CCTNAME)
We use the line description name for the circuit name.

Line description (LIND)
The line description created above.

IPX network number (IPXNETNBR)
For the token-ring interface circuit this is the network number associated with the token-ring LAN segment.

Enable for NLSP (ENBNLSP)
For the token-ring interface circuit we only use RIP and SAP and hence have disabled NLSP.

The important parameters in an IPX circuit for X.25 are:

Circuit name (CCTNAME) Specifies the name of the IPX circuit being added.

Line description (LIND) The X.25 line description created above.

X.25 SVC network address (SVCNETADR)
This is the remote system's X.25 network address.

X.25 SVC call type (SVCTYPE) This SVC is established only when there is data to send.

X.25 default packet size and default window size (DFTPKTSIZE and DFTWDWSIZE)
Providing the network is reliable, increasing the packet and window sizes used improves data throughput. We have specified here the maximum values supported by the X.25 network we were using. When higher values are specified here than in the X.25 line description default packet and window sizes, the AS/400 requests the values specified here in the CALL REQUEST packet.

Enable NLSP (ENBNLSP), RIP State (RIPSTATE) and SAP State (SAPSTATE)
For this on-demand connection we have turned NLSP, RIP and SAP off. Static routes and services have been defined to allow for this.

14.3.3.3 IPX Circuit Routes

With the X.25 IPX circuit set to *DEMAND the switched connection is not be established for RIP or SAP. The AS/400 does not, therefore, automatically learn about the networks available via the remote router. Therefore we must configure static RIP table entries (circuit routes).

To create the IPX circuit routes, enter the following commands:

```
ADDCCTRTE CCTNAME(MPR_ON_DEMAND) RMTNETNBR(00000B01) NBRHOP(2)
NBRTICK(30)
ADDCCTRTE CCTNAME(MPR_ON_DEMAND) RMTNETNBR(31AC7F25) NBRHOP(2)
NBRTICK(30)
```

The first circuit route entry (to 00000B01) is to allow the server to find a route back to the client. The second entry (to 31AC7F25) is to the internal network number of the MPR router; this route entry allows us to test the connection via IPXPING.

14.3.3.4 IPX Circuit Services

With the X.25 IPX circuit set to *DEMAND the switched connection is not established for RIP or SAP. The AS/400 does not, therefore, automatically learn about the services available via the remote router. Therefore we must configure a static SAP table entry (circuit service).

To create the IPX circuit service, enter the following commands:

```
ADDCCTSRV CCTNAME(MPR_ON_DEMAND)
              SRVNAME('MPR')
              SRVTYPE(*FILESVR)
              RMTNETNBR(31AC7F25)
              RMTNDEADR(1)
              RMTSCKADR(0451)
```

The above circuit service entry allows clients attached to the AS/400 LAN to access the MPR file server.

14.4 MPR Configuration

The Novell multiprotocol router is configured as shown in the following panels. Note that the configuration process flows down the panel: we start with the top item on the main menu (Boards) and work through to Bindings.

14.4.1 Network Adapter Configuration

The Novell MPR adapter configuration is as follows.

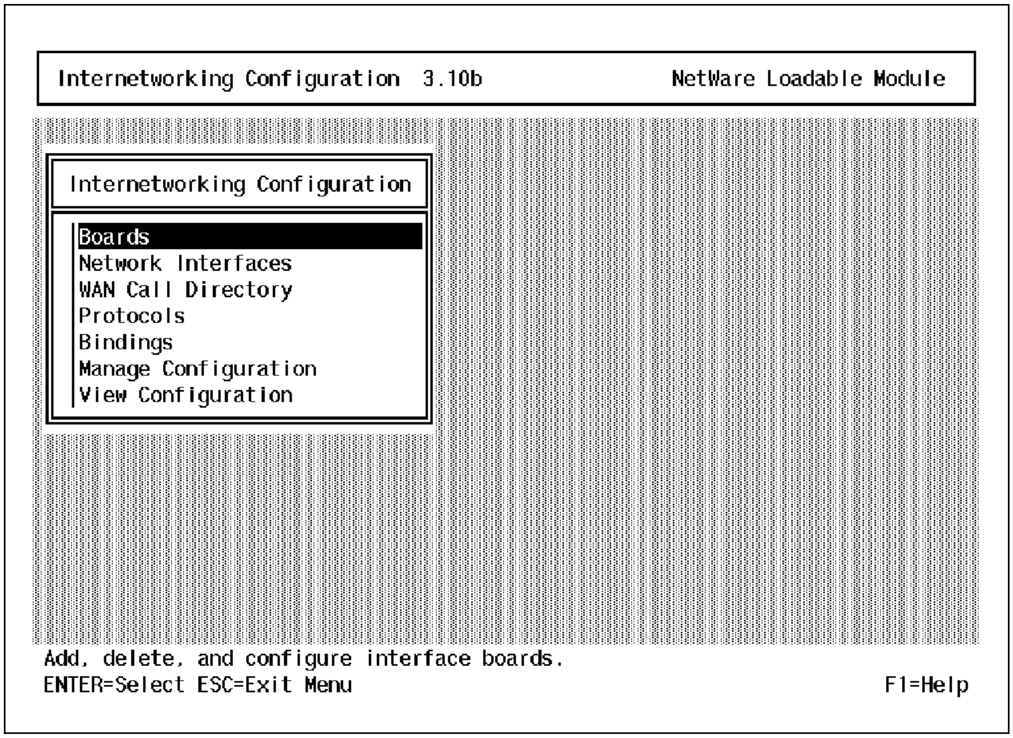

Figure 189. MPR Main Configuration Menu

Select **Boards** from the main configuration menu.

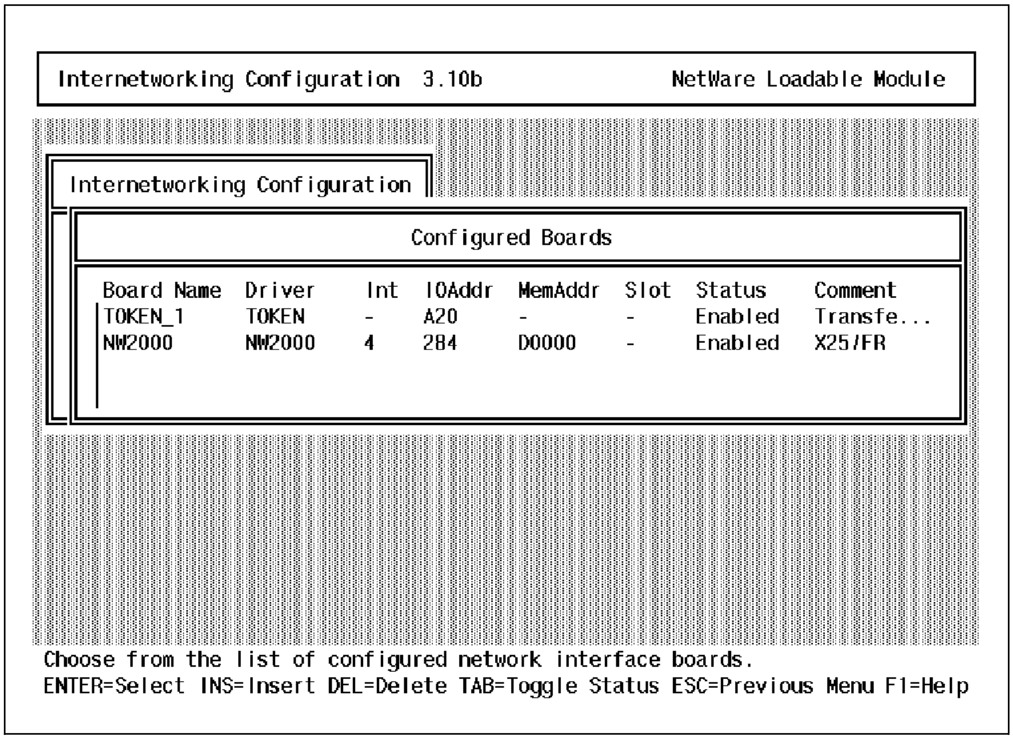

Figure 190. MPR Network Board Configuration

Figure 190 shows the installed network adapters.

14.4.2 Network Interface Configuration

The Novell MPR interface configuration is as follows.

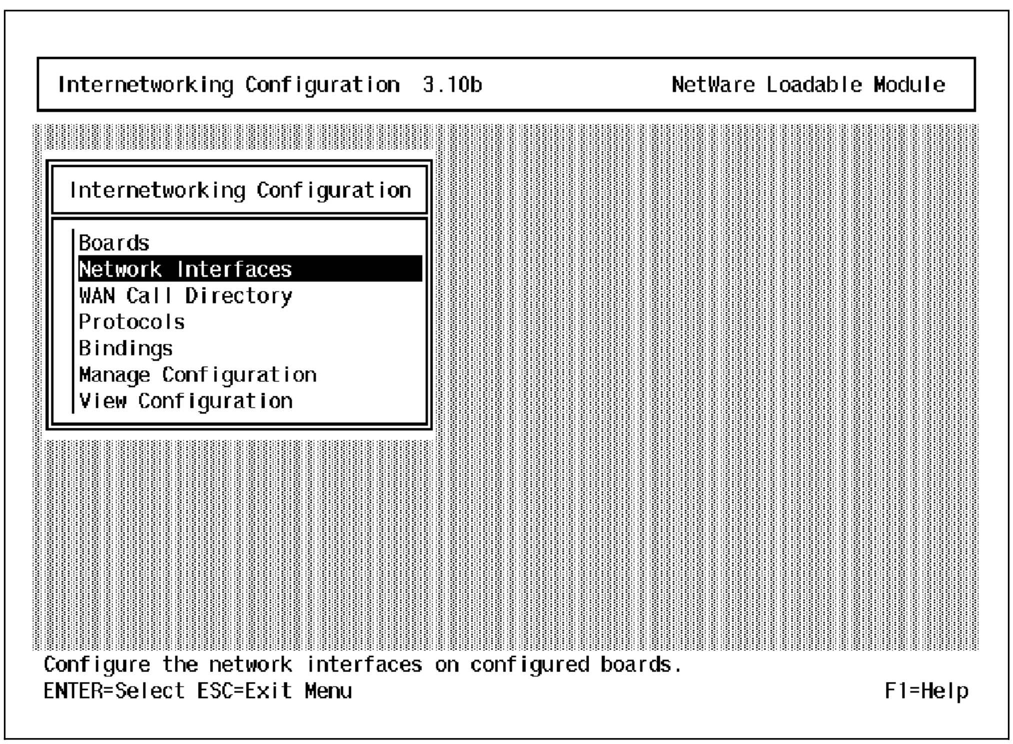

Figure 191. MPR Main Configuration Menu

Select **Network Interfaces** from the main configuration menu.

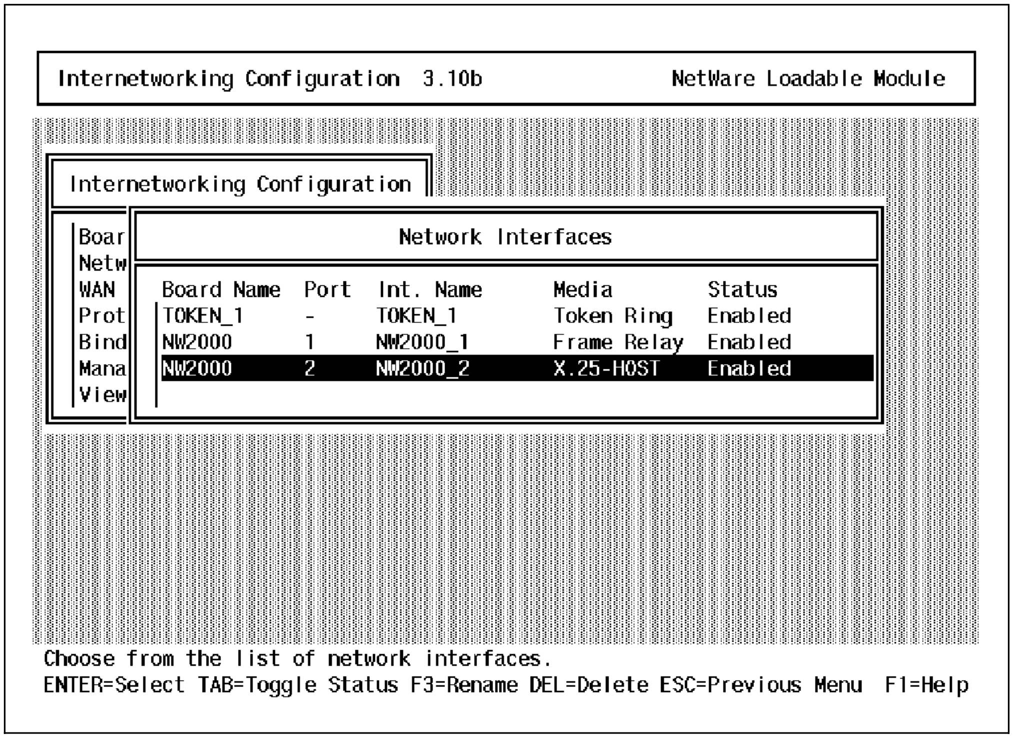

Figure 192. MPR Configured Network Interfaces

The NW2000 interface board port 2 is configured for X.25. In Figure 192 we have selected to view the configuration parameters associated with the X.25 interface.

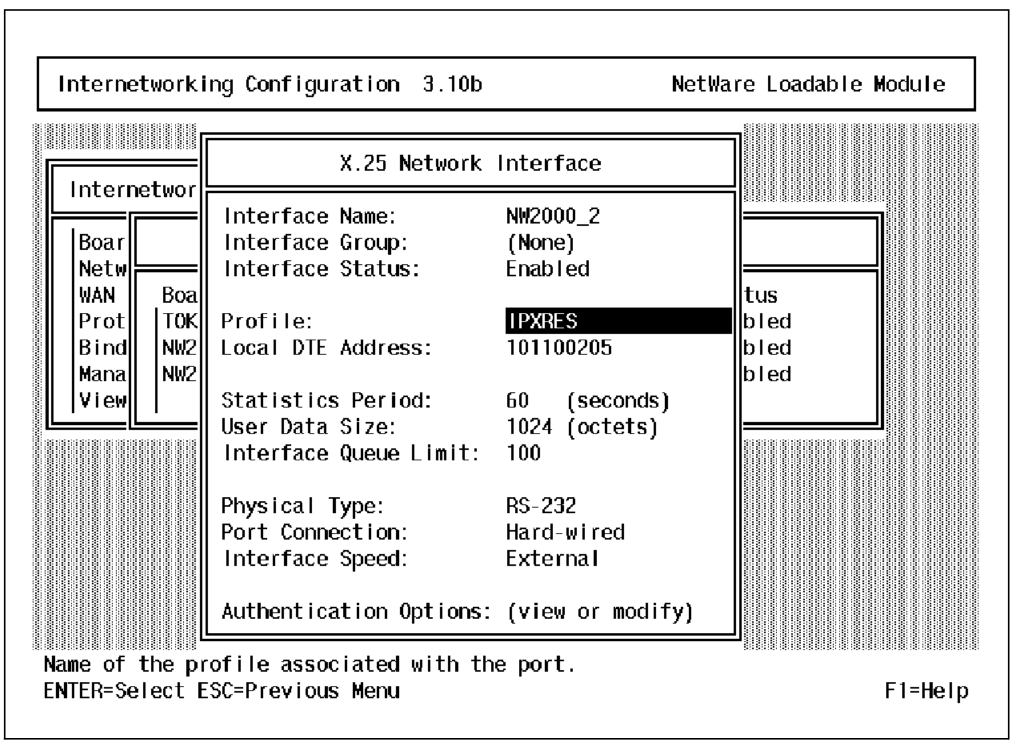

Figure 193. MPR X.25 Network Interface Configuration

Figure 193 shows the X.25 network interface parameters, for example, the local (MPR) X.25 address. We have selected to view the configuration profile (IPXRES).

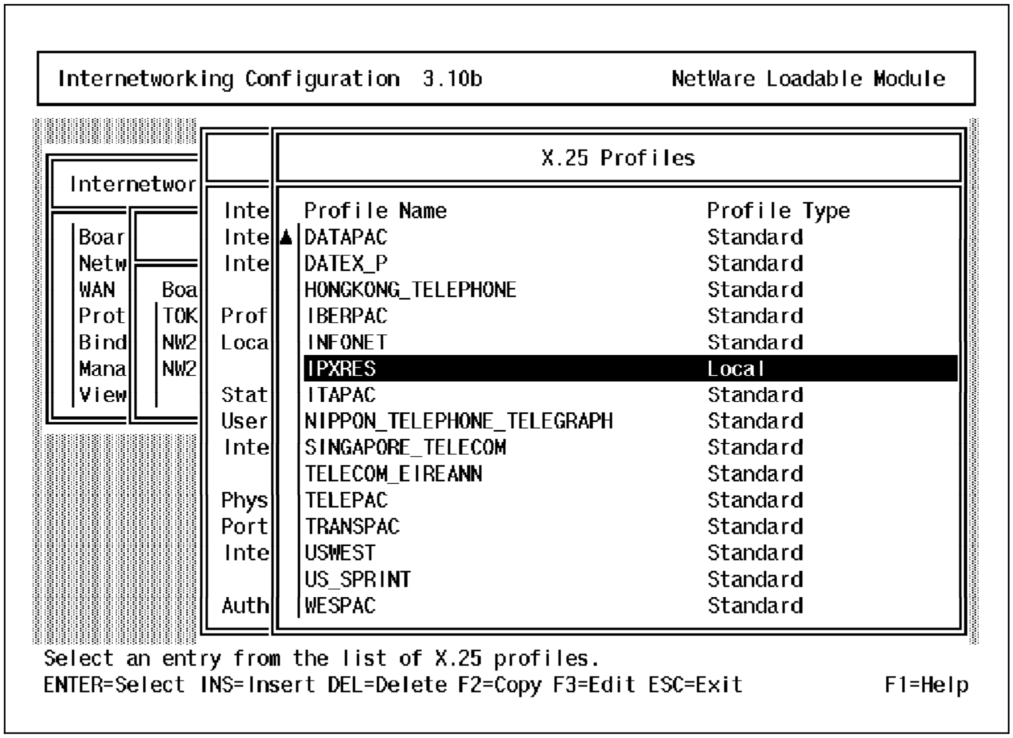

Figure 194. MPR X.25 Profiles

In Figure 194 we have selected to view the configuration associated with IPXRES.

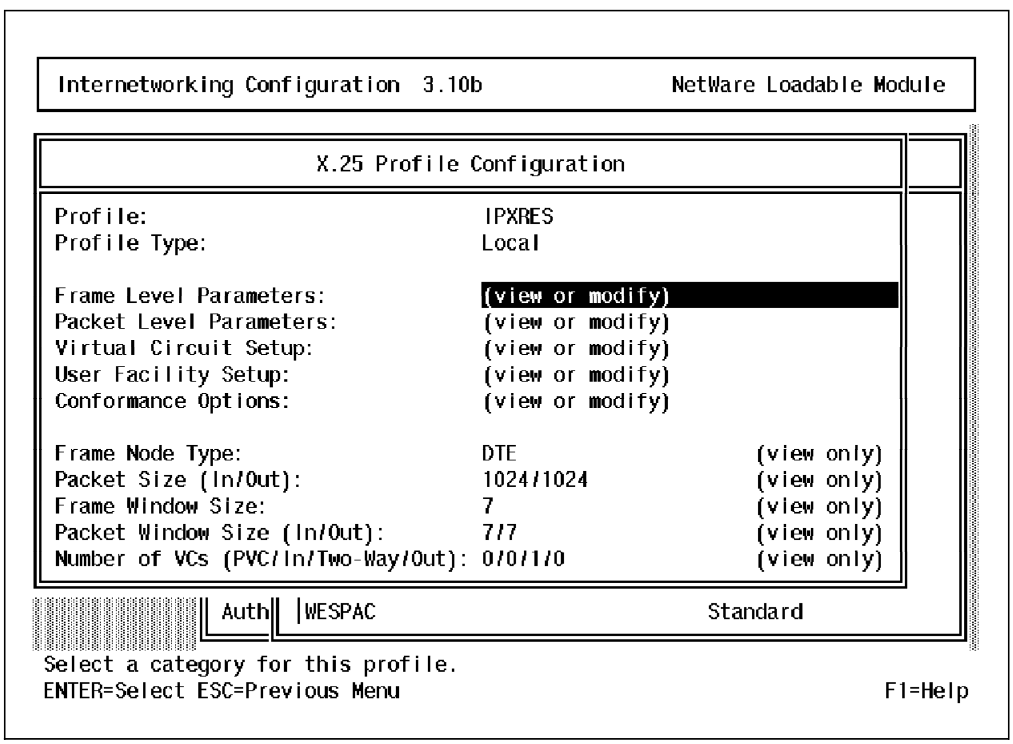

Figure 195. MPR X.25 Profile Configuration

The packet and window sizes are configured in Figure 195. The number of X.25 virtual circuits of each type (permanent, incoming, both-way and outgoing only) is also configured on this panel. We have selected to view the frame level parameters.

```
Internetworking Configuration  3.10b          NetWare Loadable Module

                    X.25 Profile Configuration

Prof        X.25 Frame Level Parameters
Prof
     Profile:                   IPXRES
Fram                                          )
Pack Frame Node Type:           DTE           )
Virt Connection Mode:           Active        )
User                                          )
Conf Frame Sequencing Modulo:     8           )
     Frame Window Size (K):     7
Fram                                                      (view only)
Pack Maximum Frame Size (N1): 1024 (octets)               (view only)
Fram Retry Count (N2):          20                        (view only)
Pack Retry Timeout (T1):        2    (seconds)            (view only)
Numb Disconnect Timeout (T3):   20   (seconds)            (view only)
     Idle Timeout (T4):         10   (seconds)
                                                   Standard

Select the logical link interface type to be used.
ENTER=Select ESC=Previous Menu                                F1=Help
```

Figure 196. MPR X.25 Frame Level Parameters

Figure 196 shows the values of the X.25 frame level parameters. Next we have selected to view (via Figure 195 on page 222) the packet level parameters.

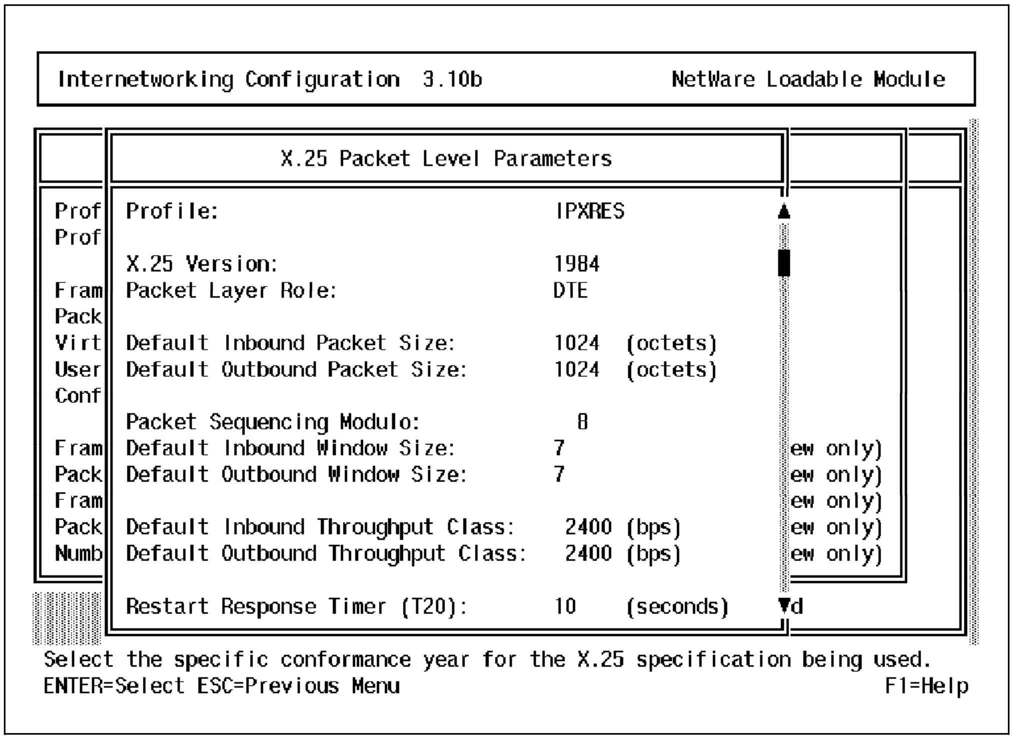

Figure 197. MPR X.25 Packet Level Parameters

Figure 197 shows the values of the X.25 packet level parameters. Next we have selected to view (via Figure 195 on page 222) the virtual circuit setup.

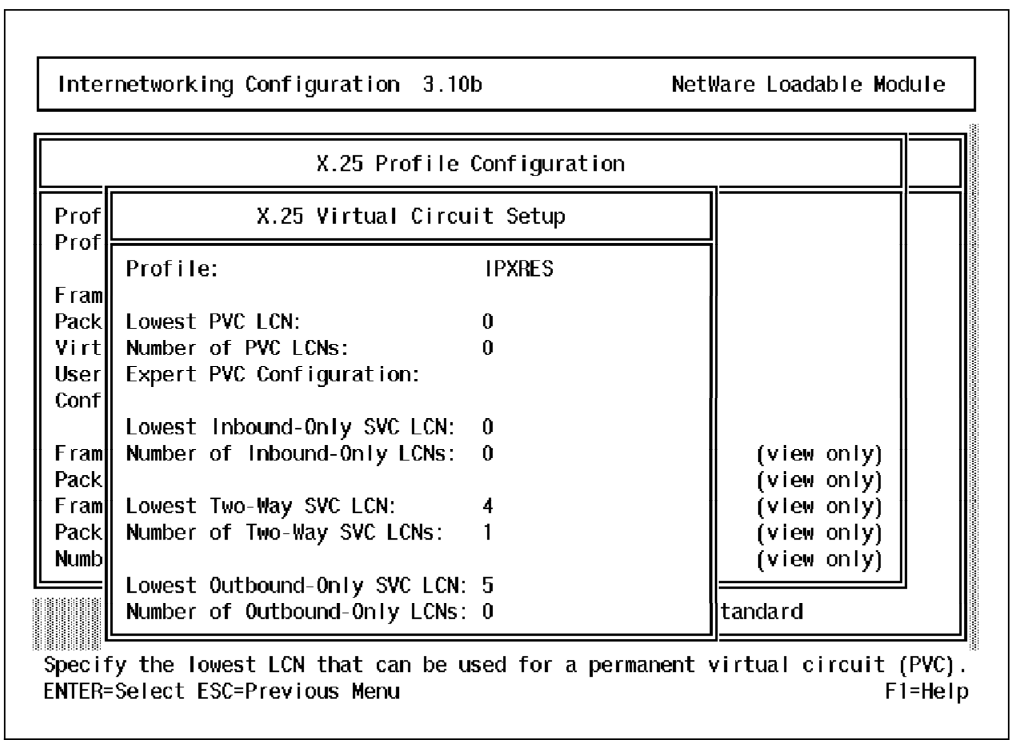

Figure 198. MPR X.25 Virtual Circuit Setup

Figure 198 shows the X.25 virtual circuits configured. We can see that a both-way SVC has been configured and that it uses logical channel 004. Next we have selected to view (via Figure 195 on page 222) the user facility setup.

```
 Internetworking Configuration  3.10b            NetWare Loadable Module

                       X.25 User Facility Setup

 Prof  Profile:                             IPXRES
 Prof
       Allow Flow Control Negotiation:      Yes
 Fram  Maximum Inbound Packet Size:         1024  (octets)
 Pack  Maximum Outbound Packet Size:        1024  (octets)
 Virt  Maximum Inbound Window Size:         7
 User  Maximum Outbound Window Size:        7
 Conf
       Allow Throughput Negotiation:        No
 Fram  Maximum Inbound Throughput Class:     2400 (bps)        w only)
 Pack  Maximum Outbound Throughput Class:    2400 (bps)        w only)
 Fram                                                          w only)
 Pack  Allow Incoming Reverse Charge Calls: No                 w only)
 Numb  Allow Closed User Group:             No                 w only)
       Allow Bilateral CUG:                 No

 Select YES to allow Flow Control Negotiation.
 ENTER=Select ESC=Previous Menu                                  F1=Help
```

Figure 199. MPR X.25 User Facility Setup

In Figure 199 any required X.25 user facilities are configured. Next we have selected to view (via Figure 195 on page 222) the X.25 conformance options.

```
 Internetworking Configuration  3.10b            NetWare Loadable Module

                   X.25 Conformance Options

 Prof  Profile:                       IPXRES
 Prof
       Unknown Frame Option:          No
 Fram  Disconnect Answer Option:      No
 Pack  Disconnect Action Option:      No
 Virt  Force FRMR Option:             No
 User  Force FRMR on RR:              No
 Conf  T1 Action Option:              No

 Fram  Call Accept Data:              No                 (view only)
 Pack  D-Bit on Call Confirm:         No                 (view only)
 Fram  General Diagnostic Code:       No                 (view only)
 Pack  Clear Unassigned LCN:          No                 (view only)
 Numb  Short Call Confirm:            No                 (view only)
       Facility Field:                No
       Clear Long Call:               No               andard

 Select YES to allow to send a long Clear Request packet.
 ENTER=Select ESC=Previous Menu                                  F1=Help
```

Figure 200. MPR X.25 Conformance Options

In Figure 200 we can see the MPR X.25 conformance values.

14.4.3 WAN Call Directory Configuration

The Novell MPR call directory configuration is as follows.

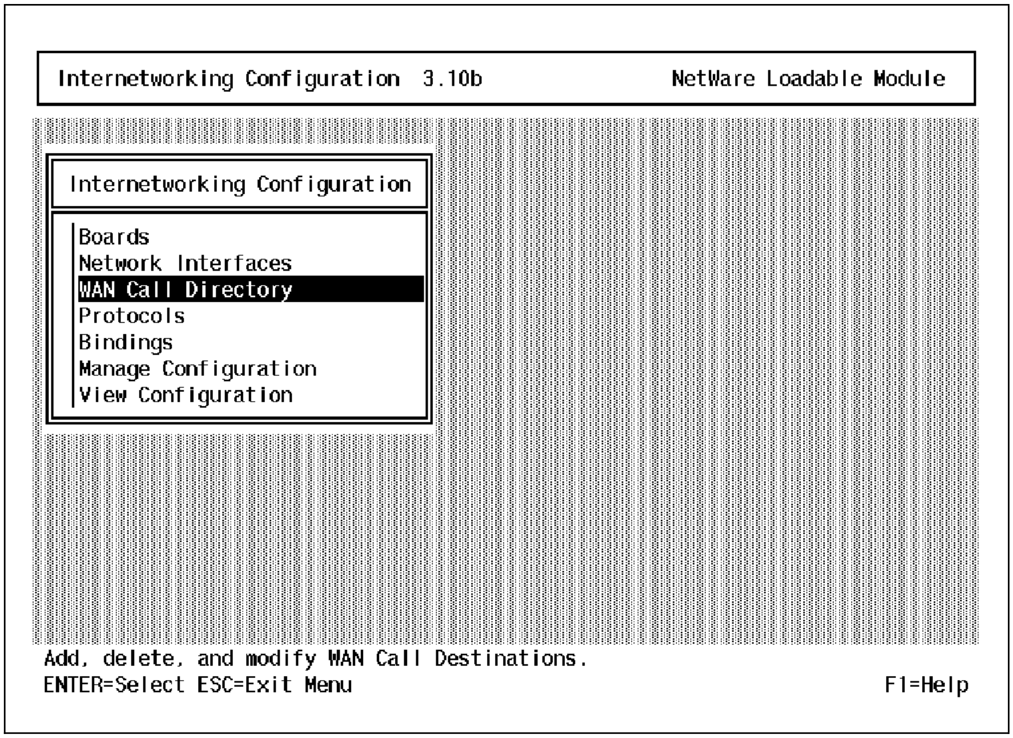

Figure 201. MPR Main Configuration Menu

Select **WAN Call Directory** from the main configuration menu.

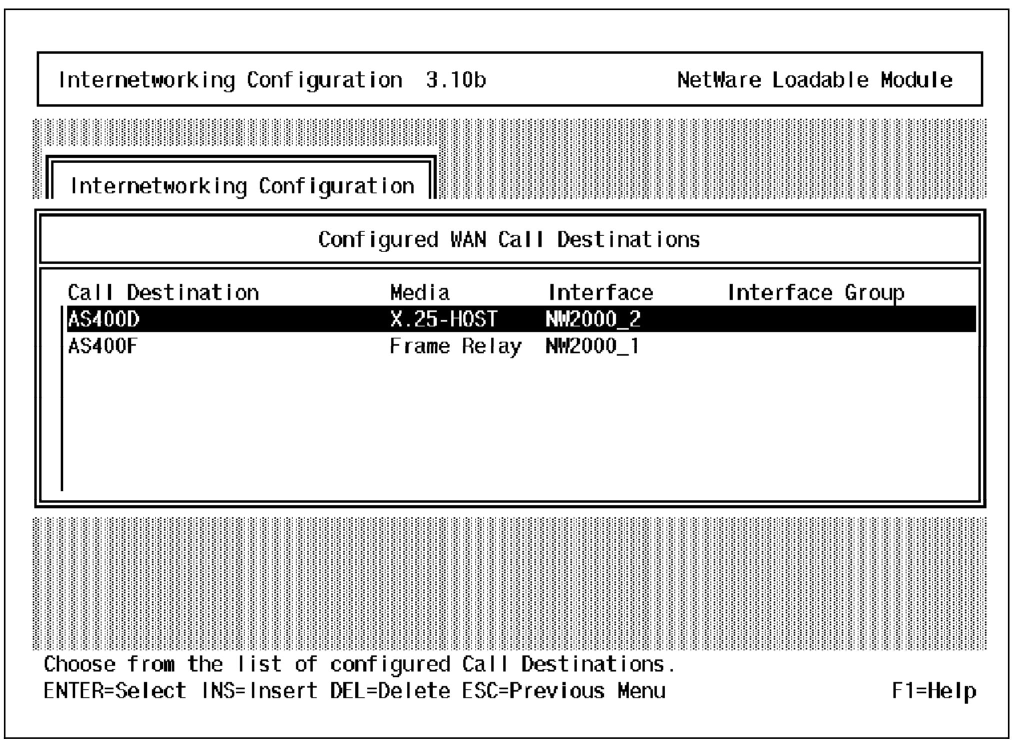

Figure 202. MPR WAN Call Destinations

A call destination of AS400D has been configured for the X.25 SVC on-demand connection to the AS/400. In Figure 202 we have selected to view the configuration associated with this call destination.

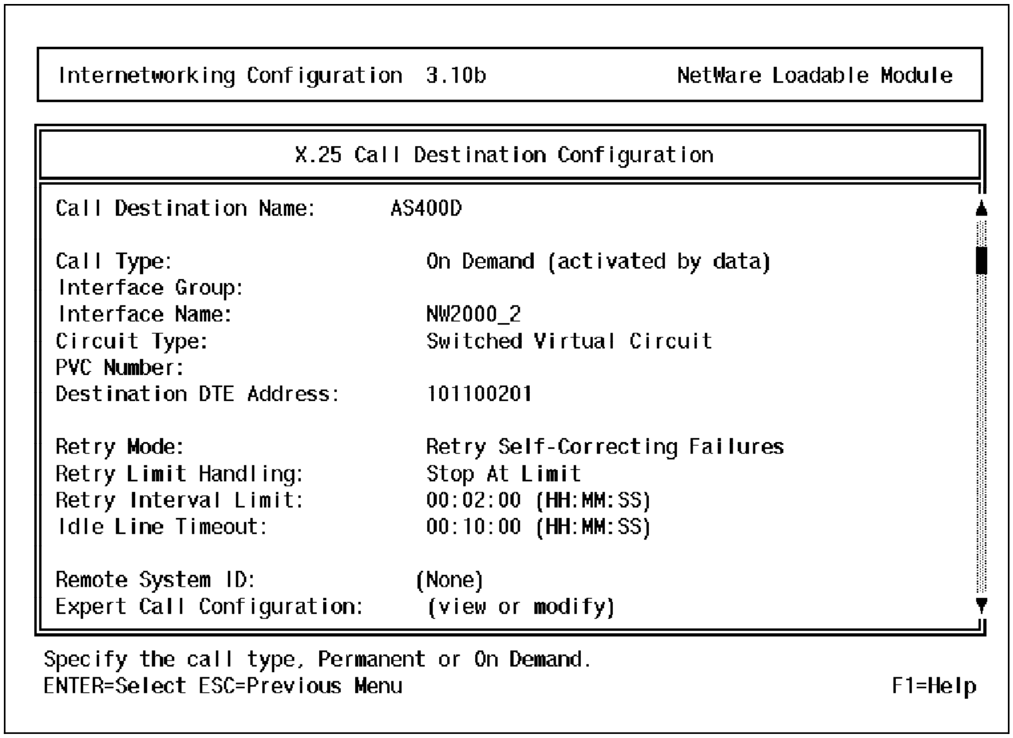

Figure 203. MPR X.25 Call Destination Configuration

In Figure 203 the SVC connection is configured as an on-demand connection. The AS/400's X.25 address is also configured in this panel.

14.4.4 Protocol Configuration

The Novell MPR protocol configuration is as follows.

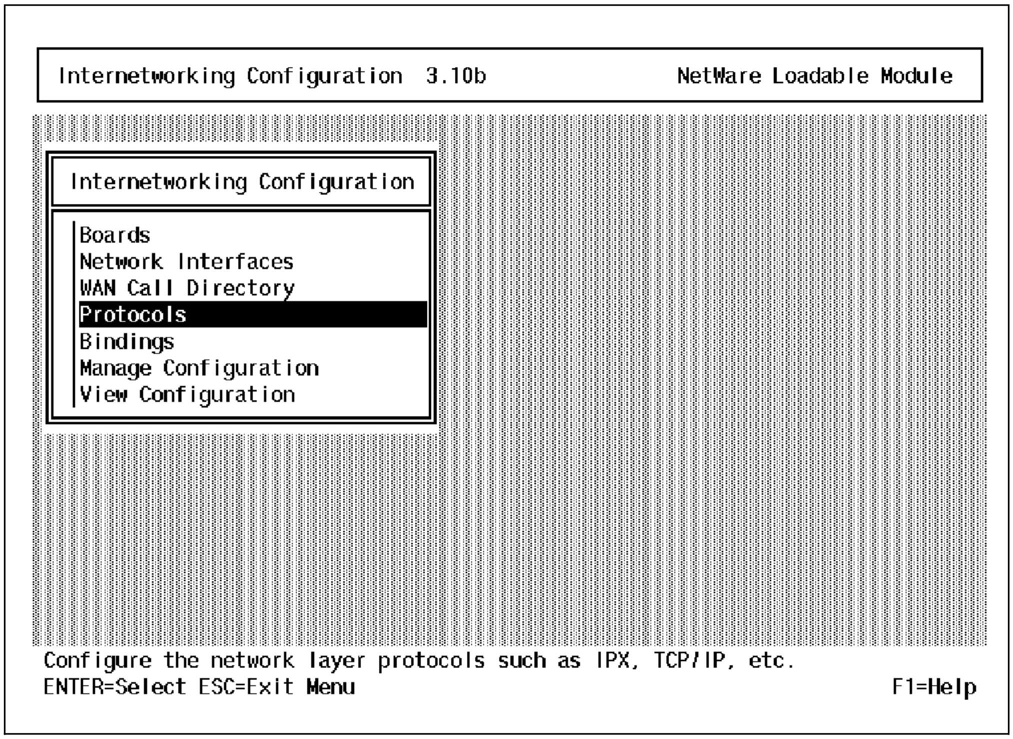

Figure 204. MPR Main Configuration Menu

Select **Protocols** from the main configuration menu.

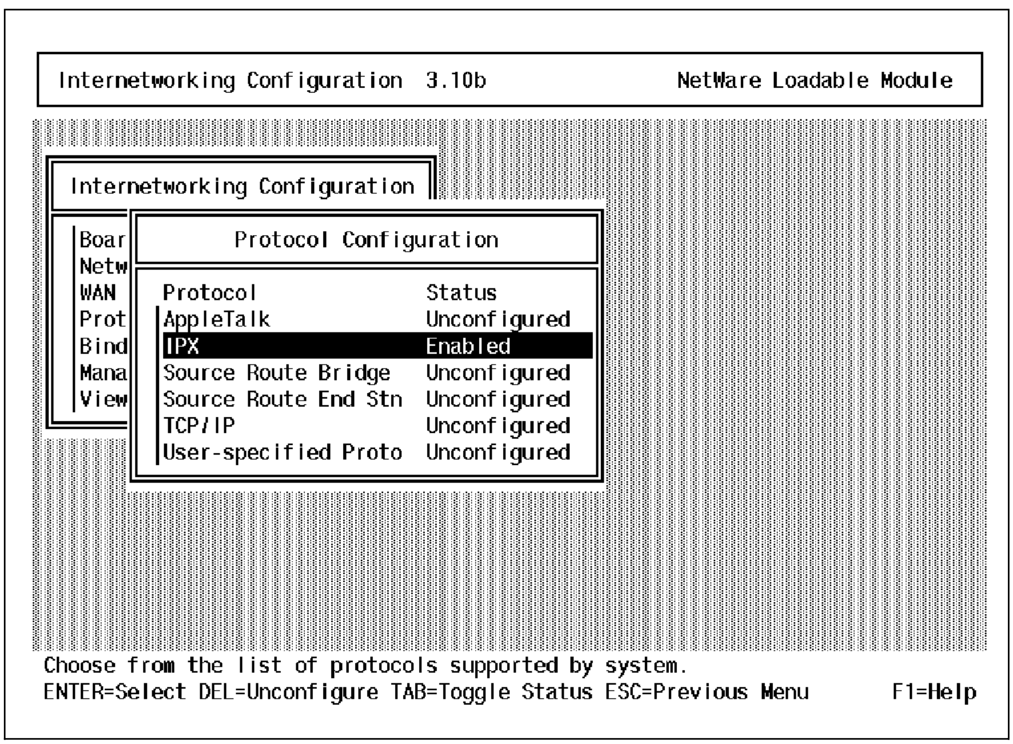

Figure 205. MPR Protocol Configuration

In Figure 205 we can see that IPX has been enabled. We have selected to view the IPX protocol configuration parameters.

```
Internetworking Configuration  3.10b          NetWare Loadable Module

                   IPX Protocol Configuration

Packet Forwarding:                    Enabled
Routing Protocol:                     NLSP with RIP/SAP Compatibility

On Demand Calls:                      Enabled
Static Services for On Demand Calls:  (Select to Configure)
Static Routes for On Demand Calls:    (Select to Configure)

Tunnel IPX Through IP:                Disabled
Tunnel Configuration:

Filtering Support:                    Disabled
Expert Configuration Options:         (Select to Configure)

Enable to configure On Demand calls.
ENTER=Select ESC=Previous Menu                                F1=Help
```

Figure 206. MPR IPX Protocol Configuration

In Figure 206 we can see that the MPR packet forwarding capability and NLSP have been enabled.

When using on-demand we must configure static routes and services; in Figure 206 we select to configure static services.

```
Internetworking Configuration  3.10b          NetWare Loadable Module

                   IPX Protocol Configuration

Pac          Static Services for On Demand Calls
Rou
     Service Name                 Type        WAN Call Destination
On   NW41                         (0004) FILE AS400D
Sta
Sta

Tun
Tunnel Configuration:

Filtering Support:                    Disabled
Expert Configuration Options:         (Select to Configure)

List of Static Services configured.
ENTER=Configure F2=Sort INS=Insert DEL=Delete ESC=Previous Menu    F1=Help
```

Figure 207. Static Services for On-Demand Calls

In Figure 207 we have entered to configure a static service to server NW41.

```
Internetworking Configuration  3.10b            NetWare Loadable Module

                      IPX Protocol Configuration

Pac                   Static Services for On Demand Calls

                      Static Service Configuration

WAN Call Destination:      AS400D
Service Name:              NW41
Service Type:              (0004) FILE SERVER
Service Address Network:   30ABA597
Service Address Node:      000000000001
Service Address Socket:    0451
Hops To Service:           4
Ticks To Service:          70

Choose from a list of configured WAN Call Destinations.
ENTER=Select ESC=Previous Menu                                F1=Help
```

Figure 208. Definition of Static Services

In Figure 208 we have defined the static service to NW41 against the on-demand WAN call destination AS400D defined in Figure 202 on page 226.

```
Internetworking Configuration  3.10b            NetWare Loadable Module

                      IPX Protocol Configuration

Packet Forwarding:                     Enabled
Routing Protocol:                      NLSP with RIP/SAP Compatibility

On Demand Calls:                       Enabled
Static Services for On Demand Calls:   (Select to Configure)
Static Routes for On Demand Calls:     (Select to Configure)

Tunnel IPX Through IP:                 Disabled
Tunnel Configuration:

Filtering Support:                     Disabled
Expert Configuration Options:          (Select to Configure)

Enable to configure On Demand calls.
ENTER=Select ESC=Previous Menu                                F1=Help
```

Figure 209. Define Static Routes

When using on-demand we must configure static routes and services; in Figure 209 we select to configure static routes.

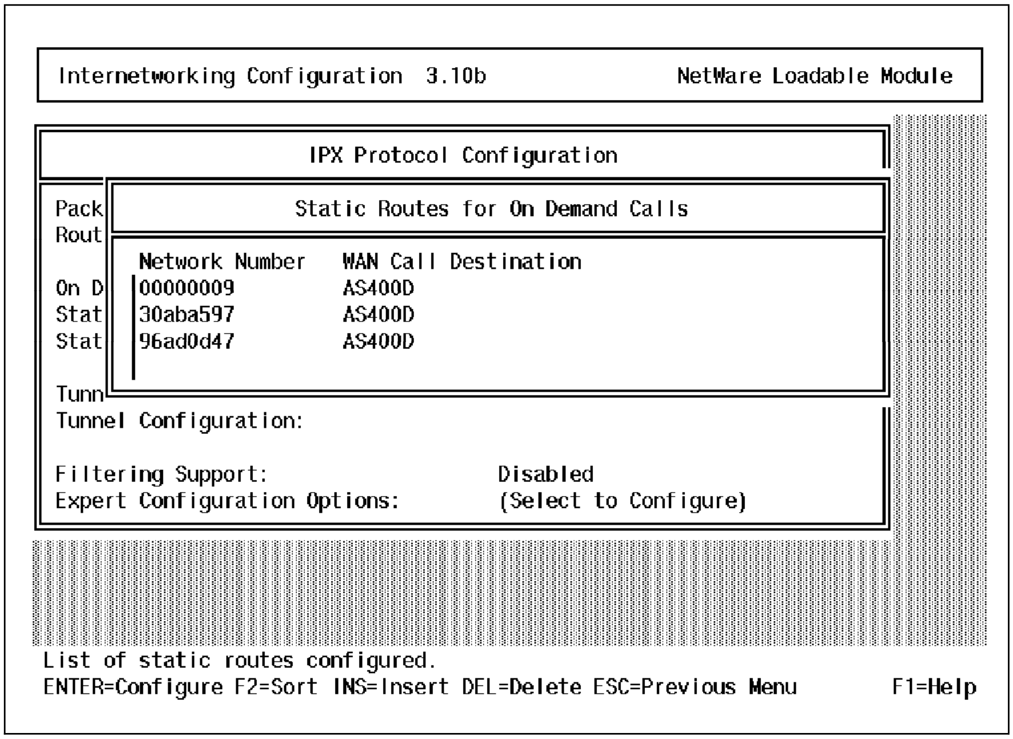

Figure 210. Definition of Static Routes

In Figure 210 we have defined the static routes against the on-demand WAN call destination AS400D defined in Figure 202 on page 226. The following routes have been defined:

00000009 This is the remote token-ring network number.

30ABA597 This is the internal network number of NW41.

96AD0D47 This is the AS/400's internal network number.

```
Internetworking Configuration  3.10b            NetWare Loadable Module

                     IPX Protocol Configuration

Packet Forwarding:                    Enabled
Routing Protocol:                     NLSP with RIP/SAP Compatibility

On Demand Calls:                      Enabled
Static Services for On Demand Calls:  (Select to Configure)
Static Routes for On Demand Calls:    (Select to Configure)

Tunnel IPX Through IP:                Disabled
Tunnel Configuration:

Filtering Support:                    Disabled
Expert Configuration Options:         (Select to Configure)

Enable to configure On Demand calls.
ENTER=Select ESC=Previous Menu                                    F1=Help
```

Figure 211. Select to View Expert Configuration

In Figure 211 we select to view the expert configuration options.

```
Internetworking Configuration  3.10b            NetWare Loadable Module

                        IPX Expert Configuration

Get Nearest Server Requests:          Accept
Override Nearest Server:              Disabled
Nearest Server:
Advanced Packet Type 20 Flooding:     Enabled

Hop Count Limit:                      64
Maximum Number of Path Splits:        1
LSP Size:                             512

NLSP Local Area Addresses:            (Select to Configure)
Override NLSP System ID:              Disabled
NLSP System Identification:
NLSP Convergence Rate:                Default
NLSP Convergence Rate Configuration:  (Select to View)

IPX/SPX Parameters:                   (Select to View/Configure)

Specifies whether get nearest server requests should be ignored.
ENTER=Select ESC=Previous Menu                                    F1=Help
```

Figure 212. MPR IPX Expert Call Configuration

In Figure 212 we can configure any special requirements. For example, we can see that Get Nearest Server Requests are accepted by this router. This allows the MPR PC to respond to get-nearest-server requests from PCs attached to its LAN interface.

14.4.5 Bindings Configuration

The Novell MPR bindings configuration is as follows.

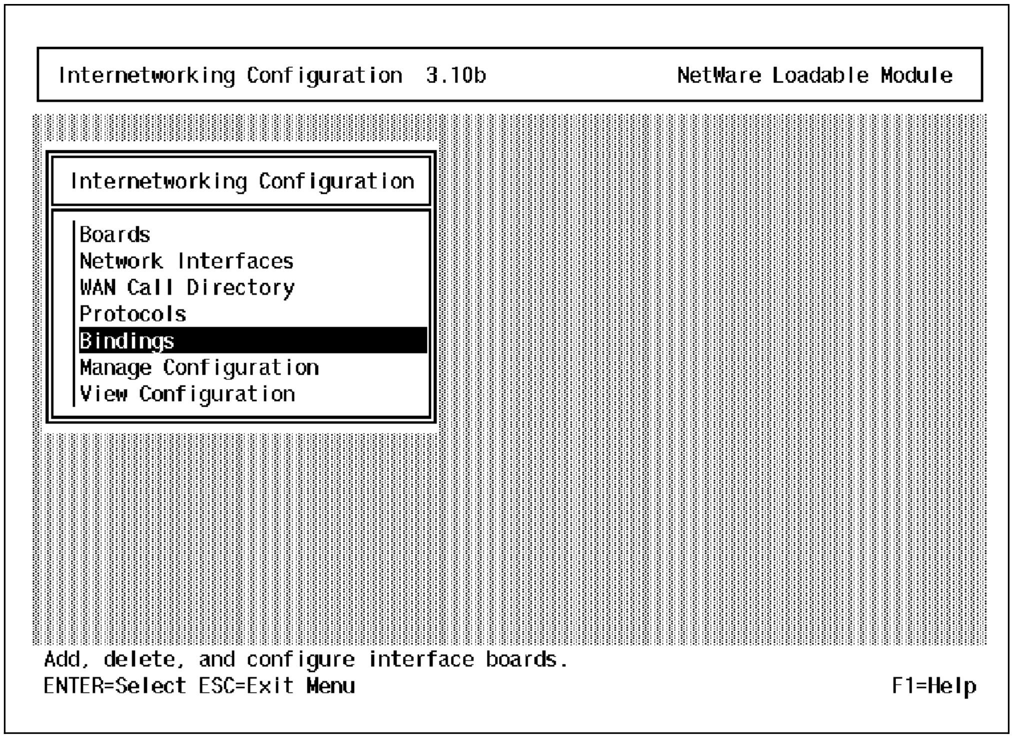

Figure 213. MPR Main Configuration Menu

Select **Bindings** from the main configuration menu.

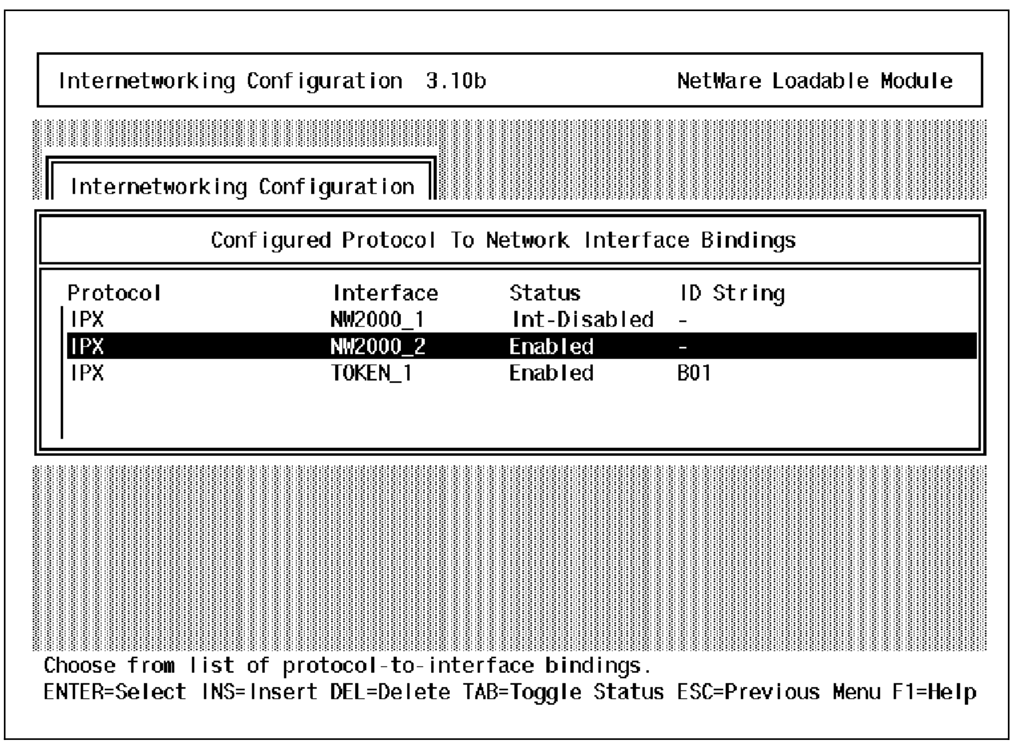

Figure 214. MPR Protocol to Interface Binding

In Figure 214 we can see that IPX has been bound to the WAN interface (NW2000_2) to be used to the AS/400. We have selected to view the configuration parameters associated with this binding.

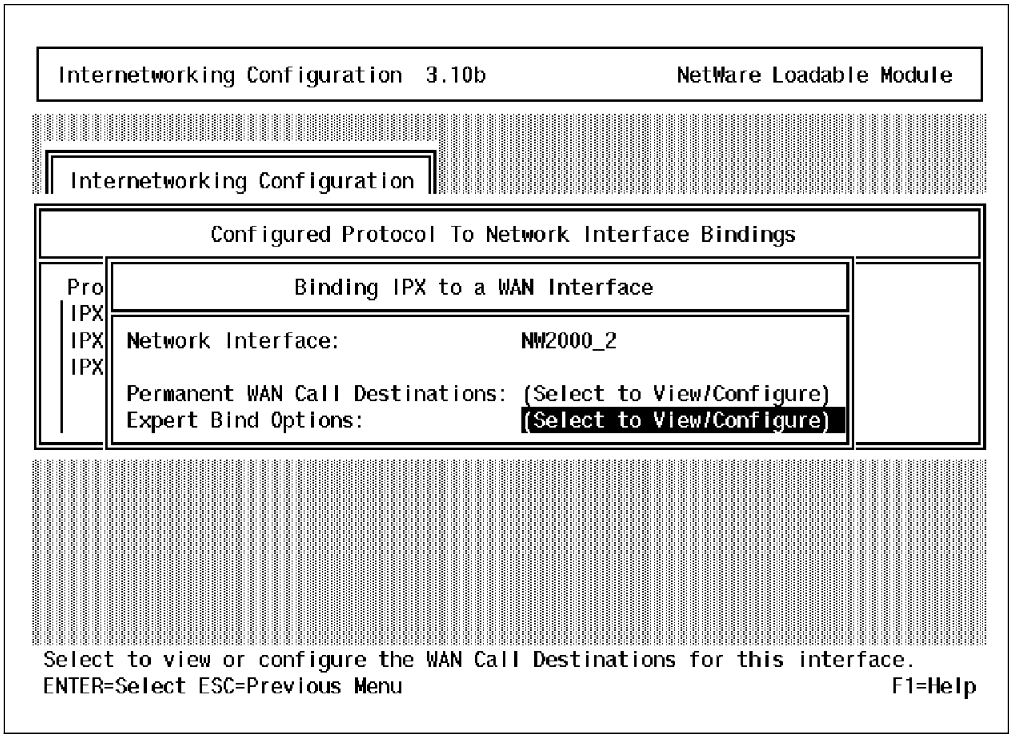

Figure 215. MPR Binding IPX to a WAN Interface

In Figure 215 we select to view the expert bind configuration options associated with the WAN interface.

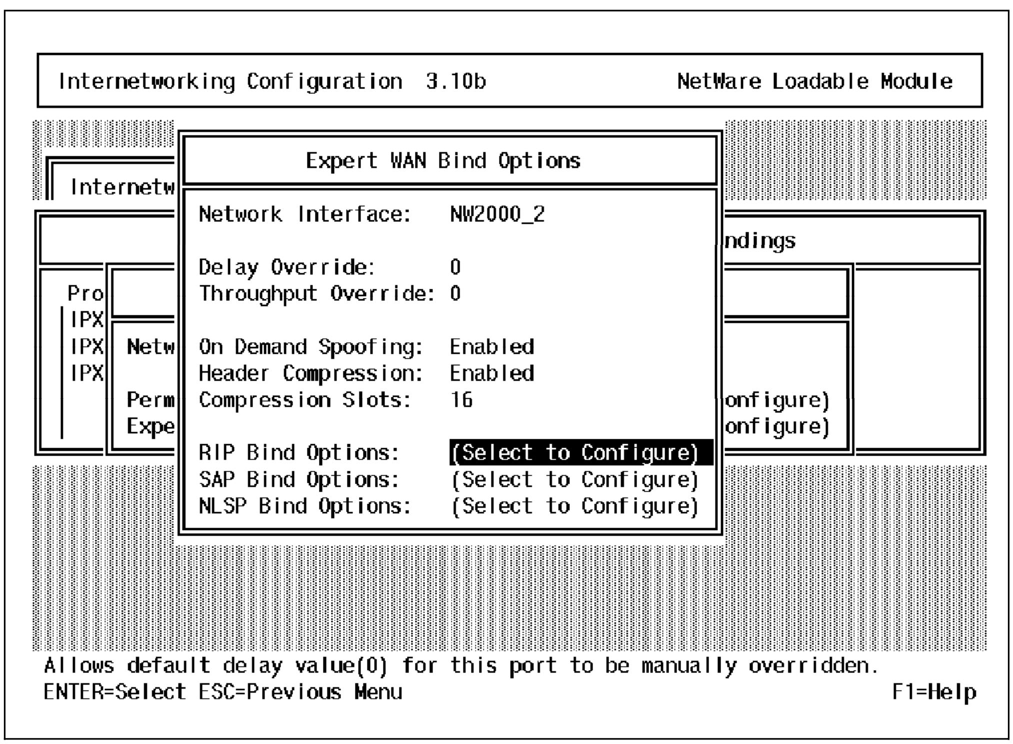

Figure 216. Expert WAN Bind Options

In Figure 216 we have selected to view the expert RIP bind configuration values.

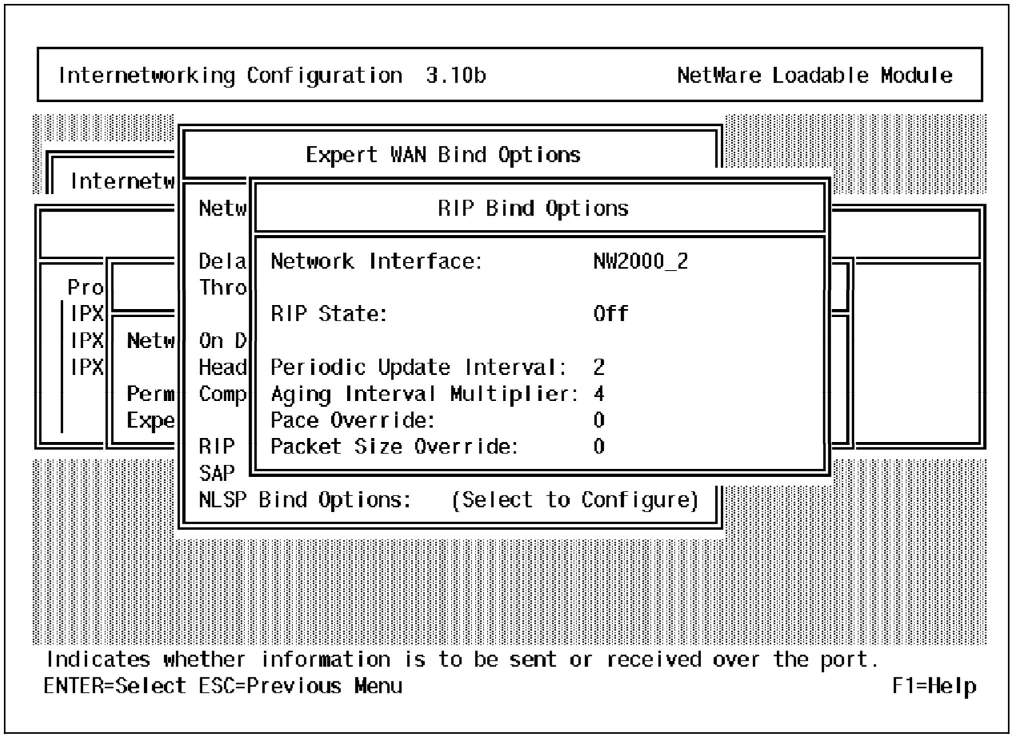

Figure 217. Expert WAN Bind RIP Options

In Figure 217 we can see that RIP has been turned off. Next we have selected to view (via Figure 216 on page 234) the expert SAP configuration parameters.

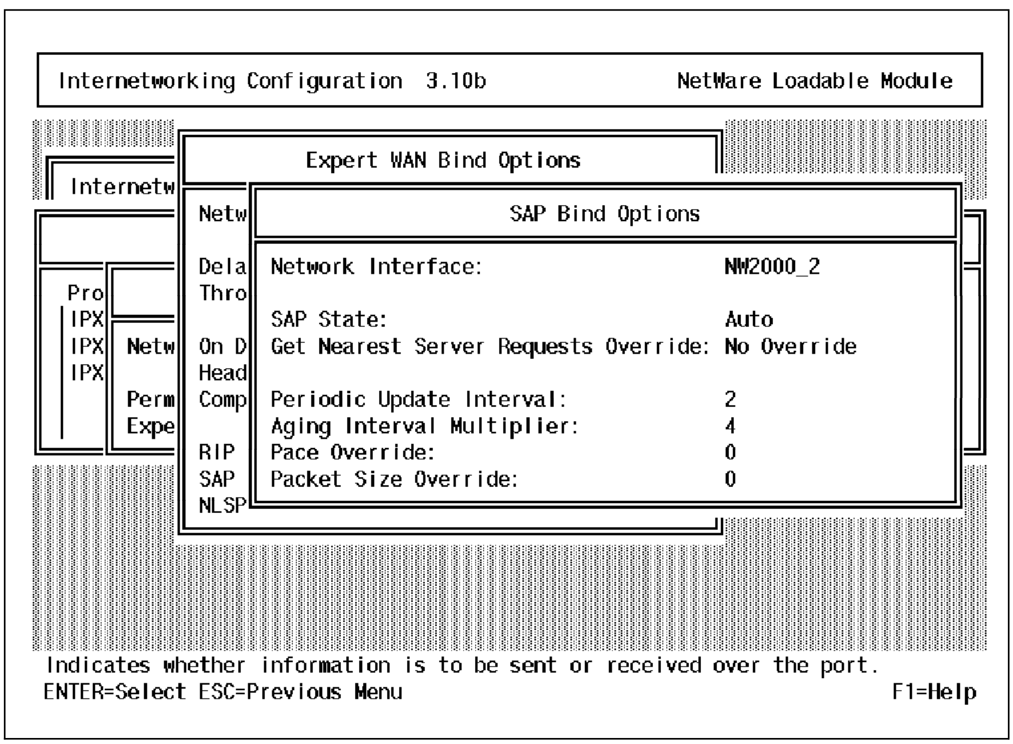

Figure 218. Expert WAN Bind SAP Options

In Figure 218 we can see that SAP is set to AUTO. Next we have selected to view (via Figure 216 on page 234) the expert NLSP configuration parameters.

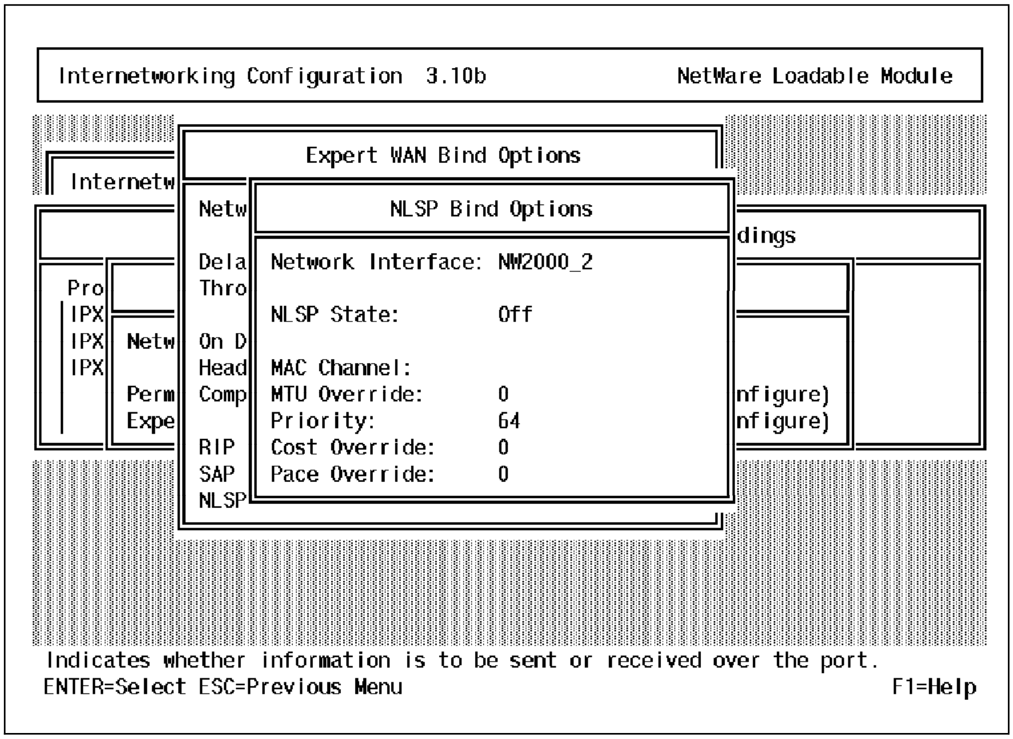

Figure 219. Expert WAN NLSP Bind Options

In Figure 219 we can see that NLSP has been turned off.

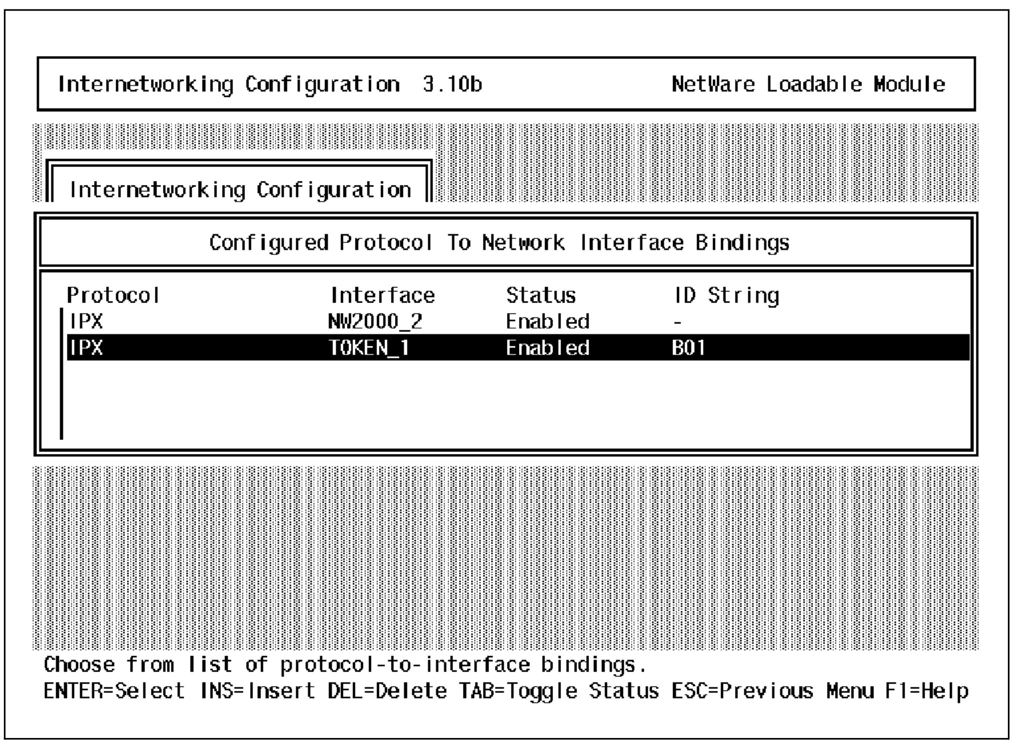

Figure 220. MPR Protocol to Interface Binding

In Figure 220 we can see that IPX has been bound to the LAN interface. We have selected to view the configuration parameters associated with this binding.

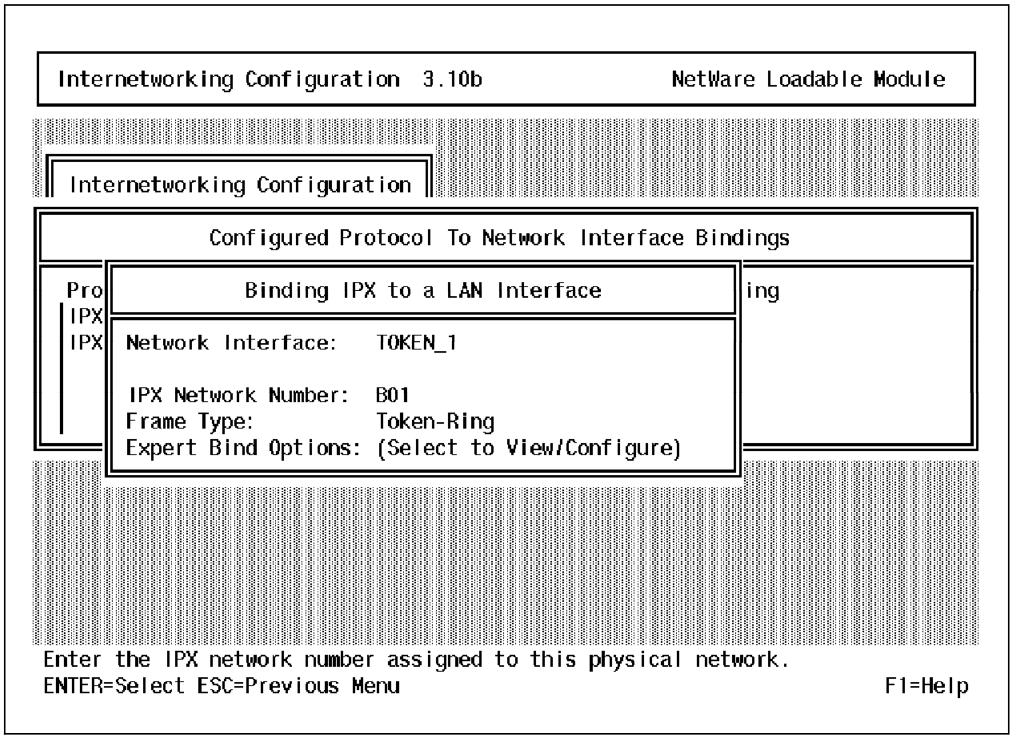

Figure 221. Binding IPX to a LAN Interface

In Figure 221 we can see details of the IPX LAN binding. For example the network number associated with this interface.

14.5 Starting and Verifying the IPX Router Support

Before we can start the IPX support on the AS/400, we have to vary on the line descriptions being used by the IPX circuits. We can do this by entering the following commands:

```
VRYCFG CFGOBJ(TRN2619A) CFGTYPE(*LIN) STATUS(*ON)
VRYCFG CFGOBJ(X25LINE_A) CFGTYPE(*LIN) STATUS(*ON)
```

14.5.1 Starting IPX

To start IPX using the IPX descriptions we created above, enter the following commands:

```
STRIPX RALYAS4A
```

Starting the AS/400 IPX Support creates a *NET controller and an *NET device description.

14.5.2 Verifying the IPX Configuration

To verify that the line descriptions have become active and that the *NET controller and device descriptions have been created and are also active, use the command WRKCFGSTS. For example, if we enter the command WRKCFGSTS *LIN X25LINE_A on RALYAS4A, we see the panel shown in Figure 222 on page 238.

```
                        Work with Configuration Status               RALYAS4A
                                                            03/11/96  14:59:32
Position to  . . . . .                Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description       Status                ------------Job-------------
     X25LINE_A         ACTIVE
       X25LINET        ACTIVE
         X25LIIPX      ACTIVE                QIPX        QSYS        042428







                                                                      Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 222. WRKCFGSTS X25 Line RALYAS4A

From Figure 222 we can see that the IPX network controller (*NET) has become active with the QIPX job.

Tip

STRIPX starts all IPX Circuits that have AUTOSTART set to *YES.

To verify that the IPX circuits have become active, use the WRKIPXSTS command. For example, if we enter the command `WRKIPXSTS OPTION(*CCT)` on RALYAS4A, we see the panel shown in Figure 223 on page 239.

```
                           Work with IPX Circuits
                                                          System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Display associated services
   8=Display associated routes   9=Start     10=End

        Circuit                Line        Line          Circuit
 Opt    Name                 Description   Type          Status

        MPR_ON_DEMAND        X25LINE_A     *X25          Waiting
        TRN2619A             TRN2619A      *TRLAN        Active







                                                                      Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 223. Work with IPX Circuit Status

In Figure 223 we can see that the LAN circuit has become active but the X.25 circuit is in a waiting state. Both circuits were started automatically because we accepted the default of *YES for Automatic start in the IPX circuits. However, because we configured the X.25 circuit for *DEMAND, instead of going to an active state it has instead gone to a waiting state. It stays in a waiting state until a connection is established for data transfer.

To verify that the IPX routes have been propagated between the routers, we can use the command WRKIPXSTS. For example, if having established the connection for data (we used IPXPING), we enter the command WRKIPXSTS OPTION(*RTE) on RALYAS4A, we see the panel shown in Figure 224.

```
                       Display IPX Route Information
                                                          System:   RALYAS4A
 Type options, press Enter.
   5=Display details

         Remote       Number      Number      Next Hop         Route
 Opt     Network      of Hops     of Ticks    Node Address     Source
         00000009        0             1      *NONE            *CCT
         00000B01        2            30      *NONE            *CFG
         30AA0F92        1             2      400052005240     *RIP
         30ABA597        1             2      08005A48816B     *RIP
         31AC7F25        2            30      *NONE            *CFG
         96AD0D47        0             1      000000000001     *LOCAL



                                                                      Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 224. Display IPX Route Information

To verify that the IPX services information has been propagated between the routers, we can use the command WRKIPXSTS. For example, if we enter the command WRKIPXSTS OPTION(*SRV) on RALYAS4A, we see the panel shown in Figure 225 on page 240.

```
                      Display IPX Service Information
                                                          System:   RALYAS4A
 Type options, press Enter.
   5=Display details

        Service               Service        Remote      Hops to    Service
 Opt    name                  Type           Network     Service    Source
        MANSERV1              *FILESVR       30AA0F92       1       *SAP
        MPR                   *FILESVR       31AC7F25       1       *CFG
        NW41                  *FILESVR       30ABA597       1       *SAP
        BSER4.00-6.10_30A>    004B           30AA0F92       1       *SAP
        ISMANSERV11841501>    0102           30AA0F92       1       *SAP
        IVMANSERV11841501>    0102           30AA0F92       1       *SAP
        LANPROTECT1841501>    0102           30AA0F92       1       *SAP
        MANSERV1              0107           30AA0F92       1       *SAP
        NW41                  0107           30ABA597       1       *SAP
        FERGUS_TREE______>    026B           30ABA597       1       *SAP
        SYSMAN___________>    026B           30AA0F92       1       *SAP
        FERGUS_TREE______>    0278           30ABA597       1       *SAP
        SYSMAN___________>    0278           30AA0F92       1       *SAP
        IBM8235_031           0751           00000009       1       *SAP
                                                                    More...
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 225. Display IPX Service Information Screen

We can now verify the connection with the IPXPING command. IPXPING is very similar to TCP/IP PING. Here we ping the MPR's internal IPX network address from RALYAS4A.

```
                         Verify IPX Connection (IPXPING)

 Type choices, press Enter.

 Remote IPX network number  . . . > 31AC7F25      00000001-FFFFFFFD
 Remote IPX node address  . . . . > 1             000000000001-FFFFFFFFFFFE...

                            Additional Parameters

 Message mode . . . . . . . . . .   *VERBOSE      *VERBOSE, *QUIET
 Packet length (in bytes) . . . .   256           8-65495
 Number of packets  . . . . . . .   5             1-999
 Wait time (in seconds) . . . . . > 5             1-120






                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 226. Verify IPX Connection

```
                                 Command Entry                         RALYAS4A
                                                          Request level:   5
3 > IPXPING RMTNETNBR(31AC7F25) RMTNDEADR(1) WAITTIME(5)
    Verifying connection to remote system at network number 31AC7F25, node
      address 000000000001.
      Connection verification 1 took 1.077 seconds.  1 successful connection
        verifications.
      Connection verification 2 took 1.077 seconds.  2 successful connection
        verifications.
      Connection verification 3 took 1.079 seconds.  3 successful connection
        verifications.
      Connection verification 4 took 1.075 seconds.  4 successful connection
        verifications.
      Connection verification 5 took 1.079 seconds.  5 successful connection
        verifications.
      Round-trip (in milliseconds) min/avg/max = 1075/1077/1079
      Connection verification statistics: 5 of 5 successful (100 %).
                                                                         Bottom
 Type command, press Enter.
 ===>

 F3=Exit   F4=Prompt   F9=Retrieve   F10=Include detailed messages
 F11=Display full      F12=Cancel    F13=Information Assistant   F24=More keys
```

Figure 227. Verify IPX Connection Joblog

The information in Figure 228, Figure 229 and Figure 230 on page 243 is the result of an IPXPING from the AS/400 as traced at the MPR router.

```
X25 Network Monitor  1.00                           NetWare Loadable Module

        Play-Back Screen [I/F Name=NW2000_2     LSLBoardNo=2   Port=2]

Dir Time        Size  LCN Packet     Pr  Ps QDM Data        Freeze
Rcv 11:12:23.8   26     4 CALL                  99101100205101100201064 20A0A4307
Snd 11:12:23.8    5     4 CALL C                0000
Snd 11:12:23.8  579     4 DATA        0   0     FFFF0240000400000000FFFFFFFFFFFF
Rcv 11:12:24.9  579     4 DATA        1   0     FFFF0240000400000000FFFFFFFFFFFF
Snd 11:12:24.9    3     4 RR          1
Snd 11:12:24.9  579     4 DATA        1   1     FFFF0240000400000000FFFFFFFFFFFF
Rcv 11:12:25.9    6     0 DIAG                  331001
Rcv 11:12:25.9    5     1 RESET                 0333
Rcv 11:12:25.9    6     0 DIAG                  331002
Rcv 11:12:25.9    5     2 RESET                 0333
Rcv 11:12:26.1  102     4 DATA        2   1     FFFF0063000400000000FFFFFFFFFFFF
Snd 11:12:26.1    3     4 RR          2
Snd 11:12:26.1  102     4 DATA        2   2     FFFF0063000400000000FFFFFFFFFFFF
Rcv 11:12:26.9  299     4 DATA        3   2     FFFF01280000760D0117000000000001

F2=Restart F3=Raw Mode F4=Complete Display F5=ASCII F6=Resume
Esc=Exit Play-Back
```

Figure 228. MPR X.25 Trace (1 of 3)

```
X25 Network Monitor  1.00                           NetWare Loadable Module

        Play-Back Screen [I/F Name=NW2000_2     LSLBoardNo=2   Port=2]

Dir Time        Size  LCN Packet     Pr  Ps QDM Data        Freeze
Snd 11:12:26.9    3     4 RR          3
Snd 11:12:26.9  299     4 DATA        3   3     FFFF0128010096AD0D47000000000001
Rcv 11:12:28.0  299     4 DATA        4   3     FFFF01280000760D0117000000000001
Snd 11:12:28.0    3     4 RR          4
Snd 11:12:28.0  299     4 DATA        4   4     FFFF0128010096AD0D47000000000001
Rcv 11:12:29.1  299     4 DATA        5   4     FFFF01280000760D0117000000000001

F2=Restart F3=Raw Mode F4=Complete Display F5=ASCII F6=Resume
Esc=Exit Play-Back
```

Figure 229. MPR X.25 Trace (2 of 3)

```
X25 Network Monitor  1.00                              NetWare Loadable Module

        Play-Back Screen [I/F Name=NW2000_2     LSLBoardNo=2   Port=2]

Dir Time       Size  LCN Packet    Pr  Ps QDM Data        Freeze
Snd 11:12:29.1    3    4 RR         5
Snd 11:12:29.1  299    4 DATA       5   5     FFFF0128010096AD0D470000000000001
Rcv 11:12:30.2  299    4 DATA       6   5     FFFF01280000760D01170000000000001
Snd 11:12:30.2    3    4 RR         6
Snd 11:12:30.2  299    4 DATA       6   6     FFFF0128010096AD0D470000000000001
Rcv 11:12:31.3  299    4 DATA       7   6     FFFF01280000760D01170000000000001
Snd 11:12:31.3    3    4 RR         7
Snd 11:12:31.3  299    4 DATA       7   7     FFFF0128010096AD0D470000000000001
Rcv 11:12:37.7    3    4 RR         0
Rcv 11:13:35.7   33    4 DATA       0   7     FFFF001EFF00000000000000000000000
Snd 11:13:35.7    3    4 RR         0
Rcv 11:13:36.7    5    4 CLEAR                8000
Snd 11:13:36.7    3    4 CLEAR C
Rcv 11:13:39.2    5    1 RESET                0533
Rcv 11:13:39.2    5    2 RESET                0533

F2=Restart F3=Raw Mode F4=Complete Display F5=ASCII F6=Resume
Esc=Exit Play-Back
```

Figure 230. MPR X.25 Trace (3 of 3)

As a final verification step we verified a successful login to a NetWare server from a NetWare client.

14.5.3 Ending IPX

We can end an individual IPX circuit either from the Work with IPX Circuit Status menu or by using the command ENDIPXCCT.

We can end the AS/400 IPX router by using the ENDIPX command.

Attention

No confirmation display is shown when the ENDIPX command is entered. The ENDIPX command *immediately* ends all IPX processing on the AS/400.

Chapter 15. Scenario 8. IPX Routing between an AS/400 and a Novell Multiprotocol Router via a Frame Relay Connection

In this scenario we use an AS/400 (RALYAS4A) as an IPX Router to a Novell Multiprotocol Router (MPR) over a frame relay connection. Since the connection is permanent and not switched, we allow RIP and SAP to be exchanged over the connection. However, since both routers (the AS/400 and the MPR router) support NLSP, we use this in preference to standard RIP/SAP. For a WAN connection, NLSP is more efficient than RIP/SAP. Frame relay offers a relatively high-speed (up to 2.048 Mbps) connection. While normally used via a frame relay network, frame relay can be used in a point-to-point mode with one system acting as a frame handler (by specifying *FH in the AS/400 frame relay network interface).

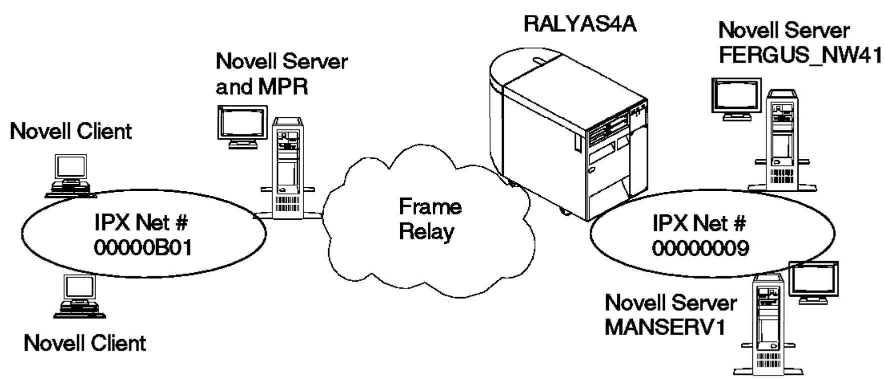

Figure 231. Environment for Scenario 8

Note that this configuration would work as above (with the Novell clients attached to the Novell MPR and the Novell servers attached to the AS/400) or with the clients attached to the AS/400 and the servers attached to the MPR (or provide access to the MPR server itself).

15.1 Novell MPR Hardware and Software Installed

The following hardware and software was installed on the Novell MPR PC.

- Hardware
  - Novell NW2000 wide area network adapter (manufactured by Eagle) and cable.
- Software
  - NetWare Multiprotocol Router 3.0
  - NetWare WAN Extensions 3.0

15.2 What Information Do We Need before We Start?

Table 22. RALYAS4A - Information Needed.

	Whom/Where	Token-Ring	WAN/Frame relay	RALYAS4A
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000009	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	N/A	N/A	N/A
FR DLCI	FR Provider	N/A	333	N/A
WAN Speed	FR Provider	N/A	256 Kbps	N/A
AS/400 Adapter Resource Names	WRKHDWRSC *CMN	LIN191	LIN111	N/A
IPX Router Name	Network Administrator	N/A	N/A	Router_1
AS/400 IPX Internal Network Number	Network Administrator	N/A	N/A	96AD0D47

Table 23. Novell MPR - Information Needed.

	Whom/Where	Token-Ring	WAN/Frame relay	MPR
Routing Protocol	Network Administrator	RIP	NLSP	N/A
LAN IPX Network Number	Network Administrator	00000B01	N/A	N/A
LAN Frame-type	Network Administrator	SSAP	N/A	N/A
LAN Speed	Network Administrator	4 Mb	N/A	N/A
FR DLCI	FR Provider	N/A	333	N/A
WAN Speed	FR Provider	N/A	256 Kbps	N/A

15.3 RALYAS4A Configuration

For this scenario we have to create the following configuration objects on RALYAS4A:

- Token-ring line description
- Frame relay interface description
- Frame relay line description
- IPX description
- IPX circuit for token-ring interface

IPX circuit for frame relay interface

15.3.1 Token-Ring Line Description

To create the token-ring line description, enter the following command:

```
CRTLINTRN LIND(TRN2619A)
          RSRCNAME(LIN191)
          LINESPEED(4M)
          TEXT('4M Token-Ring')
```

Tip

An existing token-ring line description can be used; there are no special configuration requirements to allow the line description to be used by IPX. However, you should check that SSAP x′E0′ has not be defined in the line description.

The important parameters in a token-ring line description for IPX are:

Line description (LIND)
The unique name for this line description.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the token-ring adapter you want to use.

Source service access point (SSAP)
Specifies the SSAP information, including an SSAP value, a maximum frame size and an SSAP type. The default value, *SYSGEN, automatically defines SSAP points: 04, 12, AA, and C8.

Attention

The SSAP x′E0′ to be used by IPX is not specified here. See frame type in the IPX circuit.

15.3.2 Frame Relay Network Interface

To create the frame relay network interface, enter the following command:

```
CRTNWIFR NWID(FR_IPX_A)
         RSRCNAME(LIN111)
         INTERFACE(*V35)
         LINESPEED(256000)
         TEXT('Frame Relay NWI Description RALYAS4A')
```

The important parameters in a frame relay network interface for IPX are:

Network interface description (NWID)
Specifies the unique name of the frame relay interface.

Resource name (RSRCNAME)
Use the Work with Hardware Resources (WRKHDWRSC) command with *CMN to find the correct resource name for the communications adapter you want to use.

Line speed (LINESPEED)
Specify here the line speed of the frame relay interface as per your frame relay network provider subscription.

15.3.3 Frame Relay Line Description

To create the frame relay line description, enter the following command:

```
CRTLINFR LIND(FR_IPX_A)
            NWI(FR_IPX_A)
            NWIDLCI(333)
            LINKSPEED(256000)
            TEXT('Frame Relay Line Description RALYAS4A')
```

The important parameters in a frame relay line description for IPX are:

Line description (LIND)
The unique name for this line description.

Network interface (NWI)
The network interface that this line description is to be associated with.

Link speed (LINKSPEED)
Specify here the link speed of the frame relay line as per your frame relay network provider subscription.

15.3.4 IPX Configuration

In this configuration example we create the IPX configuration via CL commands.

15.3.4.1 IPX Description

To create the IPX description, enter the following command:

```
CRTIPXD IPXD(RALYAS4A)
           IPXNETNBR(96AD0D47)
           IPXRTRNAME(ROUTER_1)
           Text('IPX Description for RALYAS4A')
```

The important parameters in an IPX description are:

IPX description (IPXD)
We use the system name for the IPX description name.

IPX internal network number (IPXNETNBR)
The IPX network number used for the AS/400's internal network number must be unique to all other network numbers (internal and external) in this IPX network.

IPX routing protocol (IPXRTGPCL)
In this configuration we use RIP over the LAN connections and over the WAN connection.

IPX router name (IPXRTRNAME)
We have chosen to use the name Router_1 for this IPX router.

15.3.4.2 IPX Circuits

To create the IPX circuits for the token-ring and frame relay interfaces, enter the following commands:

```
ADDIPXCCT CCTNAME(TRN2619A) LIND(TRN2619A) IPXNETNBR(00000009)
ENBNLSP(*NO)
ADDIPXCCT CCTNAME(MPR_FRAME_RELAY) LIND(FR_IPX_A)
```

The important parameters in an IPX circuit for the token-ring interface are:

Circuit name (CCTNAME)
: We use the line description name for the circuit name.

Line description (LIND)
: The token-ring line description created above.

IPX network number (IPXNETNBR)
: The network number associated with the token-ring LAN segment.

Enable for NLSP (ENBNLSP)
: We only use RIP and SAP.

The important parameters in an IPX circuit for frame relay are:

Circuit name (CCTNAME)
: We use the line description name for the circuit name.

Line description (LIND)
: The line description created above.

Enable for NLSP (ENBNLSP)
: For the frame relay interface circuit we use NLSP, this is the default.

Note

Since we have configured the circuits to allow RIP and SAP to flow (via NLSP), we do not have to configure IPX circuit routes or IPX circuit services.

15.4 MPR Configuration

The Novell multiprotocol router is configured as shown in the following panels. Note that the configuration process flows down the panel: we start with the top item on the main menu (Boards) and work through to Bindings.

15.4.1 Network Adapter Configuration

The Novell MPR adapter configuration is as follows.

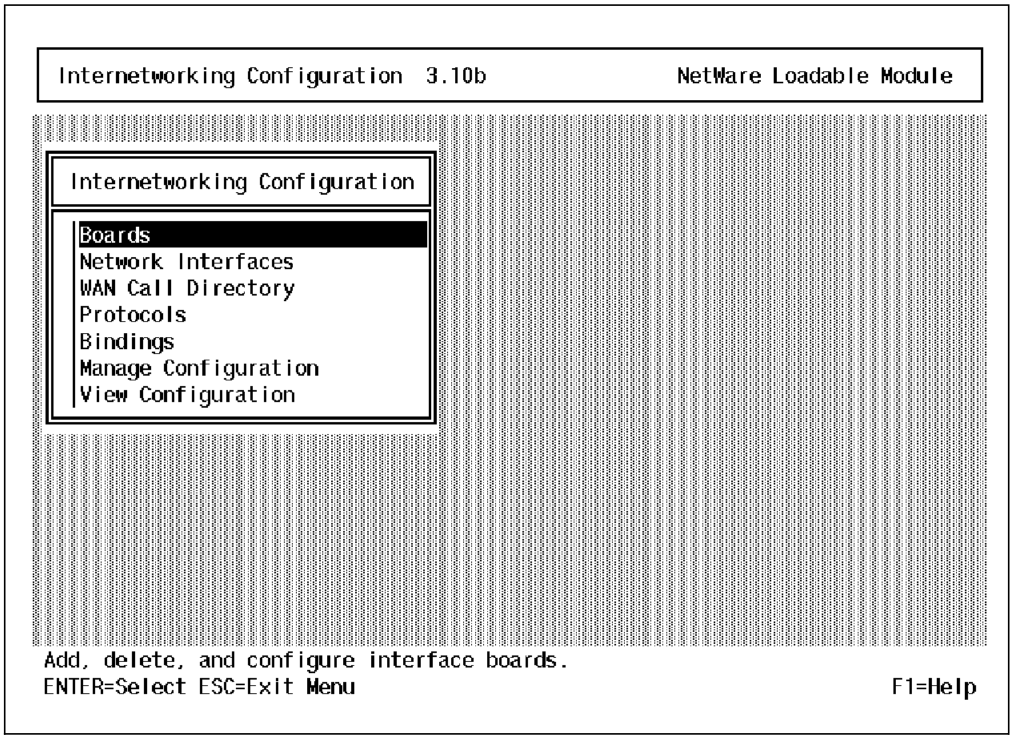

Figure 232. MPR Main Configuration Menu

Select **Boards** from the main configuration menu.

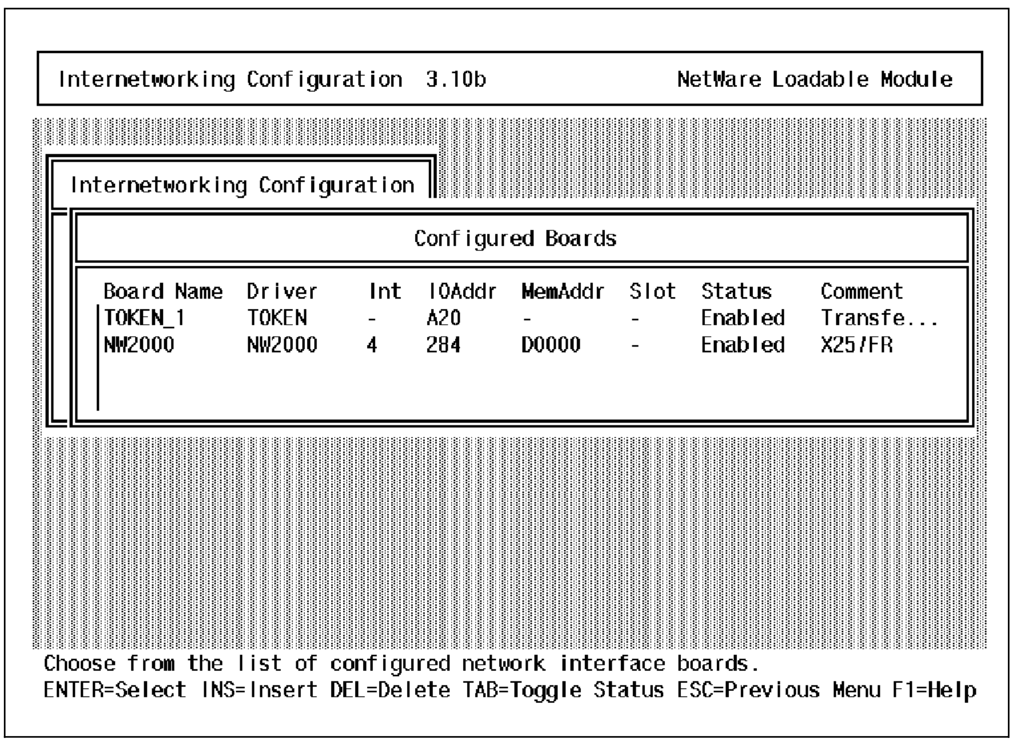

Figure 233. MPR Network Board Configuration

Figure 233 shows the installed network adapters.

15.4.2 Network Interface Configuration

The Novell MPR interface configuration is as follows.

```
Internetworking Configuration  3.10b             NetWare Loadable Module

 Internetworking Configuration

  Boards
  Network Interfaces
  WAN Call Directory
  Protocols
  Bindings
  Manage Configuration
  View Configuration

Configure the network interfaces on configured boards.
ENTER=Select ESC=Exit Menu                                        F1=Help
```

Figure 234. MPR Main Configuration Menu

Select **Network Interfaces** from the main configuration menu.

```
Internetworking Configuration  3.10b             NetWare Loadable Module

 Internetworking Configuration

  Boar                      Network Interfaces
  Netw
  WAN    Board Name  Port   Int. Name    Media         Status
  Prot   TOKEN_1     -      TOKEN_1      Token Ring    Enabled
  Bind   NW2000      1      NW2000_1     Frame Relay   Enabled
  Mana   NW2000      2      NW2000_2     -             Unconfigured
  View

Choose from the list of network interfaces.
ENTER=Select TAB=Toggle Status F3=Rename DEL=Delete ESC=Previous Menu  F1=Help
```

Figure 235. MPR Configured Network Interfaces

The NW2000 interface board port 1 is configured for frame relay. In Figure 235 we have selected to view the parameters associated with the frame relay interface.

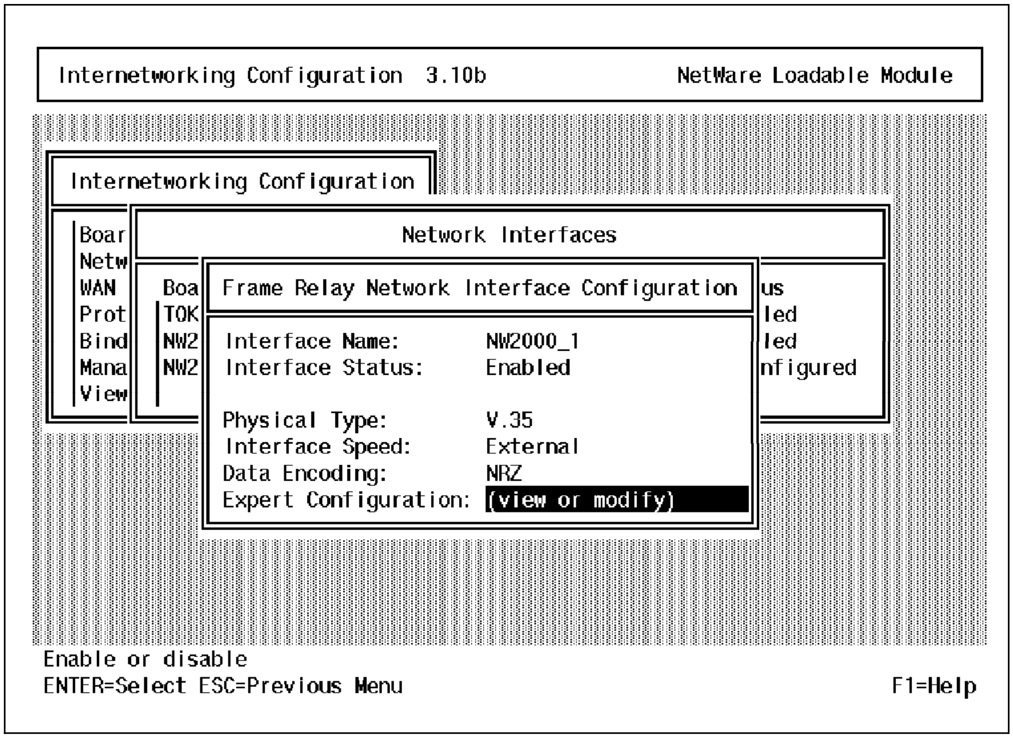

Figure 236. MPR Frame Relay Network Interface Configuration

Figure 236 shows the frame relay interface type, that external clocking has been selected and that NRZ encoding is used. We have selected to view the frame relay expert configuration.

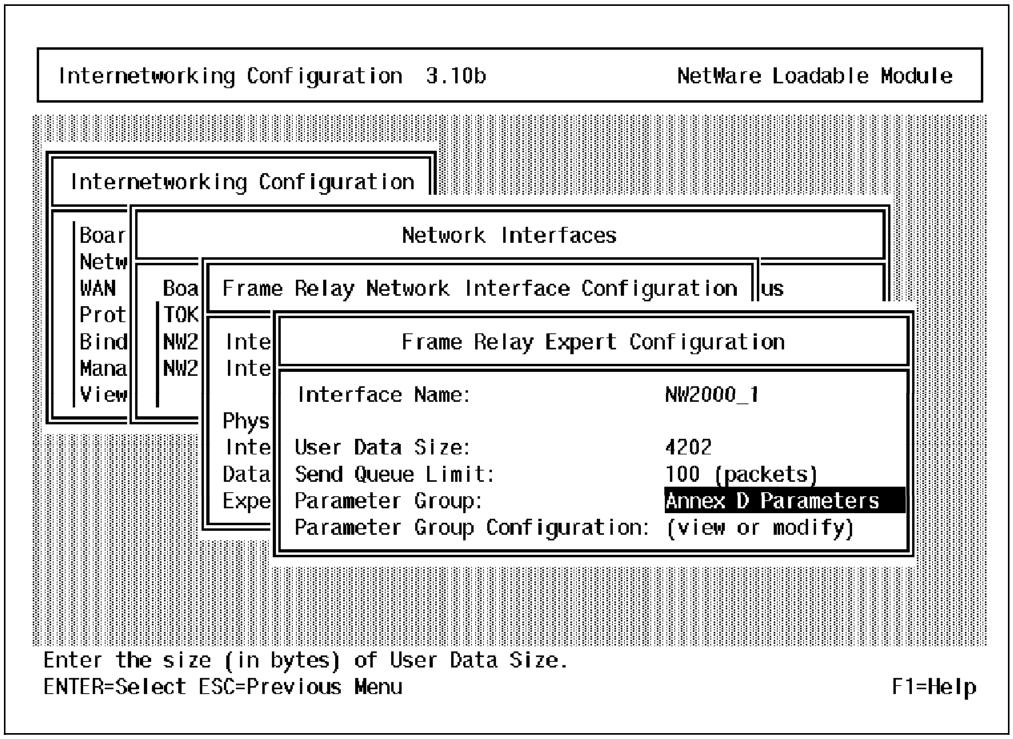

Figure 237. MPR Frame Relay Expert Configuration

In Figure 237 we can configure any special requirements for the frame relay network connection. We have selected to view the Annex D parameters.

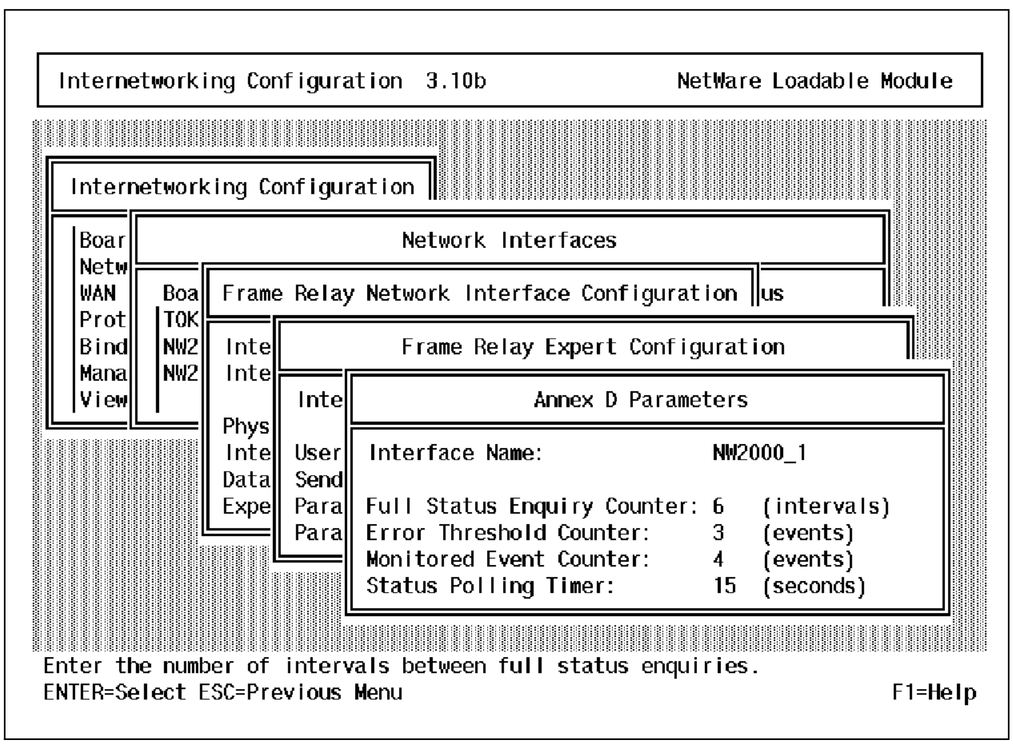

Figure 238. MPR Frame Relay Annex D Parameters

In Figure 238 we see the frame relay Annex D parameters configured.

15.4.3 WAN Call Directory Configuration

The Novell MPR call directory configuration is as follows.

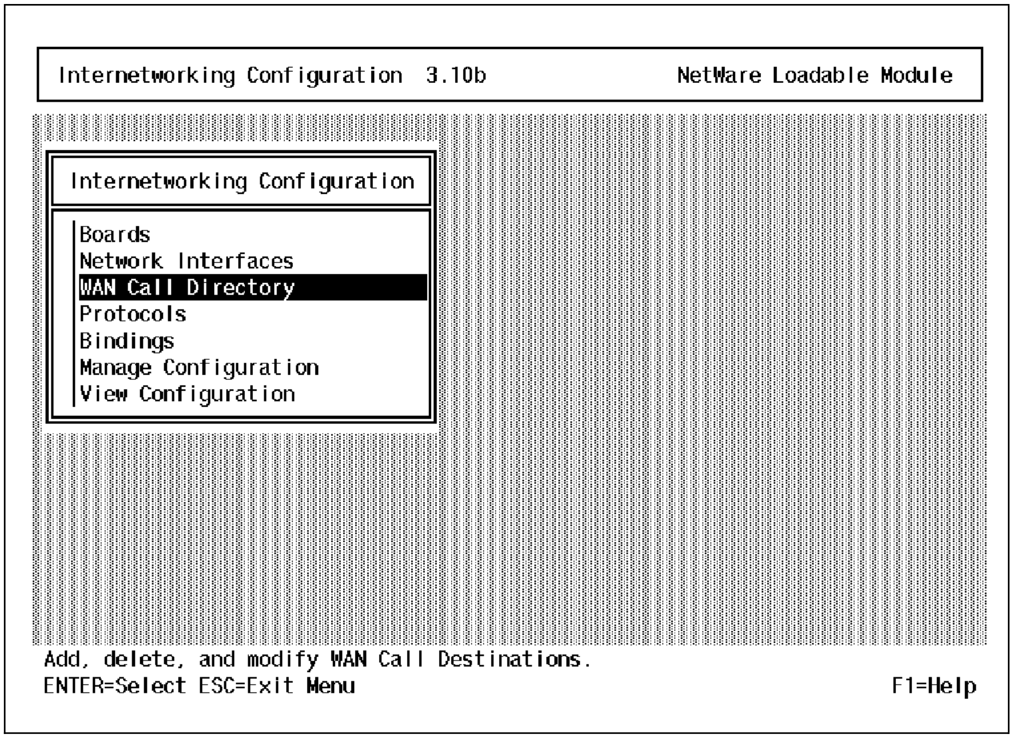

Figure 239. MPR Main Configuration Menu

Select **WAN Call Directory** from the main configuration menu.

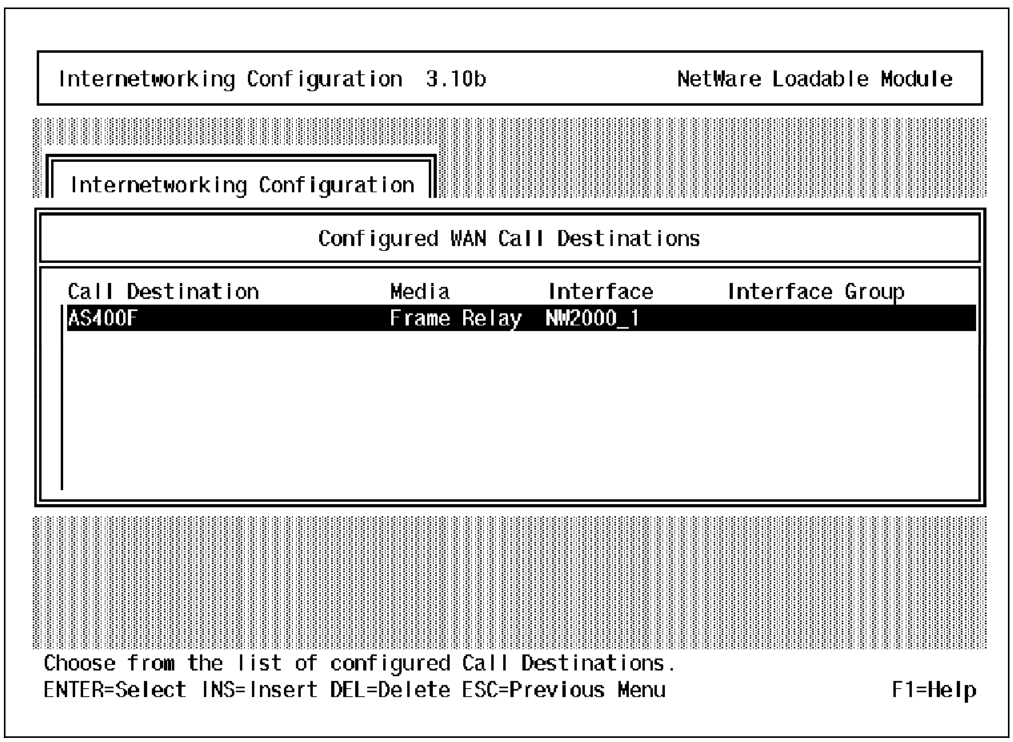

Figure 240. MPR WAN Call Destinations

A call destination of AS400F has been configured for a frame relay connection to the AS/400. In Figure 240 we have selected to view the configuration associated with this call destination.

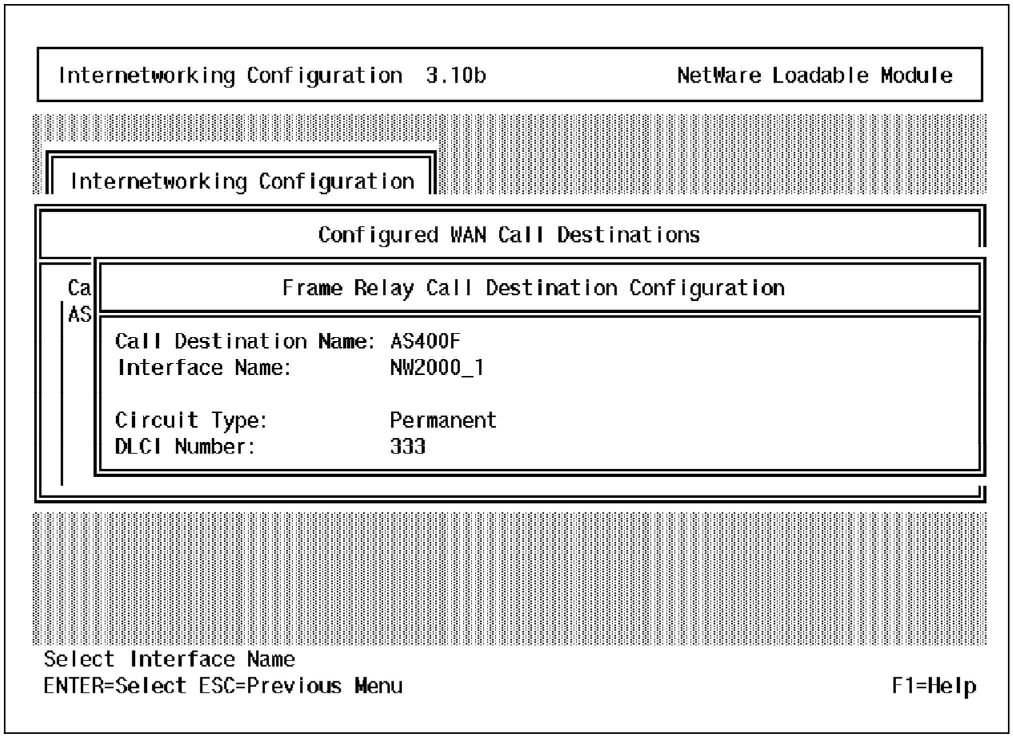

Figure 241. MPR X.25 Call Destination Configuration

In Figure 241 the frame relay DLCI number is configured.

15.4.4 Protocol Configuration

The Novell MPR protocol configuration is as follows.

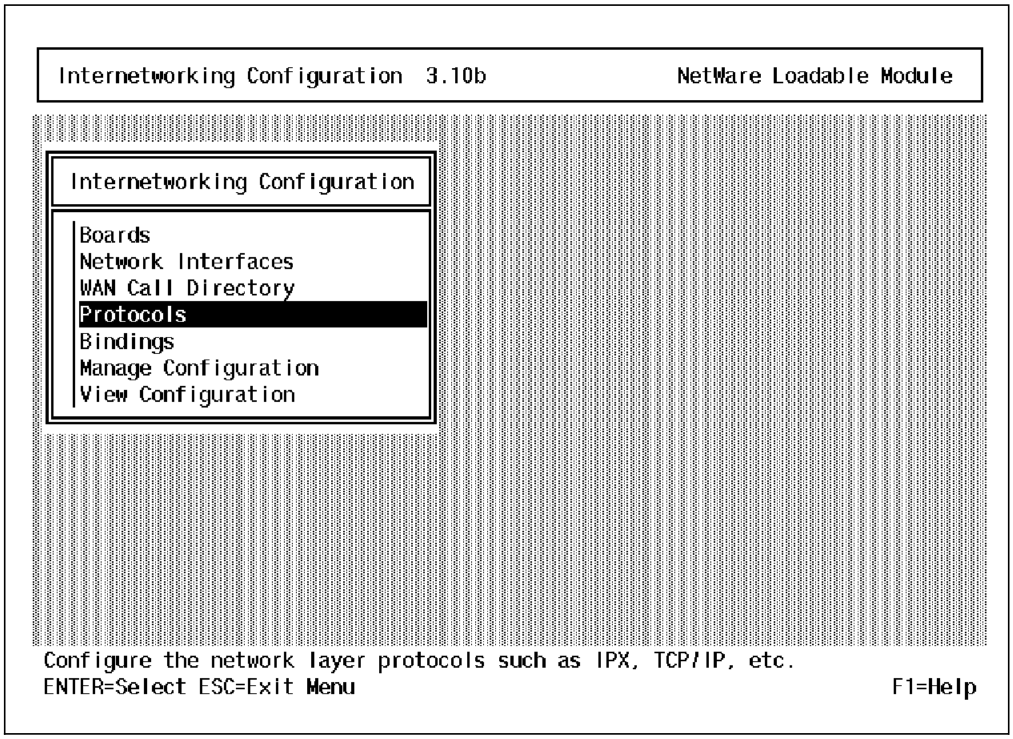

Figure 242. MPR Main Configuration Menu

Select **Protocols** from the main configuration menu.

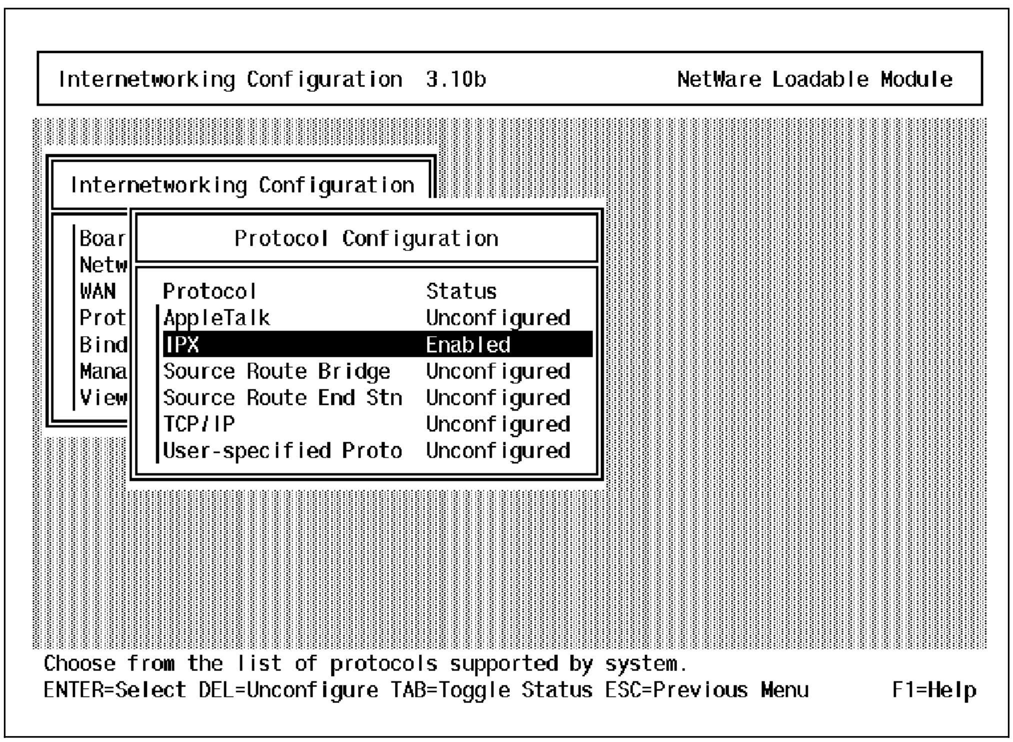

Figure 243. MPR Protocol Configuration

In Figure 243 we can see that IPX has been enabled. We have selected to view the IPX protocol configuration parameters.

```
Internetworking Configuration  3.10b           NetWare Loadable Module

                     IPX Protocol Configuration

Packet Forwarding:                     Enabled
Routing Protocol:                      NLSP with RIP/SAP Compatibility

On Demand Calls:                       Disabled
Static Services for On Demand Calls:
Static Routes for On Demand Calls:

Tunnel IPX Through IP:                 Disabled
Tunnel Configuration:

Filtering Support:                     Disabled
Expert Configuration Options:          (Select to Configure)

Enable to operate this server as a router. Disable to operate as an end node.
ENTER=Select ESC=Previous Menu                                        F1=Help
```

Figure 244. MPR IPX Protocol Configuration

In Figure 244 we can see that the MPR packet forwarding capability and NLSP have been enabled. We have selected to view the IPX expert configuration.

```
Internetworking Configuration  3.10b           NetWare Loadable Module

                        IPX Expert Configuration

Get Nearest Server Requests:           Accept
Override Nearest Server:               Disabled
Nearest Server:
Advanced Packet Type 20 Flooding:      Enabled

Hop Count Limit:                       64
Maximum Number of Path Splits:         1
LSP Size:                              512

NLSP Local Area Addresses:             (Select to Configure)
Override NLSP System ID:               Disabled
NLSP System Identification:
NLSP Convergence Rate:                 Default
NLSP Convergence Rate Configuration:   (Select to View)

IPX/SPX Parameters:                    (Select to View/Configure)

Specifies whether get nearest server requests should be ignored.
ENTER=Select ESC=Previous Menu                                        F1=Help
```

Figure 245. MPR IPX Expert Configuration

In Figure 245 we can configure any special IPX configuration requirements. For example, we can see that Get Nearest Server Requests are accepted by this router. This allows the MPR PC to respond to get-nearest-server requests from PCs attached to its LAN interface.

15.4.5 Bindings Configuration

The Novell MPR bindings configuration is as follows.

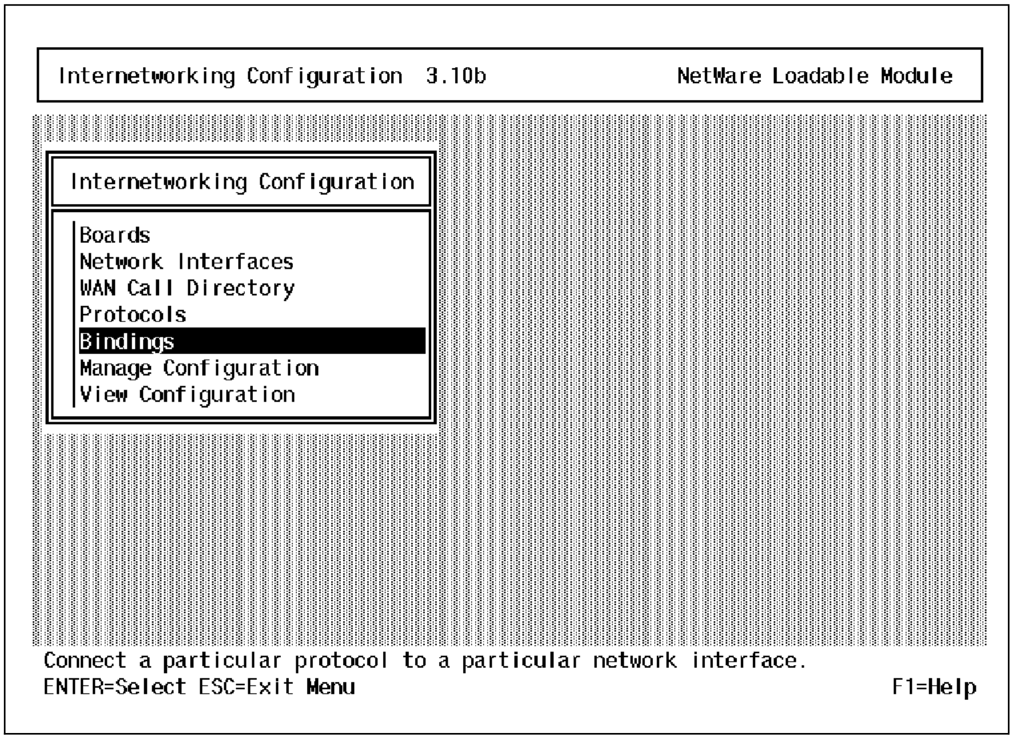

Figure 246. MPR Main Configuration Menu

Select **Bindings** from the main configuration menu.

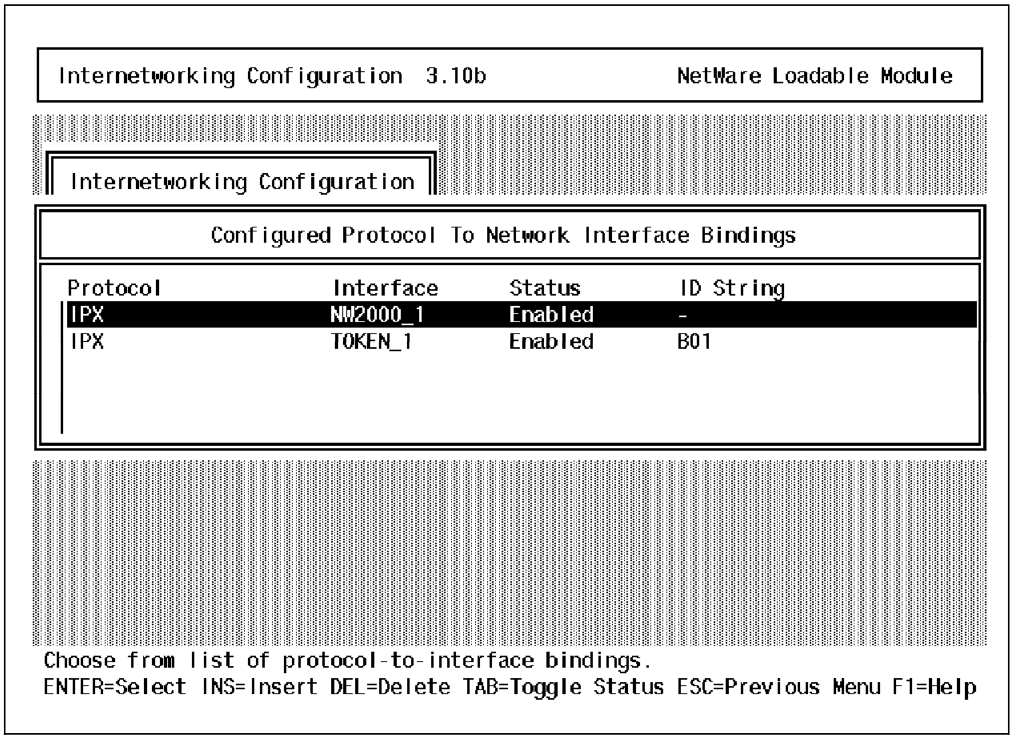

Figure 247. MPR Protocol to Interface Binding

In Figure 247 we can see that IPX has been bound to the WAN interface (NW2000_1) to be used to the AS/400. We have selected to view the configuration parameters associated with this binding.

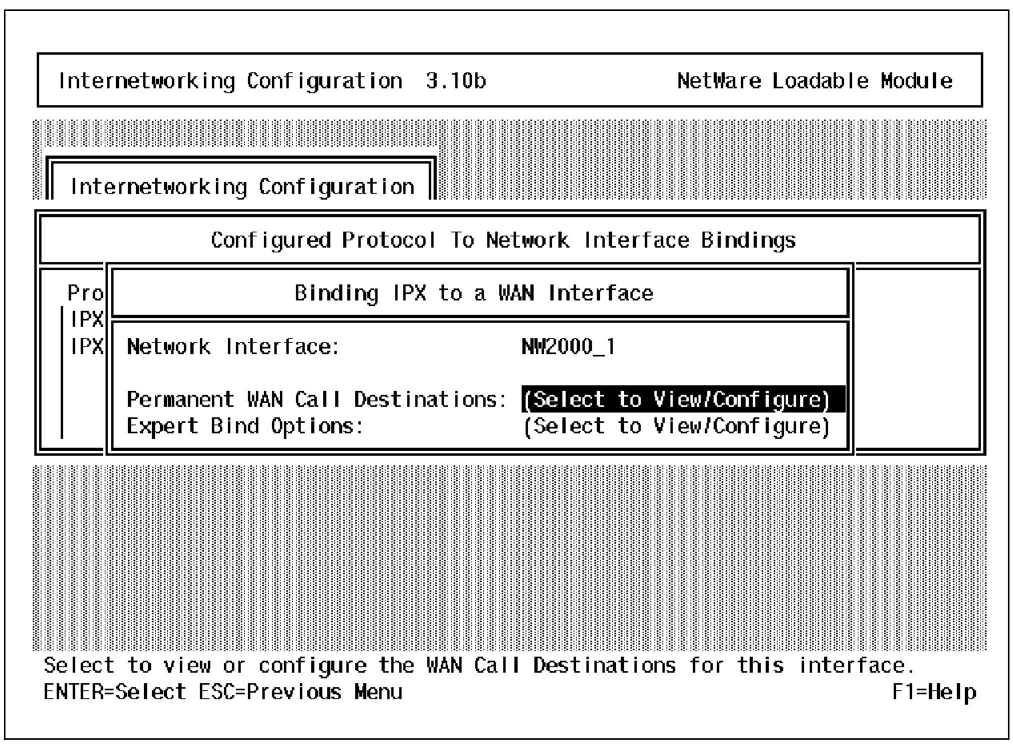

Figure 248. MPR Binding IPX to a WAN Interface

In Figure 248 we have selected to view the permanent call destinations associated with the WAN interface.

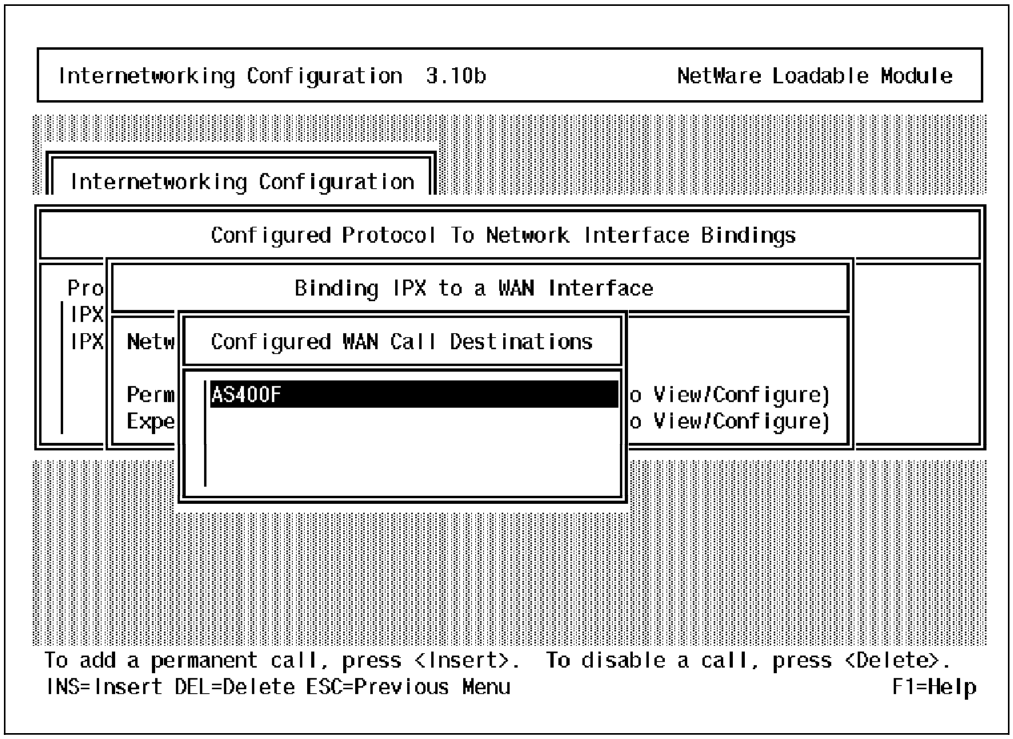

Figure 249. MPR Configured WAN Call Destinations

AS400F is the call destination name for the AS/400 connection. In Figure 249 we have selected to view the configuration parameters associated with this call destination.

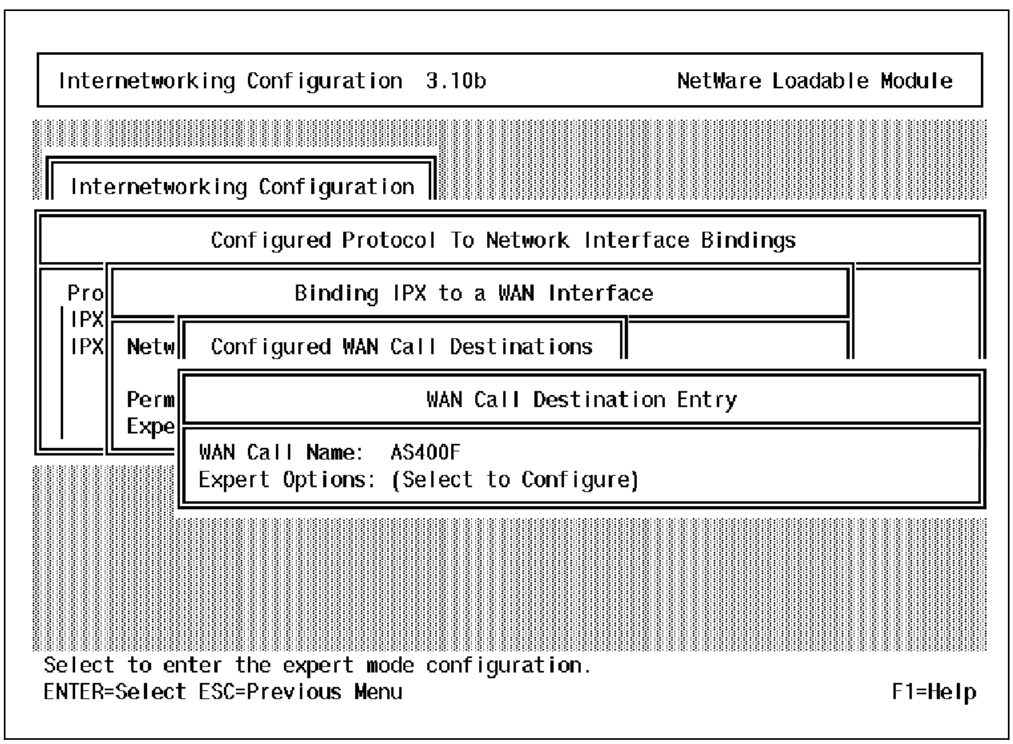

Figure 250. MPR WAN Call Destination Entry

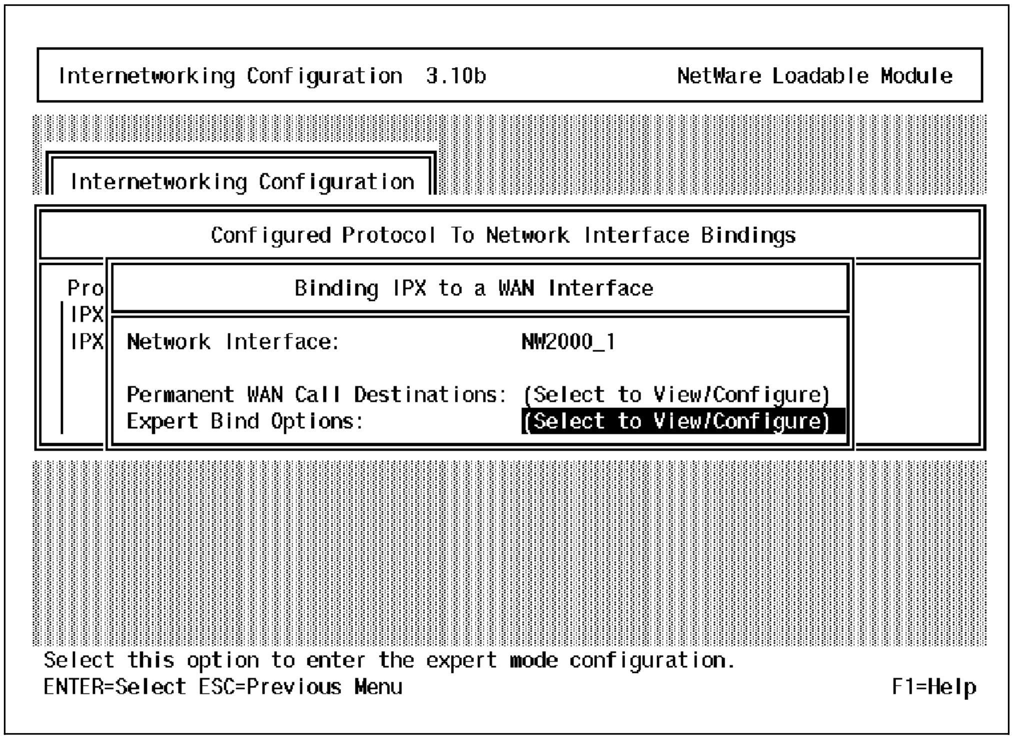

Figure 251. MPR Binding IPX to a WAN Interface

In Figure 251 we have selected to look at the WAN interface expert IPX bind options.

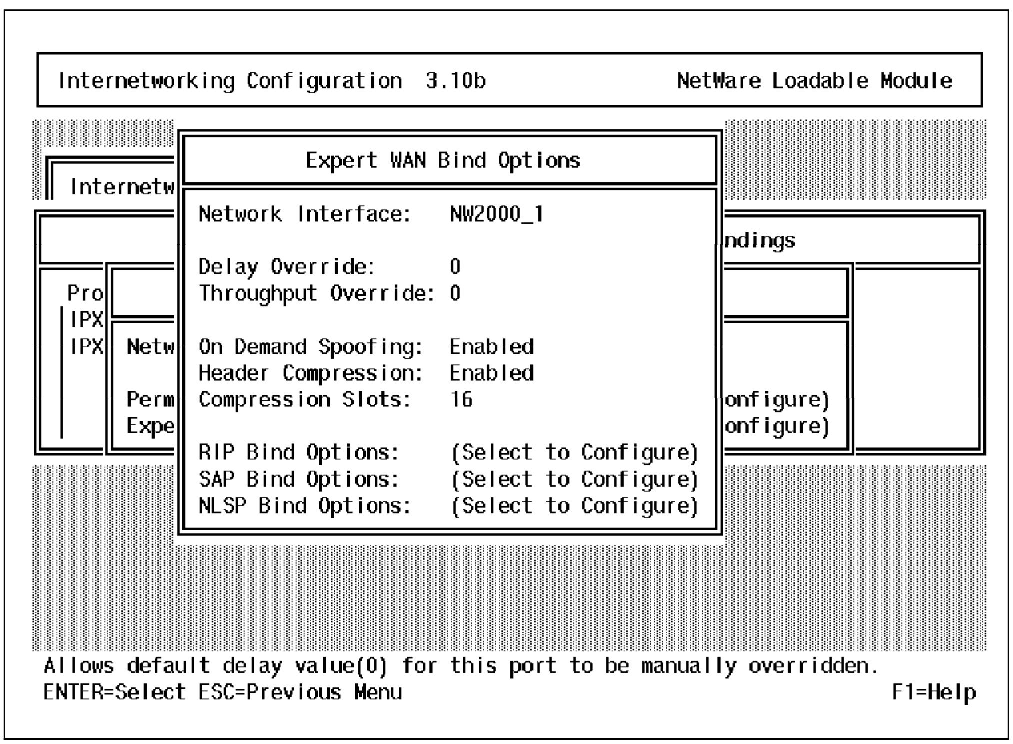

Figure 252. MPR IPX Expert Configuration

In Figure 252 we can configure any special IPX configuration requirements. For example, via this panel we can select to disable RIP/SAP/NLSP on the WAN interface. Like the AS/400, by default these are all set to AUTO.

```
Internetworking Configuration  3.10b            NetWare Loadable Module

  Internetworking Configuration

             Configured Protocol To Network Interface Bindings

  Protocol               Interface      Status        ID String
  IPX                    NW2000_2       Enabled       -
  IPX                    TOKEN_1        Enabled       B01

Choose from list of protocol-to-interface bindings.
ENTER=Select INS=Insert DEL=Delete TAB=Toggle Status ESC=Previous Menu F1=Help
```

Figure 253. MPR Protocol to Interface Binding

In Figure 253 we can see that IPX has been bound to the LAN interface. We have selected to view the configuration parameters associated with this binding.

```
Internetworking Configuration  3.10b            NetWare Loadable Module

  Internetworking Configuration

             Configured Protocol To Network Interface Bindings

  Pro          Binding IPX to a LAN Interface             ing
  IPX
  IPX  Network Interface:   TOKEN_1

       IPX Network Number:  B01
       Frame Type:          Token-Ring
       Expert Bind Options: (Select to View/Configure)

Enter the IPX network number assigned to this physical network.
ENTER=Select ESC=Previous Menu                                   F1=Help
```

Figure 254. Binding IPX to a LAN Interface

In Figure 254 we can see details of the IPX LAN binding. For example the network number associated with this interface.

15.5 Starting and Verifying the IPX Router Support

Before we can start the IPX support on the AS/400, we have to vary on the network interface and line descriptions being used by the IPX circuits. We can do this by entering the following commands:

```
VRYCFG CFGOBJ(TRN2619A) CFGTYPE(*LIN) STATUS(*ON)
VRYCFG CFGOBJ(FR_IPX_A) CFGTYPE(*NWI) STATUS(*ON)
VRYCFG CFGOBJ(FR_IPX_A) CFGTYPE(*LIN) STATUS(*ON)
```

15.5.1 Starting IPX

To start IPX using the IPX descriptions we created above, enter the following commands:

```
STRIPX RALYAS4A
```

Starting the AS/400 IPX Support creates a *NET controller and an *NET device description.

15.5.2 Verifying the IPX Configuration

To verify that the frame relay interface and line description have become active and that the *NET controller and device descriptions have been created and are also active, use the command WRKCFGSTS. For example, if we enter the command `WRKCFGSTS *NWI FR_IPX_A` on RALYAS4A, we see the panel shown in Figure 255.

```
                         Work with Configuration Status                RALYAS4A
                                                             03/20/97  16:20:48
Position to  . . . . .               Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description       Status                -------------Job--------------
     FR_IPX_A          ACTIVE
       FR_IPX_A        ACTIVE
         FR_IPNET      ACTIVE
           FR_IPIPX    ACTIVE                QIPX        QSYS        008186






                                                                         Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 255. WRKCFGSTS X25 Line RALYAS4A

From Figure 255 we can see that the IPX network controller (*NET) has become active with the QIPX job.

Tip

STRIPX starts all IPX Circuits that have AUTOSTART set to *YES.

To verify that the IPX circuits have become active, use the WRKIPXSTS command. For example, if we enter the command WRKIPXSTS OPTION(*CCT) on RALYAS4A, we see the panel shown in Figure 256 on page 264.

```
                         Work with IPX Circuit Status
                                                         System:   RALYAS4A
 Type options, press Enter.
   5=Display details   7=Display associated services
   8=Display associated routes   9=Start   10=End
   12=Work with configuration status

        Circuit                  Line        Line          Circuit
 Opt    Name                  Description    Type          Status
        MPR_FRAME_RELAY       FR_IPX_A       *FR           Active
        TRN2619A              TRN2619A       *TRLAN        Active










                                                                     Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 256. Work with IPX Circuit Status

In Figure 256 we see that the LAN and WAN circuits have become active. Both circuits were started automatically because we accepted the default of *YES for Automatic start in the IPX circuits.

To verify that the IPX routes have been propagated between the routers, we can use the command WRKIPXSTS. For example, if we enter the command WRKIPXSTS OPTION(*RTE) on RALYAS4A, we see the panel shown in Figure 257 on page 265.

```
                         Display IPX Route Information
                                                           System:   RALYAS4A
Type options, press Enter.
  5=Display details

        Remote        Number      Number      Next Hop         Route
Opt     Network      of Hops     of Ticks     Node Address     Source
        00000009         0            1       *NONE            *CCT
        00000B01         1           16       *NONE            *NLSP
        30AA0F92         1            2       400052005240     *RIP
        31AC7F25         1           16       *NONE            *NLSP
        31ECF1DD         1            2       08005A0D2860     *RIP
        53914BBA         1            2       08005A0D294A     *RIP
        96AD0D47         0            1       000000000001     *LOCAL
        E46366AE         1           24       0001CB32C00A     *RIP








                                                                       Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 257. Display IPX Route Information

To verify that the IPX services information has been propagated between the routers, we can use the command WRKIPXSTS. For example, if we enter the command WRKIPXSTS OPTION(*SRV) on RALYAS4A, we see the panel shown in Figure 258.

```
                        Display IPX Service Information
                                                           System:   RALYAS4A
Type options, press Enter.
  5=Display details

       Service               Service        Remote      Hops to    Service
Opt    name                  Type           Network     Service    Source
       FERGUS_NW41           *FILESVR       31ECF1DD        1      *SAP
       MANSERV1              *FILESVR       30AA0F92        1      *SAP
       MPR                   *FILESVR       31AC7F25        1      *SAP
       NW41SERV              *FILESVR       53914BBA        1      *SAP
       BSER4.00-6.10_30A>    004B           30AA0F92        1      *SAP
       BSER4.00-6.10_539>    004B           53914BBA        1      *SAP
       ISMANSERV11841501>    0102           30AA0F92        1      *SAP
       ISNW41SERV0787289>    0102           53914BBA        1      *SAP
       IVMANSERV11841501>    0102           30AA0F92        1      *SAP
       IVNW41SERV0787289>    0102           53914BBA        1      *SAP
       LANPROTECT1841501>    0102           30AA0F92        1      *SAP
       LDPNVIRUS_PROTECT>    0102           53914BBA        1      *SAP
       FERGUS_NW41           0107           31ECF1DD        1      *SAP
       MANSERV1              0107           30AA0F92        1      *SAP
                                                                      More...
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 258. Display IPX Service Information Screen

We can now verify the connection with the IPXPING command. IPXPING is very similar to TCP/IP PING. Here we ping the MPR's internal IPX network address from RALYAS4A.

```
                           Verify IPX Connection (IPXPING)

 Type choices, press Enter.

 Remote IPX network number  . . . > 31AC7F25      00000001-FFFFFFFD
 Remote IPX node address  . . . . > 1             000000000001-FFFFFFFFFFFE...

                              Additional Parameters

 Message mode . . . . . . . . . .   *VERBOSE      *VERBOSE, *QUIET
 Packet length (in bytes) . . . .   256           8-65495
 Number of packets  . . . . . . .   5             1-999
 Wait time (in seconds) . . . . .   5             1-120




                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 259. Verify IPX Connection

```
                               Display All Messages
                                                              System:   RALYAS4A
Job . . :   WTR0528S01    User . . :   MICK         Number . . . :   008191

3 > IPXPING RMTNETNBR(31AC7F25) RMTNDEADR(1) WAITTIME(5)
    Verifying connection to remote system at network number 31AC7F25, node
      address 000000000001.
    Connection verification 1 took .175 seconds.  1 successful connection
      verifications.
    Connection verification 2 took .108 seconds.  2 successful connection
      verifications.
    Connection verification 3 took .106 seconds.  3 successful connection
      verifications.
    Connection verification 4 took .106 seconds.  4 successful connection
      verifications.
    Connection verification 5 took .106 seconds.  5 successful connection
      verifications.
    Round-trip (in milliseconds) min/avg/max = 106/120/175
    Connection verification statistics: 5 of 5 successful (100 %).
                                                                        More...
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F17=Top   F18=Bottom
```

Figure 260. Verify IPX Connection Joblog

As a final verification step we verified a successful login to a NetWare server from a NetWare client.

15.5.3 Ending IPX

We can end an individual IPX circuit either from the Work with IPX Circuit Status menu or by using the command ENDIPXCCT.

We can end the AS/400 IPX router by using the ENDIPX command.

Attention

No confirmation display is shown when the ENDIPX command is entered. The ENDIPX command *immediately* ends all IPX processing on the AS/400.

Chapter 16. Comparison between the AS/400 IPX Router and a Multiprotocol Router

We have seen in this redbook that the AS/400 now has the capability to be an IPX router and that this IPX router capability can be used either locally (between LAN adapters on the same AS/400) or via a wide area (WAN) connection. We have also seen that the wide area links over which this IPX data flows can be concurrently used by other protocols (TCP/IP and APPN). The AS/400 would not, however, be used as a dedicated IPX router. In this chapter we compare this IPX router capability with that of a dedicated multiprotocol router (for example, with the IPX router support provided by an IBM 2210 multiprotocol router).

16.1 AS/400 / IBM 2210 Router Support Comparison

In Table 24 we compare interface types supported for IPX routing by the AS/400 and an IBM 2210.

Table 24. LAN and WAN Routing Support

Type	Function	AS/400	IBM 2210
IPX local routing	Token-ring to token-ring	Yes	Yes
	Token-ring to Ethernet	Yes	Yes
	Ethernet to Ethernet	Yes	Yes
IPX remote routing	LAN-to-LAN over Frame relay	Yes	Yes
	LAN-to-LAN over X.25	Yes	Yes
	LAN-to-LAN over PPP	No	Yes

We can see from Table 24 that, with the exception of PPP, the interfaces supported are the same. Now let′s look at some other IPX router capabilities.

Table 25. IPX Router Capabilities

Function	AS/400	IBM 2210
IPXWAN	Yes	Yes
IPXWAN V2	Yes	No
RIP and SAP	Yes	Yes
NLSP	Yes	No
Static routes and services	Yes	No
Get nearest server request handing	Yes	Yes

We can see from Table 25 that, outside of the interface support provided, there are significant differences between the AS/400 and IBM 2210 IPX router support implementations. It is these differences (in particular the difference for on-demand connections) that makes interoperability between the two limited.

16.2 Selecting the Right IPX Router Solution

In the above sections we have looked at some of the differences between the AS/400 IPX router support and that provided by a multiprotocol router. In this section we look at some additional areas that should considered when looking for the right IPX router solution.

16.2.1 Protocol Prioritization

A LAN is a shared media that normally has sufficient bandwidth for us to not have to worry about protocol prioritization, that is, has sufficient bandwidth for the concurrent use of different protocols (SNA, TCP/IP, IPX, etc.) without one protocol affecting the performance of another. A WAN (wide area network) would normally, however, have a much lower bandwidth. With a WAN it is therefore much more relevant for us to look at ways to prevent one protocol consuming excessive amounts of bandwidth to the detriment of the other protocols. A multiprotocol router would normally have a mechanism for achieving this. For example, on an IBM 2210, BRS (bandwidth reservation system) can be used to achieve this. On the AS/400, however, although we can have multiple protocols sharing a wide area connection, no mechanism exists to protect these protocols from each other.

16.2.2 Manageability

Configuration, problem determination and maintenance are all aspects of the manageability of a network solution. With the AS/400 IPX router solution, these areas are taken care of from the aspect of the AS/400. That is, we can manage the AS/400 IPX router from the same interface as we would manage other aspects of the AS/400′s communications support. If, however, we use a multiprotocol router solution, then the routers have to be managed external to the AS/400.

16.2.3 Skills

Both solutions require an understanding of the basics of an IPX router for example, an understanding of RIP/SAP, etc. However in addition to these skills, a multiprotocol router requires skills in the basic configuration and maintenance of the router. On the other hand, the configuration and maintenance of the AS/400 IPX router is as for the configuration and maintenance of any other aspect of the AS/400′s communications support.

16.2.4 Multiprotocol Connectivity

We have seen how, in addition to IPX, the WAN connection between two AS/400s can be used for SNA and TCP/IP. If, however, there is a requirement for greater connectivity (support for more protocols) between two sites, then a multiprotocol router will offer this greater connectivity, for example, support for NetBIOS, DecNet, etc.

16.2.5 Integrated Solution

If we use the AS/400 IPX router support, then no additional hardware is required. With a multiprotocol router solution we have to purchase the routers.

Appendix A. Communication Traces

In this section we take a look at some IPX communications traces. First, we look at traces taken from the AS/400 and then at a trace taken using DatagLANce.

A.1 AS/400 to AS/400 X.25 On-Demand (Outgoing Call)

This AS/400 trace shows the establishment of an X.25 on-demand session between AS/400s. The trace is taken from the setup in scenario 2 (Chapter 9, “Scenario 2. IPX Routing between AS/400s via an On-Demand X.25 SVC Connection” on page 105).

The trace shows the establishment of the X.25 circuit, the IPXPING and then the X.25 circuit brought down by the idle timer expiring. The trace is taken from the AS/400 that made the IPXPING.

The trace is shown formatted for IPX (Format IPX data only).

Format IPX data only

The following PTFs provide IPX trace format capability:

- V3R2 PTF MF13610 and co-req PTF MF13625
- V3R7 PTF MF13493

```
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A             05/09/97  11:31:12                          Page:       1
  Trace Description  . . . . . :   IPXPING TO RALYAS4A
  Configuration object . . . . :   X25LINE_B
  Type . . . . . . . . . . . . :   1            1=Line, 2=Network Interface
                                                3=Network server
  Object protocol  . . . . . . :   X.25
  Start date/Time  . . . . . . :   05/09/97  11:22:39
  End date/Time  . . . . . . . :   05/09/97  11:31:00
  Bytes collected  . . . . . . :   30739
  Buffer size  . . . . . . . . :   3            1=128K, 2=256K, 3=2048K
                                                4=4096K, 5=6144K, 6=8192K
  Data direction . . . . . . . :   3            1=Sent, 2=Received, 3=Both
  Stop on buffer full  . . . . :   N            Y=Yes, N=No
  Number of bytes to trace
    Beginning bytes  . . . . . :   *CALC        Value, *CALC
    Ending bytes   . . . . . . :   *CALC        Value, *CALC
  Controller name  . . . . . . :   *ALL         *ALL, name
  Data representation  . . . . :   3            1=ASCII, 2=EBCDIC, 3=*CALC
  Format SNA data only . . . . :   N            Y=Yes, N=No
  Format RR, RNR commands  . . :   N            Y=Yes, N=No
  Format TCP/IP data only  . . :   N            Y=Yes, N=No
  Format IPX data only     . . :   Y            Y=Yes, N=No
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A             05/09/97  11:31:12                          Page:       2
Record Number . . . .  Number of record in trace buffer (decimal)
S/R . . . . . . . . .  S=Sent   R=Received    M=Modem Change
Data Length . . . . .  Amount of data in record (decimal)
  Packet Types:
  ------------
   IN CALL  . . . . .  Incoming Call
   CLR CFM  . . . . .  Clear Confirmation
   DATA   . . . . . .  Data
   CALL CONN  . . . .  Call Connected
   CLR IND  . . . . .  Clear Indication
   INT  . . . . . . .  Interrupt
   INT CFM  . . . . .  Interrupt Confirm
   RR . . . . . . . .  Receive Ready
   RNR  . . . . . . .  Receive Not Ready
   RST IND  . . . . .  Reset Indication
   RST CFM  . . . . .  Reset Confirmation
   RSTRT IND  . . . .  Restart Indication
   RSTRT CFM  . . . .  Restart Confirmation
   DIAG . . . . . . .  Diagnostic
   CALL REQ . . . . .  Call Request
   CALL ACC . . . . .  Call Accept
   CLR REQ  . . . . .  Clear Request
   REJ  . . . . . . .  Reject
   RST REQ  . . . . .  Reset Request
   ********** . . . .  Packet Type Not Valid
  Packet Header Information:
  -------------------------
   Q-BIT  . . . . . .  Qualifier Bit
   A-BIT  . . . . . .  Address Bit
   D-BIT  . . . . . .  Delivery Confirmation Bit
   LCGN . . . . . . .  Logical Channel Group Number
   LCN  . . . . . . .  Logical Channel Number
   P(R) . . . . . . .  Packet Receive Sequence Number (next packet expected)
   P(S) . . . . . . .  Packet Send Sequence Number
   M-BIT  . . . . . .  More Data Bit
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A             05/09/97  11:31:12                          Page:       3
Record       Data    Record    Record  Data    Controller             Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length  Status    Timer   Type    Name/Number    Command Sent     Received  Final  Type        Header    Type
------  ---  ------  --------  ------  ------  -------------  ------- ------   --------  -----  ----------  --------  -----
     1   S       23  00000000  1509.2  EBCDIC  X25LINET  /01   I         1         1     OFF    CALL REQ    10040B    NSNA
                     Packet Header :  LCGN= 0   LCN=  4
                     Data . . . :  991011002051011002010642OC0C430707800000008137                *R....................A.       *
     3   R       11  00000000  1511.5  EBCDIC  X25LINET  /03   I         1         2     OFF    CALL CONN   10040F    NSNA
                     Packet Header :  LCGN= 0   LCN=  4
                     Data . . . :  9910110020510110020100                                        *R..........                   *
     5   S      576  00000000  1511.7  EBCDIC  X25LINET  /01   I         2         2     OFF    DATA        100400    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                  P(S)=  0  P(R)=  0
                     IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                      Hop Count:   0
                                   Src Addr  : 00000000:000000000000:9004 (IPW2)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                     IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
                     IW2  . . . :  WPkt Type: 0x00 (TIMER REQ)  WNode ID: 0x00000000  WSeq No.:   0  # Options:   5
                     Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                   Routing Type: 0x01 (NLSP)
                     Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                   Routing Type: 0x02 (Unnumbered RIP)
                     Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                   Routing Type: 0x00 (RIP)
                     Option . . :  WOpcode: 0x04 (Extd Node ID)     WAccept: 0x01 (Yes)     WOption Len:     4
                                   Internal Network Number: 0x76AD0117
```

```
                    Option . . :  WOpcode: 0xFF (Pad)             WAccept: 0x01 (Yes)     WOption Len:   508
                    Data . . . :  5741534D000000000000005000100010100010001020001000100040100004   *...(..........................*
                                  76AD0117FF0101FCF234B288E1B57AF3D19B5B4AAE86C2C9915E73A4CFFA   *........2..H..:3J.$".FBIJ;.U..*
                                  5E8CBE55A401E8829F47D7A76593AEFE0482A6DA4C90C5D8D7859F2DC23E   *;...U.YB..PX.L...BW.<.EQPE..B.*
                                  F52BC6178CDA8DC2E09103CDD090FAEADE4983A0AC60EF649004E6A7B1C3   *5.F....B.J..}.....C..-....WX.C*
                                  27D0836B23DEEF00073AEADAEB6CCA9677EADC9B0B8FC7144A708523652D   *.}C,.........%.O......G.".E...*
                                  D6C7B1A5D06035CDDC6C909CDB8A62D3DA5E7B40F0EE16C19F18547BF652   *OG.V}-...%.....L.;# O..A...#6.*
                                  A8D7ACCB3999D232C47082FF00E1B392F6F8F5946FE3E43E1E0BAA26D93F   *YP...RK.D.B....K685M?TU.....R.*
                                  DC810E5F9CD6F013E32BBFD7CD4030C6B142807184FED5A3F67C048CC80F   *.A.,.OO.T..P. .F....D.NT6@..H.*
                                  01C1D13C8C84DE2D996E83B476B8BCDE6D96AEECF3BAC675920FD0C87C94   *.AJ..D..R>C....._0..3.F.K.}H@M*
                                  9A6B43A3F825D189FADFF8A6863DDAF8C6F314A380D03F61E7F13B598E6F   *.,.T8.JI..8WF..8F3.T.}./X1...?*
                                  C707CC73E5A0CCE8D43EC9C69B8C8E0E6BD3D4C93282E51361F2DB83CC5D   *G...V..YM.IF....,LMI.BV./2.C.)*
                                  A9DE5E43C5FED7D6DE0C882888BF6BFDCF4AF52FC2274AFCA1AC49FAB62D   *Z.;.E.PO..H.H.,.."5.B."........*
                                  0F03C834EB668A4ADC3BB8C0EC6C81E205389DC4E227E8DBBF5DB2F0EA1B   *..H....".....{.%AS...DS.Y..).O..*
                                  E699EE6583F29F2BADB003BBFEC54313C8B71712EC4C05B1F30A20AA9DE6   *WR..C2.......E..H....<..3....W*
                                  F58FA603D047C45F3A78C7F80101EB0A4F38F1D75E16F26272659D44C136   *5.W.}.D,..G8....|.1P;.2.....A.*
                                  8CE910E5995472AAF734458B88C2277982ADBF15DCDC3EBAFF9A969EFE16   *.Z.VR...7...HB..B.........O...*
                                  E22C905B3908D4FD8643D07A05F4FB1D411ABD9D92C3B40EA177AC8AE7FC   *S..$..M.F.}:.4......KC......X.*
                                  D384A9E4AAAE243A8ECCB362A115302DF60E2CFA9CAB4F4BB2E31549DA8A   *LDZU............6.....|..T....*
                                  C760CD27DFB8                                                   *G-....                        *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A               05/09/97  11:31:12                         Page:       4
Record       Data   Record    Record  Data    Controller                Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command    Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  -------    ------   --------  -----  ----------   --------  -----
     7   R        0 00000000  1512.0  EBCDIC  X25LINET  /03    I           2         3     OFF    RR           100421    NSNA
                    Packet Header :  LCGN= 0    LCN=  4                                 P(R)=  1
     9   R      576 00000000  1512.6  EBCDIC  X25LINET  /03    I           3         3     OFF    DATA         100420    NSNA
                    Packet Header :  LCGN= 0    LCN=  4                       P(S)=  0  P(R)=  1
                    IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                        Hop Count:   0
                                  Src Addr  : 00000000:000000000000:9004 (IPW2)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                    IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
                    IW2  . . . :  WPkt Type: 0x00 (TIMER REQ)  WNode ID: 0x00000000  WSeq No.:   0  # Options:   5
                    Option . . :  WOpcode: 0x00 (Routing Type)    WAccept: 0x01 (Yes)     WOption Len:     1
                                  Routing Type: 0x01 (NLSP)
                    Option . . :  WOpcode: 0x00 (Routing Type)    WAccept: 0x01 (Yes)     WOption Len:     1
                                  Routing Type: 0x02 (Unnumbered RIP)
                    Option . . :  WOpcode: 0x00 (Routing Type)    WAccept: 0x01 (Yes)     WOption Len:     1
                                  Routing Type: 0x00 (RIP)
                    Option . . :  WOpcode: 0x04 (Extd Node ID)    WAccept: 0x01 (Yes)     WOption Len:     4
                                  Internal Network Number: 0x96AD0D47
                    Option . . :  WOpcode: 0xFF (Pad)             WAccept: 0x01 (Yes)     WOption Len:   508
                    Data . . . :  5741534D000000000000005000100010100010001020001000100040100004   *...(..........................*
                                  96AD0D47FF0101FCFAFE1396BEB85D97BA08C65496151438C1E2B5838AFB   *O..........O..)P..F.O...AS.C..*
                                  0EE8E88FE8A1BFF21950AF5C35A4CEC5FBEEA81F3051979D6C13E022A129   *.YY.Y..2.&.*.U.E..Y...P.%.....*
                                  8182FDB6BEDEFA28A0F9B9FFEB2266EA9F930541ED3E404091ECA370C6DE   *AB.......9.......L....  J.T.F.*
                                  58E9AF9F8F009465A3159CB603D1F1B4DEB8998A7E02D357040FF5CBE12F   *.Z....M.T....J1...R.=.L...5...*
                                  9C2D52BCE39304BFC91D0C539214844D80FA2629A6DF8FE79F60DC49901E   *....TL..I...K.D(....W..X.-....*
                                  8E5FC61548E59F6517FDA60A34CDE810D3E5A8C7D66BD7CE615FAE5B12AA   *.,F..V....W...Y.LVYGO,P./,.$..*
                                  DD26B0549702CC3BB8AE82F2C9173C98948B864DD41E756C9BAF72419B76   *....P.....B2I..QM.F(M..%......*
                                  5942F6DE4BCBFC427B0CF09CD237C7AD944BD4E32E588EF8009ABBEFC7CB   *..6.....#.O.K.G.M.MT...8....G.*
                                  FB2640D28C6A1BD08A483CB68C8A17A8BE175EAEF0495302DDE9238DF51D   *.. K...}.......Y..;.O....Z..5.*
                                  6FCDDF977974D1A7215BB37F48E6E98B501BB9389467B1975532C65AA0B5   *?..P..JX.$.".WZ.&...M..P..F!..*
                                  E7ED30D085201EA6FFBC6892AA75CC6A9BBF9A95C03DFC16A5716AF5B925   *X..}E..W...K.......N{...V..5..*
                                  4FAFC092C920E4D2B6A6C5D5C1A8D49D6211A891B725F68F3499B3C6A746   *|.{KI.UK.WENAYM...YJ..6..R.FX.*
                                  B71040E08C139006D854C1C3A47D582BA127C36CB98F3A1DEA30A5189FA7   *.. .....Q.ACU'....C%......V..X*
                                  42C79E1168B588F19427AC35D2AF819B377EF55873AC82129F0C94880F8C   *.G....H1M...K.A..=5...B...MH..*
                                  F0B4FC83FA2E77EB80C365A09C452D6C81A95D9C9640EF46811D29BCA19F   *O..C.....C.....%AZ).O ..A.....*
                                  37DEDC0D22B8E262CEE6C4FDD228F3F0A522BBE9D84DF578079D9B3C5253   *......S..WD.K.3OV..ZQ(5.......*
                                  954116C5E43E2C11ADBF8529F8BF9FDDEC98E5C1AA145B429E73A14BB962   *N..EU.....E.8....QVA..$.......*
                                  9433F6EFFF5B                                                   *M.6..$                        *
    11   S        0 00000000  1512.6  EBCDIC  X25LINET  /01    I           3         4     OFF    RR           100421    NSNA
                    Packet Header :  LCGN= 0    LCN=  4                                 P(R)=  1
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A               05/09/97  11:31:12                         Page:       5
Record       Data   Record    Record  Data    Controller                Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command    Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  -------    ------   --------  -----  ----------   --------  -----
    13   S      576 00000000  1512.7  EBCDIC  X25LINET  /01    I           4         4     OFF    DATA         100422    NSNA
                    Packet Header :  LCGN= 0    LCN=  4                       P(S)=  1  P(R)=  1
                    IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                        Hop Count:   0
                                  Src Addr  : 00000000:000000000000:9004 (IPW2)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                    IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
                    IW2  . . . :  WPkt Type: 0x01 (TIMER RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   5
                    Option . . :  WOpcode: 0x00 (Routing Type)    WAccept: 0x01 (Yes)     WOption Len:     1
                                  Routing Type: 0x01 (NLSP)
                    Option . . :  WOpcode: 0x00 (Routing Type)    WAccept: 0x00 (No)      WOption Len:     1
                                  Routing Type: 0x02 (Unnumbered RIP)
                    Option . . :  WOpcode: 0x00 (Routing Type)    WAccept: 0x00 (No)      WOption Len:     1
                                  Routing Type: 0x00 (RIP)
                    Option . . :  WOpcode: 0x04 (Extd Node ID)    WAccept: 0x01 (Yes)     WOption Len:     4
                                  Internal Network Number: 0x76AD0117
                    Option . . :  WOpcode: 0xFF (Pad)             WAccept: 0x01 (Yes)     WOption Len:   508
```

```
                  Data . . . :  5741534D0176AD01170005000100010100000001020000000100004010004   *...(.........................*
                                76AD0117FF0101FCF4D11242CA0628A0DA5587FFA553E656A7376CE7A7CF   *........4J........G.V.W.X.%XX.*
                                077688F32A0D944E01BA8D53A668EED23E55ACFAB8F280847098F6FC4D13   *..H3..M+....W..K.....2.D.Q6.(.*
                                AE289914EB5A4960F487B657F9D4872DEFF71B7FC82EA9EEEF96AEEF8DB7   *..R..!.-4G..9MG..7."H.Z..O....*
                                47CDFBCB2C6BD7D1A5F384E66338B17C35B3D1A9D5CEE51432EC911B9974   *.....,PJV3DW...@..JZN.V...J.R.*
                                AAF7D91AF5CE91A7CCBCE9058666B047BFBF4A41A7A453C19576F9E4B610   *.7R.5.JX..Z.F.....".XU.AN.9U..*
                                3466E1E071ECD657B0CF971953FAFFD88F96E2BB4414F472F157A6430423   *......O...P....Q.OS...4.1.W...*
                                F9C4EB1CEF27FB60A9E8D64BF54D2D139DCAB837E80473D0FC4FD3B1DCD3   *9D.....-ZYO.5(......Y..}.|L..L*
                                8AE1C4432B0B95BF43D8BFFF66B798B0DADC82F0EFD698120DC4C9460CDC   *..D...N..Q....Q...BO.OQ..DI...*
                                95F6A6C1F43E15D2980B0B45FD112CFFF2A19B26CFD1583DB8F87763C066   *N6WA4..KQ.......2....J...8..{.*
                                6375820BF903E00976A98D4DC429EC89A839C183AF82AC77E310F2DC87E6   *..B.9....Z.(D..IY.AC.B..T.2.GW*
                                EC5E899BB29C985AC6D69853B2AAD722EE1254D2F57F211AED56AFE1D635   *.;I...Q!FOQ...P....K5"......O.*
                                5683C7C32054DB7FD142A483B4A4C2C8CF5E8DA6883BB03A2225B8980587   *.CGC..."J.UC.UBH.;.WH......Q.G*
                                849340C0DF804140DD3C43639F6C8A0F8EDC308F99F84590FA9F3FE9ED1D   *DL {... .....%......R8.....Z..*
                                5A8BA223D54CDE88C3BEE4EB6116993360C5FC167417A620134E83D3BB18   *!.S.N<.HC.U./.R.-E....W..+CL..*
                                C1A068468A1E2EFBC39EA795E50C8B899A9D44DBCB13D52B83106237A8A0   *A.......C.XNV..I......N.C...Y.*
                                4C1BB3E4D71BF4E689E2CB66D20BCB683881A756057C808265B9F0E49699   *<..UP.4WIS..K....AX..@.B..OUOR*
                                AF5B925EA4E6B344A60389F1B255825E8BE244CBB412B32DB7B1ABB8F181   *.$K;UW..W.I1..B;.S..........1A*
                                1B40D324829F                                                   *. L.B.                       *
    15   R        0  00000000  1512.9  EBCDIC  X25LINET  /03   I          4         5      OFF     RR          100441    NSNA
                  Packet Header :  LCGN= 0    LCN=  4                               P(R)=  2
    17   S      296  00000000  1513.9  EBCDIC  X25LINET  /01   I          5         5      OFF     DATA        100424    NSNA
                  Packet Header :  LCGN= 0    LCN=  4                     P(S)=  2  P(R)=  1
                  IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                Src Addr  : 76AD0117:000000000001:4000 (Dynamic Low Bound)
                                Dest Addr : 96AD0D47:000000000001:9086 (PING)
                  IPX Raw Hdr:  FFFF0128000096AD0D4700000000000019086 76AD01170000000000014000
                  PING . . . :  Type:   0 (Request)       Ping ID: 0x0002     Result: 0x00
                  PING Header:  50696E67010000020000
                  Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                                7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                                7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                           Page:      6
                  Data . . . :  274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#              *
    18   R     4096  00000000  1515.0  EBCDIC  X25LINET  /03   I          5         5      OFF     DATA        100442    NSNA
                  Packet Header :  LCGN= 0    LCN=  4                     P(S)=  1  P(R)=  2
                  IPX  . . . :  Pkt Length:  4096     Pkt Type: 0x04                     Hop Count:   0
                                Src Addr  : 00000000:000000000000:9004 (IPW2)
                                Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                  IPX Raw Hdr:  FFFF1000000400000000FFFFFFFFFFFF900400000000000000000000009004
                  IW2  . . . :  WPkt Type: 0x04 (THRU. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                  Option . . :  WOpcode: 0xFF (Pad)             WAccept: 0x01 (Yes)      WOption Len:  4051
                  Data . . . :  5741534D0496AD0D470001FF010FD3FD54798CB4F858449C6B352FC270F0   *...(.O........L.....8...,..B.O*
                                E484D76C78DB127E6B9B2A132BE750BBA3E54F40FAB63352B4E37B04E0A1   *UDP%...=,....X&.TV| .....T#...*
                                7D82CEB716F537C43D4BCA943B1F6EB58CBACAAA3B80E5A88B91B4E30B16   *'B...5.D...M..>.......VY.J.T..*
                                DFED0AFEEDECE6F330AE684DD3C1CDB11AA726855ED1FE340E880BEED8C7   *......W3...(LA...X.E;J...H..QG*
                                6DECB081CE7D1B9B77BA32D161785CD6254B69AA7A4856C2235D8B9FD2B4   *_..A.'.....J/.*O....:..B.)..K.*
                                41C2386961858EC2E6DF9DCE8BF1637A5FB9F76EC9A38AAD82E58585B0A1   *.B../E.BW....1.:,.7>IT..BVEE..*
                                0C5B8AB24E13A1A3EB0A7C9BFDA6F8A9DD33CBF973AB8D990435EEE370EA   *.$..+..T..@..W8Z...9...R...T..*
                                BE8A43D49BEB3B530883C8AAE0EB4A9BB8EF35C5B7B347EC13B6DC2F5AB1   *...M.....CH..."....E........!.*
                                A91B81D54D0D47B5A31DB9E7F4B9D9F3D5CC88D96771C9965FB2A2E4C8F6   *Z.AN(...T..X4.R3N.HR..IO,.SUH6*
                                CFC5C40562C83DCA5ED0B14807A6F02E9CE2845964DF09286BD23CFB33A1   *.ED..H..;}...WO..SD.....,K....*
                                903D1B849C0A7CA07496E9C65FED4CC3D47E54B3B2213EF3A4C99DC7B0DF   *...D..@..OZF,.<CM=.....3UI.G..*
                                63AD1A430297259118A3590C2FAB2F3572A85E272CBD5E1010EA70EB919B   *.....P.J.T.......Y;...;.....J.*
                                79F4D7E3B99F00AF762DCEF7B98961B5EABE57C6769F1095C5393CC730DE   *.4PT.......7.I/....F...NE..G..*
                                F6D97E4EA5F35DA2318843BBCB96DE5252DDEED2E0EA56E1F5EE0D14059C   *6R=+V3)S.H...O.....K....5.....*
                                9DCE5DBC578C0097A8B49BC4E979E7BC4291B1B66B5C07C2672D2283C476   *..)....PY..DZ.X..J..,*.B...CD.*
                                E5D759F7F9D3A76AE4945B0B4CE542F6AC8F510BCC91DDC797F75AD552EC   *VP.79LX.UM$.<V.6.....J.GP7!N..*
                                6B795D83ED41EFCD83F594927030F6839EB197A79D7404D22C0895C8E7DA   *,.)C....C5MK..6C..PX...K..NHX.*
                                00ED999D0C8015F8B3A27AF178B583509FC02253D38DADA43282F7174AAC   *..R....8.S:1..C&.{..L..U.B7.".*
                                1A3E73EEFA484BF1A0AE80EC20D16FDE964786DC322095DEF98724D017BE   *.......1.....J?.O.F...N.9G.}..*
                                DAC6F344F28D33D1EAC51AA213D786F27EDC9A9CBEAAA8EF19B8E9A9D8F4   *.F3.2..J.E.S.PF2=.....Y...ZZQ4*
                                8E02C0975708B0D2FBA87087EFBD488C7407B295A57F29A43FA981CF91A8   *..{P...K.Y.G.......NV".U.ZA.JY*
                                66E3C72B01A8D8C37CAF0A587FD03853A1A1FAD9D4DBF34061BF081118AA   *.TG..YQC@..."}.....RM.3 /.....*
                                9AA0A48DA8C67EC37FC2DBF8D21C23AA35BD75AE29A3A1AFB5F85CD3C4BA   *..U.YF=C"B.8K........T...8*LD.*
                                249898FE1BE452ECE2803E5E8BFEB13974A533714FD4544E45EADF00EBD6   *.QQ..U..S..;.....V..|M.+.....O*
                                B5BCC5B57C97A486C7ED13AF9DBF879D899225B2DA0BF1894656F4E8F6F3   *..E.@PUFG.....G.IK....1I..4Y63*
                                95ACF232B1D0DE5B2CB63410D6943DAF0FDDB04DD2E1C587B3EF506C9289   *N.2..}.$....OM.....(K.EG..&%KI*
                                085FFE84D662FC96FCD287B061EA83EC6B98ED8C0568DFB728504BB7AFC9   *.,.DO..O.KG./.C.,Q.......&...I*
                                DFF5EEADB088CD7BF5EA8557FED8545CFC8AA5135ADB99C0D3CB42CD488E   *.5...H.#5.E..Q.*..V.!.R{L.....*
                                B39A3AB1529F08A747212CAED32581A84391D3EC1B09F3E32AA99F85E67A   *.......X....L.AY.JL...3T.Z.EW:*
                                3EDE63C120E71C8DF183AB3FC2DFE71D17BE2743D983D7BD18C8BFB648A2   *...A.X..1C..B.X.....RCP..H...S*
                                5897F0E65F60D5FFCEB61CDC166B79C3EA45D2C98E427B9AAF009FD75216   *.POW,-N......,.C..KI..#....P..*
                                10CE26E2E1DAF98B84B536F76DABAE720EC9C24D31F35A3373A6E83FD7D9   *...S..9.D..7_....IB(.3!..WY.PR*
                                B791DDA2C9B3D7E83E3BC0CDC5315FCD2CBD84B44E8E599163D18BB05247   *.J.SI.PY..{.E.,...D.+..J.J....*
                                40E9C41530C84B7A37D345179DDD11B0C8B46D8BDC83F97510EE74B121AF   * ZD..H.:.L......H._..C9.......*
                                1967D6ACF06C6ADC5DFBDA9E42163E84C2919F81E6A1D2CC8A249F816AAB   *..O.0%..)......DBJ.AW.K....A..*
                                A3822A9CB7BB96F525B3B8B05BA242828CBC89088EC8910356A87269FAEF   *TB....O5....$S.B..I..HJ..Y....*
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                                       8BF27CCCDD25C2CADA4CA2C1DD87BAB6FA27C6E1499604A618542A873DE6   *.2@...B..<SA.G....F..O.W...G.W*
                                       98F0EE4A86AC5F1EFE98EC0E1CB1929EB490F19681E4D0397FA26F3636B3   *QO."F.,..Q....K...1OAU}."S?...*
                                       50668BE37C8BA685B4B3F99A93E504E3A0B8E5CCCB3724B1918587C8D5BD   *&..T@.WE..9.LV.T..V.....JEGHN.*
                                       25C8752F26856ACE9CA722A833D45101FF925A7940F1CEA3D1B5656A5E95   *.H...E...X.Y.M...K!. 1.TJ...;N*
                                       2A9E5DA103382EDA5DA698BA64B529A9B1F65AE2A4E5C0B7E81480E59A3D   *..).....)WQ....Z.6!SUV{.Y..V..*
                                       D4F1519F10A5A24F37C2FEF8D6F1830D9ED2F37BF2EF4EB911995885D682   *M1...VS|.B.8O1C..K3#2.+..R.EOB*
                                       BAF342BFB8B51CF77AA39A948B5266C6CEF2BBBCA238F6BE49FF3BEC13DC   *.3.....7:T.M...F.2..S.6.......*
                                       178BD6E318C8D78462BD34A4F2CB396CEAA71DDEE39A145ECDAF5C33C3CE   *..OT.HPD...U2..%.X..T..;..*.C.*
                                       4AA127859A7141DE81A6EE91F6C563E019317395FDE7F7D0885610A6CA9F   *"..E....AW.J6E.....N.X7}H..W..*
                                       66C0A73717A21229D2D677ED1FDB70FC3AD6BFB464C3DC7F62C12F5F648D   *.{X..S..KO.......O...C.".A.,..*
                                       200153B0373888F960C31ABFA95FDF88D58BC8FBCC3DA79DE42018EBF758   *......H9-C..Z,.HN.H...X.U...7.*
                                       A4BBDCF004A611F6F8E56D68F6F20664278199B895932580AD83232955F9   *U..O.W.68V_.62...AR.NL...C...9*
                                       6ECEB6D9C58EAAB919AA99C40F81C0D60FC8D0A6493D7C9263ED2FDE68F3   *>..RE.....RD.A{O.H}W..@K.....3*
                                       BFBC5AF2ADF6F29C77B1FEC74BCDCE6839AA1CDFBFCDA5CBDABFEABEB1CC   *..!2.62....G..........V.......*
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A                05/09/97  11:31:12                   Page:     7
                Data . . . :   8DB8E7EC66AE9CC951FD05A5BABA86862C086CB4DD2F46A54AF96FDD3E3B   *..X....I...V..FF..%....V"9?...*
                                       31A0A07F72890F67C2D26537DBF33676C7FCB07F90A787488CA2AC3542D7   *...".I..BK...3..G..".XG..S...P*
                                       DCD37EE2C163EA86870BF58C2246D49E58502DB7F80B93FDC03E41D8379F   *.L=SA..FG.5...M..&..8.L.{..Q..*
                                       8EABCC928983A8B87EB9E89BBAD6482FB19D337B609EE92C42DE58F290A1   *...KICY.=.Y..O.....#-.Z....2..*
                                       9D3DFCDA50BE49EAFD1A998EDDAB57FB1C2608F5055804B1D5EC49D38C07   *....&.....R........5....N..L..*
                                       D68E56DF1CE951F0468275FB578FC84FACA7E6EEF4AA522B4BF898A049EC   *O....Z.O.B....H|.XW.4....8Q...*
                                       439821C9B917B696C41532A34BD2F3C706A34784C9F067E5C63E4DBA24A7   *.Q.I...OD..T.K3G.T.DIO.VF.(..X*
                                       16BC55F4D4AF3CEAE6C861FBEC98E2A9BCC8F5C40FFF1B1BDCCCC28B5DF8   *...4M...WH/..QSZ.H5D......B.)8*
                                       4BEFB1C165CCD2826A5231923A51DCB2D48D85A097727DB6DDBEEA982152   *...A..KB...K....M.E.P.'....Q..*
                                       72B3AC0866E35BBCB29BC1BEBCCCD17888CC4091C6A322C6EEC03286EFB5   *.....T$...A...J.H. JFT.F.{.F..*
                                       39177EB735AE26A53C9EC3AEDB68F6C6C8482A86FA235C9027B2409E27D1   *..=....V..C...6FH..F..*... ..J*
                                       B1C8380C96D7C2B28CAF5873FFD827C4499AC8037EC15D9496E6C66708EB   *.H..OPB......Q.D..H.=A)MOWF...*
                                       96B496F32A5CB0E22BA3899EFDEB61B0687ED49C5EEAC89B8840AD8E4E6D   *O.O3.*.S.TI.../..=M.;.H.H ..+_*
                                       A2BEFFEFAC94D0672CFE25C608E1ECB993FC8BD5C6C0803BB3A2CFC782F7   *S....M}....F....L..NF{...S.GB7*
                                       337B50D4E53FFB96CBE4F0A42395E99C4748308BD49779B224D0A88EFF20   *.#&MV..O.UOU.NZ.....MP...}Y...*
                                       F88FCDC3218DC5F54ABF6B15FE8F7138E1D24D855ADF6E4394C0171C26AD   *8..C..E5".,......K(E!.>.M{....*
                                       396551932B01B1EC7C56F3D730E4D1CAFEC3B79BE38B80F7DBD075805330   *...L....@.3P.UJ..C..T..7.}....*
                                       75D592932589FACFAFB15930EFD69BF5E0992BB3348402697DBA5BD141E2   *.NKL.I.......O.5.R...D..'.$J.S*
                                       0761FDD2B29CFACC604D28C669E5ECD2764EB9D52ABFA2E98B9204CA1FBC   *./.K....-(.F.V.K.+.N..SZ.K....*
                                       66E98A3436F06A3D03CECC0B45B5F84915BF865F098EC9AA1CD9BF5D81A2   *.Z...O........8...F,..I..R.)AS*
                                       942FD7AED11FA5A374E34ECEF769B9D53E5AD7F0BE46A1DC0F6F82F96230   *M.P.J.VT.T+.7..N.!PO.....?B9..*
                                       AD9D6A2DC5A5E33141E6B6F77DF632A5E1F728D50E99BC08E887ED0633DA   *....EVT..W.7'6.V.7.N.R..YG....*
                                       3243FD9A0E06F68EEB4F7FFAB06427D27FBD06C05340E299C91814E14C17   *......6..|"....K"..{. SRI...<.*
                                       EDCAB73C2AC3CF5160DFE7DA0FEE9D81A1A6A9EB6BDD9F1349F6AB8F4BF9   *.....C..-.X....A.WZ.,.....6...9*
                                       4D0372AF1DB13DC65F759DA522FC2B9BD9BFC1F4BC67D7FD45D1C8F2D023   *(......F,..V....R.A4..P..JH2}.*
                                       60BEC2F02BF025F8E5CCF7FD90AD286212B63EE48FDB0FC5C3E880F591EA   *-.BO.O.8V.7........U...ECY.5J.*
                                       7A79D88ED5CC2DF64FE79EF7EFB4689A2D9704A715D6B18AC2542BDC241A   *:.Q.N..6|X.7.....P.X.O..B.....*
                                       39C6360519848911FAC2FB78118B88081A8FCC2A88A4FC907AC1718E3686   *.F...DI..B....H.....HU..:A...F*
                                       2FDE73B0B594D9E13F8D32934F4127B83EB3009C5A2381E1D13A59EF4E1C   *.....MR....L|.......!.A.J...+.*
                                       E2F14AB42CDF7B307790AB4742DCD38842C3971652F43AC5D0BE9157F5B8   *S1"...#.......LH.CP..4.E}.J.5.*
                                       25F792C4A0F0B2A21A9AF980B4A495D3A174378CD5336E8123C2FFD2D735   *.7KD.O.S..9..UNL....N.>A.B.KP.*
                                       96AEFF76FF85DDB91C9FA421EED0AFE224CB281486B45BD19EF81F3894C9   *O....E....U..}.S....F.$J.8..MI*
                                       BBFBD0D4917C299B6ED4C78953A48BD257E81D894833CFE341A173E9CEF9   *..}MJ@..>MGI.U.K.Y.I...T...Z.9*
                                       9593641D2091B46B7ADBFC61529659BF54DE2070EAA3D5849596F3A63CD6   *NL...J.,:../.O.......TNDNO3W.O*
                                       26FA91990CB36F90D88AEAF88852F1BDFDCBB1E14832EACB071433BDBF88   *..JR..?.Q..8H.1..............H*
                                       68E994C52BA61D01DCBA6567B8D77CC0A3BF4B7BDCF4B10AA293318F309A   *.ZME.W.......P@{T..#.4..SL....*
                                       AFE3D09195BC08FD6BFBE4BC66B7B8FBA7F1AACEEB50FABB11B73888141D   *.T}JN...,.U.....X1...&.....H..*
                                       7CE09BFDB0A12CA105F8FFA1EED6E08FF9B10C92A6B0702B1A941E1276C2   *@........8...O..9..KW....M...B*
                                       4E4CF3A29E492FC5D70012A6460338BE7DA6D1AB53450CE7DA6EB4B59A62   *+<3S...EP..W....'WJ....X.>....*
                                       58AAAEDC8EBE12462EA1BDD780B68F677680D1D19ECF191E25FA0A795CC5   *...........P......JJ........*E*
                                       A60744972766BD9BCA4FD3FF3EF58DFE6B7EE6C358B089F3AE5691BAB5C6   *W..P.....|L..5..,=WC..I3..J..F*
                                       94F4007E50CC653357880DFD98CE844BF1CF9625248A60C8F6D829D574A2   *M4.=&....H..Q.D.1.O...-H6Q.N.S*
                                       7D218CC525C1ACB1CE6853E6237C58A3B8EB73C16A1EFF9E195A8E928871   *'..E.A.....W.@.T...A.....!.KH.*
                                       BABBE2B57FA0FA0538FE6CF219A28AC9CFC5C78868AECCC94A86B372EFEF   *..S.".....%2.S.I.EGH...I"F....*
                                       3EEE008C7BBCB78FA2DA708CB338BDCA524876E013A2C0A9225E2F8F55B6   *....#...S............S{Z.;....*
                                       6AC43B32AB8A7BDD34C9F7C7F4AA68CBC4C61A0844D7150DF8A748831A89   *.D....#..I7G4...DF...P..8X.C.I*
                                       9775C4B6B4DD6F9C3600209D428500FA2A13A9E0713C8FAA3F43689F62B8   *P.D...?......E....Z...........*
                                       2B8A2960CEA292BB40CF43BA23E771BA24DB7408329EC67B2EF8C15A72DE   *...-.SK. ....X........F#.8A!..*
                                       1971F5D888FDBE89CB3403FBC3F7A2FEB72DD0AC213556B834F9649DE172   *..5QH..I....C7S...}......9....*
                                       B8BC32DF03AFCF9E7DE7AE7AB8EFFB3CDDD7594C42A79DEF83F1D7D76E91   *........'X.:.....P.<.X..C1PP>J*
                                       80F2CEA8C4FD049CBF682DDA50B2C1E8080CE1E885FECAB51AF70AFD510E   *.2.YD.......&.AY...YE....7....*
                                       6AD489D314A48133109E3FB3D1E836AF82DE3CF6E9F476ACFC9B5751C881   *.MIL.UA.....JY..B..6Z4......HA*
                                       BA7126F75AB854E4FC11ABE0EC6700C05EA45E857979FEEA38572898E27B   *...7!..U.......{;U;E.......QS#*
                                       3BBD08ACE88490144E8F2550E1DAE12D33F55EDF89A7A6193A89C284D4C1   *....YD..+..&.....5;.IXW..IBDMA
                                       9EC0F59D8E7823F47192A5CC530C04E03A436991201582D164543E91D71D   *.{5....4.KV........J..BJ...JP.*
                                       D9C1E8DC5D9EDBC121ED64AF02ED1E2611D6559FB68F68D3AAAB208775E4   *RAY.)..A.........O.....L...G.U*
                                       9D6A199AA10492C1335C8E9301D1BBDC709764E3E3974DF2E2B51E81E141   *......KA.*.L.J...P.TTP(2S..A..*
                                       27EB7CAA0FC5813792A667B78CE3439DAEEC257F1391BA3185D7095D82A7   *..@..EA.KW...T.....".J..EP.)BX*
                                       DA701AF5F6110EEDDA2C4A8E9228469D9254CBF1FD2C3FA4645838B7DC18   *...56....".K...K..1...U......*
                                       DAD2E3EE84F2408847EAB36992A8D868A097BD36FB8764E692F15DC0B0C2   *.KT.D2 H....KYQ..P...G.WK1){.B*
                                       15DE9DA9CA78F8ABCC38DFECAA10979127A2E5C137B2D7AFBEA45C8D18EE   *...Z..8.......PJ.SVA..P..U*...*
                                       29DFBC0E1EB343465485BE90BFA21130339673B766870DD6B69D8B8C00B4   *.........E...S...O...G.O......*
                                       94A4CF8AD06EA9FA1160728AD35CA2BA66D6E3B5A630B1B1C711A384573F   *MU..}>Z..-..L*S..OT.W...G.TD..*
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A                05/09/97  11:31:12                   Page:     8
                Data . . . :   85FC0B78A4D51DD8439A618405F822B372AE3380A4B742E85689A3C41ADE   *E...UN.Q../D.8......U..Y.ITD..*
                                       9FCD8FCD70D979ABD6004FEEAE9AAC892D0CA1EC98646388E718F0FC167A   *.....R..O.|....I....Q..HX.O..:*
                                       C8A7D761C5AD54229AEEAC055DDF949716944B9808EEEA8148E5CE1883BD   *HXP/E.......).MP.M.Q...A.V..C.*
                                       ABB654D44FA615B9211999AC17EAC4D6364221842FF267E7D38BFEF18C47   *...M|W....R...DO...D.2.XL..1..*
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                                   9AB0B14B5BC7CA9DFEC74AF52C8A2681EDE61C3577C5FA8DA8C46A7624A9   *....$G...G"5...A.W...E..YD...Z*
                                   729A3BA2EBEE67AF70FFC2A3A7738BC692FE9EDC8A9CEC9044BB13905626   *...S......BTX..FK............*
                                   6587F2FAECE137E1AF9BC21BAEE4A78C66B3F2F1D292E26E4BCFB749448A   *.G2.......B..UX...21KKS>......*
                                   2B79E7AC507390D5D34B52A2F6622BDDA748A391923706965AB5959D4796   *..X.&..NL..S6...X.TJK..O!.N..O*
                                   52C6DE322AA5AFC967B7CFDE2DB003BAA3C4D27D9DD735335FE5C0105BA4   *.F...V.I........TDK'.P..,V{.$U*
                                   723C35C7CF0FECEB1EB570AD1A44A997920C09F554709DFAADD140A98541   *...G..........ZPK..5.....J ZE.*
                                   54EB8448BFB9C46C668EA8FBD3F82D22D1DB4946A2A7BCA628D240E221A1   *..D...D%..Y.L8..J...SX.W.K S..*
                                   BE505FD58EDFEF97103173A81EC281FB73F962FAFA11E7B7ADD56CF59703   *.&,N...P...Y.BA..9....X..N%5P.*
                                   AA8D720BDEBA69645FDD3CF896CDE4B154E1366B67BBC5AAB5AE4AB163A9   *........,..8O.U....,..E..."..Z*
                                   C433FB9030FAD1FFA2F94CA49D6FB3DC10A534C8CE69CCE7843713993C37   *D.....J.S9<U.?...V.H...XD..R..*
                                   25C048ACBCE344CD44BA009FEEFF0421A9E83E610CD755D1F3C34B16F8F6   *.{...T..........ZY./.P.J3C..86*
                                   D157F3A9E5911E9E9A9FB7B96BF8BBDF971C18B9B5DE57D3188102EDBE16   *J.3ZVJ......,8..P......L.A....*
                                   94DABCC87DA00EF6BDB6694464B9095ECC962F01FDE82BD61395F3F07BC2   *M..H'..6.......;.O...Y.O.N30#B*
                                   316827B9AD3C0C9C41971196252D3DE2BD4CCEF9FDDCAE89A3A3BCD652D2   *.........P.O...S.<.9...ITT.O.K*
                                   3DD76910B9B2C9502CBEAED468C7FB59A6C6BB07DDA101A41AF2BCF98BD4   *.P....I&...M.G..WF.....U.2.9.M*
                                   A3912EBE90D013954CF124EE6BBF10E3CD2DBAB375832EE7F79D0EB16879   *TJ...}.N<1..,..T.....C.X7.....*
                                   1DC1E7B9EAD45F151BAE630C8BE8CCD31FDF390FA19B318586D0357004E4   *.AX..M,......Y.L.......EF}...U*
                                   4D81679C6B064BB66A7628877399A9B66D6BB9C9BB9C41BC0FD6E0B3E46C   *(A..,......G.RZ._,.I.....O..U%*
                                   96D995481FD7B25AD3FE69414700FFEF                               *ORN..P.!L.......              *
  21   S       0  00000000  1515.0  EBCDIC  X25LINET  /01   I          6         6     OFF     RR          100441    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                            P(R)=  2
  22   R    4096  00000000  1516.7  EBCDIC  X25LINET  /03   I          6         6     OFF     DATA        100444    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                   P(S)=  2  P(R)=  2
                  IPX  . . . :  Pkt Length:  4096     Pkt Type: 0x04                       Hop Count:   0
                                Src Addr  : 00000000:000000000000:9004 (IPW2)
                                Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                  IPX Raw Hdr:  FFFF1000000400000000FFFFFFFFFFFF900400000000000000000000009004
                  IW2  . . . :  WPkt Type: 0x04 (THRU. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                  Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)     WOption Len:  4051
                  Data . . . :  5741534D0496AD0D470001FF010FD385E26CF5D45F8D7FCD42F9C7E81CE1   *...(.O........LES%5M,."..9GY..*
                                19BFFEA75DE79E2D25C1A64EF08D88D1E4918C18558491BF1BFC99C99CD4   *...X)X...AW+O.HJUJ...DJ...RI.M*
                                83A2548E16A5CDF0DF7E9CE0F1AF509B2D2091AFB55F2FAC7C60C999B684   *CS...V.O.=..1.&...J..,..@-IR.D*
                                989DBB6600FA25DAE7CB46F3FF9F3D529DF2FB1318C1A30949B6B6FAF1A7   *Q.......X..3.....2...AT.....1X*
                                1541EFE49C079CBFB80806CB172440DC4D4DEBD736F04CD7DA7BF7C90103   *...U.......... .((.P.O<P.#7I..*
                                D8E1A3C101C5D49C6389678D0EED5DD89CAC386384AA0DC772EEA16497A5   *Q.TA.EM..I....)Q....D..G....PV*
                                D36FE7DC57FBBF9451299EDC839025C16CDE3ED2731BA8831D1E8AECC039   *L?X....M....C..A%..K..YC....{.*
                                46BFF09C19CD988FC2DB0673028468F8A6879C9E35BB56EF22C86E0145AE   *..O...Q.B....D.8WG.......H>...*
                                15BFD195E48BA2CF8B8590D0EE1B64C048AD66E370662AE843C40EB8FCEA   *..JNU.S..E.}...{...T...Y.D....*
                                44E478753EA059AEA2DFD85FEDF682336BDDFE343DDC1802A8AC56D47CF8   *.U......S.Q,.6B.,........Y..M@8*
                                987149E035EF21F4E6D287DE081AAEE6100764A655AC3DC29F2E1CE08C94   *Q......4WKG....W...W...B.....M*
                                17AD4EE52E96A887E792729BF8A25E01E6C9CEF652B28DE90182BC9C3DAC   *..+V.OYGXK..8S;.WI.6...Z.B....*
                                B5ABDACB25CDCC9EEA7447B27832D4F15157D6935E1E61881CBDDE96F57F   *..............M1..OL;./H...O5"*
                                A3CF8EF3C3B225F1ABD91D6CED9ADAAAF88A0ECF36D246290AFC30BB60E3   *T..3C..1.R.%....8....K......-T*
                                5E1CFAB7C0D5B5D50EBC53BA6E5A6DA2F309BB82042792DEC224EE9C06F7   *;...{N.N....>!_S3..B..K.B....7*
                                848D644B24B3817102F7229660FFBEF762D263C61B94638287910EB92EDD   *D.....A..7.O-..7.K.F.M.BGJ....*
                                9FC569A459E22C89100B01FC42B4F4FF76808FBCF2AF51E0D44FC192C07B   *.E.U.S.I......4.....2...M|AK{#*
                                399ADA2675E8131AC0BE41AA49C9130035FE72FEB5AFB09F96F4BD8AF7C7   *.....Y..{....I..........O4..7G*
                                EEDBA992979ACC9F341245939BC1ACD6C84EEAF8B552D0C8505541920D85   *..ZKP......L.A.OH+.8..}H&..K.E*
                                26B5A0CCB4CFDF9A95E11E16D2FE6CA8758FA81BD3E5BB0354D8D7F5A1CA   *........N...K.%Y..Y.LV...QP5..*
                                3F8C409211257DA3B47C779E57BC99921F3207BE0DB484F5C6A797C52528   *.. K..'T.@....RK......D5FXPE..*
                                918A8AACB6965127CAAA0B8BE0DC0C7658B62DFC46850DB51CC6ED858393   *J....O...............E...F.ECL*
                                D8C17EFB878307FDABC19497325DA9EBA34FCCAECC52F1E859A5DFD5994A   *QA=.GC...AMP.)Z.T|....1Y.V.NR"*
                                A6C2F445D9B3160D8EECD4417DE317EF04B84D6417E0E68089BD0115BA92   *WB4.R.....M.'T....(...W.I....K*
                                39C7488F4A92F9E8F762EEC9806EC08EE7669BFA019369FD7552BAA18AB3   *.G.."K9Y7..I.>{.X....L........*
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A                  05/09/97  11:31:12                     Page:      9
                  Data . . . :  579904679DF02EC2E78DFE46E3B0E029EACCE01C5F8D670A0FE7C5A750E1   *.R...O.BX...T.......,....XEX&.*
                                6BEC11F457C3B6ADF25F0E833EE95B974A98AFA26E56C3FA026F85B5E804   *,..4.C..2,.C.Z$P"Q.S>.C..?E.Y.*
                                FF93A05EA785A671AAF2709473BD22865FA5A427FCBC3D665AE30AFF43E6   *.L.;XEW..2.M...F,VU.....!T...W*
                                FCFC29EB0F5E39BDF368C0B76276AEA15DF792A028E503DCD37A1BBFF5F3   *.....;..3.{.....)7K..V..L:..53*
                                E1AC5E9B3DF7221A34DFE6CAAEA904D85AFD185367C80C1102903100EA81   *..;..7....W..Z.Q!....H.......A*
                                334C9CCEEAD8099C0DA101C2C598B2BAAC3205FF084602F82CB01DBDDEBF   *.<...Q.....BEQ.........8......*
                                36EADBD39D862260E2BB06DA3BBEE1B76BD4D133B5F29A1D3BE3F588EC8C   *...L.F.-S.......,MJ..2...T5H..*
                                F0B2E18E701A12E1BFDCCDFB398A85FEB5A29EC6C7B5B7E16B6756D24DB2   *O............E..S.FG...,..K(.*
                                B9EB10FB8DA7F35E8DDAC4D120AF7DFC16F831625DF23146F8812AC0029D   *.....X3;..DJ..'..8..)2..8A.{..*
                                A4058FFB694024BAF27C7085C7FCF48CB03BCB8625D4979DA84A5093A71B   *U.... ..2@.EG.4....F.MP.Y"&LX.*
                                0EBFE17FDEED922A3D971384A68269FBC8FC114A5CD3295F4EC1306631D0   *..."..K..P.DWB..H.."*L.,+A...}*
                                857E0EEC173416E75D09728D17920A867516E5F132595AA0889F6DE99AFF   *E=.....X)....K.F..V1..!.H._Z..*
                                72BEF90D30D0D12C44D4B18F77D5423AB9EF1DB511875AE9BDE1A7BCB8CB   *..9..}J..M...N.......G!Z..X...*
                                5747C6CF298076ADB12D3CCB11173BCF0C8AA5C062C0D693628448A8DADE   *..F...............V{.{OL.D.Y..*
                                91B94A5833BFE4DB4FC9FA81F6DD6AA513847BF3F7E5CE2115BFDE5F92A0   *J."...U.|I.A6..V.D#37V.....,K.*
                                54CCA89F487BD5CFBA2EA6C84CFED6B6EEFA578375C396A87BF048E0DC5D   *..Y..#N...WH<.O....C.COY#O...)*
                                63A37781EBFAF2BF25D6E396DAF7C5306EB2EF04D8EA275CAFBE365D43E3   *.T.A..2..OTO.7E.>...Q..*...).T*
                                253B45A156A385BF09C3849A037119D7F66F4EF405D8A7ABD3391BB84A73   *.....TE..CD....P6?+4.QX.L...".*
                                BF9FF55F20A6387FECC756B4368D51AB79ECD0DD6B84791545A963A8F6CD   *..5,.W.".G........}.,D...Z.Y6.*
                                EA055CBF0644A2B48449A9D90052D6A43ECEE897823597E58C9A37F1E106   *..*...S.D.ZR..OU..YPB.PV...1..*
                                9EEC79EB22B83C7E798B93986F86FCE701C5A237E49D03BF1BE0F7D626AF   *.......=..LQ?F.X.ES.U.....7O..*
                                0CCC2EF13139CBD6C9BA23D5DBBE00CD975FB18D0BC6EB8030B6A6FE278E   *...1...OI..N....P,...F....W...*
                                0AD6DEB4E2B735CFA4ADD375F595E580FC8E776D47C2A799648947D814CB   *.O..S...U.L.5NV...._.BXR.I.Q..*
                                BB4F76F65E3479A2C7724DD42170B9DF6FEE7DAD92C326FE4A4CD1BFF9AF   *.|.6;..SG.(M....?.'.KC.."<J.9.*
                                C5A18310FBA3D02195B54D1139D6A6122DB0F3B674D04FD46FA9042E42D1   *E.C..T}.N.(..OW...3..}|M?Z...J*
                                7945BFF0D26A0A8630320CC625F6A8E664F53AEE2029028164BC72FC9022   *...OK..F...F.6YW.5.....A......*
                                BCDAD8E62FD5F087E9A26B3FBBAF25614CBF171E6A86CE232AC766DF8BB2   *..QW.NOGZS,..../<....F...G....*
                                DE84F4AEEB0AEBC91A2405D3332B69C46766D3E0900B6290DBC21DCBA548   *.D4....I...L...D..L......B..V.*
```

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                                         38D028BCFCA28FAF2987350021A89BBBE1884C0743B771059EDD282629F6   *.}...S...G...Y...H<..........6*
                                         E1BF2EDECEE3A3E0C3549DB7E882B481DD55C1EA293483B736FC90FAFFAF   *.....TT.C...YB.A..A...C.......*
                                         E9A8766ABDF659F4B38BD09221AA29FC3EAA6FA1BA86E311C2A5A31CBEF7   *ZY...6.4..}K......?..FT.BVT..7*
                                         B452E7DFAF3ABEE93A02ADDF86237BDF83D2E3C78AA7BAE00A0AAFB343DA   *..X....Z....F.#.CKTG.X........*
                                         13ABA27158B5BFA071B7BEB7F0CA1E4BCF8B036AB58D52D861B9FC10C4D3   *..S.........0..........Q/...DL*
                                         B113418E677CFCAC3ECD6FCF218AC2A31D30CCD16EF4BECB86515EDF485A   *.....@....?...BT...J>4..F.;..!*
                                         B6873BD541E92DE3C4C3C4D076AE5257649FE7BFA6A7D77D4FB46423A09A   *.G.N.Z.TDCD}......X.WXP'|.....*
                                         5F39E7E1D2BBDFD22CA14DF0123208BA93265B92BB8010D3D4E5B3BE34B7   *,.X.K..K..(0....L.$K...LMV....*
                                         6CF6F67503AE7C96A1F5857D868EF46659CF6BA662A478D652F93EF5DA94   *%66...@0.5E'F.4...,W.U.0.9.5.M*
                                         7F3B0EACFE604DF064B7F6E469F2C7E7C25BF98924AF4FC771B1E1F95591   *".....-(0..6U.2GXB$9I..|G...9.J*
                                         13E0A7F648B31A643389A8AC23A0BD7471F627F929BA577101C2BC583BDB   *..X6.....IY......6.9.....B....*
                                         44ED5F8A3C687183ED199FC32D5964D64818589736A75185230467BDF64A   *..,....C...C...0...P.X.E....6"*
                                         7BF49432ACAD8B37A78EF30DF5F7199925B195CAE1E13AD4DDDD6D6CB1BA   *#4M.....X.3.57.R..N....M.._%..*
                                         FB4A0AC7BA366E924BD634B0DC3AF6CAA34731A59749E7EF7531A0F70D7A   *.".G..>K.0....6.T..VP.X....7.:*
                                         3295D1E75687AB0BF3EE9DC41BB7B643019EE954E2E8C412F0A0B7C1F480   *.NJX.G..3..D......Z.SYD.0..A4.*
                                         1ECC9CE60B577BF29CC23B91942BEE96D060EECA8BF69DAAEC254FF585BD   *...W..#2.B.JM..0}-...6....|5E.*
                                         349F491EDBF9890D9094D9E8EEEE4BAD9BAA731557E97E5A2EE652F9C5D1   *.....9I..MRY.........Z=!.W.9EJ*
                                         8C6AA6D9AE23C5B7AECA2AB45AE99DBC9F9EED937B3A5BFF347802CDB34E   *..WR..E.....!Z.....L#.$......+*
                                         34B6D3A16E800B9A89F9CEDA0CFB4DC9F5B00674B9F7D977F8E653B9E882   *..L.>...I9....(I5....7R.8W..YB*
                                         D2A47CD32D0BFEB26EBD03843B6B7BD90D9C108C814DC5FD190894F682AE   *KU@L....>..D.,#R....A(E...M6B.*
                                         5DFD85DA1BDEB2A4A6A2580084BF8A2D6188A99D86B7A50E83B55C18A7B1   *).E....UWS..D.../HZ.F.V.C.*.X.*
                                         56D8F7BCBE9B1785B863D18CA172EEBB80AF64FD7B2E68A2242FDCF5C267   *.Q7....E..J.........#..S...5B.*
                                         AEAE254E9093492943A8343941FC9B30ADB0992F6C98F8B609F0775755AB   *...+.L...Y........R.%Q8..0....*
                                         0708CADAD25D7FA8F8AD16DE2BD6058FF05438EB29725CEE136EA2BDC4C7   *....K)"Y8....0..0.....*..>S.DG*
                                         CBC21941C3882CCCC4B5379DB5D6533306F03B3CD8C11804208FB733EBC4   *.B..CH..D....0...0..QA.......D*
                                         B1D304F695107FB46E8053C2AB25B1F237EB50B53A4D6D86B18C10F262B3   *.L.6N.".>..B...2..&..(_F...2..*
                                         86ADF89EBD9D7DE387B3E504D980A19ED5F2C2F3EDDD1CC91F8CD883A3DA   *F.8...'TG.V.R...N2B3...I..QCT.*
                                         AA8A93F270290DA19790D5E5A5E2D5EDCF83BDD2D26745F37A4F25E2E283   *..L2....P.NVVSN..C.KK..3:|.SSC*
                                         05850831A3DCF30891D7B7D8EBE7029AF2DC0AFC5BD53E2B3AE4885A36B3   *.E..T.3.JP.Q.X..2...$N...UH!..*
                                         DB0472F001349EDF25EC2CB2B4AF29F4580868BF90612C9FDBF1F6A0EA9F   *...0...........4...../...16...*
                                         798B8C13799952B48384C9531ABD6F1412C78F0AE880156BB4FE52381EC7   *.....R..CDI...?..G..Y..,.....G*
                                         E2BC04F6A6112290AF4DB1E515E9AD81A0D25CE552D881A20472C7D20BB9   *S..6W....(.V.Z.A.K*V.QAS..GK..*
                                         EBFFDB5F099B3CCB1BB43AA93DF73D403CD644A1F4B3E50813817573ABC5   *...,.......Z.7. .0..4.V..A...E*
                                         FD21F4EDC07FB9F901C4A1E314A5BFE08E13128F8675ECC4A82292FA7604   *..4.{".9.D.T.V......F..DY.K...*
                                         1CDA084ABBD662AAD2E7BD2EF4B5560C09A4307FE2EC1C22A5AB26F7BE8B   *...".0..KX..4....U."S...V..7..*
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A               05/09/97  11:31:12                      Page:      10
                     Data . . . :  5332BC83281C1BBE4D73E3CEF39DB1DBF6399D8240E33EF2073E41B98899   *...C....(.T.3...6..B T.2....HR*
                                         8BB718D3D7BEFC262B9C2E33039D175A11E81A62AA9C43FDF3B3D5ACAC91   *...LP..........!.Y......3.N..J*
                                         3BAC72E4B6BADC98A636D4C859E69886326BECD84B97C9CADA7C10CE0766   *...U...QW.MH.WQF.,.Q.PI..@....*
                                         7CC7D9C091A8F1D6199D1F59F7F54BB7B8BE0B0ED9C7FC2A09FC2C1B72B3   *@GR{JY10....75......RG........*
                                         BE5AB69635BEECA289C50082E4D65FFDB63A1CC6A18666967EF86CE9E7C7   *.!.0...SIE.BUO,....F.F.0=8%ZXG*
                                         A5EFE4999C89214BD0E8F88B06956FAE69D723BC25EB158F7CD47F8E7882   *V.UR.I..}Y8..N?..P......@M"..B*
                                         62D547A6A06B32EDDDF5158705AFB58652D955A93AA059C7F589DCC92E31   *.N.W.,...5.G...F.R.Z...G5I.I..*
                                         14F7987F3CBCC9BB23E01D57AAA666CCDAA7135190E5501AA2EE04F74C88   *.7Q"..I......W...X...V&.S..7<H*
                                         0818AACB8B86ACB536EE9BA96B5F10C82E6A56DF479AC7D602F157DB32F4   *.....F.....Z,,.H......GO.1...4*
                                         86EE53F9D8CB384E26DD930906E035DA90EFA096F09815E179C4861CF1C0   *F..9Q..+..L........00Q...DF.1{*
                                         D67704C0200A85F793044ED5001BDEFA25F912D3038D0C8E217B10B816A0   *O..{..E7L.+N.....9.L.....#....*
                                         57D5790E2DFE9219D9A9DF78228E485750AF5C8E2BE57A02FFAD5B290DBB   *.N....K.RZ......&.*..V:...$...*
                                         E46D6691CAA3EA8ECFA26EE1B12D02B7025211F95A37F5921035B9E6374F   *U_.J.T...S>........9!.5K...W.|*
                                         9AB94B7D8B8B1F8FB8C514C064D5634A52E9A4BAF1BDED9C0EBAA0BC8D8E   *...'.....E.{.N.".ZU.1.........*
                                         BB2CB5A2746849886AE3F3A19BAC7EF359D7168F38622CBEB5802AFDF1A7   *...S...H.T3...=3.P..........1X*
                                         3784198E22A9C29DF0A80F4EA384F40589B097A991B4FDC92B81A282E3D4   *.D...ZB.0Y.+TD4.I.PZJ..I.ASBTM*
                                         3F4793867470C3C697572CF9DC6F90F720D7188D09E76A8538287EA9EAAC   *..LF..CFP..9.?.7.P...X.E..=Z..*
                                         87EDE52A38E0373C8DCA68BFFCA314A1369F6433E0EB8A08E1B34D64979E   *G.V..........T............(.P.*
                                         075179F2762FFDAD490768958595BAF5293307E3D58E50D9729B0CF321A0   *...2.......NEN.5...TN.&R...3..*
                                         5CA4A774B9EDE07223AA65D1D882B4134FFC5FEA93FD21DA57B98607978E   **UX........JQB..|.,.L.....F.P.*
                                         5CA9AAE58720EB8A829A08844ECA44D0C17A39CE3F9F42B2F10FD8F04789   **Z.VG...B..D+..}A:......1.Q0.I*
                                         B0E8A0FD0EA146197481316165D0F170279AFA7B9DB2C9CFE9DF7125B3FD   *.Y.......A./.}1....#..I.Z.....*
                                         627D60CD15AB97C9B4AFB2F57B3693EC3C6ACEF288738DDC5AAA61C46837   *.'-...PI...5#.L....2H...!./D..*
                                         4D960704F9A6D7C4639F9E9529E453089E875B322FF43BF1168B5158A089   *(0..9WPD...N.U...G$..4.1.....I*
                                         91B7D6BDBC892AA4D185B8B7A24792FF09206EB0309892C670F39DA18A2E   *J.O..I.UJE..S.K...>..QKF.3....*
                                         34F6DFAAC7D6456D71E814839E9ACD711CA5BD34ABA8CD1B90B1CCE18581   *.6..GO._.Y.C.....V...Y......EA*
                                         EA3DF6B98A241D9C494B168FE0E184F4F5EAE8BD11A2FDD0E3F105A4E4EA   *..6...........D45.Y..S.}T1.UU.*
                                         68B0D9A66CA13D572AC225D91AC2D09D8B8E17749AA5E87358BFECEB81DB   *..RW%....B.R.B}......VY.....A.*
                                         59C498E27A47AAC9F75E108F40D408E920A2B2DD99CBB19C0C4321E90B7B   *.DQS:..I7;.. M.Z.S..R......Z.#*
                                         91F0DDE41FF7AC2AC4C82C28E5CB31390F8C997002AD88DB6CF3FDE876A2   *J0.U.7..DH..V.....R...H.%3.Y.S*
                                         A918208B6F304FB0CCDA0ED90027D1993679A5C76C8E39A7EDA679E34CA8   *Z...?.|....R..JR..VG%..X.W.T<Y*
                                         11BDAE68AD855A9726FE798430DBD5EDD6B9F1ED5CBA1692649FE542AF84   *.....E!P...D..N.0.1.*..K..V..D*
                                         7D412DBB423550F7BA773CF2EA8334824C4785DDEBAF989C5595FCB6EA23   *'.....&7...2.C.B<.E...Q..N....*
                                         94C5C6275ED442F1C3F70EA614E2B9E9C49BA2B727D7A6B14580C097A0E4   *MEF.;M.1C7.W.S.ZD.S..PW...{P.U*
                                         22CB6AA859112AEF7632BFB8FE146CB0EF1D57A26F9582CBC0DD1FE2F586   *...Y..........%....S?NB.{..S5F*
                                         BBE560D366B7D74331957CA443AA0477628B3A1A23938A373FD73154C6E7   *.V-L..P..N@U.........L...P..FX*
                                         B5018A9C7881DFAB96A7BBAFDE3E00A7B8CC35D567019ADD9A92EBCF23F3   *.....A..0X.....X...N.....K...3*
                                         F7C1664760A1D852D38125EDA9E116347DF8D06DFEBBE5BE51E8321837B0   *7A..-.Q.LA..Z...'8}_..V..Y....*
                                         D439FABD2AA6C9BB2C3726D3D8FFCBCB81D516B8CCFFBC9AA9EE6E8A64C7   *M....WI....LQ...AN......Z.>..G*
                                         17DE4AFDFD8D695F1080E05BF989B67A8AAB2740A99E066F09B86408EDAF   *.."....,...$9I.:... Z..?......*
                                         865E2F9E91B9B1F13664CCAA1408CD894E21F8E8986735EDA03FE0B3C205   *F;..J..1.......I+.8YQ.......B.*
                                         0286D72282961AC9F8B8C205C6CA0968EEAFC848E38629893F90F1CBEAF2   *.FP.B0.I8.B.F.....H.TF.I..1..2*
                                         82B9FEE4814F15E56F60E7F343535FC916FEBF84AF14BE827B0A01DBCE0A   *B..UA|.V?-X3..,I...D...B#.....*
                                         94B418EB4ACFFFA3A6985151FA82DD42378C266C01AE7CFD8A8FE9C886BD   *M..."..TWQ...B.....%..@...ZHF.*
                                         6C1F3B8576BBA6B619D3BFD99CFE00D1E8219EDEF777BCC8D64A01EC94EE   *%..E..W..L.R...JY...7..HO"..M.*
                                         AAA5C1543FB782491ECA8EAEB2DD6F9003C7582689EC4A529E83767C45D7   *.VA...B.......?..G..I."..C.@.P*
                                         D8D971DDABF86DC5432DCEBD749490B0C5DB1D8DB4A797CF66F330EFE83E   *QR...8_E.....M..E....XP..3..Y.*
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                                  B1F86C51848F5C3088ED767A4000FFEF                                *.8%.D.*.H..: ...             *
    25   R       0 00000000  1516.7  EBCDIC  X25LINET  /03   I          7         7     OFF    RR          100461    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                             P(R)=  3
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A               05/09/97  11:31:12                        Page:      11
Record        Data   Record    Record  Data    Controller             Number   Number   Poll/  Packet       Packet    LLC
Number  S/R  Length  Status    Timer   Type    Name/Number   Command  Sent     Received Final  Type         Header    Type
------  ---  ------  --------  ------  ------  ------------- -------  ------   -------- -----  ----------   --------  -----
    27   S       0 00000000  1516.7  EBCDIC  X25LINET  /01   I          7         0     OFF    RR          100461    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                             P(R)=  3
    28   S      53 00000000  1516.7  EBCDIC  X25LINET  /01   I          0         0     OFF    DATA        100466    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                   P(S)=  3  P(R)=  3
                   IPX  . . . :  Pkt Length:    53     Pkt Type: 0x04                         Hop Count:   0
                                 Src Addr  : 00000000:000000000000:9004 (IPW2)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                   IPX Raw Hdr:  FFFF0035000400000000FFFFFFFFFFFF9004000000000000000000009004
                   IW2  . . . :  WPkt Type: 0x05 (THRU. RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   1
                   Option . . :  WOpcode: 0x03 (NLSP Raw)         WAccept: 0x01 (Yes)     WOption Len:     8
                                 Request Size: 0x00001000         Delta Time: 0x0019B221 usec
                   Data . . . :  5741534D0576AD011700010301000800010000019B221                     *...(..................         *
    29   R     296 00000000  1516.8  EBCDIC  X25LINET  /03   I          0         7     OFF    DATA        100466    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                   P(S)=  3  P(R)=  3
                   IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)               Hop Count:   0
                                 Src Addr  : 96AD0D47:000000000001:9086 (PING)
                                 Dest Addr : 76AD0117:000000000001:4000 (Dynamic Low Bound)
                   IPX Raw Hdr:  FFFF0128000076AD01170000000000014000096AD0D470000000000019086
                   PING . . . :  Type:   1 (Response)      Ping ID: 0x0002     Result: 0x01
                   PING Header:  50696E67010100020100
                   Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                                 7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                 00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                 274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                 CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                                 7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                 00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                 274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                 CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#               *
    33   R       0 00000000  1516.8  EBCDIC  X25LINET  /03   I          1         1     OFF    RR          100481    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                             P(R)=  4
    35   S       0 00000000  1516.9  EBCDIC  X25LINET  /01   I          1         2     OFF    RR          100481    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                             P(R)=  4
    37   S     296 00000000  1517.3  EBCDIC  X25LINET  /01   I          2         2     OFF    DATA        100488    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                   P(S)=  4  P(R)=  4
                   IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)               Hop Count:   0
                                 Src Addr  : 76AD0117:000000000001:4000 (Dynamic Low Bound)
                                 Dest Addr : 96AD0D47:000000000001:9086 (PING)
                   IPX Raw Hdr:  FFFF0128000096AD0D470000000000019086 76AD01170000000000014000
                   PING . . . :  Type:   0 (Request)       Ping ID: 0x0003     Result: 0x00
                   PING Header:  50696E67010000030000
                   Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                                 7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                 00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                 274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A               05/09/97  11:31:12                        Page:      12
                   Data . . . :  CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                                 7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                 00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                 274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                 CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#               *
    38   R    4096 00000000  1518.6  EBCDIC  X25LINET  /03   I          2         2     OFF    DATA        100488    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                   P(S)=  4  P(R)=  4
                   IPX  . . . :  Pkt Length:  4096     Pkt Type: 0x04                         Hop Count:   0
                                 Src Addr  : 00000000:000000000000:9004 (IPW2)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                   IPX Raw Hdr:  FFFF1000000400000000FFFFFFFFFFFF9004000000000000000000009004
                   IW2  . . . :  WPkt Type: 0x04 (THRU. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                   Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)     WOption Len:  4051
                   Data . . . :  5741534D0496AD0D470001FF010FD3A1325523EF73BF839822AC478C5CB7   *...(.O........L.......CQ....*.*
                                 5A9B09BDB59C860599A2D9D01889ED2B30B1AEA30FC05388ECAC42A09ACA   *!.....F.RSR}.I.....T.{.H......*
                                 3E36D1BA813B13FA4DBC0E8575BB85F46A5D37F30E433EAD61181DC17670   *..J.A...(..E..E4.).3..../..A..*
                                 D9C6EB19CAF4EA82CDD031DE5AF9FD517FE5F1E912ECFD12AFDAD618B79D   *RF...4.B.}..!9..”V1Z......O...*
                                 F106A0BAEA4363E9EE7874A7267FA9D08785FBF16D8CB2CF3075F3F6900E   *1......Z...X.”Z}GE.1_.....36..*
                                 CAEBBB6E3DDE42DFB4F86D146CC1583DE08846A04CD4C6237A9C438BB996   *...>.....8_.%A...H..<MF.:....O*
                                 8A6ED6DA72F0D1B0209963AC368CECB15E32499F37B199816D057A9C82CE   *.>O..OJ..R......;.....RA_.:.B.*
                                 F9CFE28DB6A2C6125BF9DF67DABA1B9960E9F2CD15C37695B29E5E3D60BD   *9.S..SF.$9.....R-Z2..C.N..;.-.*
                                 0FBADBD3B4E0D688156E31B6F598C4B600C9B4EDBAA5C6F8D9E419A90EA4   *...L..OH.>..5QD..I...VF8RU.Z.U*
                                 F3806FA43CA187A105CF5CA21DCA978847A274553B8387E7D1CF848DCE87   *3.?U..G...*S..PH.S...CGXJ.D..G*
                                 7A39D3E96A9122D35EC6E7F354D41BC631B56CE97E2B1CDA40B307CDAA00   *:.LZ.J.L;FX3.M.F..%Z=... .....*
                                 83D40801F2D9B8239FC82B0B6581F97A8FA1DD84F4D64402328AEC8E85B0   *CM..2R...H...A9:...D4O......E.*
                                 810505E670E5CBFDFEE89FEA5AA100E4007F34DC9FA3DEF4BFB4FBD60348   *A..W.V...Y..!..U.”...T.4...O..*
                                 46F17E596F9E220247CAC3D46DFEAFA81BBE46073FE7861AB19542D138D5   *.1=.?.....CM_..Y.....XF..N.J.N*
                                 B600179FC0539F8BB23DAAE2EEAB8DA3412A618B459A048682C40CF31534   *....{......S...T../....FBD.3..*
                                 D2F53F43AC8C744EFFA7EE8F649F08445FD7C10A8BC29B9A57F5B2299283   *K5.....+.X......,PA..B...5..KC*
                                 C7AE44AA8235F4CAA47DA1F5343CF7B88EF9E6B2B8C9B481C2A41891A366   *G...B.4.U’.5..7..9W..I.ABU.JT.*
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                                          37FE8BEF94951E601CFD381AC0EE64B52195B003CED6CA1629ED754BEAAF   *....MN.-....{....N...O........*
                                          CB6972D3781589F0CE41D6F544C41DF5A7C9B8DAACCD0886C938628494EF   *...L..IO..O5.D.5XI.....FI..DM.*
                                          11CDDB89188805F03FBDDFFDDEBC945B36AFF096F4DC46C76AAACE7122D7   *...I.H.O......M$..OO4..G.....P*
                                          65C6CADADE6641BF0BA5AA95A99DE4B2BD3080A2BB7F2EC39AF87AF32F75   *.F.......V.NZ.U....S.".C.8:3..*
                                          EAB0E6D26281FE7AABEA27B33AD4681CF0FF443D82D922A4BCF16DA203D4   *..WK.A.:.....M..O...BR.U.1_S.M*
                                          A7EECADD2E7CD99706FC02CB8B34C5A035D9EAAF75E3D3E4C08BA49D1031   *X....@RP......E..R...TLU{.U...*
                                          5192160D67E5CA301FBD1DB916EA62B45AF62EF8EE85D94F88FDF4AE5FCA   *.K...V..........!6.8.ER|H.4.,.*
                                          E4613BD7ABD08ED1098941C912759FDAE880DBD6641A25C5F0E11AC94AD7   *U/.P.}.J.I.I....Y..O...EO..I"P*
                                          7DD089B6CA813FF2BD8D599897F5312A01EEBD256AC3E3CC9AA08DF6F0C8   *'}I..A.2...QP5.......CT....6OH*
                                          4F58EAD156D1649ACD679CA34D822BB59D28D0E0E2CCD7C9F6AA9AE13ACC   *|..J.J.....T(B....}.S.PI6.....*
                                          0DDB2ADD01DB13DD11F516F775B6D0A009BABB0CA4CE3B42C3949C79FDAD   *.........5.7..}.....U...CM....*
                                          0D1D45B7FCF5C6C06BF889F08A4D1187CA1278E382C9EE9F979CF49AC1A9   *.....5F{,8IO.(.G...TBI..P.4.AZ*
                                          08A0409B99F1A7AC01B70DF19AF471135AABADF717AA395F109C906AC0CD   *.. .R1X....1.4..!..7...,....{.*
                                          50B38EED3C98F1A55D6FE6995DB9DCD855692ECF6CB9F8EB25B32CF81686   *&....Q1V)?WR)..Q....%.8....8.F*
                                          508ECC6D708F251D4FCDA776F5AD73384FE7762380FD151F38F5B51757C4   *&.._....|.X.5...|X.......5...D*
                                          0FCEC8E9D111089CB59C26D71ED32BA8BA1A64D21AF1C7E6F7AB958E2239   *..HZJ......P.L.Y...K.1GW7.N...*
                                          ABE8F8527486EDB52BE0115F42948558FCBE955492BDE39EFFAADBD8BFC7   *.Y8..F.....,.ME...N.K.T....Q.G*
                                          733B3CDE364671BD4B16B18CBF1F8FD7B12D7AB1211338F2751C62E69AE2   *..............P..:....2...W.S*
                                          4AC27EDE8E9745A065DC25947AA73746819DF614EC86D7E2FAC776D040C9   *"B=..P.....M:X..A.6..FPS.G.} I*
                                          62800FE1C5C014FDC5D4D9C71974B9D83E83CEF03FB84CE75D00CE8AE04B   *....E{..EMRG...Q.C.O..<X).....*
                                          0E8B5FCB5EBE20CFCFDC2B808EAC055B9093BEA32CC8CAE97C81A732E287   *..,.;..........$.L.T.H.Z@AX.SG*
                                          FDD5EFA9E883AAE01C650CE82E69C7BF22FEE8928D93628CC7521AF1DF71   *.N.ZYC.....Y..G...YK.L..G..1..*
                                          2B847F3A1DBCC089E1849C7398BB69442DFBFB467BADD0B67CE17CE00BCD   *.D"...{I.D..Q.......#.}.@.@...*
                                          5965D5A82CEC479D4C7F94894C1E3BE454F9E986E3A51DCB6D581BF7B3BC   *..NY....<"MI<..U.9ZFTV.._..7..*
                                          F4B93AB639BD91B731A9925333C594903F9C8A7D71C831D602BFD983FDE1   *4.....J..ZK..EM....'.H.O..RC..*
                                          68B972A2675EFCB08D45B18ADAC2069FF85F23EB2E44E2AAACCA0FB605F6   *...S.;.......B..8,....S......6*
                                          54C16F6229F795D4F68DD0E1788C82D606E1B16BFCC728E127CCD62D9881   *.A?..7NM6.}...BO...,.G....O.QA*
                                          4BBF3993F77981DC4A500C92CDB4D2FF1A924AA97ABB1FB8934727CD24B0   *...L7.A."&.K..K..K"Z:...L.....*
                                          1DA3A6A92492AACE6D8BD6A156B7FA5CD495E4C0AADD2525C8B1D3DEE6CC   *.TWZ.K.._.O....*MNU{....H.L.W.*
                                          CF2940B49D91CDD4CF865F847F3421BB37A67DC293B892F03ADD0BA88678   *.. ..J.M.F,D"....W'BL.KO...YF.*
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A               05/09/97  11:31:12                          Page:      13
                    Data . . . :  65944A8554A87799DCC41690EDA5851C2FC5FDA68F8FC25BD7A11BC9FEA7   *.M"E.Y.R.D...VE..E.W..B$P..I.X*
                                          6A9555C6725552FC3FE047C59DD6B3FD7AE7218FDCA98BDFFF2E77EA43F9   *.N.F.......E.O..:X...Z.......9*
                                          8594B302ECF4852039D006FB9AFA70A629F9AD4E33E0E97655FF5839CFF9   *EM...4E..}.....W.9.+..Z......9*
                                          3BC801C3C8397D8E36A1F7A4C3A813A94FCBE8B5D443308287619486177E   *.H.CH.'...7UCY.Z|.Y.M..BG/MF.=*
                                          80F0724A47DF6AF6A5E7673D3BAAE5632EB9D2B8AAB95A0036C3C4384C87   *.O."...6VX....V...K...!..CD.<G*
                                          4C69FEA9C2E818BB13D6BB9376EEF2E5419D81B6CBF5BE8872EAB5B08F57   *<..ZBY...O.L..2V..A..5.H......*
                                          10929D36008F448534DB85626892000A71C0ADCB9AD2124E4AAFD2480696   *.K.....E..E..K...{...K.+".K..O*
                                          76DC19D56C3A7CB474105CAFDE6493B19D491ACD2AA510AABB26ACE4E83D   *...N%.@...*...L......V.....UY.*
                                          C6CB300793BE41AC1DC98B0581C616BF87FF789DABC7B7C896F2D2564ACF   *F...L....I..AF..G....G.HO2K.".*
                                          1F90D2A15D353BEE520741CB5AB6A4B08D314A859F4BD59D2BD17DA7C6B6   *..K.).......!.U..."E..N..J'XF.*
                                          29E6E193CDE3AEEE27F195B7399C307B19B2E1F66C90F98835EE5D99EFC3   *.W.L.T...1N....#...6%.9H..)R.C*
                                          25942CD82338CCF06647F0CAFD58DEBED5BEF0C2EAE072CA35C0588EE739   *.M.Q...O..O.....N.OB.....{..X.*
                                          20EE57AD2CBE2A9DF4DFE85FB690E41893EF09A536E23DF6D5D2188DFECA   *........4.Y,..U.L..V.S.6NK....*
                                          128A7587406EF99735E2CFD2BDD198AC0BBE40B6F7B3FFC04A8832DD33ED   *...G >9P.S.K.JQ... .7..{"H....*
                                          3FFC1D348EE165D7F2E544C47A85BF9B2FE6656F438D6C0DE2B103B8F8EB   *.......P2V.D:E...W.?..%.S...8.*
                                          64FC93B3028FA2ED24307FE2EC5B7B8B6A5CA2F3E7D730F9E10D6AA6382A   *..L...S..."S.$#..*S3XP.9...W..*
                                          51B1628119BA09EB4BE136E859DBD09E93DD5B35A48F1F1386C13B0BD38B   *...A.......Y..}.L.$.U...FA..L.*
                                          85ACC2F5113C1EBE825345DE2938BAE44BAD49A45E08B8998EBC57E9EF42   *E.B5....B......U...U;..R...Z..*
                                          84DAF86019E86D799FEB4C2CF0D61AB940F478869194CB16FCA15246B6A0   *D.8-.Y_...<.OO.. 4.FJM........*
                                          A0A97993D69953EDEC63F9BA97EA78CBA2CBFDACFEB77E86C109EEEB732D   *.Z.LOR....9.P...S.....=FA.....*
                                          60D6A87264CCEE7156BA532E37AAFF7C73EB43B9BAAB56DB02D344B830C4   *-OY...........@.........L...D*
                                          98C3AD8956F7B2ACA00D90BFDAC17BB2D4D4A5B2D4F85DBBFDFD65A00752   *QC.I.7.......A#.MMV.M8).......*
                                          50C0AD5445B377E0D7834A9F4F98213EE1AEA773CFF3A4749EB1E4AE0A9C   *&{......PC".|Q....X..3U...U...*
                                          5E6DC5FB78F0B7C103FF5DED7295ABFDC08757EAF5E2E8B50465DCB3BBAB   *;_E..O.A..)..N..{G..5SY.......*
                                          5DE5EFC2DBDFE22DCDFA2D6090B91F0E42A5E16E02F2FD9A63E7A3563794   *)V.B..S....-.....V.>.2...XT..M*
                                          71ABB1B2BF3D9BA965E6CCE113B1F7D4094293ABF22DA7A8938723ED8D61   *.......Z.W....7M..L.2.XYLG.../*
                                          4CDCEF3E6CDEEB95C6BCB66C81EC8DE9F2D8FA8833A8043B90ADE2C11E81   *<...%..NF..%A..Z2Q.H.Y....SA.A*
                                          F4F1C3F82C7BDDB0786976B1541C7E891AEF27C74B2FC4992D5315EEA9D6   *41C8.#........=I...G..DR....ZO*
                                          44D03284C6A4AB4DF4EA8B22A2D48F31FB851AC2C49FE91622FFAC64338E   *.}.DFU.(4...SM...E.BD.Z.......*
                                          E6D369D441DBCBAFC5594CC569E6BCABABA5E69218F718A5069398D2C434   *WL.M....E.<E.W...VWK.7.V.LQKD.*
                                          CDCF66EAD6EDC3F1FBDB440FB1D1629DEEA16EDFA8F61DE165A3B92C20D2   *....O.C1.....J....>.Y6...T...K*
                                          003CDA8D9B77EDD9DEB13DAB468B8BA473AA87A5C0D96B980254D2C10EF4   *.......R.......U..GV{R,Q..KA.4*
                                          F6BCF4A580E19DD76BC1AA25868985E3C0B52B98CAC13C52B3DF59C8E2FF   *6.4V...P,A..FIET{..Q.A.....HS.*
                                          93DFFDC556DE22CA11EF66DF7C792FE4F86F4AF252D8B79D1252AC9DF1EA   *L..E........@..U8?"2.Q......1.*
                                          C5F56C7C86A563BF4CB7A46B698B8818B1940D5409F70866CFC8961EBEF7   *E5%@FV..<.U,..H..M...7...HO..7*
                                          BCB2D48580FB5ED6F71CCCF9840356C9F7831598BF3F4BB3D4A346CD2BA4   *..ME..;O7..9D..I7C.Q....MT...U*
                                          E7EC57A2EDED89EED4FA9F1A22E36D2EBA951729FDA3C5ED84976CC91DE7   *X..S..I.M....T_..N...TE.DP%I.X*
                                          07DC96B523725AAA28CF9FDD57270084C1E288D4FF92D0D70002F0C1C148   *..O...!........DASHM.K}P..OAA.*
                                          D7F8957EA29EAD3D2FFF8C2A0CCB1CFCE7DC2009DFBB688061C9C4C06794   *P8N=S...........X......./ID{.M*
                                          3411AFE675442D9CCF5C90F1C6425E8F2FA555810FB8E5AF34049680196D   *...W.....*.1F.;..V.A..V...O.._*
                                          B885728CBDA37610BE9C457DCA9645A8EEB755EE56EA92AE23C3E6F426EF   *.E...T.....'.O.Y......K..CW4..*
                                          A74F45D145B5EFB7ABC940EF29E6F5A7FA597FA509F702B137F8F5D1B9F7   *X|.J.....I ..W5X.."V.7...85J.7*
                                          B98836FE42D26EE4ECEE77ADE3F3398C65C730B7A4CF68D627EBC404D392   *.H...K>U....T3...G..U..O..D.LK*
                                          193193B405F4D5F30D2849E4D04D49A78268FCE2BACE4FD63F18D4C87774   *..L..4N3...U}(.XB..S..|O..MH..*
                                          309A6D62238346370BF6C7F682C2094F62F13B0E74DC325D67EE928622D5   *.._..C...6G6BB.|.1.....)..KF.N*
                                          A49C8CAA2218E9A491C043DCE5C31EF06D57DF9AA46CCBA0E2D2BF8B7A4C   *U.....ZUJ{..VC.O_...U%..SK..:<*
                                          1F8A1BCEC4A7A3ECB3FB0931C198A1F6AAB1496130C88BF13FDB8BC5F6B5   *....DXT.....AQ.6.../.H.1...E6.*
                                          720A16D1F4876B8CE6ED7E8CF23378F1115393A886538B8AD7211EB1BF7F   *...J4G,.W.=.2..1..LYF...P...."*
                                          C9935EC04BB1A2C784B5D90639BB27E575B849C452F2F8420488B6913C89   *IL;{..SGD.R....V...D.28..H.J.I*
                                          F94044CAEA7721E7337F9BE5FF0FB3CC6026BDBC8FAB1FFC2BE0F0A4BD2D   *9 .....X.".V....-.........OU..*
                                          E880112ED8E81AA898AE330A3598E376EDFD951006C54F7BFBE55500F1AF   *Y...QY.YQ....QT...N..E|#.V..1.*
                                          B143D89EDD7406DCEC8766ACADAADBBDAC686F81FCB0B3F4B4FA7195A68E   *..Q......G........?A...4...NW.*
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                                3BE9C4103FC7071000A0ABD616F17490C39BCC6E0E8A4DA90CF09599C4ED   *.ZD..G.....0.1..C..>..(Z.ONRD.*
                                A28E42CB2A08F1B4B16E6CECC8D122F41A88A1FA007F3BB6A17AB8A38023   *S.....1..>%.HJ.4.H..."...:.T..*
                                B5B1A893F0B288CCB0B3369263C3C4FD81B9DF84918178AAEE991E31AB8D   *..YLO.H....K.CD.A..DJA...R....*
                                4F2017C5C40E7CCA9354548E85BEB4EEAB6486B65513D58B896279E8A03D   *|..ED.@.L...E.....F...N.I..Y..*
                                81F0265778E539027581D0C4E6B12F1AA08B7D5942D26F439A86BF9F668E   *AO...V...A}DW.....'..K?..F....*
                                7A26A8F58028ACB0EEB22086F0ADA1A3176A3ED64060199C657734C97547   *:.Y5.......FO..T...O -.....I..*
                                24B291F3D18C1E79EFA4D781C8C089C6059527D505EA1287C4E68FCCEBEA   *..J3J....UPAH{IF.N.N...GDW....*
                                D6CE8FBC9386BDF9734304FE353B8ED8D96A05A9BFDD7DF366909CD2A06E   *O...LF.9.......QR..Z..'3...K.>*
                                9CA2BE2FCDF4348F34A6A61C2EE384657C89232497E2377BD8A8A415F0AC   *.S...4...WW..TD.@I..PS.#QYU.0.*
                                9C9610DC404CF9817DE068EF180E439450CB58C4564A7BFD3435F1EEC1E3   *.O.. <9A'......M&..D."#...1.AT*
                                16FB2433D085C61D8191BB44C59DA02C43FEBA338EF28F3249972ED30983   *....}EF.AJ..E........2...P.L.C*
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                     Data . . . :  21416BFC4E1B0FEBD2F732E7636C93B06D9D94EC84BA0AFDD25FD6FE925C   *..,.+...K7.X.%L._.M.D...K,O.K**
                                CABB0A5459A327FEFF96D66B09D70D693DB1789219E2C00256ABD9D068E9   *.....T...OO,.P.....K.S{...R}.Z*
                                01B3FDEED01E8EA186772082F728BAB0930E83869F1507F476C39DA124F5   *....}...F..B7...L.CF...4.C...5*
                                CF81863BB193B923E7DFE45E7689F607D1F77B711AC93EE0E6BF1F8343AD   *.AF..L..X.U;.I6.J7#..I..W..C..*
                                E305BD938E147CD4E324938C769C17BF01F20D98BA957481AA4103D0926E   *T..L..@MT.L......2.Q.N.A...}K>*
                                77BD92B19CE9CADA0084AEADEBE81C635B9FBF626BCDD6B0BDC9EDB1DF94   *..K..Z...D...Y..$...,.O..I...M*
                                390F0CAE0B28DBDEA79B22CDBA476280A4DC74C78585A88F0A3EEFE9AA06   *........X.......U..GEEY....Z..*
                                479982972BCC92D6CABC53D0B4A2AB3A05976E71B3D3EAEC71E4495B698C   *.RBP..KO...}.S...P>..L...U.$..*
                                10BF979F929A59D1D39AE89B5F60F892D7897A8482F3E8B15B4850DFE8D7   *..P.K..JL.Y.,-8KPI:DB3Y.$.&.YP*
                                28AF85F5F183D5FB3FD56228B89F5FB57BC483EFFCB200EE30DB15EC9DFC   *..E51CN..N....,.#DC...........*
                                61A7CAEF4F4039BC01D8EE9D4951B1B8928C249D2EEE28F415D4B7C540B7   */X..| ...Q......K......4.M.E .*
                                939BD479129A58DCACBFFFEF5FBBBCA874DED7B7F7A46F2B6EFE8C9719C0   *L.M.........,..Y..P.7U?.>..P.{*
                                146CDFFCF806FEFF938F72B0AF0875B35493F3F5BD9280F0DD8F8BE1FB6A   *.%..8...L........L35.K.O......*
                                38C0FAF6719C49D7B3B3F078EFF093EF34803DBA52D4939F45A7BDD80CA0   *.{.6...P..O..OL......ML..X.Q..*
                                B351DEDCC4183FCE14415593CD9D27A008B7419C375E7DF71CB0ABFC9329   *....D......L.........;'7....L.*
                                4CA17CBE2184A6BB5CDE56D90E97C4982DEBE3003384228D43F8686D7B8F   *<.@..DW.*..R.PDQ..T..D...8._#.*
                                EC25A7D89C40C3FA60314FC145B9F5C8B3E6F59B0045C5AEE4D804B22248   *..XQ. C.-.|A..5H.W5...E.UQ....*
                                51E8BA193591CD5DF2C1D305A785187A5C8A097249F22E5D6CC1F7D9ACF6   *.Y...J.)2AL.XE.:*....2.)%A7R.6*
                                F40EB190F10522BF8845868B8CC2A8C63FEB2C8E68FB648E50AB48D21D4C   *4...1...H.F..BYF........&..K.<*
                                F781A857E7D3234132AF8DA5EAFC87FFB1C4A43EFEFB23FA8EF717017287   *7AY.XL.....V..G..DU......7...G*
                                60621BC8C9200D8C579C78CBE1D244D6B3D6EFB8E453099607D2B5DB9AB6   *-..HI........K.O.O..U..O.K....*
                                078A24F63580A0586F9F0E2163D8B23C2A9D8C588CE909A023F6F0D15CBC   *...6....?....Q.......Z...60J*.*
                                416DADEB87D96AA3D336F5FFBD62DAEAA559628D8FA949D2B3403BF63E4D   *._..GR.TL.5.....V....Z.K. .6.(*
                                8FF4566596D427D82D83E1DF2DE2034700C52AC4EDFAE708BCD5EEEF55B9   *.4..OM.Q.C...S...E.D..X..N....*
                                A3232E855B003A996C243D8ABF6F7D9E30BEB69238EFDED80C22D284C277   *T..E$..R%....?'....K...Q..KDB.*
                                CFFB47FB21B2B8B46AFC4CF6D100FFEF                               *..........<6J...             *
   41   S        0  00000000  1518.6  EBCDIC  X25LINET  /01   I          3         3     OFF    RR         1004A1    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  5
   42   R     4096  00000000  1520.3  EBCDIC  X25LINET  /03   I          3         3     OFF    DATA       10048A    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  5  P(R)=  4
                    IPX  . . . :  Pkt Length:  4096     Pkt Type: 0x04                      Hop Count:   0
                                  Src Addr  : 00000000:000000000000:9004 (IPW2)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                    IPX Raw Hdr:  FFFF1000000400000000FFFFFFFFFFFF9004000000000000000000009004
                    IW2  . . . :  WPkt Type: 0x04 (THRU. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                    Option . . :  WOpcode: 0xFF (Pad)             WAccept: 0x01 (Yes)     WOption Len:  4051
                    Data . . . :  5741534D0496AD0D470001FF010FD3B03D1ECFFCB2026E8ABE055FC152E7   *...(.O........L.......>...,A.X*
                                23A9C50DFEC819F5C6A05700CDAFF5E4F9B88BF1B0EBA8B87891E74728E6   *.ZE..H.5F.....5U9..1..Y..JX..W*
                                F0DDEECF7AAAB6FE5DFD25CC970A9BD039AF0DFB13E948D838F6C083D026   *O...:...)...P..}.....Z.Q.6{C}.*
                                28D6794FB4B660206EE0F1734D8BC9379CC7622A77FDD250E5FABD6C93AA   *.O.|..-.>.1.(.I..G....K&V..%L.*
                                23A7818ACA5D6CEBBBA4A4EC3683E5EF0DA88BE9B4B84AD7AF7A25C17C81   *.XA..)%..UU..CV..Y.Z.."P.:.A@A*
                                C4D52BCE1AAEE87A4DA0B5AEF2F7F0E44CE81CB8C0B5A5BC4E93EE020EEE   *DN....Y:(...270U<Y..{.V.+L....*
                                C93102DAB0F4C89796E6A4B40066BD86595E9FD5535DA2D428A419B82DD2   *I....4HPOWU....F.;.N.)SM.U...K*
                                21C83ED2FF948ECA0FAA73EAFCA0489DD2FF719834FAC000F1D37E4ED489   *.H.K.M..........K..Q..{.1L=+MI*
                                69ACC7F8CE834CBE0E7232A66B921AE0453E52E1FEEC86A75AC555B851A5   *..G8.C<....W,K........FX!E...V*
                                4AF83AFBD0E86A9402AD1B8684EA1C9CE6FC81381E878BBB16E6A7E6E099   *"8..}Y.M...FD...W.A..G...WXW.R*
                                26F26FCBF6A3F7AD8715BFFFA5079AAB969296AA720DDDA5EC7F98C9AD29   *.2?.6T7.G...V...OKO....V."QI..*
                                4387705527DFE6B8E9A4763BD7CE52F49CA8399798DD0FD271B9C16A1AC9   *.G....W.ZU..P..4.Y.PQ..K..A..I*
                                1D303D9B4A5BF3AEDAFE2CAB6554648987C926B1A72455D442A392E30133   *...."$3........IGI..X..M.TKT..*
                                1DE3C3295AA1D04889F14A6D5ECD52B215F029EA03CFC2E6248493B00DFC   *.TC.!.}.I1"_;....O....BW.DL...*
                                0B697BD13A8B84DA9DF26DB797423DAB7E10F6E18BDE70A5B8FEC0945D44   *..#J..D..2_.P...=.6....V..{M).*
                                41F72C5380FF1E7747A929592CD99DAE78FF29B7E68BE8DFEBE5C50510E9   *.7.......Z...R......W.Y..VE..Z*
                                CFD34ACB39173391227D82EF5E2C3F8FAB56E0B9D4D5D1C421EBA88EF6C7   *.L"....J.'B.;.......MNJD..Y.6G*
                                32EB8FECF2B60D7CB1AF75A5D8D4DB61E78EF8F1DFF9CFB0CEB261248487   *....2..@...VQM./X.81.9..../.DG*
                                A4B19BCD887CB0BBB2703CBFE6D36ACB423694E80D96CDD427E3C186DA00   *U...H@......WL....MY.O.M.TAF..*
                                B9D265B6DA93C80E21B317E454E58FA2A8B9003957BDB4DDA5AD43DCF1C2   *.K...LH....U.V.SY.......V...1B*
                                5EAB16D532950CEBD7B42E9E76B0FA825D3E5EB7A9D030EDA35D848050FF   *;..N.N..P......B).;.Z}..T)D.&.*
                                00C5959AD1E0E774AFFB9E0084C2345B2BFB4DC7A9AF6FA925CBCA161FC0   *.EN.J.X.....DB.$..(GZ.?Z.....{*
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A             05/09/97  11:31:12                     Page:     15
                     Data . . . :  72B5C0AAFAB2F6B0FB8C2DD2B03922AF77533FC2FAA719D5F0BE51B05F25   *..{...6....K.......B.X.NO...,.*
                                93B69C305CC82B45AE90EC092EF84EF55787CDA21ECD4EA53AE641EC24F1   *L...*H.......8+5.G.S..+V.W...1*
                                F6A596F7F196F595EE2E00C80E4EE7A35E864E92C3BEAEF11BDCC9DC3C8B   *6VO71O5N...H.+XT;F+KC..1..I...*
                                CA8AFDEBBDA4800C96D2BAA03ADA6DABECD63282FD8E361DE982E5F4F1C7   *.....U..OK...._..O.B....ZBV41G*
                                343D5BB6A8878AF25AD2B6A8C02709DF43166DAD75C09F8DB95FB28539E7   *..$.YG.2!K.Y{....._..{...,.E.X*
                                D09CA24D06E36F154191DCD30FB8A4C89ACA6E552B9199E1E28DBD071DF5   *}.S(.T?..J.L..UH..>..JR.S....5*
                                1E499E9773A1CCA883A5C3DAF7FBA4CEAA3C4C8A5D0B95E2A3AA2BE6F961   *...P...YCVC.7.U...<.).NST..W9/*
                                4CFE633B0CA4BA134FB449FC07E5418C0AB2515A1DFAF3816188B387FFC2   *<....U..|....V.....!..3A/H.G.B*
                                A5BC778EF88C78DFCE639DE6EE4B36A68C3CADC0E3D748AE4B1AE8C4D3CE   *V...8......W...W...{TP....YDL.*
                                BEADAA80E794F516C5E6AA2BEAAE2985F6A81A32CFCFFE0A42AF53DDBDAB   *....XM5.EW.....E6Y............*
                                02FD39D13F00E6FF54675DFE4E8DA1D734C777CA13C403D7AA089BDC1B66   *...J..W...).+..P.G...D.P......*
                                BB8AF5EFE39858675CD3EA1728AD96AFCAFFEF4FCFB861224FF113CF1BCB   *..5.TQ..*L....O....|../.|1....*
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                                        827144E0DA8FBEAD137647D8BA8817BE3D0D2B9A2BE3A1B76DAE1B81C1CC   *B.........Q.H.......T.._..AA.*
                                        B3DA663E53EE862B2AAA7C4CBEC692A564C5A8AE16C53D8BBCCBA148CFC9   *......F...@<.FKV.EY..E.......I*
                                        B3767BA527ECB2E024EED498BC1344E39523B3D45B3180AF0F376C8FFFED   *..#V......MQ...TN..M$.....%...*
                                        3FEB310CF5E14A2175C9DAFBE1C7CED850DCDBD2ACE3E48B7CB181EEC8C9   *....5.”..I...G.Q&..K.TU.@.A.HI*
                                        63E784BDF4F2689C56EB478E70D282910C9DDED350A438D34DC4EB96BB8C   *.XD.42.......KBJ...L&U.L(D.O..*
                                        AFF3118279828D529C8C2AC2BBCB56CAE2AF2223BAEA57E22AAFC1AB99D3   *.3.B.B.....B....S......S..A.RL*
                                        E923F5EF381684CB4EAECF9AB70051E47615328469FACDC9D0ECA6B360ED   *Z.5...D.+......U...D...I}.W.-.*
                                        CEA09CCB6495ED649E94690DF9FD14A28ED5BC9A71D13FDE58B81ECEBCEE   *.....N...M..9..S.N...J........*
                                        96F714F937BC6CBA33D648A139707AC207AC4885C00E7E83F7B6CDFC0290   *O7.9..%..O....:B...E{.=C7.....*
                                        6B8C57E210DDBAD06C93C9D42FA789A577BDCE7D90BF95DA4B872ED43293   *,..S...}%LIM.XIV...’..N..G.M.L*
                                        6D63F5F2BDB57184D38A39DC17E850A5954D14ECF7B0FAF98466A1E36E54   *_.52...DL....Y&VN(..7..9D..T>.*
                                        02E04DC3F5917C7CE083EAA0C0A0DFE0EACA27752AE47D8016EB64998C99   *..(C5J@@.C..{........U’....R.R*
                                        9D2F119E7D53E2B60E6BB9ECC29C10DC9457E08F15A444D5D3B5C0BE41BD   *....’.S..,..B...M....U.NL.{...*
                                        EDCE1C7431AE10A6AFC72F847180A07CE2A8671B6889389F39E45D9D91BE   *.......W.G.D...@SY...I...U).J.*
                                        140FB997149C2ECA19DD80E81D6629E21E84CDC1A122B6B9EE3E0BC82BA3   *...P.......Y...S.D.A.......H.T*
                                        8BA8FE6159D4A970BDC028F55FC1059289D4D7C360A15C40CCAFA263D8CE   *.Y./.MZ..{.5,A.KIMPC-.* ..S.Q.*
                                        4953FEB029B28181868D83A8B4D5E5F84703EBFE52B8A5E8D8DB15F517B7   *......AAF.CY.NV8......VYQ..5..*
                                        21E7F8553DE0A48EC6D399DC639A54541E965ECCBBA9D3561EF1BB22ADB4   *.X8...U.FLR......O;..ZL..1....*
                                        E207D8E37152AFA4EBD3D2F69FD495F73E00B287A024EFA2D90C7AD7C271   *S.QT...U.LK6.MN7...G...SR.:PB.*
                                        1D9E909596A64CFC2F8840C6F6D4C6865DB59FB0CE8711018BED7C91F48D   *...NOW<..H F6MFF)....G....@J4.*
                                        52A3FCAC8C3DE1AB32D74896D40FC8BC5860D5CE3DA08EAFF8346BD039B7   *.T.......P.OM.H..-N.....8.,}..*
                                        0FFD21A496ABBCF5B082A64DE7F444BBB4CC7FA3B6CFD56A9EC44B15AC9D   *...UO..5.BW(X4....”T..N..D....*
                                        7C33E3C532CCDC8A27E4AAC1159BC3F1A5823EA90A3064DBEF4BF0BB62EA   *@.TE.....U.A..C1VB.Z......O...*
                                        5FDB096316C548A9B3A57D8BF6D570185CB24FAD7E8D0786A8E919C7EE9B   *,....E.Z.V’.6N..*.|.=..FYZ.G..*
                                        9551D2E82F01CBE61F2D8488E5AB259E47505BDBECD78C9A3B9922BEC2D6   *N.KY...W..DHV....&$..P...R..BO*
                                        4AE982F61E94ECA358BBD832CBEEEF0DC69071BCB89B1D1E1F94A4D4C9D1   *”ZB6.M.T..Q.....F........MUMIJ*
                                        8E245DCAF5C127CC5C4F8BC06A977F9600758BF825459DD6FDC5B2AEBE97   *..).5A..*|.{.P”O...8...O.E...P*
                                        64E2C57FDD944DFA7C8B782EF6FF536003BAC4E7EBD556551996ED49BCB4   *.SE”.M(.@...6..-..DX.N...O....*
                                        84230ECF19C8B9A5C953E9C4A43B08FA1FEF14C6898A57EFD9BB96BFAAEF   *D....H.VI.ZDU......FI...R.O...*
                                        E0EF6ABD6FC8BB3D36FCB00B2F89AEBC45AECA9CA2F7F1A9559AA48AA0A8   *....?H.......I......S71Z..U..Y*
                                        895DB2D266A790D1834ADB82A7DB54DA30AAD0B11EAD9AD517B44F873F1B   *I).K.X.JC”.BX.....}....N..|G..*
                                        D6C03CC3F9D5667309B90AC154F11AD0B5977C96BEF48CE1A5CD329512B3   *O{.C9N.....A.1.}.P@O.4..V..N..*
                                        D939FEFA6EAEF1F89FD0AAC43CC86CF28A8F1BE6B9B204A9569AF4F4D760   *R...>.18.}.D.H%2...W...Z..44P-*
                                        07E7E1E926A09234BADEC3F1B292314F61E352B443CAB90F4EBB9C31DD8B   *.X.Z..K...C1.K.|/T......+.....*
                                        8E046698C30C1FAD511594A6600072E8BD91B4F5A937CCB88EB0159FCA91   *...QC.....MW-..Y.J.5Z........J*
                                        5DAC0DC2A1BB653047F044E56FBB3355A6A73C654FEE1F7B50D4D93B5381   *)..B.....O.V?...WX..|..#&MR..A*
                                        C63352FB538F0EAAD5610B9ED670CD9087F434CDB1CC0ED3CC14A3FB5F45   *F.......N/..O...G4.....L..T.,.*
                                        F7ABEADC10C815F69E99F265B3F8F319BBA01EC3AEC3C126A3BDCFFBBDA1   *7....H.6.R2..83....C.CA.T.....*
                                        9896A7A8CB00D4A7A3B4E0ECB8341CB16593AF83C32127FFB5CB06F8247A   *QOXY..MXT........L.CC......8.:*
                                        12A2CAB305A9AF60C3B8F9F93EA35AB45397F508EFD81DD0DA8D7B071088   *.S...Z.-C.99.T!..P5..Q.}..#..H*
                                        0CF4028A67F517AF0BFFFFBCD41822887CC109B6657BE1C0A84E55E9AF11   *.4...5......M..H@A...#.{Y+.Z..*
                                        44E496FF38F54E2AC7DEDAECA3F6E633A3834890F991260EC6D994339D90   *.UO..5+.G...T6W.TC..9J..FRM...*
                                        C8F805FA135A868C9C93AFFBA40E48CFA61A0AA1F7F1089CF1974CB9044F   *H8...!F..L..U...W...71..1P<..|*
                                        14C9E408F29A07AF6CEE8E2A75B785E1AFB6A4064BCA99839BA48F9D08D0   *.IU.2...%.....E...U...RC.U...}*
                                        8ECCA0CF1C8759D9FA4E4AC02A4C1498E9179DEF0D92D9E4245F2C8FE4B6   *.....G.R.+”{.<.QZ....KRU.,..U.*
                                        B9F098757DA949DCF3B0492C5A93FF2322D35BD917B309E16ACDAE51FBEF   *.OQ.’Z..3...!L...L$R..........*
                                        889F3CF28E9700EF5BFD69805A7345B245F8D98FD4CA00DB1A0FC68C0200   *H..2.P..$...!....8R.M.....F...*
                                        8CD7722F24897552FEF59BE833CEA9EA3FF5523819E8E16F23A847DA4885   *.P...I...5.Y..Z..5...Y.?.Y...E*
                                        4C0349C16BF1FE95DCBDE8CF381736EB7C4483AB766D3EEBFE5964879F2D   *<..A,1.N..Y.....@.C.._.....G..*
                                        48E3561788A9235653CEF8B9E6AB75153393C31F37EF369FABEB2D0E3FDB   *.T..HZ....8.W....LC...........*
                                        02C2B9923E7005C12CA346D993ABBFEDF0F832E73714A9D12DD9D799391D   *.B.K...A.T.RL...O8.X..ZJ.RPR..*
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                   Data . . . :  8CF4C320EBB6A6A1D8F5CBC99796205694A5145B8DDB86DAA7F27D7A8A8B   *.4C...W.Q5.IPO..MV.$..F.X2’:..*
                                        F87667E525ABFC8C3EA2EDE43ABD8ACC722416D99F8937F8E9E980C4E152   *8..V.....S.U.......R.I.8ZZ.D..*
                                        2CA4DA2BB0EF6A845EBA18B21FAB5670ADB7FFC5BDF90F59ABDEC8694CB7   *.U.....D;..........E.9....H.<.*
                                        796ED9855CC6AB8DF748F5E5D715A48BCE37E08FB69AD69D6FA1518BC81D   *.>RE*F..7.5VP.U.......O.?...H.*
                                        98FF0F2DDABD8BC609A376DA18CFE8B180B5DDB524EE9FABC4B4C64B41C6   *Q......F.T....Y.........D.F..F*
                                        76F520ABD76DACCC618F58990A433DF0C4A84AFF050DC4A4CB41AA9C4454   *.5..P_../..R...ODY”...DU......*
                                        6DCA0310428F20C4ACB050419EE5044681FBB1349EAEF5F22B94EE3ECBA5   *_......D..&..V..A.....52.M...V*
                                        5CCDD1EFCCA928E575FC17A4F9BFB38898D564E9E1DE4CEBC9C78A8C4BAD   **.J..Z.V...U9..HQN.Z..<.IG....*
                                        F7BC8A7B17A79783B6CC4877B0A9AA2C98E356062EA4B02A9DA9BDFDE4F8   *7..#.XPC.....Z..QT...U...Z..U8*
                                        67DACCEA4E067DA88C70B99C3CD823DE9231F8D00F02F1898A86EFE5A0FB   *....+.’Y.....Q..K.8}..1I.F.V..*
                                        75ABDD341BC78830C4BE39FA34D059CD7EB7C27610BFD572B1D65D24DCFD   *.....GH.D....}..=.B...N..O)...*
                                        1F557794247976E6A27DF6B5FC17C6B97D2582C729D8F28C625E068E0B23   *...M...WS’6...F.’.BG.Q2..;....*
                                        ECFD63A3CF9897ED019E492AECD5A13D24CCB5740F9CD6EDC9E2957791C2   *...T.QP......N........O.ISN.JB*
                                        DD44CFCCD0D5FCA290FC72DCADF3C0A05E3371888391F9F5E4B874FB0A45   *....}N.S.....3{.;..HCJ95U.....*
                                        CBDF6C9330D133A6E99613764DD7BC0635F93BF03ACE18EFACC71F6EEAE0   *..%L.J.WZO..(P...9.O.....G.>..*
                                        AB2AC8858623B5A9928490D23D60EABBA60E7C93014F24BAF30FE3AB985F   *..HEF..ZKD.K.-..W.@L.|..3.T.Q,*
                                        F9A0C52C73F0E9847BF2F922CEC25C7F02C696BFFFD3176435A4B43FD9B5   *9.E..OZD#29..B*”.FO..L...U..R.*
                                        CC140AE937F9C5D9EF6C22F5A49BF689FBB179EB40C5B5E97466BDD9057A   *...Z.9ER.%.5U.6I.... E.Z...R.:*
                                        09F68F542FBBE0582085B9FD3EF5A13609AAE306DC9ED7AD2BE1AA3386ED   *.6.......E...5....T...P.....F.*
                                        1D1629909A575E84DE267E94B15E5988A97154AC4F87E5996323C5BBC1A9   *......;D..=M.;.HZ...|GVR..E.AZ*
                                        30A74AEE9EA8781CE1E5B04E3099DDA720A70774CCDA8552C0E6FC2B55B5   *.X”..Y...V.+.R.X.X....E.{W....*
                                        814FEDBCA6ADB4E2D6652FE98D6502C1E2DE1995639EC2BF4C1F2E9E9367   *A|..W..SO..Z...AS..N..B.<...L.*
                                        21DF57F8DD8893E7BAA652AA64FD30E08B93E6478BF3634289F9A5AD35EC   *...8.HLX.W.......LW..3..I9V...*
                                        0EF29FC95B1DCDFD01E50287626814CD9F3E7D91BFEA03CE9CB5B7925E6B   *.2.I$....V.G......’J.......K;,*
                                        5BF4DA6E70B088F8A7F07CF67D9C1B03E5B19CFF75BA47B56DB9D866A7AE   *$4.>..H8XO@6’...V......._.Q.X.*
                                        3BBD44D40714BA9CE22C17C4BCEA79CEC612D8ADFF8CF7E480056090E156   *...M....S..D....F.Q...7U..-...*
                                        D4BA0BC29CDA15EF31D60AE9D3E67D896EBBCA0AFBCD97450F8637453D96   *M..B.....O.ZLW’I>.....P..F...O*
                                        A2ECA3A25E0E99CD10B217831C6D30BF44AD90B5DF2B0BCE833C7689F6D0   *S.TS;.R....C._..........C..I6}*
                                        E7AB0D3475EFEF450FC59F56DADFFF6793F8E956C99F4125CBEE18841C8B   *X........E......L8Z.I......D..*
                                        89C46481BCC8CF9123D095C65330A5FF9F065CA15B0521DEAE0C4AF4A940   *ID.A.H.J.}NF..V...*.$.....”4Z *
                                        7D93C94C09849F2EADEEB1A3E1D07E8335A1D877848A8ECE20A57EDDF2AC   *’LI<.D.....T.}=C..Q.D....V=.2.*
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                                         1D8FC1C8C9202F8C6054A68855A64BAF18CBDB84EFF0ADA4A2320B9483C4   *..AHI...-.WH.W.....D.O.US..MCD*
                                         9FD6E1EEE68B0BAC42AB5A6860BC7ACE84A28C9CC9BD89A37F974D4811D2   *.O..W.....!.-.:.DS..I.IT"P(..K*
                                         B6A1B2D4321932A5148E75E894F7FF8C25FDA5922FA386F598FD658F246F   *...M...V...YM7....VK.TF5Q....?*
                                         DCA12C1DF0D761CA3BD52455F6C487F6CDBA5C71898B2238F6F3C9E5D7CC   *....0P/..N..6DG6..*.I...63IVP.*
                                         11034CF0EFDB3F932380AEFFD56AFA9462C64FE0C9B8A5DB79CBEF993C28   *..<0...L....N..M.F|.I.V....R..*
                                         7CBC86337D8E9EB43ED54B9B99D6D4C736AB63186BF6D870B5FBCFF9AF93   *@.F.'....N..ROMG....,6Q....9.L*
                                         11D152F6C5A9EDAB17852E9528E6C4B0469A5EEB40EBBCF334FC4E9BA0E1   *.J.6EZ...E.N.WD...;. ..3..+...*
                                         A1DF3D60DAB6A1FAB7C453620EBE4AE9D5A83E008EFE96C0EDDB548A308B   *...-.....D...."ZNY....0{......*
                                         3CC5D0C2DF221BC7387E91CDFDC7C6D04701D2E5C8ECD2EA3444DA8D94BC   *.E}B...G.=J..GF}..KVH.K.....M.*
                                         579FD93C60EF0B149DC076CA07B6C9F44984C54261B2893261CD4AD9DAED   *..R.-....{....I4.DE./.I./."R..*
                                         24E082900FF0718672D49CDCE492BAA25D62A3A0F70E9DBBE0B7FB9E4F20   *..B..0.F.M..UK.S).T.7.......|.*
                                         1BDCC51DD09128B3ED873CD710AB4BA0CEF22A8C3EC75DB6A8D98335DAB5   *..E.}J...G.P.....2...G).YRC...*
                                         44EAC7BF920BCB8D449EB0940E7D46C342CA9BD603EA449B0984228DC223   *..G.K......M.'.C...0.....D..B.*
                                         B4C4B647229AF86E14AC03328985EB189A8D9C6B27983F1614D5C2C923E7   *.D....8>....IE.....,.Q...NBI.X*
                                         238679CD51E87DBC76CFDB9C489388E0CE15E1F9FEDA15CAA018EDD4C4D7   *.F...Y'......LH....9.......MDP*
                                         89C722D081BEA72B4BD10BAAB7D4F53F9AB12304B1F2095B52C44AE0A38F   *IG.}A.X..J...M5......2.$.D".T.*
                                         E25204D376CE699CE9BBF6B53363F6C0E8086BC1810BBFFF2A8BD9C243D6   *S..L....Z.6...6{Y.,AA.....RB.O*
                                         70F3B3B6B49BA0606CBE1AA247C69444D3B032DE80DBADFFE0FC7A3BCDBC   *.3.....-%..S.FM.L.........:...*
                                         EC913BCF331964A3C85E83B7B53E77DC1854DBC16B66C1F2276C1CFA2B1E   *.J.....TH;C........A,.A2.%....*
                                         78A4DDD899E0B7795FAD81BF3C00FFEF                               *.U.QR...,.A.....              *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A            05/09/97  11:31:12                       Page:     17
Record       Data    Record    Record  Data     Controller              Number    Number    Poll/  Packet      Packet    LLC
Number  S/R  Length  Status    Timer   Type     Name/Number    Command  Sent      Received  Final  Type        Header    Type
------  ---  ------  --------  ------  ------   -------------  -------  ------    --------  -----  ----------  --------  -----
    45   R        0  00000000  1520.4  EBCDIC   X25LINET  /03   I         4          4      OFF    RR          1004A1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                           P(R)=  5
    47   S        0  00000000  1520.4  EBCDIC   X25LINET  /01   I         4         5       OFF    RR          1004C1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                           P(R)=  6
    48   S       53  00000000  1520.4  EBCDIC   X25LINET  /01   I         5         5       OFF    DATA        1004CA    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                 P(S)=  5  P(R)=  6
                     IPX  . . . :  Pkt Length:    53     Pkt Type: 0x04                      Hop Count:   0
                                   Src Addr  : 00000000:000000000000:9004 (IPW2)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                     IPX Raw Hdr:  FFFF0035000400000000FFFFFFFFFFFF9004000000000000000000009004
                     IW2  . . . :  WPkt Type: 0x05 (THRU. RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   1
                     Option . . :  WOpcode: 0x03 (NLSP Raw)         WAccept: 0x01 (Yes)     WOption Len:     8
                                   Request Size: 0x00001000         Delta Time: 0x0019FC59 usec
                     Data . . . :  5741534D0576AD0117000103010008000010000019FC59               *...(..................        *
    49   R      296  00000000  1520.5  EBCDIC   X25LINET  /03   I         5         4       OFF    DATA        1004AC    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                 P(S)=  6  P(R)=  5
                     IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 96AD0D47:000000000001:9086 (PING)
                                   Dest Addr : 76AD0117:000000000001:4000 (Dynamic Low Bound)
                     IPX Raw Hdr:  FFFF0128000076AD01170000000000014000096AD0D470000000000019086
                     PING . . . :  Type:   1 (Response)     Ping ID: 0x0003     Result: 0x01
                     PING Header:  50696E67010100030100
                     Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                                   7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                   00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                   274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                   CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                                   7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                   00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                   274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                   CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#               *
    53   R        0  00000000  1520.5  EBCDIC   X25LINET  /03   I         6         6       OFF    RR          1004C1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                           P(R)=  6
    55   S        0  00000000  1520.5  EBCDIC   X25LINET  /01   I         6         7       OFF    RR          1004E1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                           P(R)=  7
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A            05/09/97  11:31:12                       Page:     18
Record       Data    Record    Record  Data     Controller              Number    Number    Poll/  Packet      Packet    LLC
Number  S/R  Length  Status    Timer   Type     Name/Number    Command  Sent      Received  Final  Type        Header    Type
------  ---  ------  --------  ------  ------   -------------  -------  ------    --------  -----  ----------  --------  -----
    56   S      296  00000000  1520.5  EBCDIC   X25LINET  /01   I         7         7       OFF    DATA        1004EC    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                 P(S)=  6  P(R)=  7
                     IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:4000 (Dynamic Low Bound)
                                   Dest Addr : 96AD0D47:000000000001:9086 (PING)
                     IPX Raw Hdr:  FFFF0128000096AD0D470000000000019086 76AD01170000000000014000
                     PING . . . :  Type:   0 (Request)      Ping ID: 0x0004     Result: 0x00
                     PING Header:  50696E67010000040000
                     Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                                   7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                   00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                   274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                   CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                                   7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                   00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                   274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                   CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#               *
    57   R      576  00000000  1520.7  EBCDIC   X25LINET  /03   I         7         6       OFF    DATA        1004CE    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                 P(S)=  7  P(R)=  6
                     IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                      Hop Count:   0
```

```
                        Src Addr  : 00000000:000000000000:9004 (IPW2)
                        Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
          IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF900400000000000000000000009004
          IW2  . . . :  WPkt Type: 0x06 (DELAY REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
          Option . . :  WOpcode: 0xFF (Pad)           WAccept: 0x01 (Yes)     WOption Len:   531
          Data . . . :  5741534D0696AD0D470001FF010213A0E094C0F8461BC4C2C96034B2CB59   *...(.O...........M{8..DBI-....*
                        D5C4770AA8E35D005DEEC34E49D8491516A607C64AC86B796F87F1CD3693   *ND..YT).).C+.Q...W.F"H,.?G1..L*
                        D7D9F5C026AFA8ABD6A12797EE5F95A2C57D21D39A5504B943E62598BAE6   *PR5{..Y.O..P.,NSE'.L.....W.Q.W*
                        2A965D1DBDBB4BB06BE62BA0DEBA4EC4E1895FEF57F95A7F37A45673C7A7   *.O).....,W....+D.I,..9!".U..GX*
                        CB621C99967255E42C793AA3CB43DFF5D5397C81B179FCAABFD1EA976EB1   *...RO..U...T...5N.@A.....J.P>.*
                        3BE435E6298E9A02CDA12E29E0DDBF83CCC86637D1AEDAE121A3F297378B   *.U.W...........C.H..J....T2P..*
                        A5EFF9BB2E0C10CC1A4E72D314870EE8AF1466BE64ABE3C35125BD8484FF   *V.9......+.L.G.Y......TC...DD.*
                        7AB7A0E68FA481147996676850DEF1A955CBA47DCD9C3F862F8E82C7CEAC   *:..W.UA..O..&.1Z..U'...F..BG..*
                        0BEE7BC356257CCCB7541597F197B4F61EF85BEB439C9AA3DEBB22F3D009   *..#C..@....P1P.6.8$....T...3}.*
                        3BDF0E7D8BB054A316849F53CCF836BA1AD0F48046E411DED7D13D6A3C97   *...'...T.D...8...}4..U..PJ...P*
                        09F4778E90FE1AD11AA616AC8E599BB59D279FE09494E0BABA7151A665DC   *.4.....J.W..........MM.....W..*
                        9EE9775E6B9BD83A8D90EC4EEB8A3170A3B3DA2437B67FF3218A335923B1   *.Z.;,.Q....+....T....."3......*
                        214FB881F913E38788DEC0AAD854C5E0A5A9249C03EDB6C5EB97C0EE3823   *.|.A9.TGH.{.Q.E.VZ.....E.P{...*
                        C4A7B4930CC0224ED98C66EB1CB8D5C348DA080AC6C5FBBCFF92356EE6F2   *DX.L.{.+R.....NC....FE...K.>W2*
                        040908E6ED685AEC5E6328A8C05055E9DA5301FC7FDE99AEEF9052F1EC51   *...W..!.;..Y{&.Z...."..R....1..*
                        38D1C8AF9ECE8219ACBF63D520B33D8A0B8D32341DDAFBA457BEE2BC1397   *.JH...B....N...........U..S..P*
                        A9E54E930DB1ADE80C2048F41BCDFDCD711A40BC72C92093F2B489A32ADA   *ZV+L...Y...4...... ..I.L2.IT..*
                        42D25F76BFF96D6180FC1C9A6FB9DF6EB9FBDE9305D186AE73E1276B7DE3   *.K,..9_/....?..>...L.JF....,'T*
                        024F0724829F                                                   *.|..B.                        *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A            05/09/97  11:31:12                       Page:      19
Record       Data    Record    Record  Data     Controller             Number   Number     Poll/  Packet       Packet     LLC
Number  S/R  Length  Status    Timer   Type     Name/Number    Command Sent     Received   Final  Type         Header     Type
------  ---  ------  --------  ------  ------   -------------  ------- ------   --------   -----  ----------   --------   -----
    61   R        0  00000000  1520.7  EBCDIC   X25LINET  /03   I         0         0      OFF    RR           1004E1     NSNA
                     Packet Header :  LCGN= 0   LCN=  4                           P(R)=  7
    63   S        0  00000000  1520.7  EBCDIC   X25LINET  /01   I         0         1      OFF    RR           100401     NSNA
                     Packet Header :  LCGN= 0   LCN=  4                           P(R)=  0
    64   S      576  00000000  1520.8  EBCDIC   X25LINET  /01   I         1         1      OFF    DATA         10040E     NSNA
                     Packet Header :  LCGN= 0   LCN=  4                  P(S)=  7  P(R)=  0
          IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                          Hop Count:   0
                        Src Addr  : 00000000:000000000000:9004 (IPW2)
                        Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
          IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF900400000000000000000000009004
          IW2  . . . :  WPkt Type: 0x07 (DELAY RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   1
          Option . . :  WOpcode: 0xFF (Pad)           WAccept: 0x01 (Yes)     WOption Len:   531
          Data . . . :  5741534D0776AD01170001FF01021381FC0106C7A77396C295E342FE7B65   *...(...........A...GX.OBNT..#.*
                        DCD75CD10B8EA097A4D143D924BD6535D2BFB0CF23F0EF6527F4DA5F05AC   *.P*J...PUJ.R....K....O...4.,..*
                        94BEDAD97E32BBEC35028B8C3A6CD5CFBF5BE09C2939AFD68A604296B5FB   *M..R=........%N..$.....O.-.O..*
                        198578739DA6EE8CE1F7635D669C89526EFB83040CD67F30D5B85F5DF8FD   *.E...W...7.)..I.>.C..O".N.,)8.*
                        12A359D2A2A9DDB53E583590115C8AE3D2B1EB9D9F3028BE12E2F1C9F19D   *.T.KSZ.......*.TK........S1I1.*
                        B595A93DA89A0F2D5CDA6B4209B7BCCCE7CC30AFEF906EDCA5DE581EB8EB   *.NZ.Y...*.,.....X.....>.V.....*
                        49341392FA4414EC8BC86FCD1468BDF6E8B97BA8E9B8E288695412BB0EAF   *...K.....H?....6Y.#YZ.SH......*
                        B6C13235ACC762124CF79FA1D8913AEAEBB31534CBB53D5748CE2D94EE92   *.A...G..<7..QJ............M.K*
                        8CFF03E6BA6920D84C2A38F0683179C8887A3EF811E34DDE62537889565D   *...W...Q<..O...HH:.8.T(....I.)*
                        59850AC48185EB356594FEBE94E09232F89E50AAF8C208D0FCD0D0B3EAB5   *.E.DAE...M..M.K.8.&.8B.}.}}...*
                        D432C1FE507A2AD584DDD78600BBC69A2808E6BA60831C964002DDC47C48   *M.A.&:.ND.PF..F...W.-C.O ..D@.*
                        3CBB6ABFECDD5E7F15E6E9AD3EF76D37E2A3705557A3F31696AC5025F2C1   *......;".WZ..7_.ST...T3.O.&.2A*
                        EB8B40CF037A37ED4D1B0FE12BEF808B792FFFC13E55E3E3790D33A05203   *.. ..:..(..........A..TT......*
                        F2E8815719837DA191ACFA7A09F0623D98C1BA4174AB1F8A0AA39FEE4CD8   *2YA..C'.J..:.O..QA.......T..<Q*
                        D61381CE9AE95F9C4FC5F2B94CE30BE6CE4638F0647CEAD54561F3BE2205   *O.A..Z,.|E2.<T.W...O.@.N./3...*
                        E9ABB26585CD2756D4D1B5E186FBE98FFAA2EBE74CAD9E82258172A4318D   *Z...E...MJ..F.Z..S.X<..B.A.U..*
                        79CF5DB81D2B3C8301CE94EBA199BEBE7501CEF3C9DD12C9D145C9CA3CF6   *..)....C..M..R.....3I..IJ.I..6*
                        A3E864AF10AA21BAA38C647A9998AD1AD28CBC1F4E92AB8212B9E8B6F9DD   *TY......T..:RQ..K...+K.B..Y.9.*
                        44F4CA24829F                                                   *.4..B.                        *
    65   R      296  00000000  1520.9  EBCDIC   X25LINET  /03   I         1         0      OFF    DATA         1004E0     NSNA
                     Packet Header :  LCGN= 0   LCN=  4                  P(S)=  0  P(R)=  7
          IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)                Hop Count:   0
                        Src Addr  : 96AD0D47:000000000001:9086 (PING)
                        Dest Addr : 76AD0117:000000000001:4000 (Dynamic Low Bound)
          IPX Raw Hdr:  FFFF0128000076AD01170000000000014000096AD0D470000000000019086
          PING . . . :  Type:   1 (Response)     Ping ID: 0x0004     Result: 0x01
          PING Header:  50696E67010100040100
          Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                        7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                        00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                        274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                        CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                        7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                        00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                        274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                        CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#               *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A            05/09/97  11:31:12                       Page:      20
Record       Data    Record    Record  Data     Controller             Number   Number     Poll/  Packet       Packet     LLC
Number  S/R  Length  Status    Timer   Type     Name/Number    Command Sent     Received   Final  Type         Header     Type
------  ---  ------  --------  ------  ------   -------------  ------- ------   --------   -----  ----------   --------   -----
    68   S        0  00000000  1521.0  EBCDIC   X25LINET  /01   I         2         2      OFF    RR           100421     NSNA
                     Packet Header :  LCGN= 0   LCN=  4                           P(R)=  1
    69   S      296  00000000  1521.0  EBCDIC   X25LINET  /01   I         3         2      OFF    DATA         100420     NSNA
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                  Packet Header :  LCGN= 0   LCN=  4                  P(S)=  0  P(R)=  1
                  IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                Src Addr  : 76AD0117:000000000001:4000 (Dynamic Low Bound)
                                Dest Addr : 96AD0D47:000000000001:9086 (PING)
                  IPX Raw Hdr:  FFFF0128000096AD0D4700000000000190867 6AD01170000000000014000
                  PING . . . :  Type:   0 (Request)      Ping ID: 0x0005     Result: 0x00
                  PING Header:  50696E67010000050000
                  Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                                7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                                7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#              *
    72   R        0 00000000  1521.0  EBCDIC  X25LINET  /03   I          2         3     OFF    RR          100401    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                           P(R)=  0
    74   R      576 00000000  1521.3  EBCDIC  X25LINET  /03   I          3         3     OFF    DATA        100402    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                  P(S)=  1  P(R)=  0
                  IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                     Hop Count:   0
                                Src Addr  : 00000000:000000000000:9004 (IPW2)
                                Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                  IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
                  IW2  . . . :  WPkt Type: 0x06 (DELAY REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                  Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)      WOption Len:   531
                  Data . . . :  5741534D0696AD0D470001FF010213AC92C901D8CAB92BE543253F9B42C0   *...(.O..........KI.Q...V.....{*
                                B1BB78F41A81E2371FAA9116D89B731665A0C3909F874C092F90EF320FC7   *...4.AS...J.Q.....C..G<......G*
                                BFC120FE208254884CDB25EDC7A00CCCDCEDCABC7FD1DAEBAA9FE58EE7EC   *.A...B.H<...G......."J....V.X.*
                                449C48ADA9E7818268E798F096E9DB7EA4C957B8EF9E2EBA2F8DC1B4CCA8   *....ZXAB.XQOOZ.=UI........A..Y*
                                4505CACB7F67159948FC14869DD3ACE3B40640C006C88BFD58802BBD4708   *....."..R...F.L.T.. {.H........*
                                FF829FFE6FD5F96C69EA3CCF3FBE4AA93E97AD870D817DB448E3C72563A7   *.B..?N9%......"Z.P.G.A'..TG..X*
                                67FB6A9BAB4204887B6475DD008354CCAE7127D087206DD7623F10F31AA1   *.......H#....C.....}G._P...3..*
                                E9D97C44B0ED81EE5DED48957DB84EBB40B8E7C549F8499A76A83C385489   *ZR@...A.)..N'.+. .XE.8...Y...I*
                                966917F1CDAB93F5BBBBEBF82EBF57C514680DBEBB92918C93CF6CBC1703   *O..1..L5...8...E.....KJ.L.%...*
                                8F8AEB01C3CAC0F076C0EB3AF9936D1463DE55BB33CE75834F8500216FCB   *....C.{0.{..9L_........C|E..?.*
                                9342A1B0FBC072E017D725BD2E3114A3987915EF35A59CAB0C1F76A8E5D3   *L....{...P.....TQ....V.....YVL*
                                B688AEA85C82AF7620CD7471E897E29FBA9F64BA3E8DFF8E3484D140C2C5   *.H.Y*B......YPS..........DJ BE*
                                F2C4AEC54EE10ABD98BCBAF68EB89593F8BCAAAF2A88CC917B62EDBB9C00   *2D.E+...Q..6..NL8....H.J#.....*
                                3AFED34010DF135D24F04858E79DC520F0F8F5BD7CCD6B9796D2AD6237F5   *..L ...).0..X.E.085.@.,POK...5*
                                0B74F0C32AB640A92387DBDBAC919E9E8C8CBF9D6CA0ECC6B936B3A9B687   *..0C.. Z.G...J......%..F...Z.G*
                                B38E874FD2D589AD19C1C3B1D696D0BBFDE1E62C66CE6D5068EABA45B9EB   *..G|KNI..AC.OO}...W..._&......*
                                37ED14A4AE34B2A905E696C265D88CAC6C330AF38B2DF6B676EE65BA1D86   *...U...Z.WOB.Q..%..3..6......F*
                                7AE868130C88BAF009A8E52501DBE0BB48FF27E4BF941B3A79879C29E79D   *:Y...H.O.YV........U.M...G..X.*
                                83424024829F                                                   *C. .B.                       *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                         Page:      21
Record        Data    Record     Record  Data     Controller              Number    Number     Poll/  Packet      Packet    LLC
Number  S/R  Length  Status     Timer   Type     Name/Number     Command  Sent      Received   Final  Type        Header    Type
------  ---  ------  --------   ------  ------   -------------   -------  ------    --------   -----  ----------  --------  -----
    77   R        0 00000000  1521.3  EBCDIC  X25LINET  /03   I          4         4     OFF    RR          100421    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                           P(R)=  1
    79   S        0 00000000  1521.3  EBCDIC  X25LINET  /01   I          4         5     OFF    RR          100441    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                           P(R)=  2
    80   S      576 00000000  1521.3  EBCDIC  X25LINET  /01   I          5         5     OFF    DATA        100442    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                  P(S)=  1  P(R)=  2
                  IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                     Hop Count:   0
                                Src Addr  : 00000000:000000000000:9004 (IPW2)
                                Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                  IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
                  IW2  . . . :  WPkt Type: 0x07 (DELAY RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   1
                  Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)      WOption Len:   531
                  Data . . . :  5741534D0776AD01170001FF010213DA236B44CB57AD3FE92F6B65A8342B   *...(.............,.....Z.,.Y..*
                                7EF913B378FC6C0B099948FD5886F0EB08B2D69F6FA87D8C24CA7BE5E88C   *=9....%..R...FO...O.?Y'...# VY.*
                                334A34FB4CE3D5F50235D8E41D7593CA127AE68342F9B0A216D524890381   *."..<TN5..QU..L..:WC.9.S.N.I.A*
                                A0C53375A7B5718C17B1A49712ACBA79DC8696B31D8FC979F4F465CBECC7   *.E..X.....UP.....FO...I.44...G*
                                2F704FFB76B8B3AF5870C0D752A730F35EAEC1CD237DBBD513E9358E3403   *..|.......{P.X.3;.A..'.N.Z....*
                                DEF8EA2CC2D620F43A8D8279ABF1021222BEF4F1CCC32EEA06BD069407FA   *.8..BO.4..B..1....41.C.....M..*
                                E0B885B772A471C78A54CFCAC648629FBA81F08DA9057ED3A7DBDBB15373   *..E..U.G....F....AO.Z.=LX.....*
                                6DDDBF540FBC281686EBDF17EC839BFFF0F6C02911C1C899A7D8E00656DB   *_.......F....C..06{..AHRXQ....*
                                C06757B4C0F178E72D59FED26FA945A0D25CF3D2D4A80287628772D5AA92   *{...{1.X...K?Z..K*3KMY.G.G.N.K*
                                CFB18CC1A18FFC8C198D52072A84549EE3CF8B8CF5D2D39347C06A867491   *...A.........D..T...5KLL.{.F.J*
                                A18C5E8506BA05FC9EE27EA3283FC5A772F233EB7B4828EABEB2E08DD208   *..;E.....S=T..EX.2..#.......K.*
                                88D82E6176CD00F8DCFAD29CAA992BDD8D8EDEA28CBA81DE9CA43E336EEF   *HQ./...8..K..R.....S..A..U..>.*
                                A2CF00A9C483EAA4B0CEBAD3D469CF9E6F01B089D81B14CADA04C0AF6E41   *S..ZDC.U...LM...?..IQ.....{.>.*
                                4CEF813E8F8E3299229BE3D01E8974B188CC339E39D0D918ECDCF39913FC   *<.A....R..T}.I..H....}R...3R..*
                                C71FB9F4F42C56CA8B3FBEFC063AD5FD00F737CA66BDA69F2D451BD51441   *G..44.........N..7....W....N..*
                                42A4C8C159F80E0E94E2DF95C7C4E2B02FFE9D42A58682E13CFA916F22E2   *.UHA.8..MS.NGDS.....VFB...J?.S*
                                17A1B3FD7962BCAC41A6A78A24764CDFD2BE6F84D4DC37B2C5E303DDBB35   *.........WX...<.K.?DM...ET....*
                                A7ADBFD8AC8E2A5D53FF553D10B51C6867DC0A9F16BD52CE378760DDFDE8   *X..Q...)................G-..Y*
                                8E527B24829F                                                   *..#.B.                       *
    81   R      296 00000000  1521.4  EBCDIC  X25LINET  /03   I          5         4     OFF    DATA        100424    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                  P(S)=  2  P(R)=  1
                  IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
```

```
                    Src Addr  : 96AD0D47:000000000001:9086 (PING)
                    Dest Addr : 76AD0117:000000000001:4000 (Dynamic Low Bound)
      IPX Raw Hdr:  FFFF0128000076AD01170000000000014000096AD0D470000000000019086
      PING . . . :  Type:   1 (Response)     Ping ID: 0x0005     Result: 0x01
      PING Header:  50696E67010100050100
      Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                    7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                    00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                    274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                    CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                    7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                    00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                    274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                    CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#               *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A            05/09/97  11:31:12                      Page:      22
Record       Data   Record    Record  Data    Controller             Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command Sent     Received  Final  Type        Header    Type
------  ---  ------ --------  ------  ------  -------------  ------- ------   --------  -----  ----------  --------  -----
    84   S        0 00000000  1521.6  EBCDIC  X25LINET  /01   I         6         6      OFF   RR          100461    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                          P(R)=  3
    87   R        0 00000000  1521.6  EBCDIC  X25LINET  /03   I         6         7      OFF   RR          100441    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                          P(R)=  2
    89   R      111 00000000  1521.6  EBCDIC  X25LINET  /03   I         7         7      OFF   DATA        100446    NSNA
                    Packet Header :  LCGN= 0   LCN=  4               P(S)=  3  P(R)=  2
                    IPX  . . . :  Pkt Length:   111     Pkt Type: 0x04                     Hop Count:   0
                                  Src Addr  : 00000000:000000000000:9004 (IPW2)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                    IPX Raw Hdr:  FFFF006F000400000000FFFFFFFFFFFF90040000000000000000000009004
                    IW2  . . . :  WPkt Type: 0x02 (INFO. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   2
                    Option . . :  WOpcode: 0x01 (RIP/SAP)         WAccept: 0x01 (Yes)     WOption Len:    54
                                  Delay:  6270 ms   Network: 0x00000000   Router :ROUTER_1
                    Option . . :  WOpcode: 0x02 (NLSP)            WAccept: 0x01 (Yes)     WOption Len:     8
                                  Delay: 0x000089B1               Throughput: 0x00004B64
                    Data . . . :  5741534D0296AD0D47000201010036187E00000000524F555445525F3100   *...(.O..........=.....|....,..*
                                  000000000000000000000000000000000000000000000000000000000000   *..............................*
                                  000000000000000000002010008000089B100004B64                    *...............I.....         *
    91   S        0 00000000  1521.6  EBCDIC  X25LINET  /01   I         7         0      OFF   RR          100481    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                          P(R)=  4
    93   S      111 00000000  1521.7  EBCDIC  X25LINET  /01   I         0         0      OFF   DATA        100484    NSNA
                    Packet Header :  LCGN= 0   LCN=  4               P(S)=  2  P(R)=  4
                    IPX  . . . :  Pkt Length:   111     Pkt Type: 0x04                     Hop Count:   0
                                  Src Addr  : 00000000:000000000000:9004 (IPW2)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                    IPX Raw Hdr:  FFFF006F000400000000FFFFFFFFFFFF90040000000000000000000009004
                    IW2  . . . :  WPkt Type: 0x03 (INFO. RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   2
                    Option . . :  WOpcode: 0x01 (RIP/SAP)         WAccept: 0x01 (Yes)     WOption Len:    54
                                  Delay:  6270 ms   Network: 0x00000000   Router :ROUTER_2
                    Option . . :  WOpcode: 0x02 (NLSP)            WAccept: 0x01 (Yes)     WOption Len:     8
                                  Delay: 0x000089B1               Throughput: 0x00004B64
                    Data . . . :  5741534D0376AD011700020101036187E00000000524F555445525F3200   *...(............=.....|....,..*
                                  000000000000000000000000000000000000000000000000000000000000   *..............................*
                                  000000000000000000002010008000089B100004B64                    *...............I.....         *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A            05/09/97  11:31:12                      Page:      23
Record       Data   Record    Record  Data    Controller             Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command Sent     Received  Final  Type        Header    Type
------  ---  ------ --------  ------  ------  -------------  ------- ------   --------  -----  ----------  --------  -----
    95   R        0 00000000  1521.7  EBCDIC  X25LINET  /03   I         0         1      OFF   RR          100461    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                          P(R)=  3
    97   S       66 00000000  1521.8  EBCDIC  X25LINET  /01   I         1         1      OFF   DATA        100486    NSNA
                    Packet Header :  LCGN= 0   LCN=  4               P(S)=  3  P(R)=  4
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                  State: 2 (Down)       Cct Type:  1          Src ID: 0x020076AD0117
                                  Hold Time:     60s    Pkt Length:    36     WAN ID: 0x03
                    Fixed Hdr  :  831401001101000009020076AD0117003C002403
                    Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                  Address: 00000000     Mask: 00000000
                    Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
                    Data . . . :  C008000000000000000000C50400001000                               *{.........E.....              *
    98   S      296 00000000  1521.8  EBCDIC  X25LINET  /01   I         2         1      OFF   DATA        100488    NSNA
                    Packet Header :  LCGN= 0   LCN=  4               P(S)=  4  P(R)=  4
                    IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:4000 (Dynamic Low Bound)
                                  Dest Addr : 96AD0D47:000000000001:9086 (PING)
                    IPX Raw Hdr:  FFFF0128000096AD0D470000000000019086 76AD01170000000000014000
                    PING . . . :  Type:   0 (Request)     Ping ID: 0x0001     Result: 0x00
                    PING Header:  50696E67010000010000
                    Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                                  7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                  00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
```

```
                                274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                                7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#               *
   100   R       0 00000000  1521.8  EBCDIC  X25LINET  /03   I         1        2     OFF    RR         100481    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                           P(R)=  4
   103   R       0 00000000  1522.0  EBCDIC  X25LINET  /03   I         2        3     OFF    RR         1004A1    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                           P(R)=  5
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                         Page:      24
Record       Data   Record    Record  Data    Controller             Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command Sent     Received  Final  Type        Header    Type
------  ---  ------ --------  ------  ------  -------------  ------- ------   --------  -----  ----------  --------  -----
   105   R     296 00000000  1522.1  EBCDIC  X25LINET  /03   I         3        3     OFF    DATA       1004A8    NSNA
                   Packet Header :  LCGN= 0   LCN=  4              P(S)=  4  P(R)=  5
                   IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                 Src Addr  : 96AD0D47:000000000001:9086 (PING)
                                 Dest Addr : 76AD0117:000000000001:4000 (Dynamic Low Bound)
                   IPX Raw Hdr:  FFFF0128000076AD0117000000000001400096AD0D470000000000019086
                   PING . . . :  Type:   1 (Response)     Ping ID: 0x0001     Result: 0x01
                   PING Header:  50696E67010100010100
                   Data . . . :  7B40CE8C27400090CE8C274000907B40CE8C274000907B40CE8C27400090   *# ... ..... ..# ... ..# ... ..*
                                 7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                 00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                 274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                 CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C27400090   *... ..# ... ..# ... ..# ... ..*
                                 7B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C2740   *# ... ..# ... ..# ... ..# ... *
                                 00907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40CE8C   *..# ... ..# ... ..# ... ..# ..*
                                 274000907B40CE8C274000907B40CE8C274000907B40CE8C274000907B40   *. ..# ... ..# ... ..# ... ..# *
                                 CE8C274000907B40CE8C274000907B40                               *... ..# ... ..#               *
   107   S       0 00000000  1522.1  EBCDIC  X25LINET  /01   I         3        4     OFF    RR         1004A1    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                           P(R)=  5
   109   R      66 00000000  1522.3  EBCDIC  X25LINET  /03   I         4        4     OFF    DATA       1004AA    NSNA
                   Packet Header :  LCGN= 0   LCN=  4              P(S)=  5  P(R)=  5
                   IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                 Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                   IPX Raw Hdr:  FFFF004200000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                   WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                 State: 2 (Down)       Cct Type:  1          Src ID: 0x020096AD0D47
                                 Hold Time:    60s     Pkt Length:    36     WAN ID: 0x01
                   Fixed Hdr  :  831401001101000009020096AD0D47003C002401
                   Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                                 Address: 00000000     Mask: 00000000
                   Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
                   Data . . . :  C0080000000000000000C50400001000                               *{.........E.....              *
   111   S       0 00000000  1522.3  EBCDIC  X25LINET  /01   I         4        5     OFF    RR         1004C1    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                           P(R)=  6
   113   S      66 00000000  1523.1  EBCDIC  X25LINET  /01   I         5        5     OFF    DATA       1004CA    NSNA
                   Packet Header :  LCGN= 0   LCN=  4              P(S)=  5  P(R)=  6
                   IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                 Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                   IPX Raw Hdr:  FFFF004200000000000000FFFFFFFFFFFF900176AD01170000000000019001
                   WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                 State: 2 (Down)       Cct Type:  1          Src ID: 0x020076AD0117
                                 Hold Time:    60s     Pkt Length:    36     WAN ID: 0x03
                   Fixed Hdr  :  831401001101000009020076AD0117003C002403
                   Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                                 Address: 00000000     Mask: 00000000
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                         Page:      25
                   Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
                   Data . . . :  C0080000000000000000C50400001000                               *{.........E.....              *
   115   R       0 00000000  1523.2  EBCDIC  X25LINET  /03   I         5        6     OFF    RR         1004C1    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                           P(R)=  6
   117   R      66 00000000  1524.1  EBCDIC  X25LINET  /03   I         6        6     OFF    DATA       1004CC    NSNA
                   Packet Header :  LCGN= 0   LCN=  4              P(S)=  6  P(R)=  6
                   IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                 Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                   IPX Raw Hdr:  FFFF004200000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                   WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                 State: 2 (Down)       Cct Type:  1          Src ID: 0x020096AD0D47
                                 Hold Time:    60s     Pkt Length:    36     WAN ID: 0x01
                   Fixed Hdr  :  831401001101000009020096AD0D47003C002401
                   Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                                 Address: 00000000     Mask: 00000000
                   Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
                   Data . . . :  C0080000000000000000C50400001000                               *{.........E.....              *
   119   S       0 00000000  1524.1  EBCDIC  X25LINET  /01   I         6        7     OFF    RR         1004E1    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                           P(R)=  7
   121   S      66 00000000  1524.8  EBCDIC  X25LINET  /01   I         7        7     OFF    DATA       1004EC    NSNA
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                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  6  P(R)=  7
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                  State: 1 (Init)       Cct Type:  1         Src ID: 0x020076AD0117
                                  Hold Time:    60s     Pkt Length:    36    WAN ID: 0x03
                    Fixed Hdr  :  831401001101000005020076AD0117003C002403
                    Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                                  Address: 00000000     Mask: 00000000
                    Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
                    Data . . . :  C0080000000000000000C50400001000                              *{.........E.....               *
   123   R       0  00000000  1524.9  EBCDIC  X25LINET  /03   I          7         0     OFF    RR          1004E1    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  7
   125   R      66  00000000  1525.9  EBCDIC  X25LINET  /03   I          0         0     OFF    DATA        1004EE    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  7  P(R)=  7
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                  State: 1 (Init)       Cct Type:  1         Src ID: 0x020096AD0D47
                                  Hold Time:    60s     Pkt Length:    36    WAN ID: 0x01
                    Fixed Hdr  :  831401001101000005020096AD0D47003C002401
                    Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                                  Address: 00000000     Mask: 00000000
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                             Page:      26
                    Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
                    Data . . . :  C0080000000000000000C50400001000                              *{.........E.....               *
   127   S       0  00000000  1525.9  EBCDIC  X25LINET  /01   I          0         1     OFF    RR          100401    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  0
   129   S     177  00000000  1526.1  EBCDIC  X25LINET  /01   I          1         1     OFF    DATA        10040E    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  7  P(R)=  0
                    IPX  . . . :  Pkt Length:   177     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF00B1000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    CSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x18
                                  Pkt Length:   147     Src ID: 0x020076AD011700
                                  LSP ID: 0x000000000000 (Src):0x00 (Node):0x00 (LSP No.)  "Start LSP ID"
                                  LSP ID: 0xFFFFFFFFFFFF (Src):0xFF (Node):0xFF (LSP No.)  "End LSP ID"
                    Fixed Hdr  :  83210100180100000093020076AD0117000000000000000000FFFFFFFFFFFFFFFF
                    Option . . :  Code: 0x09 (LSP Entries)          Length: 112
                                  Rem. Life:  7499 sec  LSP ID: 0x020076AD01170000  Seq. No.: 0x00000004  Chksum: 0x0B9B
                                  Rem. Life:  5779 sec  LSP ID: 0x020076AD01170200  Seq. No.: 0x00000001  Chksum: 0x5CF6
                                  Rem. Life:  5787 sec  LSP ID: 0x020076AD01170201  Seq. No.: 0x00000003  Chksum: 0x1A8D
                                  Rem. Life:  5779 sec  LSP ID: 0x020076AD01170202  Seq. No.: 0x00000001  Chksum: 0xEF0F
                                  Rem. Life:  5795 sec  LSP ID: 0x020076AD01170203  Seq. No.: 0x00000004  Chksum: 0x9E45
                                  Rem. Life:  5779 sec  LSP ID: 0x020076AD0117FF00  Seq. No.: 0x00000001  Chksum: 0xB4A0
                                  Rem. Life:  5780 sec  LSP ID: 0x020076AD0117FF02  Seq. No.: 0x00000001  Chksum: 0x9F9A
                    Data . . . :  09701D4B020076AD01170000000000040B9B1693020076AD011702000000  *..................L..........*
                                  00015CF6169B020076AD01170201000000031A8D1693020076AD01170202  *..*6.................L........*
                                  00000001EF0F16A3020076AD01170203000000049E451693020076AD0117  *.......T...............L......*
                                  FF0000000001B4A01694020076AD0117FF02000000019F9A              *.........M..............       *
   131   R       0  00000000  1526.1  EBCDIC  X25LINET  /03   I          1         2     OFF    RR          100401    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  0
   133   S      66  00000000  1526.9  EBCDIC  X25LINET  /01   I          2         2     OFF    DATA        100400    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  0  P(R)=  0
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                  State: 0 (Up)         Cct Type:  1         Src ID: 0x020076AD0117
                                  Hold Time:    60s     Pkt Length:    36    WAN ID: 0x03
                    Fixed Hdr  :  831401001101000001020076AD0117003C002403
                    Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                                  Address: 00000000     Mask: 00000000
                    Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
                    Data . . . :  C0080000000000000000C50400001000                              *{.........E.....               *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                             Page:      27
Record       Data   Record     Record  Data     Controller            Number    Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status     Timer   Type     Name/Number   Command Sent      Received  Final  Type         Header    Type
------  ---  ------ --------   ------  ------   ------------- ------- ------    --------  -----  ----------   --------  -----
   135   R       0  00000000  1526.9  EBCDIC  X25LINET  /03   I          2         3     OFF    RR          100421    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  1
   137   R     113  00000000  1527.2  EBCDIC  X25LINET  /03   I          3         3     OFF    DATA        100420    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  0  P(R)=  1
                    IPX  . . . :  Pkt Length:   113     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0071000000000000FFFFFFFFFFFF900196AD0D470000000000019001
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                    CSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x18
                                  Pkt Length:    83     Src ID: 0x020096AD0D4700
                                  LSP ID: 0x000000000000 (Src):0x00 (Node):0x00 (LSP No.)  "Start LSP ID"
                                  LSP ID: 0xFFFFFFFFFFFF (Src):0xFF (Node):0xFF (LSP No.)  "End LSP ID"
                    Fixed Hdr  :  832101001801000000053020096AD0D4700000000000000000FFFFFFFFFFFFFFFF
                    Option . . :  Code: 0x09 (LSP Entries)           Length:  48
                                  Rem. Life:  7499 sec  LSP ID: 0x020096AD0D470000  Seq. No.: 0x00000003  Chksum: 0xD2CF
                                  Rem. Life:  5283 sec  LSP ID: 0x020096AD0D47FF00  Seq. No.: 0x00000001  Chksum: 0xB6E5
                                  Rem. Life:  5284 sec  LSP ID: 0x020096AD0D47FF02  Seq. No.: 0x00000001  Chksum: 0xDD5B
                    Data . . . :  09301D4B020096AD0D47000000000003D2CF14A3020096AD0D47FF000000   *......O.........K..T..O.......*
                                  0001B6E514A4020096AD0D47FF0200000001DD5B                       *...V.U..O..........$          *
   139   S       0  00000000  1527.2  EBCDIC  X25LINET  /01   I          3         4     OFF    RR          100421    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  1
   141   R      66  00000000  1527.9  EBCDIC  X25LINET  /03   I          4         4     OFF    DATA        100422    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  1  P(R)=  1
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                  State: 0 (Up)         Cct Type:  1          Src ID: 0x020096AD0D47
                                  Hold Time:    60s     Pkt Length:    36     WAN ID: 0x01
                    Fixed Hdr  :  8314010011010000001020096AD0D47003C002401
                    Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                  Address: 00000000     Mask: 00000000
                    Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
                    Data . . . :  C0080000000000000000C50400001000                               *{.........E.....              *
   143   S       0  00000000  1527.9  EBCDIC  X25LINET  /01   I          4         5     OFF    RR          100441    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  2
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A             05/09/97  11:31:12                             Page:      28
Record       Data   Record    Record  Data    Controller              Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type        Header    Type
------  ---  ------ --------  ------  ------  -------------  -------  ------   --------  -----  ----------  --------  -----
   145   S      97  00000000  1528.3  EBCDIC  X25LINET  /01   I          5         5     OFF    DATA        100442    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  1  P(R)=  2
                    IPX  . . . :  Pkt Length:    97     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0061000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    PSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x1A
                                  Pkt Length:    67     Src ID: 0x020076AD011700
                    Fixed Hdr  :  831101001A0100000043020076AD011700
                    Option . . :  Code: 0x09 (LSP Entries)           Length:  48
                                  Rem. Life:    59 sec  LSP ID: 0x020096AD0D470000  Seq. No.: 0x00000000  Chksum: 0xD2CF
                                  Rem. Life:    59 sec  LSP ID: 0x020096AD0D47FF00  Seq. No.: 0x00000000  Chksum: 0xB6E5
                                  Rem. Life:    59 sec  LSP ID: 0x020096AD0D47FF02  Seq. No.: 0x00000000  Chksum: 0xDD5B
                    Data . . . :  0930003B020096AD0D47000000000000D2CF003B020096AD0D47FF000000   *......O.........K.....O.......*
                                  0000B6E5003B020096AD0D47FF0200000000DD5B                       *...V....O..........$          *
   147   R       0  00000000  1528.3  EBCDIC  X25LINET  /03   I          5         6     OFF    RR          100441    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  2
   149   S     170  00000000  1535.9  EBCDIC  X25LINET  /01   I          6         6     OFF    DATA        100444    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  2  P(R)=  2
                    IPX  . . . :  Pkt Length:   170     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF00AA000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                                  Pkt Length:   140     Rem. Life:  7490s     Seq. No.: 0x00000004
                                  LSP ID: 0x020076AD0117 (Src):0x00 (Node):0x00 (LSP No.)
                    Fixed Hdr  :  831B010012010000008C1D42020076AD01170000000000040B9B01
                    Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                  Address: 00000000     Mask: 00000000
                    Option . . :  Code: 0xC1 (Management)            Length:  20
                                  Network: 0x76AD0117                Node: 0x000000000001
                                  Router : ROUTER_2
                    Option . . :  Code: 0xC2 (Link Information)      Length:  25
                                  S1: 0     I/E: 0     Cost : 0x19      Nbor ID: 0x020076AD011702
                                  MTU: 0x00000FD9     Delay: 0x000000C8 usec
                                  Thru: 0x003D0900    Media: 0x0004 (IEEE 802.5 w/802.2 w/o SNAP)
                    Option . . :  Code: 0xC2 (Link Information)      Length:  25
                                  S1: 0     I/E: 0     Cost : 0x1E      Nbor ID: 0x020076AD0117FF
                                  MTU: 0x00000000     Delay: 0x000001F4 usec
                                  Thru: 0x000F4240    Media: 0x0000 (Generic LAN)
                    Option . . :  Code: 0xC2 (Link Information)      Length:  25
                                  S1: 0     I/E: 0     Cost : 0x37      Nbor ID: 0x020096AD0D4700
                                  MTU: 0x00001000     Delay: 0x000089B1 usec
                                  Thru: 0x00004B64    Media: 0x801E (X.25)
                    Data . . . :  C0080000000000000000C11476AD01170000000000010108524F55544552   *{.........A..............|....*
                                  5F32C21919808080020076AD01170200000FD9000000C8003D09000004C2   *,.B...............R...H......B*
                                  191E808080020076AD0117FF00000000000001F4000F42400000C2193780   *...................4... ..B...*
                                  8080020096AD0D47000000001000000089B100004B64801E               *....O..........I.......       *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A             05/09/97  11:31:12                             Page:      29
Record       Data   Record    Record  Data    Controller              Number   Number    Poll/  Packet      Packet    LLC
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Number  S/R  Length  Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type        Header    Type
------  ---  ------  --------  ------  ------  -------------  -------  ------   --------  -----  ----------  --------  -----
   150   S       98  00000000  1536.0  EBCDIC  X25LINET  /01   I         7        6       OFF    DATA        100446    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                 P(S)=  3  P(R)=  2
                     IPX  . . . :  Pkt Length:    98     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0062000000000000FFFFFFFFFFFF900176AD0117000000000019001
                     LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                                   Pkt Length:    68     Rem. Life:  5770s     Seq. No.: 0x00000001
                                   LSP ID: 0x020076AD0117 (Src):0x02 (Node):0x00 (LSP No.)
                     Fixed Hdr  :  831B01001201000000044168A020076AD01170200000000015CF601
                     Option . . :  Code: 0xC1 (Management)           Length:  12
                                   Network: 0x00000009               Node: 0x400052005010
                     Option . . :  Code: 0xC2 (Link Information)     Length:  25
                                   S1: 0    I/E: 0    Cost : 0x00     Nbor ID: 0x020076AD011700
                                   MTU: 0x00000000    Delay: 0x00000000 usec
                                   Thru: 0x00000000   Media: 0x0004 (IEEE 802.5 w/802.2 w/o SNAP)
                     Data . . . :  C10C000000094000520050100100C219008080800200076AD011700000000   *A..... ...&...B...............*
                                   0000000000000000000004                                     *...........                   *
   152   R        0  00000000  1536.0  EBCDIC  X25LINET  /03   I         6        7       OFF    RR          100461    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                           P(R)=  3
   154   S      530  00000000  1536.0  EBCDIC  X25LINET  /01   I         0        7       OFF    DATA        100448    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                 P(S)=  4  P(R)=  2
                     IPX  . . . :  Pkt Length:   530     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0212000000000000FFFFFFFFFFFF900176AD0117000000000019001
                     LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                                   Pkt Length:   500     Rem. Life:  5777s     Seq. No.: 0x00000003
                                   LSP ID: 0x020076AD0117 (Src):0x02 (Node):0x01 (LSP No.)
                     Fixed Hdr  :  831B01001201000001F41691020076AD01170201000000031A8D01
                     Option . . :  Code: 0xC3 (Services)             Length:  23
                                   Hops:    1            Service Addr: 00000009:400052005188:E885
                                   Service Type: 0x0640     Service Name: WINNT100
                     Option . . :  Code: 0xC3 (Services)             Length:  61
                                   Hops:    1            Service Addr: 31ECF1DD:000000000001:4006
                                   Service Type: 0x0278     Service Name: FERGUS_NW41_TREE________________****M@@@@@D*PJ
                     Option . . :  Code: 0xC3 (Services)             Length:  61
                                   Hops:    1            Service Addr: 31ECF1DD:000000000001:0005
                                   Service Type: 0x026B     Service Name: FERGUS_NW41_TREE________________****M@@@@@D*PJ
                     Option . . :  Code: 0xC3 (Services)             Length:  62
                                   Hops:    1            Service Addr: 31ECF1DD:000000000001:1F80
                                   Service Type: 0x012B     Service Name: FERGUS_NW41____________________________0200040a
                     Option . . :  Code: 0xC3 (Services)             Length:  62
                                   Hops:    1            Service Addr: 31ECF1DD:000000000001:1F80
                                   Service Type: 0x0115     Service Name: FERGUS_NW41____________________________0200040a
                     Option . . :  Code: 0xC3 (Services)             Length:  26
                                   Hops:    1            Service Addr: 31ECF1DD:000000000001:1F80
                                   Service Type: 0x0130     Service Name: FERGUS_NW41
                     Option . . :  Code: 0xC3 (Services)             Length:  26
                                   Hops:    1            Service Addr: 31ECF1DD:000000000001:8104
                                   Service Type: 0x0107     Service Name: FERGUS_NW41
                     Option . . :  Code: 0xC3 (Services)             Length:  26
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A             05/09/97  11:31:12                        Page:      30
                                   Hops:    1            Service Addr: 31ECF1DD:000000000001:0451
                                   Service Type: 0x0004     Service Name: FERGUS_NW41
                     Option . . :  Code: 0xC3 (Services)             Length:  29
                                   Hops:    1            Service Addr: 00000009:0001CB32C00A:4004
                                   Service Type: 0x0751     Service Name: IBM8235_32C00A
                     Option . . :  Code: 0xC3 (Services)             Length:  29
                                   Hops:    1            Service Addr: 00000009:0001CBA2470E:4004
                                   Service Type: 0x0751     Service Name: IBM8235_A2470E
                     Option . . :  Code: 0xC3 (Services)             Length:  22
                                   Hops:    1            Service Addr: 00000009:400052005187:E885
                                   Service Type: 0x0640     Service Name: WINNT68
                     Option . . :  Code: 0xC3 (Services)             Length:  22
                                   Hops:    1            Service Addr: 00000009:400052005186:E885
                                   Service Type: 0x0640     Service Name: WINNT80
                     Data . . . :  C31701000000094000520051 88E885064057494E4E54313030C33D0131EC   *C...... ....HYE. ..++....C....*
                                   F1DD0000000000014006027846455247555 35F4E5734315F545245455F5F   *1....... .........,+...,....,,*
                                   5F5F5F5F5F5F5F5F5F5F5F5F5F5F96D3C2EA4D40404040404485504AC33D   *,,,,,,,,,,,,,,OLB.(     .E&"C.*
                                   0131ECF1DD00000000000010005026B4645524755535F4E5734315F545245   *...1.......,......,+...,...*
                                   455F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F96D3C2EA4D4040404040448550   *.,,,,,,,,,,,,,,,,OLB.(     .E&*
                                   4AC33E0131ECF1DD00000000000011F80012B4645524755535F4E5734315F   *"C....1.................,+...,*
                                   5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F303230   *,,,,,,,,,,,,,,,,,,,,,,,,,,...*
                                   3030343061C33E0131ECF1DD00000000000011F8001154645524755535F4E   *..../C....1.................,+*
                                   5734315F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F   *...,,,,,,,,,,,,,,,,,,,,,,,,,,*
                                   5F303230303034 3061C31A0131ECF1DD00000000000011F80013046455247   *,......./C....1..............*
                                   55535F4E573431C31A0131ECF1DD00000000000018104010746455247555 3   *..,+...C....1.......A........*
                                   5F4E573431C31A0131ECF1DD00000000000010451000446455247555 35F4E   *,+...C....1................,+*
                                   573431C31D01000000090001CB32C00A4004075149424D383233355F3332   *...C..........{. .....(....,..*
                                   43303041C31D01000000090001CBA2470E4004075149424D383233355F41   *....C.........S.. .....(....,.*
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                                    3234373045C31601000000009400052005187E885064057494E4E543638C3   *.....C...... ....GYE. ..++...C*
                                    16010000000094000520051 86E885064057494E4E543830                *...... ....FYE. ..++...       *
   156   R        0 00000000  1536.0  EBCDIC  X25LINET  /03   I          7         0     OFF   RR          100481    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  4
   158   S       66 00000000  1536.3  EBCDIC  X25LINET  /01   I          1         0     OFF   DATA        10044A    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                  P(S)=  5  P(R)=  2
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                                  Pkt Length:    36     Rem. Life:  5769s     Seq. No.: 0x00000001
                                  LSP ID: 0x020076AD0117 (Src):0x02 (Node):0x02 (LSP No.)
                    Fixed Hdr  :  831B01001201000000241689020076AD0117020200000001EF0F01
                    Option . . :  Code: 0xC4 (External Routes)       Length:  7
                                  Network: 31ECF1DD     Hops:     1     Ticks:     2
                    Data . . . :  C4070131ECF1DD0002                                            *D....1...                     *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                          Page:      31
Record        Data  Record    Record  Data    Controller             Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command Sent      Received  Final  Type        Header    Type
------  ---  ------ --------  ------  ------  -------------  ------- ------    --------  -----  ----------  --------  -----
   160   R        0 00000000  1536.3  EBCDIC  X25LINET  /03   I          0         1     OFF   RR          1004A1    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  5
   162   S      303 00000000  1536.3  EBCDIC  X25LINET  /01   I          2         1     OFF   DATA        10044C    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                  P(S)=  6  P(R)=  2
                    IPX  . . . :  Pkt Length:   303     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF012F000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                                  Pkt Length:   273     Rem. Life:  5785s     Seq. No.: 0x00000004
                                  LSP ID: 0x020076AD0117 (Src):0x02 (Node):0x03 (LSP No.)
                    Fixed Hdr  :  831B01001201000001111699020076AD0117020300000049E4501
                    Option . . :  Code: 0xC3 (Services)              Length:  52
                                  Hops:     1             Service Addr: 00000009:0001CB92FE09:4004
                                  Service Type: 0x0751    Service Name: If_changing_conf._please_tell_Ricardo
                    Option . . :  Code: 0xC3 (Services)              Length:  62
                                  Hops:     1             Service Addr: 00000009:400052005110:4000
                                  Service Type: 0x064E    Service Name: HIROAKI!!!!!!!!A5569B20ABE511CE9CA400004C762832
                    Option . . :  Code: 0xC3 (Services)              Length:  62
                                  Hops:     1             Service Addr: 00000009:400052005186:4018
                                  Service Type: 0x064E    Service Name: WINNT80!!!!!!!!A5569B20ABE511CE9CA400004C762832
                    Option . . :  Code: 0xC3 (Services)              Length:  62
                                  Hops:     1             Service Addr: 00000009:08005A5530E7:4008
                                  Service Type: 0x064E    Service Name: MQNT1!!!!!!!!!!A5569B20ABE511CE9CA400004C762832
                    Data . . . :  C33401000000090001CB92FE094004075149665F6368616E67696E675F63   *C.........K.. .....,../>..>.,.*
                                  6F6E662E5F706C656173655F74656C6C5F5269636172646FC33E01000000   *?>..,.%./..,..%%,.../..?C.....*
                                  094000520051104000064E4849524F414B4921212121212121212141353536   *. ..... ..+...|...............*
                                  394232304142453531314345394341343030303034433736323833 32C33E  *............................C.*
                                  0100000009400052005186401806 4E57494E4E5438302121212121212121  *..... ....F ..+..++...........*
                                  4135353639423230414245353131434539434134303030303443373 63238  *..............................*
                                  3332C33E010000000908005A5530E74008064E4D514E5431212121212121  *..C........!..X ..+(.+........*
                                  2121212141353536394232304142453531314345394341343030303034 43  *..............................*
                                  373632383332                                                  *......                        *
   164   R        0 00000000  1536.3  EBCDIC  X25LINET  /03   I          1         2     OFF   RR          1004C1    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  6
   166   S       98 00000000  1536.4  EBCDIC  X25LINET  /01   I          3         2     OFF   DATA        10044E    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                  P(S)=  7  P(R)=  2
                    IPX  . . . :  Pkt Length:    98     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0062000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                                  Pkt Length:    68     Rem. Life:  5769s     Seq. No.: 0x00000001
                                  LSP ID: 0x020076AD0117 (Src):0xFF (Node):0x00 (LSP No.)
                    Fixed Hdr  :  831B01001201000000441689020076AD0117FF0000000001B4A001
                    Option . . :  Code: 0xC1 (Management)            Length:  12
                                  Network: 0x00000000                Node: 0x000000000000
                    Option . . :  Code: 0xC2 (Link Information)      Length:  25
                                  S1: 0     I/E: 0     Cost : 0x00     Nbor ID: 0x020076AD011700
                                  MTU: 0x00000000    Delay: 0x00000000 usec
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                          Page:      32
                                  Thru: 0x00000000   Media: 0x0000 (Generic LAN)
                    Data . . . :  C10C0000000000000000000000100C21900808080020076AD011700000000   *A.............B...............*
                                  0000000000000000000000                                        *...........                   *
   168   R        0 00000000  1536.4  EBCDIC  X25LINET  /03   I          2         3     OFF   RR          1004E1    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  7
   170   S       66 00000000  1536.5  EBCDIC  X25LINET  /01   I          4         3     OFF   DATA        100440    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                  P(S)=  0  P(R)=  2
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
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                    LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                                  Pkt Length:    36     Rem. Life:  5770s     Seq. No.: 0x00000001
                                  LSP ID: 0x020076AD0117 (Src):0xFF (Node):0x02 (LSP No.)
                    Fixed Hdr  :  831B0100120100000024168A020076AD0117FF02000000019F9A01
                    Option . . :  Code: 0xC4 (External Routes)       Length:   7
                                  Network: 96AD0D47     Hops:     1     Ticks:    30
                    Data . . . :  C4070196AD0D47001E                                          *D..0.....               *
   172   R        0 00000000  1536.5  EBCDIC  X25LINET  /03   I          3         4     OFF    RR          100401    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  0
   175   R        0 00000000  1536.5  EBCDIC  X25LINET  /03   I          4         5     OFF    RR          100421    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  1
   177   R      143 00000000  1537.1  EBCDIC  X25LINET  /03   I          5         5     OFF    DATA        100424    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  2  P(R)=  1
                    IPX  . . . :  Pkt Length:   143     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF008F000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                                  Pkt Length:   113     Rem. Life:  7490s     Seq. No.: 0x00000003
                                  LSP ID: 0x020096AD0D47 (Src):0x00 (Node):0x00 (LSP No.)
                    Fixed Hdr  :  831B01001201000000711D42020096AD0D47000000000003D2CF01
                    Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                  Address: 00000000     Mask: 00000000
                    Option . . :  Code: 0xC1 (Management)            Length:  20
                                  Network: 0x96AD0D47               Node: 0x000000000001
                                  Router : ROUTER_1
                    Option . . :  Code: 0xC2 (Link Information)      Length:  25
                                  S1: 0    I/E: 0    Cost : 0x1E     Nbor ID: 0x020096AD0D47FF
                                  MTU: 0x00000000    Delay: 0x000001F4 usec
                                  Thru: 0x000F4240   Media: 0x0000 (Generic LAN)
                    Option . . :  Code: 0xC2 (Link Information)      Length:  25
                                  S1: 0    I/E: 0    Cost : 0x37     Nbor ID: 0x020076AD011700
                                  MTU: 0x00001000    Delay: 0x000089B1 usec
                                  Thru: 0x00004B64   Media: 0x801E (X.25)
                    Data . . . :  C008000000000000000000C11496AD0D47000000000000010108524F55544552   *{.........A.0............|....*
                                  5F31C2191E808080020096AD0D47FF00000000000001F4000F42400000C2   *,.B.......0...........4... ..B*
                                  1937808080020076AD0117000000100000089B100004B64801E           *..................I.......    *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A                05/09/97  11:31:12                         Page:      33
Record       Data    Record    Record  Data    Controller               Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length  Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type        Header    Type
------  ---  ------  --------  ------  ------  -------------  -------  ------   --------  -----  ----------  --------  -----
   179   S        0 00000000  1537.1  EBCDIC  X25LINET  /01   I          5         6     OFF    RR          100461    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  3
   180   R       98 00000000  1537.1  EBCDIC  X25LINET  /03   I          6         5     OFF    DATA        100426    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  3  P(R)=  1
                    IPX  . . . :  Pkt Length:    98     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0062000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                                  Pkt Length:    68     Rem. Life:  5273s     Seq. No.: 0x00000001
                                  LSP ID: 0x020096AD0D47 (Src):0xFF (Node):0x00 (LSP No.)
                    Fixed Hdr  :  831B01001201000000441499020096AD0D47FF0000000001B6E501
                    Option . . :  Code: 0xC1 (Management)            Length:  12
                                  Network: 0x00000000               Node: 0x000000000000
                    Option . . :  Code: 0xC2 (Link Information)      Length:  25
                                  S1: 0    I/E: 0    Cost : 0x00     Nbor ID: 0x020096AD0D4700
                                  MTU: 0x00000000    Delay: 0x00000000 usec
                                  Thru: 0x00000000   Media: 0x0000 (Generic LAN)
                    Data . . . :  C10C000000000000000000000100C21900808080020096AD0D4700000000   *A.............B.......0.......*
                                  0000000000000000000000                                         *...........                  *
   183   S        0 00000000  1537.1  EBCDIC  X25LINET  /01   I          6         7     OFF    RR          100481    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                             P(R)=  4
   185   R      161 00000000  1537.6  EBCDIC  X25LINET  /03   I          7         7     OFF    DATA        100428    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                   P(S)=  4  P(R)=  1
                    IPX  . . . :  Pkt Length:   161     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF00A1000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    PSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x1A
                                  Pkt Length:   131     Src ID: 0x020096AD0D4700
                    Fixed Hdr  :  831101001A0100000083020096AD0D4700
                    Option . . :  Code: 0x09 (LSP Entries)           Length: 112
                                  Rem. Life:  7489 sec  LSP ID: 0x020076AD01170000  Seq. No.: 0x00000004  Chksum: 0x0B9B
                                  Rem. Life:  5769 sec  LSP ID: 0x020076AD01170200  Seq. No.: 0x00000001  Chksum: 0x5CF6
                                  Rem. Life:  5776 sec  LSP ID: 0x020076AD01170201  Seq. No.: 0x00000003  Chksum: 0x1A8D
                                  Rem. Life:  5768 sec  LSP ID: 0x020076AD01170202  Seq. No.: 0x00000001  Chksum: 0xEF0F
                                  Rem. Life:  5784 sec  LSP ID: 0x020076AD01170203  Seq. No.: 0x00000004  Chksum: 0x9E45
                                  Rem. Life:  5768 sec  LSP ID: 0x020076AD0117FF00  Seq. No.: 0x00000001  Chksum: 0xB4A0
                                  Rem. Life:  5769 sec  LSP ID: 0x020076AD0117FF02  Seq. No.: 0x00000001  Chksum: 0x9F9A
                    Data . . . :  09701D41020076AD01170000000000040B9B1689020076AD011702000000   *..................I..........*
                                  00015CF61690020076AD01170201000000031A8D1688020076AD01170202   *..*6.................H........*
                                  00000001EF0F1698020076AD01170203000000049E451688020076AD0117   *.......Q...............H......*
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                                FF0000000001B4A01689020076AD0117FF02000000019F9A            *.........I..............     *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                            Page:      34
Record       Data    Record    Record  Data     Controller              Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length  Status    Timer   Type     Name/Number    Command  Sent     Received  Final  Type         Header    Type
------  ---  ------  --------  ------  ------   -------------  -------  ------   --------  -----  ----------   --------  -----
   187   S        0  00000000  1537.6  EBCDIC  X25LINET  /01   I          7        0       OFF    RR           1004A1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                            P(R)=  5
   189   S       81  00000000  1538.4  EBCDIC  X25LINET  /01   I          0        0       OFF    DATA         1004A2    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                   P(S)=  1  P(R)=  5
                     IPX  . . . :  Pkt Length:    81     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0051000000000000FFFFFFFFFFFF900176AD01170000000000019001
                     PSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x1A
                                   Pkt Length:    51     Src ID: 0x020076AD011700
                     Fixed Hdr  :  831101001A0100000033020076AD011700
                     Option . . :  Code: 0x09 (LSP Entries)            Length:  32
                                   Rem. Life:  7489 sec  LSP ID: 0x020096AD0D470000  Seq. No.: 0x00000003  Chksum: 0xD2CF
                                   Rem. Life:  5272 sec  LSP ID: 0x020096AD0D47FF00  Seq. No.: 0x00000001  Chksum: 0xB6E5
                     Data . . . :  09201D41020096AD0D47000000000003D2CF1498020096AD0D47FF000000   *......O.........K..Q..O.......*
                                   0001B6E5                                                       *...V                          *
   191   R        0  00000000  1538.4  EBCDIC  X25LINET  /03   I          0        1       OFF    RR           100441    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                            P(R)=  2
   193   R       57  00000000  1547.0  EBCDIC  X25LINET  /03   I          1        1       OFF    DATA         10044A    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                   P(S)=  5  P(R)=  2
                     IPX  . . . :  Pkt Length:    57     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0039000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                     LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                                   Pkt Length:    27     Rem. Life:     0s     Seq. No.: 0x00000002
                                   LSP ID: 0x020096AD0D47 (Src):0xFF (Node):0x02 (LSP No.)
                     Fixed Hdr  :  831B010012010000001B0000020096AD0D47FF0200000002000001
   195   S        0  00000000  1547.0  EBCDIC  X25LINET  /01   I          1        2       OFF    RR           1004C1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                            P(R)=  6
   197   S       65  00000000  1548.0  EBCDIC  X25LINET  /01   I          2        2       OFF    DATA         1004C4    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                   P(S)=  2  P(R)=  6
                     IPX  . . . :  Pkt Length:    65     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0041000000000000FFFFFFFFFFFF900176AD01170000000000019001
                     PSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x1A
                                   Pkt Length:    35     Src ID: 0x020076AD011700
                     Fixed Hdr  :  831101001A0100000023020076AD011700
                     Option . . :  Code: 0x09 (LSP Entries)            Length:  16
                                   Rem. Life:     0 sec  LSP ID: 0x020096AD0D47FF02  Seq. No.: 0x00000002  Chksum: 0x0000
                     Data . . . :  09100000020096AD0D47FF02000000020000                           *......O...........            *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A              05/09/97  11:31:12                            Page:      35
Record       Data    Record    Record  Data     Controller              Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length  Status    Timer   Type     Name/Number    Command  Sent     Received  Final  Type         Header    Type
------  ---  ------  --------  ------  ------   -------------  -------  ------   --------  -----  ----------   --------  -----
   199   R        0  00000000  1548.0  EBCDIC  X25LINET  /03   I          2        3       OFF    RR           100461    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                            P(R)=  3
   201   S       57  00000000  1555.8  EBCDIC  X25LINET  /01   I          3        3       OFF    DATA         1004C6    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                   P(S)=  3  P(R)=  6
                     IPX  . . . :  Pkt Length:    57     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0039000000000000FFFFFFFFFFFF900176AD01170000000000019001
                     LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                                   Pkt Length:    27     Rem. Life:     0s     Seq. No.: 0x00000002
                                   LSP ID: 0x020076AD0117 (Src):0xFF (Node):0x02 (LSP No.)
                     Fixed Hdr  :  831B010012010000001B0000020076AD0117FF0200000002000001
   203   R        0  00000000  1555.8  EBCDIC  X25LINET  /03   I          3        4       OFF    RR           100481    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                            P(R)=  4
   205   R       65  00000000  1557.0  EBCDIC  X25LINET  /03   I          4        4       OFF    DATA         10048C    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                   P(S)=  6  P(R)=  4
                     IPX  . . . :  Pkt Length:    65     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0041000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                     PSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x1A
                                   Pkt Length:    35     Src ID: 0x020096AD0D4700
                     Fixed Hdr  :  831101001A0100000023020096AD0D4700
                     Option . . :  Code: 0x09 (LSP Entries)            Length:  16
                                   Rem. Life:     0 sec  LSP ID: 0x020076AD0117FF02  Seq. No.: 0x00000002  Chksum: 0x0000
                     Data . . . :  09100000020076AD0117FF02000000020000                           *..................            *
   207   S        0  00000000  1557.0  EBCDIC  X25LINET  /01   I          4        5       OFF    RR           1004E1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                            P(R)=  7
   209   R       66  00000000  1560.0  EBCDIC  X25LINET  /03   I          5        5       OFF    DATA         10048E    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                   P(S)=  7  P(R)=  4
                     IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
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                     Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
              IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900196AD0D470000000000019001
              WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                            State: 0 (Up)         Cct Type:  1          Src ID: 0x020096AD0D47
                            Hold Time:    60s     Pkt Length:    36     WAN ID: 0x01
              Fixed Hdr  :  83140100110100000102009 6AD0D47003C002401
              Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                            Address: 00000000     Mask: 00000000
              Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
              Data . . . :  C0080000000000000000C50400001000                          *{.........E.....                *
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A             05/09/97  11:31:12                      Page:      36
Record       Data   Record    Record  Data    Controller             Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type        Header    Type
------  ---  ------ --------  ------  ------  -------------  -------  ------   --------  -----  ----------  --------  -----
   211   S       0  00000000  1560.0  EBCDIC  X25LINET  /01   I         5         6      OFF    RR          100401    NSNA
              Packet Header :  LCGN= 0   LCN=  4                                P(R)=  0
   213   S      66  00000000  1562.1  EBCDIC  X25LINET  /01   I         6         6      OFF    DATA        100408    NSNA
              Packet Header :  LCGN= 0   LCN=  4                      P(S)=  4  P(R)=  0
              IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                            Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                            Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
              IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
              WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                            State: 0 (Up)         Cct Type:  1          Src ID: 0x020076AD0117
                            Hold Time:    60s     Pkt Length:    36     WAN ID: 0x03
              Fixed Hdr  :  831401001101000001020076AD0117003C002403
              Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                            Address: 00000000     Mask: 00000000
              Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
              Data . . . :  C0080000000000000000C50400001000                          *{.........E.....                *
   215   R       0  00000000  1562.2  EBCDIC  X25LINET  /03   I         6         7      OFF    RR          1004A1    NSNA
              Packet Header :  LCGN= 0   LCN=  4                                P(R)=  5
   217   R      66  00000000  1585.3  EBCDIC  X25LINET  /03   I         7         7      OFF    DATA        1004A0    NSNA
              Packet Header :  LCGN= 0   LCN=  4                      P(S)=  0  P(R)=  5
              IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                            Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                            Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
              IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900196AD0D470000000000019001
              WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                            State: 0 (Up)         Cct Type:  1          Src ID: 0x020096AD0D47
                            Hold Time:     0s     Pkt Length:    36     WAN ID: 0x01
              Fixed Hdr  :  831401001101000001020096AD0D470000002401
              Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                            Address: 00000000     Mask: 00000000
              Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
              Data . . . :  C0080000000000000000C50400001000                          *{.........E.....                *
   219   S       0  00000000  1585.3  EBCDIC  X25LINET  /01   I         7         0      OFF    RR          100421    NSNA
              Packet Header :  LCGN= 0   LCN=  4                                P(R)=  1
COMMUNICATIONS TRACE       Title: IPXPING TO RALYAS4A             05/09/97  11:31:12                      Page:      37
Record       Data   Record    Record  Data    Controller             Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type        Header    Type
------  ---  ------ --------  ------  ------  -------------  -------  ------   --------  -----  ----------  --------  -----
   221   S      66  00000000  1585.7  EBCDIC  X25LINET  /01   I         0         0      OFF    DATA        10042A    NSNA
              Packet Header :  LCGN= 0   LCN=  4                      P(S)=  5  P(R)=  1
              IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                            Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                            Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
              IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
              WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                            State: 0 (Up)         Cct Type:  1          Src ID: 0x020076AD0117
                            Hold Time:     0s     Pkt Length:    36     WAN ID: 0x03
              Fixed Hdr  :  831401001101000001020076AD01170000002403
              Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                            Address: 00000000     Mask: 00000000
              Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
              Data . . . :  C0080000000000000000C50400001000                          *{.........E.....                *
   223   R       0  00000000  1585.7  EBCDIC  X25LINET  /03   I         0         1      OFF    RR          1004C1    NSNA
              Packet Header :  LCGN= 0   LCN=  4                                P(R)=  6
   225   R       2  00000000  1585.9  EBCDIC  X25LINET  /03   I         1         1      OFF    CLR IND     100413    NSNA
              Packet Header :  LCGN= 0   LCN=  4
              Data . . . :  8000                                                      *..                              *
   227   S       0  00000000  1586.0  EBCDIC  X25LINET  /01   I         1         2      OFF    CLR CFM     100417    NSNA
              Packet Header :  LCGN= 0   LCN=  4
* * * * *   E N D   O F   C O M P U T E R   P R I N T O U T   * * * * *
```

A.2 AS/400 to AS/400 X.25 On-Demand (Incoming Call)

This AS/400 trace shows the establishment of an X.25 on-demand session between AS/400s. The trace is taken from the setup in scenario 2 (Chapter 9, "Scenario 2. IPX Routing between AS/400s via an On-Demand X.25 SVC Connection" on page 105).

The trace shows the establishment of the X.25 circuit, the IPXPING and then the X.25 circuit brought down by the idle timer expiring. The trace is taken from the AS/400 that received the IPXPING.

The trace is shown formatted for IPX (Format IPX data only).

Format IPX data only

The following PTFs provide IPX trace format capability:

- V3R2 PTF MF13610 and co-req PTF MF13625
- V3R7 PTF MF13493

```
COMMUNICATIONS TRACE      Title: IPXPING FRM RALYAS4A           05/09/97  11:42:52                          Page:       1
  Trace Description  . . . . . :   IPXPING FRM RALYAS4A
  Configuration object . . . . :   X25LINE_B
  Type . . . . . . . . . . . . :   1            1=Line, 2=Network Interface
                                                3=Network server
  Object protocol  . . . . . . :   X.25
  Start date/Time  . . . . . . :   05/09/97  11:37:57
  End date/Time  . . . . . . . :   05/09/97  11:42:28
  Bytes collected  . . . . . . :   30221
  Buffer size  . . . . . . . . :   3            1=128K, 2=256K, 3=2048K
                                                4=4096K, 5=6144K, 6=8192K
  Data direction . . . . . . . :   3            1=Sent, 2=Received, 3=Both
  Stop on buffer full  . . . . :   N            Y=Yes, N=No
  Number of bytes to trace
    Beginning bytes  . . . . . :   *CALC        Value, *CALC
    Ending bytes   . . . . . . :   *CALC        Value, *CALC
  Controller name  . . . . . . :   *ALL         *ALL, name
  Data representation  . . . . :   3            1=ASCII, 2=EBCDIC, 3=*CALC
  Format SNA data only . . . . :   N            Y=Yes, N=No
  Format RR, RNR commands  . . :   N            Y=Yes, N=No
  Format TCP/IP data only  . . :   N            Y=Yes, N=No
  Format IPX data only     . . :   Y            Y=Yes, N=No
COMMUNICATIONS TRACE      Title: IPXPING FRM RALYAS4A           05/09/97  11:42:52                          Page:       2
Record Number . . . .  Number of record in trace buffer (decimal)
S/R . . . . . . . . .  S=Sent   R=Received    M=Modem Change
Data Length . . . . .  Amount of data in record (decimal)
  Packet Types:
  ------------
   IN CALL  . . . . .  Incoming Call
   CLR CFM  . . . . .  Clear Confirmation
   DATA   . . . . . .  Data
   CALL CONN  . . . .  Call Connected
   CLR IND  . . . . .  Clear Indication
   INT  . . . . . . .  Interrupt
   INT CFM  . . . . .  Interrupt Confirm
   RR . . . . . . . .  Receive Ready
   RNR  . . . . . . .  Receive Not Ready
   RST IND  . . . . .  Reset Indication
   RST CFM  . . . . .  Reset Confirmation
   RSTRT IND  . . . .  Restart Indication
   RSTRT CFM  . . . .  Restart Confirmation
   DIAG . . . . . . .  Diagnostic
   CALL REQ . . . . .  Call Request
   CALL ACC . . . . .  Call Accept
   CLR REQ  . . . . .  Clear Request
   REJ  . . . . . . .  Reject
   RST REQ  . . . . .  Reset Request
   ********** . . . .  Packet Type Not Valid
  Packet Header Information:
  -------------------------
   Q-BIT  . . . . . .  Qualifier Bit
   A-BIT  . . . . . .  Address Bit
   D-BIT  . . . . . .  Delivery Confirmation Bit
   LCGN . . . . . . .  Logical Channel Group Number
```

```
   LCN  . . . . . . .  Logical Channel Number
   P(R) . . . . . . .  Packet Receive Sequence Number (next packet expected)
   P(S) . . . . . . .  Packet Send Sequence Number
   M-BIT  . . . . . .  More Data Bit
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A             05/09/97  11:42:52                          Page:      3
Record       Data    Record    Record  Data    Controller               Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length  Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type        Header    Type
------  ---  ------  --------  ------  ------  -------------  -------  ------   --------  -----  ----------  --------  -----
     1   R       23  00000000  2107.0  EBCDIC  X25LINET  /03   I          2          2     OFF    IN CALL     10040B    NSNA
                     Packet Header :  LCGN= 0   LCN=  4
                     Data . . . :  9910110020110110020506420C0C430707800000008137                *R....................A.        *
     3   S       11  00000000  2107.4  EBCDIC  X25LINET  /01   I          2          3     OFF    CALL ACC    10040F    NSNA
                     Packet Header :  LCGN= 0   LCN=  4
                     Data . . . :  9910110020110110020500                                         *R..........                    *
     5   S      576  00000000  2107.5  EBCDIC  X25LINET  /01   I          3          3     OFF    DATA        100400    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                  P(S)=  0  P(R)=  0
                     IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                      Hop Count:   0
                                   Src Addr  : 00000000:000000000000:9004 (IPW2)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                     IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
                     IW2  . . . :  WPkt Type: 0x00 (TIMER REQ)  WNode ID: 0x00000000  WSeq No.:   0  # Options:   5
                     Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                   Routing Type: 0x01 (NLSP)
                     Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                   Routing Type: 0x02 (Unnumbered RIP)
                     Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                   Routing Type: 0x00 (RIP)
                     Option . . :  WOpcode: 0x04 (Extd Node ID)     WAccept: 0x01 (Yes)     WOption Len:     4
                                   Internal Network Number: 0x76AD0117
                     Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)     WOption Len:   508
                     Data . . . :  5741534D00000000000000500010001010001000102000100010004010004   *...(..........................*
                                   76AD0117FF0101FCD6D21A43FBBA92E4960237DAEBA116279CB5D34DE543   *........OK....KUO.........L(V.*
                                   B49CC006E35C84390F83BE29A547A02239DBA704AB00A376E2ABD21B9C65   *..{.T*D..C..V.....X...T.S.K...*
                                   92B916A8B57EBADA931D9B4EFCBF6957FA9D5064EE0955C7A6DEF5E9F7E2   *K..Y.=..L..+......&....GW.5Z7S*
                                   E996D255F5FF8989A43CAB7DA5B0C6091DC6808217BEDCE4FCDCBD9540D1   *ZOK.5.IIU..'V.F..F.B...U...N J*
                                   91D2BA95A1D7D6FFE164525C815B89A0A0A8A9BAA11F44BE8BDA6897B008   *JK.N.PO....*A$I..YZ........P..*
                                   D93D94EE8E16B9B292BEFAC05731E99CD294B6C56A5FDACAE0B8BD67C041   *R.M.....K..{..Z.KM.E.,......{.*
                                   E67F4C8DAF7B3335C15F3695D1F8D362A6FE32A1FAAE3DAEC553EB16886F   *W"<..#..A,.NJ8L.W.......E...H?*
                                   5691C59C8F92A9961F9ABEF50E72CA87C05096632C12C8E29EE1962D2CD1   *.JE..KZO...5...G{&O...HS..O..J*
                                   EFD99A5EB7260C58A2F4C359F3455BA4CE83E8C3B626C422AB16F19CEF50   *.R.;....S4C.3.$U.CYC..D...1..&*
                                   908592408683CA3F4D7981F7AAACAAE644DEF3B3A27A96707496B0F67104   *.EK FC..(.A7...W..3.S:O..O.6..*
                                   83761861BE3ACBB5861439A699D50610F0815357BA86F01DF0FE5F97CC36   *C../....F..WRN..OA...FO.O.,P..*
                                   2E1DF90DDAA9FC8F0CFD939E3796F853A491BB59AAF6FBE75C92926EF673   *..9..Z....L..O8.UJ...6.X*KK>6.*
                                   B2F64321C5B187528A2B7DE5AD568C428D1299F7C03A6F7DBC6DDA24D00C   *.6..E.G...'V......R7{.?'._..}.*
                                   D222F9B820E4A777D8D2AD3C18E4C4867997D8990D4EA838EAFBB0CB5B06   *K.9..UX.QK...UDF.PQR.+Y.....$.*
                                   F6C541989055E0BBF6155F05F511BF7BE032A1F09C26068F8478E6619D5D   *6E.Q....6.,.5..#...O....D.W/.)*
                                   2E3AD086328D9A6131F0E315D2BFADBF6E13F2D3FA83BAE42B02D9C3F02A   *..}F.../.0T.K...>.2L.C.U..RC0.*
                                   CECCC518E5A014BAF0B1351D82167E6092C3135AC52BC4FDBC92232D9E43   *..E.V...O...B.=-KC.!E.D..K....*
                                   C014F1F7B239                                                   *{.17..                         *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A             05/09/97  11:42:52                          Page:      4
Record       Data    Record    Record  Data    Controller               Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length  Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type        Header    Type
------  ---  ------  --------  ------  ------  -------------  -------  ------   --------  -----  ----------  --------  -----
     6   R      576  00000000  2107.7  EBCDIC  X25LINET  /03   I          3          3     OFF    DATA        100400    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                  P(S)=  0  P(R)=  0
                     IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                      Hop Count:   0
                                   Src Addr  : 00000000:000000000000:9004 (IPW2)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                     IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
                     IW2  . . . :  WPkt Type: 0x00 (TIMER REQ)  WNode ID: 0x00000000  WSeq No.:   0  # Options:   5
                     Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                   Routing Type: 0x01 (NLSP)
                     Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                   Routing Type: 0x02 (Unnumbered RIP)
                     Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                   Routing Type: 0x00 (RIP)
                     Option . . :  WOpcode: 0x04 (Extd Node ID)     WAccept: 0x01 (Yes)     WOption Len:     4
                                   Internal Network Number: 0x96AD0D47
                     Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)     WOption Len:   508
                     Data . . . :  5741534D00000000000000500010001010001000102000100010004010004   *...(..........................*
                                   96AD0D47FF0101FCC5E0B4DBA381FB5CAA9DA8E2D4BAE4F1BA0CF754A942   *O.......E...TA.*..YSM.U1..7.Z.*
                                   0B3AAEEF63A7E677C2ABC08DDEC3A21C36F9EA5D68959A7D8669A703A6BD   *.....XW.B.{..CS..9.).N.'F.X.W.*
                                   E0B817F5D62D4916B719B135F7C16C7DBBBA019FB0C0CE03C215819E91F1   *...5O.......7A%'.....{..B.A.J1*
                                   0F9FE938DA949396A22C86714268F5BEFECDCE4AC2C78E3A00A181FF92FB   *..Z..MLOS.F...5...."BG....A.K.*
                                   B20ADF6BE7D2451F9DB86D21B704E26DA1ADBFFB96174AABD3276D89C188   *...,XK...._..._S_....O.".L._IAH*
                                   A9ADF33C001FE82C6FFBBD6C3ED38D90EFCEA67005FF8499FDB899E07F0C   *Z.3...Y.?..%.L....W...DR..R.".*
                                   E1B53BC1C1666FACAC2DE867F9F51A81CA9F8B5CB076ACF2BF549E61CC6A   *...AA.?...Y.95.A...*...2.../..*
                                   546AD8CC63FFD2B9698C8AC0D26AF9367451E60EF1AADF1C45E6B931717A   *..Q...K....{K.9...W.1....W...:*
                                   DD115F939F9A1D49BEF8F57CCABD01D8BEC473E5D395213CE3B956AA9CE9   *..,L.....85@...Q.D.VLN..T....Z*
                                   27B48F2DEAE88F996EC9A23897C7B174DD06EF5B0FEFC3738EAED79CA5C2   *.....Y.R>IS.PG.....$..C...P.VB*
                                   ED46D225C48EF4D7856CB413A3A28FD585913CE282345DF1BC03BC00992C   *..K.D.4PE%..TS.NEJ.SB.)1....R.*
                                   047098D7A3A1F537ED6CAAC4CB3BDDFAE61483179CE8833E8696FDF6252B   *..QPT.5..%.D....W.C..YC.FO.6..*
                                   AB02AC50BC7F0FE7B9ED6760911E2EFED49F7021AF7AF396B10E56DCA468   *...&.".X...-J...M....:3O....U.*
```

```
                           E055E16040C7F63D3C6AAE49D173F0562E6AAA01AC6CD3DF3DA7E5490B9D   *...- G6.....J.O......%L..XV...*
                           9E99E60689CCE544EAE01A0A9ECDFEFFE62068CDD9C0E0C485E4D38DF1FD   *.RW.I.V.........W...R{.DEUL.1.*
                           12A89DD44FB7DDBDC855D6ABB62FA34635C5D6746C42F56FCF0DFF82DC5E   *.Y.M|...H.O...T..EO.%.5?...B.;*
                           E8522260E84F43C9ABEBB847808F9580D2A0487198F45EC0D378DDB4A423   *Y..-Y|.I......N.K...Q4;{L...U.*
                           C0E4A74D0CED                                                  *{UX(..                        *
    8   S        0 00000000  2107.7  EBCDIC  X25LINET  /01   I          4         4     OFF    RR          100421    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                             P(R)=  1
    9   S      576 00000000  2107.7  EBCDIC  X25LINET  /01   I          5         4     OFF    DATA        100422    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                   P(S)=  1  P(R)=  1
                   IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                    Hop Count:   0
                                 Src Addr  : 00000000:000000000000:9004 (IPW2)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                   IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
                   IW2  . . . :  WPkt Type: 0x01 (TIMER RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   5
                   Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x01 (Yes)     WOption Len:     1
                                 Routing Type: 0x01 (NLSP)
                   Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x00 (No)      WOption Len:     1
                                 Routing Type: 0x02 (Unnumbered RIP)
                   Option . . :  WOpcode: 0x00 (Routing Type)     WAccept: 0x00 (No)      WOption Len:     1
                                 Routing Type: 0x00 (RIP)
                   Option . . :  WOpcode: 0x04 (Extd Node ID)     WAccept: 0x01 (Yes)     WOption Len:     4
                                 Internal Network Number: 0x76AD0117
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A              05/09/97  11:42:52                       Page:       5
                   Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)     WOption Len:   508
                   Data . . . :  5741534D0176AD0117000500010001010000000102000000010004010004   *...(..........................*
                                 76AD0117FF0101FCBCD6384B940A24C9A5F5540E8D61B8428A883D93F682   *.........O..M..IV5.../...H.L6B*
                                 C4F38350ABF6A549E6D596D1FEBBB4AAF459C3905BBABA7674A5B6E45C47   *D3C&.6V.WNOJ....4.C.$....V.U*.*
                                 CA669720954C1DB1B8319C0BC0FBF4A7DD7B62EDCF9C273594D273108480   *..P.N<......{.4X.#......MK..D.*
                                 6BC68B23D821DE42A5E5E999CF63F0FEE466EE4560268CABD901E63418CE   *,F..Q...VVZR..O.U...-...R.W...*
                                 E648F275BF265571EDB3CFC2B80D437AEEC95CFDE5F86085958931B8E21F   *W.2........B...:.I*.V8-ENI..S.*
                                 73BBFEE76DF88BE53787F5A0C7D28E9F29FBF37D66E4ADEE7FA084FD3A97   *...X_8.V.G5.GK....3'.U..".D..P*
                                 8D11D3B88D631D64E61ED8C1F328DCEFFFC14BA1EB4CBA35FA556643FCAD   *..L.....W.QA3....A...<........*
                                 391BD0809D37ABD1F0D3E41A04C6E82FD8299D18E2D7CCD4E1D5AC36D003   *..}....JOLU..FY.Q...SP.M.N..}.*
                                 C292CD4AB3E41913C42A8AAAC4F60384F3613422F2A62103F8C1C86AFA4D   *BK.".U..D...D6.D3/..2W..8AH..(*
                                 26BDDF2AC2ADF0535E52F155D4C2BA038857BDEC672AEB6957D0D104916F   *....B.O.;.1.MB..H........}J.J?*
                                 82E8799FEC88F8DE948B3025BE06195482693B44CAB23040F87E21B7A0D7   *BY...H8.M.......B...... 8=...P*
                                 F4D6C20B601AF8D2AE7DCFBE102BC717E19BF0DCED3BB85B3808ECBBF3C7   *4OB.-.8K.'....G...O....$....3G*
                                 A782073EC9A9CD5DAAE9FC1BE7A6A847EE7244228FD78E7C90CBB8ACAEC9   *XB..IZ.).Z..XWY......P.@.....I*
                                 6E79AA742396AECCA448FD35CCA0D70D9E40BF10EA0EEF769FF22D4C9EC01   *>....O..U.....P.. ........MI..*
                                 94A5A2CC86634B53E0E67B13BB9A8FC0A053E67AE440A5D2D046F311E200   *MVS.F....W#....{..W:U VK}.3.S.*
                                 4BEB8178A53997A78398F6B0BDF1CD8697BFBF54E604DEC972BFFB8CCBDE   *..A.V.PXCQ6..1.FP...W..I......*
                                 D89CDCD8A2675803AEC38042A519C6B2BF4424CD92CC70D6AC043CE6CA3A   *Q..QS....C..V.F.....K..O...W..*
                                 7845C4AE61BD                                                  *..D./.                        *
   12   R        0 00000000  2107.7  EBCDIC  X25LINET  /03   I          4         5     OFF    RR          100421    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                             P(R)=  1
   15   R        0 00000000  2108.0  EBCDIC  X25LINET  /03   I          5         6     OFF    RR          100441    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                             P(R)=  2
   17   R     4096 00000000  2109.8  EBCDIC  X25LINET  /03   I          6         6     OFF    DATA        100442    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                   P(S)=  1  P(R)=  2
                   IPX  . . . :  Pkt Length:  4096     Pkt Type: 0x04                    Hop Count:   0
                                 Src Addr  : 00000000:000000000000:9004 (IPW2)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                   IPX Raw Hdr:  FFFF1000000400000000FFFFFFFFFFFF9004000000000000000000009004
                   IW2  . . . :  WPkt Type: 0x04 (THRU. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                   Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)     WOption Len:  4051
                   Data . . . :  5741534D0496AD0D470001FF010FD399DA8602D9943C3892FDF022DDA093   *...(.O........LR.F.RM..K.O...L*
                                 93D9390992AFA3BFA9A77C4A56D0F4AA02EEC5D47BFE0151B5889BC45CAA   *LR..K.T.ZX@".}4...EM#....H.D*.*
                                 78BA16DC0151CADAA1159E8592A836DF61B5BD87E2FDDFC789812C947FD6   *...........EKY../..GS..GIA.M"O*
                                 0DD4BE3BA6953E7C69B95A1E0CCB6B04E6DF0F0060D1E21109D0CCD186B6   *.M..WN.@..!...,.W...-JS..}.JF.*
                                 D01F8399C52F3AE09FD7B59E0B1F4AEC338456AA35A341A77157B5823581   *}.CRE....P....."..D...T.X...B.A*
                                 F686E78044C896358EFD9664849CA1982EB50E4459BBA98BEDF821D4DCF5   *6FX..HO...O.D..Q......Z..8.M.5*
                                 1E36C9929F43D9961FA6C4F7FDDADCBB2C20B7CE182E62958D8DA4804E56   *..IK..RO.WD7...........N..U.+.*
                                 B2971E01EEB310FDC5A084EC5CF6B9DE59A4B5239CF0352B3FB2AAB04EE4   *.P......E.D.*6...U...O......+U*
                                 1D2C86B756866B919338D7D878F5ECED59C7FCA158EB22D4B557F0CDA0BA   *..F..F,JL.PQ.5...G.....M..O...*
                                 AAF33F585EC3C30016B73B08C384BC9831F9ABFD0C8A729EE4EB1DD1BFF2   *.3..;CC.....CD.Q.9......U..J.2*
                                 B5CB31FD2F7A74B810D789D9B6C1C8ED6CA123F6C77A9CA2431658E2703E   *.....:...PIR.AH.%..6G:.S...S..*
                                 A2B72071D3B3113193ADCE05BEB0DB56188FF19C5FBF516ACEFA3B5C83CF   *S...L...L.........1.,......*C.*
                                 371CCEAB4482AB9EDF0066C2937A07E030C55EA1EE115094B2EE3FEF37B6   *.....B.....BL:...E;...&M......*
                                 5EB2A65005C4CFD3E5A860C456E8FA4077859EBC21F8515F10A63892CECC   *;.W&.D.LVY-D.Y. .E...8.,.W.K..*
                                 2E67A4FA96A8B6B91EC5429328CF02DC2ED7C987593E0FF3F99035856B04   *..U.OY...E.L.....PIG...39..E,.*
                                 B7B502CED0CB581688842FA305D377E110E3594DE7FC09ED4DEFBADB81D4   *....}...HD.T.L...T.(X...(...AM*
                                 A16D1DB202F7FBE0E6DB0BD4372288EFBC7B91BF54E78EDF2E7DC5E54382   *._...7..W..M..H..#J..X...'EV.B*
                                 FCB34CE3FCFD0C115BA347EF28C7A67ED883D1FD50CF4DD2CDFE4AFB0FEC   *..<T....$T...GW=QCJ.&.(K.."...*
                                 A91837D1753C44E7C7FFCBFB6ADF4FA56B3C7EA350C90B8CBF44F2E147B4   *Z..J...XG.....|V,.=T&I....2...*
                                 0FAA7EB856E5786D8DC560B9AED13EB3BFEB8B2BECFDF10BC4DC3BF31CE3   *..=..V._.E-..J........1.D..3.T*
                                 D6243AFFE4D0B28741D95FF4263159F7724749EFA6888A9E4E96F2B9983B   *O...U}.G.R,4...7....WH..+O2.Q.*
                                 11B94E3849BE519FABE0C9F52BEAFF4D599F2F8698E92DB6CEB83D05FCAE   *..+.......I5...(...FQZ........*
                                 5441E49DB239279FC68054A1135CC0FE2E93DEA3EE5632F45D40B3964325   *..U.....F....*{..L.T...4) .O..*
                                 1C92399E5784CAACC2961438AB8994AF888090504A82876C3888D2137C97   *.K...D..BO...IM.H..&"BG%.HK.@P*
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A              05/09/97  11:42:52                       Page:       6
                   Data . . . :  FD781281D633B495DCB105CBEA0C21F2C2B31ECC7DF316E0E2923DBAEF56   *...AO..N.......2B...'3..SK....*
                                 24B700B55E8F838C308568ECEDAB9B0009CD1FA6E4D9062BF2A42F8C2FAD   *....;.C..E.........WUR..2U....*
                                 9CB5E08B68DE2D91D2A3DD9C044CF7DE593C27B47C967DDF7C451ED79E27   *.......JKT...<7.....@O'.@..P..*
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                                  33D01FF3DDE1C39CEBF1737C19D4D8C927E47E8C9DB0420C9EC04AB37AE8   *.}.3..C..1.@.MQI.U=......{”.:Y*
                                  4D7137B4444908EF1708AED13B52248D8E24CEEF1298FDADFA84AB9A1C4F   *(..........J.........Q...D...|*
                                  CAB8BAA5D2E5DCDCBE8720B3D9F3FFB0DE97B53BF9FB74A63FA74EF313B0   *...VKV...G..R3...P..9..W.X+3..*
                                  38BA36DC49899DDFEA136880A083B2AA265D18BCAA29EEC7A72907AF76F0   *.....I.......C...).....GX....0*
                                  F9A9C6C56FB8CC517EEDFA85FBDA729BCD9A531FC7C74B90F9B21B31A897   *9ZFE?...=..E........GG..9...YP*
                                  5967F3EEB7D026E5C2E93BDF5E9656BAE05AACDF61320EE61DA7B5A4EDD2   *..3..}.VBZ..;0...!../..W.X.U.K*
                                  1BF97D3F358DC1308B865A3E638EB61A7FD585D10CC45FD859F0751FC899   *.9’...A..F!.....”NEJ.D,Q.0..HR*
                                  79FECE9847D51B93F82DB98A821895E31C253ECCD17DEFCDA33EF7987B33   *...Q.N.L8...B.NT....J’..T.7Q#.*
                                  9BC0795353DD4DD0DE9FCC10558E448E6AB6E21A1FB6214707C2BE79FCE7   *.{....(}..........S......B...X*
                                  3AF347CF3A30EBF561FE97F491E95D9770561DD025D798E46DA6EBDAEA03   *.3.....5/.P4JZ)P...}.PQU_W....*
                                  77B989E9EA8D5C60D1ABD881D9933525B4863E97EEF768CF1D81F5F7D2BB   *..IZ..*-J.QARL...F.P.7...A57K.*
                                  613EA7ED58A60DD6FE1938C42A19CEA8048800C17D0E2EF92E5140CFD8C0   */.X..W.O...D...Y.H.A’..9.. .Q{*
                                  8F9F4A56E5C98F2617D50E17639021D1DD9C594E19AB169B81D93B89E8D3   *..”.VI...N.....J...+....AR.IYL*
                                  DB4DC4E2CEEB86FEC91EBFC6021048B17B4C8895DDCFC19572D4C6A5EF5F   *.(DS..F.I..F....#<HN..AN.MFV.,*
                                  D2867C291BC16EF098DA75EE5FF4750F06B12DD04DB6C6CA1CB4FF5204E6   *KF@..A>0Q...,4.....}(.F......W*
                                  61E172A4187989C2D3658AC4AFAAF4E900DE0EB7F2E0A5AA7ACEFDE4AB9B   */..U..IBL..D..4Z....2.V.:..U..*
                                  7CBE6D5F2EFE8426AE9607EC0EE21AD816D0610053905CB407B62F819DE8   *@._,..D..0...S.Q.}/...*....A.Y*
                                  E6C7DD874BF5A18BEB626D8A8B29E0B66A783087F8F4E1E9952585BED2B6   *WG.G.5...._........G84.ZN.E.K.*
                                  92FBD08D1EB8E12DBBC781AED192FC81ACFFA58E98CE35204881DAC0BDC0   *K.}......GA.JK.A..V.Q....A.{.{*
                                  A3FAE6CDAD74D9B6D2BC0EC53898E886BF0C81E8CE2E44B83FE9C5EC0CE3   *T.W...R.K..E.QYF..AY.....ZE..T*
                                  04C20C94AFC7F5D0B1DB587B078DF57913EEE01735BA141319FBF22DC0D8   *.B.M.G5}...#..5...........2.{Q*
                                  9A197AECFF07AFDB51EBB8DF4AED86B0306AF2BABD903DF348F493BAB15B   *..:.........”.F...2....3.4L..$*
                                  AED1FA5C448BBFE010E20F821EE827F38596E517D79A8071A7E6A5DA3092   *.J.*.....S.B.Y.3EOV.P...XWV..K*
                                  97FB9EB8088D43B972881A8E45C21585C939ADDDE9D17AA1B81269BBC0FE   *P........H...B.EI...ZJ:.....{.*
                                  72FB814EABE6543D8DA4956A1FCD6A6DA4864493598025FCEEBE00AEFD9E   *..A+.W...UN...._UF.L..........*
                                  E0C580B6C6A7FEAC3F7272F972F2B7E99D4C53D5FE54F8AC7CD38BB724A3   *.E..FX.....9.2.Z.<.N..8.@L...T*
                                  26C65371BA904FD010E7E51475F0A28444BD9A07C9CB757E5F8EBBF755D6   *.F....|}.XV..0SD....I..=,..7.O*
                                  6B36A998D1FF3A82CB8739801AF246E918135FABA03988A42167C08D22C2   *,.ZQJ..B.G...2.Z..,...HU..{..B*
                                  70E50B8F74D9F77E27877BA23EC5D8D9F09FCC810BAB2C4B24E8F98048D4   *.V...R7=.G#S.EQR0..A.....Y9..M*
                                  556E77B4C7B38AA2DC85C0BBD153C9ABD41175EFC67075CD018C4FA0A2FF   *.>..G..S.E{.J.I.M...F.....|.S.*
                                  B0AD40CE35F9A252708FD2B71BD2F39762F6580F218F49BDE2B25189ED87   *.. ..9S...K..K3P.6......S..I.G*
                                  3682128B95B119909E27E8FF4E3A85E8E474B6EEAAD02E9049F66DE7D1B8   *.B..N.....Y.+.EYU....}...6_XJ.*
                                  1DF98EEED296E19CFFB60A76BDE8F9CFAAE8B11965C2FAAD3DD783E3CD93   *.9..KO.......Y9..Y...B...PCT.L*
                                  E116469E7D9984C7E9FA67D236E6BB92666AD081EEC8C8E3C0051DD39027   *....’RDGZ..K.W.K..}A.HHT{..L..*
                                  BC9D211428E6B29EB0D8D0AB24EB9437B1CFD4BE4C9819DA2EC9435006E2   *.....W...Q}...M...M.<Q...I.&.S*
                                  3B212597FD782D81DD2051DC74E873FF494718A3DAFB99FDBC4DDAD59BA5   *...P...A.....Y.....T..R..(.N.V*
                                  5BDD8566EDE128C33ABB298853A3B56125D8FD181BD03A03E990D720CD9B   *$.E....C...H.T./.Q...}..Z.P...*
                                  AABD06E66024C2B20DB2B8A150A95CB69F29C28B6EDD3A9B7E525B825124   *...W-.B.....&Z*...B.>...=.$B..*
                                  1F9D1AB211C3A0CAACF15A468BDDCDCB78F1E9A50CA25332E98433B242DD   *.....C...1!......1ZV.S..ZD....*
                                  FC4EDDDF9E0107FE55E543B93F1429DC44EEC3B197B530DEF8BD679C5B27   *.+.......V........C.P...8...$.*
                                  8FA4826D7CEEE23C45C6E3508AF5BCFA09C9C3E2EADB66D823BCF8525ED2   *.UB_@.S..FT&.5...ICS...Q..8.;K*
                                  E7FA3FFBDEAA46D77D5ADAE6D80CBDF22CC2B2D8A2B055A0E70B91A0A8AF   *X......P’!.WQ..2.B.QS...X.J.Y.*
                                  1FA2816EA1DF865F61EEE04BEDC7992F2199E585E8ABBA9148E598660DF8   *.SA>..F,/....GR..RVEY..J.VQ..8*
                                  54553EE8A8D8D1A532F8ADB5647A97D7ACAC8B8974484DB136FDBC914C9C   *...YYQJV.8...:PP...I..(....J<.*
                                  8ABCB9728DB30FE7C8D93A5750853AB49CD127B21A851E343E81F816BAC6   *.......XHR..&E...J...E...A8..F*
                                  9C5000C04895DFDD67C619C7FF04DFB799330EAAE73A4EB2A52E8BFA9303   *.&.{.N...F.G....R...X.+.V...L.*
                                  4EC9BE7668F7500D52A89B0158D8758EE38DF8481CA7466F1681276327C0   *+I...7&..Y...Q..T.8..X.?.A...{*
                                  DED7B0E622C6BDF52618559807F231B1ADBCF285500F01CB094F08D023FE   *.P.W.F.5...Q.2....2E&....|.}..*
                                  5CEB10B4C695CCABBCB01F107AC77313ECD4215141D75DEF35D803EF0AEA   **...FN......:G...M...P)..Q....*
                                  42E852CEA2D7A6A4FC3D47AC1B54F1B665F27EDF138BC0FC3C5CABDEE85F   *.Y..SPWU......1..2=...{..*..Y,*
                                  EDE9F232F09BEEA28FCFF2AA44C488C105EE389411C48162478A5B881CFF   *.Z2.0..S..2..DHA...M.DA...$H..*
                                  452D3B969CFF6C9D4558B5B3C323BED05FEB26C94776ABF2C03BCAAA95C7   *...0..%.....C..},..I...2{...NG*
                                  49CF4EE11EC39DE2E7B29C1007A3E0972EEDE5A110FEB19B75BE55A0F6E7   *..+..C.SX....T.P..V.........6X*
                                  BAD81A9BC209D2E01309E281EE475DC28F6D50D65202FBA2421AABA1E523   *.Q..B.K...SA..)B._&0...S....V.*
                                  C7CA9030DBC077E1C3FE872BEDDC555728E6CD741BBA820EFFB0A6E7039D   *G....{..C.G......W....B...WX..*
                                  88D09181353065CAFC79298576DADDBE1B27A0E8C6DAE2D74CA2D3E85639   *H}JA.......E.......YF.SP<SLY..*
                                  13F4BD8590C68C2E789D3F2E1F9EED45E1EB87084BEE31ECBB8FAD632AC0   *.4.E.F............G..........{*
                                  49A418A2B48649F9DC7613F8CC598DB00BB798D142B674F2D8E501FDA321   *.U.S.F.9...8......QJ...2QV..T.*
                                  36E0D9E2528099E8D3F884B69BD0F0F995FC92105ED9710CDE8D04325A8E   *..RS..RYL8D..}09N.K.;R......!.*
                                  85FB0BFE24D847A4F39FACF67829CFCB015374C40E4CCC86D449A4DB2EF3   *E....Q.U3..6.......D.<.FM.U..3*
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                   Data . . . :  24E75D30E897364604EC2EFE2B81313232C4D6B2E2EB7A7864B5766604F0   *.X).YP.......A...DO.S.:......0*
                                 23EDAFC6C9F755F58D5369915F9072990476EFF41C936580114919EED649   *...FI7.5...J,..R...4.L......O.*
                                 FFB6947EDACF1477DCC8C976BBA29255FAB54AE379C79C79ECF208DB56A3   *..M=.....HI..SK...”T.G...2...T*
                                 78673FB5C2ACF2FFE8A11881A8B1EBEA38FDCEC39F5785922B411AD5BF5C   *....B.2.Y..AY......C..EK...N.**
                                 EF866EBC8CD01CD04893AE91B7A9E0D121E6C224A9D3F5499B8CB3CBD5F0   *.F>..}.}.L.J.Z.J.WB.ZL5.....NO*
                                 0B551EF8019FB1B29B9CAC864B3BD1B5445B399AC158298B833B20D49EF9   *...8.......F..J..$..A...C..M.9*
                                 6F910A5378BCEE35ADBB0651C39BE23923A11578CA88AD6866B0A146A5AC   *?J..........C.S......H......V.*
                                 25553CC6FF2E709B422122928D8ED18B9B86838F9C4A11DDC2EBC0A803FB   *...F.......K..J..FC..”..B.{Y..*
                                 FF9D957887C01C37E5FC99FDECE1EE1284D5020BFEF961BDF3FFFE1C6E83   *..N.G{..V.R.....DN...9/.3...>C*
                                 FCFD10D64A6923AF3CE6BFC7515F7BAF53EA79AE4707DDB955978FA2518C   *...O”....W.G.,#..........P.S..*
                                 5997D57A51C051A9B8B15DD1AD86710FD5E8C6ADE8CBC3D1BDA4FF37CFEF   *.PN:.{.Z..)J.F..NYF.Y.CJ.U....*
                                 A94BAAD3A700D3F927893492A134B8958C673EB4CE6427DA11992EB9600A   *Z..LX.L9.I.K...N.........R..-.*
                                 DCD0695099B22AD7B59AB80776A7F2235689EE393FF6F09DD8AF0B4E918F   *.}.&R..P.....X2..I...60.Q..+J.*
                                 536B60ADAEB524A8F6A792D973B8E8BC70F6E19C608E6F8727699FAC878B   *.,-....Y6XKR..Y..6..-.?G....G.*
                                 0CF6BA1952B3D4D50BD9EF216AE27B25EE82F7A06DCF459748E1CF6248F6   *.6....MN.R...S#..B7._..P.....6*
                                 3DD8CAD6643413CC97395CDC372FF4AB2DAD20C3C167ADCE7DF343AEEE1D   *.Q.O....P.*...4....CA...’3....*
                                 9F92DB0B73EACCF658B64183D78736F5BDA93F90A68C31D91A9CA481DFF4   *.K.....6...CPG.5.Z..W..R..UA.4*
                                 4AA7D1D15007A4DD260B58ECB32FD6E80A0402E98D9652CE885949D99E31   *”XJJ&.U.......OY...Z.O..H..R..*
                                 8EA0C7D1419E7B54DFB3014DC39A9899069866A836FBADBF65CBF100FABB   *..GJ..#....(C.QR.Q.Y......1...*
                                 7785B1A3EA879FFA6E2BCCD6FDDE87B51CDF57FA8B25A6C55535CCDD3F49   *.E.T.G..>..O..G.......WE......*
                                 4BE5E54C68B0FBB5C3DD5A6FFCDC6E7AEDD948CEABBAF8AC009BE493E7BB   *.VV<....C.!?..>:.R....8...ULX.*
                                 AA72A7B34D9233A9B9AE3DDD5E7DD9E698A31AAEFC763DC0B6F88CAC7812   *..X.(K.Z....;’RWQT.....{.8....*
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                                                  2DFEF1A0D1A9757C1BE0272788AA94C4B18CFD97F6DD03DFCBA959F9CAD2   *..1.JZ.@....H.MD...P6....Z.9.K*
                                                  1E93A3D56F1E1BF221EC169113148CFBAA3DBDE5BBC4608A59F07696BA19   *.LTN?..2...J.......V.D-..0.O..*
                                                  F193FD6A87E25D10F9CC05BF8A8D6265ACB70147B9B50C208DAF2D65D8CD   *1L..GS).9..................Q.*
                                                  79A1C2EC6B30F2F15AD92183658153FD0DB38A8E86AAD2AB390A19ADC647   *..B.,.21!R.C.A......F.K.....F.*
                                                  22B4686250B10ECEB9C3262E80FFB73998D626AD51853D0EAFEB8F47808B   *....&....C......QO...E........*
                                                  9F9D539C11FBC3E0A80F42B98229499064D6C6CC50AB3AC419D5A2FC18E3   *......C.Y...B....OF.&..D.NS..T*
                                                  43C5F0C503C216AD7CDED80B71B9D79A04F9C0DBEEE4A7665CAA31974C9D   *.EOE.B..@.Q...P..9{..UX.*..P<.*
                                                  C455E0C4E2360CDF4AB2D0A121E838B915072E938ABBF1F93916E4930E52   *D..DS...".}..Y.....L..19..UL..*
                                                  91914EF905D7BF01CBBD0F2516AD4C2853E2EBBA08E202D79CA899B6B183   *JJ+9.P........<..S...S.P.YR..C*
                                                  A974F2EA3CFF66CAA3F9AFD35DB819ADE1DDB9C7A3F5DFDD6369DFA9BC21   *Z.2.....T9.L)......GT5.....Z..*
                                                  07FE1CA9A08BC4C9B7A4975512CB52652A8E7010B0DF57DBDF8124800883   *...Z..DI.UP.............A...C*
                                                  51CF76F00B8F5586EF9093D9FCE81BEAEAB46CD6EB96F28503581B9E8D98   *...O...F..LR.Y....%O.O2E.....Q*
                                                  D7E22D9C94A0832C8F83E2B29E983CE6B8C64F881E8F71CF4AF8E04CD9CD   *PS..M.C..CS..Q.W.F|H...."8.<R.*
                                                  D5BA368AB498CED69C4387AD15C225EF7D63EA912B127DA2CB1701C35396   *N....Q.O..G..B..'..J..'S...C.O*
                                                  27A4A73EA1E001107BE5E16E22B305F017CAD5D1D49BC31D56A6BB48FFD1   *.UX.....#V.>...O..NJM.C..W...J*
                                                  B5B2DEEFF2786297BDE501B405F27CF273073ADDDFED31984D9DC58FB13E   *....2..P.V...2@2.......Q(.E...*
                                                  A2BD874762FC5FD424F76108EE8391C025D5DE009FE1FB346BB32ED0B6C6   *S.G...,M.7/..CJ{.N.......,..}.F*
                                                  88B8A2BA11F983F21466E5996FC08EF7CAF955AEB7BA8CA03896F2E33E3C   *H.S..9C2..VR?{.7.9.......O2T..*
                                                  0C8AD8AC63971DDECDAA0EB23EAAD85BACE26AD0D5D2B4C415D9B5AAC6A5   *..Q..P........Q$.S.}NK.D.R..FV*
                                                  DF1CD5DADE3907B3726AD49CC3E057FFBDC029829346EC931572EEE52CB2   *..N.......M.C....{.BL..L...V..*
                                                  B3D9887B518F58726BF7C01853E47D7038E752E1BAF261F0FCFC14ACB6B1   *.RH#....,7{..U'..X...2/O......*
                                                  576206DFE4D2E0A7D0E2F782E51C358F9F1EB79799CA0CF1A02796C98764   *....UK.X}S7BV......PR..1..OIG.*
                                                  C9D7EA2F7DCFD4264AF11E2EDFF497AE25922A7C98A35A2A21F484305092   *IP..'.M."1...4P..K.@QT!..4D.&K*
                                                  80519BA66DE242F821B06BEBC5C01283C556AD90BDBB72985D839CA36BC4   *...W_S.8..,.E{.CE......Q)C.T,D*
                                                  EBF84D741FA5031E95EFCD1CD68320A09AD31021B8C816234AA56735E79B   *.8(..V..N...OC...L...H.."V..X.*
                                                  042588AD3C533BD37C9F589AC1B6E2A3CDFECFA9141C0EE73E31DBA43B97   *..H....L@...A.ST...Z...X...U.P*
                                                  79C455DD2CE12BD868858D075700FFEF                               *.D.....Q.E......              *
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Record       Data    Record    Record  Data    Controller                 Number    Number    Poll/  Packet        Packet     LLC
Number  S/R  Length  Status    Timer   Type    Name/Number     Command    Sent      Received  Final  Type          Header     Type
------  ---  ------  --------  ------  ------  -------------   -------    ------    --------  -----  ----------    --------   -----
    19   S        0  00000000  2109.8  EBCDIC  X25LINET  /01    I           6          7      OFF    RR            100441     NSNA
                     Packet Header :  LCGN= 0    LCN=  4                             P(R)=  2
    20   R     4096  00000000  2111.5  EBCDIC  X25LINET  /03    I           7          6      OFF    DATA          100444     NSNA
                     Packet Header :  LCGN= 0    LCN=  4                  P(S)=  2  P(R)=  2
                     IPX  . . . :  Pkt Length:  4096     Pkt Type: 0x04                         Hop Count:   0
                                   Src Addr  : 00000000:000000000000:9004 (IPW2)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                     IPX Raw Hdr:  FFFF1000000400000000FFFFFFFFFFFF900400000000000000000000009004
                     IW2  . . . :  WPkt Type: 0x04 (THRU. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                     Option . . :  WOpcode: 0xFF (Pad)            WAccept: 0x01 (Yes)      WOption Len:  4051
                     Data . . . :  5741534D0496AD0D470001FF010FD3FE0F69F6A5F617CABF9423E696C133   *...(.O........L...6V6...M.WOA.*
                                   4EE60F93358889F29498951895E4812C76DC8E6C2E8A60B123D20DB7CF82   *+W.L.HI2MQN.NUA....%..-..K...B*
                                   9EE2C78D3AB9D18A7D90C8B9AC8181EC6A9B63CAFFF9D8EB6C3C078ED968   *.SG...J.'.H..AA......9Q.%...R.*
                                   52E35028C3A3A48ECD889B88AB9B29D89FD84CFE4FA6CC637BB49775CBC3   *.T&.CTU..H.H...Q.Q<.|W..#.P..C*
                                   B6BF0E92B99485D5C5F305B6D63AE9AAB5F4C78FD98C61938F7E10B19D98   *...K.MENE3..O.Z..4G.R./L.=...Q*
                                   20E16EB7FAABF0F1B7D78D7D928A2F6ACEAF0D41438F37EF7FA14CC44FB6   *..>...01.P.'K..........".<D|.*
                                   EC7145DD00C6D6DDFE7CF5EEBE2AB086E50345A539EC34FDC29EABF43F6E   *.....FO..@5....FV..V....B..4.>*
                                   B5F07DAA5ACA3B761085C47C2BA6B42FAAFFA59767D0776E51D0EBF2C4B2   *.O'.!....ED@.W....VP.}.>.}.2D.*
                                   8F8D05EE739ED9E8C232DDA599C28E91B44D93D45138A1A05D3EEEC9CECD   *......RYB..VRB.J.(LM....)..I..*
                                   83A816BAF8EC4D45FFC52EE18D88DA551FB60AAC6BF6BE022CB481154386   *CY..8.(..E...H......,6....A..F*
                                   9B3E4BBA16F2F8B8A9D73B9671C1358643CBBECCF56BD084798DD1C84DD8   *.....28.ZP.O.A.F....5,}D..JH(Q*
                                   4AEEB34903BC7EDE64AD3AD7EBF235DE27AE8C4EADFD819962C77D72F5FD   *".....=....P.2.....+..AR.G'.5.*
                                   069925BC30CDEBA81F5FD4A3CCAD88D2950FBCB83C6BA786BFFF71A71B98   *.R.....Y.,MT..HKN....,XF...X.Q*
                                   D584CF1DAAB9A4C805F1481F7BB60B3FFF9C96DBB9F4339F00E90C3641A0   *ND....UH.1..#.....O..4...Z....*
                                   BE5CF0B1C7E303BA093525B2806F8F8E1C70D8ED34BDCCA19915BFC96301   *.*O.GT.......?....Q.....R..I..*
                                   7C82F6DB309CB06F7D8367C7EA9276170D86E3A19BCA870C4DE838FB1CF4   *@B6....?'C.G.K...FT...G.(Y...4*
                                   EE6260CE7D0A41F32C9B50F5891DEAFD0B6B96F8C4C6A4BECDB895B411A0   *..-.'..3..&5I....,O8DFU...N...*
                                   11F1241873F8C1A1B4F05FB0039A1D1040EA1628CCD4D0E125DD6DB14BCC   *.1...8A..O,..... ....M}..._...*
                                   932480D041B86E8AB3A8949900D3B1854A57F2D3D4153C88BE82CB937D23   *L..}..>..YMR.L.E".2LM..H.B.L'.*
                                   91FCAA503D917A5664F6BE09DAB67945C5D3D3E61BFCA86343930D454DCC   *J..&.J:..6......ELLW..Y..L..(.*
                                   410DA8C2E7F95C8BA46AFDD76C4FAB87E2D20CBC4C5787B806C0A6C35230   *..YBX9*.U..P%|.GSK..<.G..{WC..*
                                   AEC8FA53B1AA8CF08D8B051076F97BFA48BA6D0CEFCD6C7E888DE77C16D8   *.H.....O.....9#..._..._%=H.X@.Q*
                                   83D123B617BFE3D1372D7BFD8B518CC5974060CD03C3F9B2377997D81003   *CJ....TJ..#....EP -..C9...PQ..*
                                   EA8371667989FED55BB9699025C176CC3DDE5B1C06AF8D3FF7E262CB2CC4   *.C...I.N$....A....$.....7S...D*
                                   0929D2B598FE8BCF6FB4D2AEC8B164F9F675E2A3B5C8A4F387DAF4DC3846   *..K.Q...?.K.H..96.ST.HU3G.4...*
                                   15F2817DA79360DB54BBDFB364DB7ACA99DA8B7362F944970686178AC5F3   *.2A'XL-.......:.R....9.P.F..E3*
                                   97D04AF3EC2737950308FEFA43A820EFD34D3D99745ACEA5F5D918AF800B   *P}"3...N.....Y..L(.R.!.V5R....*
                                   C8FF85D17CAA7CA6F4DDB5349EA391E2CABEC08FACD418C70BA6B40FF7F7   *H.EJ@.@W4....TJS..{..M.G.W..77*
                                   8476A2998904A3F28FB815B97EE71DBA778010FB78FA14C36AB808935879   *D.SRI.T2....=X.........C...L..*
                                   74958DFA409C28CC76BA87A7139FEA3012C7FA3FC4FE70C36E9D2EED44F3   *.N.. .....GX.....G..D..C>....3*
                                   DB5BFBC67438D1F83E8721D11A06DB83B87F1EC5A1CE2281E47F8DC07244   *.$.F..J8.G.J...C.".E...AU".{..*
                                   9B8DF67ED3B2009776C4D81F47C8EDD348F5CA8307C260BEA3DD8423088E   *..6=L..P.DQ..H.L.5.C.B-.T.D...*
                                   1853D7DF289123E051034BE6AFA3FB95372A10D8AACCF9B5775E91AFE1DE   *..P..J.....W.T.N...Q..9..;J...*
                                   AB95E206C4AA2A7ABDCAE06593D22CFDF487D509FAB38241C2ACAB83A1B0   *.NS.D..:....LK..4GN...B.B..C..*
                                   4F179898965697B60F21C59B7269E5F486891EAC948DFECCF67737C90D25   *|.QQO.P...E...V4FI..M...6..I..*
                                   02FDF90D6DE9E0F15FAF070BEFF7A0D1AFDF26B72CE6C41C29D5153E1CE5   *..9._Z.1,....7.J.....WD..N...V*
                                   A10D8FB0819D118D6F21A0FB08D7EB81980610A3B646E993E9BEF8D6F8D7   *....A...?....P.AQ..T..ZLZ.8O8P*
                                   A6EB16418D822A0890959868B4C9024E27B659498B9FEBA235A6E6979AEC   *W....B...NQ..I.+.......S.WWP..*
                                   EB5511CE1E489CA631637DF47AF8C9B563D185AC50CFCDED7AF41DA33115   *.......W..'4:8I..JE.&...:4.T..*
                                   BAEB89BA0A9F155F56B42658B3C189AC2CB586DFF9A9DAB18BD4BE73CCA3   *..I....,.....AI...F.9Z...M...T*
                                   A4C333960B9D35D47E4F89B098185DD167DC3FF9AD1781D2E2963799F461   *UC.O...M=|I.Q.)J...9..AKSO.R4/*
                                   0CFB0FA9CBC154CF33A6EF806FB5D94D09CD50E725FA779772C1783DD6BD   *...Z.A...W..?.R(..&X...P.A..O.*
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                                         240FD68A8C0B9EF04EF922D0C6A270A0D2D226F0E30F47CB0079DF8C4187   *..O....O+9.}FS..KK.OT........G*
                                         99A22D95C0DEC2C36FC4AD1EABC1B8D16ECCBDF01FC9DFEC3D8C0F0057AC   *RS.N{.BC?D...A.J>..O.I........*
                                         DF97988B59D4D4B6A3F1C6C5565BD8A8A82720B7A0FC62AA19E41E89CFC4   *.PQ..MM.T1FE.$QYY........U.I.D*
 COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A                05/09/97  11:42:52                          Page:     9
                      Data . . . :  D2A782FDAE88DD006EE5477BF5B81B876D9758638AABEF46A7EA07D621A8   *KXB..H..>V.#5..G_P......X..O.Y*
                                         7B8891C6433E02E89C5AFFF11A92A88792CF43B7657D3FE802112ADFB553   *#HJF...Y.!.1.KYGK....'.Y......*
                                         66F976C048E34A36EC9D5C3489907D5F1696EDE777DCF7830BFDBCB883F0   *.9.{.T"...*.I.',.O.X..7C....CO*
                                         F6229AAF5A280EC7FC0913F3B824F8BE8392CAB01A6D7E970AC586C42E2D   *6...!..G...3..8.CK..._=P.EFD..*
                                         E3B3C6F6B5CB6F4149F52787F7F64FE6DFF7BEB8CF8A579D1CFE0BE039BD   *T.F6..?..5.G76|W.7............*
                                         AE407DFB0C2FD5DD18C9B786637EC9EE19030DAC17C49BCC6CF4628520B6   *. '...N..I.F.=I......D..%4.E..*
                                         C9A6C08A68AABF0760E37D8734C637DB9BFD3302C89FFC1A57E02597D0C4   *IW{.....-T'G.F......H......P}D*
                                         124BA88D25672A92983ECCC9430E45D15E3B3E8183CED6F4808608A1DFF4   *..Y....KQ..I...J;..AC.O4.F...4*
                                         A1F635C90EC523346B8A46C1EBAB65723A912E95C08969BAB8FC61CC83F8   *.6.I.E..,..A.....J.N{I..../.C8*
                                         BA2DE8871C59ECD653DA419B1E4F56E2EAE6AAABCE174AE75B53659CC082   *..YG...O.....|.S.W...."X$...{B*
                                         8EA2BB8909C6220157E2865C61E31B5877984D611E802346B18BF65031D8   *.S.I.F...SF*/T...Q(/......6&.Q*
                                         0B08C1BC6C25B7E0207206F21E5ADFA6E062A9D56D9AD78ED106BABD10E6   *..A.%......2.!.W..ZN_.P.J....W*
                                         97A093247B9C40599AC4BADD9BC82B50059392DEEF8F6A689B92F9E1ADD3   *P.L.#. ..D...H.&.LK......K9..L*
                                         4F703E845262D5BCD6D1D2BB6992DA90288657D48C03B2B4470823A3678E   *|..D..N.OJK..K...F.M.......T..*
                                         4DE3AFB50BA49759F6CC9379E6E62853F8E1A134D59E93FFAE867749D981   *(T...UP.6.L.WW..8...N.L..F..RA*
                                         918A88FA1E292DD221C9A5A83DDB6BF510A4189785A15BC624AB15915C55   *J.H....K.IVY..,5.U.PE.$F...J*.*
                                         55C4E68A02FB6EEE4CAFDF408BEA06BFE2E1200677FD88E219A5B4595AE3   *.DW...>.<.. ....S.....HS.V..!T*
                                         5678B4C20EE607E020391AE3854CEBC47D4D00FE4A9FC8D54085E6FF172C   *...B.W.....TE<.D'(..".HN EW...*
                                         6BCA65A7A4D7E167CC8F65F0CFEDA4EF96E76DDABEDD3466A69B3F8DC0E9   *,..XUP.....O..U.OX_.....W...{Z*
                                         7387E19FDE3C85B75791C3D622F73F9196B6EFBDC44F96A3456230A03191   *.G....E..JCO.7.JO...D|OT.....J*
                                         0F962AC1F4D123C73283EB0EE4BD1EDE66B59B5B8BEA975FD3F8148DF88D   *.O.A4J.G.C..U......$..P,L8..8.*
                                         75140781762020F23757478F43728E9516121EDBFFBC0AF292A55DF9A6F9   *...A...2.......N.......2KV)9W9*
                                         16C12B936793DAB246FAEE5D80B73CFF3585974E9090A71476C930992C95   *.A.L.L.....).....EP+..X..I.R.N*
                                         987EE6CEB37AC5E9418588CCA61B5CAD4E9DFC84666449DE423888CD8DDA   *Q=W..:EZ.EH.W.*.+..D......H...*
                                         B89C12CF7796F2DDAFA2B85996F501DA50CCA437DBB14F73D4D73DBE3E96   *.....O2..S..O5..&.U...|.MP...O*
                                         9546D9A25E9DCCF1CA0F5C88B6DD099D69BFFF89BC4F17A9ECB5A7F38A3E   *N.RS;..1..*H.......I.|.Z..X3..*
                                         19F8F35839B02585E0EF788F79D413CBC3DFA6DBFCC3B4F01B9BFFE0FFBC   *.83....E.....M..C.W..C.O......*
                                         0CD55DEE8C2D1FB4E6C8949B7AC9569A387CDAF28D1B508DFC9D99C3CEF0   *.N).....WHM.:I...@.2..&...RC.O*
                                         A3C718C1C4AA5990FBDE3DA61DA1652BE9F92620C7B632689CA7723738BB   *TG.AD......W....Z9..G....X....*
                                         87936BC1DFB5FDC625587CBDD49A86D0ED34C88524A1A2A7EFD6F9F30ACB   *GL,A...F..@.M.F}..HE..SX.O93..*
                                         92C9BB5AE7AB4D5B2AE39C7A43B61F3974BBF54C16E55698C298475E30F5   *KI.!X.($.T.:......5<.V.QBQ.;.5*
                                         78EF6BD6AED7B5F0D41A30F503C0D6C9699F46B55813F9A9879D7386723F   *..,O.P.OM..5.{OI......9ZG..F..*
                                         FAB6C67B0CA0B8AE94BCCDC8FCEA46793BB8C188A7A9F2EAB58B0F683FA0   *..F#....M..H......AHXZ2.......*
                                         85476D8E149771E9E2C497A6D90D78F40396DC97A5C2AD839039A4F1B881   *E._..P.ZSDPWR..4.O.PVB.C..U1.A*
                                         77883C279DA54CFA4CE0C4E85D9F73A4F5E153229C9905A357C126F33EE4   *.H...V<.<.DY)..U5....R.T.A.3.U*
                                         2BCE84F803B124BA6331B2C653FCB8B3F4F9C298398BDCEA0D669895CAFD   *..D8.......F....49BQ......QN..*
                                         35C1B5EF688F78F834CEEF6783C7753399DF8EE81D9F293A96CBC59F7D9B   *.A.....8....CG..R..Y....O.E.'.*
                                         6A3010D879BA279FACC57A87D91E7DBF60E639F2AB0A58BB3493E0F8D8B7   *...Q.....E:GR.'.-W.2.....L.8Q.*
                                         25DBE05DC6E72CE2F1B3E7B2CAB08B480D8827A809E3892CB5C2D693C895   *...)FX.S1.X......H.Y.TI..BOLHN*
                                         809368AC4DDD87AC0B22728F02C29DFE371AC5D3BEFDE7A00FB54DE74824   *.L..(.G......B....EL..X...(X..*
                                         54B1497D6DCFC9DA0ACD0A311AD81E0B219C6D1261BCD1EE83FA823B4EFC   *...'_.I......Q...._./.J.C.B.+.*
                                         03FE5FEA31903CDBF4CB43A44D0C87BE71C7579FD68270BC0DD90CB12503   *..,.....4..U(.G..G..OB...R....*
                                         49F4FB087B8CEA40E5E74AC2AADD329D88A604BD2D81202A83E6C740B0A3   *.4..#.. VX"B....HW...A..CWG .T*
                                         68592F97B7707A8C39A7689D1DE4C59596921AD05235B0C54320AABA15DE   *...P..:..X...UENOK.}...E......*
                                         14F1A7527EA0194A25DC531541D298CF69AE596284EE53218993BF239DE9   *.1X.=..".....KQ.....D...IL...Z*
                                         BB64338DAFC8288F7E02C599E81D1DD5CFA9DCB499182FAF03124BF2A653   *.....H..=.ERY..N.Z..R......2W.*
                                         B185C105EDC36C4F36FBC4C676B3C1EE1D80F80E1F9D675760EB99B05CB7   *.EA..C%|..DF..A...8.....-.R.*.*
                                         09E0DCE989E966DD3A9F53B3B2739E88C4E63EB6E83699C758D4A098EFBA   *...ZIZ.........HDW..Y.RG.M.Q..*
                                         A0A2C5ACD2DFD5627BB234EC0CB075633CEAC652A6825C88B68913A798E9   *.SE.K.N.#.........F.WB*H.I.XQZ*
                                         603277AA919A55BD2B99F0F987BC97BE6EDD7EE08FDCDF84EE27A8AF6DCA   *-...J....RO9G.P.>.=....D..Y._.*
                                         C7D11C28CC8FBAD456B2CAA3D395C9CD5AF3C91C8A98712511AC38CD48C5   *GJ.....M...TLNI.!3I..Q.......E*
                                         2D8A4EB0D36C05885916F690F2B66AAEA6337FA17F306EA544D898CAE837   *..+.L%.H..6.2...W.".".>V.QQ.Y.*
                                         EDD3B010AECC177C1699D3F109A975D4C6F6E46A158DF10756CB18E7E8D0   *.L.....@.RL1.Z.MF6U...1....XY}*
                                         219884CDA46CDDE5E78AA5C43FCC8FB88F24F2BDC2EA88C7B3E80DF44813   *.QD.U%.VX.VD......2.B.HG.Y.4..*
                                         E9A813A34BA145E723F449FD8DA5A5B148A11A42EFC320AB8B95DE96C3C8   *ZY.T...X.4...VV......C...N.OCH*
                                         7C2914CF6D46E18F48C82CF34E0A32887FD56A8094682A8F42DF5AEF55D7   *@..._....H.3+..H"N..M.....!..P*
                                         31ECA34CB9D5027F0F96E41F0BDAB25892F2D5496A90C74AB48BF9B9AFB8   *..T<.N.".OU.....K2N...G"..9...*
                                         0DD7F594DD743BD6FA19D8BDB7222CC224D80380E2108AF9AC162190E150   *.P5M...O..Q....B.Q..S..9.....&*
                                         97B87233D1D1A83CF2FC399F67AB10A490D1A441AEF6D47209F58B2B7983   *P...JJY.2......U.JU..6M..5...C*
                                         D392E1B7503565F2E1D7E9C9267E93FE404C11AF427280B36B8B65D98CEF   *LK..&..2.PZI.=L. <......,..R..*
                                         EAB3DB5B3C86431C659FFD6FC1B7B439F79949E55BC27107FD8AC3D6C7BF   *...$.F.....?A...7R.V$B....COG.*
                                         49E9FE8DA184D0E716BC5585A6E6FB9086AD4BF9DB610EB1C15E4A8E15A7   *.Z...D}X...EWW..F..9./..A;"..X*
                                         73AFA4B7E6E725B721DD1A4E16E9FCF7C2DEEE5992F23AF296FC0CD218AD   *..U.WX.....+.Z.7B...K2.2O..K..*
 COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A                05/09/97  11:42:52                          Page:    10
                      Data . . . :  B5A6F0F0E32FA9D34E7BCDC5A23C1D9E18F94AF996BA5D96A5AFB0D7B199   *.WOOT.ZL+#.ES....9"9O.)OV..P.R*
                                         15CCB9A055AECD9575BB0F8DFCFA32FB56A9134B6FB1BDBB229F491059F5   *.......N.........Z..?........5*
                                         D094C2D0D6CAA3C591FE73F3D8955B90360670CAE0ED08F4EA1047B2D322   *}MB}O.TEJ..3QN$........4....L.*
                                         F0C39B1649FAD476F392CDCC2D8517E9A8E4ED58DC9A6548F0EF97D3C1D8   *OC....M.3K...E.ZYU......O.PLAQ*
                                         CF9ECBA6C290A2AFA5D137AF4ACBF9D795A258A0D5ADFCAC91CDE398644A   *...WB.S.VJ..".9PNS..N...J.TQ."*
                                         99E05DD0F9AF42FE84D753E601C521BA19A941246CF3BE8544E11FB061E7   *R.)}9...DP.W.E...Z..%3.E..../X*
                                         7523BFBB7E4751DF7C7702E46996EFD0349A11AD6F3CE2E2067263954035   *....=...@..U.O.}....?.SS...N .*
                                         84AA79B9AA9D8C9F57FB315990E4EF7DC7A72B093EFA6C1B30CF6D6CC298   *D...........U.'GX....%..._%BQ*
                                         FF9EF3B61CB1FF95EA39C2C4763C73AE7B06CA8EFB1145852B125ACEC217   *..3....N..BD....#......E..!.B.*
                                         04A87571A9B67964A7DBBF6D89F4B0AE15FB756234D782C4E6CA4D469497   *.Y..Z...X.._I4.......PBDW.(.MP*
                                         550650CF11BBCF95417D3FFE85FFA78F53AF7EBF26C2B689B99CC6F8E3D1   *..&....N.'..E.X...=..B.I..F8TJ*
                                         CEB4E3AB0BCEF2BBF5A2123BF9DB1FAB90FC38EB54FCE2592AF04C561BA3   *..T...2.5S..9.........S..O<..T*
                                         A981DECD8D69C4FF1B2C4AD0F9311F98085569CB1FAE7A8CF833C6FB0F54   *ZA....D..."}9..Q......:.8.F...*
                                         78AB73130E8FE85413DDE7F535A793DC65DC6AC0D7E49AD44FF0E903CAD1   *......Y...X5.XL....{PU.M|OZ..J*
                                         F83E5780C52D74912B5CB9B5D4C025A2931A67E7AAB394F7F4305FC0942C   *8...E..J.*..M{.SL..X..M74.,{M.*
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                                27BFDF1738CF6DBFF2AE551343D363ED20C5653C4DF95A487A964CC17C89   *......_.2....L...E..(9!.:0<A@I*
                                3300FCF385E6C3DBF1891DCE613FBBD29F77D8E37571F0B38BB83B99EC85   *...3EWC.1I../..K..QT..0....R.E*
                                95F73648268CBB3597D6BB94B0B51F1CF48DA634139AA5140DCBC7B0CDA3   *N7......PO.M....4.W...V...G..T*
                                28CB41CB386C17E540C23DFE90A861CB1EFAD9DEE724BE991DA847EA131B   *.....%.V B...Y/...R.X..R.Y....*
                                DA8C89FD46B75346C0BC4A4548B00ADA8C989277A0B7EBF7A2E4CF0B04D4   *..I.....{.”......QK....7SU...M*
                                DCA8F8E2D99EF6BD539CD5BC5DC50FB034BC67D63D6892D99CB721BFBB47   *.Y8SR.6...N.)E.....O..KR......*
                                25A03C307BCF932D6DC78BB993A644C83FEDB6F56186A82D358B3037A58A   *....#.L._G..LW.H...5/FY.....V.*
                                957908DB3D434D930DE4AFF520E896C3864D95A64FD57DC34956D983E524   *N.....(L.U.5.YOCF(NW|N′C..RCV.*
                                BAB8CE72FDF9DF9ED5C835321D9C6D749CD602FE00DE721FC59684309CC0   *.....9..NH...._..0......EOD..{*
                                939EF89BAA0E8FB9A21E21C26867BED4734EA9DE31A6378D97D6D9EB9A89   *L.8.....S..B...M.+Z..W..POR..I*
                                2FEEA4E5818BD7F28F8E75D204D92F4DAEB09549E8992778EBEE73DADBF8   *..UVA.P2...K.R.(..N.YR.......8*
                                25DA2BFD16BC54DFA6B09CB895447BCFC345EA9D237037819C7B7BC86F0A   *........W...N.#.C......A.##H?.*
                                B8F2291CD6E924A1CFE3FB949E00FFEF                               *.2..OZ...T.M....              *
    23   S       0  00000000  2111.5  EBCDIC  X25LINET  /01   I         7        0     OFF    RR          100461    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  3
    24   S      53  00000000  2111.5  EBCDIC  X25LINET  /01   I         0        0     OFF    DATA        100464    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                  P(S)=  2  P(R)=  3
                    IPX  . . . :  Pkt Length:    53     Pkt Type: 0x04                     Hop Count:   0
                                  Src Addr  : 00000000:000000000000:9004 (IPW2)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                    IPX Raw Hdr:  FFFF0035000400000000FFFFFFFFFFFF90040000000000000000000009004
                    IW2  . . . :  WPkt Type: 0x05 (THRU. RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   1
                    Option . . :  WOpcode: 0x03 (NLSP Raw)        WAccept: 0x01 (Yes)     WOption Len:    8
                                  Request Size: 0x00001000        Delta Time: 0x0019F871 usec
                    Data . . . :  5741534D0576AD0117000103010008000010000019F871                *...(.................8.       *
    27   R       0  00000000  2111.6  EBCDIC  X25LINET  /03   I         0        1     OFF    RR          100461    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  3
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A             05/09/97  11:42:52                      Page:      11
Record        Data    Record    Record  Data    Controller                Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length  Status    Timer   Type    Name/Number     Command   Sent     Received  Final  Type        Header    Type
------  ---  ------  --------  ------  ------  -------------   -------   ------   --------  -----  ----------  --------  -----
    29   R    4096  00000000  2113.4  EBCDIC  X25LINET  /03   I         1        1     OFF    DATA        100466    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                  P(S)=  3  P(R)=  3
                    IPX  . . . :  Pkt Length:  4096     Pkt Type: 0x04                     Hop Count:   0
                                  Src Addr  : 00000000:000000000000:9004 (IPW2)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                    IPX Raw Hdr:  FFFF1000000400000000FFFFFFFFFFFF90040000000000000000000009004
                    IW2  . . . :  WPkt Type: 0x04 (THRU. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                    Option . . :  WOpcode: 0xFF (Pad)             WAccept: 0x01 (Yes)     WOption Len:  4051
                    Data . . . :  5741534D0496AD0D470001FF010FD3E010A4CDE4B401A8E5D931E6965B68   *...(.O........L..U.U..YVR.WO$.*
                                  EFCB467008FD65857B941ED036F2F7D533ECCE83E4EA356732D80A7BBF98   *.......E#M.}.27N...CU....Q.#.Q*
                                  42A769BFFD2C98867B11A2F9C2E7A8EAF746B390430A4AA158CA45CC47CA   *.X....QF#.S9BXY.7.....”.......*
                                  C5FD51B44AFF13E834F3F230C1A15F4C07F778B2569504AB09E579284EF5   *E...”..Y.32.A.,<.7...N...V..+5*
                                  458E95A9945601C99AB2A2CB461116E50C239DFFF68DE693DE7A54F3316C   *..NZM..I..S....V....6.WL.:.3.%*
                                  A4B1D3FFB9D53A25E5DC8E4AC181CE3608893D89CDA7223820B793129A98   *U.L..N..V..”AA...I.I.X....L..Q*
                                  AA9A9FE88D8B07A4A2EFD9C530E4018CC962CCF975874A93058B3AD0F7D8   *...Y...US.RE.U..I..9.G”L...}7Q*
                                  3FBF967B48B078163D9BFC594FD44BA18BB15B1991D3EBD98FA118A7FCD9   *..0#........|M....$.JL.R...X.R*
                                  BCE405801E73F2CF4E5695A016BA88B43088D5DE67B45FEA733B0CB32A09   *.U....2.+.N...H..HN...,.......*
                                  158CBA9D99AFC0EFFEA3CC66D8C07442EC90D5F6ABCF359ED7C94F9F898A   *....R.{..T..Q{....N6....PI|.I.*
                                  7342A1951B9F0BC866D7A8D7D8BD62D679DBA4DA4359FEFBC9A2A5F2D57F   *...N...H.PYPQ..O..U.....ISV2N”*
                                  C89EB8A006EB123B53F9F53EB7D3E8E096DDF1048BFA61B383A450DDE2B9   *H........95..LY.O.1.../.CU&.S.*
                                  1774B6B2EFB7AA980355AE82EE607BF0006E65AC5023FDC16B0F6DDBC220   *.......Q...B.-#0.>..&..A,._.B.*
                                  50A5D7D4E8FCDB2068962D0D8AE7D42C0D9A98806492157488BE95D7A6DF   *&VPMY....O...XM...Q..K..H.NPW.*
                                  81350B9BC1D7D1D3402A3B9994F3D8821538AFBF3CABE2A838E485AF232E   *A...APJL ..RM3QB......SY.UE...*
                                  0CAEA46FA9AD9F19D3A858C4B3DBDA1A1ECBE91856B43D1EB198AA52EAD6   *..U?Z...LY.D......Z......Q...O*
                                  29CEF4D2D26305F2634965D4680236F869942CDB7F541E846BEE28C9E0C8   *..4KK..2...M...8.M..”..D,..I.H*
                                  04C46BE62887D3B0D8DAFF7A93BAC8B939CFF8ACFDCF2580B7A725D8A1A5   *.D,W.GL.Q..:L.H...8......X.Q.V*
                                  B187C3AA486832F7B101F585F7FADFDB778B3085536CE2A811ADD1A0AACA   *.GC....7..5E7......E.%SY..J...*
                                  8CACD7FFBD98D729F3D6035EEAF74CC26BD0707DA58949468DA9B71966B3   *..P..QP.3O.;.7<B,}.′VI...Z....*
                                  E4CE97F2B777C6EB18E4A8AF4C4A2EB99A6BECC923B227C685859CE8072A   *U.P2..F..UY.<”...,.I...FEE.Y..*
                                  97AE7D9684B7250D9CE1A0DAB48776D3278A20EAEDF71FB474C280AA6D8D   *P.′OD........G.L.....7...B.._.*
                                  353DDFA27143E7BA214603DE7BCE6D922DC839FBB46129FF574BD9BC3516   *...S..X.....#._K.H.../....R...*
                                  87C15A599A92B0F0A39E86A8939AA59C35EEB2AAE593F21AD2FBBF1CE0C0   *GA!..K.OT.FYL.V.....VL2.K....{*
                                  0137408FD2AD3CD06B87E9C3A83CE6DA368465B12E72D0E0741091E3EC12   *.. .K..},GZCY.W..D....}...JT..*
                                  B79FC12149C07091909E64E7A5F2A452E1823DAE3C9F7A27F28CD4D2ABE8   *..A..{.J...XV2U..B....:.2.MK.Y*
                                  5320C9A98DE349A2452497E96588BC88F4665BE56C269C9F5B4171A025B3   *..IZ.T.S..PZ.H.H4.$V%...$.....*
                                  748B28D6D1A62F7AB8F7221B45E02CCDC59D79B37FA0F7A79FE31E0A49C9   *...OJW.:.7......E...”.7X.T...I*
                                  35B31DE4829C1FBAD82C6EC64D4998FC1AFFDED094C921D8210083DEA907   *...UB...Q.>F(.Q....}MI.Q..C.Z.*
                                  50AB1F8765A2F24FA9D24C33D388DECD83DB8699A9E1D296D8C8ADB2BC83   *&..G.S2|ZK<.LH..C.FRZ.KOQH...C*
                                  B1BB938991F372CD0607EEC6F3036BFC65CBD8FF2A535DB3C7818CEF0A6A   *..LIJ3.....F3.,...Q...).GA....*
                                  8A94D904A2B3BF7407DE5AD3C39D051942B9BD8C98CB59AE6DECCADE68FA   *.MR.S.....!LC.......Q..._.....*
                                  CFF74CEB751F39D6554FF4FAF48A1BCC977355EB153A63BEACB229BBE503   *.7<....O.|4.4...P...........V.*
                                  8CB84C3CB49525ABF4DC3C6CAC8303012BBA41F140BF4600498CBD1ABBD3   *..<..N..4..%.C.....1 ........L*
                                  26332DF0EA3BA8A1F30E2ADC273A77936FCB8D909CE19BAB9FD14A8965A9   *...O..Y.3......L?........J”I.Z*
                                  4EF14E865BDA573C22952D4C2CD0E42938B34E86ADE86C23D393A468DC8E   *+1+F$....N.<.}U...+F.Y%.LLU...*
                                  E08F3FB8DCBA62A350D6C090432B05A9BD9F42E022FD1E99182F8982D919   *.......T&O{....Z.......R..IBR.*
                                  E6FB338E27F5BA23498F630BA9AF92CDCBCF05247BDA9E716CD828D996E1   *W....5......Z.K.....#...%Q.RO.*
                                  E575B99F94388DBC0D02D5FA354E67C1AECC87BAF61669F239A764A71D12   *V...M.....N..+.A..G.6..2.X.X..*
                                  7AE5A85D4D9085E007C53735B2ABA69E46C7E15DB59CCF7C99F9FD713DEE   *:VY)(.E..E....W..G.)...@R9....*
                                  15DC04DD2004BAE116C0C19CC9325BDD0944C88B8317D8CB92AD778ABAC8   *.........{A.I.$...H.C.Q.K....H*
                                  0CECA3D2FCF77117C4A1CFC3C7CF3E90D09495B1FDEFD8A541F849C96CB4   *..TK.7..D..CG...}MN...QV.8.I%.*
                                  4750CEB60A60DAE35CE595E7E50DD1EEEE8B48EEFA9E8587BDA857B4772D   *.&...-.T*VNXV.J.......EG.Y....*
                                  61FC4497D7FB4D25A585E2F489F724930B823235F1AE73A3FFAA1413D48C   */..PP.(.VES4I7.L.B..1..T....M.*
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                                 221A8992FC6040F7135524963B2D378715C2F0A5B15FDAA00C363381BAA0    *..IK.- 7...0...G.BOV.,.....A..*
                                 5D83767C36D7D500A8E11E844C9A800D0CCCD8DE13B1DC1A77E94DD5DBF5    *)C.@.PN.Y..D<.....Q......Z(N.5*
                                 139487D87CA8C5E02C8C8D8CBFEFF78D238953980CF08AF9844203DA0A52    *.MGQ@YE.......7..I.Q.0.9D.....*
                                 F0DBCB7A668BD12F47D27726088C62432C872845B6E4F8F50D94A09DEDBC    *0..:..J..K.......G...U85.M....*
                                 E07ED7B6A7B622BCA6CFDEEB995895A087170B84FA2584C2B5415189D390    *.=P.X...W...R.N.G..D..DB...IL.*
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A              05/09/97  11:42:52                         Page:     12
                   Data . . . :  B6A0C1E36C993A19E9B57B5E97B67F6897E6ABEF1CA1DF8D95DBC8843AC9    *..AT%R..Z.#;P.".PW......N.HD.I*
                                 616C919B1F0AE29303CAFFDE0476C1F710EAC7F7A62D8ABEF83E0C9BB1E7    */%J...SL......A7..G7W...8....X*
                                 C8BCE84B54B6A9D8B1C8D1AA28BCFA8F19E5C9133DF40E7FA7E3DF2A1FD0    *H.Y...ZQ.HJ......VI..4."XT...}*
                                 46CE1AD88577CAA27BDDD5F2211E4ADC4C087783C02DA0BDF3A6F4C7563E    *...QE..S#.N2..".<..C{...3W4G..*
                                 9AEF2856B4C154BE17A28C3B2BA480D76D86BF897C88DB7102FED88080B7    *.....A...S...U.P_F.I@H....Q...*
                                 DCD63783741330B997F7BDA809F87DA6992CBC92484018C56832B0BBD826    *.O.C....P7.Y.8'WR..K. .E....Q.*
                                 11EBAB8670CA079BF1B98F52D7F088006EF0D4B1219BB9690EA9A06602E1    *...F....1...POH.>OM......Z....*
                                 89644F8318F238DAC67DC69D6BC2618DA6BF06BE476B92C2E79FD7F4AF40    *I.|C.2..F'F.,B/.W....,KBX.P4. *
                                 399DA1DBB0ED5E50AACB0242A68166086BD1B2EB2CB96E0143E51534D1D3    *......;&....WA..,J....>..V..JL*
                                 3EFAD7CBC6A59BDEA2CBA291E76AE0F019E2F6B383FFA19F03FF1BBF6197    *..P.FV..S.SJX..0.S6.C......./P*
                                 2DA00C6D858FEA88DBEEBF2BAEC8CD26F794B98920A0D9E029C00BF640D1    *..._E..H.....H..7M.I..R..{.6 J*
                                 544641F3D0C0C58E204292E7F2C824F4322A748981A2ED9DEFBC23E628EE    *...3}{E...KX2H.4...IAS.....W..*
                                 D78958DB4FA8A665FCC471D9E58E98AE26C9D189EEDBB6CFC6BF0340DCEE    *PI..|YW..D.RV.Q..IJI....F.. ..*
                                 978D7D9FCA83ECA89B4CEAEBD6ED21EB6A8A7E9FAACEF286F8C3C4B5FCBE    *P.'..C.Y.<..O.....=...2F8CD...*
                                 17E4243559852ADB14C095425A8737857ECE1D588DE8A0FAB3A0AB7517D8    *.U...E...{N.!G.E=....Y.......Q*
                                 948B6A804D4B3DD286D39A91AE8F72DB4BD017CE4B067C9F9720B4FAE45B    *M...(..KFL.J.....}....@.P...U$*
                                 47A6251301CC02FBDFD7E6561DD31FF8A8D7FE49E2F7A50337F2768EE6C5    *.W.......PW..L.8YP..S7V..2..WE*
                                 A01A679225C58FEDCD7A3FCD153812AC148EEFF9B4452CAA29CBC89E020E    *...K.E...:.........9......H...*
                                 C09916B04CA0909C1AF5F8C1519E5C2B01B50B9FE18E2DC9A4E01176E99A    *{R..<....58A..*........IU...Z.*
                                 962DEDF9A171E5D63CF16DBB0E98FEBB5EABA4C456FC17AAC0AEB6D00E86    *O..9..VO.1_..Q..;.UD....{..}.F*
                                 4FE9941740F982E28EFFE8589CEF11ED0681E09F8AC20A5FA4B70D6B83D2    *|ZM. 9BS..Y......A...B.,U..,CK*
                                 0DC359859473CDD53EDC3F91EE197AA6CAE370D21A239DB218842FE78E85    *.C.EM..N...J..:W.T.K.....D.X.E*
                                 02BDBEBD13B56F8BB8AE3E3A18F7585707C8BA0B6FAE450B5EB6EDA1B5AB    *......?......7...H..?...;.....*
                                 13CFE7A1B69E71DC5C5FA9B48CC14684E53746E49018D4B04E7B88F09078    *..X.....*,Z..A.DV..U..M.+#HO..*
                                 269CC0822EA2A2EA69F5CBE6EA9DA58AB9DF36C88B85A8902BFD913B9BC9    *..{B.SS..5.W..V....H.EY...J..I*
                                 E0BF2CC2274940A13A6C56829ED4CD89A521BBB849C297F286A607E5FE91    *....B.. ..%.B.M.IV....BP2FW.V.J*
                                 F6AC212372B39E69A8E52AF0B9E622773AE0C1F6E0DE375F68855916D39B    *6.......YV.O.W....A6...,.E..L.*
                                 E9BB0B8DF71F26DB1E409B9F23F081F082F6C7A617FE2EF130D333BC7A34    *Z...7.... ...0A0B6GW...1.L..:.*
                                 FBFB2CAB69B1A9FB548EB3A2EDB38DBECD9EE9E0D48CA7CFCFDD3C672EA8    *......Z....S......Z.M.X......Y*
                                 9A6E7CB2CBE55FE8401BAEC8D9B3A2CCA0B7B3CB7CB1BAE77892B59CE81F    *.>@..V,Y ..HR.S.....@..X.K..Y.*
                                 CDCB801C36C7BC859BA9E7E990B8974416D2F75F08EE80726DB2D8CC70B7    *.....G.E.ZXZ..P..K7,...._.Q...*
                                 5628CCF990C71D9000C0EDA17A5178E57AF01BEA29F251E7E41BF2B0E723    *...9.G...{..:..V:0...2.XU.2.X.*
                                 CF96E045C6DE05178DA04D9BDCC733DABD9D5E14788B922300A7381C97D4    *.O..F.....(..G....;...K..X..PM*
                                 DD53468E8685D9A1BDB2AAAD1D09DCCD72A34FA14000EAF0FC555BC64844    *....FER..........T|. ..O..$F..*
                                 F8B2A85B7CCB0E8587A660CA389C7C77DFAFA221BDBD555961AE5F5064F3    *8.Y$@..EGW-...@...S...../.,&.3*
                                 972EACCA799B25F5B901FDC5320714D76F1731BE5C00778A22E645F93C02    *P......5...E...P?...*....W.9..*
                                 DDD2E07B018FABEAD1DFC58908A1A7DEFF94218A44A5FCC257F53B32E481    *.K.#....J.EI..X..M....V.B.5..UA*
                                 8A9485B11CEA35E154986BF8E30C608241F249B789D96FBB22648DCEF7C4    *.ME......Q,8T.-B.2..IR?.....7D*
                                 F7ECA49E49AB94440092FCB4028C8E3AB3CDB005DDDF5159ABD5D65C18EC    *7.U...M..K..............NO*..*
                                 389956F7DB5643E0FCC7D6F3A426009DBB46F8F23094AFD371E962DB918D    *.R.7.....GO3U.....82.M.L.Z..J.*
                                 62B0D98D8D9ADC7EB18201E5E6CA9CA1B9F13DE09B95655BDAB17191D797    *..R....=.B.VW....1...N.$...JPP*
                                 1E1545B806B286BFB2D9CEF6F9C5B588236CC1CDB938BBBB3BE682D99AC0    *......F..R.69E.H.%A......WBR.{*
                                 D7BEEAD2DEAABA4EBFAD88352BC95AF30FF20BC510E2B71996E2F13B23CB    *P..K...+..H..I!3.2.E.S..OS1...*
                                 61EB3C899B1876A563318F934AF81E9EE7C51F823EC7BBE7AB08CB8DCEBE    */..I...V...L"8..XE.B.G.X......*
                                 41802CE62483B9873B895D760ED6F1D7979F8168C1E904A8B7B0E0FDE683    *...W.C.G.I)..O1PP.A.AZ.Y....WC*
                                 3D61C4B2DDCE2D800B481AE4AAE4A38F88FE9FEB04C258857397F4E7FD58    *./D........U.UT.H....B.E.P4X..*
                                 9FA9C5A5B7EF02E875A7EBD3EBEBA63F6EEF8EC7A086D45440DDE77AE888    *.ZEV...Y.X.L..W.>..G.FM. .X:YH*
                                 36872AB3E41C44C4FC10A180A81F119D8FD715CE71F4849B6C7000EC2D5F    *.G..U..D....Y....P...4D.%....,*
                                 B896E7A22CC148441BEF6FABC08C754510E709657B99E5E4BEC40CC4E2A2    *.OXS.A....?.{....X..#RVU.D.DSS*
                                 5235FDC356C84DF6789B6CE8244DDFA774E28BEAC56991C6962702ABDB5A    *...C.H(6..%Y.(.X.S..E.JFO....!*
                                 2ACDFCD38C91A4F5FCE511BE18EFD78F26B0F782CFC9AD3ECE8CF6ADD497    *...L.JU5.V....P...7B.I....6.MP*
                                 0E819AB95EF2F188A00B4CC345F0A8A4BB09C1F37DB265C14B81C7C43592    *.A..;21H..<C.OYU..A3'..A.AGD.K*
                                 F69943B91EAD2EAF2FD3EF8F7D94B5C440A9679207CEA4607589B90B51D3    *6R.......L..'M.D Z.K..U-.I...L*
                                 96397BAB9826C4921965E0C16FA0108775DDA8CB2B8613966FB19BFEF584    *O.#.Q.DK...A?..G..Y..F.O?...5D*
                                 46A8BF9270B9274D9EC3591F0A90052DB9C3FD168E9CD42929ACDA9330C1    *.Y.K...(.C.......C....M....L.A*
                                 F58CF9DFFA92EBBBC3F52FBE1640F8A703BB48E5FCC9A2B71A20A594558E    *5.9..K..C5... 8X...V.IS...VM..*
                                 8EFD0258B7A50ED827F1913D1AF642F1DDA515627B9EF4CDEAD9FB0F2EF1    *.....V.Q.1J..6.1.V..#.4..R...1*
                                 A204D0C3EA6FA0D446D5DDF6830D0C95CE0D458AC979DAB15F1E66DBC515    *S.}C.?.M.N.6C..N....I...,...E.*
                                 84E807FDD5E4AA21F6DD9C12C3B19431E0F856C435886BF2F4E71BB725CC    *DY..NU..6...C.M..8.D.H,24X....*
                                 9554ADDFEA92CAA14B7EA0E3668D1BE1BA5C4091FEE188F488F29ACAEFD9    *N....K...=.T.....* J..H4H2...R*
                                 E3C8CA2E2CD19DB1B1C7FD46FBC53F6F51C7A59403C798B75CFB2E5F64A1    *TH...J...G...E.?.GVM.GQ.*..,..*
                                 791F1296E72991A25A3BFED218F3F8E4398A8BFDB720BC81C698C7955873    *...OX.JS!..K.38U.......AFQGN..*
                                 62E1FF7388C9FA59A3D31343EE95D12A86D73F1042ED44CB75BF89E806F6    *....HI..TL...NJ.FP........IY.6*
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A              05/09/97  11:42:52                         Page:     13
                   Data . . . :  E04428FD9B1CB8D27AF61C86B4143A989C30EEB650A789E92770E29C647D    *.......K:6.F...Q....&XIZ..S..'*
                                 05894C237BE5ADA6A9EB99170D8FB8CF53AE339BDDBE3E2385E18E5257C6    *.I<.#V.WZ.R.............E....F*
                                 C04172F809094F9942A0C2E5486F2AF67AA400EDA57A6C8B08C259EC0FA8    *{..8..|R..BV.?.6:U..V:%..B...Y*
                                 5FF7F76E0D955A96ABEE5A0128D7026359DDC8D657AC705B8384884DE890    *,77>.N!O..!..P....HO...$CDH(Y.*
                                 B2FE53D757455DA28B4B1FE6F13398E572B69CCE33317482F42070E97DDC    *...P..)S...W1.QV.......B4..Z'.*
                                 3BC6061D40BB6ABA52DBEEBD9F96E38288B28EFC1DC94A2F81A5752566AD    *.F.. ........OTBH....I".AV....*
                                 EAA06886C9650D90097D9EDF1659F3B46BD2F292E66A69D5545ED8961F24    *...FI....'....3.,K2KW..N.;QO..*
                                 54D68A53CC9383E41FB7F5FAE3F62AAB70EB5DC453D9049DDEBE18C922CD    *.O...LCU..5.T6....).D.R.....I..*
                                 3D38AFEE54D26E82C3AE01FCD506B985ACDD5E97F98AE3800D8B09F9233D    *.....K>BC...N..E..;P9.T.....9..*
                                 8DF89E73C4EAC2C86199F1D0B1D2BC636DCE23F5329AB70F5AE8512D11A9    *.8..D.BH/R1}.K.._..5....!Y...Z*
                                 662E40F366C2A3DF74D82DF01CE4F8F8FCD0F09DF9BC46F6B7E8B1A40E3B    *.. 3.BT..Q.0.U88.}0.9..6.Y.U..*
                                 03A244961BC4DB19D88C7E18E1AA93A3D7C2E9CFBF84466893AA7BCEBEA6    *.S.O.D..Q.=...LTPBZ..D..L.#..W*
                                 427364D4A5FF83DE2A5E87AFA46305D161375AC579611BA3D698E7DDD0B9    *...MV.C..;G.U..J/.!E./.TOQX.}.*
```

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                         BAB251D41C9A3CD5BB8FF4371AEA4DD5CC9C0FBC42CD10E11A8F2ADB25C6   *...M...N..4...(N............F*
                         99A39290C22C1CBBDE2C84F73CEE78C14C871887399BCED72436BE8A8662   *RTK.B.....D7...A<G.G...P....F.*
                         4CFC9FB2A1D888E99A84A0EC87E108D7188B61DC15C5B82E31BEE0F861A3   *<....QHZ.D..G..P../..E.....8/T*
                         D30A2FF441E7B092D25119ADCA8B9ECC948B36AC3FEF29996EC519B74E3B   *L..4.X.KK.......M......R>E..+.*
                         02F1045E53D5CD16C48B920B86A132D2018F799256F67695B1E35E15E1B5   *.1.;.N..D.K.F..K...K.6.N.T;...*
                         EEDB66D48662DBC2C484DFF3EFB05FFD24AA17F21B4DD8DE941C16CDC05A   *...MF..BDD.3..,....2.(Q.M...{!*
                         848F76F9A5CC000939965DE5D2EE9B8B1EA5CAD8F5A86A11DDCBBB1A8DE8   *D..9V....O)VK....V.Q5Y.......Y*
                         CC877ACBD2D1FEFDD8E33DAA2F3BFF830C39A4979C8134A3E6CAB085053C   *.G:.KJ..QT.....C..UP.A.TW..E..*
                         E29AE05DA9802551B092163B8BF19F6D9B99D5570C854623BCBFD450008B   *S..)Z....K...1._.RN..E....M&..*
                         D09265AA3B6C9AA35749C7B7ACFB99BDBA580594E91194D18157ED82B3F4   *}K...%.T..G...R....MZ.MJA..B.4*
                         11F45CCB21F81C60DD8F1BCC6E00FFEF                               *.4*..8.-....>...              *
   31   S        0 00000000  2113.4  EBCDIC  X25LINET  /01   I         1         2     OFF    RR         100481    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                            P(R)=  4
   32   R     4096 00000000  2115.1  EBCDIC  X25LINET  /03   I         2         1     OFF    DATA       100468    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                  P(S)=  4  P(R)=  3
                   IPX  . . . :  Pkt Length:  4096     Pkt Type: 0x04                    Hop Count:   0
                                 Src Addr  : 00000000:000000000000:9004 (IPW2)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                   IPX Raw Hdr:  FFFF100000040000000FFFFFFFFFFFF9004000000000000000000009004
                   IW2  . . . :  WPkt Type: 0x04 (THRU. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                   Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)      WOption Len:  4051
                   Data . . . :  5741534D0496AD0D470001FF010FD3EDDD2541D1B94868DB410F6A8C5B68   *...(.O........L....J........$.*
                                 9CC53121C29C9FACB3B7036C1BC1AEBE7CB75C223C81CBEF31F3C4BC8AF9   *.E..B......%.A..@.*..A...3D..9*
                                 36850EEA59D9F5B0F4DC079B99AA55857E024393C6C12EDDB4FECE95C4F8   *.E...R5.4...R..E=..LFA.....ND8*
                                 1AB67CBFC8B8134112F8156328C4215657E8ABCE5AE778EE0DB4550E35BC   *..@.H....8...D...Y..!X........*
                                 181612D1515838B3772FE5D5E9BF70E517BFC8FA3058F9FC21C3C28CBB76   *...J......VNZ..V..H...9..CB...*
                                 E1E779F5F6F8036034A5A175228B116023A1BEE12AFAB0DF5CF2189199AA   *.X.568.-.V.....-........*2.JR.*
                                 FF4FFCDFDC811985A00322CC2DF1B8DC58CFC2CAB03A93F7D5F0DBFEB838   *.|...A.E.....1....B...L7NO....*
                                 FBF0A56963FBAA5E03EE02980AEC4C329AFE8E95A9C3040CD0BEE58FB7D1   *.0V....;...Q..<....NZC..}.V..J*
                                 3E994BE4C276409AE1D916E17382CBE69051108CBA67B3A1EE60F4A91F86   *.R.UB. ..R...B.W.........-4Z.F*
                                 3BD4A5E23CD6A83E36BF8CB954AFDB9C0CFAE232079842EA40D1215DD9E5   *.MVS.OY...........S..Q.. J.)RV*
                                 98BCD38E953669E62770A1A753D014EF8226DFC9C675528440C1FDB7800C   *Q.L.N..W...X.}..B..IF..D A....*
                                 E1B7CDE5E6AEB0BD51D55D6A71E7F78E27AD96196CD95F5A7D832E340ACE   *...VW....N)..X7...O.%R,!'C....*
                                 5ABFCFA7E718E1B512B1E6DE5DCFEAE0FD7DB4A24827D3AF2EE0E2AEAE6F   *!..XX.....W.)....'.S..L...S..?*
                                 49BE0C7B38A56DFB03D77AD6CFC1AD1E8FCCB1A1A0A1EA785EA884B65FA0   *...#.V_..P:O.A..........;YD.,.*
                                 E16D69AFD65B04A1F1BDCD85E430CCC83FE5C1DB05489DB7E2ABC2827AAB   *._..O$..1..EU..H.VA.....S.BB:.*
                                 E0C3AA420DDED6C7D7E6DA668D8C832964F712AC4EEAEEB39CDD523F44C2   *.C....OGPW....C..7..+........B*
                                 B7FAE1BCB82DA7DFBD8FBD9628340EA971D027EF19075AD4322059A6EA1F   *......X....O...Z.}....!M...W..*
                                 E6D4D48AA7CDDB471BF719A733B5308403842B3DE5B2ECC92ED78C46C8BA   *WMM.X....7.X...D.D..V..I.P..H.*
                                 7B6307FAA2C037D2F9DB6F91B5C0A0B379931DF2A9B0F9E2A227E683E9E1   *#...S{.K9.?J.{...L.2Z.9SS.WCZ.*
                                 49EFC5C348A09826F4E525AF8B8D284436CE967DA1FA123EFDC3E5D44FA5   *..EC..Q.4V........O'.....CVM|V*
                                 D5F3048145E0AC92A17E83A87915ABA57DE3F7EC01C203E768CC02912A0E   *N3.A...K.=CY...V'T7..B.X...J..*
                                 00DFFD6C75F6DBE836DF6AAFD8D53F00809B3A40E18D79C366B50BA61B8F   *...%.6.Y....QN..... ...C...W..*
                                 C6937AB5FC7855D24071CB84EF3245F3CD9432BDBCDBABB9FA18DFD27737   *FL:....K ..D...3.M.........K..*
                                 DD90F4FA1FC351539390463C14F3128F0CC76DD981FCE30A719DC3026DED   *..4..C..L....3...G_RA.T...C._.*
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                   Data . . . :  D493069F00E8E7F4BAE73F9AA456A09B3371B2CE6DACB982670F91BC2F3B   *ML...YX4.X..U......._..B..J...*
                                 7AC0EA271CCCAE0237B413D1DD81376089DAA304A684869E6FA20BCD63B4   *:{.........J.A.-I.T.WDF.?S....*
                                 D971B3AFB7FB88D7E2F7D9F5FE364A849EB273CED5E00BBB685C44C081D4   *R.....HPS7R5.."D....N....*.{AM*
                                 7C8BA57BA29D58104F8097033EBA561D67EBA4B4C48A5828BAA1DA124CF3   *@.V#S...|.P.......U.D.......<3*
                                 E78E98E7431A42E67159AC9BB6A167F31EC10FE8153C7CCA3667EEB9E1A1   *X.QX...W.......3.A.Y..@.......*
                                 FA8C51836EBB8BF2BBE0ED332FF4BBC607D3C6731889AE9948A5D18C97E0   *...C>..2.....4.F.LF..I.R.VJ.P.*
                                 65628EA029CBBB97FEB424D2E4F572B5AE7B8AD230FE368E81F70AF681FA   *.......P...KU5...#.K....A7.6A.*
                                 9ECF6D198283A610338B71C7CCDAF4699AE4416DC4838DD3F0D455750AB6   *.._.BCW....G..4..U._DC.LOM....*
                                 77506FD34205009356AF5CA0130C97C29FDF9C8E11DE98B72D1607F10183   *.&?L...L..*...PB......Q....1.C*
                                 859A620C619B1B03778A80C9308D18B55BD12AB1BCC9FB18ED8421D735C9   *E.../......I....$J...I...D.P.I*
                                 B81C59D64D7E86F9ADFD558DD35784AE16E3DBE0C99828D324DD6499433C   *...O(=F9....L.D..T..IQ.L...R..*
                                 898D3B94FCC2B274D5D214AFD0CC22EC7188D1576CE7C2B9A1A1296FE7A7   *I..M.B..NK..}....HJ.%XB....?XX*
                                 71F95BABAA1B40ACE35ECD83653D69EBA2FBE49947AE99B1180D6EA21A0B   *.9$... .T;.C....S.UR..R...>S..*
                                 98DBEF7B4DC7886D0ACDAF11DEA0BE6F52B67EC2F1BC30B9D2A2F7EA85C2   *Q..#(GH_.......?..=B1...KS7.EB*
                                 46155A87242B5CD79AEA55FB8EE109E15896E6FF1B499FD87EE892F3D738   *..!G..*P.........OW....Q=YK3P.*
                                 49B6B0BDB18D760D2CC15B0C43C08265E2B0EF3B2CAA16207592AD3891AA   *.........A$..{B.S........K..J.*
                                 5D02D3C064C20796FEBC40ADF95B33CDD2CA81C9ED44B9F83B3541F725BD   *).L{.B.O.. .9$..K.AI...8...7..*
                                 B9CECB3B7380AC6517B6210B01B359CC12CC650DBCFE691A7AA649C214B4   *.......................:W.B..*
                                 650457D4004848DE89DBB5ACB7BA38D2230B1FFAAF8C019B11163CFECB0C   *...M....I......K.............*
                                 ADC4ADB48BE828768EB87FDBB6D231E85CCA8E5BD4C82F23318EAFCCA5B7   *.D...Y...."..K.Y*..$MH......V.*
                                 A4ADD39C9055D7C7F3E68FDDA61CD8C4B01A9885A2560BE4BF30B8C417F5   *U.L...PG3W..W.QD..QES..U...D.5*
                                 5C80EDCF99FCD887F0EBC51F40DA871BAEDC2AAC98F5A9A015D34D40B4F4   **...R.QGO.E.  .G.....Q5Z..L( .4*
                                 D355CDDEA6834E85F6E81694FF411182090F84A0D9E5CFC17ECB8AEB6534   *L...WC+E6Y.M...B..D.RV.A=.....*
                                 45C14B16C0A8C2FA6598C55373C2E9F1618CE67B41EFA630AC87C5E720D1   *.A..{YB..QE..BZ1/.W#..W..GEX.J*
                                 C92B84EE4852B6CE2EA4F2D84F759FC8B388AC82D23B26B8297EE4AC4A09   *I.D......U2Q|..H.H.BK....=U.".*
                                 32B0A209FDDE3E1BA4BF891DFAC30F6A54A90E14D9DB7B0945EA9E0196AB   *..S.....U.I..C...Z..R.#.....O.*
                                 7A9731FD5C69EBBE2E4541CFC50FF3929A8517DE97F433CA21B271EA4A80   *:P..*.......E.3K.E..P4......".*
                                 64C1339D68A3A379F1C19B1126AB833918B419AEA18218286880050693C9   *.A...TT.1A....C......B......LI*
                                 F2DE8FE7F1E5DEBA2AC8CACEE4A543851E3BD483EA1F94FFBF7135F1A1D1   *2..X1V...H..UV.E..MC..M....1.J*
                                 C0B6D2103099251D16D398DDE7D910D539E01F0085935B8EB8DFF71D9DD8   *{.K..R...LQ.XR.N....EL$...7..Q*
                                 B9A14B830CB217B68047399FC44CCB908DF560D7E8BBC5F07FF141DFB85D   *...C........D<...5-PY.EO"1...)*
                                 C2C113DE4EFF6835EA92AC18A7E086C72CB07E8CDEC4529D598BD8A2C2BB   *BA..+....K..X.FG..=..D....QSB.*
                                 A5B649FC62D2DEBC026E46C3961619B28527A1C3ED16988266B9A7A626C5   *V....K...>.CO...E..C..QB..XW.E*
                                 D4BB863685E865B5F2ED8C9A11A9D74BEFF5BA8F06AB0450F4A85F1AE4FB   *M.F.EY..2....ZP..5.....&4Y,.U.*
                                 DEC518DE5E2BD8F890E3F6F066AAF8E462FB169E52D67FD0807D0EA3928D   *.E..;.Q8.T60..8U.....O"}.'.TK.*
                                 14EA6C6FF2F529F11B9494A15DA9EE2CE1D3C4BEF099D3EB2FA7F5A990F1   *..%?25.1.MM.)Z...LD.ORL..X5Z.1*
                                 4F83169B279520C3AFB775C535C6B2CD883545A961AE6FCC03504AED8C92   *|C...N.C...E.F..H..Z/.?..&"..K*
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                                                EAA801BA7E897AFC5FE94F077DC3751736BC473E7BE9575DCFE6D038B8F0   *.Y..=I:.,Z|.'C......#Z.).W}..0*
                                                3C2E6BFF0BEE05E8380D14B7E313289CFF056AAABCC2ADCE91436EA2E254   *..,....Y....T........B..J.>SS.*
                                                B6B927CC46E3D466A28D9E8A8AA399B2AABFA10AD0E5CD3FFA8623ABF58F   *.....TM.S....TR.....}V...F..5.*
                                                EEA6A1FCFDDDDAFEF094F9E4C4EA32BBEBEDF5FE53D036B08B0BADF8ABE5   *.W......OM9UD.....5..}.....8.V*
                                                68DD628E64F172B8C9A2C20FF7F2A6749C8E322A3AFF728EC5B9FBAA89B9   *.....1..ISB.72W.........E...I.*
                                                7967C4D18BD3FEB30B342DA48ED2319C89E35FA0AEC244B15450C7968393   *..DJ.L.....U.K..IT,..B...&GOCL*
                                                C6985AF95EFCA9D877F2C2EE39DBA65CB387105C6FC324C0B0A1E6C6E8B6   *FQ!9;.ZQ.2B...W*.G.*?C.{..WFY.*
                                                0CFC638E8E24F6961CDB99C09566CE9090C12A8F79F68D9029EC93B06AF0   *......6O..R{N....A...6....L..0*
                                                D7BCEA0DBEAA2C95D8D521EF31A6DEE749F422BF369537EF738B49B38F93   *P......NQN...W.X.4...N.......L*
                                                ABB8BBEEED48BB9C42678ACB9BE52CE7E31423ED3F7CC5E318E333F6EC9D   *............V.XT....@ET.T.6..*
                                                C0A86926E78F795E13E90F7AFCF753ADEE96C0631EB0AB93E5D07AFA01B9   *{Y..X..;.Z.:.7...O{....LV}:...*
                                                B3C296C8AC651AAE21F4E4B754FE0DACF365849F8E15D2A93ADFD5D83D6F   *.BOH.....4U.....3.D...KZ..NQ.?*
                                                C0A974152A8419CF51BA7A1299A45B5A75E9900BA0EFEBAD2CD9B69EC3E4   *{Z...D....:.RU$!.Z.......R..CU*
                                                7183E0D8895C4CA20AF0A5FC3D33C0961103A1B7058C00CD2AB1E0AE0452   *.C.QI*<S.OV...{O..............*
                                                5C9DBB6F46FC86AD91EDED8C1D868A3DF5DDE9E4D5A6AECDC69E47D7A9FE   **..?..F.J....F..5.ZUNW..F..PZ.*
                                                9FE96EB496B75C92E055A5C6170EF993D8630AE34E715BB2F481F4D28015   *.Z>.O.*K..VF..9LQ..T+.$.4A4K..*
                                                F6D722357286E33DB7B0E8FE9190A13C55C9803AA28189C909FCEDB050D8   *6P...FT...Y.J....I..SAII....&Q*
                                                D2D5EBF9DAA68381EA629DC2F0740EB853A71FFC0142C4B6C6D31EB74EB4   *KN.9.WCA...BO....X....D.FL..+.*
                                                529020D184DA9B7B0995AAFC008C86B0C5DEBF9D97F60396C1E59ED7169F   *...JD..#.N....F.E...P6.OAV.P..*
                                                3B5B21F1DC2533AC0EB353F91F6665FC7BF0AAACF5AA67B486A8E8F4BB73   *.$.1.......9....#0..5...FYY4..*
                                                F0BEB90F17E78E10D49FF345119C3BB12292EA7F51E14CEA3280A3EC2E89   *0....X..M.3......K."..<...T..I*
                                                E701FE9D34116EC5649D64D099757B8AF0493CA5584968C73B9FA79B6EF3   *X.....>E...}R.#.0..V...G..X.>3*
                                                22911C8CE8E9671DC6F0D429E1F909EE4DFAFC80F7D77758DDC6B83AF96   *.J..YZ..FOM..9..(...7P....,C.0*
                                                92C738FE557AC39DEF1AA9BCBF9E41C82F1E378D69138FED8359D1CA7E22   *KG...:C...Z....H........C.J.=.*
                                                2A9EF55B43FE3ADD3DCA9352318DF976DFF4EB734B8DDEBE8D9AB063C0B2   *..5$......L...9..4..........{.*
                                                6521988D80DDA98758CAD4D66C69B8E7911D03E80826BBEF273600F74AB4   *..Q...ZG..MO%..XJ..Y.......7".*
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                           Data . . . :  AAC99B83BD80E654B491C3378AA7738FCA93E56CAABB4158C2BF2A889A81   *.I.C..W..JC..X...LV%....B..H.A*
                                                6E988483DF4480B70A73248F0D9E5FC718B859A7EF412ECCA08925BF8C45   *>QDC..........,G...X.....I....*
                                                18920C8CE8F5F71E41B2E3BB90852F46B2E2CA946EE1D73615F820108981   *.K..Y57...T..E...S.M>.P..8..IA*
                                                1E11A4DD186836ED6222A1C5CFF1C9D70B28959D95BC80D18AC854EE666E   *..U........E.1IP..N.N..J.H...>*
                                                4686D22FF2D149FE05D0C4659C8DEB4FD9D3C7785ACCAEC956E724961692   *.FK.2J...}D....|RLG.!..I.X.O.K*
                                                F9F4E9D83E3862DCE818D889B77E37EDBF9384BC6E390EE86426C8872E8B   *94ZQ....Y.QI.=...LD.>..Y..HG..*
                                                AB80D3CCE4D130CED0DB5A24FCFB328CE6B3C0D0E2B7D201A1BC694F50A5   *..L.UJ..}.!.....W.{}S.K....|&V*
                                                D66DD4A0C4CE5CD8C84C7AC6154CC7A064026B85DB1112F13DF9669BC113   *O_M.D.*QH<:F.<G...,E...1.9..A.*
                                                47A0D8EA3580F89014BEBB5333FC539B19D4EC07BBD3EFF333AE4805FAFA   *..Q...8..........M...L.3......*
                                                80B97A99117913CA241CE888E62B07BF131EC9804A80219B223855E3A0A4   *..:R......YHW.....I.".......T.U*
                                                05C770B904B9831BE8CE9D7B7FC51738D3F79409BC980B94A1A04B2404A5   *.G....C.Y..#"E..L7M..Q.M.....V*
                                                29D4D4DD53FF03B58B8F7BDD79315BBF97BEF6837A6AC0D9F6A6B0D039DC   *.MM.......#...$.P.6C:.{R6W.}..*
                                                9C86C2F092E840465DD3CBFACBF4BE920F8B679452BD3ADAFFE2FFFC6894   *.FBOKY .)L...4.K...M.....S...M*
                                                148447CEF89D45A41D872C8E95ADE284CB1991B1FBC2B487AC12B7B200F1   *.D..8..U.G..N.SD..J..B.G.....1*
                                                F8DC0E2C15A6708792A5D4D79DB897D97AF9473744B27DD138E2330F1586   *8....W.GKVMP..PR:9....'J.S...F*
                                                239FB98CCB6F7D8004BFC3B7C9DCDFA5C412AEEBAACCF89A7726A9848B70   *.....?'...C.I..VD.....8...ZD..*
                                                7ADE859D92962C4E61B6CE0F4E924F27A68AB44E56C383373FDBA06D6181   *:.E.KO.+/...+K|.W..+.CC...._/A*
                                                6D6BEEB6C918A5CC715664A4DF2819B6C1D5E0EFC0C2DDD839B624B4E564   *_,..I.V....U....AN..{B.Q....V.*
                                                64C0223E0588161CD0E3BDE17DC71F4A5BD74B027FFD914E46CEAA57B991   *.{...H..}T..'G."$P..".J+.....J*
                                                659CB0A6123164F468F16A95C1E383EC3FFA45DC4841308BB0274DD9E477   *...W...4.1.NATC...........(RU.*
                                                E1A67AC48AC5FD956A8B5CC7B4F83B41E7FA642403C478C163D3E0AF5BC4   *.W:D.E.N..*G.8..X....D.A.L..$D*
                                                18EC0AC030E91BCB184E31A8B5DB23BB462D5EFC4CD660988EBA09C257F3   *...{.Z...+.Y......;.<O-Q...B.3*
                                                1F9C1ADBE8A75BAC6AF394B8FDA8FD66FB94743F6BDBEFD5F2DEC773ADF8   *....YX$..3M..Y...M..,..N2.G..8*
                                                7BD51F89E565ADB3768796AABFE4E79C4D514698131AD68E47259BE0F62C   *#N.IV....GO..UX.(..Q..O.....6.*
                                                17C1C90D64F68E83A186643D7E9F016021934E68168093C7E9E629D3F2C4   *.AI..6.C.F..=..-.L+...LGZW.L2D*
                                                1A2AEC91F8508AC56FDEE5B392F1A8F437A8B3F224FD08DA60946BFAB06C   *...J8&.E?.V.K1Y4.Y.2....-M,..%*
                                                CFD4B80A9EFEC1782DCFB95506907D67769913BE17DF252685800458389D   *.M....A.......'..R......E.....*
                                                3C0632CFBB0D44816455E9E244765DFCB747B9E4C6444E94AED23AE16C2A   *.......A..ZS..)....UF.+M.K..%.*
                                                19844042EF96EA9CBF84D90D02C5E54272CE6DAFDF8335C35BBEACCEAAC3   *.D ..O...DR..EV..._..C.C$....C*
                                                345CB3A2B24FE5E89B96D6BECC32E9D022C0DC99A41646E3B29C78E33EFF   *.*.S.|VY.OO...Z}.{.RU..T...T..*
                                                12BCDC6B4DAB08ED1AD7069DB0F35AFC1ADA5D8BC8B3846779B9A59503A5   *...,(....P...3!...).H.D...VN.V*
                                                DA572EA191E214F091E1EBF98786B1B09C4E74E5E2FC42991FC6F8F54012   *....JS.OJ..9GF...+.VS..R.F85 .*
                                                52C1734349F646D0D8A339933A98F1188FFC83A2BBA6312482E454280CD1   *.A...6.}QT.L.Q1...CS.W..BU...J*
                                                11A0F1DC5D99738505BE0DBC008BB6C7D4BA28DF09FE978929DDE89BA7F0   *..1.)R.E.......GM.....PI..Y.XO*
                                                B3AEABC79C8FBE2C5C8E5295BFCFE57799E20F4871D95D66AA82FF9264D8   *...G....*..N..V.RS...R)..B.K.Q*
                                                E4266DEA972D5AEB22E809C0B01F7AEAE2E56BD6444C479DEC3738FF1D8E   *U._.P.!..Y.{..:.SV,0.<........*
                                                88ED790592A45D2E0CE17A6A22ABCE51D5F65ECF12CA6D251CC39FB918AB   *H...KU)...:.....N6;..._..C....*
                                                313AFFAD189328A8657FE19FAEE32792C36759DAB64F56F7130748824386   *.....L.Y."...T.KC....|.7...B.F*
                                                B39F409496C8DB5589B7CCFC65F2CEA929DDC43F49FF17435ED0485329BC   *.. MOH..I....2.Z..D.....;}....*
                                                4C1394A699BA21B68B21FBE864435E8E834785CCCCB5DC93B7E7908EC3EA   *<.MWR......Y..;.C.E....L.X..C.*
                                                B5E0665A4DDFB2E854DAB35589B3B5058CB17F8681AB57DA3294B66081D1   *...!(..Y....I....."FA....M.-AJ*
                                                7A016EA0F4483485B0A07B8EF82FD0C80B4A05DD28F4DEABE48C42A9B499   *:.>.4..E..#.8.}H."...4..U..Z.R*
                                                398FB7C43BE9B44734BAAF1ECBBF0F012EF216D501B8FAB0D3D26F4B8688   *...D.Z...........2.N....LK?.FH*
                                                C7B65AEF9514DEA48D75B5C32B127AC0CA6BB1A964945A8A47F799FAD0A4   *G.!.N..U...C..:{.,.Z.M!..7R.}U*
                                                BC97EFB34AF9E40D34EB1F5118D5057741D9D8B9AAA385B7A39FDB823584   *.P.."9U......N...RQ..TE.T..B.D*
                                                41B792F67B16148AE6F979C204BE2EC5622186AD8749A88CF50D9AAC5041   *..K6#...W9.B...E..F.G.Y.5...&.*
                                                C3C90DC197A62107A1C27C303DE743588CF66AC5F2DBEA1142E41374DAB9   *CI.APW...B@..X...6.E2.....U...*
                                                5D09328B0710B2FCD95D6DA28520CCD22C8470E8AB40DDC32FE482FD4376   *).......R)_SE..K.D.Y. .C.UB...*
                                                EBD834C034EF3704D1851DB00A00FFEF                               *.Q.{....JE......              *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                                Page:      16
Record         Data    Record     Record  Data    Controller                  Number    Number    Poll/  Packet      Packet    LLC
Number  S/R  Length    Status     Timer   Type    Name/Number       Command   Sent      Received  Final  Type        Header    Type
------  ---  ------    --------   ------  ------  -------------     -------   ------    --------  -----  ----------  --------  -----
    35   S        0    00000000   2115.1  EBCDIC  X25LINET  /01     I            2          3     OFF    RR          1004A1    NSNA
                       Packet Header :  LCGN= 0   LCN=  4                                P(R)=  5
    36   S       53    00000000   2115.1  EBCDIC  X25LINET  /01     I            3          3     OFF    DATA        1004A6    NSNA
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                 Packet Header :  LCGN= 0   LCN=  4                  P(S)=  3  P(R)=  5
                 IPX  . . . :  Pkt Length:    53     Pkt Type: 0x04                     Hop Count:   0
                               Src Addr  : 00000000:000000000000:9004 (IPW2)
                               Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                 IPX Raw Hdr:  FFFF0035000400000000FFFFFFFFFFFF90040000000000000000000009004
                 IW2  . . . :  WPkt Type: 0x05 (THRU. RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   1
                 Option . . :  WOpcode: 0x03 (NLSP Raw)         WAccept: 0x01 (Yes)     WOption Len:     8
                               Request Size: 0x00001000         Delta Time: 0x0019ECB9 usec
                 Data . . . :  5741534D0576AD0117000103010008000010000019ECB9                *...(..................      *
    37   R     296 00000000  2115.2  EBCDIC  X25LINET  /03   I          3         2     OFF    DATA        10046A    NSNA
                 Packet Header :  LCGN= 0   LCN=  4                  P(S)=  5  P(R)=  3
                 IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                               Src Addr  : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
                               Dest Addr : 76AD0117:000000000001:9086 (PING)
                 IPX Raw Hdr:  FFFF0128000076AD011700000000001908696AD0D470000000000014000
                 PING . . . :  Type:   0 (Request)      Ping ID: 0x0002     Result: 0x00
                 PING Header:  50696E67010000020000
                 Data . . . :  7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *# .;.{...;.{..# .;.{..# .;.{..*
                               7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                               00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                               2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                               BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *.;.{..# .;.{..# .;.{..# .;.{..*
                               7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                               00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                               2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                               BD5E2EC000427B40BD5E2EC000427B40                               *.;.{..# .;.{..#              *
    41   R       0 00000000  2115.2  EBCDIC  X25LINET  /03   I          4         4     OFF    RR          100481    NSNA
                 Packet Header :  LCGN= 0   LCN=  4                            P(R)=  4
    43   S       0 00000000  2115.2  EBCDIC  X25LINET  /01   I          4         5     OFF    RR          1004C1    NSNA
                 Packet Header :  LCGN= 0   LCN=  4                            P(R)=  6
    44   S     296 00000000  2115.2  EBCDIC  X25LINET  /01   I          5         5     OFF    DATA        1004C8    NSNA
                 Packet Header :  LCGN= 0   LCN=  4                  P(S)=  4  P(R)=  6
                 IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                               Src Addr  : 76AD0117:000000000001:9086 (PING)
                               Dest Addr : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
                 IPX Raw Hdr:  FFFF0128000096AD0D4700000000001400076AD01170000000000019086
                 PING . . . :  Type:   1 (Response)     Ping ID: 0x0002     Result: 0x01
                 PING Header:  50696E67010100020100
                 Data . . . :  7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *# .;.{...;.{..# .;.{..# .;.{..*
                               7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                               00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                               2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A              05/09/97  11:42:52                        Page:     17
                 Data . . . :  BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *.;.{..# .;.{..# .;.{..# .;.{..*
                               7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                               00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                               2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                               BD5E2EC000427B40BD5E2EC000427B40                               *.;.{..# .;.{..#              *
    45   R     576 00000000  2115.5  EBCDIC  X25LINET  /03   I          5         4     OFF    DATA        10048C    NSNA
                 Packet Header :  LCGN= 0   LCN=  4                  P(S)=  6  P(R)=  4
                 IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                     Hop Count:   0
                               Src Addr  : 00000000:000000000000:9004 (IPW2)
                               Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                 IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF90040000000000000000000009004
                 IW2  . . . :  WPkt Type: 0x06 (DELAY REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
                 Option . . :  WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)     WOption Len:   531
                 Data . . . :  5741534D0696AD0D470001FF010213EA0A9329DC43E0CAEC5B5EC0E2AA08   *...(.O...........L......$;{S..*
                               7B89133780CCA0FACFDCB294FED05420E5C33C053E997C8D96C033C19485   *#I.........M.}..VC...R@.O{.AME*
                               EA3E22D5956EDEC5A21E5F96785458B5E9AA96FFBEBB28C2F1C2458E09A4   *...NN>.ES.,O....Z.O....B1B...U*
                               019AEE8682A1C110468A13B6A2943B8C81D185B52FA13A8C218AC61D3AD4   *...FB.A.....SM..AJE.......F..M*
                               A91204A7DE31B0EC906FEAFEA3E4FCBA0EDF00A652D86F88FFB4B9CBB223   *Z..X.....?..TU.....W.Q?H......*
                               F49C56D0A7879CD422C92B49BDB8F67E7ABEE9DA75EB05993FBC906FA5AE   *4..}XG.M.I....6=:.Z....R...?V.*
                               921A5BFA00A5E7C08C60ECC02F88B7F0B908F483FB46A5E5DB3E559CD9B4   *K.$..VX{.-.{.H.O..4C..VV....R.*
                               5998CF8F83E2D72FD69D85FEF4C82595F89B993371E7008F86D5CF1CE690   *.Q..CSP.O.E.4H.N8.R..X..FN..W.*
                               72ADB5D8EA902A8F9F24A999201CEA8B4A9531CD890B69E04C83EBBF692C   *...Q......ZR....”N..I...<C....*
                               5991DEE93DC1A2EE9DAFDFE8BD95292A81C1A5C7A9EAD78B92ED0C96B2D5   *.J.Z.AS....Y.N..AAVGZ.P.K..O.N*
                               79F9B4BAF905EBB2F3E734AAD062B6D700F257FF269C08BFCE541782F314   *.9..9...3X..}..P.2.........B3.*
                               63A4BFB2C0A570AFC18922FCC3D800AC8C94408A1F992C4544A977C1EDF5   *.U..{V..AI..CQ...M ..R...Z.A.5*
                               5D0587AE165FEBBEF39698EA243719EF9DC267DE467318E32E9EAA89B31F   *).G..,..3OQ......B.....T...I..*
                               6DCED473BCDDFAA5BAF296C83189318565922CF042C451C808D523E9EAA8   *_.M....V.2OH.I.E.K.O.D.H.N.Z.Y*
                               D26EF98F73F407859A4126D22B6A51A05157A4BC512237F29DA978CCE181   *K>9..4.E...K......U....2.Z...A*
                               B9E90C01C59348A40C860A5B6091F54061FC55EB24ECC109E9F572196E95   *.Z..EL.U.F.$-J5 /.....A.Z5..>N*
                               E402A7AC6A6ED3FF923714D85E8522A576EA29A2077E9E9A0A0A2E8922A1   *U.X..>L.K..Q;E.V...S.=.....I..*
                               05C079959AEE4D142F866893E4BBC5A2ADAC3B6C2BF13AD364CD0CC5F781   *.{.N..(..F.LU.ES...%.1.L...E7A*
                               99444EAE61BD                                                   *R.+./.                        *
    49   R       0 00000000  2115.5  EBCDIC  X25LINET  /03   I          6         6     OFF    RR          1004A1    NSNA
                 Packet Header :  LCGN= 0   LCN=  4                            P(R)=  5
    51   S       0 00000000  2115.5  EBCDIC  X25LINET  /01   I          6         7     OFF    RR          1004E1    NSNA
                 Packet Header :  LCGN= 0   LCN=  4                            P(R)=  7
    52   S     576 00000000  2115.5  EBCDIC  X25LINET  /01   I          7         7     OFF    DATA        1004EA    NSNA
                 Packet Header :  LCGN= 0   LCN=  4                  P(S)=  5  P(R)=  7
                 IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                     Hop Count:   0
                               Src Addr  : 00000000:000000000000:9004 (IPW2)
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                    Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
      IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
      IW2  . . . :  WPkt Type: 0x07 (DELAY RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   1
      Option . . :  WOpcode: 0xFF (Pad)             WAccept: 0x01 (Yes)      WOption Len:   531
      Data . . . :  5741534D0776AD01170001FF0102139493242DC82C5290D5E0D29C9B236D  *...(..........ML..H...N.K..._*
                    78B2E830DBA9DFD5A1A6429429DD0D65069A63DE4C92979EC5A038E2B4F6  *..Y..Z.N.W.M........<KP.E..S.6*
                    ABE99A9075FBFCB1F2A77DB1D25AD1E948AA8CA1B544FC83C44F56CD34DA  *.Z......2X'.K!JZ.......CD|....*
                    B0C901C211926C51318546B312E496A71ADEB51135C17D20CEFDF517A0E5  *.I.B.K%..E...UOX.....A'...5..V*
                    E28BA2FC3DAE97B591BCE2F307F68F8FCCA2F1C3DDC5F994F0C2E6CA8BD6  *S.S...P.J.S3.6...S1C.E9MOBW..O*
                    6FA2AB794DA7A901ABC8ACD78CCB7B8F429CFA9E6D89B756A0E3986903AB  *?S..(XZ..H.P..#....._I...TQ...*
                    16B8B2E0B805DFD189E6BCB48BAC1EBDD1422DF54FF9B7D593DB34DE1CA0  *.......JIW......J..5|9.NL.....*
                    78A96B9835D6D61679815DD021B60B68E2A7132ACEDB5F9014DEEC8191F9  *.Z,Q.OO..A)}....SX....,....AJ9*
                    2EC8EEEE8A0111A64C7D71E7BFDB03E4C418D3863A39FCD8B5143DD8441F  *.H.....W<'.X...UD.LF...Q...Q..*
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A              05/09/97  11:42:52                           Page:      18
      Data . . . :  F2E08DB7CBF81DE39AF24A12B9DD13ABF5B67ED338C05D5F23B211558090  *2....8.T.2".....5.=L.{),......*
                    04A1D6A01D3279DCDCF80FAF221212E5D0B592E940FA1EA8E53F36E29948  *..O......8.....V}.KZ ..YV..SR.*
                    DBBD7E9617C1B021339253FE9EC8718220941669B0CB74EDC5E9A688DEB4  *..=O.A...K...H.B.M......EZWH..*
                    641EAA9919876DDB0A53A282F92108B1E7D766EBEEC4CA88BA22CAF44241  *...R.G_...SB9...XP...D.H...4..*
                    E7A9F521FA9C89FB43A6CF3C00EF6C798FBAA11617A5B19FBBB06E02FA86  *XZ5...I..W....%......V....>..F*
                    85C595B86EFE33FEF324DE8CF9ED97EC5D9CD0F5E294ECEE9F9012ADAC08  *EEN.>...3...9.P.).}5SM........*
                    23F94A8AE98CE646DDE2369F70F01DE617BAED6B2AB916F247917C724181  *.9".Z.W..S...O.W...,...2.J@..A*
                    315407CD83D9D58B52985DDB9149219F588626ECCF7A85A9752B3ACB6943  *....CRN..Q).J....F...:EZ......*
                    C1EBDF9C3CA58AA020B016E9C9B04EE5718BB9B826CDE90E75FFB48CF0A6  *A....V.....ZI.+V......Z.....OW*
                    9163B8AE61BD                                                  *J.../.                        *
    54   R      296 00000000  2115.7  EBCDIC  X25LINET  /03   I          7         7     OFF    DATA        1004AE    NSNA
      Packet Header :  LCGN= 0    LCN=  4                     P(S)=  7  P(R)=  5
      IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                    Src Addr  : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
                    Dest Addr : 76AD0117:000000000001:9086 (PING)
      IPX Raw Hdr:  FFFF0128000076AD0117000000000001908696AD0D470000000000014000
      PING . . . :  Type:   0 (Request)      Ping ID: 0x0003     Result: 0x00
      PING Header:  50696E67010000030000
      Data . . . :  7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042  *# .;.{...;.{..# .;.{..# .;.{..*
                    7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0  *# .;.{..# .;.{..# .;.{..# .;.{*
                    00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E  *..# .;.{..# .;.{..# .;.{..# .;*
                    2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40  *.{..# .;.{..# .;.{..# .;.{..# *
                    BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042  *.;.{..# .;.{..# .;.{..# .;.{..*
                    7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0  *# .;.{..# .;.{..# .;.{..# .;.{*
                    00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E  *..# .;.{..# .;.{..# .;.{..# .;*
                    2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40  *.{..# .;.{..# .;.{..# .;.{..# *
                    BD5E2EC000427B40BD5E2EC000427B40                              *.;.{..# .;.{..#               *
    56   S        0 00000000  2115.7  EBCDIC  X25LINET  /01   I          0         0     OFF    RR          100401    NSNA
      Packet Header :  LCGN= 0    LCN=  4                               P(R)=  0
    57   S      296 00000000  2115.8  EBCDIC  X25LINET  /01   I          1         0     OFF    DATA        10040C    NSNA
      Packet Header :  LCGN= 0    LCN=  4                     P(S)=  6  P(R)=  0
      IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                    Src Addr  : 76AD0117:000000000001:9086 (PING)
                    Dest Addr : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
      IPX Raw Hdr:  FFFF0128000096AD0D47000000000001400076AD0117000000000001908 6
      PING . . . :  Type:   1 (Response)     Ping ID: 0x0003     Result: 0x01
      PING Header:  50696E67010100030100
      Data . . . :  7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042  *# .;.{...;.{..# .;.{..# .;.{..*
                    7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0  *# .;.{..# .;.{..# .;.{..# .;.{*
                    00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E  *..# .;.{..# .;.{..# .;.{..# .;*
                    2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40  *.{..# .;.{..# .;.{..# .;.{..# *
                    BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042  *.;.{..# .;.{..# .;.{..# .;.{..*
                    7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0  *# .;.{..# .;.{..# .;.{..# .;.{*
                    00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E  *..# .;.{..# .;.{..# .;.{..# .;*
                    2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40  *.{..# .;.{..# .;.{..# .;.{..# *
                    BD5E2EC000427B40BD5E2EC000427B40                              *.;.{..# .;.{..#               *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A              05/09/97  11:42:52                           Page:      19
Record       Data    Record    Record  Data    Controller               Number   Number    Poll/  Packet      Packet    LLC
Number  S/R  Length  Status    Timer   Type    Name/Number    Command   Sent     Received  Final  Type        Header    Type
------  ---  ------  --------  ------  ------  -------------  -------   ------   --------  -----  ----------  --------  -----
    60   R        0 00000000  2115.8  EBCDIC  X25LINET  /03   I          0         1     OFF    RR          1004C1    NSNA
      Packet Header :  LCGN= 0    LCN=  4                               P(R)=  6
    62   R      576 00000000  2116.0  EBCDIC  X25LINET  /03   I          1         1     OFF    DATA        1004C0    NSNA
      Packet Header :  LCGN= 0    LCN=  4                     P(S)=  0  P(R)=  6
      IPX  . . . :  Pkt Length:   576     Pkt Type: 0x04                     Hop Count:   0
                    Src Addr  : 00000000:000000000000:9004 (IPW2)
                    Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
      IPX Raw Hdr:  FFFF0240000400000000FFFFFFFFFFFF9004000000000000000000009004
      IW2  . . . :  WPkt Type: 0x06 (DELAY REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   1
      Option . . :  WOpcode: 0xFF (Pad)             WAccept: 0x01 (Yes)      WOption Len:   531
      Data . . . :  5741534D0696AD0D470001FF010213F5539F5BC5038D32EC2B32AB880BF1  *...(.O.........5..$E.......H.1*
                    B0C8289F98E3061AD2A5CB4570C43C111AC387269DDDF871B5E1F193EDBB  *.H..QT..KV...D...CG...8...1L..*
                    27207F85C6D1D8BFFB0086F7DFBFE282AF0D92B2A42F46B91BF84BDB4A62  *.."EFJQ...F7..SB..K.U....8..".*
                    DFF0A18EF3FEB06EF1F14412D9AC31E04FFE7DBADBF0770265953EB03AC6  *.O..3..>11..R...|.'..O...N...F*
                    A3FC63B80F2D78EC727FB0D11D7517E4F2A443F5FEA0239FC3D802F29ABD  *T........".J...U2U.5....CQ.2..*
                    408CFF3130C5F68EA2BE0E9338AEE3A304E2E3B550D3950B90DE2A8776BA  * ....E6.S..L..TT.ST.&LN....G..*
                    23C5EE8297EBBCC3F5C6A0BCC396E3CCE771E7EEE75DCA97BEF350F95857  *.E.BP..C5F..COT.X.X.X).P.3&9..*
                    0596B98928EEDBEE67A90126B58A948BC39E63F64AB4BEC584D899B9D1D4  *.O.I.....Z....M.C..6"..EDQR.JM*
                    76B770BE05870ADCE502FDBF27A158C2D1FA74E7923999B103E296F61140  *.....G..V......BJ..XK.R..SO6. *
```

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                                   A5E6AB8ED9892FBEE09D9CAA7E987D870AD92CEFBD952FD0B0F62E1F55CE   *VW..RI......=Q'G.R...N.}.6....*
                                   0B83B8D5F50EB7CB997E1FCA278DA7EAC536A1B985FC728B80FF87C2083F   *.C.N5...R=....X.E...E.....GB..*
                                   9FAB89433FC09E3515D2AF587FF5DB65E99700221A89BF266AE4733FCDCA   *..I..{...K.."5..ZP...I...U....*
                                   6220E8F05EC726DE650B14BBBAC01EE19B51DC9C1BB63CDF596D36E81166   *..YO;G.......{..........._.Y..*
                                   C9CE738D2784386556928534ECE755BD1BADF2AE45978F8D3CD181ABE198   *I....D...KE..X....2..P...JA..Q*
                                   3BAC3DF5A926E0B437BA21B69D28F787ECCDCCCBBB51CCF6F79093F73521   *...5Z.........7G.......67.L7..*
                                   91C12F3563825A59ACF9B56E10F64D5C84D0F55C719C8869E5BFE089ADAE   *JA...B!..9.>.6(*D}5*..H.V..I..*
                                   6F1F46816E8623FF28A638C5B92968FF4DD042CDA42001D2318B21B2A58F   *?..A>F...W.E....(}..U..K....V.*
                                   579365F4638A8FDB30EA7F7362D5709F35D4E4BE0DF579B4AD894547C4A3   *.L.4......"..N...MU..5...I..DT*
                                   6ADB45AE61BD                                                   *..../.                        *
   65   R       0 00000000  2116.0  EBCDIC  X25LINET  /03   I         2         2     OFF    RR         1004E1    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                            P(R)=  7
   67   S       0 00000000  2116.0  EBCDIC  X25LINET  /01   I         2         3     OFF    RR         100421    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                            P(R)=  1
   68   S     576 00000000  2116.0  EBCDIC  X25LINET  /01   I         3         3     OFF    DATA       10042E    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                  P(S)=  7  P(R)=  1
                  IPX  . . . : Pkt Length:   576     Pkt Type: 0x04                      Hop Count:   0
                               Src Addr  : 00000000:000000000000:9004 (IPW2)
                               Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                  IPX Raw Hdr: FFFF0240000400000000FFFFFFFFFFFF900400000000000000000000009004
                  IW2  . . . : WPkt Type: 0x07 (DELAY RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   1
                  Option . . : WOpcode: 0xFF (Pad)              WAccept: 0x01 (Yes)     WOption Len:   531
                  Data . . . : 5741534D0776AD01170001FF010213932A1A78B13007C4C84E2FBE8520C9   *...(...........L......DH+..E.I*
                               B0AB998619EC332B539361CF4CFA70D22C84F6C729E58D98F2B334AD9CC7   *..RF.....L/.<..K.D6G.V.Q2....G*
                               7238AF9BE7CF768FE59BF2AB6176AD8BB6AFC386CD72DF9A30D39EFB9579   *....X...V.2./.....CF.....L..N.*
                               289245B2239DB262DCAA78AA67D7FBA7A1CABAA9CFA4E2BD05A1E7E7D680   *.K...........P.X...Z.US...XXO.*
                               25E5A6B8083705A35487A882967A5FE53C35F4D3FA9BC0EA07C6FAA498BF   *.VW....T.GYBO:,V..4L..{..F.UQ.*
                               20A82C224DE980437DE3CF3B4FBA3F34628B886D76A9CAA58CB73AE16BFA   *.Y..(Z..'T..|.....H_.Z.V....,.*
                               A595C88D0CFE08CFFA0791A8072B44EEA9D38BCF7FC517CD64D36F967585   *VNH.......JY....ZL.."E...L?O.E*
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A             05/09/97  11:42:52                         Page:      20
                  Data . . . : C3FDA11261D9BE205ED13F6B019A8A79FBF94E9D0198262C87F235A11B9E   *C.../R..;J.,......9+..Q..G2....*
                               E46FD9A76B610FFAB175A898A3E92EB122194DB5AB691688808089AC76E8   *U?RX,/....YQTZ....(....H..I..Y*
                               63B293140BD60939C5F7B0224BCC9BE8F88FDC5ABBCBC8F4C7F63E9D5788   *..L..O..E7.....Y8..!..H4G6...H*
                               CC390F97B64DF4C1B81BFD9E35E268E3A36AFEFDC5BE74C15B33D6CAA889   *...P.(4A.....S.TT...E..A$.O.YI*
                               C7FEEDCFC3AEE38DF7DD7DACD5E5DE458EE3A8E389E4F2AC24F803E4EAC7   *G...C.T.7.'.NV...TYTIU2..8.U.G*
                               AA3DDCF9C39CED99740BB791AD6A17901056BAA0AE173B857774E8E59C6F   *...9C..R...J...........E..YV.?*
                               CD81707181FD2C0E8BD76F4988CB44EE389A7406CBB76A48A6A2C7E85EF2   *.A..A....P?.H...........WSGY;2*
                               68C6D0BCD4FE06C3719CC5D7EBADC2B1DD0A4EA6CFE21D9A06337B8D1E1F   *.F}.M..C..EP..B...+W.S....#...*
                               3EB49567D4BCD3EBECFD2633CED7139B3AC8346B27E9673421F68FDA3EDE   *..N.M.L......P...H.,.Z...6....*
                               419AE9A521A8FFC4DE520CDFDCF6CEA3CFC1359C95D299B0358B208B413C   *..ZV.Y.D.....6.T.A..NKR.......*
                               42E7DB587BF18E6A29BCDC25A5992BD4828C8CF15FF93ADC1087461E468C   *.X..#1......VR.MB..1,9...G....*
                               6DCB0DAE61BD                                                   *_.../.                        *
   69   R     296 00000000  2116.1  EBCDIC  X25LINET  /03   I         3         2     OFF    DATA       1004E2    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                  P(S)=  1  P(R)=  7
                  IPX  . . . : Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                               Src Addr  : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
                               Dest Addr : 76AD0117:000000000001:9086 (PING)
                  IPX Raw Hdr: FFFF0128000076AD0117000000000001908696AD0D47000000000000014000
                  PING . . . : Type:   0 (Request)      Ping ID: 0x0004     Result: 0x00
                  PING Header: 50696E67010000040000
                  Data . . . : 7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *# .;.{...;.{..# .;.{..# .;.{..*
                               7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                               00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                               2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                               BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *.;.{..# .;.{..# .;.{..# .;.{..*
                               7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                               00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                               2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                               BD5E2EC000427B40BD5E2EC000427B40                               *.;.{..# .;.{..#               *
   72   S       0 00000000  2116.3  EBCDIC  X25LINET  /01   I         4         4     OFF    RR         100441    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                            P(R)=  2
   73   S     296 00000000  2116.3  EBCDIC  X25LINET  /01   I         5         4     OFF    DATA       100440    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                  P(S)=  0  P(R)=  2
                  IPX  . . . : Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                               Src Addr  : 76AD0117:000000000001:9086 (PING)
                               Dest Addr : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
                  IPX Raw Hdr: FFFF0128000096AD0D47000000000001400076AD0117000000000019086
                  PING . . . : Type:   1 (Response)     Ping ID: 0x0004     Result: 0x01
                  PING Header: 50696E67010100040100
                  Data . . . : 7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *# .;.{...;.{..# .;.{..# .;.{..*
                               7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                               00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                               2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                               BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *.;.{..# .;.{..# .;.{..# .;.{..*
                               7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                               00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                               2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                               BD5E2EC000427B40BD5E2EC000427B40                               *.;.{..# .;.{..#               *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A             05/09/97  11:42:52                         Page:      21
Record       Data   Record    Record  Data    Controller               Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number      Command Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------    ------- ------   --------  -----  ----------   --------  -----
   76   R       0 00000000  2116.3  EBCDIC  X25LINET  /03   I         4         5     OFF    RR         100401    NSNA
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                  Packet Header :  LCGN= 0   LCN=  4                          P(R)=  0
    78   R      111 00000000  2116.4  EBCDIC  X25LINET  /03   I          5         5     OFF    DATA        100404    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                P(S)=  2  P(R)=  0
                  IPX  . . . :  Pkt Length:   111     Pkt Type: 0x04                       Hop Count:   0
                                Src Addr  : 00000000:000000000000:9004 (IPW2)
                                Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                  IPX Raw Hdr:  FFFF006F000400000000FFFFFFFFFFFF90040000000000000000000009004
                  IW2  . . . :  WPkt Type: 0x02 (INFO. REQ)  WNode ID: 0x96AD0D47  WSeq No.:   0  # Options:   2
                  Option . . :  WOpcode: 0x01 (RIP/SAP)          WAccept: 0x01 (Yes)     WOption Len:    54
                                Delay:  2970 ms   Network: 0x00000000   Router :ROUTER_1
                  Option . . :  WOpcode: 0x02 (NLSP)             WAccept: 0x01 (Yes)     WOption Len:     8
                                Delay: 0x00008D9B                Throughput: 0x00004B00
                  Data . . . :  5741534D0296AD0D470002010100360B9A00000000524F555445525F3100   *...(.0................|....,..*
                                000000000000000000000000000000000000000000000000000000000000   *..............................*
                                0000000000000000000201000800008D9B00004B00                     *.....................         *
    80   S        0 00000000  2116.4  EBCDIC  X25LINET  /01   I          6         6     OFF    RR          100461    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                          P(R)=  3
    81   S      111 00000000  2116.4  EBCDIC  X25LINET  /01   I          7         6     OFF    DATA        100462    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                P(S)=  1  P(R)=  3
                  IPX  . . . :  Pkt Length:   111     Pkt Type: 0x04                       Hop Count:   0
                                Src Addr  : 00000000:000000000000:9004 (IPW2)
                                Dest Addr : 00000000:FFFFFFFFFFFF:9004 (IPW2)
                  IPX Raw Hdr:  FFFF006F000400000000FFFFFFFFFFFF90040000000000000000000009004
                  IW2  . . . :  WPkt Type: 0x03 (INFO. RSP)  WNode ID: 0x76AD0117  WSeq No.:   0  # Options:   2
                  Option . . :  WOpcode: 0x01 (RIP/SAP)          WAccept: 0x01 (Yes)     WOption Len:    54
                                Delay:  2970 ms   Network: 0x00000000   Router :ROUTER_2
                  Option . . :  WOpcode: 0x02 (NLSP)             WAccept: 0x01 (Yes)     WOption Len:     8
                                Delay: 0x00008D9B                Throughput: 0x00004B00
                  Data . . . :  5741534D0376AD01170002010100360B9A00000000524F555445525F3200   *...(..................|....,..*
                                000000000000000000000000000000000000000000000000000000000000   *..............................*
                                0000000000000000000201000800008D9B00004B00                     *.....................         *
    84   R        0 00000000  2116.4  EBCDIC  X25LINET  /03   I          6         7     OFF    RR          100421    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                          P(R)=  1
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                         Page:      22
Record       Data   Record     Record  Data    Controller             Number   Number   Poll/  Packet      Packet    LLC
Number  S/R  Length Status     Timer   Type    Name/Number    Command  Sent     Received Final  Type        Header    Type
------  ---  ------ --------   ------  ------  -------------  -------  ------   -------- -----  ----------  --------  -----
    86   S       66 00000000  2116.5  EBCDIC  X25LINET  /01   I          0         7     OFF    DATA        100464    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                P(S)=  2  P(R)=  3
                  IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)             Hop Count:   0
                                Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                  IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
                  WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                State: 2 (Down)       Cct Type:  1          Src ID: 0x020076AD0117
                                Hold Time:    60s     Pkt Length:    36     WAN ID: 0x03
                  Fixed Hdr  :  831401001101000009020076AD0117003C002403
                  Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                Address: 00000000     Mask: 00000000
                  Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
                  Data . . . :  C00800000000000000000C50400001000                              *{.........E.....              *
    87   R      296 00000000  2116.6  EBCDIC  X25LINET  /03   I          7         7     OFF    DATA        100426    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                P(S)=  3  P(R)=  1
                  IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)             Hop Count:   0
                                Src Addr  : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
                                Dest Addr : 76AD0117:000000000001:9086 (PING)
                  IPX Raw Hdr:  FFFF0128000076AD01170000000000019086 96AD0D470000000000014000
                  PING . . . :  Type:   0 (Request)      Ping ID: 0x0005     Result: 0x00
                  PING Header:  50696E67010000050000
                  Data . . . :  7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *# .;.{...;.{..# .;.{..# .;.{..*
                                7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                                00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                                2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                                BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *.;.{..# .;.{..# .;.{..# .;.{..*
                                7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                                00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                                2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                                BD5E2EC000427B40BD5E2EC000427B40                               *.;.{..# .;.{..#               *
    91   R        0 00000000  2116.6  EBCDIC  X25LINET  /03   I          0         1     OFF    RR          100441    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                          P(R)=  2
    93   S        0 00000000  2116.6  EBCDIC  X25LINET  /01   I          1         1     OFF    RR          100481    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                          P(R)=  4
    94   R        0 00000000  2116.6  EBCDIC  X25LINET  /03   I          1         1     OFF    RR          100461    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                          P(R)=  3
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                         Page:      23
Record       Data   Record     Record  Data    Controller             Number   Number   Poll/  Packet      Packet    LLC
Number  S/R  Length Status     Timer   Type    Name/Number    Command  Sent     Received Final  Type        Header    Type
------  ---  ------ --------   ------  ------  -------------  -------  ------   -------- -----  ----------  --------  -----
    96   S      296 00000000  2116.6  EBCDIC  X25LINET  /01   I          2         2     OFF    DATA        100486    NSNA
                  Packet Header :  LCGN= 0   LCN=  4                P(S)=  3  P(R)=  4
                  IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)             Hop Count:   0
                                Src Addr  : 76AD0117:000000000001:9086 (PING)
                                Dest Addr : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
```

```
                     IPX Raw Hdr:  FFFF0128000096AD0D4700000000000001400076AD01170000000000019086
                     PING . . . :  Type:   1 (Response)     Ping ID: 0x0005     Result: 0x01
                     PING Header:  50696E67010100050100
                     Data . . . :  7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *# .;.{...;.{..# .;.{..# .;.{..*
                                   7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                                   00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                                   2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                                   BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *.;.{..# .;.{..# .;.{..# .;.{..*
                                   7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                                   00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                                   2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                                   BD5E2EC000427B40BD5E2EC000427B40                               *.;.{..# .;.{..#               *
   97   R      66  00000000  2116.6  EBCDIC  X25LINET  /03   I         2         1     OFF    DATA       100468    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                P(S)=  4  P(R)=  3
                     IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                   Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                     WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                   State: 2 (Down)       Cct Type:  1          Src ID: 0x020096AD0D47
                                   Hold Time:    60s     Pkt Length:    36     WAN ID: 0x01
                     Fixed Hdr  :  831401001101000009020096AD0D47003C002401
                     Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                   Address: 00000000     Mask: 00000000
                     Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
                     Data . . . :  C0080000000000000000C50400001000                               *{.........E.....              *
  100   S       0  00000000  2116.7  EBCDIC  X25LINET  /01   I         3         3     OFF    RR         1004A1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                          P(R)=  5
  101   R     296  00000000  2116.8  EBCDIC  X25LINET  /03   I         3         2     OFF    DATA       10046A    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                P(S)=  5  P(R)=  3
                     IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                   Src Addr  : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
                                   Dest Addr : 76AD0117:000000000001:9086 (PING)
                     IPX Raw Hdr:  FFFF0128000076AD01170000000000019086 96AD0D470000000000014000
                     PING . . . :  Type:   0 (Request)      Ping ID: 0x0001     Result: 0x00
                     PING Header:  50696E67010000010000
                     Data . . . :  7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *# .;.{...;.{..# .;.{..# .;.{..*
                                   7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                                   00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                                   2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                                   BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *.;.{..# .;.{..# .;.{..# .;.{..*
                                   7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                                   00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                                   2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                           Page:      24
                     Data . . . :  BD5E2EC000427B40BD5E2EC000427B40                               *.;.{..# .;.{..#               *
  105   R       0  00000000  2116.8  EBCDIC  X25LINET  /03   I         4         4     OFF    RR         100481    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                          P(R)=  4
  107   S       0  00000000  2116.8  EBCDIC  X25LINET  /01   I         4         5     OFF    RR         1004C1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                          P(R)=  6
  108   S     296  00000000  2116.8  EBCDIC  X25LINET  /01   I         5         5     OFF    DATA       1004C8    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                P(S)=  4  P(R)=  6
                     IPX  . . . :  Pkt Length:   296     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9086 (PING)
                                   Dest Addr : 96AD0D47:000000000001:4000 (Dynamic Low Bound)
                     IPX Raw Hdr:  FFFF0128000096AD0D4700000000000001400076AD01170000000000019086
                     PING . . . :  Type:   1 (Response)     Ping ID: 0x0001     Result: 0x01
                     PING Header:  50696E67010100010100
                     Data . . . :  7B40BD5E2EC00042BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *# .;.{...;.{..# .;.{..# .;.{..*
                                   7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                                   00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                                   2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                                   BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC00042   *.;.{..# .;.{..# .;.{..# .;.{..*
                                   7B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC0   *# .;.{..# .;.{..# .;.{..# .;.{*
                                   00427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E   *..# .;.{..# .;.{..# .;.{..# .;*
                                   2EC000427B40BD5E2EC000427B40BD5E2EC000427B40BD5E2EC000427B40   *.{..# .;.{..# .;.{..# .;.{..# *
                                   BD5E2EC000427B40BD5E2EC000427B40                               *.;.{..# .;.{..#               *
  111   R       0  00000000  2116.9  EBCDIC  X25LINET  /03   I         5         6     OFF    RR         1004A1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                          P(R)=  5
  113   S      66  00000000  2117.5  EBCDIC  X25LINET  /01   I         6         6     OFF    DATA       1004CA    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                P(S)=  5  P(R)=  6
                     IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
                     WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                   State: 2 (Down)       Cct Type:  1          Src ID: 0x020076AD0117
                                   Hold Time:    60s     Pkt Length:    36     WAN ID: 0x03
                     Fixed Hdr  :  831401001101000009020076AD0117003C002403
                     Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                   Address: 00000000     Mask: 00000000
                     Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
                     Data . . . :  C0080000000000000000C50400001000                               *{.........E.....              *
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COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                            Page:      25
Record       Data   Record    Record  Data    Controller              Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  -------  ------   --------  -----  ----------   --------  -----
   114   R       66 00000000  2117.5  EBCDIC  X25LINET  /03   I         6        6       OFF    DATA         1004AC    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                 P(S)=  6  P(R)=  5
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                  State: 2 (Down)       Cct Type:  1          Src ID: 0x020096AD0D47
                                  Hold Time:    60s     Pkt Length:    36     WAN ID: 0x01
                    Fixed Hdr  :  83140100110100009020096AD0D47003C002401
                    Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                                  Address: 00000000     Mask: 00000000
                    Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
                    Data . . . :  C0080000000000000000C50400001000                              *{.........E.....             *
   117   R        0 00000000  2117.5  EBCDIC  X25LINET  /03   I         7        7       OFF    RR           1004C1    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  6
   119   S        0 00000000  2117.5  EBCDIC  X25LINET  /01   I         7        0       OFF    RR           1004E1    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  7
   121   S       66 00000000  2118.3  EBCDIC  X25LINET  /01   I         0        0       OFF    DATA         1004EC    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                 P(S)=  6  P(R)=  7
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                  State: 1 (Init)       Cct Type:  1          Src ID: 0x020076AD0117
                                  Hold Time:    60s     Pkt Length:    36     WAN ID: 0x03
                    Fixed Hdr  :  83140100110100005020076AD0117003C002403
                    Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                                  Address: 00000000     Mask: 00000000
                    Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
                    Data . . . :  C0080000000000000000C50400001000                              *{.........E.....             *
   123   R        0 00000000  2118.3  EBCDIC  X25LINET  /03   I         0        1       OFF    RR           1004E1    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  7
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                            Page:      26
Record       Data   Record    Record  Data    Controller              Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  -------  ------   --------  -----  ----------   --------  -----
   125   R      225 00000000  2118.5  EBCDIC  X25LINET  /03   I         1        1       OFF    DATA         1004EE    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                 P(S)=  7  P(R)=  7
                    IPX  . . . :  Pkt Length:   225     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF00E1000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    CSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x18
                                  Pkt Length:   195     Src ID: 0x020096AD0D4700
                                  LSP ID: 0x000000000000 (Src):0x00 (Node):0x00 (LSP No.)  "Start LSP ID"
                                  LSP ID: 0xFFFFFFFFFFFF (Src):0xFF (Node):0xFF (LSP No.)  "End LSP ID"
                    Fixed Hdr  :  8321010018010000000C3020096AD0D4700000000000000000FFFFFFFFFFFFFFFF
                    Option . . :  Code: 0x09 (LSP Entries)          Length: 160
                                  Rem. Life:  6904 sec  LSP ID: 0x020076AD01170000  Seq. No.: 0x00000004  Chksum: 0x0B9B
                                  Rem. Life:  5184 sec  LSP ID: 0x020076AD01170200  Seq. No.: 0x00000001  Chksum: 0x5CF6
                                  Rem. Life:  5191 sec  LSP ID: 0x020076AD01170201  Seq. No.: 0x00000003  Chksum: 0x1A8D
                                  Rem. Life:  5184 sec  LSP ID: 0x020076AD01170202  Seq. No.: 0x00000001  Chksum: 0xEF0F
                                  Rem. Life:  5200 sec  LSP ID: 0x020076AD01170203  Seq. No.: 0x00000004  Chksum: 0x9E45
                                  Rem. Life:  5184 sec  LSP ID: 0x020076AD0117FF00  Seq. No.: 0x00000001  Chksum: 0xB4A0
                                  Rem. Life:     0 sec  LSP ID: 0x020076AD0117FF02  Seq. No.: 0x00000002  Chksum: 0x0000
                                  Rem. Life:  7499 sec  LSP ID: 0x020096AD0D470000  Seq. No.: 0x00000005  Chksum: 0xBD59
                                  Rem. Life:  4688 sec  LSP ID: 0x020096AD0D47FF00  Seq. No.: 0x00000001  Chksum: 0xB6E5
                                  Rem. Life:  6970 sec  LSP ID: 0x020096AD0D47FF02  Seq. No.: 0x00000004  Chksum: 0xCA08
                    Data . . . :  09A01AF8020076AD0117000000000000040B9B1440020076AD011702000000   *...8............... ..........*
                                  00015CF61447020076AD011702010000000031A8D1440020076AD01170202   *..*6................. ........*
                                  00000001EF0F1450020076AD011702030000000049E451440020076AD0117   *.......&............... ......*
                                  FF0000000001B4A00000020076AD0117FF020000000200001D4B020096AD   *............................0.*
                                  0D470000000000005BD591250020096AD0D47FF0000000001B6E51B3A0200   *...........&..0..........V....*
                                  96AD0D47FF0200000004CA08                                     *0...........                  *
   127   S        0 00000000  2118.5  EBCDIC  X25LINET  /01   I         1        2       OFF    RR           100401    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  0
   129   R       66 00000000  2119.1  EBCDIC  X25LINET  /03   I         2        2       OFF    DATA         1004E0    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                 P(S)=  0  P(R)=  7
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                  State: 0 (Up)         Cct Type:  1          Src ID: 0x020096AD0D47
                                  Hold Time:    60s     Pkt Length:    36     WAN ID: 0x01
                    Fixed Hdr  :  83140100110100001020096AD0D47003C002401
                    Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
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                    Address: 00000000     Mask: 00000000
              Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
              Data . . . :  C00800000000000000000C50400001000                               *{.........E.....                  *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A             05/09/97  11:42:52                       Page:      27
Record       Data   Record    Record  Data    Controller             Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  ------- ------   --------  -----  ----------   --------  -----
   131   S        0 00000000  2119.2  EBCDIC  X25LINET  /01   I         2        3      OFF    RR           100421    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  1
   133   S      225 00000000  2119.2  EBCDIC  X25LINET  /01   I         3        3      OFF    DATA         10042E    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                 P(S)=  7  P(R)=  1
                    IPX  . . . :  Pkt Length:   225     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF00E1000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    CSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x18
                                  Pkt Length:   195     Src ID: 0x020076AD011700
                                  LSP ID: 0x000000000000 (Src):0x00 (Node):0x00 (LSP No.)  "Start LSP ID"
                                  LSP ID: 0xFFFFFFFFFFFF (Src):0xFF (Node):0xFF (LSP No.)  "End LSP ID"
                    Fixed Hdr  :  832101001801000000C3020076AD0117000000000000000000FFFFFFFFFFFFFFFF
                    Option . . :  Code: 0x09 (LSP Entries)           Length: 160
                                  Rem. Life:  7499 sec  LSP ID: 0x020076AD01170000  Seq. No.: 0x00000006  Chksum: 0x77A3
                                  Rem. Life:  5182 sec  LSP ID: 0x020076AD01170200  Seq. No.: 0x00000001  Chksum: 0x5CF6
                                  Rem. Life:  5190 sec  LSP ID: 0x020076AD01170201  Seq. No.: 0x00000003  Chksum: 0x1A8D
                                  Rem. Life:  5182 sec  LSP ID: 0x020076AD01170202  Seq. No.: 0x00000001  Chksum: 0xEF0F
                                  Rem. Life:  7184 sec  LSP ID: 0x020076AD01170203  Seq. No.: 0x00000005  Chksum: 0xD9A9
                                  Rem. Life:  5182 sec  LSP ID: 0x020076AD0117FF00  Seq. No.: 0x00000001  Chksum: 0xB4A0
                                  Rem. Life:  6968 sec  LSP ID: 0x020076AD0117FF02  Seq. No.: 0x00000004  Chksum: 0x7EF9
                                  Rem. Life:  6904 sec  LSP ID: 0x020096AD0D470000  Seq. No.: 0x00000003  Chksum: 0xD2CF
                                  Rem. Life:  4687 sec  LSP ID: 0x020096AD0D47FF00  Seq. No.: 0x00000001  Chksum: 0xB6E5
                                  Rem. Life:     0 sec  LSP ID: 0x020096AD0D47FF02  Seq. No.: 0x00000002  Chksum: 0x0000
                    Data . . . :  09A01D4B020076AD01170000000000000677A3143E020076AD011702000000   *.................T............*
                                  00015CF61446020076AD0117020100000031A8D143E020076AD01170202   *..*6..........................*
                                  00000001EF0F1C10020076AD0117020300000005D9A9143E020076AD0117   *....................RZ........*
                                  FF0000000001B4A01B38020076AD0117FF02000000047EF91AF8020096AD   *......................=9.8..0.*
                                  0D47000000000003D2CF124F020096AD0D47FF0000000001B6E500000200   *........K..|..0..........V....*
                                  96AD0D47FF02000000020000                                       *0...........                  *
   135   R        0 00000000  2119.3  EBCDIC  X25LINET  /03   I         3        4      OFF    RR           100401    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  0
   137   S       66 00000000  2119.9  EBCDIC  X25LINET  /01   I         4        4      OFF    DATA         100420    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                 P(S)=  0  P(R)=  1
                    IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
                    WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                  State: 0 (Up)         Cct Type:  1          Src ID: 0x020076AD0117
                                  Hold Time:    60s     Pkt Length:    36     WAN ID: 0x03
                    Fixed Hdr  :  831401001101000001020076AD0117003C002403
                    Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                  Address: 00000000     Mask: 00000000
                    Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
                    Data . . . :  C00800000000000000000C50400001000                               *{.........E.....                  *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A             05/09/97  11:42:52                       Page:      28
Record       Data   Record    Record  Data    Controller             Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  ------- ------   --------  -----  ----------   --------  -----
   139   R        0 00000000  2120.0  EBCDIC  X25LINET  /03   I         4        5      OFF    RR           100421    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  1
   141   R       97 00000000  2120.4  EBCDIC  X25LINET  /03   I         5        5      OFF    DATA         100422    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                 P(S)=  1  P(R)=  1
                    IPX  . . . :  Pkt Length:    97     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF0061000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    PSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x1A
                                  Pkt Length:    67     Src ID: 0x020096AD0D4700
                    Fixed Hdr  :  831101001A0100000043020096AD0D4700
                    Option . . :  Code: 0x09 (LSP Entries)           Length:  48
                                  Rem. Life:  6902 sec  LSP ID: 0x020076AD01170000  Seq. No.: 0x00000004  Chksum: 0x0B9B
                                  Rem. Life:  5198 sec  LSP ID: 0x020076AD01170203  Seq. No.: 0x00000004  Chksum: 0x9E45
                                  Rem. Life:     0 sec  LSP ID: 0x020076AD0117FF02  Seq. No.: 0x00000002  Chksum: 0x0000
                    Data . . . :  09301AF6020076AD01170000000000040B9B144E020076AD011702030000   *...6...............+..........*
                                  00049E450000020076AD0117FF02000000020000                       *....................          *
   143   S        0 00000000  2120.4  EBCDIC  X25LINET  /01   I         5        6      OFF    RR           100441    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                           P(R)=  2
   145   R      143 00000000  2128.3  EBCDIC  X25LINET  /03   I         6        6      OFF    DATA         100424    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                 P(S)=  2  P(R)=  1
                    IPX  . . . :  Pkt Length:   143     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                                  Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                  Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                    IPX Raw Hdr:  FFFF008F000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                    LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
```

```
                     Pkt Length:   113     Rem. Life:  7490s     Seq. No.: 0x00000005
                     LSP ID: 0x020096AD0D47 (Src):0x00 (Node):0x00 (LSP No.)
      Fixed Hdr  :   831B0100120100000711D42020096AD0D47000000000005BD5901
      Option . . :   Code: 0xC0 (Area Addresses)        Length:   8
                     Address: 00000000     Mask: 00000000
      Option . . :   Code: 0xC1 (Management)            Length:  20
                     Network: 0x96AD0D47                Node: 0x000000000001
                     Router : ROUTER_1
      Option . . :   Code: 0xC2 (Link Information)      Length:  25
                     S1: 0    I/E: 0    Cost : 0x1E     Nbor ID: 0x020096AD0D47FF
                     MTU: 0x00000000    Delay: 0x000001F4 usec
                     Thru: 0x000F4240   Media: 0x0000 (Generic LAN)
      Option . . :   Code: 0xC2 (Link Information)      Length:  25
                     S1: 0    I/E: 0    Cost : 0x37     Nbor ID: 0x020076AD011700
                     MTU: 0x00001000    Delay: 0x00008D9B usec
                     Thru: 0x00004B00   Media: 0x801E (X.25)
      Data . . . :   C0080000000000000000C11496AD0D470000000000010108524F55544552   *{.........A.O............|....*
                     5F31C2191E808080020096AD0D47FF00000000000001F4000F42400000C2   *,.B.......O...........4... ..B*
                     1937808080020076AD0117000000100000008D9B00004B00801E           *..........................    *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                        Page:      29
Record      Data   Record    Record  Data    Controller           Number   Number    Poll/  Packet      Packet    LLC
Number  S/R Length Status    Timer   Type    Name/Number  Command Sent     Received  Final  Type        Header    Type
------  --- ------ --------  ------  ------  ------------ ------- ------   --------  -----  ----------  --------  -----
   147   S       0 00000000  2128.4  EBCDIC  X25LINET  /01  I         6        7     OFF    RR          100461    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                       P(R)=  3
   148   R      66 00000000  2128.4  EBCDIC  X25LINET  /03  I         7        6     OFF    DATA        100426    NSNA
                   Packet Header :  LCGN= 0   LCN=  4              P(S)=  3  P(R)=  1
                   IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)          Hop Count:   0
                                 Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                   IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900196AD0D470000000000019001
                   LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                                 Pkt Length:    36     Rem. Life:  7499s     Seq. No.: 0x00000006
                                 LSP ID: 0x020096AD0D47 (Src):0xFF (Node):0x02 (LSP No.)
                   Fixed Hdr  :  831B0100120100000241D4B020096AD0D47FF0200000006D36001
                   Option . . :  Code: 0xC4 (External Routes)      Length:   7
                                 Network: 76AD0117     Hops:     2     Ticks:    30
                   Data . . . :  C4070276AD0117001E                                          *D........                   *
   151   S       0 00000000  2128.4  EBCDIC  X25LINET  /01  I         7        0     OFF    RR          100481    NSNA
                   Packet Header :  LCGN= 0   LCN=  4                       P(R)=  4
   153   S     170 00000000  2129.1  EBCDIC  X25LINET  /01  I         0        0     OFF    DATA        100482    NSNA
                   Packet Header :  LCGN= 0   LCN=  4              P(S)=  1  P(R)=  4
                   IPX  . . . :  Pkt Length:   170     Pkt Type: 0x00 (UNKNOWN)          Hop Count:   0
                                 Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                   IPX Raw Hdr:  FFFF00AA000000000000FFFFFFFFFFFF900176AD01170000000000019001
                   LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                                 Pkt Length:   140     Rem. Life:  7490s     Seq. No.: 0x00000006
                                 LSP ID: 0x020076AD0117 (Src):0x00 (Node):0x00 (LSP No.)
                   Fixed Hdr  :  831B010012010000008C1D42020076AD0117000000000000677A301
                   Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                                 Address: 00000000     Mask: 00000000
                   Option . . :  Code: 0xC1 (Management)           Length:  20
                                 Network: 0x76AD0117               Node: 0x000000000001
                                 Router : ROUTER_2
                   Option . . :  Code: 0xC2 (Link Information)     Length:  25
                                 S1: 0    I/E: 0    Cost : 0x19     Nbor ID: 0x020076AD011702
                                 MTU: 0x00000FD9    Delay: 0x000000C8 usec
                                 Thru: 0x003D0900   Media: 0x0004 (IEEE 802.5 w/802.2 w/o SNAP)
                   Option . . :  Code: 0xC2 (Link Information)     Length:  25
                                 S1: 0    I/E: 0    Cost : 0x1E     Nbor ID: 0x020076AD0117FF
                                 MTU: 0x00000000    Delay: 0x000001F4 usec
                                 Thru: 0x000F4240   Media: 0x0000 (Generic LAN)
                   Option . . :  Code: 0xC2 (Link Information)     Length:  25
                                 S1: 0    I/E: 0    Cost : 0x37     Nbor ID: 0x020096AD0D4700
                                 MTU: 0x00001000    Delay: 0x00008D9B usec
                                 Thru: 0x00004B00   Media: 0x801E (X.25)
                   Data . . . :  C0080000000000000000C11476AD01170000000000010108524F55544552   *{.........A..............|....*
                                 5F32C219198080800020076AD01170200000FD9000000C8003D09000004C2   *,.B...............R...H......B*
                                 191E808080020076AD0117FF00000000000001F4000F42400000C2193780   *...................4... ..B...*
                                 8080020096AD0D47000000100000008D9B00004B00801E                 *....O..................       *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                        Page:      30
Record      Data   Record    Record  Data    Controller           Number   Number    Poll/  Packet      Packet    LLC
Number  S/R Length Status    Timer   Type    Name/Number  Command Sent     Received  Final  Type        Header    Type
------  --- ------ --------  ------  ------  ------------ ------- ------   --------  -----  ----------  --------  -----
   154   S      98 00000000  2129.2  EBCDIC  X25LINET  /01  I         1        0     OFF    DATA        100484    NSNA
                   Packet Header :  LCGN= 0   LCN=  4              P(S)=  2  P(R)=  4
                   IPX  . . . :  Pkt Length:    98     Pkt Type: 0x00 (UNKNOWN)          Hop Count:   0
                                 Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                 Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                   IPX Raw Hdr:  FFFF0062000000000000FFFFFFFFFFFF900176AD01170000000000019001
                   LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                                 Pkt Length:    68     Rem. Life:  5172s     Seq. No.: 0x00000001
```

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                      LSP ID: 0x020076AD0117 (Src):0x02 (Node):0x00 (LSP No.)
        Fixed Hdr  :  831B010012010000004414340200076AD01170200000000015CF601
        Option . . :  Code: 0xC1 (Management)            Length:  12
                      Network: 0x00000009                Node: 0x400052005010
        Option . . :  Code: 0xC2 (Link Information)      Length:  25
                      S1: 0    I/E: 0    Cost : 0x00     Nbor ID: 0x020076AD011700
                      MTU: 0x00000000    Delay: 0x00000000 usec
                      Thru: 0x00000000   Media: 0x0004 (IEEE 802.5 w/802.2 w/o SNAP)
        Data . . . :  C10C00000009400052005010010C2190080808002007 6AD011700000000   *A..... ...&...B..............*
                      0000000000000000000004                                        *...........                  *
  156  R       0  00000000  2129.2  EBCDIC  X25LINET  /03   I         0         1     OFF    RR          100441    NSNA
        Packet Header :  LCGN= 0   LCN=  4                          P(R)=  2
  158  S     530  00000000  2129.2  EBCDIC  X25LINET  /01   I         2         1     OFF    DATA        100486    NSNA
        Packet Header :  LCGN= 0   LCN=  4                P(S)=  3  P(R)=  4
        IPX  . . . :  Pkt Length:   530     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                      Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                      Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
        IPX Raw Hdr:  FFFF0212000000000000FFFFFFFFFFFF900176AD01170000000000019001
        LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12        NR Bit: 0
                      Pkt Length:   500     Rem. Life:  5180s     Seq. No.: 0x00000003
                      LSP ID: 0x020076AD0117 (Src):0x02 (Node):0x01 (LSP No.)
        Fixed Hdr  :  831B01001201000001F4143C020076AD01170201000000031A8D01
        Option . . :  Code: 0xC3 (Services)              Length:  23
                      Hops:    1              Service Addr: 00000009:400052005188:E885
                      Service Type: 0x0640    Service Name: WINNT100
        Option . . :  Code: 0xC3 (Services)              Length:  61
                      Hops:    1              Service Addr: 31ECF1DD:000000000001:4006
                      Service Type: 0x0278    Service Name: FERGUS_NW41_TREE________________****M@@@@@D*PJ
        Option . . :  Code: 0xC3 (Services)              Length:  61
                      Hops:    1              Service Addr: 31ECF1DD:000000000001:0005
                      Service Type: 0x026B    Service Name: FERGUS_NW41_TREE________________****M@@@@@D*PJ
        Option . . :  Code: 0xC3 (Services)              Length:  62
                      Hops:    1              Service Addr: 31ECF1DD:000000000001:1F80
                      Service Type: 0x012B    Service Name: FERGUS_NW41____________________________0200040a
        Option . . :  Code: 0xC3 (Services)              Length:  62
                      Hops:    1              Service Addr: 31ECF1DD:000000000001:1F80
                      Service Type: 0x0115    Service Name: FERGUS_NW41____________________________0200040a
        Option . . :  Code: 0xC3 (Services)              Length:  26
                      Hops:    1              Service Addr: 31ECF1DD:000000000001:1F80
                      Service Type: 0x0130    Service Name: FERGUS_NW41
        Option . . :  Code: 0xC3 (Services)              Length:  26
                      Hops:    1              Service Addr: 31ECF1DD:000000000001:8104
                      Service Type: 0x0107    Service Name: FERGUS_NW41
        Option . . :  Code: 0xC3 (Services)              Length:  26
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                        Page:      31
                      Hops:    1              Service Addr: 31ECF1DD:000000000001:0451
                      Service Type: 0x0004    Service Name: FERGUS_NW41
        Option . . :  Code: 0xC3 (Services)              Length:  29
                      Hops:    1              Service Addr: 00000009:0001CB32C00A:4004
                      Service Type: 0x0751    Service Name: IBM8235_32C00A
        Option . . :  Code: 0xC3 (Services)              Length:  29
                      Hops:    1              Service Addr: 00000009:0001CBA2470E:4004
                      Service Type: 0x0751    Service Name: IBM8235_A2470E
        Option . . :  Code: 0xC3 (Services)              Length:  22
                      Hops:    1              Service Addr: 00000009:400052005187:E885
                      Service Type: 0x0640    Service Name: WINNT68
        Option . . :  Code: 0xC3 (Services)              Length:  22
                      Hops:    1              Service Addr: 00000009:400052005186:E885
                      Service Type: 0x0640    Service Name: WINNT80
        Data . . . :  C3170100000009400052005188E885064057494E4E54313030C33D0131EC   *C...... ....HYE. ..++....C....*
                      F1DD000000000000140060278464552475553 5F4E5734315F545245455F5F   *1....... .........,+...,....,*
                      5F5F5F5F5F5F5F5F5F5F5F5F5F5F96D3C2EA4D404040404040485504AC33D   *,,,,,,,,,,,,,,OLB.(     .E&"C.*
                      0131ECF1DD0000000000010005026B4645524755535F4E5734315F545245   *...1.........,......,+...,...*
                      455F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F96D3C2EA4D40404040404048550   *.,,,,,,,,,,,,,,,OLB.(     .E&*
                      4AC33E0131ECF1DD000000000011F80012B4645524755535F4E5734315F   *"C....1.................,+...,*
                      5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F303230   *,,,,,,,,,,,,,,,,,,,,,,,,,,,...*
                      3030343061C33E0131ECF1DD000000000011F80011546455247555 35F4E   *..../C....1.................,+*
                      5734315F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F   *...,,,,,,,,,,,,,,,,,,,,,,,,,,*
                      5F3032303030343061C31A0131ECF1DD000000000011F80013046455247   *,......./C....1..............*
                      55535F4E573431C31A0131ECF1DD0000000000018104010746455247 5553   *..,+...C....1.......A.........*
                      5F4E573431C31A0131ECF1DD0000000000010451000446455247555 35F4E   *,+...C....1.................,+*
                      573431C31D01000000090001CB32C00A4004075149424D383233355F3332   *...C..........{. .....(....,..*
                      43303041C31D01000000090001CBA2470E4004075149424D383233355F41   *....C.........S.. .....(....,.*
                      3234373045C316010000000940005200518 7E885064057494E4E543638C3   *.....C...... ....GYE. ..++...C*
                      1601000000094000520051 86E885064057494E4E543830                *...... ....FYE. ..++...       *
  160  R       0  00000000  2129.2  EBCDIC  X25LINET  /03   I         1         2     OFF    RR          100461    NSNA
        Packet Header :  LCGN= 0   LCN=  4                          P(R)=  3
  162  S      66  00000000  2129.5  EBCDIC  X25LINET  /01   I         3         2     OFF    DATA        100488    NSNA
        Packet Header :  LCGN= 0   LCN=  4                P(S)=  4  P(R)=  4
        IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                      Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                      Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
        IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
```

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                     LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                                   Pkt Length:    36     Rem. Life:  5172s     Seq. No.: 0x00000001
                                   LSP ID: 0x020076AD0117 (Src):0x02 (Node):0x02 (LSP No.)
                     Fixed Hdr  :  831B01001201000000241434020076AD01170202000000001EF0F01
                     Option . . :  Code: 0xC4 (External Routes)       Length:   7
                                   Network: 31ECF1DD     Hops:     1     Ticks:     2
                     Data . . . :  C4070131ECF1DD0002                                        *D....1...                    *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                       Page:      32
Record       Data   Record    Record  Data    Controller             Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  -------  ------   --------  -----  ----------   --------  -----
   164   R        0 00000000  2129.5  EBCDIC  X25LINET  /03   I         2         3      OFF    RR           100481    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                          P(R)=  4
   166   S      249 00000000  2129.5  EBCDIC  X25LINET  /01   I         4         3      OFF    DATA         10048A    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                P(S)=  5  P(R)=  4
                     IPX  . . . :  Pkt Length:   249     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF00F9000000000000FFFFFFFFFFFF900176AD01170000000000019001
                     LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                                   Pkt Length:   219     Rem. Life:  7174s     Seq. No.: 0x00000005
                                   LSP ID: 0x020076AD0117 (Src):0x02 (Node):0x03 (LSP No.)
                     Fixed Hdr  :  831B01001201000000DB1C06020076AD0117020300000005D9A901
                     Option . . :  Code: 0xC3 (Services)              Length:  62
                                   Hops:    1               Service Addr: 00000009:400052005110:4000
                                   Service Type: 0x064E     Service Name: HIROAKI!!!!!!!!A5569B20ABE511CE9CA400004C762832
                     Option . . :  Code: 0xC3 (Services)              Length:  62
                                   Hops:    1               Service Addr: 00000009:400052005186:4018
                                   Service Type: 0x064E     Service Name: WINNT80!!!!!!!!A5569B20ABE511CE9CA400004C762832
                     Option . . :  Code: 0xC3 (Services)              Length:  62
                                   Hops:    1               Service Addr: 00000009:08005A5530E7:4008
                                   Service Type: 0x064E     Service Name: MQNT1!!!!!!!!!!A5569B20ABE511CE9CA400004C762832
                     Data . . . :  C33E010000000940005200511040000064E4849524F414B49212121212121   *C...... ..... ..+...|.........*
                                   2121413535363942323041424535313143453943413430303030344433736   *..............................*
                                   32383332C33E010000000940005200518640180 64E57494E4E5438302121   *....C...... ....F ..+..++.....*
                                   2121212121214135353639423230414245353131434539434134303030 30   *..............................*
                                   3443373632383332C33E010000000908005A5530E74008064E4D514E5431   *........C........!..X ..+(.+..*
                                   2121212121212121212141353536394232304142453531314345394341 34   *..............................*
                                   303030303443373632383332                                  *............                  *
   168   R        0 00000000  2129.5  EBCDIC  X25LINET  /03   I         3         4      OFF    RR           1004A1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                          P(R)=  5
   170   S       98 00000000  2129.6  EBCDIC  X25LINET  /01   I         5         4      OFF    DATA         10048C    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                P(S)=  6  P(R)=  4
                     IPX  . . . :  Pkt Length:    98     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0062000000000000FFFFFFFFFFFF900176AD01170000000000019001
                     LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                                   Pkt Length:    68     Rem. Life:  5172s     Seq. No.: 0x00000001
                                   LSP ID: 0x020076AD0117 (Src):0xFF (Node):0x00 (LSP No.)
                     Fixed Hdr  :  831B01001201000000441434020076AD0117FF0000000001B4A001
                     Option . . :  Code: 0xC1 (Management)            Length:  12
                                   Network: 0x00000000              Node: 0x000000000000
                     Option . . :  Code: 0xC2 (Link Information)      Length:  25
                                   S1: 0    I/E: 0    Cost : 0x00     Nbor ID: 0x020076AD011700
                                   MTU: 0x00000000    Delay: 0x00000000 usec
                                   Thru: 0x00000000   Media: 0x0000 (Generic LAN)
                     Data . . . :  C10C000000000000000000000100C219008080800 20076AD011700000000   *A.............B...............*
                                   0000000000000000000000                                    *...........                   *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                       Page:      33
Record       Data   Record    Record  Data    Controller             Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  -------  ------   --------  -----  ----------   --------  -----
   172   R        0 00000000  2129.6  EBCDIC  X25LINET  /03   I         4         5      OFF    RR           1004C1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                          P(R)=  6
   174   S       66 00000000  2129.6  EBCDIC  X25LINET  /01   I         6         5      OFF    DATA         10048E    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                P(S)=  7  P(R)=  4
                     IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
                     LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                                   Pkt Length:    36     Rem. Life:  7499s     Seq. No.: 0x00000006
                                   LSP ID: 0x020076AD0117 (Src):0xFF (Node):0x02 (LSP No.)
                     Fixed Hdr  :  831B01001201000000241D4B020076AD0117FF0200000006959F01
                     Option . . :  Code: 0xC4 (External Routes)       Length:   7
                                   Network: 96AD0D47     Hops:     1     Ticks:    30
                     Data . . . :  C4070196AD0D47001E                                        *D..0.....                    *
   176   R        0 00000000  2129.7  EBCDIC  X25LINET  /03   I         5         6      OFF    RR           1004E1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                          P(R)=  7
   178   S       98 00000000  2129.7  EBCDIC  X25LINET  /01   I         7         6      OFF    DATA         100480    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                P(S)=  0  P(R)=  4
                     IPX  . . . :  Pkt Length:    98     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
```

```
                    Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                    Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
      IPX Raw Hdr:  FFFF0062000000000000FFFFFFFFFFFF900176AD01170000000000019001
      LSP LVL 1  :  Protocol ID: 0x83     Pkt Type: 0x12       NR Bit: 0
                    Pkt Length:    68     Rem. Life:  4677s     Seq. No.: 0x00000001
                    LSP ID: 0x020096AD0D47 (Src):0xFF (Node):0x00 (LSP No.)
      Fixed Hdr  :  831B010012010000004412450200096AD0D47FF0000000001B6E501
      Option . . :  Code: 0xC1 (Management)           Length:  12
                    Network: 0x00000000               Node: 0x000000000000
      Option . . :  Code: 0xC2 (Link Information)     Length:  25
                    S1: 0    I/E: 0    Cost : 0x00     Nbor ID: 0x020096AD0D4700
                    MTU: 0x00000000    Delay: 0x00000000 usec
                    Thru: 0x00000000   Media: 0x0000 (Generic LAN)
      Data . . . :  C10C000000000000000000000100C219008080800200096AD0D4700000000   *A............B.......0.......*
                    0000000000000000000000                                          *...........                  *
   180   R       0  00000000  2129.7  EBCDIC  X25LINET  /03   I          6         7     OFF    RR         100401    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                          P(R)=  0
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                      Page:      34
Record       Data   Record    Record  Data    Controller              Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  -------  ------   --------  -----  ----------   --------  -----
   182   S      81  00000000  2129.7  EBCDIC  X25LINET  /01   I          0         7     OFF    DATA       100482    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                P(S)=  1  P(R)=  4
      IPX  . . . :  Pkt Length:    81     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                    Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                    Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
      IPX Raw Hdr:  FFFF0051000000000000FFFFFFFFFFFF900176AD01170000000000019001
      PSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x1A
                    Pkt Length:    51     Src ID: 0x020076AD011700
      Fixed Hdr  :  831101001A0100000033020076AD011700
      Option . . :  Code: 0x09 (LSP Entries)          Length:  32
                    Rem. Life:  7489 sec  LSP ID: 0x020096AD0D470000  Seq. No.: 0x00000005  Chksum: 0xBD59
                    Rem. Life:  7498 sec  LSP ID: 0x020096AD0D47FF02  Seq. No.: 0x00000006  Chksum: 0xD360
      Data . . . :  09201D41020096AD0D47000000000005BD591D4A020096AD0D47FF020000   *......0............”..0.......*
                    0006D360                                                        *..L-                         *
   184   R       0  00000000  2129.7  EBCDIC  X25LINET  /03   I          7         0     OFF    RR         100421    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                          P(R)=  1
   187   R       0  00000000  2129.8  EBCDIC  X25LINET  /03   I          0         1     OFF    RR         100441    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                          P(R)=  2
   189   R     177  00000000  2130.4  EBCDIC  X25LINET  /03   I          1         1     OFF    DATA       100448    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                P(S)=  4  P(R)=  2
      IPX  . . . :  Pkt Length:   177     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                    Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                    Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
      IPX Raw Hdr:  FFFF00B1000000000000FFFFFFFFFFFF900196AD0D470000000000019001
      PSNP LVL 1 :  Protocol ID: 0x83     Pkt Type: 0x1A
                    Pkt Length:   147     Src ID: 0x020096AD0D4700
      Fixed Hdr  :  831101001A0100000093020096AD0D4700
      Option . . :  Code: 0x09 (LSP Entries)          Length: 128
                    Rem. Life:  7489 sec  LSP ID: 0x020076AD01170000  Seq. No.: 0x00000006  Chksum: 0x77A3
                    Rem. Life:  5172 sec  LSP ID: 0x020076AD01170200  Seq. No.: 0x00000001  Chksum: 0x5CF6
                    Rem. Life:  5179 sec  LSP ID: 0x020076AD01170201  Seq. No.: 0x00000003  Chksum: 0x1A8D
                    Rem. Life:  5172 sec  LSP ID: 0x020076AD01170202  Seq. No.: 0x00000001  Chksum: 0xEF0F
                    Rem. Life:  7173 sec  LSP ID: 0x020076AD01170203  Seq. No.: 0x00000005  Chksum: 0xD9A9
                    Rem. Life:  5172 sec  LSP ID: 0x020076AD0117FF00  Seq. No.: 0x00000001  Chksum: 0xB4A0
                    Rem. Life:  7498 sec  LSP ID: 0x020076AD0117FF02  Seq. No.: 0x00000006  Chksum: 0x959F
                    Rem. Life:  4676 sec  LSP ID: 0x020096AD0D47FF00  Seq. No.: 0x00000001  Chksum: 0xB6E5
      Data . . . :  09801D41020076AD01170000000000000677A31434020076AD011702000000   *.................T............*
                    00015CF6143B020076AD01170201000000031A8D1434020076AD01170202   *..*6..........................*
                    00000001EF0F1C05020076AD0117020300000005D9A91434020076AD0117   *....................RZ........*
                    FF0000000001B4A01D4A020076AD0117FF0200000006959F1244020096AD   *.........”............N.....0.*
                    0D47FF0000000001B6E5                                            *.........V                   *
COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A            05/09/97  11:42:52                      Page:      35
Record       Data   Record    Record  Data    Controller              Number   Number    Poll/  Packet       Packet    LLC
Number  S/R  Length Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type         Header    Type
------  ---  ------ --------  ------  ------  -------------  -------  ------   --------  -----  ----------   --------  -----
   191   S       0  00000000  2130.4  EBCDIC  X25LINET  /01   I          1         2     OFF    RR         1004A1    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                          P(R)=  5
   193   S      66  00000000  2154.4  EBCDIC  X25LINET  /01   I          2         2     OFF    DATA       1004A4    NSNA
                    Packet Header :  LCGN= 0   LCN=  4                P(S)=  2  P(R)=  5
      IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)           Hop Count:   0
                    Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                    Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
      IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD01170000000000019001
      WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                    State: 0 (Up)         Cct Type:  1         Src ID: 0x020076AD0117
                    Hold Time:    60s     Pkt Length:    36    WAN ID: 0x03
      Fixed Hdr  :  831401001101000001020076AD0117003C002403
      Option . . :  Code: 0xC0 (Area Addresses)       Length:   8
                    Address: 00000000     Mask: 00000000
      Option . . :  Code: 0xC5 (Local MTU)            Length:   4     MTU: 0x00001000
      Data . . . :  C00800000000000000000C50400001000                               *{.........E.....             *
   195   R       0  00000000  2154.4  EBCDIC  X25LINET  /03   I          2         3     OFF    RR         100461    NSNA
```

```
                     Packet Header :  LCGN= 0   LCN=  4                            P(R)=  3
   197   R       66  00000000  2154.5  EBCDIC  X25LINET  /03   I          3         3     OFF    DATA        10046A    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                  P(S)=  5  P(R)=  3
                     IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 96AD0D47:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900196AD0D47000000000001900I
                     WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                   State: 0 (Up)         Cct Type:  1          Src ID: 0x020096AD0D47
                                   Hold Time:    60s     Pkt Length:    36     WAN ID: 0x01
                     Fixed Hdr  :  831401001101000001020096AD0D47003C002401
                     Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                   Address: 00000000     Mask: 00000000
                     Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
                     Data . . . :  C00800000000000000000C50400001000                          *{.........E.....               *
   199   S        0  00000000  2154.6  EBCDIC  X25LINET  /01   I          3         4     OFF    RR          1004C1    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                            P(R)=  6
 COMMUNICATIONS TRACE       Title: IPXPING FRM RALYAS4A             05/09/97  11:42:52                          Page:      36
 Record       Data    Record    Record  Data    Controller             Number   Number    Poll/  Packet      Packet    LLC
 Number  S/R  Length  Status    Timer   Type    Name/Number    Command  Sent     Received  Final  Type        Header    Type
 ------  ---  ------  --------  ------  ------  -------------  -------  ------   --------  -----  ----------  --------  -----
   201   S       66  00000000  2180.3  EBCDIC  X25LINET  /01   I          4         4     OFF    DATA        1004C6    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                  P(S)=  3  P(R)=  6
                     IPX  . . . :  Pkt Length:    66     Pkt Type: 0x00 (UNKNOWN)            Hop Count:   0
                                   Src Addr  : 76AD0117:000000000001:9001 (NLSP)
                                   Dest Addr : 00000000:FFFFFFFFFFFF:9001 (NLSP)
                     IPX Raw Hdr:  FFFF0042000000000000FFFFFFFFFFFF900176AD0117000000000001900I
                     WAN HELLO  :  Protocol ID: 0x83     Pkt Type: 0x11
                                   State: 0 (Up)         Cct Type:  1          Src ID: 0x020076AD0117
                                   Hold Time:     0s     Pkt Length:    36     WAN ID: 0x03
                     Fixed Hdr  :  831401001101000001020076AD01170000002403
                     Option . . :  Code: 0xC0 (Area Addresses)        Length:   8
                                   Address: 00000000     Mask: 00000000
                     Option . . :  Code: 0xC5 (Local MTU)             Length:   4     MTU: 0x00001000
                     Data . . . :  C00800000000000000000C50400001000                          *{.........E.....               *
   203   R        0  00000000  2180.3  EBCDIC  X25LINET  /03   I          4         5     OFF    RR          100481    NSNA
                     Packet Header :  LCGN= 0   LCN=  4                            P(R)=  4
   205   S        2  00000000  2180.3  EBCDIC  X25LINET  /01   I          5         5     OFF    CLR REQ     100413    NSNA
                     Packet Header :  LCGN= 0   LCN=  4
                     Data . . . :  8000                                                       *..                             *
   207   R        0  00000000  2180.6  EBCDIC  X25LINET  /03   I          5         6     OFF    CLR CFM     100417    NSNA
                     Packet Header :  LCGN= 0   LCN=  4
* * * * *   E N D   O F   C O M P U T E R   P R I N T O U T   * * * * *
```

A.3 DatagLANce Trace of NetWare Client Login to a Server

This DatagLANce trace shows the establishment of a session between a Novell client and server.

```
- - - - - - - - - - - - - Frame 49 - - - - - - - - - - - - - - - -

Number Destination       Source            Interpretation
    49 Broadcast (TokRng) 40:00:75:5C:D0:02

- - - - - - - - - - - - - Frame 375 - - - - - - - - - - - - - - - -

Number Destination       Source            Interpretation
   375 00000009.FFFFFFFFF 00000009.4000755CD IPX D=00000009.FFFFFFFFF   FF S=00000009.4000755CD002
                                           SAP C Find nearest File server   1

IPX  ***** IPX header *****
IPX
IPX  Checksum = FFFF (Null Checksum)
IPX  Length = 34 (dec)
IPX  Transport control = 00
IPX     0000 .... = Reserved
IPX     .... 0000 = Hop count
IPX  Packet type = 17 (dec) (Novell NetWare)
IPX
IPX  Destination network      = 00000009
IPX  Destination network.node = 00000009.FFFFFFFFFFFF
IPX  Destination socket       = 0452  (NetWare Service Advertising)
IPX  Source network           = 00000009
IPX  Source network.node      = 00000009.4000755CD002
IPX  Source socket            = 4020  (?)
IPX
SAP  ***** NetWare Nearest Service Query *****
SAP
SAP  Operation = 3 (dec) (Nearest Service Query)
SAP
SAP  Service type = 0004 (File server)
SAP

- - - - - - - - - - - - - Frame 376 - - - - - - - - - - - - - - - -

Number Destination       Source            Interpretation
   376 00000009.4000755CD 00000009.08005A488 IPX D=00000009.4000755CD0   02 S=00000009.08005A48816B
                                           SAP R NW41   2

IPX  ***** IPX header *****
IPX
IPX  Checksum = FFFF (Null Checksum)
IPX  Length = 96 (dec)
IPX  Transport control = 00
IPX     0000 .... = Reserved
IPX     .... 0000 = Hop count
IPX  Packet type = 0 (dec) (Novell NetWare)
IPX
IPX  Destination network      = 00000009
IPX  Destination network.node = 00000009.4000755CD002
IPX  Destination socket       = 4020  (?)
IPX  Source network           = 00000009
IPX  Source network.node      = 00000009.08005A48816B
IPX  Source socket            = 0452  (NetWare Service Advertising)
IPX
```

```
SAP  ***** NetWare Nearest Service Response *****
SAP
SAP  Operation = 4 (dec) (Nearest Service Response)
SAP
SAP  Service type = 0004 (File server)
SAP  Server name = NW41
SAP  Network = 30ABA597, Node = 000000000001, Socket = 0451
SAP  Intervening network count = 0001
SAP
SAP



- - - - - - - - - - - - - Frame 377 - - - - - - - - - - - - - - - -

Number Destination        Source             Interpretation
   377 00000009.4000755CD 00000009.400052005 IPX D=00000009.4000755CD0   02 S=00000009.400052005240
                                           SAP R MANSERV1   3

IPX  ***** IPX header *****
IPX
IPX  Checksum = FFFF (Null Checksum)
IPX  Length = 96 (dec)
IPX  Transport control = 00
IPX     0000 .... = Reserved
IPX     .... 0000 = Hop count
IPX  Packet type = 4 (dec) (PEP)
IPX
IPX  Destination network      = 00000009
IPX  Destination network.node = 00000009.4000755CD002
IPX  Destination socket       = 4020  (?)
IPX  Source network           = 00000009
IPX  Source network.node      = 00000009.400052005240
IPX  Source socket            = 0452  (NetWare Service Advertising)
IPX
SAP  ***** NetWare Nearest Service Response *****
SAP
SAP  Operation = 4 (dec) (Nearest Service Response)
SAP
SAP  Service type = 0004 (File server)
SAP  Server name = MANSERV1
SAP  Network = 30AA0F92, Node = 000000000001, Socket = 0451
SAP  Intervening network count = 0001
SAP
SAP

- - - - - - - - - - - - - Frame 378 - - - - - - - - - - - - - - - -

Number Destination        Source             Interpretation
   378 00000000.FFFFFFFFF 00000009.4000755CD IPX D=00000000.FFFFFFFFFF   FF S=00000009.4000755CD002
                                           RIP Find 30ABA597   4

IPX  ***** IPX header *****
IPX
IPX  Checksum = FFFF (Null Checksum)
IPX  Length = 40 (dec)
IPX  Transport control = 00
IPX     0000 .... = Reserved
IPX     .... 0000 = Hop count
IPX  Packet type = 1 (dec) (RIP)
IPX
IPX  Destination network      = 00000000
IPX  Destination network.node = 00000000.FFFFFFFFFFFF
IPX  Destination socket       = 0453  (NetWare Routing)
IPX  Source network           = 00000009
IPX  Source network.node      = 00000009.4000755CD002
IPX  Source socket            = 0453  (NetWare Routing)
IPX
```

```
RIP  ***** Routing Information Protocol *****
RIP
RIP  Operation = 1 (dec) (Request)
RIP  Object network = 30ABA597 , hop count = (unknown), ticks = 65535 (  dec)
RIP

- - - - - - - - - - - - - Frame 379 - - - - - - - - - - - - - - - -

Number Destination        Source             Interpretation
   379 00000009.4000755CD 00000009.08005A488 IPX D=00000009.4000755CD0   02 S=00000009.08005A48816B
                                           RIP Found 30ABA597 at 1 hops   5

IPX  ***** IPX header *****
IPX
IPX  Checksum = FFFF (Null Checksum)
IPX  Length = 40 (dec)
IPX  Transport control = 00
IPX     0000 .... = Reserved
IPX     .... 0000 = Hop count
IPX  Packet type = 1 (dec) (RIP)
IPX
IPX  Destination network      = 00000009
IPX  Destination network.node = 00000009.4000755CD002
IPX  Destination socket       = 0453  (NetWare Routing)
IPX  Source network           = 00000009
IPX  Source network.node      = 00000009.08005A48816B
IPX  Source socket            = 0453  (NetWare Routing)
IPX
RIP  ***** Routing Information Protocol *****
RIP
RIP  Operation = 2 (dec) (Response)
RIP  Object network = 30ABA597 , hop count = 1 (dec) , ticks = 2 (dec)
RIP

- - - - - - - - - - - - - Frame 380 - - - - - - - - - - - - - - - -

Number Destination      Source             Interpretation
   380 NW41             00000009.4000755CD IPX D=30ABA597.000000000001 S=00000009.4000755CD002 D=0451 S=401B
                                        NCP Create Connection   6

IPX  ***** IPX header *****
IPX
IPX  Checksum = FFFF (Null Checksum)
IPX  Length = 37 (dec)
IPX  Transport control = 00
IPX     0000 .... = Reserved
IPX     .... 0000 = Hop count
IPX  Packet type = 17 (dec) (Novell NetWare)
IPX
IPX  Destination network      = 30ABA597
IPX  Destination network.node = 30ABA597.000000000001, NW41
IPX  Destination socket       = 0451  (NetWare Server)
IPX  Source network           = 00000009
IPX  Source network.node      = 00000009.4000755CD002
IPX  Source socket            = 401B  (?)
IPX
NCP  ***** Novell Advanced NetWare *****
NCP
NCP  Request type = 1111 (Create Connection)
NCP  Seq no=0 (dec)   Connection no=255 (dec)   Task no=0 (dec)
NCP
NCP  ***** Create Service Connection *****
NCP
NCP  Request type = 1111 (Create Connection)
NCP
NCP  Normal end of "Create Service Connection"‘
NCP
NCP
```

```
- - - - - - - - - - - - - Frame 381 - - - - - - - - - - - - - - - -

Number Destination       Source         Interpretation
   381 00000009.4000755CD NW41          IPX D=00000009.4000755CD002 S=30ABA597.000000000001 D=401B S=0451
                                         NCP R OK  7

IPX  ***** IPX header *****
IPX
IPX  Checksum = FFFF (Null Checksum)
IPX  Length = 38 (dec)
IPX  Transport control = 00
IPX     0000 .... = Reserved
IPX     .... 0000 = Hop count
IPX  Packet type = 17 (dec) (Novell NetWare)
IPX
IPX  Destination network      = 00000009
IPX  Destination network.node = 00000009.4000755CD002
IPX  Destination socket       = 401B  (?)
IPX  Source network           = 30ABA597
IPX  Source network.node      = 30ABA597.000000000001, NW41
IPX  Source socket            = 0451  (NetWare Server)
IPX
NCP  ***** Novell Advanced NetWare *****
NCP
NCP  Request type = 3333 (Reply)
NCP  Seq no=0 (dec)   Connection no=9 (dec)   Task no=1 (dec)
NCP
NCP  ***** Create Service Connection Reply *****
NCP
NCP  Request type = 1111  reply to frame 380
NCP
NCP  Completion code = 00 (OK)
NCP  Connection status flags = 00 (OK)
NCP
NCP  Normal end of "Create Service Connection Reply"
NCP
```

Notes:

1 Frame 375 shows the Get Nearest Server request sent out by the client on IPX network 9 (00000009) node address 4000755CD002.

2 Frame 376 shows the server NW41 responding to frame 375 with a Get Nearest Server response. This includes the internal IPX network address, (30ABA597) the node name of server NW41 (00000001) and which socket to use (0451).

3 Because the packet sent out in frame 375 was a broadcast from the client, server MANSERV1 also responds with a Get Nearest Server response, but as the client has already received a reply from NW41 this packet is ignored.

4 As the client does not know a route to IPX network 30ABA597, it sends out another broadcast packet requesting routing information for the server network.

5 Any server/router can respond to the above request. In our case it was server NW41 which responded with the necessary routing information showing the hop count and number of ticks to its internal IPX network.

6 The client now has all the necessary information on how to get to the server, so it now wants the upper level NCP application to continue the connection using the socket number provided in frame 376 (0451). The client also provides a socket number for the server to use when sending NCP packets to it (401B)

7 The server accepts the request and all further packets will be NCP using the provided socket numbers. The login process continues now and eventually the end user will be prompted with a login screen.

Appendix B. Special Notices

This publication is intended to help AS/400 technical specialists understand and be able to configure the AS/400 IPX router support. The information in this publication is not intended as the specification of any programming interfaces that are provided by Operating System/400. See the PUBLICATIONS section of the IBM Programming Announcement for operating System/400 for more information about what publications are considered to be product documentation.

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Appendix C. Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

C.1 International Technical Support Organization Publications

For information on ordering these ITSO publications see "How to Get ITSO Redbooks" on page 325.

- *IBM 2210 Nways Multiprotocol Description and Configuration Scenarios*, SG24-4446
- *AS/400 AnyNet Scenarios*, SG24-2531

C.2 Redbooks on CD-ROMs

Redbooks are also available on CD-ROMs. **Order a subscription** and receive updates 2-4 times a year at significant savings.

CD-ROM Title	Subscription Number	Collection Kit Number
System/390 Redbooks Collection	SBOF-7201	SK2T-2177
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Transaction Processing and Data Management Redbook	SBOF-7240	SK2T-8038
AS/400 Redbooks Collection	SBOF-7270	SK2T-2849
RS/6000 Redbooks Collection (HTML, BkMgr)	SBOF-7230	SK2T-8040
RS/6000 Redbooks Collection (PostScript)	SBOF-7205	SK2T-8041
Application Development Redbooks Collection	SBOF-7290	SK2T-8037
Personal Systems Redbooks Collection	SBOF-7250	SK2T-8042

C.3 Other Publications

These publications are also relevant as further information sources:

- *AS/400 Advanced Series Internetwork Packet Exchange Support Version 3*, SC41-3400
- *NetWare, the Professional Reference third edition* by Karanjit Siyan
- *OS/400 Integration for Novell NetWare Version 3*, SC41-3124-00

How to Get ITSO Redbooks

This section explains how both customers and IBM employees can find out about ITSO redbooks, CD-ROMs, workshops, and residencies. A form for ordering books and CD-ROMs is also provided.

This information was current at the time of publication, but is continually subject to change. The latest information may be found at http://www.redbooks.ibm.com.

How IBM Employees Can Get ITSO Redbooks

Employees may request ITSO deliverables (redbooks, BookManager BOOKs, and CD-ROMs) and information about redbooks, workshops, and residencies in the following ways:

- **PUBORDER** — to order hardcopies in United States
- **GOPHER link to the Internet** - type GOPHER.WTSCPOK.ITSO.IBM.COM
- **Tools disks**

  To get LIST3820s of redbooks, type one of the following commands:

  ```
  TOOLS SENDTO EHONE4 TOOLS2 REDPRINT GET SG24xxxx PACKAGE
  TOOLS SENDTO CANVM2 TOOLS REDPRINT GET SG24xxxx PACKAGE (Canadian users only)
  ```

  To get BookManager BOOKs of redbooks, type the following command:

  ```
  TOOLCAT REDBOOKS
  ```

  To get lists of redbooks, type one of the following commands:

  ```
  TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET ITSOCAT TXT
  TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET LISTSERV PACKAGE
  ```

  To register for information on workshops, residencies, and redbooks, type the following command:

  ```
  TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ITSOREGI 1996
  ```

  For a list of product area specialists in the ITSO: type the following command:

  ```
  TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ORGCARD PACKAGE
  ```

- **Redbooks Web Site on the World Wide Web**

  http://w3.itso.ibm.com/redbooks

- **IBM Direct Publications Catalog on the World Wide Web**

  http://www.elink.ibmlink.ibm.com/pbl/pbl

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- **REDBOOKS category on INEWS**
- **Online** — send orders to: USIB6FPL at IBMMAIL or DKIBMBSH at IBMMAIL
- **Internet Listserver**

  With an Internet e-mail address, anyone can subscribe to an IBM Announcement Listserver. To initiate the service, send an e-mail note to announce@webster.ibmlink.ibm.com with the keyword subscribe in the body of the note (leave the subject line blank). A category form and detailed instructions will be sent to you.

Redpieces

For information so current it is still in the process of being written, look at ″Redpieces″ on the Redbooks Web Site (http://www.redbooks.ibm.com/redpieces.htm). Redpieces are redbooks in progress; not all redbooks become redpieces, and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

How Customers Can Get ITSO Redbooks

Customers may request ITSO deliverables (redbooks, BookManager BOOKs, and CD-ROMs) and information about redbooks, workshops, and residencies in the following ways:

- **Online Orders** — send orders to:

	IBMMAIL	Internet
In United States:	usib6fpl at ibmmail	usib6fpl@ibmmail.com
In Canada:	caibmbkz at ibmmail	lmannix@vnet.ibm.com
Outside North America:	dkibmbsh at ibmmail	bookshop@dk.ibm.com

- **Telephone orders**

United States (toll free)	1-800-879-2755
Canada (toll free)	1-800-IBM-4YOU
Outside North America	(long distance charges apply)
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(+45) 4810-1420 - Dutch	(+45) 4810-1620 - Italian
(+45) 4810-1540 - English	(+45) 4810-1270 - Norwegian
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(+45) 4810-1220 - French	(+45) 4810-1170 - Swedish

- **Mail Orders** — send orders to:

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Raleigh, NC 27626-0570	Canada	Denmark
USA		

- **Fax** — send orders to:

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Canada	1-403-267-4455
Outside North America	(+45) 48 14 2207 (long distance charge)

- **1-800-IBM-4FAX (United States)** or **(+1)001-408-256-5422 (Outside USA)** — ask for:

  Index # 4421 Abstracts of new redbooks
  Index # 4422 IBM redbooks
  Index # 4420 Redbooks for last six months

- **Direct Services** - send note to `softwareshop@vnet.ibm.com`

- **On the World Wide Web**

Redbooks Web Site	http://www.redbooks.ibm.com
IBM Direct Publications Catalog	http://www.elink.ibmlink.ibm.com/pbl/pbl

- **Internet Listserver**

  With an Internet e-mail address, anyone can subscribe to an IBM Announcement Listserver. To initiate the service, send an e-mail note to `announce@webster.ibmlink.ibm.com` with the keyword `subscribe` in the body of the note (leave the subject line blank).

Redpieces

For information so current it is still in the process of being written, look at ″Redpieces″ on the Redbooks Web Site (`http://www.redbooks.ibm.com/redpieces.htm`). Redpieces are redbooks in progress; not all redbooks become redpieces, and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

IBM Redbook Order Form

Please send me the following:

Title	Order Number	Quantity

First name Last name

Company

Address

City Postal code Country

Telephone number Telefax number VAT number

- Invoice to customer number
- Credit card number

Credit card expiration date Card issued to Signature

We accept American Express, Diners, Eurocard, Master Card, and Visa. Payment by credit card not available in all countries. Signature mandatory for credit card payment.

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ITSO Redbook Evaluation

Using the AS/400 as an IPX Router
SG24-4736-00

Your feedback is very important to help us maintain the quality of ITSO redbooks. **Please complete this questionnaire and return it using one of the following methods:**

- Use the online evaluation form found at http://www.redbooks.com
- Fax this form to: USA International Access Code + 1 914 432 8264
- Send your comments in an Internet note to redbook@vnet.ibm.com

Please rate your overall satisfaction with this book using the scale:
(1 = very good, 2 = good, 3 = average, 4 = poor, 5 = very poor)

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Please answer the following questions:

Was this redbook published in time for your needs? Yes____ No____

If no, please explain:

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What other redbooks would you like to see published?

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Comments/Suggestions: (THANK YOU FOR YOUR FEEDBACK!)

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