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International Technical Support Organization

AS/400 AnyNet Scenarios

April 1996

IBM

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Raleigh Center

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Second Edition (April 1996)

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Abstract

This redbook is unique in its detailed coverage of AnyNet/400. It focuses on providing configuration information and configuration examples for AS/400 AnyNet scenarios. These scenarios cover not just AnyNet/400-to-AnyNet/400 connections and Client Access/400 AnyNet connections, but also AnyNet/400-to-AnyNet/2 connections and AnyNet/400-to-AnyNet/MVS connections. Also included is a 5494 scenario showing how this remote workstation controller can be connected to an AS/400 via a TCP/IP network. Information is provided about the AS/400 configuration steps required to implement Sockets over SNA, APPC over TCP/IP, APPC over IPX and Sockets over IPX. Information is also provided about the Client Access/400 configuration steps for APPC over TCP/IP on Client Access/400 for Windows 3.1 and Client Access/400 Optimized for OS/2. The document also includes information on AS/400 APING.

This book was written for customers and IBM technical professionals. Some knowledge of TCP/IP and APPN is assumed.

(357 pages)

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Preface

This document is intended to give customers and IBM technical professionals a quick start in the implementation of AnyNet/400. It contains information that will help the reader understand the steps necessary to implement AnyNet/400 in both a totally AS/400 environment and a mixed (AS/400 - non-AS/400) environment. Sockets over SNA, APPC over TCP/IP, Sockets over IPX and APPC over IPX are covered.

How This Document is Organized

The document is organized as follows:

- "AnyNet Introduction"

  This introduction chapter gives a general overview of AnyNet and the functions provided by the AnyNet family of products.

- "Networking Blueprint"

  This chapter gives an overview of the IBM Networking Blueprint. AnyNet products implement the MPTN (Multiprotocol Transport Networking) architecture. MPTN is a component the networking blueprint.

- "Multiprotocol Transport Networking (MPTN) Architecture"

  This chapter gives an overview of the MPTN (Multiprotocol Transport Networking) architecture.

- "AnyNet Product Family"

  This chapter gives an overview of the members of the AnyNet product family.

- "AnyNet/400 Sockets over SNA"

  This chapter discusses AnyNet/400 Sockets over SNA. It includes configuration information and configuration examples for various Sockets over SNA scenarios.

- "AnyNet/400 APPC over TCP/IP"

  This chapter discusses AnyNet/400 APPC over TCP/IP. It includes configuration information and configuration examples for various APPC over TCP/IP scenarios.

- "AnyNet Gateways"

  This chapter describes how AnyNet/400 can be used in conjunction with AnyNet Gateways. It includes configuration examples for various Sockets over SNA and APPC over TCP/IP scenarios.

- "AnyNet/400 APPC over IPX"

  This chapter discusses AnyNet/400 APPC over IPX. It includes configuration information in the form of a configuration example.

- "AnyNet/400 Sockets over IPX"

  This chapter discusses AnyNet/400 Sockets over IPX. It includes configuration information and configuration examples for Sockets over IPX scenarios.

- "Client Access/400 for Windows 3.1 over TCP/IP"

This chapter describes how AnyNet can be used by Client Access/400 for Windows 3.1 to provide Client Access/400 connectivity over a TCP/IP network. It includes configuration information in the form of a configuration example.

- "Client Access/400 Optimized for OS/2 over TCP/IP"

  This chapter describes how AnyNet can be used by Client Access/400 Optimized for OS/2 to provide Client Access/400 connectivity over a TCP/IP network. It includes configuration information in the form of a configuration example.

- Appendix A, "Communications Traces"

  This chapter provides formatted communications trace examples for both Sockets over SNA and APPC over TCP/IP.

- Appendix B, "APING"

  This chapter discusses the APING test tool.

Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this document.

- *AS/400 TCP/IP Configuration and Reference*, SC41-3420
- *AS/400 Communications Configuration*, SC41-3401
- *AS/400 APPC Programming*, SC41-3443
- *AS/400 Sockets Programming*, SC41-3422
- *AS/400 APPN Support*, SC41-3407
- *AS/400 International Packet Exchange Support*, SC41-3400
- *Client Access/400 for Windows 3.1 TCP/IP Setup*, SC41-3580
- *Client Access/400 Optimized for OS/2 Getting Started*, SC41-3510
- *Multiprotocol Transport Networking (MPTN) Architecture: Technical Overview*, GC31-7073
- *Multiprotocol Transport Networking (MPTN) Architecture: Formats*. This manual is part of the Networking Architectures Overview Online Library, which may be obtained by ordering the IBM Online Library Networking Systems Softcopy Collection Kit, SK2T-6012.

International Technical Support Organization Publications

- *MPTN Architecture: Tutorial and Product Implementations*, SG24-4170
- *AnyNet/2: Sockets over SNA and NetBIOS over SNA, Installation and Interoperability*, GG24-4396
- *AnyNet: SNA over TCP/IP, Installation and Interoperability*, GG24-4395
- *Inside Client Access/400 Optimized for OS/2*, SG24-2587

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AnyNet Introduction

AnyNet is a family of software products designed to make it easier for customers to choose the applications that meet the needs of their business, regardless of what transport protocol is used in their local or wide area network. AnyNet products implement the Multiprotocol Transport Networking (MPTN) architecture. Members of the AnyNet family make it possible for these communications paths on various platforms:

- APPC over TCP/IP
- APPC over IPX
- SNA over TCP/IP
- Sockets over SNA
- Sockets over IPX
- Sockets over NetBIOS
- NetBEUI over SNA

Note

OS/400 Version 3 Release 1 provides support for APPC over TCP/IP, Sockets over SNA, APPC over IPX and Sockets over IPX.

In addition to the above access node solutions, the following gateway solutions are also currently available:

- SNA over TCP/IP Gateway
- Sockets over SNA Gateway
- IPX over SNA Gateway

Note

OS/400 Version 3 Release 1 provides no gateway support.

An example of a customer solution provided by AnyNet is: A customer may like TCP′s File Transfer Program (FTP) which runs on TCP/IP, but their transport network is SNA. AnyNet Sockets over SNA would allow them to use FTP across their SNA network. Thus, they can choose FTP as an application without having to introduce another logical network to the enterprise or extend the reach of an existing network.

AnyNet products are based on the Multiprotocol Transport Networking (MPTN) architecture, which allows applications to be enabled in mixed protocol networks. The industry standard MPTN solution is part of the Networking Blueprint framework introduced in 1992 by IBM. MPTN is an architecture for the common boundary between the application support and transport network layers. The common boundary can be used for application enablement and network integration.

The customer requirements satisfied by AnyNet products fall into two areas:

Application: Application providers can now focus on best meeting the end user′s needs. The current investment in applications is protected, even if the network they depend on changes. Further, current applications can now be used to serve more end users in more locations, since the constraints of network protocol dependence can be removed. By selecting from a much wider range of standard applications, without concern for the network implications, more users can be given more solutions sooner. Application developers, whether in-house of ISVs, can use standard APIs and services to create much more portable applications, which can now operate across a much wider range of network configurations.

Network: Network providers can now concentrate on solving their problems without constantly struggling to keep from impacting users who are dependant on access to certain applications and data. They can now begin to extend the reach of their networks to more users, thus providing a better service; the ability to install and run non-native applications on existing networks will relieve network administrators from some of the difficulty of migrating their networks to achieve cost savings. Being able to consolidate networks and reduce the number of transport protocols to be managed, without changing the installed user applications, should allow for more cost-effective networks to be developed. Where there are now completely separate networks serving different sorts of users, which have grown to become largely parallel and redundant, it will be possible to more easily consolidate their traffic onto a single transport network without impacting the existing users.

The AnyNet products will be attractive to customers who:

- Have SNA application solutions that they want to extend to TCP/IP network end users
- Are interested in adding support for sockets applications and/or NetBIOS applications on SNA networks
- Want to allow remote IPX and/or TCP/IP branch locations to be managed over an existing SNA network at the customer central site
- Want to provide SNA connectivity over TCP/IP networks
- Want to consolidate or change network backbones

APPC over TCP/IP

APPC over TCP/IP allows APPC applications to communicate over TCP/IP networks. LU 6.2 APPC or CPI-C applications can be added to an existing TCP/IP network.

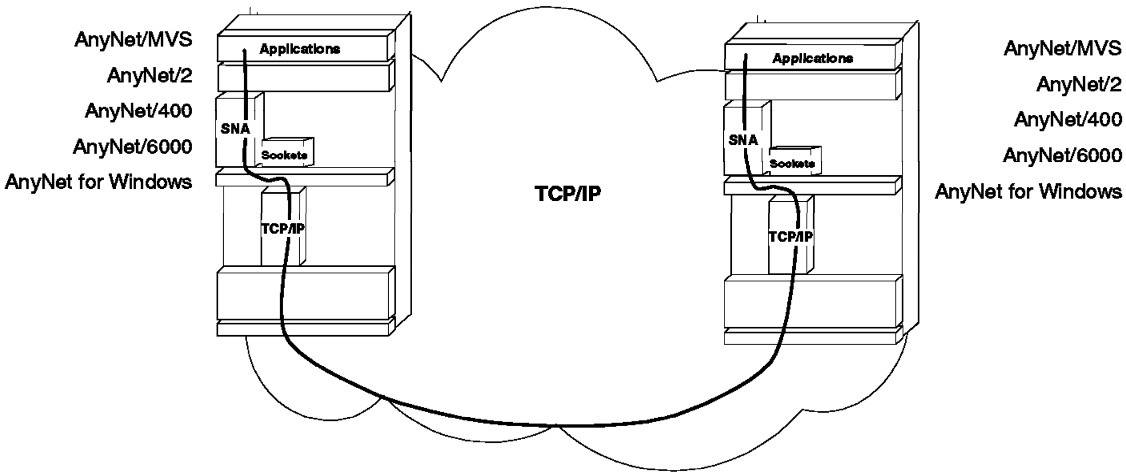

Figure 1. APPC over TCP/IP

APPC over IPX

APPC over IPX allows APPC applications to communicate over IPX networks. LU 6.2 APPC or CPI-C applications can be added to an existing IPX network.

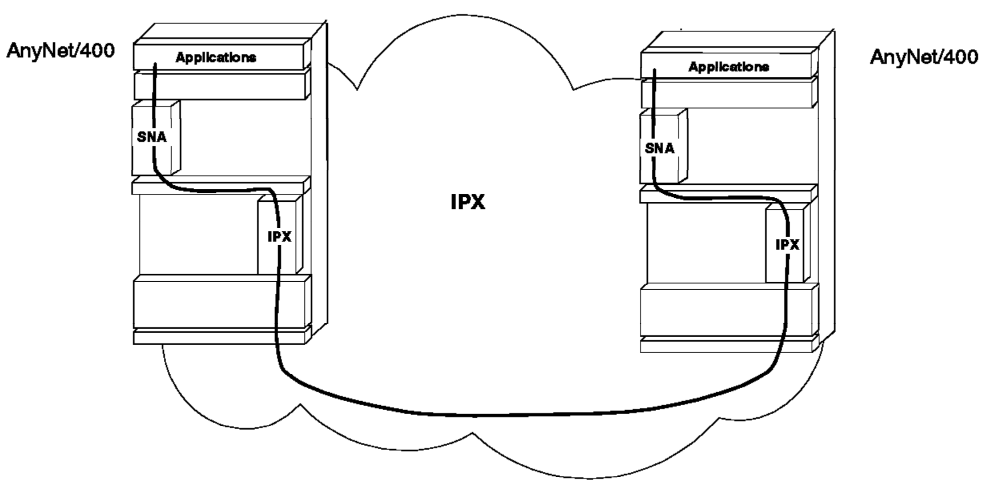

Figure 2. APPC over IPX

SNA over TCP/IP

SNA over TCP/IP broadens the above APPC over TCP/IP support to include other LU types. This allows, in addition to APPC over TCP/IP, LU2 emulator and LU1/LU3 printer sessions to communicate across TCP/IP networks.

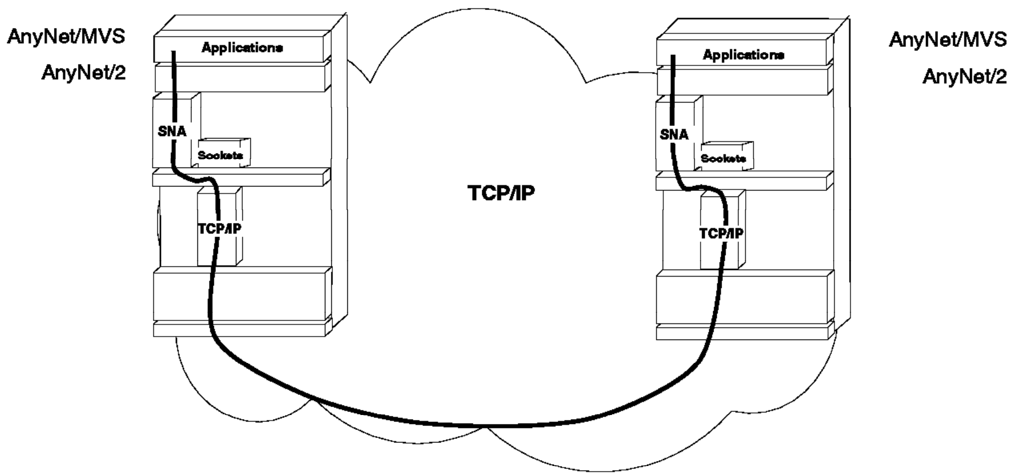

Figure 3. SNA over TCP/IP

Sockets over SNA

Sockets over SNA allows sockets applications to communicate over SNA networks. Applications written to the sockets interface can be added to an existing SNA network.

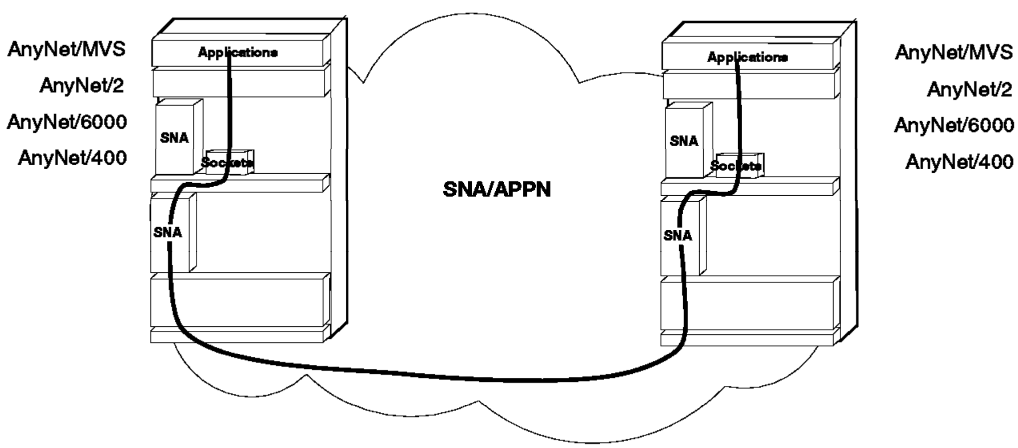

Figure 4. Sockets over SNA

Sockets over IPX

Sockets over IPX allows sockets applications to communicate over IPX networks. Applications written to the sockets interface can be added to an existing IPX network.

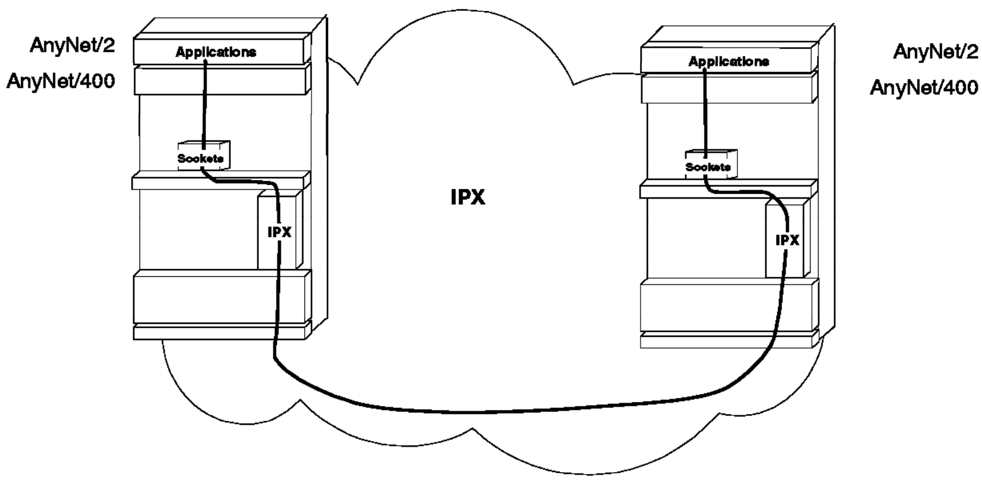

Figure 5. Sockets over IPX

Sockets over NetBIOS

Sockets over NetBIOS allows sockets applications to communicate over NetBIOS networks. Applications written to the sockets interface can be added to an existing NetBIOS network.

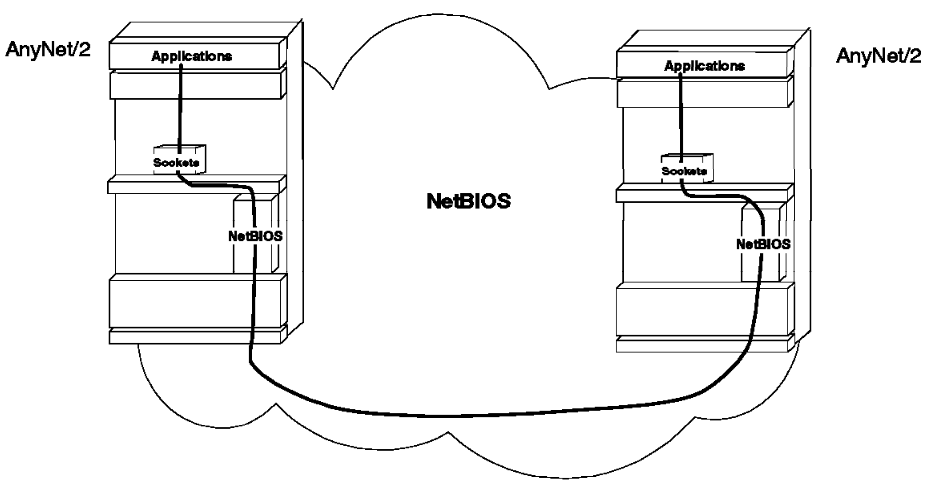

Figure 6. Sockets over NetBIOS

NetBEUI over SNA

NetBEUI over SNA allows NetBIOS-based applications (for example Lotus Notes, IBM′s LAN Server) to communicate across SNA networks.

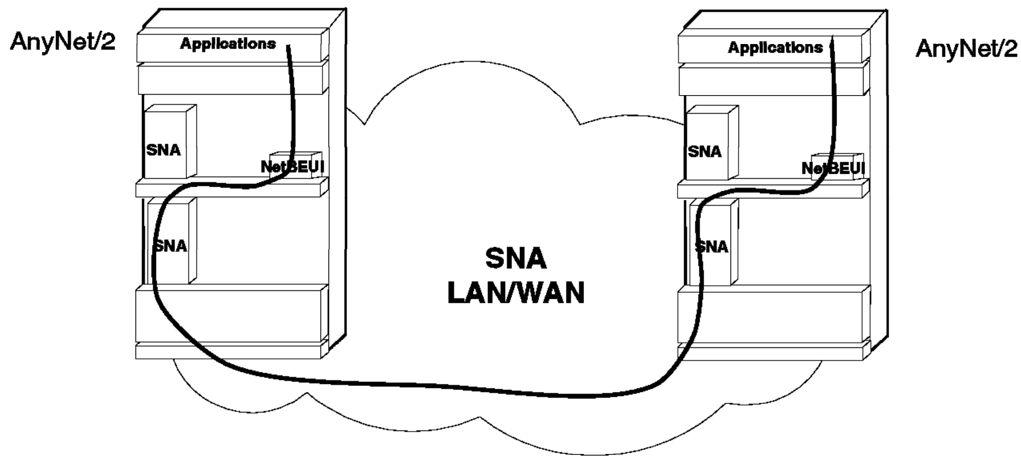

Figure 7. NetBEUI over SNA

SNA over TCP/IP Gateway

An SNA over TCP/IP Gateway provides SNA application connectivity across SNA and TCP/IP networks. Applications on existing SNA systems can communicate through the gateway to SNA applications on TCP/IP networks.

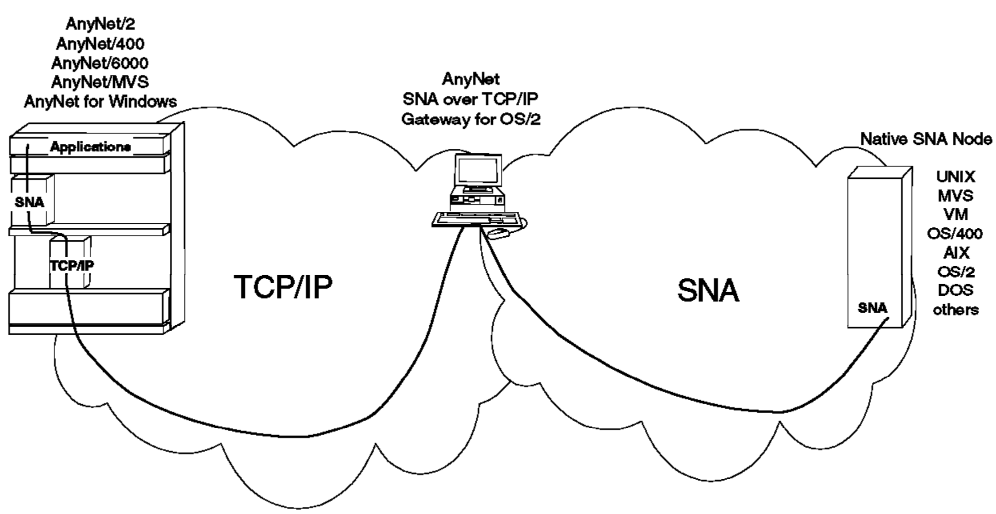

Figure 8. SNA over TCP/IP Gateway

Multiple SNA over TCP/IP Gateways can also be linked to provide communications between native SNA systems over a TCP/IP network.

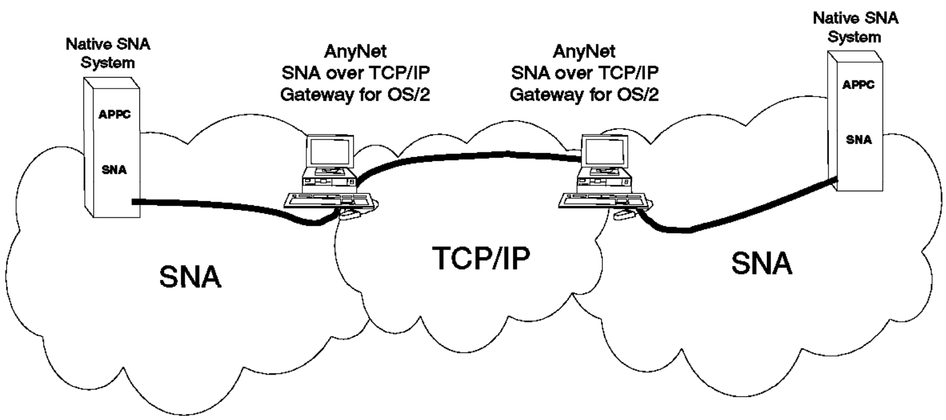

Figure 9. Multiple SNA over TCP/IP Gateways

AnyNet/MVS also provides an SNA over TCP/IP Gateway function.

Sockets over SNA Gateway

A Sockets over SNA Gateway provides socket application connectivity across TCP/IP and SNA networks. Applications on existing TCP/IP systems can communicate through the gateway to TCP/IP applications on SNA networks.

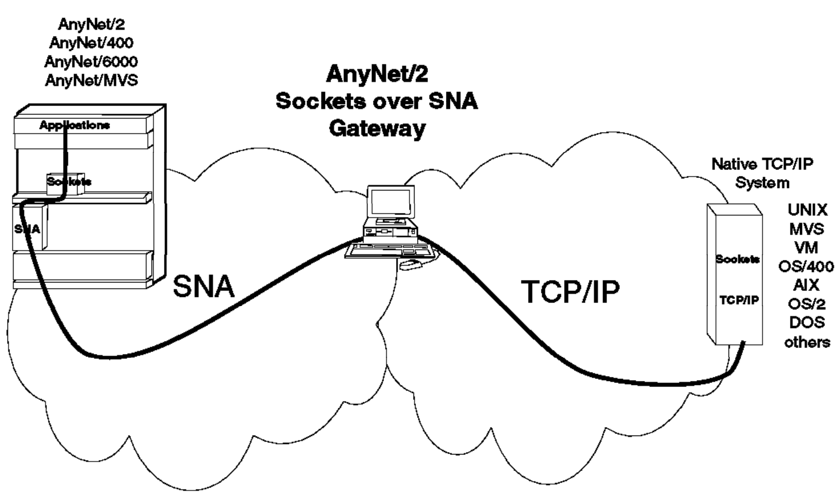

Figure 10. Sockets over SNA Gateway

Multiple Sockets over SNA Gateways can also be linked to provide communications between native TCP/IP systems over an SNA network.

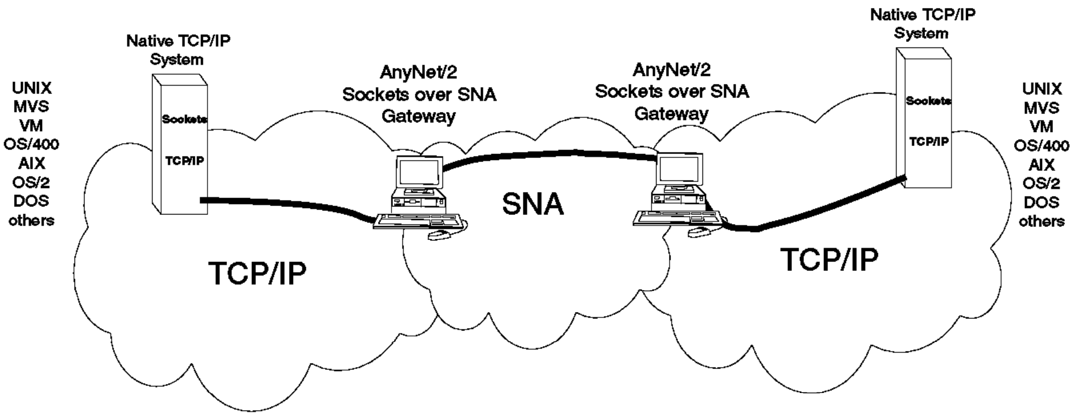

Figure 11. Multiple Sockets over SNA Gateways

IPX over SNA Gateway

An IPX over SNA Gateway provides IPX application connectivity across IPX LANs and SNA networks. End users on IPX LANs can access and communicate with other IPX LANs across SNA networks.

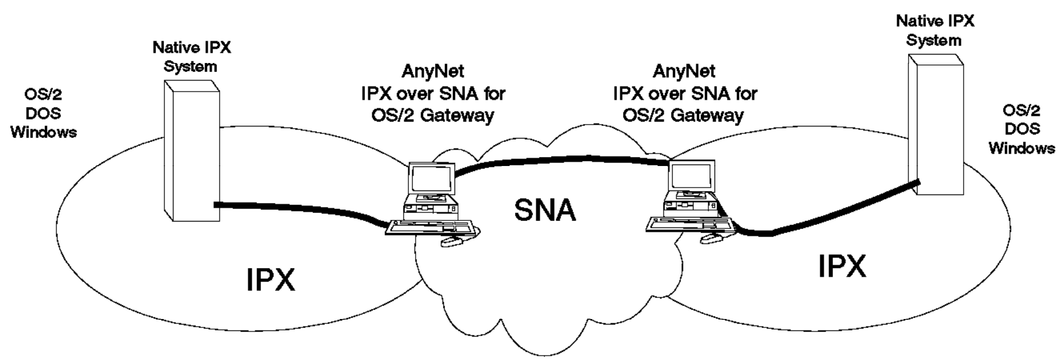

Figure 12. IPX over SNA Gateway

Networking Blueprint

The Networking Blueprint framework was introduced by IBM in 1992. AnyNet products implement the Multiprotocol Transport Networking (MPTN) architecture. MPTN is a component of the Common Transport Semantics layer of the Networking Blueprint.

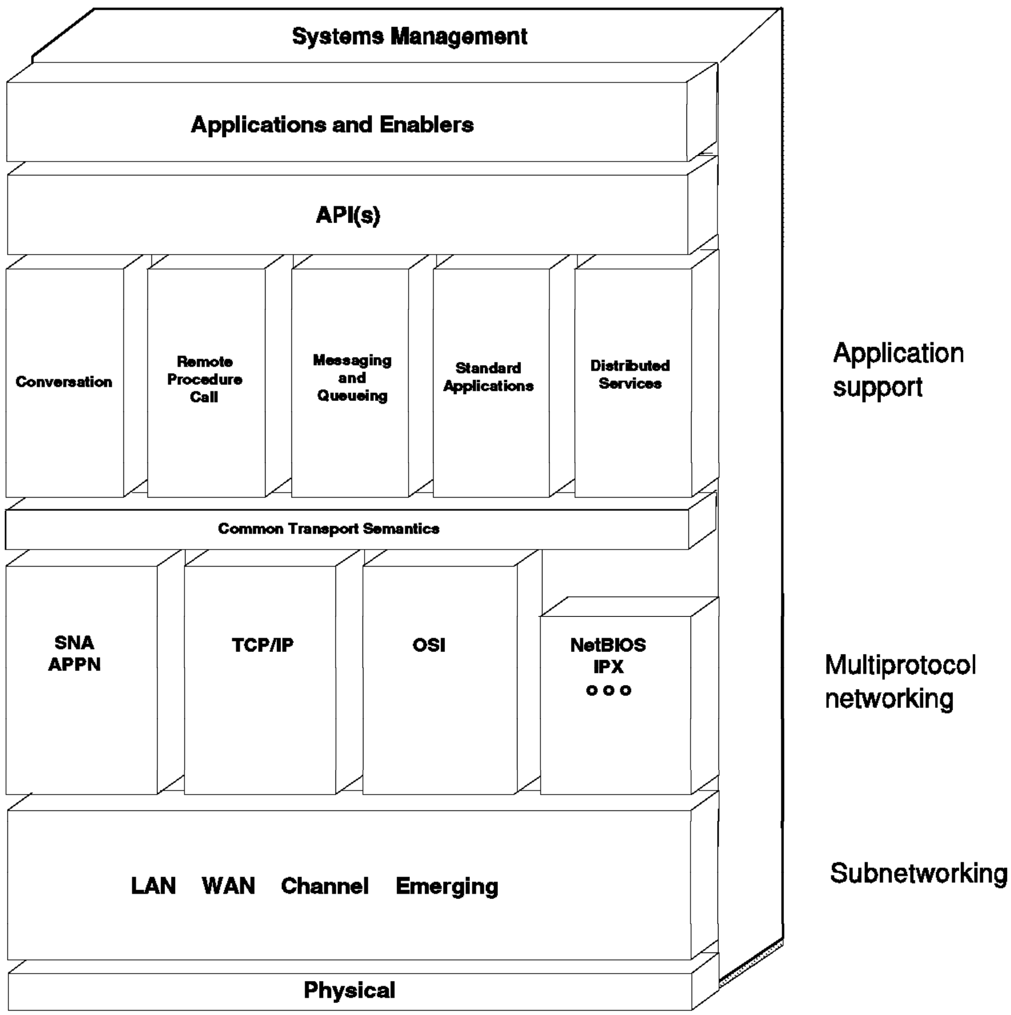

Figure 13. The IBM Networking Blueprint

The Blueprint puts forth a framework for integrating applications using different types of communications protocols into a single network. In this way customers can concentrate on productivity enhancing applications to strengthen their business' competitiveness without being constrained by networking issues.

The Application and Enablers layer represents the applications that make use of the underlying capabilities of the network. These applications may be customer applications or they may be application services, such as distributed database, print, store-and-forward messaging services, etc. that are commonly used by applications.

The API (Application Programming Interfaces) boundary serves the application process and application services. One purpose of this boundary is to make the application process and supporting application services independent of the underlying system architecture. This boundary currently includes three common application programming interfaces for conversations, remote procedure calls and message queuing. In the Blueprint, any application or application service can use one (or more) of these interfaces to obtain appropriate communications support.

The Application Support layer represents the range of application interfaces and services in use today. Typically, these interfaces and services are only able to operate in a specific network environment. For example, Remote Procedure Call (RPC) would only operate in a TCP/IP environment. The Blueprint contains a structure for extending the reach of many different types of applications throughout many different networking environments.

The Common Transport Semantics (CTS) boundary is below the application support layer. The purpose of this boundary is to give the application, with its end-to-end application support facilities, the opportunity to use alternative transport service providers below this boundary. MPTN (of which AnyNet is an implementation) delivers a CTS function.

The Multiprotocol Networking layer represents the variety of networking protocols in use today for sending and exchanging information throughout the network. The Blueprint contains a structure to build a single network that will support all these protocols.

The Subnetworking layer represents a piece of a larger network, for instance a bridged local area network, or a frame relay network. It is in this layer where dramatic change to high speed cell/packet switching will occur.

The Systems Management entity represents a comprehensive management capability encompassing all the elements of the Blueprint.

Open Blueprint

Introduced by IBM in 1994, the Open Blueprint is IBM′s technical approach for integrated, open, client/server and distributed computing across systems platforms. The structure includes industry-standard interfaces, protocols and formats, and IBM extensions to provide the flexibility to accommodate new technologies as they emerge in today′s dynamic open computing environment.

The Open Blueprint incorporates the lower layers and Systems Management backplane of the Networking Blueprint and provides more detail and structure to the software components in the Application Enabling services. In the future, the Networking Blueprint and Open Blueprint will be converged. The Open Blueprint will be used to position new networking technologies in the same way as the Networking Blueprint has been used.

Multiprotocol Transport Networking (MPTN) Architecture

The MPTN architecture is defined in the terminology of the Networking Blueprint. AnyNet products implement the MPTN architecture. In Figure 14, the arrows depict the way the MPTN architecture, by delivering CTS (Common Transport Semantics) function, allows applications designed to run over one transport network to run over another. The arrows depict APPC applications over TCP/IP, sockets applications over SNA and NetBEUI applications over SNA.

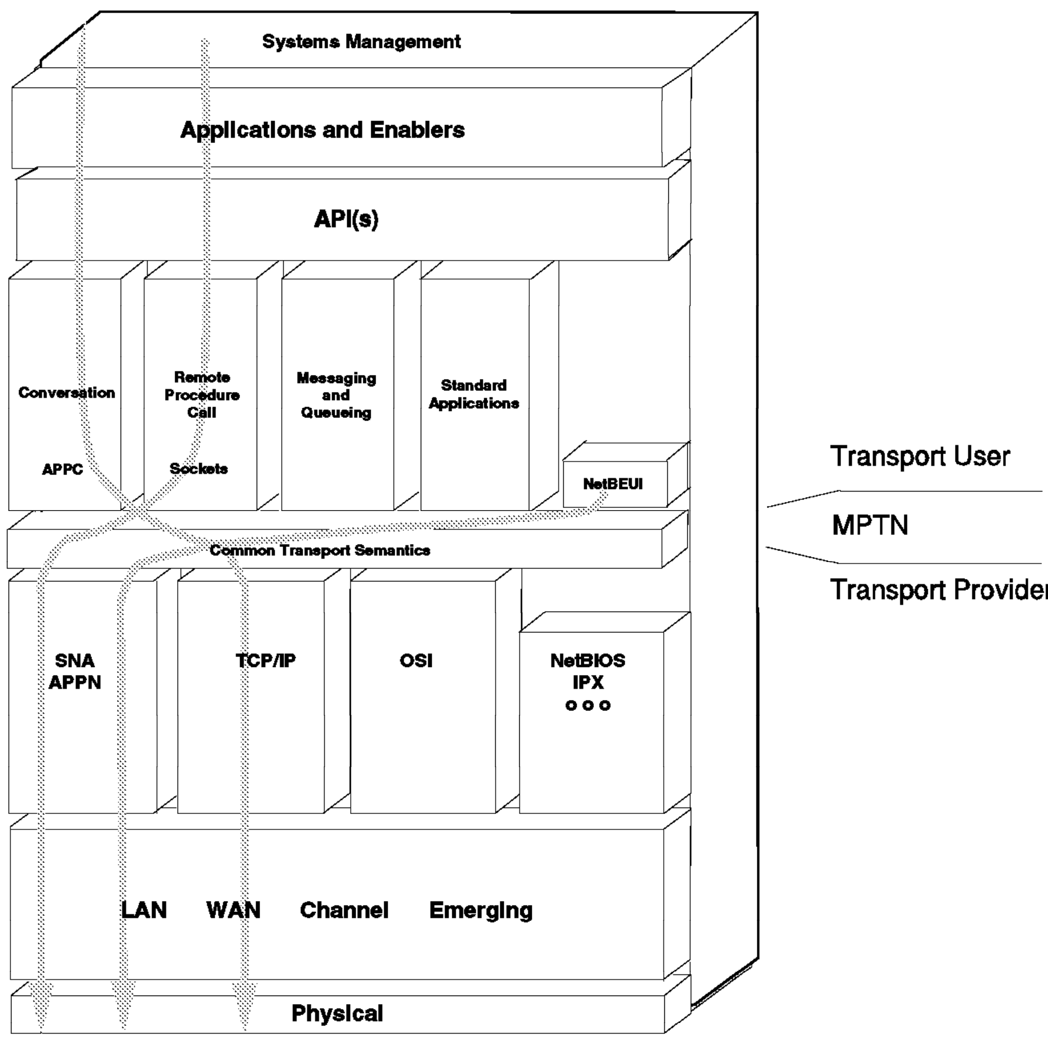

Figure 14. IBM Networking Blueprint - MPTN Implementations

In Networking Blueprint terminology, the term Transport User means application programs and application support functions. The term Transport Provider means a provider of communication service at the transport layer. A transport provider uses one transport protocol to govern the exchange of information between nodes, thus providing a transport network of that type. The terms native and non-native describe a vertical relationship between a transport user and a transport provider. Application programs, designed assuming a particular transport provider, are native to that transport provider. At the same time, they are non-native to another transport provider. A native node is a node with no MPTN capability. For example, a node with SNA application programs running over an SNA transport is a native node.

Note

OS/400 Version 3 Release 1 provides support for: APPC over TCP/IP, Sockets over SNA, APPC over IPX and Sockets over IPX.

Common Transport Semantics (CTS) in the Networking Blueprint divides the protocol stacks at layer 4, the Transport layer. The applications, APIs and application support layers, are above the CTS while the transport network is below the CTS.

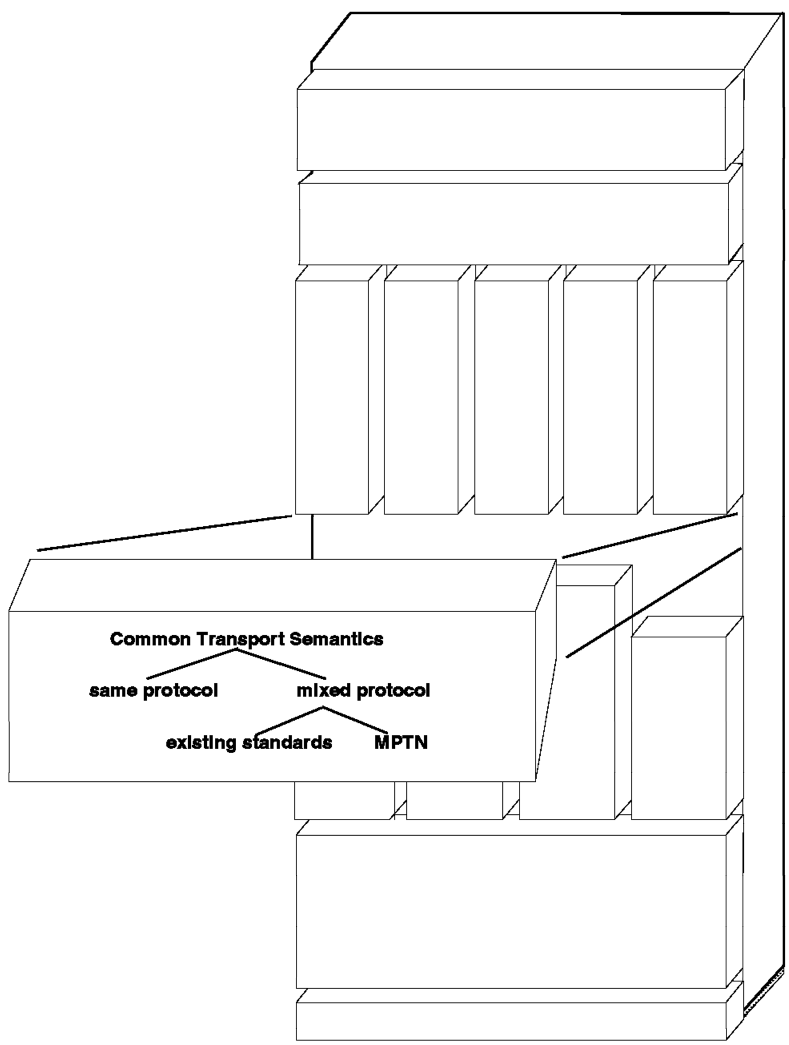

Figure 15. IBM Networking Blueprint - Common Transport Semantics (CTS)

CTS includes all of the functions in the underlying transport providers in the Networking Blueprint. If needed functions are missing from any of the transport providers, CTS itself provides those functions. CTS functions can be achieved in different ways depending on the following situations:

1. Where the installed application program is native to a transport protocol, CTS does not interfere with the native flows.
2. CTS function can be achieved using industry standard compensation methods for particular transport-user/transport-provider combinations, such as a Request for Comment (RFC) 1006 for OSI over TCP/IP and RFCs 1001 and 1002 for NetBIOS over TCP/IP.
3. The MPTN architecture formats, and protocols deliver CTS function where the installed application programs are not native to the installed transport protocol. For example, the MPTN architecture defines how SNA can be the transport provider for sockets applications and how TCP/IP can be the transport provider for CPI-C applications.

Figure 16 illustrates the three situations.

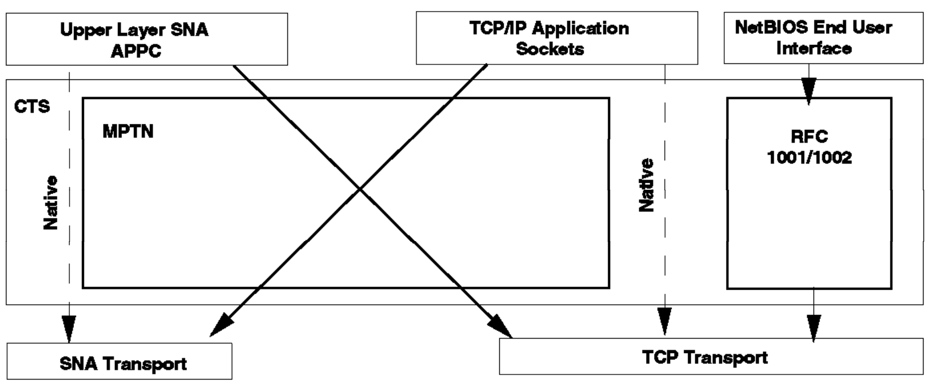

Figure 16. Common Transport Semantics (CTS) Example

Function Compensation in MPTN

Every transport provider lacks some functions supported by other transport providers. For example, SNA, NetBIOS and OSI all support a record model which is lacking in TCP/IP, while TCP/IP supports a stream model which is lacking in SNA, NetBIOS and OSI. In order to support multiple transport users over a common transport provider, MPTN provides function compensation when a transport user requests services that are not provided by the transport provider.

Address Mapping in MPTN

Address mapping is required when the transport user (application) and the transport provider (network protocol) have different addressing schemes.

For example, APPC applications use SNA fully qualified LU names to communicate with each other. If the transport provider is TCP/IP, MPTN needs to perform some address mapping.

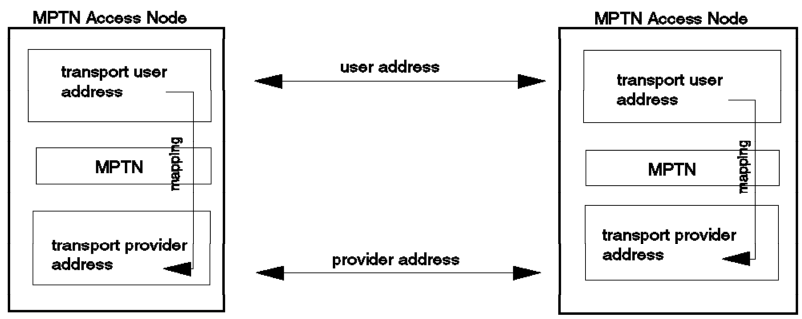

Figure 17. MPTN Address Mapping

In MPTN, there are three architected approaches to address mapping:

1. **Algorithmic**

   MPTN uses an algorithm to generate a transport provider address based on the transport user address. This approach is appropriate when the user's address space is smaller than the provider's address space. Sockets over SNA uses algorithmic mapping with IP host addresses mapped to SNA LU names.

2. **Extended protocol-specific directory**

   This is the extending of a protocol-specific directory to handle transport addresses of other formats. This approach is appropriate when the transport providers directory supports the registration of different address types. APPC over TCP/IP and SNA over TCP/IP support this form of addressing: the TCP/IP domain name server can be used to support SNA names. For example, NETA.LU1 could be registered in the domain name server as LU1.NETA.SNA.IBM.COM.

3. **Address mapper**

   This is basically a database which holds the transport user to transport provider mappings. This is the most general approach but also the most costly.

Figure 18 illustrates the three mapping methods.

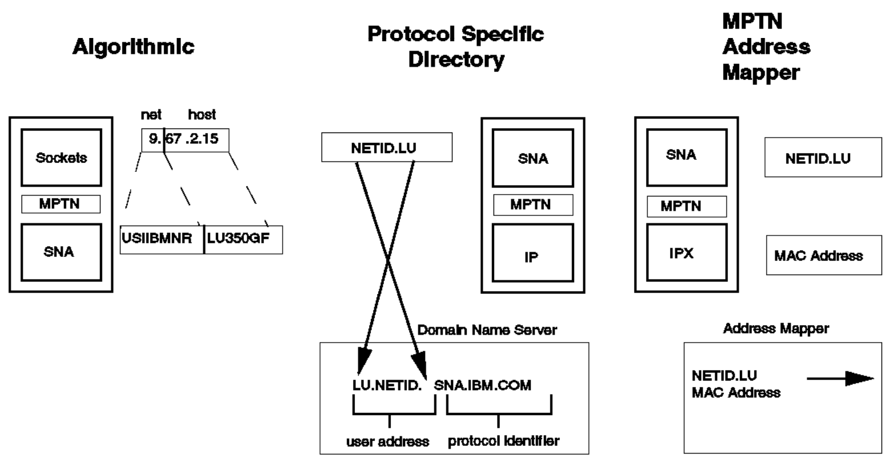

Figure 18. MPTN Address Mapping Examples

The algorithmic example shows how, for Sockets over SNA, the TCP/IP address is mapped into an SNA network-qualified name. This is a two step process. First, by using a mask, the TCP net ID is determined and then mapped to an SNA network name via table lookup. Next, an algorithm is used to determine the LU name from the host ID which is the remaining portion of the TCP/IP address.

The second part of the example illustrates the method used by an extended native directory to generate the TCP/IP address. The TCP/IP domain name server (DNS) is extended to store the user address and protocol identifier. DNS is used to support SNA name types and provide IP addresses for these names when requested. Thus, when the SNA network-qualified name NETID.LU is presented to the name server for address resolution, the SNA name is used as an index into an address mapping table. In this case, the user address portion of the IP address is simply the bit reversed form of the network-qualified SNA name, LU.NETID, and the protocol identifier is preset, in this case, to SNA.IBM.COM.

The third part of the example illustrates the method used by an MPTN address mapper. In this case, the transport user and transport provider association is registered in the address mapper. This occurs dynamically each time a transport user registers a transport-user address, causing a (user-provider) address pair to flow to the address mapper for registration. Thus, when the netBIOS name is presented to the MPTN address mapper for resolution, the associated SNA name, NETID.LU, is returned.

MPTN Data Transport

For data to be routed over a non-native transport network, the data must be formatted such that header information is added appropriate to the transport network over which the data is to be routed. In Figure 19 we can see that when the transport network is *native* to the transport user, SNA in our example, then the data bypasses any MPTN function. However, when the transport network is *non-native* to the transport user, TCP/IP in our example, then an MPTN header and a transport provider header are added to the data.

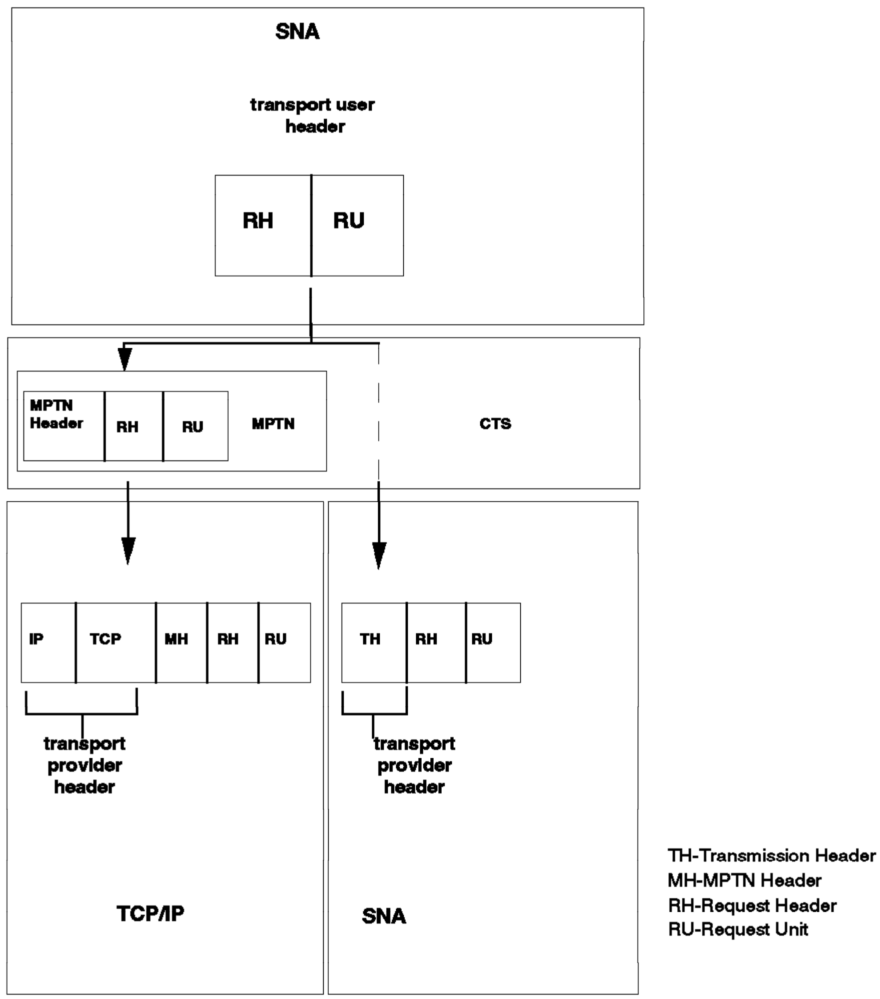

Figure 19. MPTN Data Transport Example

MPTN Network Management

Multiprotocol networks represent a set of heterogeneous networks for the network administrators to manage. MPTN uses *existing* network management protocols in their native environments. For example:

- SNA Management Services (MS) for Alerts in SNA
- SNMP (Simple Network Management Protocol) in TCP/IP
- CMIP (Common Management Information Protocol) in OSI

In the future, MPTN network management will include providing a single user interface to manage not only the native environment but also the following:

- The association between the transport users and the transport provider in the MPTN access node.
- The association between concatenated transport connections at each MPTN gateway.

MPTN Access Node

The MPTN access node is a component that allows application programs to run on a non-native transport network. For example, a node that allows APPC to run over TCP/IP is an MPTN access node.

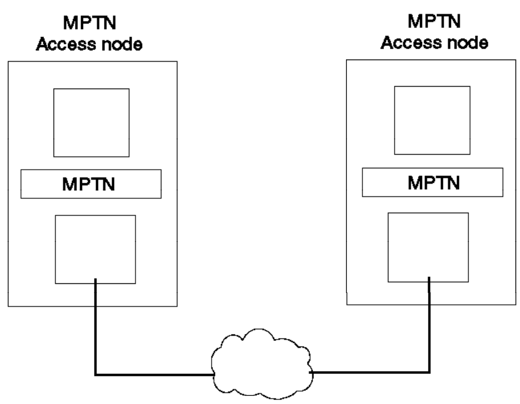

Figure 20. MPTN Access Nodes

Figure 20 shows two MPTN access nodes attached to the same transport network. An MPTN access node can also interoperate with a native node through an MPTN gateway (Figure 21 on page 18).

MPTN Gateway

An MPTN transport gateway connects two dissimilar networks to provide an end-to-end service over their concatenation. Figure 21 shows a single MPTN gateway providing communication between an MPTN access node and a native node. Figure 22 shows two MPTN gateways providing communication between two native nodes. No changes are required at the native nodes in either case.

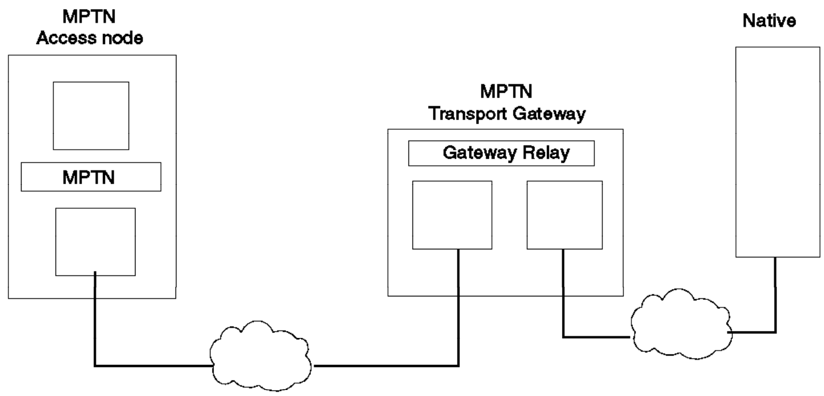

Figure 21. MPTN Transport Gateway

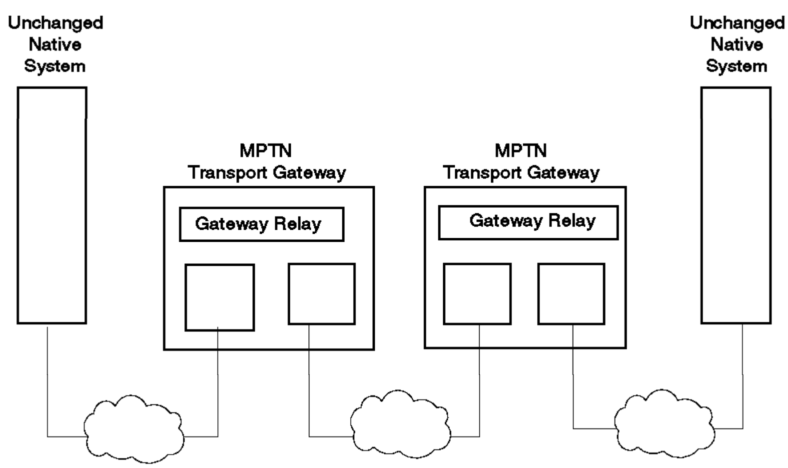

Figure 22. Multiple MPTN Gateways

AnyNet Product Family

The AnyNet family of solutions makes it easier for new applications to be added to existing networks and for multiprotocol networks to be simplified. Each member of the AnyNet family will work in conjunction with another member of the family within the same family group (APPC over TCP/IP, Sockets over SNA, etc.). For example, AnyNet/2 Sockets over SNA will work in conjunction with AnyNet/400 Sockets over SNA. The current members of the family are as follows:

APPC over TCP/IP

- AnyNet/2
- AnyNet/MVS
- AnyNet/400
- Client Access/400
- AnyNet/6000
- AnyNet for Windows

APPC over IPX

- AnyNet/400

SNA over TCP/IP

- AnyNet/2
- AnyNet/MVS

SNA over TCP/IP Gateway

- AnyNet/2
- AnyNet/MVS

Sockets over SNA

- AnyNet/2
- AnyNet/MVS
- AnyNet/400
- AnyNet/6000

Sockets over IPX

- AnyNet/2
- AnyNet/400

Sockets over NetBIOS

- AnyNet/2

Sockets over SNA Gateway

- AnyNet/2

NetBEUI over SNA

- AnyNet/2

IPX over SNA Gateway

- AnyNet/2

AnyNet/2 SNA over TCP/IP

AnyNet/2 Version 2.0 SNA over TCP/IP provides support for all LU types (LU 0, 1, 2, 3 and LU 6.2). This provides total SNA connectivity across TCP/IP networks. For example, LU2 terminal emulation and LU1/3 printer emulation in addition to APPC are supported over TCP/IP. The terminal and printer emulation support gives users on TCP/IP workstations access to host applications. Any SNA application that runs with Communications Manager/2, such as CICS OS/2, DB/2, and terminal emulators, can communicate across a TCP/IP network without change.

AnyNet/2 Sockets over SNA

AnyNet/2 Version 2.0 Sockets over SNA provides support for BSD (Berkeley Software Distribution) 4.3 sockets applications on existing SNA networks. Most sockets applications such as FTP, TELNET and NFS can use this support to run across any combination of APPN or subarea networks without change to the application programs.

AnyNet/2 Sockets over IPX

AnyNet/2 Version 2.0 Sockets over IPX allows sockets applications to communicate over an IPX network to other AnyNet Sockets over IPX access nodes.

AnyNet/2 Sockets over NetBIOS

AnyNet/2 Version 2.0 Sockets over NetBIOS allows sockets applications to communicate over a NetBIOS network to other AnyNet sockets over NetBIOS access nodes.

AnyNet/2 NetBEUI over SNA

AnyNet/2 NetBEUI over SNA Version 1.0 allows NetBIOS applications to be added to exiting SNA networks. Applications such as Lotus Notes and IBM LANServer can be used across any combination of APPN or SNA subarea networks without requiring any application changes.

AnyNet/2 Sockets over SNA Gateway

AnyNet/2 Sockets over SNA Gateway Version 1.1 can be used to either connect SNA and TCP/IP networks or connect TCP/IP networks across an SNA network. When used to connect SNA and TCP/IP networks, most BSD 4.3 sockets applications (such as FTP, TELNET and NFS) on systems in the TCP/IP network can, without change, communicate with like sockets applications running on AnyNet Sockets over SNA systems in the SNA network. When used to connect TCP/IP networks across an SNA network, sockets applications in one TCP/IP network can communicate with sockets applications in the another TCP/IP network without change across an SNA network.

AnyNet/2 SNA over TCP/IP Gateway

The AnyNet/2 SNA over TCP/IP Gateway can be used to connect TCP/IP and SNA networks or to connect SNA networks across a TCP/IP network. When used to connect TCP/IP and SNA networks, APPC applications on systems in the SNA network can, without change, communicate with like applications running on AnyNet APPC over TCP/IP systems in the TCP/IP network. SNA emulators and printers can communicate from an AnyNet/2 SNA over TCP/IP system through the gateway to a VTAM Version 4 Release 2 host. When used to connect SNA networks across a TCP/IP network, SNA applications in one SNA network can communicate with SNA applications in the other SNA network without change across a TCP/IP network.

AnyNet/2 IPX over SNA Gateway

The AnyNet/2 IPX over SNA Gateway provides IPX connectivity across SNA networks. To the IPX network, the IPX over SNA gateway has the appearance of a NetWare router. It provides the service and routing information protocols required to participate in IPX connectivity. The IPX over SNA gateway fully protects the SNA backbone by firewalling IPX broadcasts. It automatically learns the locations of local servers and sends information about changes to partner gateways only as needed. It also uses data compression and traffic prioritization (COS) available in Communications Manager/2 to provide bandwidth beyond rated links for the backbone network. All of the traditional benefits of a SNA network, such as reliability and predictable response time, become available to IPX traffic routed through the AnyNet IPX over SNA gateway.

AnyNet for Windows

With the AnyNet APPC over TCP/IP for Windows product, Windows workstations can access CPI-C or APPC applications via a TCP/IP network.

AnyNet/MVS

The AnyNet feature for VTAM Version 4 Release 2 includes support for SNA over TCP/IP, Sockets over SNA, and SNA over TCP/IP Gateway. It also includes a downloadable copy of AnyNet/2 Version 2 and AnyNet/2 Sockets over SNA Gateway Version 1.1. See the previous sections for information on these.

AnyNet/MVS SNA over TCP/IP provides support for all LU types (LU 0, 1, 2, 3 and LU 6.2). This provides total SNA connectivity across TCP/IP networks. For example, LU2 terminal emulation and LU1/3 printer emulation in addition to APPC are supported over TCP/IP. The terminal and printer emulation support gives users on TCP/IP workstations access to host applications.

AnyNet/MVS Sockets over SNA provides support for BSD (Berkeley Software Distribution) 4.3 sockets applications on existing SNA networks. Most sockets applications, such as FTP, TELNET and NFS, can use this support to run across any combination of APPN or subarea networks without change to the application programs.

The AnyNet/MVS SNA over TCP/IP Gateway can be used to either connect TCP/IP and SNA networks or connect SNA networks across a TCP/IP network. When used to connect TCP/IP and SNA networks, APPC applications on systems in the SNA network can, without change, communicate with like applications running on AnyNet APPC over TCP/IP systems in the TCP/IP network. When used to connect SNA networks across a TCP/IP network, SNA applications in one SNA network can communicate with SNA applications in the other SNA network, without change across a TCP/IP network.

AnyNet/6000 - APPC over SNA and Sockets over SNA

The AnyNet/6000 features of AIX SNA Server/6000 Version 2 Release 1.1 provide support for APPC over TCP/IP and Sockets over SNA.

With AnyNet/6000 APPC over TCP/IP, TCP/IP users can gain access to APPC or CPI-C applications without adding a separate SNA network.

With AnyNet/6000 Sockets over SNA, SNA users can gain access to BSD (Berkeley Software Distribution) 4.3 sockets applications without adding a separate TCP/IP network.

AnyNet/400 - APPC over SNA and Sockets over SNA

AnyNet/400 is shipped with the base OS/400 operating system and includes support for APPC over TCP/IP and Sockets over SNA. OS/400 Version 3 Release 1 Modification 0 or higher is required.

With AnyNet/400 APPC over TCP/IP, TCP/IP users can gain access to APPC or CPI-C applications without adding a separate SNA network. Client Access/400 for Windows 3.1 and Client Access/400 Optimised for OS/2 can use AnyNet to support the use of Client Access/400 across TCP/IP networks. The required portion of AnyNet APPC over TCP/IP is shipped as part of the Client Access/400 product and downloaded to the workstation as part of the installation of Client Access/400.

With AnyNet/400 Sockets over SNA, SNA users can gain access to BSD (Berkeley Software Distribution) 4.3 sockets applications without adding a separate TCP/IP network.

AnyNet/400 - APPC over IPX and Sockets over IPX

Base OS/400 Version 3 Release 1 provides support for APPC over TCP/IP and Sockets over SNA. The OS/400 V3R1 Network Extensions feature (5733-SA1) adds support for APPC over IPX and Sockets over IPX.

When using AnyNet/400 APPC over IPX, CPI-C and APPC applications can run, with no changes, over an IPX network.

The AnyNet/400 Sockets over IPX support allows AF_INET sockets applications to run, unchanged, between systems over an IPX network.

AnyNet/400 Sockets over SNA

This chapter presents the process of defining and verifying AnyNet/400 Sockets over SNA at the International Technical Support Organization in Raleigh.

Along with the AnyNet/400 environments, the AnyNet/2 implementation will also be used in some of the scenarios.

The information is presented in the following sections:

1. Introduction to OS/400 Sockets over SNA
2. Using AnyNet/400 Sockets over SNA
3. Configuring AnyNet/400 Sockets over SNA
4. Sockets over SNA Scenarios
   - Sockets over SNA Scenario 1: AS/400 to AS/400 - Same Subnetwork
   - Sockets over SNA Scenario 2: AS/400 to AS/400 - Different Subnetworks
   - Sockets over SNA Scenario 3: AS/400 to PS/2 - Same Subnetwork
   - Sockets over SNA Scenario 4: AS/400 to Various - Algorithmic Mapping
5. Verifying the Scenarios

For further information on AnyNet/400 Sockets over SNA refer to *AS/400 Sockets Programming*, SC41-3442.

Introduction to OS/400 Sockets over SNA

In today′s computing world, the consumer is able to choose from a vast number of application programs to help run and maintain their businesses. However, these applications are normally developed to run on a specific transport protocol. For example, the File Transfer Protocol (FTP) application was written to be used with the TCP/IP protocol. Similarly, Systems Network Architecture Distributed Services (SNADS) runs over SNA. A company running SNA on their network would need to use an application developed for SNA protocols. A problem arises if this company finds that the FTP application is better suited to their file transfer needs than the SNADS application. This was a problem in the past, but with the announcement of the AnyNet family of products, they can use the FTP application across their SNA network. AnyNet allows a company to choose the application programs that best meet the needs of their business without having to worry about the transport protocol they are using over their network.

AnyNet/400 is one member of the AnyNet family of products. AnyNet/400 is included with the base OS/400 Version 3 Release 1 Modification 0 or higher. Support is provided to allow APPC applications to run over TCP/IP and sockets applications to run over SNA. In addition, Network Extensions (5733-SA1) provides AnyNet/400 support to allow APPC applications to run over IPX and sockets applications to run over IPX. Support is also provided to allow Client Access/400 to run over TCP/IP. In this chapter we look at sockets applications over SNA.

AnyNet/400 Sockets over SNA can be used by those customers who:

- Want to add support for sockets applications on their existing SNA network

- Want to simplify their network by reducing the number of protocols being used

Specifically, Sockets over SNA support in AnyNet/400 allows sockets application programs to communicate between systems over an SNA network. Sockets over SNA support can also be used to communicate with systems in a TCP/IP network. This, however, requires an AnyNet gateway between the SNA and TCP/IP networks. The AnyNet gateway is covered in “AnyNet Gateways” on page 141.

AnyNet/400 Sockets over SNA makes it possible to add BSD (Berkeley Software Distribution) sockets applications to existing SNA networks. This allows OS/400 users to use most sockets applications (for example, FTP, SMTP and SNMP) across an SNA network.

Using AnyNet/400 Sockets over SNA

The AnyNet/400 Sockets over SNA code is part of the base OS/400 V3R1M0 code. There are no special installation requirements.

Once AnyNet/400 Sockets over SNA has been configured, you will be able to run sockets applications over your existing SNA network. At the time that this book was written, the following sockets applications were supported under AnyNet/400:

- File Transfer Protocol (FTP)
- Remote Printing (LPD and LPR)
- Simple Network Management Protocol (SNMP)
- Simple Mail Transfer Protocol (SMTP)
- AS/400 DCE Base Services/400
- PING Server
- Any customer application written to AF_INET using sock_stream or sock_dgram (see below)

The following were not supported:

- TELNET - Still written in PASCAL interface
- PING client - Written to sock_raw

So, TELNET and PING client are not supported by AnyNet/400.

PING client

An OS/400 V3R1 PTF is now available that makes it possible to use the OS/400 PING client with AnyNet. The PTF number is SF25273.

AF_INET sockets applications using either the sock_stream or sock_dgram socket types will work but not those that use the sock_raw interface. The characteristics of a socket are determined by the following:

- Socket type
- Address family
- Protocol

The AS/400 sockets API will support the following three type of sockets:

- Sock_stream

- Sock_dgram
- Sock_raw

The AS/400 will also support the following two address families:

- AF_INET
- AF_UNIX

When we say AF_INET over SNA, we mean any AF_INET sockets application that uses sock_stream or sock_dgram will be supported by AnyNet/400. Note that sock_raw is *not* supported at this time.

The running of these applications is transparent to the user regardless of what transport protocol is being used. The user may, however, notice a performance degradation when using a sockets application via AnyNet/400 as opposed to running the same application natively under TCP/IP. Applications running on their native protocols may run faster than those running on a non-native protocol. The flexibility of the AnyNet/400 product should, however, outweigh any performance degradation. The sockets data will, however, benefit from the following when running over an SNA network:

- From the flow control mechanisms provided by SNA. For large file sizes this may mean that Sockets over SNA will actually run faster than native TCP/IP.
- SNA traffic prioritization via Class of Service. This allows, for example, interactive data to be given a higher priority than file transfer data.
- From the data compression available with APPC/SNA allowing for higher link utilization.

It is important to note that if your system implements AnyNet/400 (the Network Attribute ALWANYNET is set to *YES), any sockets applications running natively over TCP/IP will run slower.

All of these points need to be considered when deciding whether to use the AnyNet/400 support. If not using AnyNet, ALWANYNET should be set to *NO.

Note

To use AnyNet/400 Sockets over SNA it is not necessary to have the TCP/IP Connectivity Utilities (5763-TC1) installed on your system. However, it is necessary to have this licensed program installed before we can use the FTP, LPD/LPR and SMTP TCP/IP applications. To see if this licensed program is installed on your system, enter the command `GO LICPGM` and take option 10.

Configuring AnyNet/400 Sockets over SNA

In order to run Sockets over SNA on your AS/400, the following OS/400 configuration steps are required:

1. Establish an SNA/APPC configuration between the systems.
2. Change the Network Attribute ALWANYNET to *YES.
3. Assign an IP address to your system for Sockets over SNA.
4. Define routes (if necessary) to the system(s) to which you will communicate.
5. Establish IP address to LU name mapping.
6. Map the IP over SNA type of service to an SNA mode.

7. Verify the IP address to LU name mapping.

Note

Configuring AnyNet/400 Sockets over SNA can be a simple three-step process. In many situations steps 2, 3 and 5 only will be required.

The user ID, under which the Sockets over SNA configuration is created, must have sufficient authority to access the relevant commands. Some of the commands require the user ID to have the IOSYSCFG authority. The examples shown here were created using a profile with QSECOFR authority.

1. **Establish an SNA/APPC configuration between the systems**

   A prerequisite for Sockets over SNA is an SNA configuration between the systems. In this step we will show the basic steps to establishing an SNA configuration between two systems. If your system already has an SNA configuration to the remote system with which you want to communicate via Sockets over SNA, then you can skip this step and proceed to step 2 on page 29 in this section.

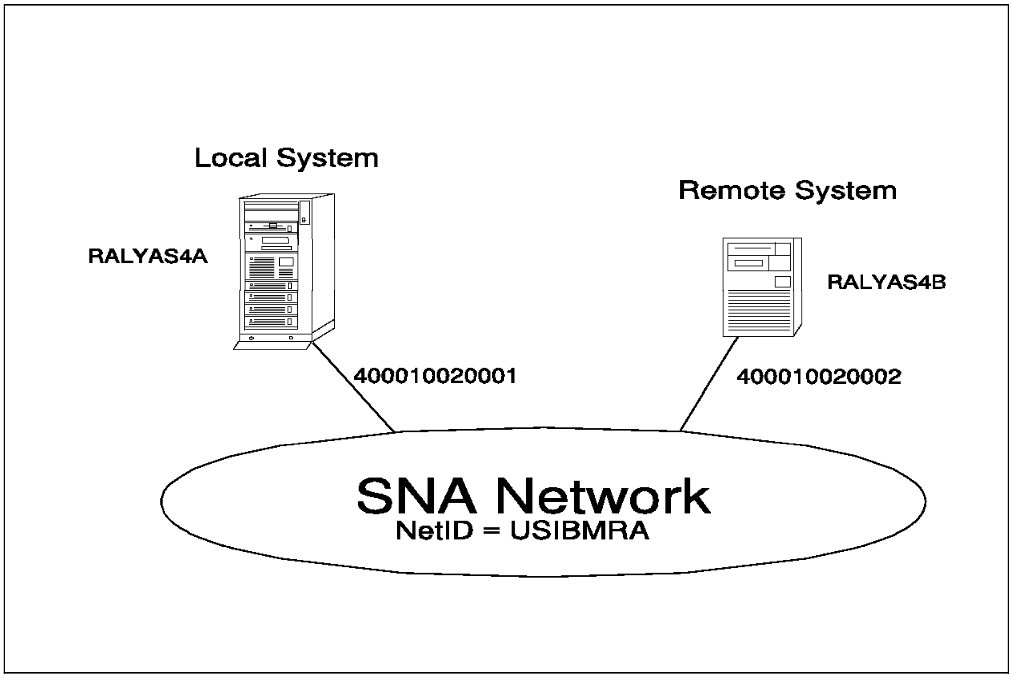

Figure 23. Two Systems Connected Using SNA (Systems Network Architecture)

   Here we will create the SNA configuration for RALYAS4A in Figure 23. The configuration steps for RALYAS4B would be the same using the different Remote control point name and the different adapter (LAN) addresses.

   The following panels show the line and controller descriptions for the AS/400 system RALYAS4A for a token-ring connection. If you require help in establishing an SNA configuration over another type of interface, refer to the redbook *AS/400 Communication Definitions Examples* GG24-3449.

Network Attributes

The AS/400 Network Attributes define system-wide configuration parameters. The following panel shows the first Network Attributes display for system RALYAS4A.

```
                         Display Network Attributes
                                                         System:   RALYAS4A
 Current system name  . . . . . . . . . . . . . . :   RALYAS4A
   Pending system name  . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4A
 Default local location . . . . . . . . . . . . . :   RALYAS4A
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression  . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions  . . . . :   200
 Route addition resistance  . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY

                                                                    More...
```

Figure 24. Initial display of Network Attributes for System RALYAS4A

From this display you should note the Local network ID, Local control point name, and APPN node type. You will need these values when creating the SNA configuration on any system that is to connect to this system.

Line Description

The AS/400 line description defines the physical interface to the network. If an appropriate line description does not already exist (they can be shared), you need to create one. Here we use the CRTLINTRN command to create a token-ring line description.

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

Type choices, press Enter.

Line description . . . . . . . . > L41TR         Name
Resource name  . . . . . . . . . > LIN041        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 description for LIN041

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

Figure 25. Create Token-Ring Line Description - System RALYAS4A

Controller Description

The AS/400 controller description defines the remote system. Use the CRTCTLAPPC (Create APPC Controller Description) command to create an APPC controller description. In this example we create a LAN APPC controller description.

```
                     Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > RALYAS4B      Name
 Link type  . . . . . . . . . . . > *LAN          *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 APPN-capable . . . . . . . . . .   *YES          *YES, *NO
 Switched line list . . . . . . . > L41TR         Name
                + for more values
 Maximum frame size . . . . . . .   *LINKTYPE     265-16393, 256, 265, 512...
 Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > RALYAS4B      Name, *ANY
 Exchange identifier  . . . . . . > 05615533      00000000-FFFFFFFF
 Initial connection . . . . . . .   *DIAL         *DIAL, *ANS
 Dial initiation  . . . . . . . .   *LINKTYPE     *LINKTYPE, *IMMED, *DELAY
 LAN remote adapter address . . . > 400010020002  000000000001-FFFFFFFFFFFF
 APPN CP session support  . . . .   *YES          *YES, *NO
 APPN node type . . . . . . . . .   *NETNODE      *ENDNODE, *LENNODE...
 APPN/HPR capable . . . . . . . .   *YES          *YES, *NO
                                                                      More...
```

Figure 26. Create Controller Description for System RALYAS4A

The Switched line list parameter should match the line description created above. The Remote network identifier should match the remote system's local network identifier (*NETATR indicates that the value in network attributes should be used because the local system and remote system have the same network ID) and the Remote control point name should match the remote system's local control point name. The LAN remote adapter address should match the local adapter address at the remote system.

The device description will be automatically created when the link is activated (VARIED ON). To vary on the controller, use the command WRKCFGSTS *CTL RALYAS4B and take option 1.

The established SNA connection can be verified by checking the status of the controller. The following display shows the result of entering the command WRKCFGSTS *CTL RALYAS4B.

```
                         Work with Configuration Status                RALYAS4A
                                                             11/18/94  16:45:29
 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--------------
 __   L41TR             ACTIVE
 __     RALYAS4B        ACTIVE
 __       RALYAS4B      ACTIVE

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

Figure 27. Establishment of SNA Connection - System RALYAS4A

The establishment of CP (Control Point) sessions between the systems results in the ACTIVE status.

2. Change the network attribute ALWANYNET to *YES

Now we start the AnyNet specific configuration steps. First we must change the ALWANYNET network attribute to *YES. Changing this attribute will allow Sockets over SNA, APPC over TCP/IP, Sockets over IPX, and APPC over IPX to run on your system. The default for this value, when V3R1 is initially installed, is *NO. Use the DSPNETA command to see what your system is set to. If it is set to *NO, use the following command:

```
CHGNETA ALWANYNET(*YES)
```

After changing this attribute, you can verify the change by entering the DSPNETA command. The resulting displays are shown next.

```
                          Display Network Attributes
                                                        System:   RALYAS4A
Current system name . . . . . . . . . . . . . . :   RALYAS4A
  Pending system name . . . . . . . . . . . . . :
Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
Local control point name . . . . . . . . . . . . :   RALYAS4A
Default local location . . . . . . . . . . . . . :   RALYAS4A
Default mode . . . . . . . . . . . . . . . . . . :   BLANK
APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
Data compression . . . . . . . . . . . . . . . . :   *NONE
Intermediate data compression . . . . . . . . . :   *NONE
Maximum number of intermediate sessions . . . . :   200
Route addition resistance . . . . . . . . . . . :   128
Server network ID/control point name . . . . . . :   *LCLNETID   *ANY
                                                                 More...
```

```
                          Display Network Attributes
                                                        System:   RALYAS4A
Alert status . . . . . . . . . . . . . . . . . . :   *ON
Alert logging status . . . . . . . . . . . . . . :   *ALL
Alert primary focal point . . . . . . . . . . . :   *YES
Alert default focal point . . . . . . . . . . . :   *NO
Alert backup focal point . . . . . . . . . . . . :
  Network ID . . . . . . . . . . . . . . . . . . :     *NONE
Alert focal point to request . . . . . . . . . . :   RAK
  Network ID . . . . . . . . . . . . . . . . . . :     USIBMRA
Alert controller description . . . . . . . . . . :   *NONE
Alert hold count . . . . . . . . . . . . . . . . :   0
Alert filter . . . . . . . . . . . . . . . . . . :   AS400NET
  Library . . . . . . . . . . . . . . . . . . . :     QALSNDA
Message queue . . . . . . . . . . . . . . . . . :   QSYSOPR
  Library . . . . . . . . . . . . . . . . . . . :     QSYS
Output queue . . . . . . . . . . . . . . . . . . :   QPRINT
  Library . . . . . . . . . . . . . . . . . . . :     QGPL
Job action . . . . . . . . . . . . . . . . . . . :   *FILE
                                                                 More...
```

```
                          Display Network Attributes
                                                        System:   RALYAS4A
Maximum hop count . . . . . . . . . . . . . . . :   16
DDM request access . . . . . . . . . . . . . . . :   *OBJAUT
Client request access . . . . . . . . . . . . . :   *OBJAUT
Default ISDN network type . . . . . . . . . . . :
Default ISDN connection list . . . . . . . . . . :   QDCCNNLANY
Allow ANYNET support . . . . . . . . . . . . . . :   *YES
Network Server Domain . . . . . . . . . . . . . :   RALYAS4A



                                                                  Bottom
Press Enter to continue.

F3=Exit   F12=Cancel
```

Figure 28. AS/400 Network Attributes - System RALYAS4A

3. **Assign an IP address to your local system for Sockets over SNA**

We have to define a logical internet address on the system for use with Sockets over SNA. We do this by entering the CFGIPS command and taking option 1.

```
CFGIPS                      Configure IP over SNA
                                                          System:   RALYAS4A
Select one of the following:

     1. Work with IP over SNA interfaces
     2. Work with IP over SNA routes
     3. Work with IP over SNA locations
     4. Work with IP over SNA type of service

    20. Convert IP address into location name
    21. Convert location name into IP address



Selection or command
===> 1

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
(C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 29. Configure IP over SNA - System RALYAS4A

```
                       Work with IP over SNA Interfaces
                                                          System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   9=Start   10=End

        Internet            Subnet              Interface
Opt     Address             Mask                Status
1       xxx.xxx.xxx.xxx

  (No interfaces)


                                                                      Bottom
F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
F12=Cancel   F17=Top      F18=Bottom
```

Figure 30. AS/400 Work with IP over SNA Interfaces (1 of 2)

Add an entry by entering 1 in the option field and typing in an IP address for Sockets over SNA. Your system administrator should help you determine what IP address to give to the system for use with Sockets over SNA.

Note

Your IP over SNA IP addresses must use a separate network (or subnetwork) to any other networks (or subnetworks) that you use. For example, if already have a native TCP/IP network, Sockets over SNA must be allocated a separate network (or subnetwork) to this.

After entering the IP address, you will be prompted for a Subnet mask.

```
                     Add IP over SNA Interface (ADDIPSIFC)

 Type choices, press Enter.

 Internet address . . . . . . . . . > 'XXX.XXX.XXX.XXX'
 Subnet mask  . . . . . . . . . .     _________________



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

Figure 31. AS/400 Add IP over SNA Interface

Here again, your system administrator should be able to help you determine what subnet mask to use for your Sockets over SNA IP network.

In our case, we have chosen to use 9.67.60 for our Sockets over SNA IP network (subnet mask 255.255.255.0). Our system has a native TCP/IP connection to network 9.24.104 (subnet mask 255.255.255.0). The native TCP/IP address can be seen using the CFGTCP command and taking option 1.

Shown in the following figure is the AS/400's IP over SNA interface. After creating this interface, it is automatically started and shows a status of ACTIVE.

```
                       Work with IP over SNA Interfaces
                                                              System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

         Internet            Subnet              Interface
 Opt     Address             Mask                Status

 __      _______________
 __      9.67.60.20          255.255.255.0       Active



                                                                         Bottom
 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 32. AS/400 Work with IP over SNA Interfaces (2 of 2)

Along with adding a new interface, the panel above allows you to either change, remove, start or end an existing interface.

There can be multiple IP over SNA interfaces defined; up to eight can be active concurrently.

This interface defines a logical interface and not a physical interface. It is not associated with any line description or network interface. This is illustrated in Figure 33 on page 33. The second entry represents our systems' IP over SNA interface. Unlike the native TCP/IP interface (9.24.104.56), there is no line description associated with the IP over SNA interface (9.67.60.20). The value of *IPS indicates that this interface is used by IP over SNA.

NETSTAT Interface Information

The NETSTAT command gives network status information for all network types (native TCP/IP and Sockets over SNA). NETSTAT option 1 (Work with TCP/IP Interface Status) gives interface information for all interfaces (native TCP/IP and Sockets over SNA). The panel also shows whether or not the interface is active.

```
                      Work with TCP/IP Interface Status
                                                          System:   RALYAS4A
Type options, press Enter.
  5=Display details   8=Display associated routes   9=Start   10=End
  12=Work with configuration status

     Internet         Network           Line      Interface
Opt  Address          Address         Description  Status
__   9.24.104.56      9.24.104.0      L41TR        Active
__   9.67.60.20       9.67.60.0       *IPS         Active
__   127.0.0.1        127.0.0.0       *LOOPBACK    Active




                                                                      Bottom
F3=Exit   F4=Prompt   F5=Refresh   F11=Display line information   F12=Cancel
F13=Sort by column    F24=More keys
```

Figure 33. Work with TCP/IP Interface Status - System RALYAS4A

From this display you can start or end any of the interfaces listed. This screen is a quick way of viewing the status of both your TCP/IP interfaces and your IP over SNA interfaces.

IP over SNA Interface CL Commands

For those users that prefer to use CL commands, the following is a list of the CL commands that can be used to manage IP over SNA interfaces:

- ADDIPSIFC - Add IP over SNA interface
- CHGIPSIFC - Change IP over SNA interface
- RMVIPSIFC - Remove IP over SNA interface
- STRIPSIFC - Start IP over SNA interface
- ENDIPSIFC - End IP over SNA interface

4. **Define routes (if necessary) to the systems to which you will communicate**

It may be necessary to define a route to the remote system for Sockets over SNA.

As with native TCP/IP, a route definition is required when the remote system is in a different network to the local system. You need to define a route when either of the following is true:

- The remote system is in a different network (or subnetwork) to that of the local system.
- The remote system is reached via an AnyNet Sockets over SNA gateway.

The system automatically builds a route that gives access to systems that are in the same network as the local system.

A route is assigned by entering the CFGIPS command and taking option 2.

```
                        Work with IP over SNA Routes
                                                       System:   RALYAS4A
Type options, press Enter.
  1=Add   4=Remove

        Route              Subnet             Next
Opt     Destination        Mask               Hop
1_      xxx.xxx.xxx.xxx    _______________    _______________

  (No Routes)






                                                                  Bottom
F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
F12=Cancel   F17=Top      F18=Bottom
```

Figure 34. AS/400 Work with IP over SNA Routes

The Route Destination can be the address of a network, subnetwork or a specific host. For example, a Route Destination for all hosts in the 112.2.3 subnetwork would be identified by entering 112.2.3.0 for the Route destination with a Subnet Mask of 255.255.255.0. A Subnet Mask value of *HOST indicates that the internet address value specified in the Route Destination field is a host address; the Subnet Mask value is calculated to be 255.255.255.255. If the Internet address value specified for the Route Destination field is the address of a network or subnetwork, you must specify a value other than *HOST for the Subnet Mask field.

Note

Where the dominant network is Sockets over SNA or where there is Sockets over SNA on a system with no native TCP/IP interface, it is possible to use the default route entry (*DFTROUTE) for Sockets over SNA.

Remote System in a Different Network to Local System

In Figure 35, the remote system is in a different Sockets over SNA network (subnetwork) to the local system, it is therefore necessary to define a route to that system.

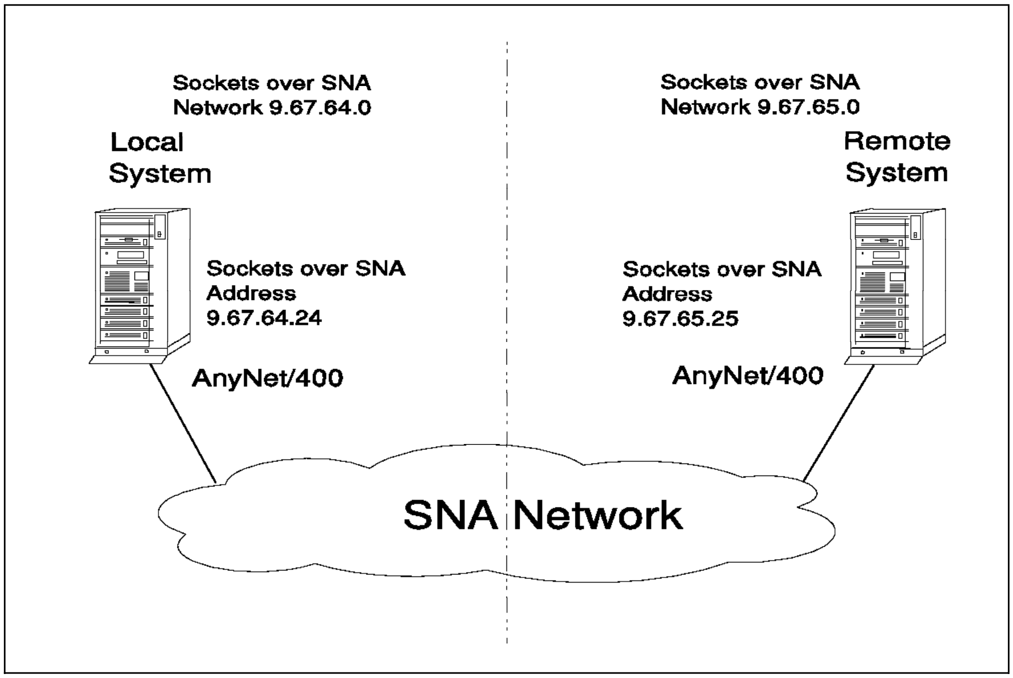

Figure 35. Two Systems Connected Via SNA - Using Different IP over SNA Subnets

The following displays show the route entries that should be entered on both systems. These routes will enable each system to access the other, via Sockets over SNA. Route entry for local system:

```
                         Work with IP over SNA Routes
                                                             System:   LOCALSYS
Type options, press Enter.
  1=Add   4=Remove

        Route               Subnet              Next
Opt     Destination         Mask                Hop

 _      _______________     _______________     _______________
 _      9.67.65.0           255.255.255.0       9.67.64.24




                                                                         Bottom
F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
F12=Cancel   F17=Top      F18=Bottom
```

Figure 36. IP over SNA Route Entry for Local System

The above entry allows the local system to communicate with any host in the 9.67.65 network. We could have used a Route Destination of 9.67.65.25 with a Subnet Mask of *HOST, but this would only allow this system to communicate with the single remote system.

Route entry for remote system:

```
                         Work with IP over SNA Routes
                                                          System:   REMOTSYS
 Type options, press Enter.
   1=Add   4=Remove

         Route               Subnet              Next
 Opt     Destination         Mask                Hop

  _      _______________     _______________     _______________
  _      9.67.64.0           255.255.255.0       9.67.65.25




                                                                      Bottom
 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 37. IP over SNA Route Entry for Remote System

The above entry allows the remote system to communicate with any host in the 9.67.64 network. We could have used a Route Destination of 9.67.64.24 with a Subnet Mask of *HOST, but this would only allow this system to communicate with the single remote system.

Note that in both cases the Next Hop is the local IP over SNA interface internet address.

Remote System Reached via an AnyNet Sockets over SNA Gateway

In Figure 38, the remote system is reached via an AnyNet Sockets over SNA gateway, it is therefore necessary to define a route to that system.

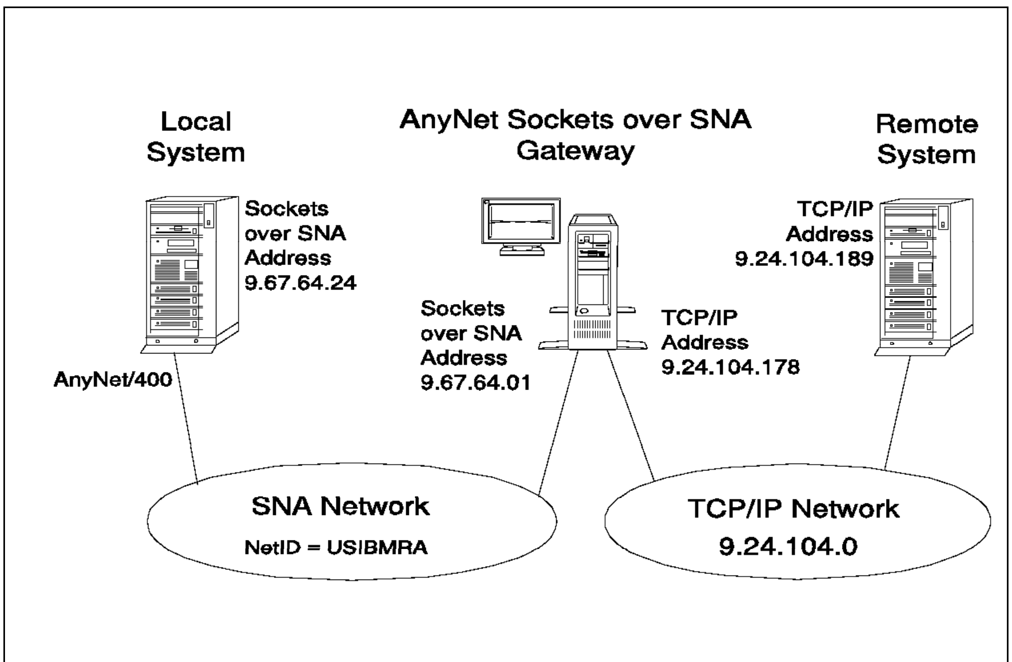

Figure 38. Two Systems Connected via an AnyNet Sockets over SNA Gateway

The following panel shows the route entry that should be entered on the local system. This route will enable the local system to access the remote system, via Sockets over SNA.

```
                            Work with IP over SNA Routes
                                                                  System:   LOCALSYS
 Type options, press Enter.
   1=Add   4=Remove

         Route               Subnet              Next
 Opt     Destination         Mask                Hop

  _      _______________     _______________     _______________
  _      9.24.104.0          255.255.255.0       9.67.64.01




                                                                            Bottom
 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 39. IP over SNA Route Entry on LOCALSYS for Remote System Via an AnyNet Sockets over SNA Gateway

The above entry allows the local system to communicate with any host in the 9.24.104 network. We could have used a Route Destination of 9.24.104.189 with a Subnet Mask of *HOST, but this would only allow this system to communicate with the single remote system.

Note that the Next Hop is the internet address of the AnyNet Sockets over SNA gateway.

In this example the remote system is a native TCP/IP system. The system has no AnyNet and therefore no IP over SNA configuration. It would, however, require a TCP/IP route entry to allow it to reach systems in the 9.67.64 network. A suitable route entry would be:

```
                                     Type
Route               Subnet           of            Next
Destination         Mask             Service       Hop
9.67.64.0           255.255.255.0    *normal       9.24.104.178
```

IP over SNA Route CL Commands

For those users that prefer to use CL commands, the following is a list of the CL commands that can be used to manage IP over SNA routes:

- ADDIPSRTE - Add IP over SNA route
- RMVIPSRTE - Remove IP over SNA route

5. **Establish IP address to LU name mapping**

We now map the logical Sockets over SNA internet addresses to SNA LU (location) names. To do this, take option 3 from the CFGIPS menu, to work with IP over SNA locations.

```
                       Work with IP over SNA Locations
                                                            System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove

                                                Remote
         Remote              Subnet             Network      Location
 Opt     Destination         Mask               ID           Template
  1      xxx.xxx.xxx.xxx     xxx.xxx.xxx.xxx




                                                                        Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 40. AS/400 Work with IP over SNA Locations

This display is used to map IP over SNA internet addresses to SNA LU (location) names. IP over SNA internet addresses can be mapped to SNA LU names in one of two ways. The simplest method is to use one-to-one mapping where there is an entry for each system to which IP over SNA will be used. The other method uses algorithmic mapping where the system builds the LU name from the remote destination host ID using a location template.

You will need to have entries for both:

- The local system
- Any remote systems you require to communicate with using Sockets over SNA

Remember

For SNA to be able to activate the sessions, both the location (LU) names generated algorithmically from the location template entries and those directly entered (one-to-one mapping entries) must be defined to SNA. If the local location (LU) name being used for Sockets over SNA is not the default local location name or local control point name (see Figure 24 on page 27) of your system, an entry must be added to the an APPN local location list. This is covered in more detail in step 7 on page 43.

One-to-One IP to LU Mapping

In simple environments, IP over SNA internet addresses can be mapped to SNA LU names on a one-to-one basis.

```
                        Work with IP over SNA Locations
                                                             System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove

                                                   Remote
         Remote               Subnet               Network      Location
 Opt     Destination          Mask                 ID           Template
  _      _______________      _______________
  _      9.67.60.20           *HOST                *NETATR      RALYAS4A
  _      9.67.60.21           *HOST                *NETATR      RALYAS4B




                                                                         Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 41. AS/400 Work with IP over SNA Locations - One-to-One Mapping

With one-to-one mapping there is an IP over SNA Locations entry for *each* remote system to which Sockets over SNA will be used. If you decide to use one-to-one mapping addresses, enter the remote system's internet address in the Remote Destination address field and specify *HOST in the Subnet Mask field. Enter the remote system's SNA network ID in the Remote Network ID field and its LU (location) name in the Location Template field. A value of *NETATR indicates that the value in the network attributes should be used. When *HOST is specified in the subnet mask field, the subnet mask value is calculated to be 255.255.255.255.

Algorithmic IP to LU Mapping

In more complex environments, algorithmic mapping can be used to map IP over SNA internet addresses to SNA LU names.

```
                        Work with IP over SNA Locations
                                                             System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove

                                                   Remote
         Remote               Subnet               Network      Location
 Opt     Destination          Mask                 ID           Template
  _      _______________      _______________
  _      9.67.60.20           *HOST                *NETATR      RAL0000M
  _      9.67.60.0            255.255.255.0        *NETATR      RAL?????




                                                                         Bottom
 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 42. AS/400 Work with IP over SNA Locations - Algorithmic Mapping

With algorithmic mapping, a single IP over SNA Locations entry can map multiple IP over SNA internet addresses to SNA LU names. The LU names are algorithmically generated from the host ID portion of the remote system′s internet address using the location template. Question marks (?) in the Location Template entry determine which characters are to be algorithmically generated. Algorithmic mapping can only be used where the LU names in the IP over SNA network follow a pattern. For example, if all of the LU names in an IP over SNA network begin with the characters RAL, RAL????? could be used as the location template as in the example in Figure 42 on page 39. The system will then generate these characters using the host ID portion of the internet address. The Subnet Mask is used to determine the host ID portion of the internet address. Thus for algorithmic mapping, a value other than *HOST must be specified in the subnet mask field. All systems in a Sockets over SNA network must use the same location template.

While it is possible, in some cases, for the IP over SNA Locations entry for the local system to be algorithmically generated, the recommendation is to have a one-to-one entry for this system as shown in Figure 42 on page 39. Using a location name of RAL0000M for the local system allows remote systems to use an algorithmic entry when accessing this system. RAL0000M is the name that would be algorithmically generated for a remote destination of 9.67.60.20 from the algorithmic entry shown. An algorithmically generated name can be determined via option 20 from the CFGIPS menu (see step 7 on page 43 for more details).

With algorithmic mapping, the LU name is built from the host ID part of the internet address. The system must therefore have sufficient room (question marks) to allow it to generate an LU name for each possible host ID for a given host ID field length. The longer the host ID field, the more question marks that are required. The subnet mask determines the subnet ID for a given internet address, the remaining part of the address is the host ID. The MPTN rules for the possible number of user-specified characters in the location template is dependant on the number of bits in the subnet mask as shown in Table 1.

Table 1. MPTN Conditions for Defining a Location Template

Number of bits in Subnet Mask	**Subnet Mask Example**	**User Specified Characters**	**Minimum # of System Generated Characters**
8-11 (includes class A)	255.0.0.0	1-3	5
12-16 (includes class B)	255.255.0.0	1-4	4
17-21		1-5	3
22-26 (includes class C)	255.255.255.0	1-6	2
27-31		1-7	1
32	255.255.255.255 •	1-8	0

Note: • Only value possible.

The rules implemented by AnyNet/400 V3R1 are, however, slightly different from the above. The rules implemented by OS/400 V3R1 are dependant on the network class rather than the subnet mask as shown in Table 2 on page 41.

Table 2. AnyNet/400 V3R1 Conditions for Defining a Location Template			
Class of Network (and size)	**Range of first byte**	**User Specified Characters**	**Minimum # of System Generated Characters**
A (large)	0 - 127	1 - 3	5
B (medium)	128 - 191	1 - 4	4
C (small)	192 - 223	1 - 6	2

The difference between these two sets of rules must be taken into account when deciding on a location template for a Sockets over SNA network where that network will contain AnyNet/400 V3R1 systems: the AnyNet/400 V3R1 rules should be followed by *every* system in the Sockets over SNA network. It can be seen from the above tables that the AnyNet/400 V3R1 rules fall within the MPTN rules.

Remember that the first byte of an internet address signifies the network class as follows:

> If the first byte of an internet address is in the range 0 to 127, it is a class A network. The first byte of the internet address is the network ID.
>
> If the first byte of an internet address is in the range 128 to 191, it is a class B network. The first two bytes of the internet address is the network ID.
>
> If the first byte of an internet address is in the range 192 to 223, it is a class C network. The first three bytes of the internet address is the network ID.

IP over SNA Location CL Commands

For those users that prefer to use CL commands, the following is a list of the CL commands that can be used to manage IP over SNA locations:

- ADDIPSLOC - Add IP over SNA location
- CHGIPSLOC - Change IP over SNA location
- RMVIPSLOC - Remove IP over SNA location

6. **Map the IP over SNA type of service to an SNA mode**

   AF_INET socket applications can select the IP type of service to be used for their connections. AnyNet/400 Sockets over SNA allows us to choose the SNA mode that this IP type of service is mapped to. The default is to map each to the default mode specified in the network attributes.

Option 4 from the CFGIPS menu is used to change this mapping.

```
                     Work with IP over SNA Type of Service
                                                         System:   RALYAS4A
 Type options, press Enter.
   2=Change

 Opt    Type of Service                  SNA Mode
  _       *MINDELAY                      *NETATR
  _       *MAXTHRPUT                     *NETATR
  _       *MAXRLB                        *NETATR
  _       *MINCOST                       *NETATR
  _       *NORMAL                        SNACKETS
                                                                     Bottom

 F3=Exit   F5=Refresh   F6=Print list   F10=Work with Mode Descriptions
 F12=Cancel
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 43. AS/400 Work with IP over SNA Type of Service

This screen allows each IP type of service to be associated with an SNA mode. Any mode can be used with Sockets over SNA. SNACKETS is the default mode AnyNet/2 Sockets over SNA will use.

If necessary, use option 2 to change the SNA Mode entry.

If the mode being used is not already defined to OS/400 (SNACKETS is not currently a system-supplied mode), use the CRTMODD (Create Mode Description) command to create an APPC mode description. A PTF (SF22357) is available that makes SNACKETS a system-supplied mode. To create a mode, enter the command CRTMODD and press F4.

```
                       Create Mode Description (CRTMODD)

 Type choices, press Enter.

 Mode description . . . . . . . .   SNACKETS      Name
 Maximum sessions . . . . . . . .   30            1-512
 Maximum conversations  . . . . .   30            1-512
 Locally controlled sessions  . .   2             0-512
 Pre-established sessions . . . .   0             0-512
 Maximum inbound pacing value . .   *CALC         1-32767, *CALC
 Inbound pacing value . . . . . .   7             0-63
 Outbound pacing value  . . . . .   7             0-63
 Maximum length of request unit     *CALC         241-32768, *CALC
 Data compression . . . . . . . .   *NETATR       1-2147483647, *NETATR...
 Inbound data compression . . . .   *RLE          *RLE, *LZ9, *LZ10, *LZ12...
 Outbound data compression  . . .   *RLE          *RLE, *LZ9, *LZ10, *LZ12...
 Text 'description' . . . . . . .   Mode for AnyNet Sockets over SNA

                                                                     Bottom

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

Figure 44. AS/400 Create Mode Command

The above mode parameters match those used by SNACKETS under AnyNet/2.

Note

When deciding the session limits associated with any mode to be used for Sockets over SNA, consideration should be given to the number of sessions that some applications (for example, FTP) can use. See *Configuration Advice* in “AnyNet/400 Sockets over SNA Verification” on page 74.

7. **Verify the IP address to LU name mapping**

   Two options are provided to allow you to verify the IP address to LU name mapping on your system. One option allows you to verify the mapping of an IP address to an LU name and the other allows you to verify the mapping of an LU name to an IP address.

   Looking back at Figure 42 on page 39, we can use option 20 (Convert IP address into location name) from the CFGIPS menu to verify the LU name that would be generated for an internet address of 9.67.60.20.

```
                          Convert IP Address (CVTIPSIFC)

 Type choices, press Enter.

 Internet address . . . . . . . .   9.67.60.20
 Output . . . . . . . . . . . . .   *              *, *PRINT




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

Figure 45. Converting an IP Address into Location Name (1 of 2)

Press Enter and you will get the following panel.

```
                                Convert IP Address
                                                            System:   RALYAS4A
 Internet address . . . . . . . :   9.67.60.20

 Network identifier . . . . . . :   *NETATR
 Location name  . . . . . . . . :   RAL0000M




 Press Enter to continue.

 F3=Exit   F12=Cancel
```

Figure 46. Converting an IP Address into Location Name (2 of 2)

If RAL0000M was the Sockets over SNA name of the local system and it was not the default local location name or local control point name of that system (see Figure 24 on page 27), then it will be necessary to add an APPN local location list entry of RAL0000M on that system.

We can use the command DSPCFGL QAPPNLCL to display the local location list. If you need to add an entry, use the command CHGCFGL *APPNLCL.

```
                        Change Configuration List                      RALYAS4A
                                                              12/14/94  10:44:11
Configuration list . . . . . . . . :   QAPPNLCL
Configuration list type  . . . . . :   *APPNLCL
Text . . . . . . . . . . . . . . . :   Local cfg list

-----APPN Local Locations-----           -----APPN Local Locations-----
Local                                    Local
Location  Text                           Location  Text
RALYAS4A
RAL0000M



                                                                         More...
Press Enter to continue.

F3=Exit   F12=Cancel   F17=Top   F18=Bottom
```

Figure 47. Local Configuration List for System RALYAS4A

The APPN local location list entry will be added to the APPN directory at the local system. This will allow an APPN search request received by this system for this LU name to be responded to positively, the SNA session for Sockets over SNA can then be established.

The Configure IP over SNA (CFGIPS) panel′s option 21 (Convert location name into IP address) can be used to verify the LU name to IP address mapping.

```
                 Convert Network ID / Location (CVTIPSLOC)

Type choices, press Enter.

Network identifier . . . . . . .   USIBMRA       Name, *NETATR
Location name  . . . . . . . . .   RAL0000N       Name
Output . . . . . . . . . . . . .   *______       *, *PRINT



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

Figure 48. AS/400 Convert Location Name into IP Address Panel (1 of 2)

Press Enter and you will get the following panel.

```
                    Convert Network ID / Location
                                                            System:   RALYAS4A
 Network identifier . . . . . . :   USIBMRA
 Location name  . . . . . . . . :   RAL0000N

                          Internet Addresses

 9.67.60.21




 Press Enter to continue.

 F3=Exit   F12=Cancel
```

Figure 49. AS/400 Convert Location Name into IP Address Panel (2 of 2)

Convert IP Address/LU Name CL Commands

For those users that prefer to use CL commands, the following is a list of CL commands that can be used to convert an IP address to an LU name and an LU name to an IP address:

- CVTIPSIFC - Convert IP Address
- CVTIPSLOC - Convert Network ID / Location

With all of the configuration steps completed, you are now ready to use the Sockets over SNA support of AnyNet/400. The next section shows specific Sockets over SNA configuration scenarios.

Sockets over SNA Scenarios

This section presents the scenarios we used to verify the different Sockets over SNA implementations. Each scenario contains a diagram showing the actual environment, AS/400 and/or PS/2 configuration displays and a matching parameters list.

The following scenarios will be covered in this section:

- Sockets over SNA Scenario 1: AS/400 to AS/400 - Same Subnetwork
- Sockets over SNA Scenario 2: AS/400 to AS/400 - Different Subnetworks
- Sockets over SNA Scenario 3: AS/400 to PS/2 - Same Subnetwork
- Sockets over SNA Scenario 4: AS/400 to various - Algorithmic Mapping

Sockets over SNA Scenario 1: AS/400 to AS/400 - Same Subnetwork

This configuration is the simplest and likely to be the most common. It is also an example of a configuration that should be set up prior to moving on to a more complex configuration.

Shown in the following figure are the two systems used in this scenario and their respective IP over SNA internet addresses. An SNA configuration is already in place between the systems using the network ID and CP names shown.

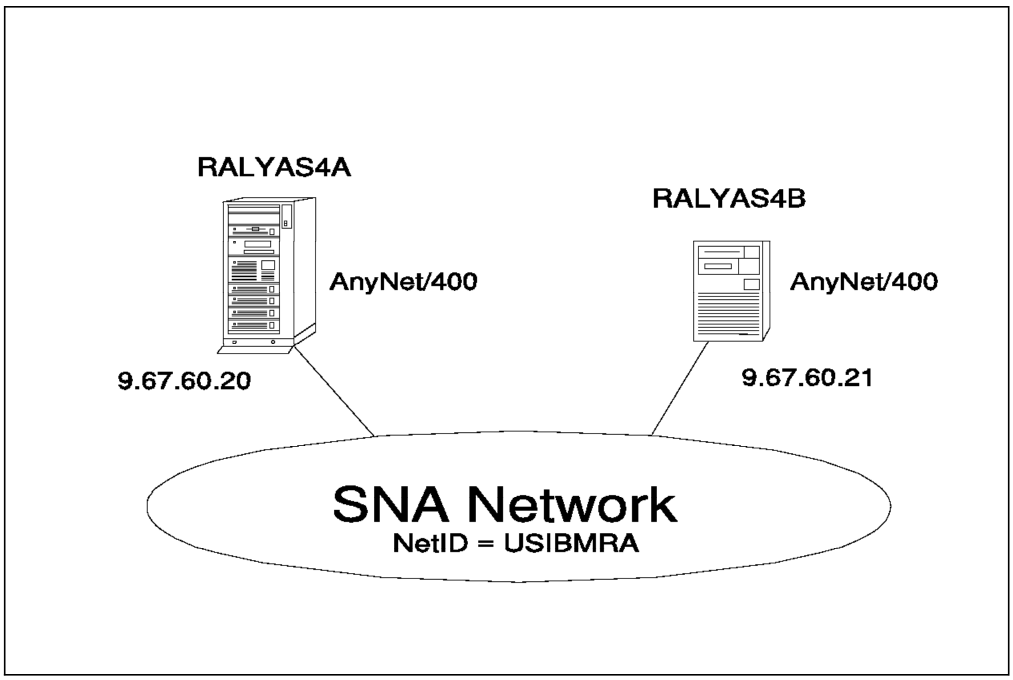

Figure 50. Systems and Addresses Used for Sockets over SNA Scenario 1

The following series of panels show the AS/400 configuration screens taken from the RALYAS4A and RALYAS4B systems. They illustrate the configuration steps required for this Sockets over SNA scenario.

First we must check that Allow ANYNET Support is set to *YES in the network attributes of each system. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Next, we configure an IP over SNA interface on RALYAS4A.

```
                         Work with IP over SNA Interfaces
                                                              System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

        Internet            Subnet              Interface
 Opt    Address             Mask                Status
 __     _______________
 __     9.67.60.20          255.255.255.0       Active




                                                                          Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 51. Scenario 1: Work with IP over SNA Interfaces - System RALYAS4A

The subnet mask of 255.255.255.0 indicates that the first three bytes of the internet address (9.67.60) is the network ID.

In the following panel we configure an IP over SNA interface on RALYAS4B.

```
                         Work with IP over SNA Interfaces
                                                              System:   RALYAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

        Internet            Subnet              Interface
 Opt    Address             Mask                Status
 __     _______________
 __     9.67.60.21          255.255.255.0       Active




                                                                          Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 52. Scenario 1: Work with IP over SNA Interfaces - System RALYAS4B

No routes are required in this scenario; both systems are in the same Sockets over SNA network (9.67.60).

In the following panel we configure the IP over SNA locations.

```
                         Work with IP over SNA Locations
                                                             System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove

                                                    Remote
         Remote               Subnet                Network      Location
 Opt     Destination          Mask                  ID           Template

  _      _______________      _______________
  _      9.67.60.20           *HOST                 *NETATR      RALYAS4A
  _      9.67.60.21           *HOST                 *NETATR      RALYAS4B




                                                                         Bottom

 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 53. Scenario 1: Work with IP over SNA Locations - System RALYAS4A

The IP over SNA locations for RALYAS4B has identical entries to those shown in Figure 53 for RALYAS4A.

Assuming the network attributes on each system show the same default mode (normally mode BLANK), we can leave the CFGIPS option 4 values at the defaults (each IP Type of Service mapped to SNA Mode *NETATR). Unless, of course, we want the IP Type of Service values mapped differently.

Shown next are the matching parameters between systems RALYAS4A and RALYAS4B.

```
SOURCE SYSTEM                                TARGET SYSTEM
   AS/400                                       AS/400
*************                                *************

FTP
RMTSYS ('9.67.60.21')

NETWORK ATTRIBUTES                          NETWORK ATTRIBUTES
------------------                          ------------------
LCLCPNAME    RALYAS4A                       LCLCPNAME    RALYAS4B
LCLNETID     USIBMRA                        LCLNETID     USIBMRA
ALWANYNET    *YES                           ALWANYNET    *YES

LINE DESCRIPTION                            LINE DESCRIPTION
----------------                            ----------------
LIND         L41TR                          LIND         L31TR

CONTROLLER DESCRIPTION                      CONTROLLER DESCRIPTION
----------------------                      ----------------------
CTLD         RALYAS4B                       CTLD         RALYAS4A
SWTLINLST    L41TR                          SWTLINLST    L31TR
LINKTYPE     *LAN                           LINKTYPE     *LAN
RMTNETID     USIBMRA                        RMTNETID     USIBMRA
RMTCPNAME    RALYAS4B                       RMTCPNAME    RALYAS4A

DEVICE DESCRIPTION                          DEVICE DESCRIPTION
------------------                          ------------------
DEVD         RALYAS4B                       DEVD         RALYAS4A
RMTLOCNAME   RALYAS4B                       RMTLOCNAME   RALYAS4A
LCLLOCNAME   RALYAS4A                       LCLLOCNAME   RALYAS4B
RMTNETID     USIBMRA                        RMTNETID     USIBMRA
CTL          RALYAS4B                       CTL          RALYAS4A

IP OVER SNA LOCATIONS                       IP OVER SNA INTERFACES
---------------------                       ----------------------
RMTDEST      9.67.60.21                     INTNETADR    9.67.60.21
SUBNETMASK   *HOST                          SUBNETMASK   255.255.255.0
RMTNETID     USIBMRA
LOCTPL       RALYAS4B
                                            IP OVER SNA LOCATIONS
                                            ---------------------
RMTDEST      9.67.60.20                     RMTDEST      9.67.60.21
SUBNETMASK   *HOST                          SUBNETMASK   *HOST
RMTNETID     USIBMRA                        RMTNETID     USIBMRA
LOCTPL       RALYAS4A                       LOCTPL       RALYAS4B

IP OVER SNA INTERFACES
----------------------
INTNETADR    9.67.60.20                     RMTDEST      9.67.60.20
SUBNETMASK   255.255.255.0                  SUBNETMASK   *HOST
                                            RMTNETID     USIBMRA
                                            LOCTPL       RALYAS4A
```

Figure 54. Sockets over SNA Scenario 1: Matching Parameters Table

Sockets over SNA Scenario 2: AS/400 to AS/400 - Different Subnetworks

In this scenario, two AS/400s communicate with each other via Sockets over SNA but from different Sockets over SNA networks (subnetworks).

Shown in the following figure are the two systems used in this scenario and their respective IP over SNA internet addresses. An SNA configuration is already in place between the systems using the network ID and CP names shown.

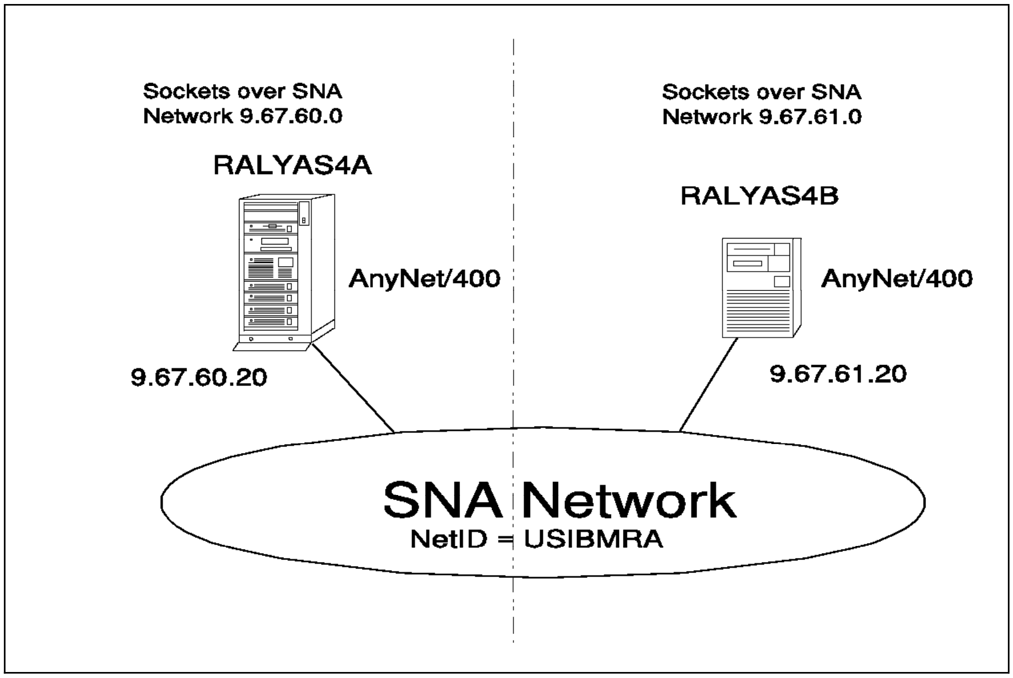

Figure 55. Systems and Addresses Used for Sockets over SNA Scenario 2

The following series of panels show the AS/400 configuration screens taken from the RALYAS4A and RALYAS4B systems. They illustrate the configuration steps required for this Sockets over SNA scenario.

First we must check that Allow ANYNET Support is set to *YES in the network attributes of each system. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Next, we configure an IP over SNA interface on RALYAS4A.

```
                         Work with IP over SNA Interfaces
                                                              System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

         Internet            Subnet              Interface
 Opt     Address             Mask                Status

 __      _______________
 __      9.67.60.20          255.255.255.0       Active




                                                                          Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 56. Scenario 2: Work with IP over SNA Interfaces - System RALYAS4A

The subnet mask of 255.255.255.0 indicates that the first three bytes (9.67.60) of the internet address is the network ID.

Next, we configure an IP over SNA interface on RALYAS4B.

```
                         Work with IP over SNA Interfaces
                                                              System:   RALYAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

         Internet            Subnet              Interface
 Opt     Address             Mask                Status

 __      _______________
 __      9.67.61.20          255.255.255.0       Active




                                                                          Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 57. Scenario 2: Work with IP over SNA Interfaces - System RALYAS4B

The subnet mask of 255.255.255.0 indicates that the first three bytes (9.67.61) of the internet address is the network ID.

In this scenario RALYAS4A and RALYAS4B are in different Sockets over SNA networks (subnetworks). We must therefore define a route on each system.

First we configure an IP over SNA route on RALYAS4A.

```
                         Work with IP over SNA Routes
                                                            System:   RALYAS4A
 Type options, press Enter.
   1=Add   4=Remove

         Route                 Subnet                Next
 Opt     Destination           Mask                  Hop
  _      _______________       _______________       _______________
  _      9.67.61.0             255.255.255.0         9.67.60.20





                                                                         Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 58. Scenario 2: Work with IP over SNA Routes - RALYAS4A

In the following panel we configure an IP over SNA route on RALYAS4B.

```
                         Work with IP over SNA Routes
                                                            System:   RALYAS4B
 Type options, press Enter.
   1=Add   4=Remove

         Route                 Subnet                Next
 Opt     Destination           Mask                  Hop
  _      _______________       _______________       _______________
  _      9.67.60.0             255.255.255.0         9.67.61.20





                                                                         Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 59. Scenario 2: Work with IP over SNA Routes - RALYAS4B

The route examples shown allow each system to communicate with any system in the remote Sockets over SNA network. Instead of the examples shown, we could have entered specific entries that *only* allowed communications between the two systems shown. These specific entries would have the following values:

```
RALYAS4A
        Route              Subnet             Next
        Destination        Mask               Hop

        9.67.61.20         *HOST              9.67.60.20

RALYAS4B
        Route              Subnet             Next
        Destination        Mask               Hop

        9.67.60.20         *HOST              9.67.61.20
```

Lastly we configure the IP over SNA locations on each system.

```
                        Work with IP over SNA Locations
                                                            System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove

                                                   Remote
        Remote               Subnet                Network      Location
 Opt    Destination          Mask                  ID           Template

  _     _______________      _______________
  _     9.67.60.20           *HOST                 *NETATR      RALYAS4A
  _     9.67.61.20           *HOST                 *NETATR      RALYAS4B





                                                                        Bottom

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

Figure 60. Scenario 2: Work with IP over SNA Locations - System RALYAS4A

The IP over SNA locations for RALYAS4B has identical entries to those shown in Figure 60 for RALYAS4A.

Assuming the network attributes on each system show the same default mode (normally mode BLANK), we can leave the CFGIPS option 4 values at the defaults (each IP Type of Service mapped to SNA Mode *NETATR). Unless, of course, we want the IP Type of Service values mapped differently.

Shown next are the matching parameters between systems RALYAS4A and RALYAS4B.

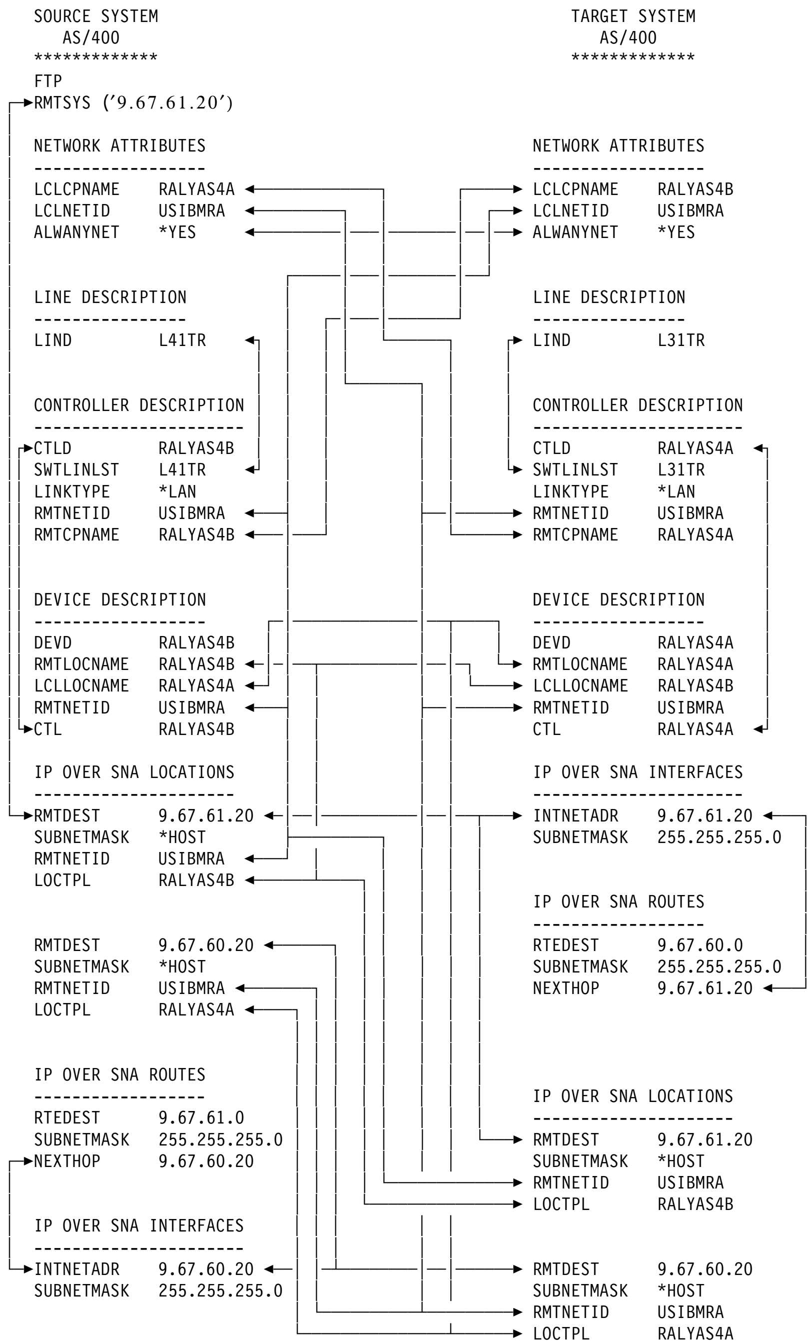

Figure 61. Sockets over SNA Scenario 2: Matching Parameters Table

Sockets over SNA Scenario 3: AS/400 to PS/2 - Same Subnetwork

Shown in the following figure are the two systems used in this scenario and their respective IP over SNA internet addresses. An SNA configuration is already in place between the systems using the network ID and CP names shown.

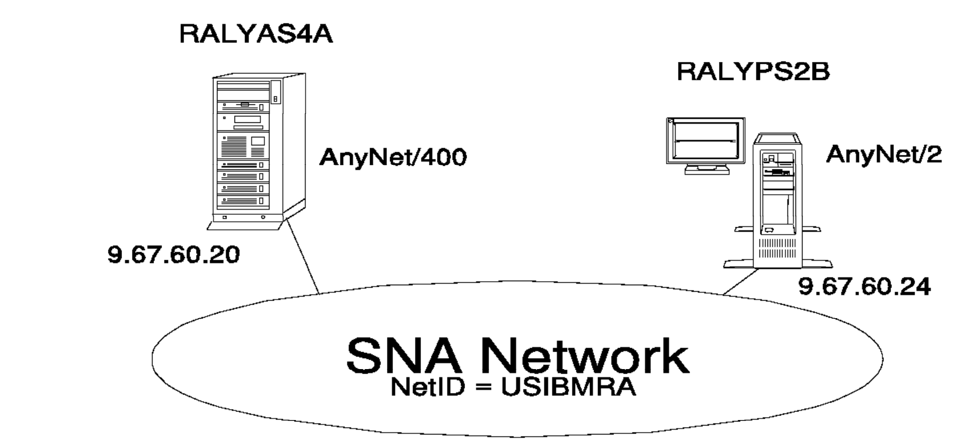

Figure 62. Systems and Addresses Used for Sockets over SNA Scenario 3

The following series of panels show the AS/400 and PS/2 configuration screens taken from the RALYAS4A and RALYPS2B systems. They illustrate the configuration steps required for this Sockets over SNA scenario.

Please note that only the key AnyNet/2 configuration displays are shown in this section. For further AnyNet/2 configuration help, refer to *AnyNet/2: Sockets over SNA and NetBIOS over SNA, Installation and Interoperability* GG24-4396.

PS/2 Software Installed

The following software was installed on RALYPS2B:

- OS/2 Version 2.1
- CM/2 Version 1.11 with AnyNet/2 support installed (additional functions)
- TCP/IP Version 2.0 for OS/2 Base kit plus CSD UN64092
- AnyNet/2 Version 2.0, Sockets over SNA plus the fix for APAR IC07730

The software was installed in the above order.

RALYAS4A Configuration

First we must check that Allow ANYNET Support is set to *YES in the network attributes of RALYAS4A. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Next, we configure a Sockets over SNA interface on RALYAS4A.

```
                         Work with IP over SNA Interfaces
                                                                System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   9=Start   10=End

        Internet            Subnet              Interface
Opt     Address             Mask                Status
__      _______________
__      9.67.60.20          255.255.255.0       Active





                                                                            Bottom
F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
F12=Cancel   F17=Top      F18=Bottom
```

Figure 63. Scenario 3: Work with IP over SNA Interfaces - System RALYAS4A

The subnet mask of 255.255.255.0 indicates that the first three bytes (9.67.60) of the internet address is the network ID.

No routes are required in this scenario; both systems are in the same Sockets over SNA network (9.67.60).

In the following panel we configure the IP over SNA locations on RALYAS4A.

```
                         Work with IP over SNA Locations
                                                                System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove

                                                    Remote
        Remote              Subnet                  Network      Location
Opt     Destination         Mask                    ID           Template
 _      _______________     _______________
 _      9.67.60.20          *HOST                   USIBMRA      RALYAS4A
 _      9.67.60.24          *HOST                   USIBMRA      RALYPS2B





                                                                            Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
(C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 64. Scenario 3: Work with IP over SNA Locations - System RALYAS4A

Note

A Subnet Mask of *HOST results in an actual mask of 255.255.255.255 and therefore is the same as the Address Mask used in the AnyNet/2 Local Node and Remote Node definitions in this scenario.

By default, AnyNet/2 will use mode SNACKETS for Sockets over SNA. We therefore map the IP Type of Service we want to use (*NORMAL) to the SNA Mode SNACKETS.

```
                    Work with IP over SNA Type of Service
                                                             System:   RALYAS4A
 Type options, press Enter.
   2=Change

 Opt    Type of Service                  SNA Mode
  _       *MINDELAY                      *NETATR
  _       *MAXTHRPUT                     *NETATR
  _       *MAXRLB                        *NETATR
  _       *MINCOST                       *NETATR
  _       *NORMAL                        SNACKETS
                                                                         Bottom

 F3=Exit   F5=Refresh   F6=Print list   F10=Work with Mode Descriptions
 F12=Cancel
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 65. AS/400 Work with IP over SNA Type of Service

Mode SNACKETS with the parameters shown in Figure 44 on page 42 should be added to RALYAS4A.

RALYPS2B Configuration

The Communications Manager/2 setup is not shown here. An end node - to network node server configuration was created via the APPC APIs through Token-Ring CM/2 menu option. The AS/400 APPC controller and device descriptions were auto-created when this CM/2 configuration was started.

Select the **Configure AnyNet/2 Sockets over SNA** icon to access the configuration screens on the PS/2. The folder icon should be displayed on the OS/2 desktop if the AnyNet/2 code has been installed correctly.

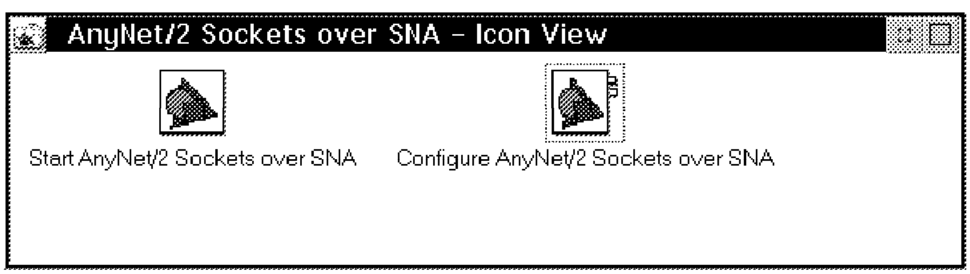

Figure 66. AnyNet/2 Sockets over SNA Folder

The first AnyNet/2 Sockets over SNA configuration screen defines the local system (local node).

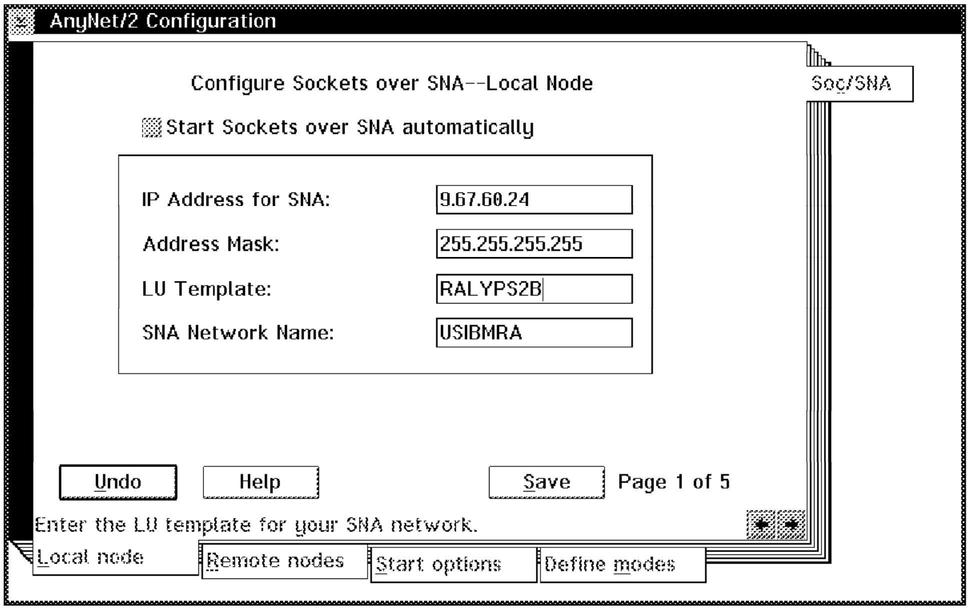

Figure 67. Scenario 3: Sockets over SNA Local Node Definition for RALYPS2B

The AnyNet/2 local node definition defines both the local Sockets over SNA interface address and the mapping of that address to an LU name. Unlike AnyNet/400, with AnyNet/2 there is not a separate Sockets over SNA interface definition. The address mask of 255.255.255.255 denotes that the LU template is a one-to-one template entry and hence is the same as *HOST in the AnyNet/400 IP over SNA locations entries.

The second AnyNet/2 Sockets over SNA configuration screen defines the remote systems (remote nodes).

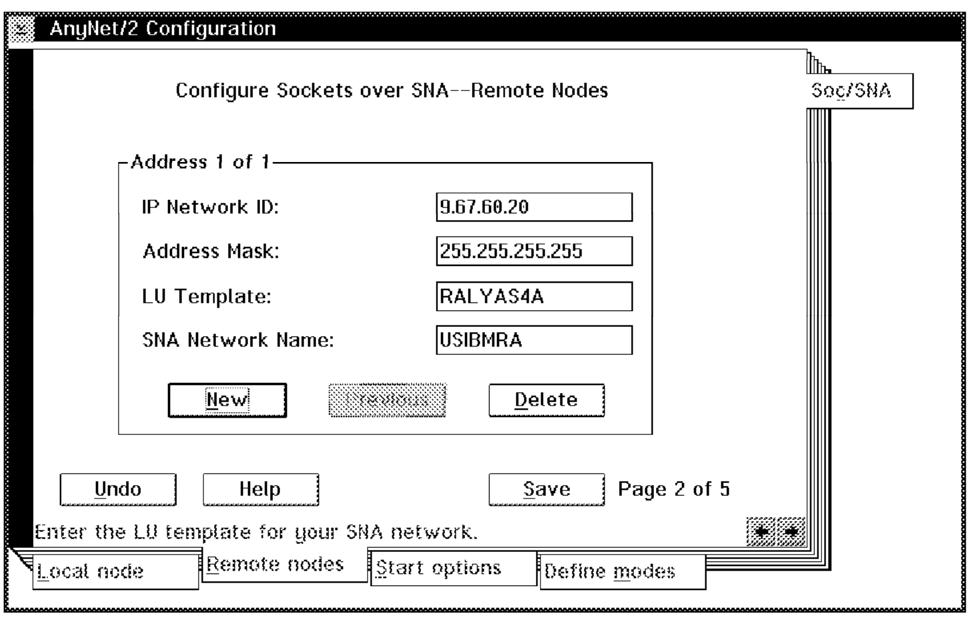

Figure 68. Scenario 3: Sockets over SNA Remote Node Definition for RALYPS2B

The final AnyNet/2 Sockets over SNA configuration screen allows the SNA mode used for Sockets over SNA to be changed. Configuration screens 3 and 4 are not shown here.

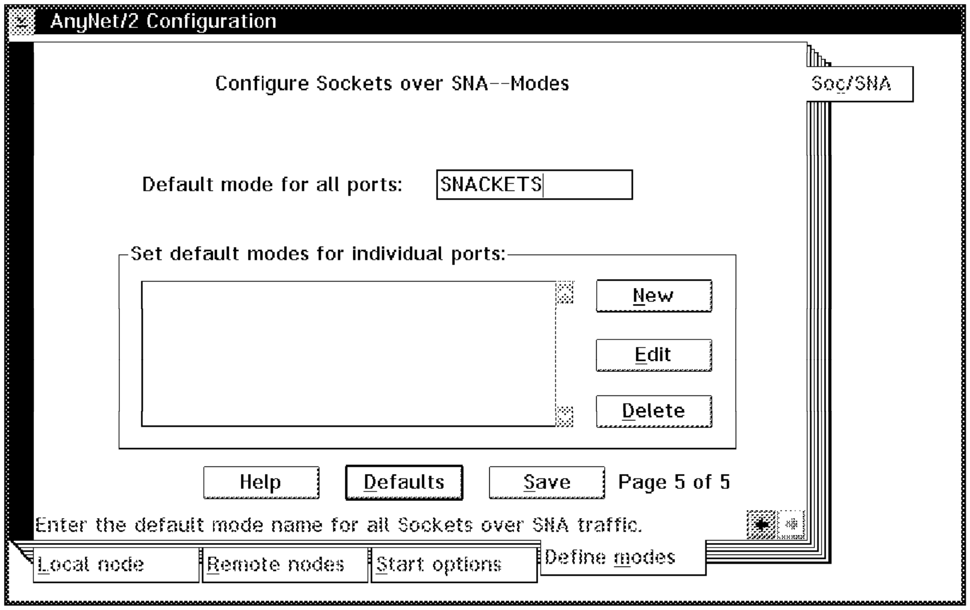

Figure 69. Scenario 3: Sockets over SNA Modes Definition for RALYPS2B

The AnyNet/2 Sockets over SNA configurator produces a command file (sxstart.cmd) based on the information in the AnyNet/2 Sockets over SNA configuration screens. This command file will be used when AnyNet/2 Sockets over SNA is started. System RALYPS2B has the following sxstart.cmd file:

```
@REM Sockets over SNA startup file

@REM First, start the Snackets program.

start snackets logfile 100000 sessions 30

@REM Next, tell Sockets over SNA how to map IP addresses to LU names.
@REM Wait for Sockets over SNA to get set up before continuing.
sxmap -w add 9.67.60.24 255.255.255.255 USIBMRA RALYPS2B

sxmap add 9.67.60.20 255.255.255.255 USIBMRA RALYAS4A

@REM Use IFCONFIG to define the local address
ifconfig sna0 9.67.60.24
route add 9.67.60.24 9.67.60.24 0
route add 9.67.60.20 9.67.60.24 0
```

Shown next are the matching parameters between systems RALYAS4A and RALYPS2B.

```
SOURCE SYSTEM                                      TARGET SYSTEM
   AS/400                                              PS/2
*************                                      *************

LINE DESCRIPTION                               CM/2 APPC APIs DEFINITION
----------------                               -------------------------
LIND         L41TR                             LOCAL NODE NAME    RALYPS2B
ADPTADR      400010020001                      NETWORK ID         USIBMRA
                                               NETWORK NODE
                                               SERVER ADDRESS     400010020001


IP OVER SNA INTERFACES                         LOCAL NODE DEFINITION
----------------------                         ---------------------
INTNETADR    9.67.60.20                        IP ADDR FOR SNA    9.67.60.24
SUBNETMASK   255.255.255.0                     ADDRESS MASK       255.255.255.255
                                               LU TEMPLATE        RALYPS2B
                                               SNA NETWORK NAME   USIBMRA


IP OVER SNA LOCATIONS                          REMOTE NODE DEFINITION
---------------------                          ----------------------
RMTDEST      9.67.60.20                        IP NETWORK ID      9.67.60.20
SUBNETMASK   *HOST                             ADDRESS MASK       255.255.255.255
RMTNETID     USIBMRA                           LU TEMPLATE        RALYAS4A
LOCTPL       RALYAS4A                          SNA NETWORK NAME   USIBMRA

RMTDEST      9.67.60.24
SUBNETMASK   *HOST
RMTNETID     USIBMRA
LOCTPL       RALYPS2B


IP OVER SNA TYPE OF SERVICE                    SOCKETS OVER SNA MODES
---------------------------                    ----------------------
TYPE OF SERVICE    NORMAL                      DEFAULT MODE FOR
SNA MODE           SNACKETS                    ALL PORTS:         SNACKETS
```

Figure 70. Sockets over SNA Scenario 3: Matching Parameters Table

Sockets over SNA Scenario 4: AS/400 to Various - Algorithmic Mapping

In this more complex scenario we use algorithmic mapping between three systems. These systems are located in two Sockets over SNA networks.

Shown in the following figure are the three systems used in this scenario and their respective IP over SNA internet addresses. SNA configurations are already in place between the systems using the network ID and CP names shown.

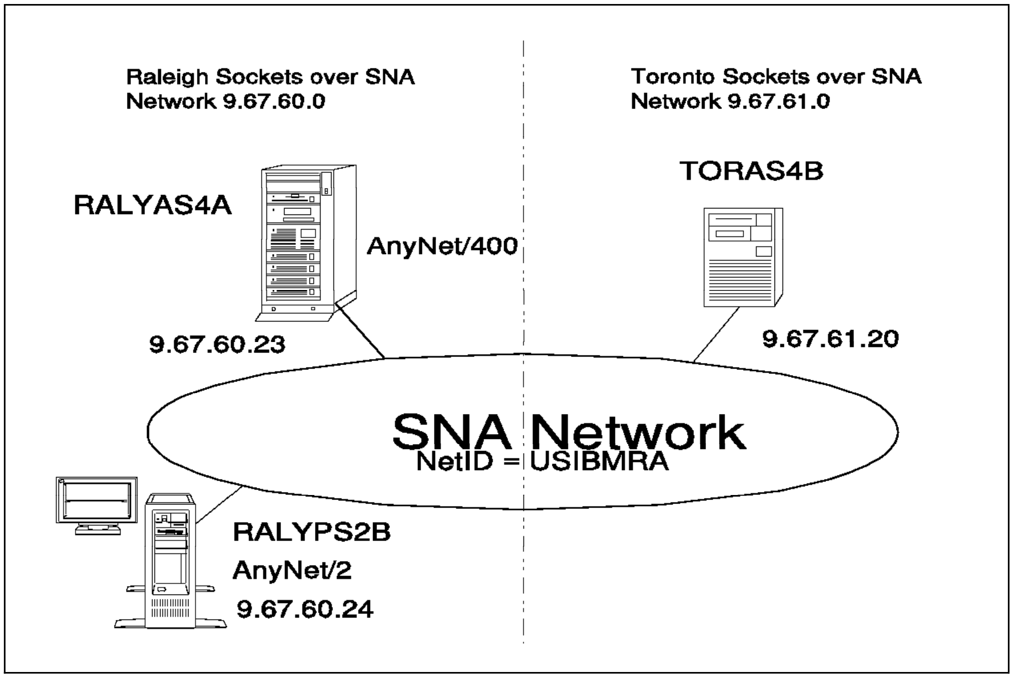

Figure 71. Systems and Addresses Used for Sockets over SNA Scenario 4

We will use RAL as the location (LU) template for Sockets over SNA systems in the Raleigh network and TOR as the location (LU) template for Sockets over SNA systems in the Toronto network.

The following series of panels show the AS/400 and PS/2 configuration screens taken from the RALYAS4A, TORAS4B and RALYPS2B systems. They illustrate the configuration steps required for this Sockets over SNA scenario.

Note

The software installed on RALYPS2B is the same as scenario 3.

Please note that only the key AnyNet/2 configuration displays are shown in this section. For further AnyNet/2 configuration help, refer to *AnyNet/2: Sockets over SNA and NetBIOS over SNA, Installation and Interoperability* GG24-4396.

RALYAS4A Configuration

First we must check that Allow ANYNET Support is set to *YES in the network attributes of RALYAS4A. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Next, we configure an IP over SNA interface on RALYAS4A.

```
                          Work with IP over SNA Interfaces
                                                              System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   9=Start   10=End

        Internet            Subnet              Interface
Opt     Address             Mask                Status

__      _______________
__      9.67.60.23          255.255.255.0       Active





                                                                          Bottom

F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
F12=Cancel   F17=Top      F18=Bottom
```

Figure 72. Scenario 4: Work with IP over SNA Interfaces - System RALYAS4A

The subnet mask of 255.255.255.0 indicates that the first three bytes (9.67.60) of the internet address is the network ID.

In this scenario the systems are in different Sockets over SNA networks (subnetworks). We must therefore define a route on each of the AS/400s. Here we configure the IP over SNA route on RALYAS4A.

```
                            Work with IP over SNA Routes
                                                              System:   RALYAS4A
Type options, press Enter.
  1=Add   4=Remove

        Route               Subnet              Next
Opt     Destination         Mask                Hop

 _      _______________     _______________     _______________
 _      9.67.61.0           255.255.255.0       9.67.60.23





                                                                          Bottom

F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
F12=Cancel   F17=Top      F18=Bottom
```

Figure 73. Scenario 4: Work with IP over SNA Routes - System RALYAS4A

Next, we configure the IP over SNA locations on RALYAS4A.

```
                         Work with IP over SNA Locations
                                                            System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove

                                                    Remote
         Remote              Subnet                 Network      Location
 Opt     Destination         Mask                   ID           Template
  _      _______________     _______________
  _      9.67.60.0           255.255.255.0          USIBMRA      RAL?????
  _      9.67.60.23          *HOST                  USIBMRA      RAL0000Q
  _      9.67.61.0           255.255.255.0          USIBMRA      TOR?????




                                                                         Bottom

 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 74. Scenario 4: Work with IP over SNA Locations - System RALYAS4A

In both Figure 74 and Figure 80 on page 66, entries representing the actual IP over SNA address for each system are included in the list. Although these specific entries may not be necessary for the correct operation of this scenario, it is still *recommended* that they be included in the IP over SNA locations. Using the location template names RAL0000Q and TOR0000M allows the algorithmic entries RAL????? and TOR????? to be used when communicating between the systems. Having entered the algorithmic entries, CFGIPS option 20 (Convert IP address into location name) can be used to determine the specific entries to be added as shown in the following panel.

```
                                Convert IP Address
                                                            System:   RALYAS4A
 Internet address . . . . . . . :   9.67.60.23

 Network identifier . . . . . . :   *NETATR
 Location name  . . . . . . . . :   RAL0000Q




 Press Enter to continue.

 F3=Exit   F12=Cancel
```

Figure 75. Scenario 4: Converting the IP Address at RALYAS4A

In this scenario, the LU name used for Sockets over SNA on each of the systems is neither the local location name nor local control point name of that system. We must therefore add an entry to the APPN local location list on each system.

Shown following is the APPN local configuration list for RALYAS4A with Sockets over SNA name RAL0000Q added.

```
                          Display Configuration List                 RALYAS4A
                                                           11/29/94  15:30:49
Configuration list . . . . . . . . :   QAPPNLCL
Configuration list type  . . . . . :   *APPNLCL
Text . . . . . . . . . . . . . . . :   Local cfg list

-----APPN Local Locations-----           -----APPN Local Locations-----
Local                                    Local
Location  Text                           Location  Text
RALYAS4A
RAL0000Q  Loc. for Scenario 4




                                                                       Bottom
Press Enter to continue.

F3=Exit   F12=Cancel   F17=Position to
```

Figure 76. Scenario 4: Local Location List - System RALYAS4A

By default, AnyNet/2 will use mode SNACKETS for Sockets over SNA. We therefore map the IP Type of Service we want to use (*NORMAL) to the SNA Mode SNACKETS.

```
                    Work with IP over SNA Type of Service
                                                           System:   RALYAS4A
Type options, press Enter.
  2=Change

Opt    Type of Service                  SNA Mode
 _       *MINDELAY                      *NETATR
 _       *MAXTHRPUT                     *NETATR
 _       *MAXRLB                        *NETATR
 _       *MINCOST                       *NETATR
 _       *NORMAL                        SNACKETS
                                                                       Bottom

F3=Exit   F5=Refresh   F6=Print list   F10=Work with Mode Descriptions
F12=Cancel
(C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 77. AS/400 Work with IP over SNA Type of Service

Mode SNACKETS with the parameters shown in Figure 44 on page 42 should be added to RALYAS4A.

TORAS4B Configuration

First we must check that Allow ANYNET Support is set to *YES in the network attributes of TORAS4B. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

In the following panel we configure an IP over SNA interface on TORAS4B.

```
                          Work with IP over SNA Interfaces
                                                              System:   TORAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

         Internet            Subnet              Interface
 Opt     Address             Mask                Status
 __      _______________
 __      9.67.61.20          255.255.255.0       Active




                                                                         Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 78. Scenario 4: Work with IP over SNA Interfaces - System TORAS4B

The subnet mask of 255.255.255.0 indicates that the first three bytes (9.67.61) of the internet address is the network ID.

In the following panel we configure the IP over SNA route on TORAS4B.

```
                            Work with IP over SNA Routes
                                                              System:   TORAS4B
 Type options, press Enter.
   1=Add   4=Remove

         Route               Subnet              Next
 Opt     Destination         Mask                Hop
  _      _______________     _______________     _______________
  _      9.67.60.0           255.255.255.0       9.67.61.20




                                                                         Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 79. Scenario 4: Work with IP over SNA Routes - System TORAS4B

Now we configure the IP over SNA locations on TORAS4B.

```
                         Work with IP over SNA Locations
                                                              System:   TORAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove

                                                    Remote
         Remote              Subnet                 Network      Location
 Opt     Destination         Mask                   ID           Template

  _      _______________     _______________
  _      9.67.60.0           255.255.255.0          USIBMRA      RAL?????
  _      9.67.61.20          *HOST                  USIBMRA      TOR0000M
  _      9.67.61.0           255.255.255.0          USIBMRA      TOR?????




                                                                           Bottom

 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 80. Scenario 4: Work with IP over SNA Locations - System TORAS4B

CFGIPS option 20 was used to determine the specific location address to be entered for the local system.

```
                                Convert IP Address
                                                              System:   TORAS4B
 Internet address . . . . . . . :   9.67.61.20

 Network identifier . . . . . . :   *NETATR
 Location name  . . . . . . . . :   TOR0000M




 Press Enter to continue.

 F3=Exit   F12=Cancel
```

Figure 81. Scenario 4: Converting the IP Address at TORAS4B

Next, we update the APPN local location list on TORAS4B.

```
                          Display Configuration List                 TORAS4B
                                                           11/29/94  15:30:18
Configuration list . . . . . . . . :   QAPPNLCL
Configuration list type  . . . . . :   *APPNLCL
Text . . . . . . . . . . . . . . . :

-----APPN Local Locations-----          -----APPN Local Locations-----
Local                                   Local
Location  Text                          Location  Text
TORAS4B
TOR0000M  Loc. for Scenario 4




                                                                       Bottom
Press Enter to continue.

F3=Exit   F12=Cancel   F17=Position to
```

Figure 82. Scenario 4: Local Location List - System TORAS4B

By default, AnyNet/2 will use mode SNACKETS for Sockets over SNA. We therefore map the IP Type of Service we want to use (*NORMAL) to the SNA Mode SNACKETS.

```
                    Work with IP over SNA Type of Service
                                                           System:   TORAS4B
Type options, press Enter.
  2=Change

Opt    Type of Service                 SNA Mode
 _       *MINDELAY                     *NETATR
 _       *MAXTHRPUT                    *NETATR
 _       *MAXRLB                       *NETATR
 _       *MINCOST                      *NETATR
 _       *NORMAL                       SNACKETS
                                                                       Bottom

F3=Exit   F5=Refresh   F6=Print list   F10=Work with Mode Descriptions
F12=Cancel
(C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 83. AS/400 Work with IP over SNA Type of Service

Mode SNACKETS with the parameters, shown in Figure 44 on page 42, should be added to TORAS4B.

RALYPS2B Configuration

The Communications Manager/2 setup is not shown here. An end node - to network node server configuration was created via the APPC APIs through Token-ring CM/2 menu option; this connected RALYPS2B with RALYAS4A. This CM/2 configuration was then modified via Advanced Configuration to add a link to TORAS4B. The AS/400 APPC controller and device descriptions were auto-created when this CM/2 configuration was started.

Select the **Configure AnyNet/2 Sockets over SNA** icon to access the configuration screens on the PS/2. The folder icon should be displayed on the OS/2 desktop if the AnyNet/2 code has been installed correctly.

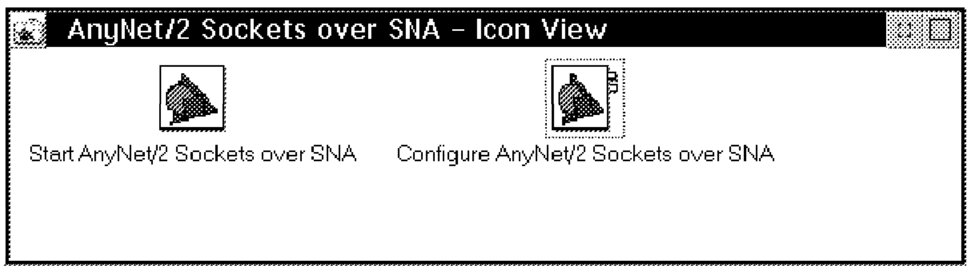

Figure 84. AnyNet/2 Sockets over SNA Folder

The first AnyNet/2 Sockets over SNA configuration screen defines the local system (local node).

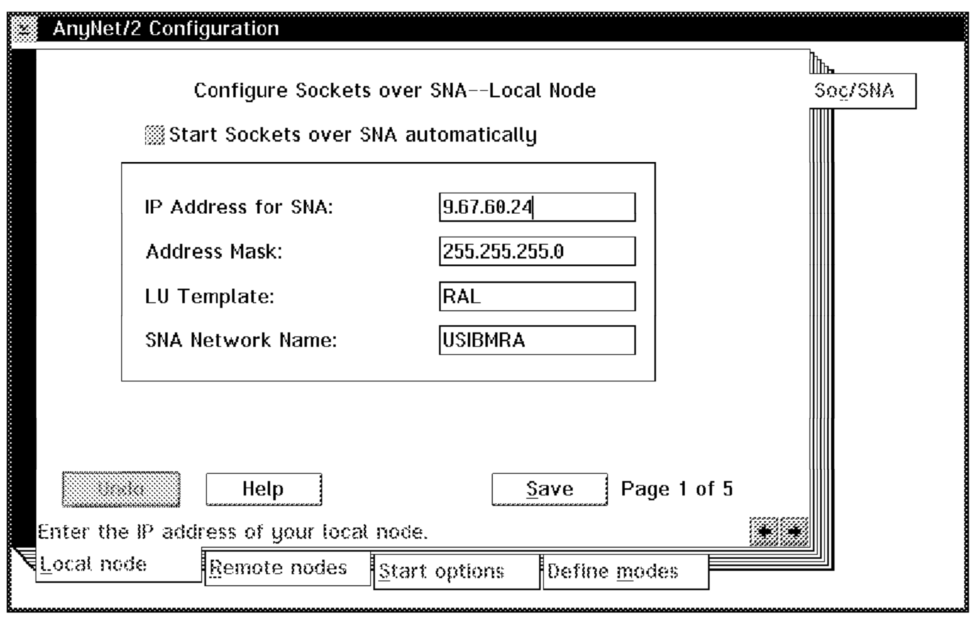

Figure 85. Scenario 4: Sockets over SNA Local Node Definition for RALYPS2B

The AnyNet/2 local node definition defines both the local Sockets over SNA interface address and the mapping of that address to an LU name. Unlike AnyNet/400, with AnyNet/2 there is not a separate Sockets over SNA interface definition. The address mask is *not* 255.255.255.255; therefore this is an algorithmic entry. The address mask of 255.255.255.0 with the IP address 9.67.60.24 denotes that this entry can be used to build LU names for Sockets over SNA systems in the 9.67.60 network.

The second AnyNet/2 Sockets over SNA configuration screen defines the remote systems (remote nodes).

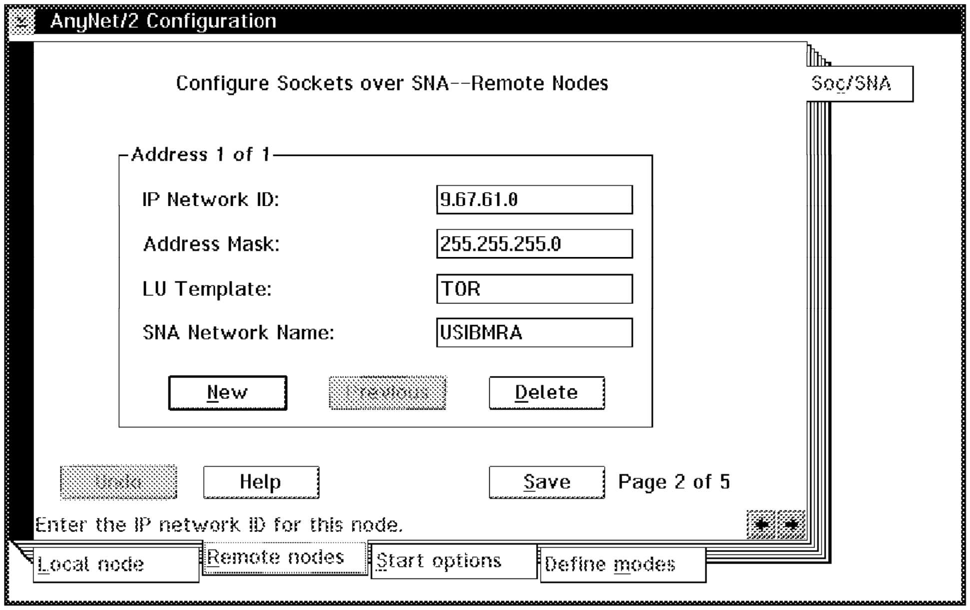

Figure 86. Scenario 4: Sockets over SNA Remote Node Definition for RALYPS2B

Unlike AnyNet/400, AnyNet/2 does not have a separate route entry. The remote node definition above will give access to Sockets over SNA systems in the 9.67.61 network. LU names for Sockets over SNA systems in the 9.67.61 network will be built from this entry.

The final AnyNet/2 Sockets over SNA configuration screen allows the SNA mode used for Sockets over SNA to be changed. Configuration screens 3 and 4 are not shown here.

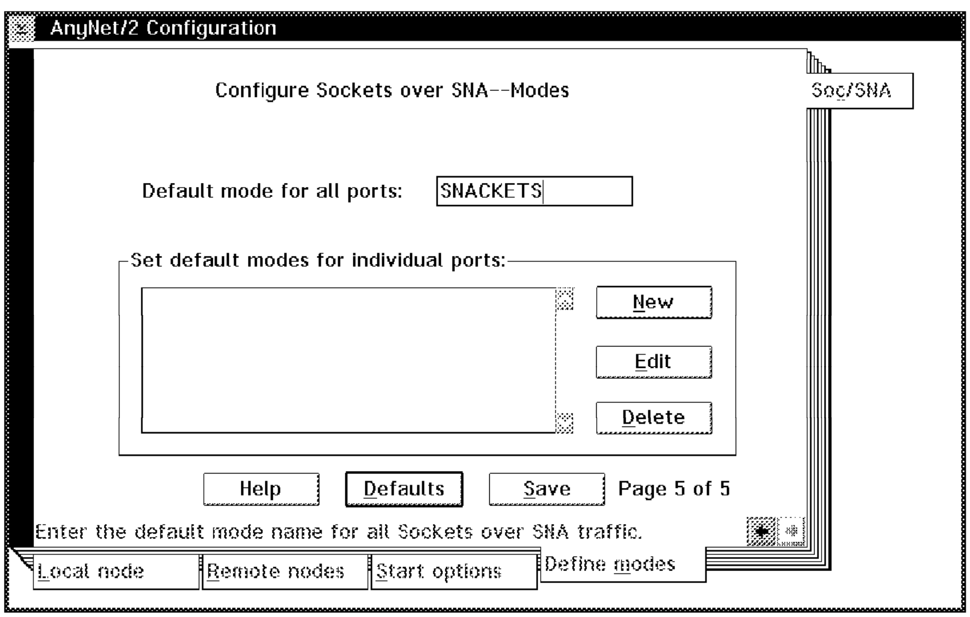

Figure 87. Scenario 4: Sockets over SNA Modes Definition for RALYPS2B

The AnyNet/2 Sockets over SNA configurator produces a command file (sxstart.cmd) based on the information in the AnyNet/2 Sockets over SNA configuration screens. This command file will be used when AnyNet/2 Sockets over SNA is started. System RALYPS2B has the following sxstart.cmd file:

```
@REM Sockets over SNA startup file

@REM First, start the Snackets program.

start snackets logfile 100000 sessions 30

@REM Next, tell Sockets over SNA how to map IP addresses to LU names.
@REM Wait for Sockets over SNA to get set up before continuing.
sxmap -w add 9.67.60.24 255.255.255.255 USIBMRA RAL

sxmap add 9.67.61.0 255.255.255.0 USIBMRA TOR

@REM Use IFCONFIG to define the local address
ifconfig sna0 9.67.60.24
route add 9.67.60.24 9.67.60.24 0
route add 9.67.61.0 9.67.60.24 0
```

Note

Changes were required to the sxstart.cmd file that is shown above because of the level of the installed AnyNet/2 code. Be aware that your configuration may also require a change to the sxstart.cmd file.

We had to edit the last line of sxstart.cmd. *Note the difference between the last lines of these files*. If your configuration is similar to this scenario, then you may also need to edit the sxstart.cmd file. The changed file is as follows:

```
@REM Sockets over SNA startup file

@REM First, start the Snackets program.

start snackets logfile 100000 sessions 30

@REM Next, tell Sockets over SNA how to map IP addresses to LU names.
@REM Wait for Sockets over SNA to get set up before continuing.
sxmap -w add 9.67.60.24 255.255.255.255 USIBMRA RAL

sxmap add 9.67.61.0 255.255.255.0 USIBMRA TOR

@REM Use IFCONFIG to define the local address
ifconfig sna0 9.67.60.24
route add 9.67.60.24 9.67.60.24 0
route add net 9.67.61 9.67.60.24 0
```

To start AnyNet/2 Sockets over SNA, do one of the following:

- Enter the SXSTART command from an OS/2 prompt.
- Open the **Start AnyNet/2 Sockets over SNA** icon (see Figure 84 on page 68).

AnyNet/2 Sockets over SNA requires the OS/2 Communications Manager to be active. If this is not yet active, Sockets over SNA will wait 10 minutes for it to become active. If after 10 minutes OS/2 Communications Manager is not active, Sockets over SNA will shut itself down.

When AntNet/2 Sockets over SNA is started, the sxstart command file is run. Once initialized, AnyNet/2 Sockets over SNA will run in a window named snackets.exe.

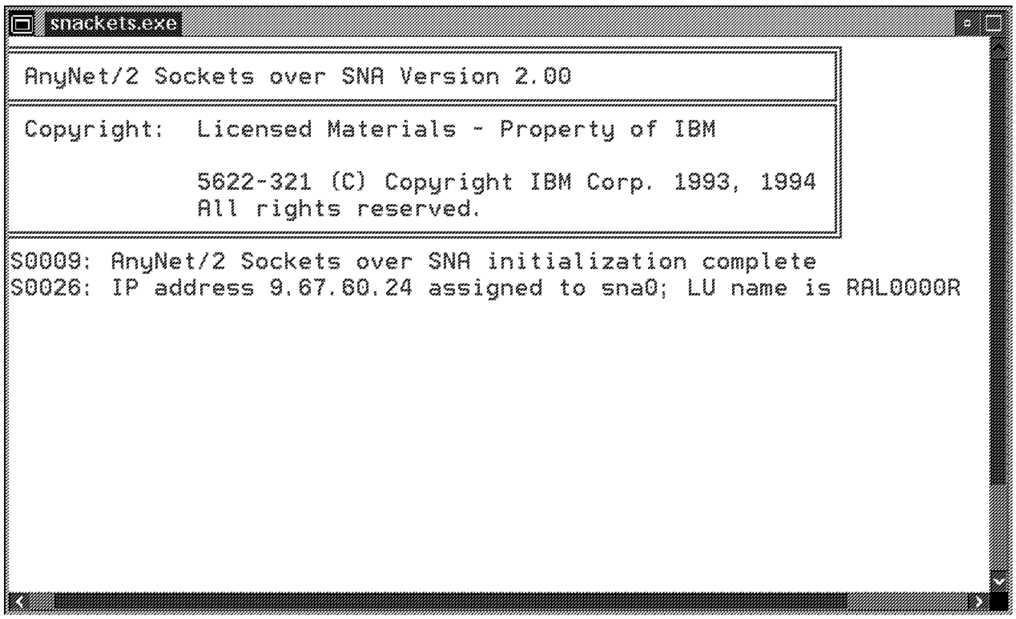

Figure 88. Scenario 4: AnyNet/2 Sockets over SNA Gateway Initialization on RALYPS2B

AnyNet/2 Sockets over SNA can be stopped by pressing Ctrl-C in the OS/2 window session where the snackets.exe program is running - the window shown in Figure 88.

Communications Manager/2 will dynamically update its local LU table when the sxstart command is run at AnyNet/2 startup, in this example to include the LU name RAL0000R. This location name will then be registered at RALYAS4A via the End node - Network node CP session between RALYPS2B and RALYAS4A. With an APPN connection between RALYAS4A and TORAS4B, TORAS4B will be able to FIND RALYPS2B via RALYAS4A.

With AnyNet/2 Sockets over SNA running, we can use the SXMAP AnyNet/2 command to verify the AnyNet/2 IP address to SNA LU name mapping.

```
OS2 C:\>sxmap
sxmap: Version 2.00
usage: sxmap [-w] (add | delete | get | flush | convert | qmap) argument(s)
       sxmap add ip_number mask netname template
       sxmap convert ip_number mask template
       sxmap convert startip endip mask template
       sxmap delete ip_number
       sxmap flush
       sxmap get
       sxmap qmap ip_number
       -w: optional parameter causing sxmap to delay until snackets is
           started. Waits up to 30 seconds. (Doesn't apply to convert.)
example: sxmap add 128.109.0.0 255.255.0.0 USIBMSER NR

OS2 C:\>sxmap qmap 9.67.60.23
IP address maps to: USIBMRA.RAL0000Q
```

Figure 89. AnyNet/2 Sockets over SNA SXMAP Command Output

Prior to starting AnyNet/2 Sockets over SNA, SXMAP can be used with the convert option to determine the SNA address that would be generated from a given IP address, mask and template.

Shown next are the matching parameters between systems RALYAS4A, TORAS4B and RALYPS2B. For simplicity, only the Sockets over SNA configurations are shown.

```
     PS/2
   RALYPS2B
   ********

LOCAL NODE DEFINITION
---------------------
IP ADDR       9.67.60.24
ADDRESS MASK  255.255.255.0
LU TEMPLATE   RAL
SNA NET.NAME  USIBMRA

REMOTE NODE DEFINITIONS
-----------------------
IP NETID      9.67.61.0
ADDRESS MASK  255.255.255.0
LU TEMPLATE   TOR
SNA NET.NAME  USIBMRA
```

```
   AS/400
  RALYAS4A
*************

IP OVER SNA LOCATIONS
---------------------
RMTDEST     9.67.60.0
SUBNETMASK  255.255.255.0
RMTNETID    USIBMRA
LOCTPL      RAL?????

RMTDEST     9.67.61.0
SUBNETMASK  255.255.255.0
RMTNETID    USIBMRA
LOCTPL      TOR?????

RMTDEST     9.67.60.23
SUBNETMASK  *HOST
RMTNETID    USIBMRA
LOCTPL      RAL0000Q

IP OVER SNA ROUTES
------------------
RTEDEST     9.67.61.0
SUBNETMASK  255.255.255.0
NEXTHOP     9.67.60.23

IP OVER SNA INTERFACES
----------------------
INTNETADR   9.67.60.23
SUBNETMASK  255.255.255.0

CONVERT IP INTO LOC (OPT 20)
-------------------
INTNETADR   9.67.60.23
NETID       USIBMRA
LOCNAME     RAL0000Q

DSPCFGL QAPPNLCL
----------------
LCLLOC      RALYAS4A
            RAL0000Q
```

```
   AS/400
  TORAS4B
*************

IP OVER SNA LOCATIONS
---------------------
RMTDEST     9.67.61.0
SUBNETMASK  255.255.255.0
RMTNETID    USIBMRA
LOCTPL      TOR?????

RMTDEST     9.67.60.0
SUBNETMASK  255.255.255.0
RMTNETID    USIBMRA
LOCTPL      RAL?????

RMTDEST     9.67.61.20
SUBNETMASK  *HOST
RMTNETID    USIBMRA
LOCTPL      TOR0000M

IP OVER SNA ROUTES
------------------
RTEDEST     9.67.60.0
SUBNETMASK  255.255.255.0
NEXTHOP     9.67.61.20

IP OVER SNA INTERFACES
----------------------
INTNETADR   9.67.61.20
SUBNETMASK  255.255.255.0

CONVERT IP INTO LOC (OPT 20)
-------------------
INTNETADR   9.67.61.20
NETID       USIBMRA
lOCNAME     TOR0000M

DSPCFGL QAPPNLCL
----------------
LCLLOC      TORAS4B
            TOR0000M
```

Figure 90. Sockets over SNA Scenario 4: Matching Parameters Table

Verifying the Scenarios

In order to prove that the Sockets over SNA connection is working, we can follow a step-by-step verification process. In a failing environment, this step-by-step process should help identify the failing area. Verification is included for the following:

- AnyNet/400 Sockets over SNA
- AnyNet/2 Sockets over SNA

AnyNet/400 Sockets over SNA Verification

The verification of Sockets over SNA should be carried out in the following stages:

- AS/400 SNA Verification
- AS/400 Sockets over SNA Verification

Note

The verifications shown in this section were carried out from RALYAS4A in Sockets over SNA scenario 4.

AS/400 SNA Verification

AnyNet/400 Sockets over SNA requires an SNA configuration between the systems. This SNA configuration is established as if it were to be used by native APPC applications; there are no special SNA configuration requirements to allow Sockets over SNA to use the SNA configuration. Before we verify the Sockets over SNA configuration, we should verify the native SNA configuration. This can be done in many ways. In our examples where the remote system was either another AS/400 or an OS/2 system, verification will take place when the link is activated. The reason being that in both cases a CP (Control Point) session is established between the systems. Assuming the connection is via a LAN, this CP session activation will result in the target AS/400 controller and device descriptions being autocreated.

The following figure shows the autocreated AS/400 LAN configuration.

```
                     Work with Configuration Status                RALYAS4A
                                                           11/30/94  11:40:12
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--------------
__   L41TR             ACTIVE
__     RALYPS2B        ACTIVE
__       RALYPS2B      ACTIVE

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

Figure 91. WRKCFGSTS of Active Sockets over SNA Configuration

To further verify the configuration, if the remote system is an AS/400, the STRPASTHR command can be used. An AS/400 command that can be used to verify *any* LU 6.2 configuration is STRMOD. For example, the following STRMOD command was used to verify an LU 6.2 configuration between an AS/400 and an OS/2 system.

```
STRMOD RMTLOCNAME(RALYPS2B) MODE(SNACKETS)
Command STRMOD completed successfully for mode SNACKETS device RALYPS2B.
The STRMOD command completed successfully for all modes.
```

The STRMOD command results in a CNOS (Change Number of Sessions) LU 6.2 command flowing to the remote system.

Once we are satisfied that the SNA configuration is working fine, we can move on to verify the Sockets over SNA configuration.

AS/400 Sockets over SNA Verification

Having verified the native SNA configuration to the remote system, we can now verify the Sockets over SNA configuration.

Before we can use an AS/400 TCP/IP application with Sockets over SNA, we must start the server for that application on the AS/400. To start the FTP application server (the application we use in this verification), enter the command:

```
STRTCPSVR SERVER(*FTP)
```

Alternatively we can start TCP/IP on the AS/400. To do this, enter the command STRTCP. In the examples that follow we have used the STRTCP command. By default, STRTCP will start the FTP server.

The NETSTAT (Network Status) command can be used to display the status of Sockets over SNA interfaces, routes and connections in addition to native TCP/IP network status. We can use NETSTAT option 1 (Work with TCP/IP Interface Status) to verify that the Sockets over SNA interface is active.

```
                      Work with TCP/IP Interface Status
                                                            System:   RALYAS4A
 Type options, press Enter.
   5=Display details   8=Display associated routes   9=Start   10=End
   12=Work with configuration status

      Internet         Network           Line      Interface
 Opt  Address          Address          Description  Status
      9.24.104.56      9.24.104.0       L41TR        Active
      9.67.60.23       9.67.60.0        *IPS         Active
      127.0.0.1        127.0.0.0        *LOOPBACK    Active










                                                                     Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F11=Display line information   F12=Cancel
 F13=Sort by column    F24=More keys
```

Figure 92. NETSTAT Work with TCP/IP Interface Status

Figure 92 shows the status of both the native TCP/IP interface (9.24.104.56) and the Sockets over SNA interface (9.67.60.23). From this display we can verify that the local IP over SNA interface is active and hence available for use. If not available (Inactive), we can use option 9 to make it available.

NETSTAT option 2 (Display TCP/IP route information) gives route information for all routes (native TCP/IP and Sockets over SNA). The display also shows whether or not the route is available.

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

      Route              Subnet            Next               Route
 Opt  Destination        Mask              Hop               Available
  _   9.67.60.0          255.255.255.0     *DIRECT             *YES
  _   9.24.104.0         255.255.255.0     *DIRECT             *YES
  _   9.67.61.0          255.255.255.0     9.67.60.23          *YES
  _   127.0.0.0          255.0.0.0         *DIRECT             *YES
  _   *DFTROUTE          *NONE             9.24.104.1          *YES







                                                                        Bottom
 F3=Exit   F5=Refresh   F6=Print list   F11=Display route type   F12=Cancel
 F13=Sort by column     F17=Top         F18=Bottom
```

Figure 93. NETSTAT Display TCP/IP Route Information

The NETSTAT option 2 example in Figure 93 is from a system with both a native TCP/IP configuration and a Sockets over SNA configuration. The first two entries were automatically added when the native TCP/IP and Sockets over SNA interfaces were added (a native TCP/IP interface with an internet address of 9.24.104.56 and a subnet mask of 255.255.255.0, a Sockets over SNA interface with an internet address of 9.67.60.23 and a subnet mask of 255.255.255.0). These entries give access to systems in the same network as the local system. Note that the next hop for these entries is *DIRECT, go use the local interface. The third entry is the result of adding a Sockets over SNA route with a route destination of 9.67.61.0, subnet mask of 255.255.255.0 and next hop of 9.67.60.23. Note that the next hop for this entry is the address of the local IP over SNA interface. The fourth entry is the loopback entry. The last entry is the default route on the system; in this example, the default route is for native TCP/IP with a next hop of 9.24.104.1. We can use this display to verify that a route is available to the remote system with which we want to communicate using Sockets over SNA.

Note

The NETSTAT option 2 route information above is how the system will decide whether to use native TCP/IP or Sockets over SNA for a connection. For the system to use Sockets over SNA, the route selected must have a next hop that specifies either *DIRECT where this maps to *IPS (as in the 9.67.60.0 route destination in Figure 93, NETSTAT option 1 can be used to verify that this route destination maps to a network address against which *IPS is specified), the address of local IP over SNA interface (as in the 9.67.61.0 route destination in Figure 93) or the address of an AnyNet Sockets over SNA gateway. When choosing a route to use, the system will select the most specific entry. You should *not* have duplicate route entries.

Having verified that the local IP over SNA interface is active and that a route is available to the remote system, we can now try to establish a Sockets over SNA session to that system. Under native TCP/IP we would normally use the PING application to initially test a configuration. However, under OS/400 Sockets over SNA, PING server only is supported. This, therefore, does not make a good test tool to use in this environment. Since the FTP (File Transfer Protocol) application is universally supported by TCP/IP systems, we have used this application here to verify the Sockets over SNA configurations.

PING client

An OS/400 V3R1 PTF is now available that makes it possible to use the OS/400 PING client with AnyNet. The PTF number is SF25273.

We must first make sure that Sockets over SNA and any application we want to use are started on the remote system. In the example that follows we will use FTP to an OS/2 system. We therefore need to start AnyNet/2 Sockets over SNA and the FTP application server on the OS/2 system. To start AnyNet/2 Sockets over SNA we use the SXSTART command (see "AnyNet/2 Sockets over SNA Verification" on page 82).

In Figure 94 we have used the following command to access an OS/2 system via Sockets over SNA:

```
ftp '9.67.60.24'
```

```
                              File Transfer Protocol

Previous FTP subcommands and messages:
  Connecting to remote host name 9.67.60.24 using port 21.
  220 as4ps2 IBM TCP/IP for OS/2 - FTP Server ver 12:58:07 on Mar 16 19
   ready.
  215 OS/2 operating system
> anyuser
  331 Password required for anyuser.
  230 User anyuser logged in.




Enter an FTP subcommand.
===>



F3=Exit     F6=Print       F9=Retrieve
F17=Top    F18=Bottom    F21=CL command line
```

Figure 94. FTP Via Sockets over SNA to an OS/2 System

Note

We could, of course, have added 9.67.60.24 to the local TCP/IP host table (or to the name server being used) which would have allowed us to use a host name rather than the internet address with the FTP command.

Having established a Sockets over SNA connection, if we now look at the AS/400 configurations status via the WRKCFGSTS command, we see the following:

```
                        Work with Configuration Status               RALYAS4A
                                                           11/30/94  10:44:11
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--------------
__   L41TR            ACTIVE
__     RALYPS2B       ACTIVE
__       RALYPS2B     ACTIVE
__       RAL0000R     ACTIVE
__         SNACKETS   ACTIVE/SOURCE         DSP01       ANYUSER     010193







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

Figure 95. WRKCFGSTS of Active Sockets over SNA Session (1 of 3)

The connection was from AnyNet/400 to AnyNet/2, hence mode SNACKETS is being used. RAL0000R is the algorithmically generated name for the AnyNet/2 session; the device for this session has been autocreated.

If, instead, the AS/400 was the target of the Sockets over SNA FTP connection, WRKCFGSTS would show the following:

```
                        Work with Configuration Status               RALYAS4A
                                                           11/30/94  10:48:14
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--------------
__   L41TR            ACTIVE
__     RALYPS2B       ACTIVE
__       RALYPS2B     ACTIVE
__       RAL0000R     ACTIVE
__         SNACKETS   ACTIVE/TARGET         QTFTP12215  QTCP        015161







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

Figure 96. WRKCFGSTS of Active Sockets over SNA Session (2 of 3)

NETSTAT option 3 (Work with TCP/IP Connection Status) will show this active session from an IP address perspective, as can be seen from Figure 97.

```
                      Work with TCP/IP Connection Status
                                                             System:   RALYAS4A
Local internet address . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  000:04:36  Listen
     *                *          telnet     000:05:14  Listen
     *                *          lpd        000:04:41  Listen
     9.67.60.24       ftp-con >  1025       000:00:01  Established



                                                                        Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 97. NETSTAT Work with TCP/IP Connection Status (1 of 2)

If, instead, the AS/400 was the target of the Sockets over SNA FTP connection, NETSTAT option 3 would show the following:

```
                      Work with TCP/IP Connection Status
                                                             System:   RALYAS4A
Local internet address . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  000:04:36  Listen
     *                *          telnet     000:05:14  Listen
     *                *          lpd        000:04:41  Listen
     9.67.60.24       1034       ftp-con >  000:04:24  Established





                                                                        Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 98. NETSTAT Work with TCP/IP Connection Status (2 of 2)

Note: ftp-con = port 21 (see CFGTCP option 21). Port 21 is the well-known port for FTP.

Configuration advice

In the above example we see a single SNA session being used to carry the FTP connection. This will not always be the case; FTP establishes one connection called a control connection which is maintained all the time the connection is up. If a request is made to transfer a file, a second connection called a data connection is established as can be seen in Figure 99. If the connection is via or to a product which uses twin-opposed half-duplex conversations for Sockets over SNA (for example, an AnyNet Sockets over SNA Gateway), then two sessions will be used for the control connection and two for each transfer. You should be aware of these points when deciding the session limits associated with modes that will be used for Sockets over SNA.

```
                          Work with Configuration Status                RALYAS4A
                                                              11/30/94  10:45:12
 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--------------
 __   L41TR             ACTIVE
 __     RALYPS2B        ACTIVE
 __       RALYPS2B      ACTIVE
 __       RAL0000R      ACTIVE
 __         SNACKETS    ACTIVE/SOURCE         DSP01       ANYUSER     010193
 __         SNACKETS    ACTIVE/TARGET         DSP01       ANYUSER     010193






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

Figure 99. WRKCFGSTS of Active Sockets over SNA Session (3 of 3)

AnyNet/2 Sockets over SNA Verification

Note

The verifications shown in this section were carried out from RALYPS2B in Sockets over SNA scenario 3.

To check whether Communication Manager/2 is running, we can use the CMQUERY command which displays the following panel:

```
OS2 C:\>cmquery

               Communications Manager Query Services

    Workstation Type      : Single User
    Default configuration : RALYPS2B
    Active configuration  : RALYPS2B

     Service                         Status
    ==============================================================
      CM Kernel                     ACTIVE
      SNA Services                  ACTIVE
      SRPI                           *** Stopped ***
      X.25                           *** Stopped ***
      SNA Phone Connect              *** Stopped ***
      ACDI                           *** Stopped ***
      3270 Emulator                  *** Stopped ***
      5250 Emulator                  *** Stopped ***
    ==============================================================
    Thursday, 02/23/95 15:53:45   End of Program - CMQuery
```

Figure 100. Communications Manager/2 CMQUERY Command Output

To start AnyNet/2 Sockets over SNA, we should do the following:

1. Start Communication Manager/2
2. Start AnyNet/2 Sockets over SNA

AnyNet/2 Sockets over SNA can be started by either opening the **Start AnyNet/2 Sockets over SNA** icon or by entering the SXSTART command.

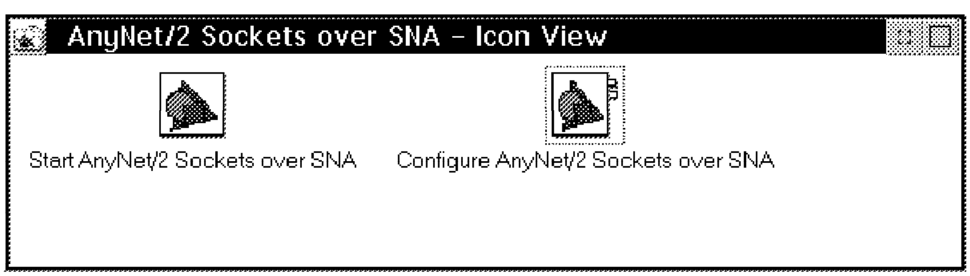

Figure 101. AnyNet/2 Sockets over SNA Folder

If you plan to use an OS/2 TCP/IP application (for example, FTP), then it is also necessary to start that application on the OS/2 system.

When AnyNet/2 Sockets over SNA is started, the sxstart command file is run. The following is an example of the output of the sxstart.cmd file:

```
OS2 C:\>sxstart

OS2 C:\>start snackets logfile 100000 sessions 30
OS2 C:\>sxmap -w add 9.67.60.24 255.255.255.255 USIBMRA RALYPS2B

OS2 C:\>sxmap add 9.67.60.20 255.255.255.255 USIBMRA RALYAS4A

OS2 C:\>ifconfig sna0 9.67.60.24

OS2 C:\>route add 9.67.60.24 9.67.60.24 0
add host 9.67.60.24: router 9.67.60.24

OS2 C:\>route add 9.67.60.20 9.67.60.24 0
add host 9.67.60.20: router 9.67.60.24
```

Figure 102. AnyNet/2 sxstart Command Output

Once initialized, Anynet/2 Sockets over SNA will run in an OS/2 window session named snackets.exe.

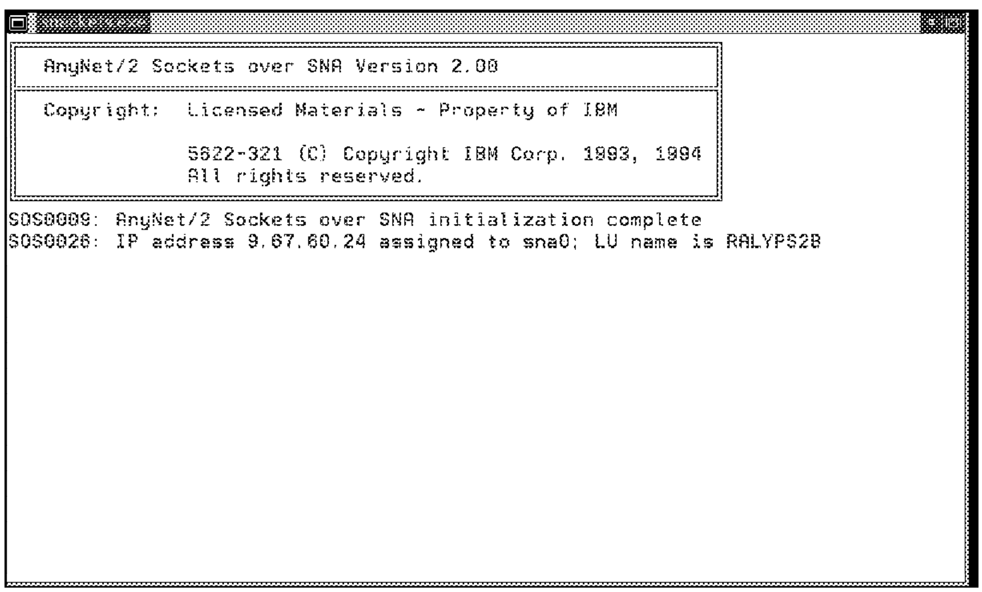

Figure 103. AnyNet/2 Sockets over SNA Initialization on System RALYPS2B

AnyNet/2 Sockets over SNA can be stopped by pressing Ctrl-C in the OS/2 window session where the snackets.exe program is running - the window shown in Figure 103.

By default, AnyNet/2 Sockets over SNA will display error messages in the snackets.exe window.

We can use the NETSTAT -s command to verify that AnyNet/2 Sockets over SNA has initialized.

```
OS2 C:\>netstat -s
SOCK      TYPE        FOREIGN          LOCAL         FOREIGN      STATE
                         PORT           PORT            HOST
==== ==========      ==========      ==========      ========== ==========
57       DGRAM              0      mptn..397         0.0.0.0   UDP
56       DGRAM              0           1031         0.0.0.0   UDP
55      STREAM           1042           1041    9.24.104.189   ESTABLISHED
54      STREAM           1041           1042    9.24.104.189   ESTABLISHED
52      STREAM           1040           1039    9.24.104.189   ESTABLISHED
51      STREAM           1039           1040    9.24.104.189   ESTABLISHED
49      STREAM              0      mptn..397         0.0.0.0   LISTEN
7       STREAM              0        ftp..21         0.0.0.0   LISTEN
```

Figure 104. TCP/IP for OS/2 NETSTAT -s Command Output

From the NETSTAT -s display, we can see that Sockets over SNA is enabled because sockets are bound to the well-known port for Sockets over SNA (port 397). The four stream sockets 55,54,52 and 51 are used for internal Sockets over SNA connections.

To verify that AnyNet/2 Sockets over SNA has built the route correctly, we can use the NETSTAT -r command.

```
OS2 C:\>netstat -r
    destination         router    refcnt        use flags     snmp  intrf
                                                             metric
     9.67.60.24     9.67.60.24       0           0     U       -1   sna0
     9.67.60.20     9.67.60.24       0           0     U       -1   sna0
        default     9.24.104.1       1          66     U       -1   lan0
     9.24.104.0   9.24.104.189       4         404     U       -1   lan0
        9.0.0.0     9.67.60.24       0           0     U       -1   sna0
```

Figure 105. TCP/IP for OS/2 NETSTAT -r Command Output

From the NETSTAT -r display, we can see both the native and non-native route entries. The first two entries are the result of the AnyNet/2 local and remote node definitions; both point to the local Sockets over SNA interface. The third entry is a result of a TCP/IP default route entry. The fourth entry is the result of adding a native TCP/IP interface.

Note

The NETSTAT -r route information above is how the system will decide whether to use native TCP/IP or Sockets over SNA for a connection. For the system to use Sockets over SNA, the route selected must either have a router definition specifying the address of the local Sockets over SNA interface or the address of an AnyNet Sockets over SNA Gateway. When choosing a route to use, the system will select the most specific entry. You should *not* have duplicate route entries.

FTP can also be initiated from the OS/2 system as shown in the following panel.

```
OS2 C:\>ftp 9.67.60.20
IBM TCP/IP for OS/2 - FTP Client ver 09:44:28 on Mar 04 1994
Connected to 9.67.60.20.
220-QTCP at 9.67.60.20.
220 Connection will close if idle more than 5 minutes.
Name (9.67.60.20): anyuser
331 Enter password.
Password: .......
230 ANYUSER logged on.
ftp>
```

Figure 106. TCP/IP for OS/2 FTP Command Output

The active Communications Manager/2 LU 6.2 sessions can be displayed as follows:

1. Open the **Communication Manager/2** icon
2. Select **Subsystem Management**
3. Select **SNA Subsystem**
4. Select **Display active configuration**
5. Select **General SNA**
6. Select **LU 6.2 sessions**

```
*************************************
*        Session Information        *
*************************************
Number of sessions                            3

          ----------------------deleted-------------------------

3>Session ID                                  X'68F417A710520D2C'
  Conversation ID                             X'A7270BCE'
  LU alias                                    ralyps2b
  Partner LU alias                            @I000002
  Mode name                                   SNACKETS
  Send maximum RU size                        1920
  Receive maximum RU size                     1920
  Send pacing window                          1
  Receive pacing window                       7
  Link name                                   LINK0001
  Outbound destination address (DAF)          X'02'
  Outbound origin address (OAF)               X'02'
  OAF-DAF assignor indicator (ODAI)           B'0'
  Session type                                LU-LU session
  Connection type                             Peer
  Procedure correlator ID (PCID)              X'C0773C225E0C886E'
  PCID generator CP name                      USIBMRA.RALYPS2B
  Conversation group ID                       X'14520D2C'
  LU name                                     USIBMRA.RALYPS2B
  Partner LU name                             USIBMRA.RALYAS4A
  Pacing type                                 Adaptive
  Primary LU indicator                        Local LU
```

```
  FMD PIUs sent by primary LU              5
  FMD PIUs sent by secondary LU            7
  Non-FMD PIUs sent by primary LU          1
  Non-FMD PIUs sent by secondary LU        1
  Bytes sent by primary LU                 349
  Bytes sent by secondary LU               372
  PLU to SLU compression level             None
  PLU to SLU compression percent           0
  SLU to PLU compression level             None
  SLU to PLU compression percent           0
```

The active Communications Manager/2 Transaction Programs can be displayed as follows:

1. Open the **Communication Manager/2** icon.
2. Select **Subsystem Management**.
3. Select **SNA Subsystem**.
4. Select **Display active configuration**.
5. Select **General SNA**.
6. Select **Transaction programs**.

```
**************************************
*    Active Transaction Programs     *
**************************************
Active transaction programs              1

1>Transaction program name               X'28F0F0F1'
  Transaction program ID                 X'08181FA7CF510D2C'
  User ID
  Transaction program initiated          Locally
  LU alias                               ralyps2b
  Logical unit of work name              USIBMRA.RALYPS2B
  Logical unit of work instance          X'DDDDDDDDDDE7'
  Logical unit of work sequence          X'0001'
  Number of conversations                1

1.1>Conversation ID                      X'A7270BCE'
    Conversation state                   Send only
    Session ID                           X'68F417A7DA510D2C'
    Synchronization level                None
    Conversation type                    Basic
    Conversation group ID                X'2C0D51DE'
    Conversation source                  Partner LU
    Conversation style                   Two-way simultaneous
    Bytes sent by source                 139
    Bytes sent by target                 193
```

X'28F0F0F1' is the transaction program name for Sockets over SNA.

If we use the NETSTAT -s command again, we can see the active session from an IP address perspective.

```
OS2 C:\>netstat -s
SOCK      TYPE         FOREIGN           LOCAL         FOREIGN      STATE
                          PORT            PORT            HOST
==== ==========     ==========      ==========      ========== ==========
68      STREAM        ftp..21            1044      9.67.60.20   CLOSED
57       DGRAM              0       mptn..397         0.0.0.0   UDP
56       DGRAM              0            1031         0.0.0.0   UDP
55      STREAM           1042            1041    9.24.104.189   ESTABLISHED
54      STREAM           1041            1042    9.24.104.189   ESTABLISHED
52      STREAM           1040            1039    9.24.104.189   ESTABLISHED
51      STREAM           1039            1040    9.24.104.189   ESTABLISHED
49      STREAM              0       mptn..397         0.0.0.0   LISTEN
7       STREAM              0         ftp..21         0.0.0.0   LISTEN
```

Figure 107. TCP/IP for OS/2 NETSTAT -s Command Output

The active Sockets over SNA connection is using local port 1044.

AnyNet/400 APPC over TCP/IP

This chapter presents the process of defining and verifying AnyNet/400 APPC over TCP/IP at the International Technical Support Organization in Raleigh.

Along with the AnyNet/400 environments, the AnyNet/2 and AnyNet/MVS implementations are used in some of the scenarios.

The information is presented in the following sections:

1. Introduction to OS/400 APPC over TCP/IP
2. Using AnyNet/400 APPC over TCP/IP
3. Configuring AnyNet/400 APPC over TCP/IP
4. APPC over TCP/IP Scenarios
   - APPC over TCP/IP Scenario 1: AS/400 to AS/400 - Same SNA Network
   - APPC over TCP/IP Scenario 2: AS/400 to AS/400 - Different SNA Networks
   - APPC over TCP/IP Scenario 3: AS/400 to PS/2 - Same SNA Network
   - APPC over TCP/IP Scenario 4: AS/400 to various - AS/400 Bridge
   - APPC over TCP/IP Scenario 5: AS/400 to MVS - Same SNA Network
5. Verifying the Scenarios

For further information on AnyNet/400 APPC over TCP/IP refer to *AS/400 Communications Configuration*, SC41-3401.

Introduction to OS/400 APPC over TCP/IP

Until recently the AS/400 has been largely an SNA-based system. Because of this, the majority of the applications (IBM-supplied and non IBM-supplied) are APPC (Advanced Program-to-Program Communications) based. Providing the network is SNA-based, these applications can communicate with each other in a very reliable manner. However, more and more networks are becoming router-based. While many routers in the market place today can handle APPC traffic, in many situations companies are reluctant to turn on the router function that accomplishes this. Many companies would also like to see only TCP/IP across their networks. This was a problem in the past but with the announcement of the AnyNet family of products, companies can use APPC (ICF) or CPI-C applications across TCP/IP networks. AnyNet allows a company to choose the application programs that best meet the needs of their business without having to worry about the transport protocol they are using over their network. 5250 Display Station Passthrough, Client Access/400, etc. can, using AnyNet/400 APPC over TCP/IP, run over a TCP/IP network.

AnyNet/400 is one member of the AnyNet family of products. AnyNet/400 is included with the base OS/400 Version 3 Release 1 or higher. Support is provided to allow APPC applications to run over TCP/IP and sockets applications to run over SNA. In addition, Network Extensions (5733-SA1) provides AnyNet/400 support to allow APPC applications to run over IPX and sockets applications to run over IPX. Support is also provided to allow Client Access/400 to run over TCP/IP. In this chapter we look at APPC applications over TCP/IP.

AnyNet/400 APPC over TCP/IP can be used by those customers who:

- Want to run existing APPC applications across a TCP/IP network
- Want to simplify their network by reducing the number of protocols being used

Specifically, APPC over TCP/IP support in AnyNet/400, allows APPC programs to communicate between systems over a TCP/IP network. APPC over TCP/IP support can also be used to communicate with systems in an SNA network. This, however, requires an AnyNet gateway between the TCP/IP and SNA networks. The AnyNet gateway is covered in "AnyNet Gateways" on page 141.

AnyNet/400 APPC over TCP/IP makes it possible to use existing APPC (ICF) or CPI-C applications over a TCP/IP network. For example, 5250 Display Station Passthrough, SNADS (SNA Distribution Services) and Client Access/400 can all run, unchanged, over a TCP/IP network.

Using AnyNet/400 APPC over TCP/IP

The AnyNet/400 APPC over TCP/IP code is part of the base OS/400 V3R1 code. There are no special installation requirements.

Once AnyNet/400 APPC over TCP/IP has been configured, you will be able to run APPC (ICF) or CPI-C applications across a TCP/IP network. At the time that this book was written, the following APPC applications were supported under AnyNet/400:

- CICS/400
- DB2/400
- 5250 Display Station Pasthrough
- DRDA
- SNADS
- Client Access/400
- ICF or CPI-C user-written APPC applications

The running of these applications is transparent to the user regardless of what transport protocol is being used. The user may, however, notice a performance degradation when using an APPC application via AnyNet/400 as opposed to running the same application natively under SNA. Applications running on their native protocols may run faster than those running on a non-native protocol. The flexibility of the AnyNet/400 product should, however, outweigh any performance degradation. It is important to note that if your system implements AnyNet/400 (the Network Attribute ALWANYNET is set to *YES) any sockets applications running natively over TCP/IP will run slower. All of these points need to be considered when deciding whether to use the AnyNet/400 support. If you are not using AnyNet, ALWANYNET should be set to *NO.

Note

To use AnyNet/400 APPC over TCP/IP, it is not necessary to have the TCP/IP Connectivity Utilities (5763-TC1) installed on your system.

Configuring AnyNet/400 APPC over TCP/IP

In order to run APPC over TCP/IP on your AS/400, the following OS/400 configuration steps are required:

1. Establish a TCP/IP configuration between the systems.
2. Change the Network Attribute ALWANYNET to *YES.
3. Create an APPC controller with LINKTYPE(*ANYNW).
4. Add an entry to the APPN remote location list.
5. Map the APPC LU name to an internet address.

The user ID, under which the APPC over TCP/IP configuration is created, must have sufficient authority to access the relevant commands. Some of the commands require the user ID to have the IOSYSCFG authority. The examples shown here were created using a profile with QSECOFR authority.

1. **Establish a TCP/IP configuration between the systems**

   A prerequisite for APPC over TCP/IP is a TCP/IP configuration between the systems. In this step we show the basic steps to establishing a TCP/IP configuration between two systems. If your system already has a TCP/IP configuration to the remote system with which you want to communicate via APPC over TCP/IP, then you can skip this step and proceed to step 2 on page 94 in this section.

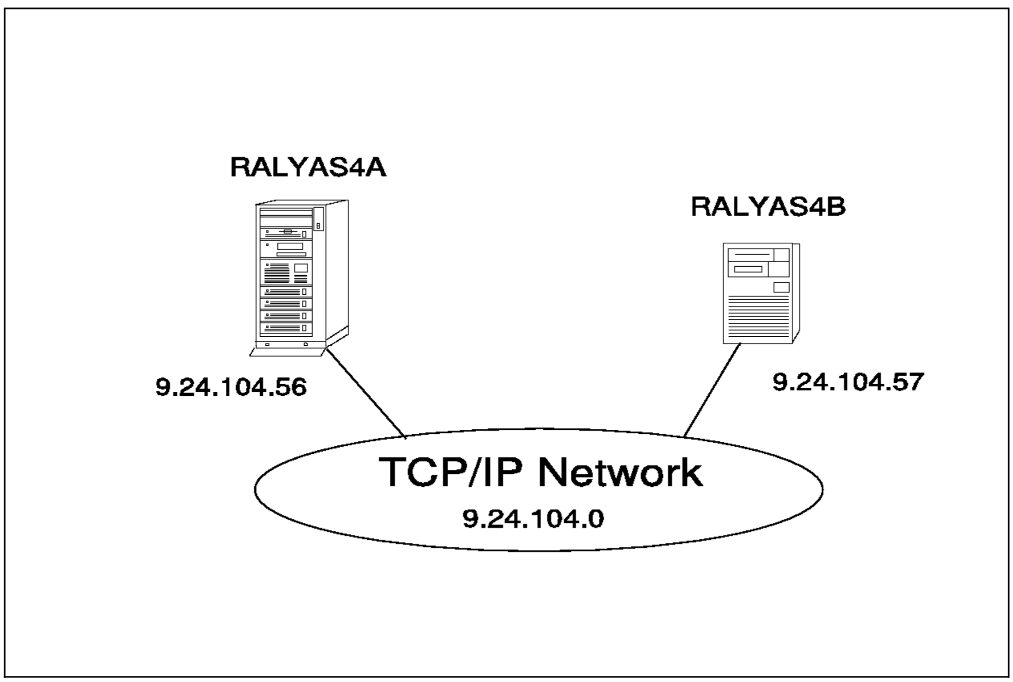

Figure 108. Two Systems Connected Using TCP/IP

   In the following panels we create the TCP/IP configuration for RALYAS4A in Figure 108. The configuration steps for RALYAS4B would be the same using the different adapter (LAN) address, internet address and host name.

   The following panels show the configuration screens for a token-ring configuration. If you require help in establishing a TCP/IP configuration over another type of interface, refer to the manual *AS/400 TCP/IP Configuration and Reference*, SC41-3420.

The AS/400 line description defines the physical interface to the network. If an appropriate line description does not already exist (they can be shared), you need to create one. Here we use the CRTLINTRN command to create a token-ring line description.

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

Type choices, press Enter.

Line description . . . . . . . . > L41TR         Name
Resource name  . . . . . . . . . > LIN041        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 description for LIN041'

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

Figure 109. Create Token-Ring Line Description - System RALYAS4A

For a TCP/IP configuration, there is no need to create controller and device descriptions, they are automatically created when TCP/IP first uses the token-ring line.

TCP/IP Interface

The TCP/IP interface defines this AS/400 on the TCP/IP network. Enter the CFGTCP command to access the Configure TCP/IP panel, and take option 1 to work with TCP/IP interfaces.

```
CFGTCP                         Configure TCP/IP
                                                           System:   RALYAS4A
Select one of the following:

     1. Work with TCP/IP interfaces
     2. Work with TCP/IP routes
     3. Change TCP/IP attributes
     4. Work with TCP/IP port restrictions
     5. Work with TCP/IP remote system information

    10. Work with TCP/IP host table entries
    11. Merge TCP/IP host table
    12. Change local domain and host names
    13. Change remote name server

    20. Configure TCP/IP applications
    21. Configure related tables


Selection or command
===> 1

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

Figure 110. TCP/IP Configuration Menu

```
                         Work with TCP/IP Interfaces
                                                           System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   9=Start   10=End

     Internet         Subnet           Line      Line
Opt  Address          Mask             Description  Type

__   _______________
__   9.24.104.56      255.255.255.0    L41TR        *TRLAN
__   127.0.0.1        255.0.0.0        *LOOPBACK    *NONE



                                                                      Bottom
F3=Exit   F5=Refresh   F6=Print list   F10=Work with IP over SNA interfaces
F11=Display interface status           F12=Cancel   F17=Top   F18=Bottom
```

Figure 111. TCP/IP Interface Definition - System RALYAS4A

If a TCP/IP interface does not already exist, add an entry using the internet address allocated to this system and the mask of the subnet in which the system resides.

Besides allowing you to add, change and remove TCP/IP interfaces, this screen also allows you to start and end these interfaces.

TCP/IP Route

If the route to the remote host is via a gateway or the remote host resides in a different network or subnetwork to the local host, it will be necessary to use option 2 from the Configure TCP/IP screen to configure a route. This is not the case in this simple scenario.

TCP/IP Host Table

The local host table on the AS/400 contains a list of the internet addresses and associated host names for this network. To access the AS/400 host table enter the CFGTCP command and take option 10 (Work with TCP/IP Host Table Entries).

```
                      Work with TCP/IP Host Table Entries
                                                             System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Rename

      Internet         Host
 Opt  Address          Name

  _   _______________
  _   9.24.104.56      RALYAS4A
                       RALYAS4A.ITSO.RAL.IBM.COM
  _   9.24.104.57      RALYAS4B
                       RALYAS4B.ITSO.RAL.IBM.COM






 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 112. TCP/IP Host Table Entries - System RALYAS4A

Unless you are planning to use a name server, add an entry for the local system and any remote system(s) to which TCP/IP is to be used. In the above example, both the short and long names have been entered.

2. **Change the Network Attribute ALWANYNET to *YES**

   Now we start the AnyNet specific configuration steps. First we must change the ALWANYNET network attribute to *YES. Changing this attribute will allow Sockets over SNA, APPC over TCP/IP, Sockets over IPX, and APPC over IPX to run on your system. The default for this value, when V3R1 is initially installed, is *NO. Use the DSPNETA command see what your system is set to. If it is set to *NO, use the command:

   ```
   CHGNETA ALWANYNET(*YES)
   ```

   After changing this attribute, you can verify the change by entering the DSPNETA command. The resulting displays are shown in the following figure.

```
                        Display Network Attributes
                                                          System:   RALYAS4A
Current system name . . . . . . . . . . . . . . :   RALYAS4A
  Pending system name . . . . . . . . . . . . . :
Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
Local control point name . . . . . . . . . . . . :   RALYAS4A
Default local location . . . . . . . . . . . . . :   RALYAS4A
Default mode . . . . . . . . . . . . . . . . . . :   BLANK
APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
Data compression . . . . . . . . . . . . . . . . :   *NONE
Intermediate data compression . . . . . . . . . :   *NONE
Maximum number of intermediate sessions . . . . :   200
Route addition resistance . . . . . . . . . . . :   128
Server network ID/control point name . . . . . . :   *LCLNETID   *ANY

                                                                   More...
```

```
                        Display Network Attributes
                                                          System:   RALYAS4A
Alert status . . . . . . . . . . . . . . . . . . :   *ON
Alert logging status . . . . . . . . . . . . . . :   *ALL
Alert primary focal point . . . . . . . . . . . :   *YES
Alert default focal point . . . . . . . . . . . :   *NO
Alert backup focal point . . . . . . . . . . . . :
  Network ID . . . . . . . . . . . . . . . . . . :     *NONE
Alert focal point to request . . . . . . . . . . :   RAK
  Network ID . . . . . . . . . . . . . . . . . . :     USIBMRA
Alert controller description . . . . . . . . . . :   *NONE
Alert hold count . . . . . . . . . . . . . . . . :   0
Alert filter . . . . . . . . . . . . . . . . . . :   AS400NET
  Library . . . . . . . . . . . . . . . . . . . :     QALSNDA
Message queue . . . . . . . . . . . . . . . . . :   QSYSOPR
  Library . . . . . . . . . . . . . . . . . . . :     QSYS
Output queue . . . . . . . . . . . . . . . . . . :   QPRINT
  Library . . . . . . . . . . . . . . . . . . . :     QGPL
Job action . . . . . . . . . . . . . . . . . . . :   *FILE
                                                                   More...
```

```
                        Display Network Attributes
                                                          System:   RALYAS4A
Maximum hop count . . . . . . . . . . . . . . . :   16
DDM request access . . . . . . . . . . . . . . . :   *OBJAUT
Client request access . . . . . . . . . . . . . :   *OBJAUT
Default ISDN network type . . . . . . . . . . . :
Default ISDN connection list . . . . . . . . . . :   QDCCNNLANY
Allow ANYNET support . . . . . . . . . . . . . . :   *YES
Network Server Domain . . . . . . . . . . . . . :   RALYAS4A

                                                                  Bottom
Press Enter to continue.

F3=Exit   F12=Cancel
```

*Figure 113. Display of Network Attributes with ALWANYNET(*YES)*

Changing the ALWANYNET network attribute to *YES will result in the APPC over TCP/IP job (QAPPCTCP) being started in the QSYSWRK subsystem.

3. **Create an APPC controller with LINKTYPE(*ANYNW)**

   The AS/400 controller description defines the remote system. A new LINKTYPE has been added to the APPC controller description for AnyNet. With AnyNet, the APPC controller is no longer directly attached to a line description. Use the CRTCTLAPPC (Create APPC Controller Description) command to create an APPC controller with LINKTYPE(*ANYNW).

```
                       Create Ctl Desc (APPC) (CRTCTLAPPC)

Type choices, press Enter.

Controller description . . . . . > ANYNWAS4B     Name
Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
Online at IPL  . . . . . . . . .   *YES          *YES, *NO
Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
Remote control point . . . . . . > AS4BANYT      Name, *ANY
User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
Text 'description' . . . . . . . > 'RALYAS4B via AnyNet/400'


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

*Figure 114. Create Controller Description with LINKTYPE(*ANYNW)*

   The Remote network identifier should match the local network identifier on the remote system. *NETATR indicates that the value in the network attributes should be used - that the local system and remote system have the same network ID. The Remote control point name, however, is not used external to the system. The remote control point name entered should match the value entered in the APPN remote location list (see below).

   APPC Device Description and Mode Description

   The APPC device description will be automatically created when the above controller is activated.

   APPC over TCP/IP uses mode descriptions in the same way as APPC over SNA does.

   Note: It is *not* possible to map an APPC mode to an IP type of service.

4. **Add an entry to the APPN remote location list**

   To communicate using APPC over TCP/IP, the system requires an APPN remote location list entry for each remote system to which APPC over TCP/IP will be used. APPC over TCP/IP communications needs the information in the APPN remote location list to determine which controller description to use when it activates the session. Furthermore, the entry allows the AS/400 system to automatically configure the APPC device description.

To update the APPN remote location list, use the following command:

```
CHGCFGL *APPNRMT
```

```
                          Change Configuration List                   RALYAS4A
                                                             11/10/94  10:47:23
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote              Remote    Control
Remote    Network   Local     Control   Point     Location          Secure
Location  ID        Location  Point     Net ID    Password           Loc
RALYAS4B  *NETATR   *NETATR   AS4BANYT  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
                                                                       More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 115. APPN Remote Location List Panel

AS/400 APPN requires that all remote location names be unique. Thus, it can not have the same remote location name/remote network ID in both its SNA network and its TCP/IP or IPX network.

The Remote Location name should match the local location (LU) name at the remote system. The Local Location name should match the remote location (LU) name at the remote system. The Remote Network ID and Control Point Net ID should match the remote network identifier in the APPC controller with a LINKTYPE(*ANYNW). *NETATR indicates that the value in the network attributes should be used. The Remote Control Point name should match the remote control name in the APPC controller with a LINKTYPE(*ANYNW).

Any entry added to the APPN remote location list will result in an entry in the local APPN topology database. However, the APPC over TCP/IP entries will not be propagated to other systems in the APPN network; the entry is as an end node, only information on attached network nodes is propagated. No topology updates will flow as a result of adding the APPC over TCP/IP entries. In addition to being used locally, the APPC over TCP/IP entries will allow this system to respond to APPN search requests received for these LU names. It is this function that allows the AS/400 to act as a bridge (see APPC over TCP/IP scenario 4).

5. **Map the APPC LU name to an internet address**

   The TCP/IP host table provides the mapping between the host name and internet address. Here it is providing the mapping between the SNA remote location name/remote network ID and the remote internet address.

Enter the CFGTCP command to access the Configure TCP/IP panel, and take option 10 to work with the TCP/IP host table.

```
                     Work with TCP/IP Host Table Entries
                                                               System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Rename

      Internet          Host
 Opt  Address           Name

  _   _______________
  _   9.24.104.56       RALYAS4A
                        RALYAS4A.ITSO.RAL.IBM.COM
  _   9.24.104.57       RALYAS4B
                        RALYAS4B.ITSO.RAL.IBM.COM
                        RALYAS4B.USIBMRA.SNA.IBM.COM


 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 116. TCP/IP Host Table Entries

For APPC over TCP/IP, the host name entries are made up as follows:

- RALYAS4B - Remote SNA location (LU) name
- USIBMRA - Remote SNA network ID
- SNA.IBM.COM - SNA Domain Name Suffix

Add an entry for each remote system to which APPC over TCP/IP will be used. The remote SNA location names and SNA network IDs should be as specified in the APPN remote location list.

Note

A PTF is now available to allow the AS/400 to use an SNA domain name suffix of other than SNA.IBM.COM. The PTF is shipped in two parts: MF08352 and SF21042. The PTF was not used during our residency.

When communicating between systems using APPC over TCP/IP, both systems must use the same SNA Domain Name Suffix.

This host table will be used by native TCP/IP and APPC over TCP/IP. The entries *without* the extension SNA.IBM.COM are for native TCP/IP.

Note

The AS/400 TCP/IP Host Table will allow a maximum of four host names to be entered against a single host internet address. This may become a restriction when using AnyNet/400 APPC over TCP/IP. One possible alternative is to use a name server rather than the AS/400 host table.

With all of the configuration steps completed, you are now ready to use the APPC over TCP/IP support of AnyNet/400. The next section shows specific APPC over TCP/IP configuration scenarios.

APPC over TCP/IP Scenarios

This section presents the scenarios we used to verify the different APPC over TCP/IP implementations. Each scenario contains a diagram showing the actual environment, AS/400 and MVS or PS/2 configuration displays and a matching parameters list.

The following scenarios will be covered in this section:

- APPC over TCP/IP Scenario 1: AS/400 to AS/400 - Same SNA Network
- APPC over TCP/IP Scenario 2: AS/400 to AS/400 - Different SNA Networks
- APPC over TCP/IP Scenario 3: AS/400 to PS/2 - Same SNA Network
- APPC over TCP/IP Scenario 4: AS/400 to various - AS/400 Bridge
- APPC over TCP/IP Scenario 5: AS/400 to MVS - Same SNA Network

APPC over TCP/IP Scenario 1: AS/400 to AS/400 - Same SNA Network

This configuration is the simplest and likely to be the most common. It is also an example of a configuration that should be set up prior to moving on to a more complex configuration.

Shown in the following figure are the two systems used in this scenario and their respective TCP/IP internet addresses. A TCP/IP configuration is already in place between the systems using the internet addresses shown.

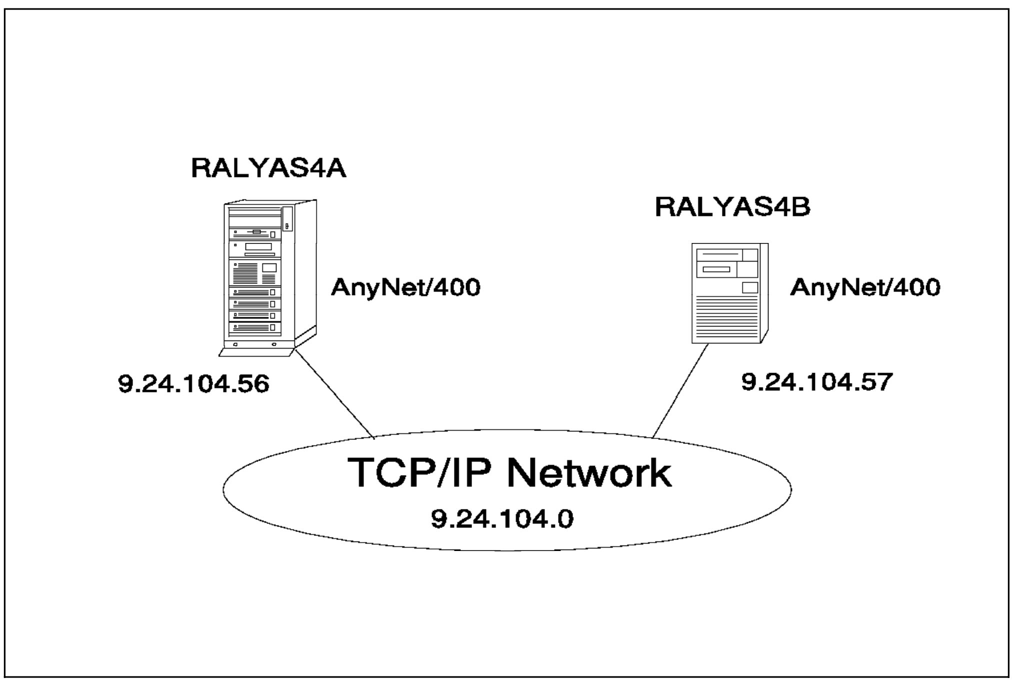

Figure 117. Systems and Addresses Used for APPC over TCP/IP Scenario 1

The following series of panels show the AS/400 configuration screens taken from the RALYAS4A and RALYAS4B systems. They illustrate the configuration steps required for this APPC over TCP/IP scenario.

First we must check that Allow ANYNET Support is set to *YES in the network attributes of each system. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Before we can configure the APPC controller descriptions and add the APPN remote location list entries, we need to display the network attributes on each system to determine the network ID and default local location name configured at each system.

```
                           Display Network Attributes
                                                          System:   RALYAS4A
 Current system name . . . . . . . . . . . . . . :   RALYAS4A
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4A
 Default local location . . . . . . . . . . . . . :   RALYAS4A
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions . . . . :   200
 Route addition resistance . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY


                                                                  More...
```

Figure 118. Scenario 1: Network Attributes - RALYAS4A

```
                           Display Network Attributes
                                                          System:   RALYAS4B
 Current system name . . . . . . . . . . . . . . :   RALYAS4B
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4B
 Default local location . . . . . . . . . . . . . :   RALYAS4B
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions . . . . :   200
 Route addition resistance . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY


                                                                  More...
```

Figure 119. Scenario 1: Network Attributes - RALYAS4B

From Figure 118 and Figure 119 we can see that the network IDs (Local network ID) on both systems are the same (USIBMRA) hence in the APPC controller descriptions and APPN Remote Location lists we can specify *NETATR for Remote Network ID and Control Point Net ID on both systems.

Next, we create a controller description on RALYAS4A with LINKTYPE *ANYNW.

```
                      Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > ANYNWAS4B     Name
 Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > AS4BANYT      Name, *ANY
 User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
 Text 'description' . . . . . . . > 'To RALYAS4B via AnyNet/400'




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

Figure 120. Scenario 1: Controller Description - RALYAS4A

In the following panel we create a controller description on RALYAS4B with LINKTYPE *ANYNW.

```
                      Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > ANYNWAS4A     Name
 Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > AS4AANYT      Name, *ANY
 User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
 Text 'description' . . . . . . . > 'To RALYAS4A via AnyNet/400'




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

Figure 121. Scenario 1: Controller Description - RALYAS4B

Next, we add the APPC over TCP/IP entry to the APPN remote location list at RALYAS4A.

```
                          Change Configuration List                 RALYAS4A
                                                          11/10/94  11:46:23
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote              Remote    Control
Remote    Network   Local     Control   Point     Location          Secure
Location  ID        Location  Point     Net ID    Password           Loc
RALYAS4B  *NETATR   *NETATR   AS4BANYT  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
                                                                   More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 122. Scenario 1: APPN Remote Location List - RALYAS4A

Next, we add the APPC over TCP/IP entry to the APPN remote location list at RALYAS4B.

```
                          Change Configuration List                 RALYAS4B
                                                          11/10/94  11:23:23
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote              Remote    Control
Remote    Network   Local     Control   Point     Location          Secure
Location  ID        Location  Point     Net ID    Password           Loc
RALYAS4A  *NETATR   *NETATR   AS4AANYT  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
                                                                   More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 123. Scenario 1: APPN Remote Location List - RALYAS4B

The host table at RALYAS4A in the following figure has had the APPC over TCP/IP entry added.

```
                    Work with TCP/IP Host Table Entries
                                                         System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   7=Rename

     Internet         Host
Opt  Address          Name
 _   _______________
 _   9.24.104.56      RALYAS4A
                      RALYAS4A.ITSO.RAL.IBM.COM
 _   9.24.104.57      RALYAS4B
                      RALYAS4B.ITSO.RAL.IBM.COM
                      RALYAS4B.USIBMRA.SNA.IBM.COM







F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 124. Scenario 1: TCP/IP Host Table Entries - RALYAS4A

The RALYAS4B host table in the following figure has also had the APPC over TCP/IP entry added.

```
                    Work with TCP/IP Host Table Entries
                                                         System:   RALYAS4B
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   7=Rename

     Internet         Host
Opt  Address          Name
 _   _______________
 _   9.24.104.57      RALYAS4B
                      RALYAS4B.ITSO.RAL.IBM.COM
 _   9.24.104.56      RALYAS4A
                      RALYAS4A.ITSO.RAL.IBM.COM
                      RALYAS4A.USIBMRA.SNA.IBM.COM







F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 125. Scenario 1: TCP/IP Host Table Entries - RALYAS4B

Shown next are the matching parameters between RALYAS4A and RALYAS4B.

```
SOURCE SYSTEM                                   TARGET SYSTEM
  AS/400                                           AS/400
*************                                   *************

STRPASTHR
RMTLOCNAME(RALYAS4B)


Network Attributes                              Network Attributes
------------------                              ------------------
ALWANYNET    *YES                               ALWANYNET    *YES
LCLLOCNAME   RALYAS4A                           LCLLOCNAME   RALYAS4B
LCLNETID     USIBMRA                            LCLNETID     USIBMRA


Controller Description                          Controller Description
----------------------                          ----------------------
CTLD         ANYNWAS4B                          CTLD         ANYNWAS4A
LINKTYPE     *ANYNW                             LINKTYPE     *ANYNW
RMTCPNAME    AS4BANYT                           RMTCPNAME    AS4AANYT
RMTNETID     USIBMRA                            RMTNETID     USIBMRA


Remote Location List                            Remote Location List
--------------------                            --------------------
CPNETID      USIBMRA                            CPNETID      USIBMRA
RMTCPNAME    AS4BANYT                           RMTCPNAME    AS4AANYT
RMTLOCNAME   RALYAS4B                           RMTLOCNAME   RALYAS4A
RMTNETID     USIBMRA                            RMTNETID     USIBMRA
LCLLOCNAME   RALYAS4A                           LCLLOCNAME   RALYAS4B


TCP/IP Host Table                               TCP/IP Host Table
-----------------                               -----------------
INTERNET ADR:                                   INTERNET ADR:
HOSTNAME:    RALYAS4B                           HOSTNAME:    RALYAS4A
             USIBMRA                                         USIBMRA
             SNA.IBM.COM                                     SNA.IBM.COM
             9.24.104.57                                     9.24.104.56


TCP/IP Interface                                TCP/IP Interface
----------------                                ----------------
INTERNET ADR: 9.24.104.56                       INTERNET ADR: 9.24.104.57
```

Figure 126. APPC over TCP/IP Scenario 1: Matching Parameters Table

APPC over TCP/IP Scenario 2: AS/400 to AS/400 - Different SNA Networks

In this scenario, two AS/400s communicate with each other via APPC over TCP/IP but from different SNA networks.

Shown in the following figure are the two systems used in this scenario and their respective IP addresses. A TCP/IP configuration is already in place between the systems using the internet addresses shown.

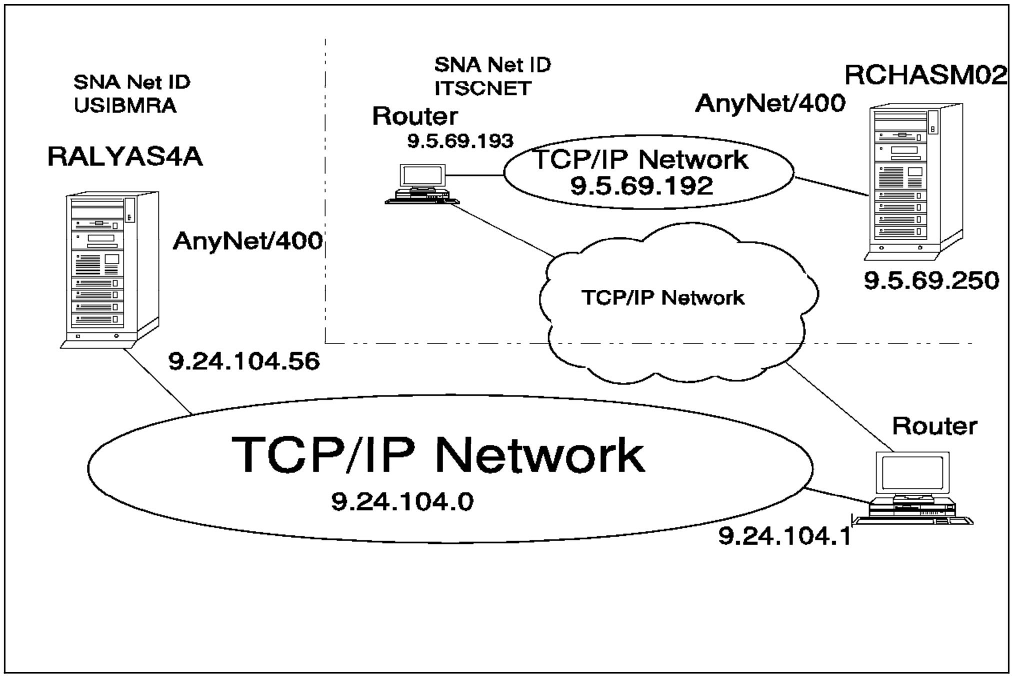

Figure 127. Systems and Addresses Used for APPC over TCP/IP Scenario 2

The following series of panels show the AS/400 configuration screens taken from the RALYAS4A and RCHASM02 systems. They illustrate the configuration steps required for this APPC over TCP/IP scenario.

First we must check that Allow ANYNET Support is set to *YES in the network attributes of each system. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Before we can configure the APPC controller descriptions and add the APPN remote location list entries, we need to display the network attributes on each system to determine the network ID and default local location name configured at each system.

```
                          Display Network Attributes
                                                          System:   RALYAS4A
 Current system name . . . . . . . . . . . . . . :   RALYAS4A
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4A
 Default local location . . . . . . . . . . . . . :   RALYAS4A
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions . . . . :   200
 Route addition resistance . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY


                                                                   More...
```

Figure 128. Scenario 2: Network Attributes - RALYAS4A

```
                          Display Network Attributes
                                                          System:   RCHASM02
 Current system name . . . . . . . . . . . . . . :   RCHASM02
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   ITSCNET
 Local control point name . . . . . . . . . . . . :   RCHASM02
 Default local location . . . . . . . . . . . . . :   RCHASM02
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions . . . . :   200
 Route addition resistance . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY


                                                                   More...
```

Figure 129. Scenario 2: Network Attributes - RCHASM02

Next, we create a controller description on RALYAS4A with LINKTYPE *ANYNW.

```
                     Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > ANYNWRAS2     Name
 Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote network identifier  . . . > ITSCNET       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > RCHASM02      Name, *ANY
 User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
 Text 'description' . . . . . . . > 'To Rochester2 via AnyNet/400'




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

Figure 130. Scenario 2: Controller Description - RALYAS4A

In the following panel we create a controller description on RCHASM02 with LINKTYPE *ANYNW.

```
                     Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > ANYNWAS4A     Name
 Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote network identifier  . . . > USIBMRA       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > RALYAS4A      Name, *ANY
 User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
 Text 'description' . . . . . . . > 'To Raleigh-A via AnyNet/400'




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

Figure 131. Scenario 2: Controller Description - RCHASM02

Now we add the APPC over TCP/IP entry to the APPN remote location list at RALYAS4A.

```
                          Change Configuration List                  RALYAS4A
                                                            11/10/94  10:47:23
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote              Remote    Control
Remote    Network   Local     Control   Point     Location          Secure
Location  ID        Location  Point     Net ID    Password           Loc
RCHASM02  ITSCNET   *NETATR   RCHASM02  ITSCNET   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
                                                                       More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 132. Scenario 2: APPN Remote Locations List - RALYAS4A

Next, we add the APPC over TCP/IP entry to the APPN remote location list at RCHASM02.

```
                          Change Configuration List                  RCHASM02
                                                            11/10/94  11:02:07
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote              Remote    Control
Remote    Network   Local     Control   Point     Location          Secure
Location  ID        Location  Point     Net ID    Password           Loc
RALYAS4A  USIBMRA   *NETATR   RALYAS4A  USIBMRA   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
                                                                       More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 133. Scenario 2: APPN Remote Locations List - RCHASM02

The host table at RALYAS4A in the following figure has had the APPC over TCP/IP entry added.

```
                    Work with TCP/IP Host Table Entries
                                                   System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   7=Rename

     Internet         Host
Opt  Address          Name
 _   _______________
 _   9.24.104.56      RALYAS4A
                      RALYAS4A.ITSO.RAL.IBM.COM
 _   9.5.69.250       RCHASM02
                      RCHASM02.RCHLAND.IBM.COM
                      RCHASM02.ITSCNET.SNA.IBM.COM







F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 134. Scenario 2: TCP/IP Host Table Entries - RALYAS4A

The RCHASM02 host table in the following figure has also had the APPC over TCP/IP entry added.

```
                    Work with TCP/IP Host Table Entries
                                                   System:   RCHASM02
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   7=Rename

     Internet         Host
Opt  Address          Name
 _   _______________
 _   9.5.69.250       RCHASM02
                      RCHASM02.RCHLAND.IBM.COM
 _   9.24.104.56      RALYAS4A
                      RALYAS4A.ITSO.RAL.IBM.COM
                      RALYAS4A.USIBMRA.SNA.IBM.COM







F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 135. Scenario 2: TCP/IP Host Table Entries - RCHASM02

Shown next are the matching parameters between RALYAS4A and RCHASM02.

```
SOURCE SYSTEM                               TARGET SYSTEM
  AS/400                                       AS/400
*************                               *************

STRPASTHR
RMTLOCNAME(RCHASM02)
RMTNETID(ITSCNET)


Network Attributes                          Network Attributes
------------------                          ------------------
ALWANYNET    *YES                           ALWANYNET    *YES
LCLLOCNAME   RALYAS4A                       LCLLOCNAME   RCHASM02
LCLNETID     USIBMRA                        LCLNETID     ITSCNET


Controller Description                      Controller Description
----------------------                      ----------------------
CTLD         ANYNWRAS2                      CTLD         ANYNWAS4A
LINKTYPE     *ANYNW                         LINKTYPE     *ANYNW
RMTCPNAME    RCHASM02                       RMTCPNAME    RALYAS4A
RMTNETID     ITSCNET                        RMTNETID     USIBMRA


Remote Location List                        Remote Location List
--------------------                        --------------------
CPNETID      ITSCNET                        CPNETID      USIBMRA
RMTCPNAME    RCHASM02                       RMTCPNAME    RALYAS4A
RMTLOCNAME   RCHASM02                       RMTLOCNAME   RALYAS4A
RMTNETID     ITSCNET                        RMTNETID     USIBMRA
LCLLOCNAME   RALYAS4A                       LCLLOCNAME   RCHASM02


TCP/IP Host Table                           TCP/IP Host Table
-----------------                           -----------------
INTERNET ADR:                               INTERNET ADR:
HOSTNAME:    RCHASM02                       HOSTNAME:    RALYAS4A
             ITSCNET                                     USIBMRA
             SNA.IBM.COM                                 SNA.IBM.COM
             9.5.69.250                                  9.24.104.56

TCP/IP Interface                            TCP/IP Interface
----------------                            ----------------
INTERNET ADR: 9.24.104.56                   INTERNET ADR: 9.5.69.250
```

Figure 136. APPC over TCP/IP Scenario 2: Matching Parameters Table

APPC over TCP/IP Scenario 3: AS/400 to PS/2 - Same SNA Network

Shown in the following figure are the two systems used in this scenario and their respective IP addresses. A TCP/IP configuration is already in place between the systems using the internet addresses shown.

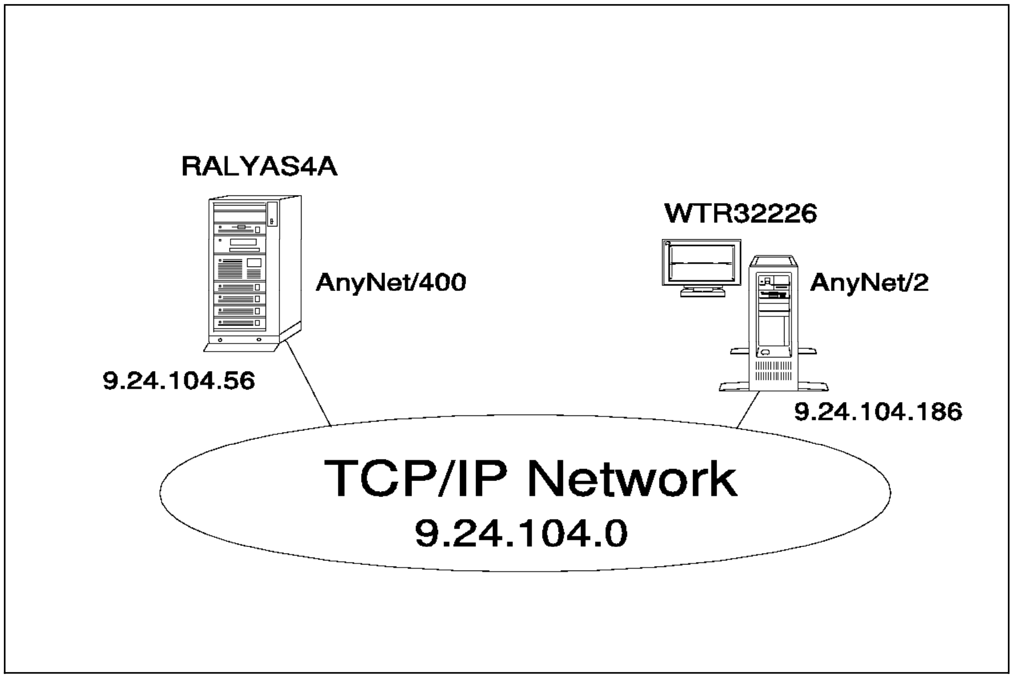

Figure 137. Systems and Addresses Used for APPC over TCP/IP Scenario 3

The following series of panels show the AS/400 and PS/2 configuration screens taken from the RALYAS4A and WTR32226 systems. They illustrate the configuration steps required for this APPC over TCP/IP scenario.

Please note that only the key AnyNet/2 configuration displays are shown in this section. For further AnyNet/2 configuration help, refer to *AnyNet: SNA over TCP/IP, Installation and Interoperability* GG24-4395.

PS/2 Software Installed

The following software was installed on WTR32226:

- OS/2 Version 2.1
- CM/2 Version 1.11 with AnyNet/2 support installed (additional functions)
- TCP/IP Version 2.0 for OS/2 Base kit plus CSD UN64092
- AnyNet/2 Version 2.0, SNA over TCP/IP

The software was installed in the above order.

RALYAS4A Configuration

First we must check that Allow ANYNET Support is set to *YES in the network attributes of RALYAS4A. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Before we can configure the APPC controller description and add the APPN remote location list entry, we need to display the network attributes on RALYAS4A and the .ndf file on WTR32226 to determine the network ID and default local location (LU) name configured at each system.

```
                          Display Network Attributes
                                                            System:   RALYAS4A
 Current system name  . . . . . . . . . . . . . . :   RALYAS4A
   Pending system name  . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4A
 Default local location . . . . . . . . . . . . . :   RALYAS4A
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression  . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions  . . . . :   200
 Route addition resistance  . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY


                                                                       More...
```

Figure 138. Scenario 3: Network Attributes - RALYAS4A

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.WTR32226 )
                 CP_ALIAS(WTR32226)
                 NAU_ADDRESS(INDEPENDENT_LU)
                 NODE_TYPE(EN)
                 NODE_ID(X'05D32226')
                 NW_FP_SUPPORT(NONE)
                 HOST_FP_SUPPORT(YES)
                 HOST_FP_LINK_NAME(HOST$1  )
                 MAX_COMP_LEVEL(NONE)
                 MAX_COMP_TOKENS(0);

DEFINE_LOGICAL_LINK  LINK_NAME(LINK0001)
                     FQ_ADJACENT_CP_NAME(USIBMRA.RALYAS4A )
                     ADJACENT_NODE_TYPE(LEARN)
                     DLC_NAME(IBMTRNET)
                     ADAPTER_NUMBER(0)
                     DESTINATION_ADDRESS(X'400010020001O4')
                     ETHERNET_FORMAT(NO)
                     CP_CP_SESSION_SUPPORT(NO)
                     SOLICIT_SSCP_SESSION(NO)
                     ACTIVATE_AT_STARTUP(YES)
                     USE_PUNAME_AS_CPNAME(NO)
                     LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
                     LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
                     MAX_ACTIVATION_ATTEMPTS(USE_ADAPTER_DEFINITION)
                     EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
```

```
                     COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
                     COST_PER_BYTE(USE_ADAPTER_DEFINITION)
                     SECURITY(USE_ADAPTER_DEFINITION)
                     PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_1(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_2(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.RALYAS4A )
                   PARTNER_LU_ALIAS(RALYAS4A)
                   PARTNER_LU_UNINTERPRETED_NAME(RALYAS4A)
                   MAX_MC_LL_SEND_SIZE(32767)
                   CONV_SECURITY_VERIFICATION(NO)
                   PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.RALYAS4A )
                            WILDCARD_ENTRY(NO)
                            FQ_OWNING_CP_NAME(USIBMRA.RALYAS4A )
                            LOCAL_NODE_NN_SERVER(NO);

DEFINE_MODE  MODE_NAME(QPCSUPP )
             COS_NAME(#CONNECT)
             DEFAULT_RU_SIZE(NO)
             MAX_RU_SIZE_UPPER_BOUND(1024)
             RECEIVE_PACING_WINDOW(7)
             MAX_NEGOTIABLE_SESSION_LIMIT(32767)
             PLU_MODE_SESSION_LIMIT(64)
             MIN_CONWINNERS_SOURCE(32)
             COMPRESSION_NEED(PROHIBITED)
             PLU_SLU_COMPRESSION(NONE)
             SLU_PLU_COMPRESSION(NONE);

DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(YES)
                 DEFAULT_MODE_NAME(BLANK)
                 MAX_MC_LL_SEND_SIZE(32767)
                 DIRECTORY_FOR_INBOUND_ATTACHES(*)
                 DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
                 DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
                 DEFAULT_TP_CONV_SECURITY_RQD(NO)
                 MAX_HELD_ALERTS(10);

START_ATTACH_MANAGER;
```

From the PS/2 .ndf file and AS/400 network attributes above, we can see that the network IDs on both systems are the same (USIBMRA); hence we specified *NETATR for Remote Network ID and Control Point Net ID in the APPC controller description and APPN remote location list entry.

Next, we create a controller description on RALYAS4A with LINKTYPE *ANYNW.

```
                      Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > ANYNWPS2A     Name
 Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > WTR32226      Name, *ANY
 User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
 Text 'description' . . . . . . . > 'To PC Workstation via AnyNet/400'




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

Figure 139. Scenario 3: Controller Description - RALYAS4A

Next, we add the APPC over TCP/IP entry to the APPN remote location list at RALYAS4A.

```
                          Change Configuration List                   RALYAS4A
                                                             11/10/94  10:47:23
 Configuration list  . . :   QAPPNRMT
 Configuration list type :   *APPNRMT
 Text  . . . . . . . . . :

 Type changes, press Enter.

 --------------------------APPN Remote Locations----------------------------
           Remote               Remote    Control
 Remote    Network   Local      Control   Point     Location          Secure
 Location  ID        Location   Point     Net ID    Password           Loc
 WTR32226  *NETATR   *NETATR    WTR32226  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
                                                                       More...
 F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 140. Scenario 3: APPN Remote Locations List - RALYAS4A

The host table at RALYAS4A in the following figure has had the APPC over TCP/IP entry added.

```
                     Work with TCP/IP Host Table Entries
                                                              System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Rename

      Internet          Host
 Opt  Address           Name
  _   _______________
  _   9.24.104.56       RALYAS4A
                        RALYAS4A.ITSO.RAL.IBM.COM
  _   9.24.104.186      AS4PS2A
                        AS4PS2A.ITSO.RAL.IBM
                        WTR32226.USIBMRA.SNA.IBM.COM




 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 141. Scenario 3: TCP/IP Host Table Entries - RALYAS4A

Note that in this scenario the PS/2's SNA name (USIBMRA.WTR32226) is different from its TCP/IP host name (AS4PS2A).

WTR32226 Configuration

To configure AnyNet/2 SNA over TCP/IP, we define the following:

- SNA Domain Name Suffix
- Routing Preference

The SNA Domain Name Suffix is used when SNA over TCP/IP creates an IP domain name from an SNA LU name, network ID and this suffix. The IP domain name for SNA over TCP/IP has the format luname.netid.snasuffix and is defined as follows:

- luname is the SNA LU name.
- netid is the SNA network ID (NETID).
- snasuffix is the SNA domain name suffix.

To define the SNA Domain Name Suffix, we use the AnyNet/2 SNA over TCP/IP configuration tool. To access the AnyNet/2 SNA over TCP/IP configuration tool, select the **Configure AnyNet/2 SNA over TCP/IP** icon from the AnyNet/2 folder. The folder icon should be displayed on the OS/2 desktop, if the AnyNet/2 code has been installed correctly.

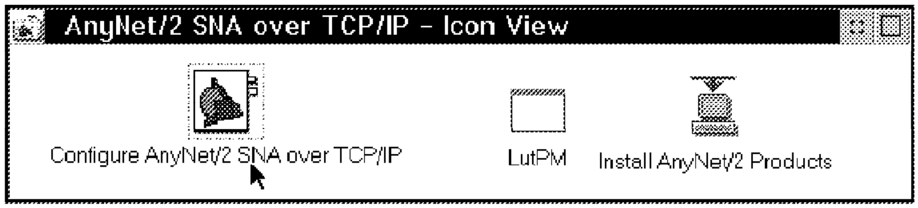

Figure 142. AnyNet/2 SNA over TCP/IP Folder

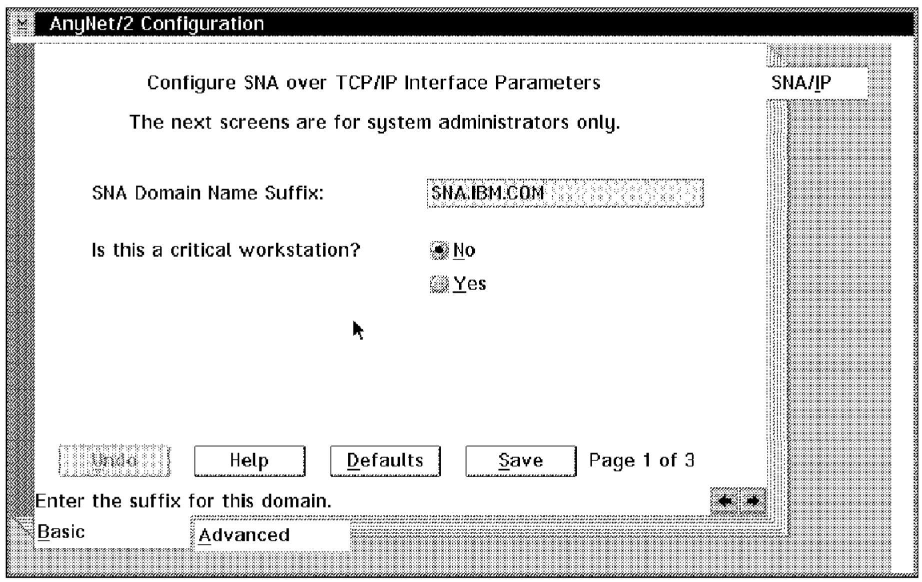

Figure 143. Scenario 3: SNA Domain Name Suffix - System WTR32226

When initiating a session, AnyNet/2 SNA over TCP/IP uses a preference table to determine whether native SNA or SNA over TCP/IP (non-native) will be used for that session. If no routing preference table is configured, the default is to first try to establish the session over native SNA. If this session setup fails, SNA over TCP/IP will be used.

To customize the routing preference table, we can use the LULIST AnyNet/2 command. When entered, the command prompts with the following information:

```
usage: lulist {a|r|l|p|f|c|d|u|h} argument(s).
    Arguments by function:.
    a netid.luname flag ( ADD LUNAME    ).
    r netid.luname      ( REMOVE LUNAME ).
    l netid.luname      ( LOOKUP LUNAME ).
    p                   ( PRINT TABLE   ).
    f                   ( FLUSH TABLE   ).
    c netid.luname flag ( CHANGE LUNAME ).
    d                   ( PRINT DEFAULT ).
    d flag              ( SET DEFAULT   ).
    u                   ( UPDATE TABLE  ).
    h                   ( HELP          ).
flag: 0=Native, 1=Non-Native, 2=Native Only, 3=Non-Native Only.
```

Figure 144. AnyNet/2 LULIST Command Prompts

The options available for the table default and table entries are as follows:

Native: SNA will be tried first. If the session request fails, SNA over TCP/IP will be used.

Non-native: SNA over TCP/IP will be tried first. If the session fails, SNA will be used.

Native only: Only SNA will be used.

Non-native only: Only SNA over TCP/IP will be used.

For the connection to RALYAS4A to use *only* the SNA over TCP/IP connection, we would enter the following command:

```
OS2 C:->lulist a usibmra.ralyas4a 3
Luname usibmra.ralyas4a added to table.
```

To verify the above change, we could use the following command:

```
OS2 C:->lulist l usibmra.ralyas4a
usibmra.ralyas4a  NON-NATIVE_ONLY
```

As for AnyNet/400, AnyNet/2 SNA over TCP/IP uses the native TCP/IP host table to map SNA LU names to internet addresses. The OS/2 TCP/IP host table is changed either via the TCP/IP Configuration icon (page 3 of the Services configuration section), or by editing the HOSTS file (\tcpip\etc\hosts).

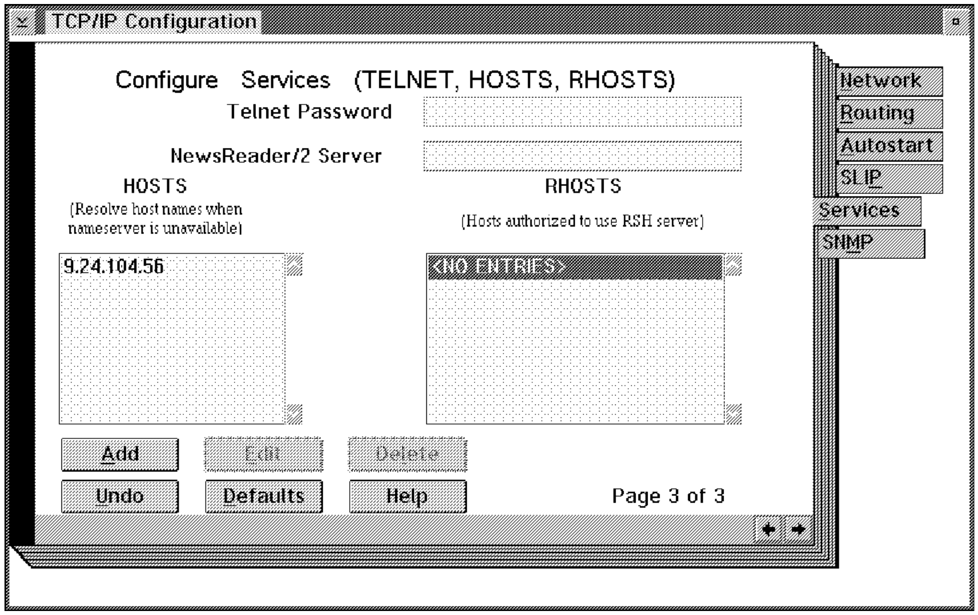

Figure 145. OS/2 TCP/IP Host Table Menu

Update the table with the required mapping, as shown in Figure 146.

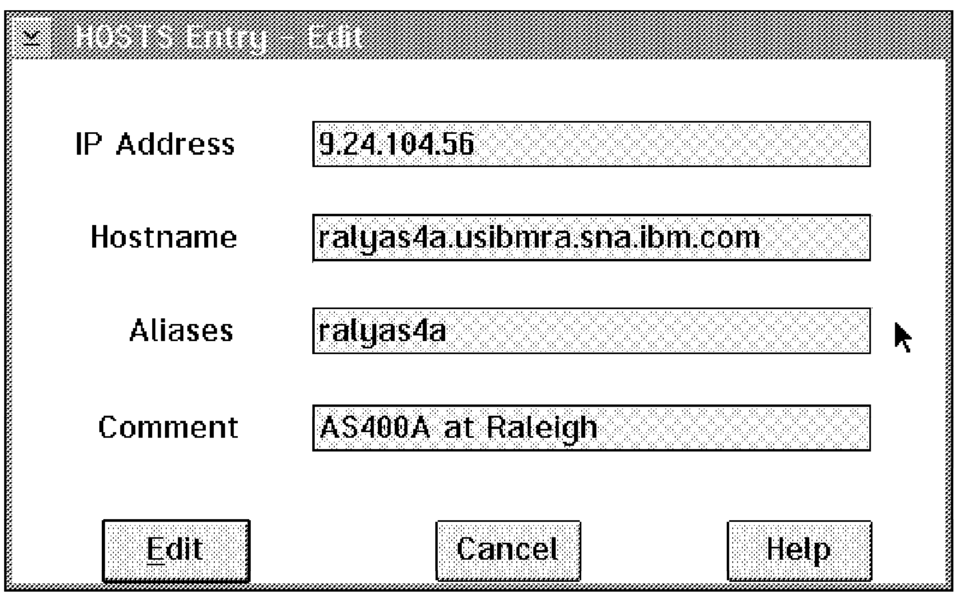

Figure 146. Scenario 3: OS/2 TCP/IP Host Table Entry - WTR32226

The Aliases field in an OS/2 TCP/IP host table entry can contain multiple host names. This would have allowed us to enter the long TCP/IP host name for RALYAS4A in addition to the short one shown.

Shown next are the matching parameters between RALYAS4A and WTR32226.

```
SOURCE SYSTEM                                  TARGET SYSTEM
   PS/2                                           AS/400
*************                                  *************

5250 emulation
  partner LU    RALYAS4A

Local Node Characteristic                      Network Attributes
-------------------------                      ------------------
Local node name WTR32226                       ALWANYNET    *YES
Network ID      USIBMRA                        LCLLOCNAME   RALYAS4A
Node type       End Node                       LCLNETID     USIBMRA

SNA connection
--------------
Partner type      To peer node                 Controller Description
Partner NetID     USIBMRA                      ----------------------
Partner Node name RALYAS4A                     CTLD         ANYNWPS2A
                                               LINKTYPE     *ANYNW
Partner LU                                     RMTCPNAME    WTR32226
----------                                     RMTNETID     USIBMRA
Fully qualified
  LU name   USIBMRA.RALYAS4A

                                               Remote Location List
SNA over TCP/IP                                --------------------
---------------                                CPNETID      USIBMRA
SNA Domain Name                                RMTCPNAME    WTR32226
  Suffix    SNA.IBM.COM                        RMTLOCNAME   WTR32226
                                               RMTNETID     USIBMRA
                                               LCLLOCNAME   RALYAS4A


TCP/IP Host Table                              TCP/IP Host Table
-----------------                              -----------------
INTERNET ADR:                                  INTERNET ADR:
HOSTNAME:   RALYAS4A                           HOSTNAME:   WTR32226
            USIBMRA                                        USIBMRA
            SNA.IBM.COM                                    SNA.IBM.COM
            9.24.104.56                                    9.24.104.186

TCP/IP Interface                               TCP/IP Interface
----------------                               ----------------
INTERNET ADR: 9.24.104.186                     INTERNET ADR: 9.24.104.56
```

Figure 147. APPC over TCP/IP Scenario 3: Matching Parameters Table

APPC over TCP/IP Scenario 4: AS/400 Bridge

AnyNet/400 does not provide an AnyNet gateway function. However, it is able to provide a connection between a TCP/IP network and an SNA network in a limited manner. Those limitations are as follows:

- Unlike an AnyNet SNA over TCP/IP Gateway, with the AS/400 Bridge, sessions can *only* be established from a system in the SNA network to an AnyNet system in the TCP/IP network. Sessions *cannot* be established from an AnyNet system to an SNA system.
- Unlike an AnyNet SNA over TCP/IP Gateway, two AS/400s running AnyNet/400 *cannot* be used together to provide connections between SNA systems across a TCP/IP network.

In this scenario we use the AS/400 bridge function on RALYAS4A to establish an APPC connection from the native SNA (no-AnyNet) system RALYAS4B to the AnyNet/400 system RCHASM02. An SNA/APPN configuration is already in place between RALYAS4A and RALYAS4B using the network ID and CP names shown. A TCP/IP configuration is already in place between RALYAS4A and RCHASM02 using the internet addresses shown.

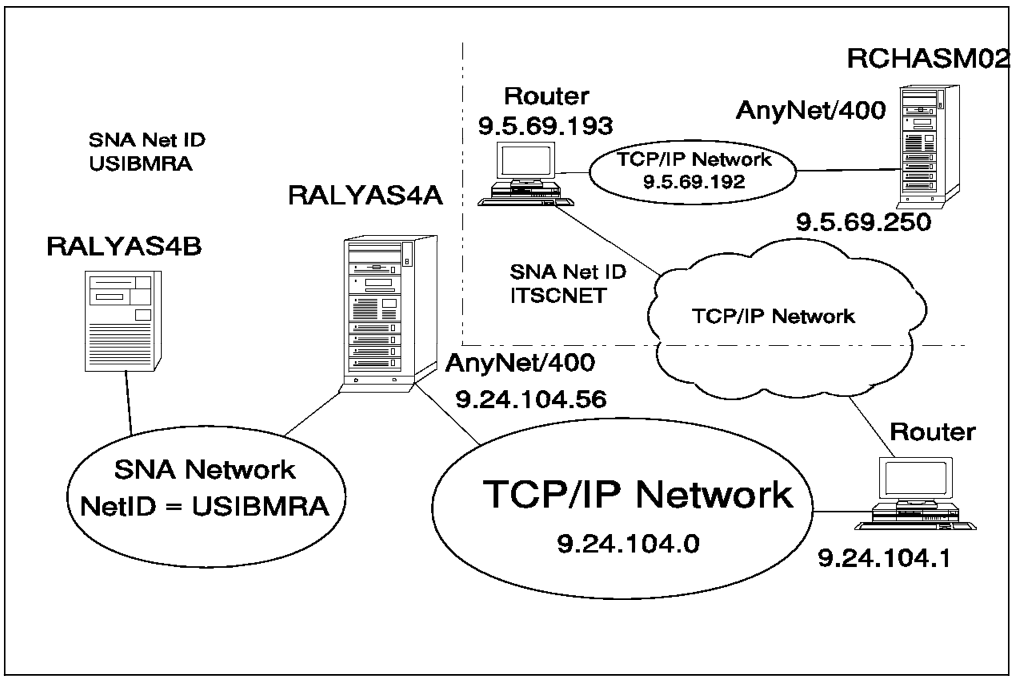

Figure 148. Systems and Addresses Used for APPC over TCP/IP Scenario 4

The configuration of RALYAS4A and RCHASM02 for this scenario is identical to that for "APPC over TCP/IP Scenario 2: AS/400 to AS/400 - Different SNA Networks" on page 105. There are no special configuration requirements for the AS/400 to act as an APPC over TCP/IP bridge. The APPN connection between RALYAS4B and RALYAS4A will allow sessions to be established from RALYAS4B using the APPC over TCP/IP APPN remote location list entry for RCHASM02 at RALYAS4A.

Remember

Sessions can only be established from a system in the SNA network to an AnyNet APPC over TCP/IP system in the TCP/IP network. Sessions *cannot* be established from an AnyNet system to an SNA system.

Shown next are the matching parameters between the three systems.

```
SOURCE SYSTEM                     BRIDGE                        TARGET SYSTEM
   AS/400                         AS/400                           AS/400
*************                  ***********                      *************

STRPASTHR RMTLOCNAME(RCHASM02)
          RMTNETID(ITSCNET)

Network Attributes                Network Attributes                Network Attributes
------------------                ------------------                ------------------
                                  ALWANYNET   *YES                  ALWANYNET   *YES
LCLCPNAME  RALYAS4B               LCLCPNAME   RALYAS4A              LCLCPNAME   RCHASM02
LCLNETID   USIBMRA                LCLLOCNAME  RALYAS4A              LCLLOCNAME  RCHASM02
                                  LCLNETID    USIBMRA               LCLNETID    ITSCNET

Controller Description            Controller Description
----------------------            ----------------------
CTLD       RALYAS4A               CTLD        RALYAS4B
LINKTYPE   *LAN                   LINKTYPE    *LAN
RMTCPNAME  RALYAS4A               RMTCPNAME   RALYAS4B
RMTNETID   USIBMRA                RMTNETID    USIBMRA               Controller Desc.
                                                                    ----------------
                                  CTLD        ANYNWRAS2             CTLD        ANYNWAS4A
                                  LINKTYPE    *ANYNW                LINKTYPE    *ANYNW
                                  RMTCPNAME   RCHASM02              RMTCPNAME   RALYAS4A
                                  RMTNETID    ITSCNET               RMTNETID    USIBMRA

                                  Remote Location List              Remote Location List
                                  --------------------              --------------------
                                  CPNETID     ITSCNET               CPNETID     USIBMRA
                                  RMTCPNAME   RCHASM02              RMTCPNAME   RALYAS4A
                                  RMTLOCNAME  RCHASM02              RMTLOCNAME  RALYAS4A
                                  RMTNETID    ITSCNET               RMTNETID    USIBMRA
                                  LCLLOCNAME  RALYAS4A              LCLLOCNAME  RCHASM02

                                  TCP/IP Host Table                 TCP/IP Host Table
                                  -----------------                 -----------------
                                  INTERNET ADR:                     INTERNET ADR:
                                  HOSTNAME:   RCHASM02              HOSTNAME:   RALYAS4A
                                              ITSCNET                           USIBMRA
                                              SNA.IBM.COM                       SNA.IBM.COM
                                              9.5.69.250                        9.24.104.56

                                  TCP/IP Interface                  TCP/IP Interface
                                  ----------------                  ----------------
                                  INTERNET ADR: 9.24.104.56         INRENET ADR: 9.5.69.250
```

Figure 149. APPC over TCP/IP Scenario 4: Matching Parameters Table

APPC over TCP/IP Scenario 5: AS/400 to MVS - Same SNA Network

Shown in the following figure are the two systems used in this scenario and their respective IP addresses. A TCP/IP configuration is already in place between the systems using the internet addresses shown.

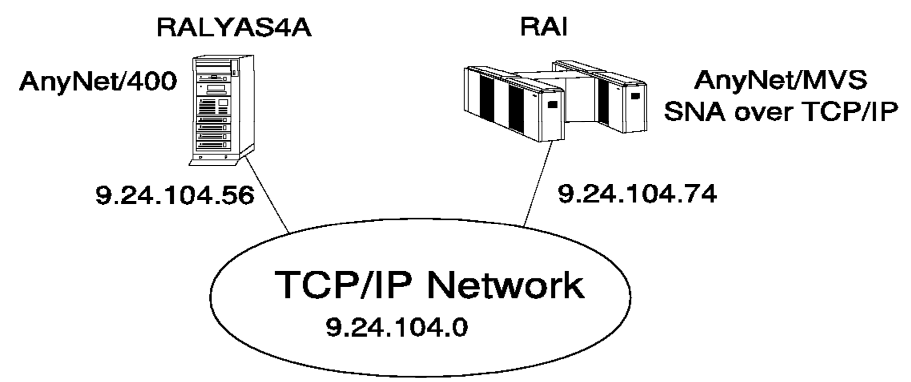

Figure 150. Systems and Addresses Used for APPC over TCP/IP Scenario 5

The following series of panels show the AS/400 configuration screens taken from the RALYAS4A system. Also shown is a subset of the AnyNet/MVS configuration information from RAI. They illustrate the configuration steps required for this APPC over TCP/IP Gateway scenario.

Please note that only the key AnyNet/MVS configuration displays are shown in this section. For further AnyNet/MVS configuration help, refer to *AnyNet: SNA over TCP/IP, Installation and Interoperability* GG24-4395.

Host Software Installed

The following software was installed on RAI:

- IBM MVS/ESA System Product (SP) Version 3 Release 1.3
- IBM MVS/ESA System Modification Program/Extended (SMPE) Release 5
- IBM TCP/IP Version 2 Release 2.1 for MVS
- IBM C for System/370 Version 2 at PUT level 9107
- VTAM Version 4 Release 2 base
- VTAM Version 4 Release 2 AnyNet host feature

RALYAS4A Configuration

First we must check that Allow ANYNET Support is set to *YES in the network attributes of RALYAS4A. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Before we can configure the APPC controller description and add the APPN remote location list entry, we need to display the network attributes on RALYAS4A and the VTAM startup options from RAI to determine the network IDs and location (LU) names to be used.

```
                          Display Network Attributes
                                                           System:   RALYAS4A
 Current system name . . . . . . . . . . . . . . :   RALYAS4A
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4A
 Default local location . . . . . . . . . . . . . :   RALYAS4A
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression  . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions  . . . . :   200
 Route addition resistance  . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY


                                                                  More...
```

Figure 151. Scenario 5: AS/400 Network Attributes

The VTAM startup options from RAI are not shown here. The relevant items from the startup options are: NETID=USIBMRA and SSCPNAME=RAI.

Next, we create a controller description on RALYAS4A with LINKTYPE *ANYNW.

```
                      Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > ANYNWMVSI     Name
 Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > RAIANYNT      Name, *ANY
 User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
 Text 'description' . . . . . . . > 'To AnyNet/MVS'





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

Figure 152. Scenario 5: AS/400 Controller Description

In the following panel we add the APPC over TCP/IP entry to the APPN remote location list at RALYAS4A.

```
                          Change Configuration List                 RALYAS4A
                                                          03/08/95  14:06:54
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote               Remote    Control
Remote    Network   Local      Control   Point     Location          Secure
Location  ID        Location   Point     Net ID    Password           Loc
RAI_____  *NETATR   *NETATR    RAIANYNT  *NETATR   _______________    *NO
________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR    ________  *NETATR   _______________    *NO
                                                                    More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 153. Scenario 5: AS/400 APPN Remote Locations

The host table at RALYAS4A, shown following, has had the APPC over TCP/IP entry added.

```
                     Work with TCP/IP Host Table Entries
                                                          System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   7=Rename

     Internet         Host
Opt  Address          Name

 _   _______________
 _   9.24.104.56      RALYAS4A
                      RALYAS4A.ITSO.RAL.IBM.COM
 _   9.24.104.74      RAI
                      RAI.ITSO.RAL.IBM.COM
                      RAI.USIBMRA.SNA.IBM.COM




F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 154. Scenario 5: AS/400 TCP/IP Host Table

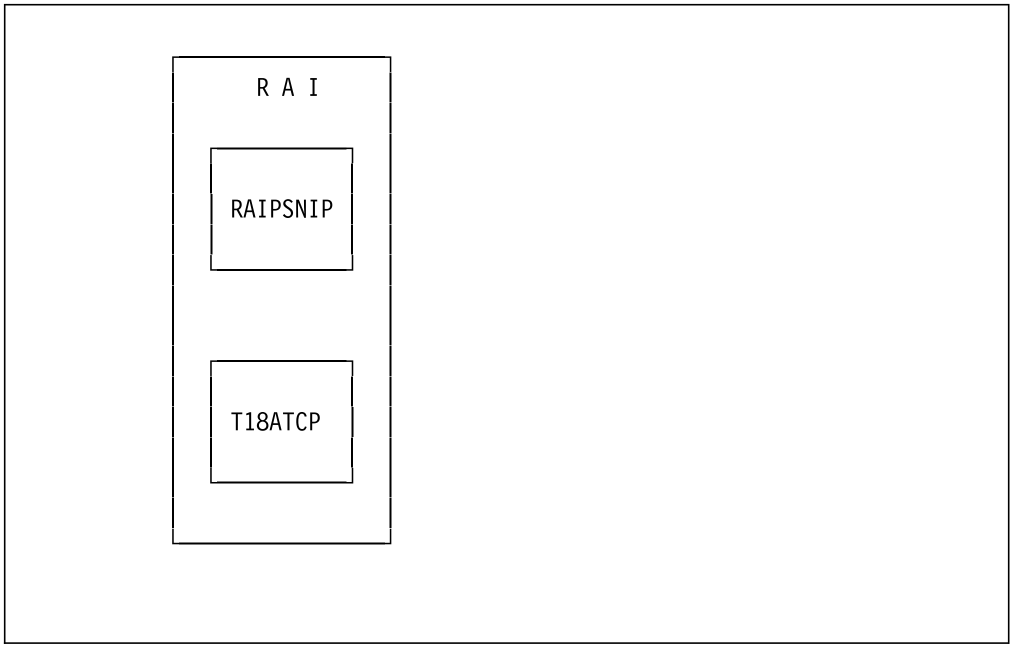

Figure 155. Scenario 5: AnyNet/MVS Configuration

The IP network is represented to VTAM as a TCP/IP major node, using a VBUILD TYPE=TCP as shown in Figure 156.

```
EDIT       RISC.VTAMLST(RAIBSNIP) - 01.03                  Columns 00001 00072
****** ***************************** Top of Data ******************************
==MSG> -Warning- The UNDO command is not available until you change
==MSG>           your edit profile using the command RECOVERY ON.
000001 ***********************************************************************
000002 *                                                                     *
000003 *           VTAM 42   ANYNET   -      SNA OVER TCP/IP                 *
000004 *                                                                     *
000005 *                      SA 18  DEFINITIONS                             *
000006 *                                                                     *
000007 ***********************************************************************
000008 RAIBSNIP VBUILD  TYPE=TCP,                                               X
000009                CONTIMER=30,            WAIT FOR MPTN TO COME UP          X
000010                DGTIMER=30,             INTERVAL BETWEEN RETRIES          X
000011                DNSUFX=IBM.COM,         DOMAIN NAME SUFFIX                X
000012                EXTIMER=3,              BETW. SEND SNA EXPEDITED DATA     X
000013                IATIMER=120,            TIME BEFORE MPTN KEEPALIVE        X
000014                PORT=397,               WELLKNOWN PORT FOR ANYNET         X
000015                TCB=10,                 NUMBER MVS SUBTASKS               X
000016                TCPIPJOB=T18ATCP        TCP/IP JOBNAME
000017 RAIGSNIP GROUP ISTATUS=ACTIVE          GROUPNAME
000018 RAILSNIP LINE  ISTATUS=ACTIVE          LINENAME
000019 RAIPSNIP PU    ISTATUS=ACTIVE          PUNAME
****** **************************** Bottom of Data ****************************
```

Figure 156. Scenario 5: IP Network Representation to VTAM

When using APPC over TCP/IP, VTAM sees any remote LUs as independent LUs, which are defined as CDRSCs.

```
EDIT       RISC.VTAMLST(RAIRSNIP) - 01.07                  Columns 00001 00072
****** ***************************** Top of Data ******************************
==MSG> -Warning- The UNDO command is not available until you change
==MSG>           your edit profile using the command RECOVERY ON.
000001 *********************************************************************
000002 *                           UPDATE LOG                              *
000003 *                                                                   *
000004 * 03/07/95 MCLI MODIFY COMMENTS                                     *
000003 *                                                                   *
000003 *                                                                   *
000008 * ----------------------------------------------------------------- *
000009 *        VTAM  42  ANYNET SNA OVER TCP/IP                           *
000010 *                                                                   *
000011 *                      SA 18  DEFINITIONS                           *
000012 *                                                                   *
000013 * NAME   CDRSC ALSLIST=.....NAME OF THE PU STATEMENT DEFINED        *
000014 *                           WITHIN THE VBUILD TYPE=TCP              *
000015 *                                                                   *
000016 *     - THE NAME LABEL OF THE CDRSC DEFINITION STATEMENT MUST BE    *
000017 *       THE REMOTE ILU NAME.                                        *
000018 *                                                                   *
000019 *     - WE MUST CODE ALSREQ=YES TO USE THE PREDEFINED LIST.         *
000020 *                                                                   *
000021 *     - WE USE SOME CDRSC WITH THE NETID NOT CODED IN ORDER TO      *
000022 *       THE CDRMNAME AS AN ADJSSCP.                                 *
000023 *                                                                   *
000024 ************************************************************************
000025          VBUILD  TYPE=CDRSC
000026 *
000027          NETWORK NETID=USIBMRA
000028 *
000034 RALYAS4A CDRSC ALSLIST=RAIPSNIP,ALSREQ=YES     AS400
****** **************************** Bottom of Data ****************************
```

Figure 157. Scenario 5: LU Representation to VTAM

The TCP/IP Host Table used by AnyNet/MVS SNA over TCP/IP is the normal host table.

```
EDIT       TCPIP.ITSC.HOSTS.LOCAL                          Columns 00001 00072
****** ***************************** Top of Data ******************************
==MSG> -Warning- The UNDO command is not available until you change
==MSG>           your edit profile using the command RECOVERY ON.
000001 ; ----------------------------------------------------------------------
000002 ;                           Update log
000003 ; 01/31/95 mcli  Change 9.67.38.3 to 9.67.38.20
000004 ;
000005 ; ----------------------------------------------------------------------
000006 ;                           WATSON IP ADDRESSES
000007 ; NOTES:
000008 ;  1. To request additions, changes, or deletions from this file please
000009 ;     use the WATIP REQUEST online form which can be found on the
000010 ;     CMSSYS 19f disk (also known as the U disk). Follow further
000011 ;     instructions within WATIP REQUEST.
000012 ;  2. This file should NOT contain any blank lines.
000013 ; ----------------------------------------------------------------------
000014 ;
000015 ;  Ring 9.2.1.0 - Netmask 255.255.255.128 - Hawthorne I 16Mb
000016 ;  Begin 9.2.1.0
000017 HOST : 14.0.0.0  : YKTVMV , CIAMPA, GARY , GTC, ME , TEST ::::
000018 HOST:9.67.38.36:WTR05221.USIBMRA.IBM.COM,ISNIPJL1.USIBMRA.IBM.COM ::::
000019 HOST:9.67.38.36:ISNIPJL2.USIBMRA.IBM.COM,ISNIPJL3.USIBMRA.IBM.COM ::::
000020 HOST:9.67.38.36:ISNIPJL4.USIBMRA.IBM.COM ::::
000021 HOST:9.67.38.37:WTR05115.USIBMRA.IBM.COM,ISNIPML1.USIBMRA.IBM.COM ::::
000022 HOST:9.67.38.37:ISNIPML2.USIBMRA.IBM.COM,ISNIPML3.USIBMRA.IBM.COM ::::
000023 HOST:9.67.38.37:ISNIPML4.USIBMRA.IBM.COM ::::
000024 HOST : 9.67.38.35 : WTR05222.USIBMSC.IBM.COM ::::
000025 HOST : 9.67.38.20 : RAIAC.USIBMRA.IBM.COM ::::
000026 HOST : 9.67.38.11 : RABAT.USIBMRA.IBM.COM ::::
000027 HOST : 9.67.38.20 : RAPAC.USIBMRA.IBM.COM ::::
000028 HOST : 9.67.38.11 : RA3AC.USIBMRA.IBM.COM ::::
000029 HOST : 9.67.38.11 : RABAC.USIBMRA.IBM.COM ::::
000030 HOST : 9.24.104.56: RALYAS4A.USIBMRA.IBM.COM ::::
000032 ;
****** **************************** Bottom of Data ****************************
```

Figure 158. Scenario 5: VTAM TCP/IP Host Table

The last entry in the table is the SNA over TCP/IP entry added for RALYAS4A.

No matching parameter table was created for this scenario.

Verifying the Scenarios

In order to prove that the APPC over TCP/IP connection is working, we can follow a step-by-step verification process. In a failing environment, this step-by-step process should help identify the failing area. Verification is shown for the following:

- AnyNet/400 APPC over TCP/IP
- AnyNet/2 SNA over TCP/IP
- AnyNet/MVS SNA over TCP/IP

AnyNet/400 APPC over TCP/IP Verification

The verification of APPC over TCP/IP should be carried out in the following stages:

- AS/400 TCP/IP Verification
- AS/400 APPC over TCP/IP Verification

Note

The verifications in this section were carried out from RALYAS4A and RCHASM02 in APPC over TCP/IP scenario 2.

AS/400 TCP/IP Verification

AnyNet/400 APPC over TCP/IP requires a TCP/IP configuration between the systems. This TCP/IP configuration is established as if it were to be used by native TCP/IP applications; there are no special TCP/IP configuration requirements to allow APPC over TCP/IP to use the TCP/IP configuration. Before we verify the APPC over TCP/IP configuration, we should verify the native TCP/IP configuration. This can be done in such a way that it also verifies part of the APPC over TCP/IP configuration. For example, the following will verify the TCP/IP connection between RALYAS4A and RCHASM02 via the APPC over TCP/IP host table entry:

```
ping rchasm02.itscnet.sna.ibm.com

Verifying connection to host system RCHASM02 at address 9.5.69.250.
Connection verification 1 took .522 seconds.  1 successful connection
  verifications.
Connection verification 2 took .299 seconds.  2 successful connection
  verifications.
Connection verification 3 took .231 seconds.  3 successful connection
  verifications.
Connection verification 4 took .234 seconds.  4 successful connection
  verifications.
Connection verification 5 took .288 seconds.  5 successful connection
  verifications.
Round-trip (in milliseconds) min/avg/max = 231/314/522
Connection verification statistics: 5 of 5 successful (100 %).
```

Figure 159. AS/400 PING Command Job Log Information

Once we are satisfied that the TCP/IP configuration is working fine, we can move on to verify the APPC over TCP/IP configuration.

AS/400 APPC over TCP/IP Verification

Having verified the native TCP/IP configuration to the remote system, we can now verify the APPC over TCP/IP configuration.

First we should check that the APPC over TCP/IP job is running. The command WRKACTJOB SBS(QSYSWRK) will display the active jobs in the QSYSWRK subsystem. The APPC over TCP/IP job QAPPCTCP should be active as shown in the following figure.

```
                              Work with Active Jobs                   RALYAS4A
                                                               03/08/95  17:24:02
 CPU %:     .0     Elapsed time:   00:00:00     Active jobs:   63

 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
 _5     QAPPCTCP     QSYS        BCH      .0  PGM-QZPAIJOB     TIMW
 __     QECS         QSVSM       BCH      .0  PGM-QNSECSJB     DEQW
 __     QMSF         QMSF        BCH      .0                   DEQW
 __     QNSCRMON     QSVSM       BCH      .0  PGM-QNSCRMON     DEQW
 __     QTCPIP       QTCP        BCH      .0                   DEQW
 __     QTFTP00619   QTCP        BCH      .0                   DEQW
 __     QTFTP00734   QTCP        BCH      .0                   DEQW
 __     QTFTP02472   QTCP        BCH      .0                   TIMW
                                                                         More...
 Parameters or command
 ===> ______________________________________________________________________________
 F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
 F12=Cancel   F23=More options   F24=More keys
```

Figure 160. Work with Active Jobs Panel

If we look at the job log associated with QAPPCTCP, we see the following:

```
                               Display Job Log
                                                               System:   RALYAS4A
 Job . . :   QAPPCTCP      User . . :   QSYS         Number . . . :   011338

  >> CALL QSYS/QZPAIJOB
     APPC over TCP/IP job started.




                                                                           Bottom
 Press Enter to continue.

 F3=Exit   F5=Refresh   F10=Display detailed messages   F12=Cancel
 F16=Job menu           F24=More keys
```

Figure 161. Display Job Log (QAPPCTCP) Panel

Note

The APPC over TCP/IP job (QAPPCTCP) is initially started when the Allow AnyNet support (ALWANYNET) network attribute is changed to *YES. If the job fails for any reason, it is necessary to stop TCP/IP (ENDTCP), and start TCP/IP (STRTCP) again to re-start the job.

Before we can use the AS/400 APPC over TCP/IP configuration, we must Vary on the APPC controller description we created for the APPC over TCP/IP connection. The Work with Configuration Status command can be used to show the status of the controller. For example, the following command resulted in the display shown in Figure 162.

```
WRKCFGSTS *CTL ANYNWRAS2
```

```
                        Work with Configuration Status               RALYAS4A
                                                           03/08/95  16:30:11
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--------------
__   ANYNWRAS2        VARIED OFF







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

Figure 162. Work with Configuration Status for Controller at RALYAS4A

To make the configuration available, use option 1 (Vary on). The configuration should then go to a VARIED ON status.

When the first controller with link type *ANYNW is varied on, two TCP/IP connections will be started; one is a TCP connection that goes to LISTEN state to allow the system to accept incoming APPC over TCP/IP sessions; while the other is a UDP connection to handle out-of-band data for all APPC over TCP/IP activity. NETSTAT option 3 can be used to display all TCP/IP sessions (native TCP/IP and APPC over TCP/IP). Figure 163 shows NETSTAT option 3 prior to any APPC over TCP/IP sessions being established.

```
                      Work with TCP/IP Connection Status
                                                            System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  026:45:25  Listen
     *                *          telnet     025:04:38  Listen
     *                *          APPCove >  000:09:55  Listen
     *                *          APPCove >  000:09:55  *UDP
     *                *          lpd        026:44:24  Listen




                                                                        Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 163. NETSTAT Option 3 - TCP/IP Connection Status (1 of 4)

If the APPC over TCP/IP connections (APPCove) fail for any reason, it is necessary to stop TCP/IP (ENDTCP) and start TCP/IP (STRTCP) again to re-start the jobs.

If the remote system is another AS/400, then STRPASTHR can be used to verify the configuration. For example:

```
STRPASTHR RMTLOCNAME(RCHASM02) RMTNETID(ITSCNET)
```

An AS/400 command that can be used to verify an APPC configuration to *any* remote APPC system is STRMOD. For example:

```
STRMOD RMTLOCNAME(RCHASM02) RMTNETID(ITSCNET)
Command STRMOD completed successfully for mode BLANK device RCHASM02.
The STRMOD command completed successfully for all modes.
```

If the remote system was an AS/400 and the Allow AnyNet support Network attribute (ALWANYNET) was set to *NO, then STRMOD would fail in the following manner:

```
STRMOD RMTLOCNAME(RCHASM02) RMTNETID(ITSCNET)
Session maximum not changed.  Command STRMOD failed.
The STRMOD command failed for one or more modes.
```

The QSYSOPR message queue message provided the following additional information:

```
BIND sense code X'80140000' received for mode BLANK device RCHASM02.
```

With a session active, WRKCFGSTS shows the active session in the normal way.

```
                     Work with Configuration Status              RALYAS4A
                                                        03/08/95  16:40:03
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--------------
__   ANYNWRAS2        ACTIVE
__     RCHASM02       ACTIVE
__       BLANK        ACTIVE/SOURCE         WTR32226E   ISTIARI     011387




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

Figure 164. Work with Configuration Status for Controller at RALYAS4A

The device description RCHASM02 was autocreated.

The NETSTAT option 3 display in Figure 165 shows the associated TCP/IP sessions.

```
                       Work with TCP/IP Connection Status
                                                       System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  027:06:16  Listen
     *                *          telnet     025:25:30  Listen
     *                *          APPCove >  000:30:47  Listen
     *                *          APPCove >  000:30:46  *UDP
     *                *          lpd        027:05:16  Listen
     9.5.69.250       APPCove >  1036       000:01:19  Established
     9.5.69.250       APPCove >  1037       000:01:09  Established


                                                                  Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 165. NETSTAT Option 3 - TCP/IP Connection Status (2 of 4)

The two sessions represent the two APPC sessions in place; one is for the SNA service manager (SNASVCMG) and the other is for the user session.

Figure 166 shows an alternate view of the previous figure after having pressed F14 to display the port numbers.

```
                     Work with TCP/IP Connection Status
                                                             System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote  Local
Opt  Address           Port    Port  Idle Time  State
     *                     *     21  027:06:16  Listen
     *                     *     23  025:25:30  Listen
     *                     *    397  000:30:47  Listen
     *                     *    397  000:30:46  *UDP
     *                     *    515  027:05:16  Listen
     9.5.69.250          397   1036  000:01:19  Established
     9.5.69.250          397   1037  000:01:09  Established




                                                                         Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port names   F15=Subset by local address   F24=More keys
```

Figure 166. NETSTAT Option 3 - TCP/IP Connection Status (3 of 4)

Port 397 is the well-known port for SNA over TCP/IP.

NETSTAT option 3 at the remote system shows the same sessions from the other end of the connection, as can be seen in Figure 167.

```
                     Work with TCP/IP Connection Status
                                                             System:   RCHASM02
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  000:53:30  Listen
     *                *          telnet     000:54:53  Listen
     *                *          APPCove >  000:14:31  Listen
     *                *          APPCove >  000:05:20  *UDP
     9.24.104.56      1036       APPCove >  000:14:33  Established
     9.24.104.56      1037       APPCove >  000:00:00  Established


                                                                         Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 167. NETSTAT Option 3 - TCP/IP Connection Status (4 of 4)

The ability to establish APPC over TCP/IP sessions can be verified in many ways. Above we showed the use of STRMOD which results in a CNOS (Change Number of Sessions) LU6.2 command flowing to the remote system.

Another means of verifying the configuration is to use APING; this test tool is available for all IBM platforms and many non-IBM platforms. It functions, in an APPC environment, in a very similar way to PING in a TCP/IP environment. See Appendix B, “APING” on page 349 for details of AS/400 APING. Figure 168 shows the output from the command:

```
CALL APING RALYAS4A
```

```
  APING version 2.39 APPC echo test with timings.
    by Peter J. Schwaller (pjs@ralvm6.vnet.ibm.com)

  Allocate duration:                           0 ms

  Connected to a partner running on: OS/400

  Program startup and Confirm duration:     8000 ms

          Duration        Data Sent        Data Rate        Data Rate
          (msec)          (bytes)          (KB/s)           (Mb/s)
          --------        ---------        ---------        ---------
              1000              200              0.2            0.002
                 0              200
  Totals:     1000              400              0.4            0.003

  Duration statistics:   Min = 0   Ave = 500   Max = 1000
  Press ENTER to end terminal session.

===>

F3=Exit F4=End of File F6=Print F9=Retrieve F17=Top
F18=Bottom  F19=Left   F20=Right F21=User Window
```

Figure 168. APING Sample Output between AS/400s

The APING example above was carried out from RALYAS4B in APPC over TCP/IP scenario 1.

AnyNet/2 SNA over TCP/IP Verification

Note

The verifications in this section were carried out from WTR32226 in APPC over TCP/IP scenario 3.

To start AnyNet/2 SNA over TCP/IP, we should do the following:

1. Start OS/2 TCP/IP.
2. Start Communication Manager/2.

The SNA over TCP/IP code is loaded into memory and linked for use when Communication Manager/2 is started following the AnyNet/2 installation.

To check whether Communication Manager/2 is running, we can use the CMQUERY command which displays the following panel:

```
            Communications Manager Query Services

     Workstation Type      : Single User
     Default configuration : WTRMODEL
     Active configuration  : WTRMODEL

      Service                        Status
     ==============================================================
       CM Kernel                    ACTIVE
       SNA Services                 ACTIVE
       SRPI                          *** Stopped ***
       X.25                          *** Stopped ***
       SNA Phone Connect             *** Stopped ***
       ACDI                          *** Stopped ***
       3270 Emulator                ACTIVE
       5250 Emulator                ACTIVE
     ==============================================================
     Thursday, 11/17/94 14:04:01   End of Program - CMQuery
```

Figure 169. Communications Manager/2 CMQUERY Command Output

From this output, you can see that the kernel and SNA services are active.

Each time Communication Manager/2 is started, it determines whether it is enabled to route SNA frames over the IP network. If the SNA over TCP/IP files are not in place, Communication Manager/2 assumes that SNA over TCP/IP is not available and routes all SNA frames over the SNA network.

To verify that AnyNet/2 SNA over TCP/IP has initialized, we can use the NETSTAT -s command to display the following:

```
SOCK      TYPE         FOREIGN          LOCAL         FOREIGN      STAT
                          PORT           PORT            HOST
==== ==========     ==========     ==========      ========== ========
32      STREAM      mptn..397           1033     9.24.104.56   ESTABLISHED
31       DGRAM              0           1025         0.0.0.0   UDP
30      STREAM      mptn..397           1032     9.24.104.56   ESTABLISHED
28       DGRAM              0      mptn..397         0.0.0.0   UDP
27       DGRAM              0              0         0.0.0.0   UDP
26      STREAM           1031           1030    9.24.104.186   ESTABLISHED
25      STREAM           1030           1031    9.24.104.186   ESTABLISHED
23      STREAM           1029           1028    9.24.104.186   ESTABLISHED
22      STREAM           1028           1029    9.24.104.186   ESTABLISHED
20      STREAM              0      mptn..397         0.0.0.0   LISTEN
```

Figure 170. OS/2 TCP/IP NETSTAT -s Command Output

From the NETSTAT -s display, we can see that SNA over TCP/IP is enabled because sockets are bound to the well-known port for SNA over TCP/IP (port 397). The four stream sockets 26,25,23 and 22 are used for internal SNA over TCP/IP connections. An SNA over TCP/IP session was active when this information was captured; it is using local ports 1033 and 1032.

The active Communications Manager/2 LU 6.2 sessions can be displayed as follows:

1. Open the **Communication Manager/2** icon.
2. Select **Subsystem Management**.
3. Select **SNA Subsystem**.
4. Select **Display active configuration**.
5. Select **General SNA**.
6. Select **LU 6.2 sessions**.

```
**************************************
*        Session Information        *
**************************************
Number of sessions                           4

           -----------------deleted----------------

2>Session ID                                 X'1044C793ACC82DB8'
  Conversation ID                            X'00000000'
  LU alias                                   WTR32226
  Partner LU alias                           RALYAS4A
  Mode name                                  SNASVCMG
  Send maximum RU size                       512
  Receive maximum RU size                    512
  Send pacing window                         1
  Receive pacing window                      1
  Link name                                  overTCP
  Outbound destination address (DAF)         X'01'
  Outbound origin address (OAF)              X'02'
  OAF-DAF assignor indicator (ODAI)          B'1'
  Session type                               LU-LU session
  Connection type                            Peer
  Procedure correlator ID (PCID)             X'F1FB3DDD790197F4'
  PCID generator CP name                     USIBMRA.WTR32226
  Conversation group ID                      X'BOC82DB8'
  LU name                                    USIBMRA.WTR32226
  Partner LU name                            USIBMRA.RALYAS4A
  Pacing type                                Adaptive
  Primary LU indicator                       Local LU
  FMD PIUs sent by primary LU                2
  FMD PIUs sent by secondary LU              2
  Non-FMD PIUs sent by primary LU            1
  Non-FMD PIUs sent by secondary LU          1
  Bytes sent by primary LU                   305
  Bytes sent by secondary LU                 170
  PLU to SLU compression level               None
  PLU to SLU compression percent             0
  SLU to PLU compression level               None
  SLU to PLU compression percent             0

           -----------------deleted----------------
```

Non-native connections show a link name of overTCP.

If the APING application is also installed on the AnyNet/2 system, it can be used to verify the session as shown in Figure 171.

```
APING for Destination: USIBMRA.RALYAS4A -- RALYAS4A
Allocate duration:                         3390 ms
Connected to a partner running on: OS/400
Program startup and Confirm duration:      3437 ms
      Duration       Data Sent       Data Rate       Data Rate
      (msec)         (bytes)         (KB/s)          (Mb/s)
      --------       ---------       ---------       ---------
           125             200             1.6           0.013
            62             200             3.2           0.025
Totals:    187             400             2.1           0.017
Duration statistics:   Min = 62   Ave = 93   Max = 125
```

Figure 171. APING Sample Output from PS/2 to AS/400

AnyNet/MVS SNA over TCP/IP Verification

Note

The verifications in this section were carried out from RAI in APPC over TCP/IP scenario 5.

We can use the TCP/IP PING application to verify the MVS - AS/400 TCP/IP configuration prior to trying APPC over TCP/IP.

```
  Menu  List  Mode  Functions  Utilities  Help
 -----------------------------------------------------------------------
                              ISPF Command Shell
 Enter TSO or Workstation commands below:

 ===> ping 9.24.104.56



 Place cursor on choice and press enter to Retrieve command

 => ping 9.24.104.56
 => ping ralyas4a.usibmra.ibm.com
 => ping 9.67.38.37
 => call 'mcli.sa11.aping.loadlib(aping)' 'usibmra.ralyas4a'
 => call 'mcli.sa11.aping.loadlib(aping)' 'usibmra.wtr05115'
 => /$sn,a=raot1b08
 =>
 =>
 =>
 EZA0458I Ping V3R1: Pinging host 9.24.104.56.  Use ATTN to interrupt.
 EZA0463I PING: Ping #1 response took 0.024 seconds. Successes so far 1.
 ***
```

Figure 172. PING sample Output from MVS to AS/400

Having verified the TCP/IP configuration and with APING installed on both the MVS system and the AS/400, we can use this to verify the APPC over TCP/IP configuration.

```
  Menu  List  Mode  Functions  Utilities  Help
-----------------------------------------------------------------------
                              ISPF Command Shell
Enter TSO or Workstation commands below:

===> call 'mcli.sa11.aping.loadlib(aping)' 'usibmra.ralyas4a'



Place cursor on choice and press enter to Retrieve command

=> ping 9.24.104.56
=> ping ralyas4a.usibmra.ibm.com
=> ping 9.67.38.37
=> call 'mcli.sa11.aping.loadlib(aping)' 'usibmra.ralyas4a'
=> call 'mcli.sa11.aping.loadlib(aping)' 'usibmra.wtr05115'
=> /$sn,a=raot1b08
=>
=>
=>
APING version 2.44  APPC echo test with timings.
  by Peter J. Schwaller (pjs@ralvm6.vnet.ibm.com)

***
```

```
Allocate duration:                      17000 ms

Connected to a partner running on: OS/400

Program startup and Confirm duration:    5000 ms

        Duration        Data Sent        Data Rate        Data Rate
        (msec)          (bytes)          (KB/s)           (Mb/s)
        --------        ---------        ---------        ---------
            1000              200              0.2            0.002
               0              200
Totals:     1000              400              0.4            0.003

Duration statistics:   Min = 0   Ave = 500   Max = 1000
***
```

Figure 173. APING Sample Output from MVS to AS/400

If we use NetView to display the status of the AnyNet PU with the APING session active, we see the following:

```
* RAIAN    D NET,E,ID=RAIPSNIP
  RAIAN    IST097I  DISPLAY  ACCEPTED
' RAIAN
IST075I  NAME = RAIPSNIP         , TYPE = PU_T2.1
IST486I  STATUS= ACTIV--L--, DESIRED STATE= ACTIV
IST1043I  CP NAME = ***NA***, CP NETID = USIBMRA , DYNAMIC LU = YES
IST081I  LINE NAME = RAILSNIP, LINE GROUP = RAIGSNIP, MAJNOD = RAIBSNIP
IST654I  I/O TRACE = OFF, BUFFER TRACE = OFF
IST355I  LOGICAL UNITS:
IST080I  RALYAS4A ACT/S      WTR05115 ACT/S
IST314I  END
```

Figure 174. NetView AnyNet PU Status

If we use NetView to display the VTAM status of RALYAS4A with the APING session still active, we see the following:

```
* RAIAN    D NET,E,ID=RALYAS4A
  RAIAN    IST097I  DISPLAY  ACCEPTED
' RAIAN
IST075I  NAME = USIBMRA.RALYAS4A , TYPE = CDRSC
IST486I  STATUS= ACT/S     , DESIRED STATE= ACTIV
IST977I  MDLTAB=***NA*** ASLTAB=***NA***
IST1333I  ADJLIST = ***NA***
IST861I  MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I  DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I  CAPABILITY-PLU ENABLED  ,SLU ENABLED  ,SESSION LIMIT NONE
IST231I  CDRSC    MAJOR NODE = RAIRSNIP
IST1044I  ALSLIST = RAIPSNIP
IST082I  DEVTYPE = INDEPENDENT LU / CDRSC
IST654I  I/O TRACE = OFF, BUFFER TRACE = OFF
IST171I  ACTIVE SESSIONS = 0000000002, SESSION REQUESTS = 0000000000
IST206I  SESSIONS:
IST1081I  ADJACENT LINK STATION = RAIPSNIP
IST634I  NAME     STATUS         SID          SEND RECV VR TP NETID
IST635I  RAIAZ    ACTIV-P    F86FE164CDFD7933 0006 0008       USIBMRA
IST635I  RAIAZ    ACTIV-P    F86FE164CDFD7925 0001 0001       USIBMRA
IST314I  END
```

Figure 175. NetView AnyNet LU Status

AnyNet Gateways

This chapter presents the process of defining and verifying AnyNet/400 Sockets over SNA and APPC over TCP/IP when used in conjunction with AnyNet Gateways. The chapter also includes a 5494 scenario.

Along with the AnyNet/400 environments, the AnyNet/2 and AnyNet/MVS implementations will also be used in some of the scenarios.

The information is presented in the following sections:

1. Introduction to using AnyNet/400 in conjunction with an AnyNet Gateway
2. Sockets over SNA Gateway Scenario
3. APPC over TCP/IP Gateway Scenario
4. 5494 over TCP/IP Gateway Scenario

Each scenario includes a section on verification.

Introduction to using AnyNet/400 in Conjunction with an AnyNet Gateway

AnyNet/400 Sockets over SNA, APPC over TCP/IP, APPC over IPX and Sockets over IPX are MPTN access node implementations. The MPTN architecture also defines a transport gateway.

As discussed in "MPTN Gateway" on page 18, an MPTN transport gateway connects two dissimilar networks to provide an end-to-end service over their concatenation. An MPTN gateway can be used in the following ways:

1. To provide a connection between an AnyNet system and a native system.
2. To provide a connection between native systems via a non-native network.

In this section we primarily discuss option 1 (connections between AnyNet systems and native systems). Although not covered in detail in this redbook (there is no AnyNet/400 content), option 2 can be used by AS/400 applications.

Specifically, in this section we will look at scenarios where AnyNet/400 is used in conjunction with either an AnyNet Sockets over SNA gateway or an AnyNet SNA over TCP/IP gateway. These AnyNet gateways implement the MPTN transport gateway function.

In the scenarios that follow we have only a single system using the gateway. This does not have to be the case. For example, if we look at the 5494 over TCP/IP Gateway scenario, there could be other native SNA systems (for example, non-AnyNet Client Access/400 PCs) using the gateway to access either the AS/400 shown or another AnyNet/400 APPC over TCP/IP system. There could also be other native SNA systems accessing other AnyNet APPC over TCP/IP (or SNA over TCP/IP) systems via this same gateway.

As discussed above, AnyNet gateways can also be used to provide connections between native systems across a non-native network. Figure 176 on page 142 and Figure 177 on page 142 show how multiple gateways can be used by AS/400 applications to provide connections between native systems via a non-native network.

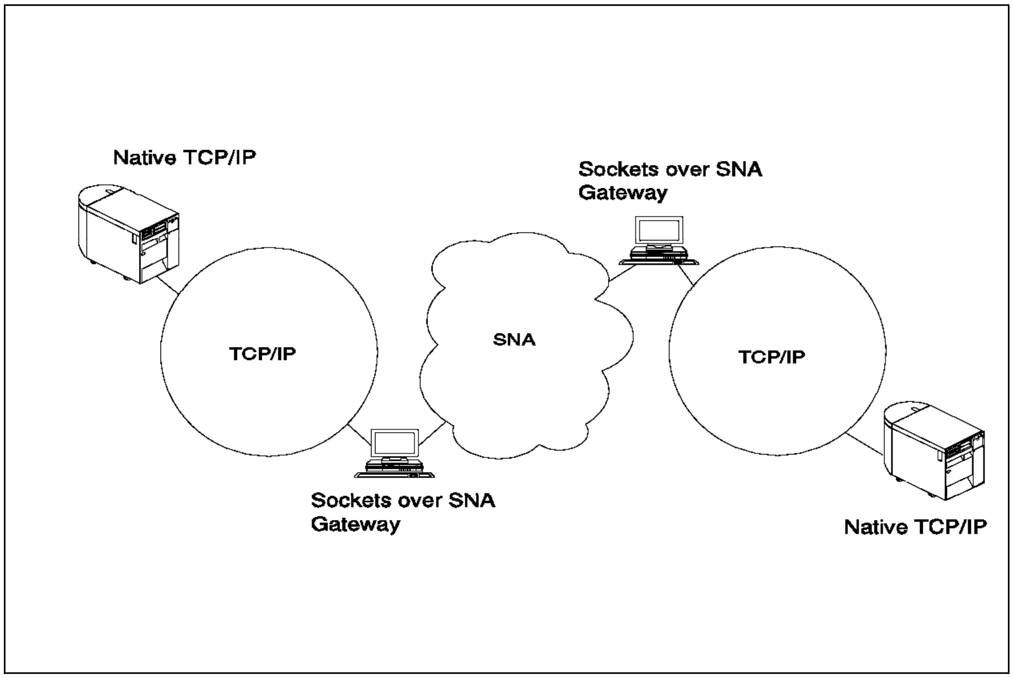

Figure 176. Multiple Sockets over SNA Gateways

In the environment in Figure 176, socket applications running on native TCP/IP systems in one network can communicate with sockets applications running on native TCP/IP systems in the other network, across an SNA network.

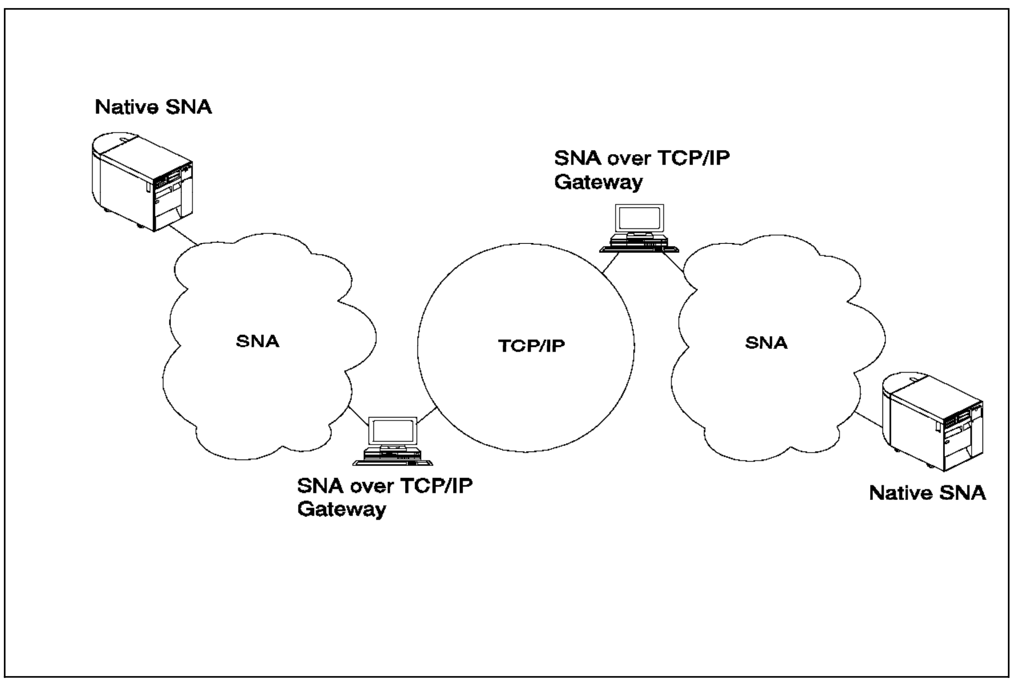

Figure 177. Multiple SNA over TCP/IP Gateways

In the environment in Figure 177, SNA applications running on native SNA systems in one network can communicate with SNA applications running on native SNA systems in the other network, across a TCP/IP network.

Sockets over SNA Gateway Scenario

This section presents the process of defining and verifying AnyNet/400 Sockets over SNA, via an AnyNet Sockets over SNA gateway, at the International Technical Support Organization in Raleigh.

Note

The AS/400 applications supported under AnyNet/400 in this environment are as when using AnyNet/400 Sockets over SNA in an non-gateway environment (as shown in “Using AnyNet/400 Sockets over SNA” on page 24).

In this scenario, we will use one-to-one mapping to map the IP addresses to SNA LU names.

Shown in the following figure are the systems used in this scenario and their respective IP over SNA addresses. An SNA/APPC configuration is already in place between RALYAS4A and RALSOCGW using the network ID and CP names shown. A TCP/IP configuration is already in place between RALSOCGW and RALYPS2B using the internet addresses shown.

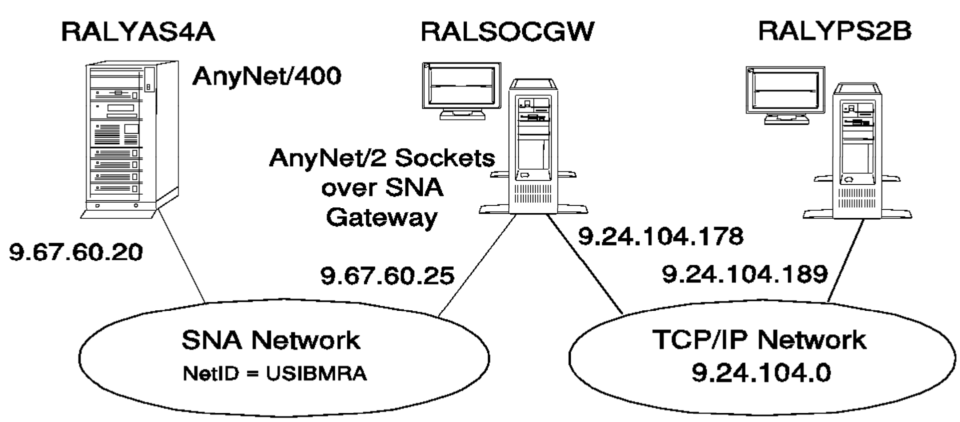

Figure 178. Systems Used for Sockets over SNA Gateway Scenario

The following series of panels show the AS/400 and PS/2 configuration panels taken from the RALYAS4A, RALSOCGW and RALYPS2B systems. They illustrate the configuration steps required for this Sockets over SNA scenario.

Please note that only the key AnyNet/2 configuration displays are shown in this section. For further AnyNet/2 configuration help, refer to *AnyNet/2: Sockets over SNA and NetBIOS over SNA, Installation and Interoperability* GG24-4396.

PS/2 Software Installed

The following software was installed on RALSOCGW:

- OS/2 Version 2.1
- CM/2 Version 1.11 with AnyNet/2 support installed (additional functions)
- TCP/IP Version 2.0 for OS/2 Base kit plus CSD UN64092
- AnyNet/2 Sockets over SNA Gateway Version 1.1 plus the fixes for APARs IC08105 and IC07866.

The software was installed in the above order.

RALYAS4A Configuration

First we must check that Allow ANYNET Support is set to *YES in the network attributes of RALYAS4A. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Next, we configure a Sockets over SNA interface on RALYAS4A.

```
                         Work with IP over SNA Interfaces
                                                                 System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

         Internet            Subnet              Interface
 Opt     Address             Mask                Status

 __      _______________
 __      9.67.60.20          255.255.255.0       Active





                                                                             Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 179. Sockets over SNA Gateway Scenario: Work with IP over SNA Interfaces

The subnet mask of 255.255.255.0 indicates that the first three bytes of the internet address (9.67.60) is the network ID.

Because system RALYAS4A will be communicating with a system via an AnyNet Sockets over SNA gateway, a route needs to be configured.

```
                          Work with IP over SNA Routes
                                                           System:   RALYAS4A
 Type options, press Enter.
   1=Add   4=Remove

        Route              Subnet             Next
 Opt    Destination        Mask               Hop

  _     _______________    _______________    _______________
  _     9.24.104.0         255.255.255.0      9.67.60.25

                                                                       Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 180. Sockets over SNA Gateway Scenario: Work with IP over SNA Routes

Next, we configure the IP over SNA locations on RALYAS4A.

```
                         Work with IP over SNA Locations
                                                           System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove

                                              Remote
        Remote             Subnet             Network      Location
 Opt    Destination        Mask               ID           Template

  _     _______________    _______________
  _     9.67.60.20         *HOST              USIBMRA      RALYAS4A
  _     9.67.60.25         *HOST              USIBMRA      RALSOCGW

                                                                       Bottom

 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 181. Sockets over SNA Gateway Scenario: Work with IP over SNA Locations

By default, AnyNet/2 will use mode SNACKETS for Sockets over SNA. We therefore map the IP Type of Service we want to use (*NORMAL) to the SNA Mode SNACKETS.

```
                    Work with IP over SNA Type of Service
                                                          System:   RALYAS4A
Type options, press Enter.
  2=Change

Opt    Type of Service                  SNA Mode
 _       *MINDELAY                      *NETATR
 _       *MAXTHRPUT                     *NETATR
 _       *MAXRLB                        *NETATR
 _       *MINCOST                       *NETATR
 _       *NORMAL                        SNACKETS
                                                                    Bottom

F3=Exit   F5=Refresh   F6=Print list   F10=Work with Mode Descriptions
F12=Cancel
(C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 182. AS/400 Work with IP over SNA Type of Service

Mode SNACKETS with the parameters shown in Figure 44 on page 42 should be added to RALYAS4A.

RALYPS2B Configuration

For RALYPS2B to be able to communicate with systems in the 9.67.60 network, a route must be added to the OS/2 TCP/IP configuration as shown in the following figure.

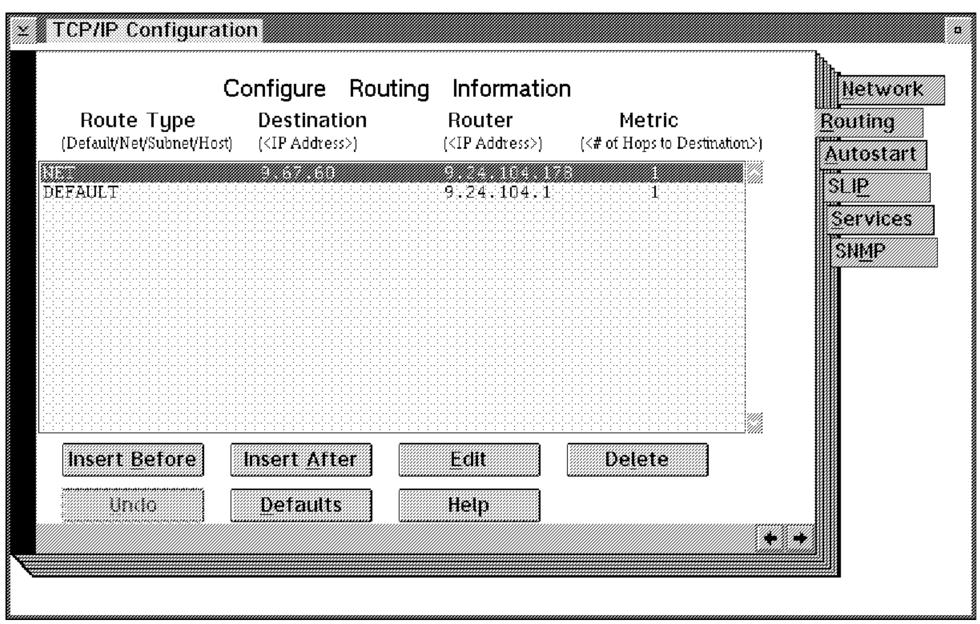

Figure 183. Sockets over SNA Gateway Scenario: OS/2 TCP/IP Route Configuration Panel

RALSOCGW Configuration

The Communications Manager/2 setup is *not* shown here. An end node-to-network node server configuration was created via the APPC APIs through Token-ring CM/2 menu option to RALYAS4A. The AS/400 APPC controller and device descriptions were auto-created when this CM/2 configuration was started.

Select the **Configure AnyNet/2 Gateway** icon to access the configuration screens on RALSOCGW. The folder icon should be displayed on the OS/2 desktop, if the AnyNet/2 Sockets over SNA Gateway has been installed correctly.

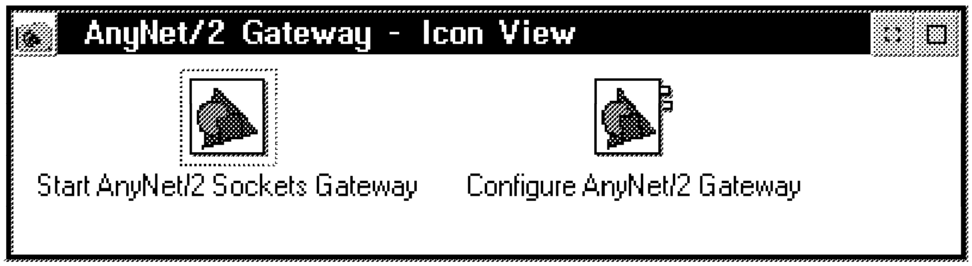

Figure 184. AnyNet/2 Sockets over SNA Gateway Folder

The first AnyNet/2 Sockets over SNA Gateway screen defines the local system (local node).

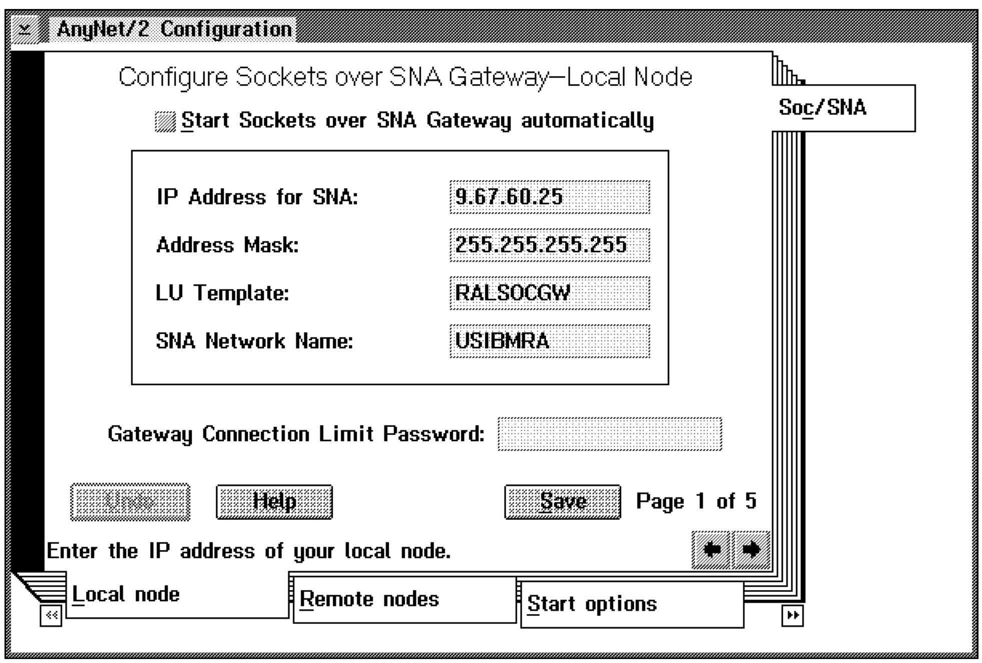

Figure 185. Sockets over SNA Gateway Scenario: Local Node Definition for RALSOCGW

The second AnyNet/2 Sockets over SNA configuration screen defines the remote systems (remote nodes).

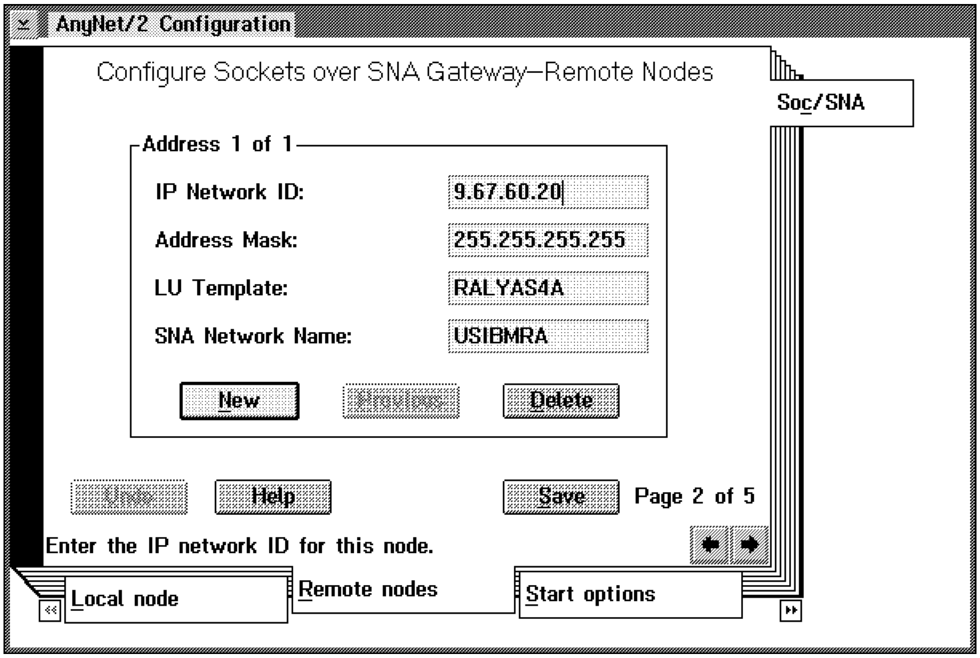

Figure 186. Scenario 3: Sockets over SNA Remote Node Definition for RALSOCGW

Note: With one-to-one mapping, a remote node definition is required for *every* Sockets over SNA system accessed via the gateway. If instead we had used algorithmic mapping, one remote node definition could be used to give access to many Sockets over SNA systems.

The final AnyNet/2 Sockets over SNA Gateway configuration screen allows the SNA mode used for Sockets over SNA to be changed. Configuration screens 3 and 4 are not shown here.

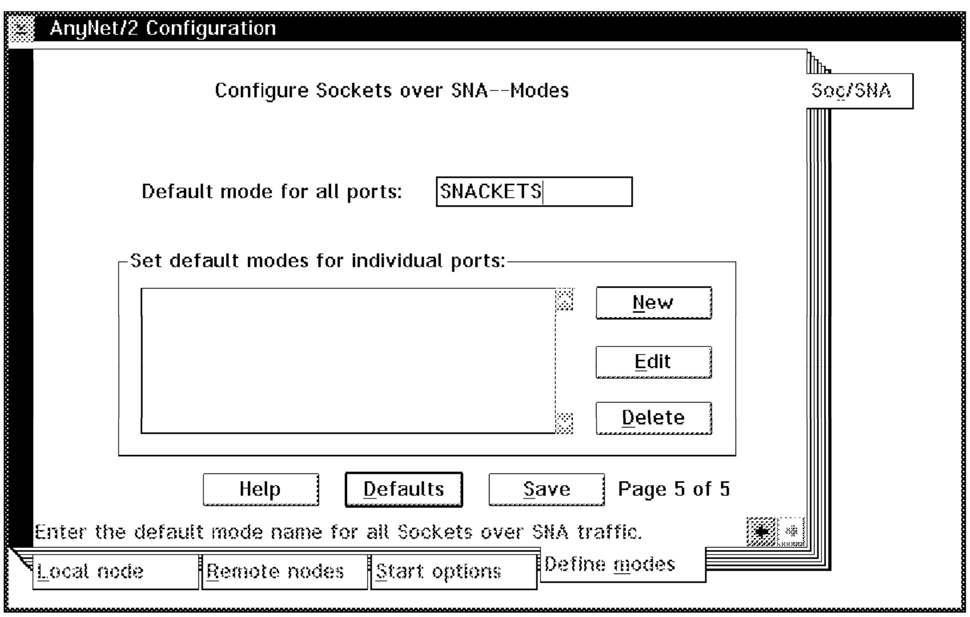

Figure 187. Sockets over SNA Gateway Scenario: Modes Definition for RALSOCGW

The AnyNet/2 Sockets over SNA Gateway configurator produces a command file (sxstart.cmd) based on the information in the AnyNet/2 Sockets over SNA Gateway configuration screens. This command file will be used when AnyNet/2 Sockets over SNA Gateway is started. System RALSOCGW has the following sxstart.cmd file:

```
@REM Sockets over SNA startup file

@REM First, start the Snackets program.

start snackets logfile 100000 sessions 30

@REM Next, tell Sockets over SNA how to map IP addresses to LU names.
@REM Wait for Sockets over SNA to get set up before continuing.
sxmap -w add 9.67.60.25 255.255.255.255 USIBMRA RALSOCGW

sxmap add 9.67.60.20 255.255.255.255 USIBMRA RALYAS4A

@REM Use IFCONFIG to define the local address
ifconfig sna0 9.67.60.25
route add 9.67.60.25 9.67.60.25 0
route add 9.67.60.20 9.67.60.25 0
```

Shown next are the matching parameters between all the systems.

```
SYSTEM                                  SYSTEM                                          SYSTEM
RALYPS2B                                RALSOCGW                                        RALYAS4A
********                                ********                                        ********

                                        CM/2 APPC APIs DEFINITION                       LINE DESCRIPTION
                                        -------------------------                       ----------------
                                        LOCAL NODE NAME    RALSOCGW                     LIND        L41TR
                                        NETWORK ID         USIBMRA                      ADPTADR     400010020001
                                        NETWORK NODE
                                        SERVER ADDRESS     400010020001

TCP/IP CONFIGURATION                    TCP/IP CONFIGURATION
--------------------                    --------------------

INTERFACE PARAMETERS                    INTERFACE PARAMETERS

IP ADDRESS   9.24.104.189               IP ADDRESS         9.24.104.178
SUBNET MASK  255.255.255.0              SUBNET MASK        255.255.255.0

ROUTING INFORMATION                     ROUTING INFORMATION

ROUTE TYPE   NET                        ROUTE TYPE         DEFAULT
DESTINATION  9.67.60                    DESTINATION
ROUTER       9.24.104.178               ROUTER             9.24.104.1

                                        SOCKETS OVER SNA GATEWAY
                                        ------------------------

                                        LOCAL NODE DEFINITION                           IP OVER SNA INTERFACES
                                                                                        ----------------------
                                        IP ADDR            9.67.60.25                   INTNETADR   9.67.60.20
                                        ADDRESS MASK       255.255.255.255              SUBNETMASK  255.255.255.0
                                        LU TEMPLATE        RALSOCGW
                                        SNA NETWORK NAME   USIBMRA
                                                                                        IP OVER SNA ROUTES
                                                                                        ------------------
                                        REMOTE NODE DEFINITION                          RTEDEST     9.24.104.0
                                                                                        SUBNET MASK 255.255.255.0
                                        IP NETWORK ID      9.67.60.20                   NEXTHOP     9.67.60.25
                                        ADDRESS MASK       255.255.255.255
                                        LU TEMPLATE        RALYAS4A
                                        SNA NETWORK NAME   USIBMRA                      IP OVER SNA LOCATIONS
                                                                                        ---------------------
                                                                                        RMTDEST     9.67.60.20
                                        SOCKETS OVER SNA MODES                          SUBNETMASK  *HOST
                                                                                        RMTNETID    USIBMRA
                                        DEFAULT MODE FOR                                LOCTPL      RALYAS4A
                                        ALL PORTS:  SNACKETS
                                                                                        RMTDEST     9.67.60.25
                                                                                        SUBNETMASK  *HOST
                                                                                        RMTNETID    USIBMRA
                                                                                        LOCTPL      RALSOCGW

                                                                                        IP OVER SNA TYPE OF SERVICE
                                                                                        ---------------------------
                                                                                        TYPE OR SEVICE NORMAL
                                                                                        SNA MODE:  SNACKETS
```

Figure 188. Sockets over SNA Gateway Scenario: Matching Parameters Table

Verifying the Sockets over SNA Gateway Scenario

In order to prove that the Sockets over SNA connection is working, we can follow a step-by-step verification process. In a failing environment, this step-by-step process should help locate the failing area. Verification is shown for the following:

- AnyNet/400 via Sockets over SNA Gateway
- AnyNet/2 Sockets over SNA Gateway

AnyNet/400 via Sockets over SNA Gateway Verification

The verification of Sockets over SNA via an AnyNet Sockets over SNA Gateway should be carried out in the following stages:

- Verify the SNA configuration between the AnyNet/400 system and the gateway.
- Verify the TCP/IP configuration between the native TCP/IP system and the gateway.
- Verify the Sockets over SNA configuration between the AnyNet/400 system and gateway.
- Verify the end-to-end Sockets over SNA configuration from either end.

Verify the SNA configuration between the AnyNet/400 system and the gateway.

AnyNet/400 Sockets over SNA requires an SNA configuration between the systems. This SNA configuration is established as if it were to be used by native APPC applications; there are no special SNA configuration requirements to allow Sockets over SNA to use the SNA configuration. Before we verify the Sockets over SNA configuration to the gateway, we should verify the native SNA configuration. This can be done in many ways. In this example where the gateway system is an OS/2 system, verification will take place when the link is activated. The reason being that a CP (Control Point) session is established between the systems. Assuming the connection is via a LAN, this CP session activation will result in the target AS/400 controller and device descriptions being autocreated.

The following figure shows the autocreated AS/400 LAN configuration.

```
                     Work with Configuration Status                RALYAS4A
                                                           12/15/94  12:45:48
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--------------
__   L41TR             ACTIVE
__     RALSOCGW        ACTIVE
__       RALSOCGW      ACTIVE


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

Figure 189. Verifying an SNA Configuration between Systems RALSOCGW and RALYAS4A

This SNA configuration can be further verified by issuing the STRMOD command as shown in the following:

```
STRMOD RMTLOCNAME(RALSOCGW) MODE(SNACKETS)
Command STRMOD completed successfully for mode SNACKETS device RALSOCGW.
The STRMOD command completed successfully for all modes.
```

Once we are satisfied that the SNA configuration is working fine, we can move on to verify the TCP/IP configuration involved.

Verify the TCP/IP configuration between the native TCP/IP system and the gateway.

The TCP/IP configuration between the native TCP/IP system and the gateway can be verified by use of the PING TCP/IP application.

```
OS2 C:\>ping 9.24.104.178
PING 9.24.104.178: 56 data bytes
64 bytes from 9.24.104.178: icmp_seq=0. time=46. ms
64 bytes from 9.24.104.178: icmp_seq=1. time=0. ms
64 bytes from 9.24.104.178: icmp_seq=2. time=0. ms
64 bytes from 9.24.104.178: icmp_seq=3. time=0. ms
64 bytes from 9.24.104.178: icmp_seq=4. time=0. ms

----9.24.104.178 PING Statistics----
5 packets transmitted, 5 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 0/9/46
```

Figure 190. OS/2 PING Command Output

Verify the Sockets over SNA configuration between the AnyNet/400 System and gateway.

Before we try to establish a Sockets over SNA connection through the gateway, it is wise to try to establish a connection to the gateway.

Before we can use an AS/400 TCP/IP application with Sockets over SNA, we must start the server for that application on the AS/400. To start the FTP application server (the application we use in this verification), enter the command:

```
STRTCPSVR SERVER(*FTP)
```

Alternatively we can start TCP/IP on the AS/400. To do this, enter the command STRTCP. In the examples that follow we have used the STRTCP command. By default, STRTCP will start the FTP server.

Besides being able to display native TCP/IP network status, NETSTAT can also be used to display Sockets over SNA interfaces, routes and connection status. Figure 191 shows the status of the Sockets over SNA interface (9.67.60.20). From this NETSTAT option 1 (Work with TCP/IP Interface Status) display we can verify that the local IP over SNA interface is active and hence available for use. If not available (Inactive), we can use option 9 to make it available. No native TCP/IP interface is configured on this system.

```
                        Work with TCP/IP Interface Status
                                                             System:   RALYAS4A
 Type options, press Enter.
   5=Display details   8=Display associated routes   9=Start   10=End
   12=Work with configuration status

      Internet         Network           Line       Interface
 Opt  Address          Address          Description  Status
      9.67.60.20       9.67.60.0        *IPS         Active
      127.0.0.1        127.0.0.0        *LOOPBACK    Active










                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F11=Display line information   F12=Cancel
 F13=Sort by column    F24=More keys
```

Figure 191. NETSTAT Work with TCP/IP Interface Status

NETSTAT option 2 (Display TCP/IP route information) gives route information for all routes (native TCP/IP and Sockets over SNA). The panel also shows whether or not the route is available.

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

      Route             Subnet           Next              Route
 Opt  Destination       Mask             Hop              Available
  _   9.67.60.0         255.255.255.0    *DIRECT            *YES
  _   9.24.104.0        255.255.255.0    9.67.60.25         *YES
  _   127.0.0.0         255.0.0.0        *DIRECT            *YES



                                                                        Bottom
 F3=Exit   F5=Refresh   F6=Print list   F11=Display route type   F12=Cancel
 F13=Sort by column     F17=Top         F18=Bottom
```

Figure 192. NETSTAT Display TCP/IP Route Information

The NETSTAT option 2 example in Figure 192 is from a system with only a Sockets over SNA configuration. The first entry was automatically added when the Sockets over SNA Interface was added (a Sockets over SNA interface with an internet address of 9.67.60.20 and a subnet mask of 255.255.255.0). This entry will give access to systems on the same network as the local system. The second entry is the result of adding a Sockets over SNA route with a route destination of 9.24.104.0, subnet mask of 255.255.255.0 and next hop of 9.67.60.25. The third entry is the loopback entry. We can use this display to verify that a route is available to the remote system with which we want to communicate using Sockets over SNA. Note that the next hop for 9.67.60.0 is direct, go use the local interface, in this case IP over SNA. Whereas the next hop for 9.24.104.0 is the address of the AnyNet Sockets over SNA gateway.

Having verified that the local IP over SNA interface is active and that a route is available, we can now try to establish a Sockets over SNA session to the gateway system. Under native TCP/IP we would normally use the PING application to initially test a configuration. However, under OS/400 Sockets over SNA, PING Server only is supported. This, therefore, does not make a good test tool to use in this environment. Since the FTP (File Transfer Protocol) application is universally supported by TCP/IP systems, we have used this application here to verify the Sockets over SNA configurations.

PING client

An OS/400 V3R1 PTF is now available that makes it possible to use the OS/400 PING client with AnyNet. The PTF number is SF25273.

We must first make sure that Sockets over SNA and any application we want to use are started on the remote system. In the example that follows we FTP to an OS/2 system. We therefore need to start AnyNet/2 Sockets over SNA and the FTP application server on the OS/2 system. To start AnyNet/2 Sockets over SNA we use the SXSTART command. See “AnyNet/2 Sockets over SNA Gateway Verification” on page 159.

In Figure 193 we have used the following command to access the OS/2 system RALSOCGW via Sockets over SNA:

ftp '9.67.60.25'

```
                              File Transfer Protocol

 Previous FTP subcommands and messages:
   Connecting to remote host name 9.67.60.25 using port 21.
   220 as4ps2 IBM TCP/IP for OS/2 - FTP Server ver 12:58:07 on Mar 16 19
    ready.
   215 OS/2 operating system
 > anyuser
   331 Password required for anyuser.
   230 User anyuser logged in.







 Enter an FTP subcommand.
 ===>




 F3=Exit     F6=Print       F9=Retrieve
 F17=Top    F18=Bottom    F21=CL command line
```

Figure 193. FTP via Sockets over SNA to an OS/2 System

Note

We could, of course, have added 9.67.60.25 to the local TCP/IP host table (or to the name server being used) which would have allowed us to use a host name rather than the internet address with the FTP command.

Having established a Sockets over SNA connection, if we now look at the AS/400 configurations status via the WRKCFGSTS command.

```
                         Work with Configuration Status              RALYAS4A
                                                             11/30/94  10:55:11
 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--------------
 __   L41TR            ACTIVE
 __     RALSOCGW       ACTIVE
 __       RALSOCGW     ACTIVE
 __         SNACKETS   ACTIVE/SOURCE        DSP01       ANYUSER     010193
 __         SNACKETS   ACTIVE/TARGET        DSP01       ANYUSER     010193


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

Figure 194. WRKCFGSTS of Active Sockets over SNA Session

Note that unlike Sockets over SNA to another access node, in this case two SNA sessions are established (one source and one target). The reason for this is the fact that an AnyNet gateway uses twin-opposed half-duplex SNA sessions for Sockets over SNA.

NETSTAT option 3 can be used to display the session from a TCP/IP perspective as shown in Figure 195.

```
                        Work with TCP/IP Connection Status
                                                            System:   RALYAS4A
 Local internet address  . . . . . . . . . . . :   *ALL

 Type options, press Enter.
   4=End   5=Display details

      Remote           Remote     Local
 Opt  Address          Port       Port       Idle Time  State
      *                *          ftp-con >  000:11:17  Listen
      *                *          telnet     000:27:03  Listen
      *                *          lpd        000:26:53  Listen
      9.67.60.25       ftp-con >  1032       000:02:39  Established



 F5=Refresh   F11=Display byte counts   F13=Sort by column
 F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 195. NETSTAT Work with TCP/IP Connection Status

Verify the end-to-end Sockets over SNA configuration from either end.

Having verified the configuration to the gateway from either end, we can now try to establish a connection through the gateway. Again, we have used FTP to verify the configuration. Having verified that FTP is running at the remote system (RALYPS2B), we FTP from RALYAS4A to RALYPS2B.

ftp '9.24.104.189'

```
                               File Transfer Protocol

 Previous FTP subcommands and messages:
   Connecting to remote host name 9.24.104.189 using port 21.
   220 as4ps2 IBM TCP/IP for OS/2 - FTP Server ver 12:48:07 on Dec 15 1994
    ready.
   215 OS/2 operating system
 > anyuser
   331 Password required for anyuser.
   230 User anyuser logged in.




 Enter an FTP subcommand.
 ===>______________________________________________________________________



 F3=Exit     F6=Print       F9=Retrieve
 F17=Top    F18=Bottom    F21=CL command line
```

Figure 196. FTP Command to RALYPS2B from RALYAS4A

NETSTAT option 1 (Work with TCP/IP interface status) and option 2 (Display TCP/IP route information) panels remain unchanged from those shown in Figure 191 on page 153 and Figure 192 on page 154. NETSTAT option 3 (Work with TCP/IP connection status) now shows the connection to RALYPS2B.

```
                      Work with TCP/IP Connection Status
                                                          System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  000:11:17  Listen
     *                *          telnet     000:27:03  Listen
     *                *          lpd        000:26:53  Listen
     9.24.104.189     ftp-con >  1054       000:01:42  Established






F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 197. NETSTAT Work with TCP/IP Connection Status

With the FTP connection established, WRKCFGSTS will be as shown in Figure 194 on page 156. If we now initiate a file transfer to RALYPS2B, a second pair of SNA sessions will be established as can be seen in Figure 198.

```
                         Work with Configuration Status                RALYAS4A
                                                             11/30/94  11:04:13
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--------------
__   L41TR            ACTIVE
__     RALSOCGW       ACTIVE
__       RALSOCGW     ACTIVE
__         SNACKETS   ACTIVE/SOURCE       DSP01       ANYUSER     010193
__         SNACKETS   ACTIVE/TARGET       DSP01       ANYUSER     010193
__         SNACKETS   ACTIVE/TARGET       DSP01       ANYUSER     010193
__         SNACKETS   ACTIVE/SOURCE       DSP01       ANYUSER     010193



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

Figure 198. WRKCFGSTS of Active Sockets over SNA Session

Configuration advice

In Figure 198 we can see that four SNA sessions have been established. Two of these are for the FTP control session and two for the data connection. Two sessions are established for each because an AnyNet Sockets over SNA gateway uses twin-opposed half-duplex conversations. You should be aware of this point when deciding the session limits associated with modes that will be used for Sockets over SNA.

AnyNet/2 Sockets over SNA Gateway Verification

To check whether Communication Manager/2 is running, we can use the CMQUERY command.

```
OS2 C:\>cmquery

               Communications Manager Query Services

    Workstation Type      : Single User
    Default configuration : RALSOCGW
    Active configuration  : RALSOCGW

     Service                         Status
    ==============================================================
      CM Kernel                     ACTIVE
      SNA Services                  ACTIVE
      SRPI                           *** Stopped ***
      X.25                           *** Stopped ***
      SNA Phone Connect              *** Stopped ***
      ACDI                           *** Stopped ***
      3270 Emulator                  *** Stopped ***
      5250 Emulator                  *** Stopped ***
    ==============================================================
    Friday, 03/24/95 10:10:12   End of Program - CMQuery
```

Figure 199. Communications Manager/2 CMQUERY command

To start AnyNet/2 Sockets over SNA Gateway, we should do the following:

1. Start Communication Manager/2.
2. Start AnyNet/2 Sockets over SNA Gateway.

AnyNet/2 Sockets over SNA can be started by either opening the **Start AnyNet/2 Sockets Gateway** icon or by entering the SXSTART command.

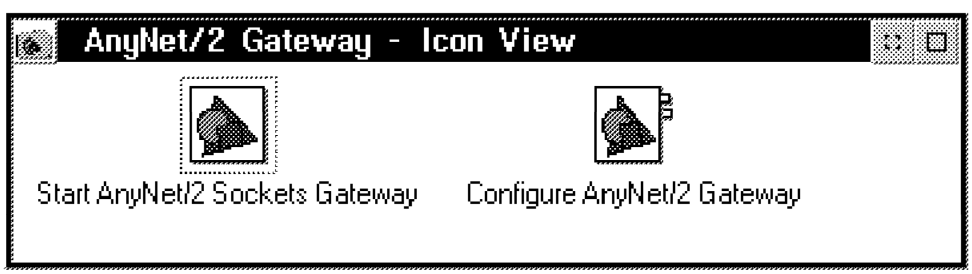

Figure 200. AnyNet/2 Sockets over SNA Gateway Folder

If you plan to use an OS/2 TCP/IP application (for example, FTP), then it is also necessary to start that application on the OS/2 system.

When AnyNet/2 Sockets over SNA Gateway is started, the sxstart command file will run. The following is an example of the output of the sxstart.cmd file:

```
OS2 C:\>sxstart

OS2 C:\>start snackets logfile 100000 sessions 30

OS2 C:\>sxmap -w add 9.67.60.25 255.255.255.255 USIBMRA RALSOCGW

OS2 C:\>sxmap add 9.67.60.20 255.255.255.255 USIBMRA RALYAS4A

OS2 C:\>ifconfig sna0 9.67.60.25

OS2 C:\>route add 9.67.60.25 9.67.60.25 0
add host 9.67.60.25: router 9.67.60.25

OS2 C:\>route add 9.67.60.20 9.67.60.25 0
add host 9.67.60.20: router 9.67.60.25
```

Figure 201. AnyNet/2 sxstart Command Output

Once initialized, AnyNet/2 Sockets over SNA Gateway will run in an OS/2 window session named snackets.exe:

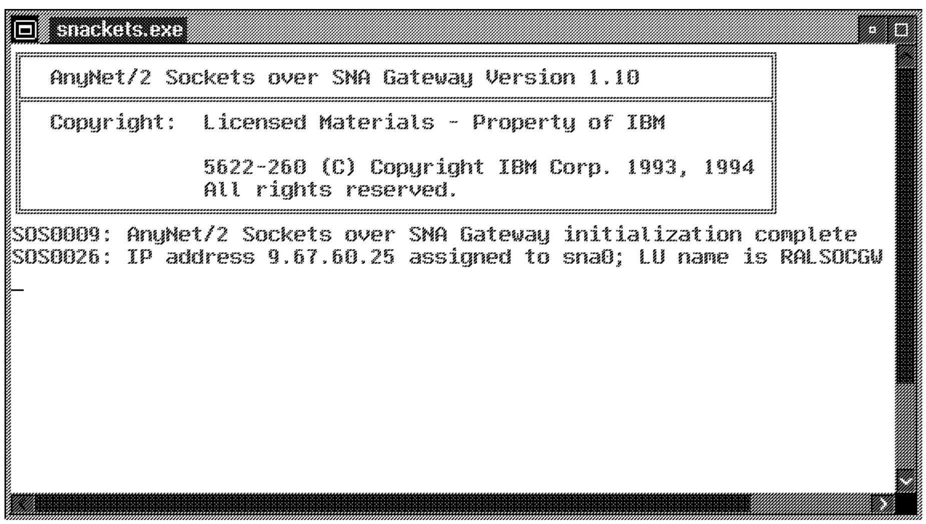

Figure 202. AnyNet/2 Sockets over SNA Gateway Initialization on RALSOCGW

AnyNet/2 Sockets over SNA Gateway can be stopped by pressing Ctrl-C in the OS/2 window session where the snackets.exe program is running - the window shown in Figure 202.

By default, AnyNet/2 Sockets over SNA Gateway will display error messages in the snackets.exe window.

In Figure 183 on page 146 we added a route to RALYPS2B, the OS/2 command NETSTAT -r can be used to verify that the route was added correctly as shown in the following figure.

```
OS2 C:\>netstat -r

    destination         router    refcnt        use flags     snmp  intrf
                                                             metric
        default     9.24.104.1       0          12     U        -1   lan0
     9.24.104.0   9.24.104.189       4         152     U        -1   lan0
      9.67.60.0   9.24.104.178       0          19     U        -1   lan0
```

Figure 203. OS/2 TCP/IP NETSTAT -r Command Output

At the gateway system (RALSOCGW) NETSTAT -r will show the native TCP/IP and Sockets over SNA route entries added at that system as shown next.

```
OS2 C:\>netstat -r

    destination         router    refcnt        use flags     snmp  intrf
                                                             metric
     9.67.60.25     9.67.60.25       0           0     U        -1   sna0
     9.67.60.20     9.67.60.25       0           0     U        -1   sna0
        default     9.24.104.1       0           0     U        -1   lan0
     9.24.104.0   9.24.104.178       0           0     U        -1   lan0
        9.0.0.0     9.67.60.25       0           0     U        -1   sna0
      127.0.0.0      127.0.0.2       0           0     U        -1   gw0
```

Figure 204. OS/2 TCP/IP NETSTAT -r Command Output

In the following example we FTP from RALYPS2B to RALYAS4A.

```
OS2 C:->ftp 9.67.60.20
IBM TCP/IP for OS/2 - FTP Client ver 09:44:28 on Mar 04 1994
Connected to 9.67.60.20.
220-QTCP at 9.67.60.20.
220 Connection will close if idle more than 5 minutes.
Name (9.67.60.20): anyuser
331 Enter password.
Password: .......
230 ANYUSER logged on.
ftp>
```

Figure 205. OS/2 TCP/IP FTP Command

The active Communications Manager/2 LU 6.2 sessions on RALSOCGW can be displayed as follows:

1. Open the **Communication Manager/2** icon.
2. Select **Subsystem Management**.
3. Select **SNA Subsystem**.
4. Select **Display active configuration**.
5. Select **LU 6.2 sessions**.

```
**************************************
*       Session Information          *
**************************************
Number of sessions                            4

      ------------deleted---------------------------------------


3>Session ID                                  X'52E717A5D7E96E3C'
  Conversation ID                             X'A51F159C'
  LU alias                                    ralsocgw
  Partner LU alias                            @I000000
  Mode name                                   SNACKETS
  Send maximum RU size                        1920
  Receive maximum RU size                     1920
  Send pacing window                          1
  Receive pacing window                       7
  Link name                                   LINK0001
  Outbound destination address (DAF)          X'02'
  Outbound origin address (OAF)               X'02'
  OAF-DAF assignor indicator (ODAI)           B'0'
  Session type                                LU-LU session
  Connection type                             Peer
  Procedure correlator ID (PCID)              X'F0D312A294ED9659'
  PCID generator CP name                      USIBMRA.RALSOCGW
  Conversation group ID                       X'DBE96E3C'
  LU name                                     USIBMRA.RALSOCGW
  Partner LU name                             USIBMRA.RALYAS4A
  Pacing type                                 Adaptive
  Primary LU indicator                        Local LU
  FMD PIUs sent by primary LU                 8
  FMD PIUs sent by secondary LU               2
  Non-FMD PIUs sent by primary LU             1
  Non-FMD PIUs sent by secondary LU           1
  Bytes sent by primary LU                    516
  Bytes sent by secondary LU                  134
  PLU to SLU compression level                None
  PLU to SLU compression percent              0
  SLU to PLU compression level                None
  SLU to PLU compression percent              0

4>Session ID                                  X'0A242FA5EBE96E3C'
  Conversation ID                             X'A517DE7E'
  LU alias                                    ralsocgw
  Partner LU alias                            @I000000
  Mode name                                   SNACKETS
  Send maximum RU size                        1920
```

```
  Receive maximum RU size                   1920
  Send pacing window                        1
  Receive pacing window                     7
  Link name                                 LINK0001
  Outbound destination address (DAF)        X'02'
  Outbound origin address (OAF)             X'02'
  OAF-DAF assignor indicator (ODAI)         B'1'
  Session type                              LU-LU session
  Connection type                           Peer
  Procedure correlator ID (PCID)            X'F64B0D2BCC94B2A6'
  PCID generator CP name                    USIBMRA.RALYAS4A
  Conversation group ID                     X'EEE96E3C'
  LU name                                   USIBMRA.RALSOCGW
  Partner LU name                           USIBMRA.RALYAS4A
  Pacing type                               Adaptive
  Primary LU indicator                      Partner LU
  FMD PIUs sent by primary LU               5
  FMD PIUs sent by secondary LU             2
  Non-FMD PIUs sent by primary LU           1
  Non-FMD PIUs sent by secondary LU         1
  Bytes sent by primary LU                  440
  Bytes sent by secondary LU                161
  PLU to SLU compression level              None
  PLU to SLU compression percent            0
  SLU to PLU compression level              None
  SLU to PLU compression percent            0
```

Note that two sessions are being used unlike the non-gateway AnyNet/2 Sockets over SNA example where a single session was used. The reason for this is the fact that an AnyNet gateway uses twin-opposed half-duplex SNA sessions for Sockets over SNA.

The active Communications Manager/2 Transaction Programs on RALSOCGW can be displayed as follows:

1. Open the **Communication Manager/2** icon.
2. Select **Subsystem Management**.
3. Select **SNA Subsystem**.
4. Select **Display active configuration**.
5. Select **Transaction programs**.

```
**************************************
*    Active Transaction Programs     *
**************************************
Active transaction programs                 2

1>Transaction program name                  X'28F0F0F1'
  Transaction program ID                    X'04002FA5E5E96E3C'
  User ID
  Transaction program initiated             Locally
  LU alias                                  ralsocgw
  Logical unit of work name                 USIBMRA.RALSOCGW
  Logical unit of work instance             X'DDDDDDDDDE09'
  Logical unit of work sequence             X'0001'
  Number of conversations                   1
```

```
1.1>Conversation ID                           X'A51F159C'
    Conversation state                        Send
    Session ID                                X'52E717A5D7E96E3C'
    Synchronization level                     None
    Conversation type                         Basic
    Conversation group ID                     X'3C6EE9DB'
    Conversation source                       Partner LU
    Conversation style                        Two-way alternate
    Bytes sent by source                      139
    Bytes sent by target                      0

2>Transaction program name                    X'28F0F0F1'
  Transaction program ID                      X'060C2FA5F0E96E3C'
  User ID
  Transaction program initiated               Remotely
  LU alias                                    ralsocgw
  Logical unit of work name                   USIBMRA.RALYAS4A
  Logical unit of work instance               X'DDDDDDDDDE0C'
  Logical unit of work sequence               X'0001'
  Number of conversations                     1

2.1>Conversation ID                           X'A517DE7E'
    Conversation state                        Receive
    Session ID                                X'0A242FA5EBE96E3C'
    Synchronization level                     None
    Conversation type                         Basic
    Conversation group ID                     X'3C6EE9EE'
    Conversation source                       Local LU
    Conversation style                        Two-way alternate
    Bytes sent by source                      207
    Bytes sent by target                      0
```

X'28F0F0F1' is the transaction program name for Sockets over SNA.

With the FTP session established from RALYPS2B to RALYAS4A, NETSTAT -s on RALYPS2B shows the following:

```
OS2 C:\>netstat -s
SOCK      TYPE        FOREIGN          LOCAL         FOREIGN      STATE
                         PORT           PORT            HOST
==== ==========     ==========     ==========     ========== ==========
24      STREAM        ftp..21           1029      9.67.60.20   ESTABLISHED
6       STREAM              0        ftp..21         0.0.0.0   LISTEN
```

Figure 206. OS/2 TCP/IP NETSTAT -s Command Output - RALYPS2B

With the FTP session still established, NETSTAT -s on RALSOCGW shows the following:

```
OS2 C:\>netstat -s
SOCK      TYPE         FOREIGN          LOCAL         FOREIGN      STATE
                          PORT           PORT            HOST
==== ==========      ==========      ==========      ========== ==========
18      STREAM            1234           1025      127.2.0.21   ESTABLISHED
5       STREAM               0        ftp..21         0.0.0.0   LISTEN
```

Figure 207. OS/2 TCP/IP NETSTAT -s Command Output - RALSOCGW

The GWSTAT utility can be used at RALSOCGW to display information about Sockets over SNA Gateway activity.

```
OS2 C:\>gwstat
Current # of gateway entries:  1
Maximum # of gateway entries:  2
Total # of gateway entries:    3

Current # of gateway threads:  1
Maximum # of gateway threads:  2
Total # of gateway threads:    3

Maximum gateway chain length:  2

UDP bytes sent native to MPTN: 0
UDP bytes sent MPTN to native: 0
TCP bytes sent native to MPTN: 312
TCP bytes sent MPTN to native: 364

Gateway entry limit:           3
Connections refused:           0
Datagrams dropped:             0
```

Figure 208. AnyNet/2 GWSTAT Command Output - RALSOCGW (1 of 2)

The GWSTAT -c command can be used to display gateway connections as shown in the following figure.

```
OS2 C:\>gwstat -c

  ID    Proto       Native endpoint         MPTN endpoint  Flags
-----------------------------------------------------------------
020015   TCP     9.24.104.189/ 1028       9.67.60.20/   21   008c
```

Figure 209. AnyNet/2 GWSTAT Command Output - RALSOCGW 2 of 2

APPC over TCP/IP Gateway Scenario

This section presents the process of defining and verifying AnyNet/400 APPC over TCP/IP, via an AnyNet SNA over TCP/IP gateway, at the International Technical Support Organization in Raleigh.

> **Note**
>
> The AS/400 applications supported under AnyNet/400 in this environment are the same as when using AnyNet/400 APPC over TCP/IP in a non-gateway environment (as shown in “Using AnyNet/400 APPC over TCP/IP” on page 90).

Shown in the following figure are the systems used and their respective IP addresses for this scenario. An SNA/APPC configuration is already in place between RALYAS4B and RAK using the network ID and CP names shown. A TCP/IP configuration is already in place between RALYAS4A and RAI using the internet addresses shown.

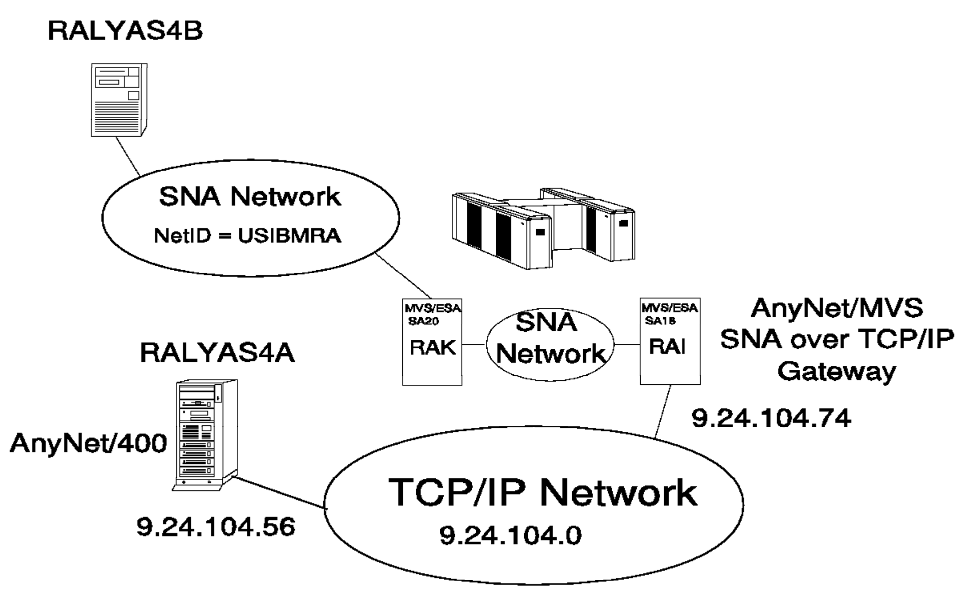

Figure 210. Systems Used for APPC over TCP/IP Gateway Scenario

> **Note**
>
> An APPN configuration exists between RAI and RAK. Originally there was also an APPN configuration between RALYAS4B and RAK. However, this scenario would not work with this APPN configuration in place. It appears that AS/400 V3R1 APPN will not work from a host LEN connection (AnyNet/MVS, looks, to VTAM like a LEN connection) to a host APPN connection. This problem has been reported and APAR MA10052 has been opened. The circumvention we used was to define the RALYAS4B - RAK connection as LEN in the host controller description on RALYAS4B.

The following series of panels show the AS/400 configuration screens taken from the RALYAS4A and RALYAS4B systems. Also shown is a subset of the AnyNet/MVS configuration information from RAI. They illustrate the configuration steps required for this APPC over TCP/IP Gateway scenario.

Please note that only the key AnyNet/MVS configuration displays are shown in this section. For further AnyNet/MVS configuration help, refer to *AnyNet: SNA over TCP/IP, Installation and Interoperability* GG24-4395.

Host Software Installed

The following software was installed on RAI:

- IBM MVS/ESA System Product (SP) Version 3 Release 1.3
- IBM MVS/ESA System Modification Program/Extended (SMPE) Release 5
- IBM TCP/IP Version 2 Release 2.1 for MVS
- IBM C for System/370 Version 2 at PUT level 9107
- VTAM Version 4 Release 2 base
- VTAM Version 4 Release 2 AnyNet host feature

RALYAS4A Configuration

First we must check that Allow ANYNET Support is set to *YES in the network attributes of RALYAS4A. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Before we can configure the APPC controller description and add the APPN remote location list entry, we need to display the network attributes on RALYAS4A and RALYAS4B, and the VTAM startup options from RAI to determine the network IDs and location (LU) names to be used.

```
                          Display Network Attributes
                                                          System:   RALYAS4A
 Current system name . . . . . . . . . . . . . . :   RALYAS4A
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4A
 Default local location . . . . . . . . . . . . . :   RALYAS4A
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression  . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions  . . . . :   200
 Route addition resistance  . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY


                                                                  More...
```

Figure 211. APPC over TCP/IP Gateway Scenario: AS/400 Network Attributes - RALYAS4A

```
                          Display Network Attributes
                                                          System:   RALYAS4B
 Current system name . . . . . . . . . . . . . . :   RALYAS4B
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4B
 Default local location . . . . . . . . . . . . . :   RALYAS4B
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression  . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions  . . . . :   200
 Route addition resistance  . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY


                                                                  More...
```

Figure 212. APPC over TCP/IP Gateway Scenario: AS/400 Network Attributes - RALYAS4B

The VTAM startup options from RAI are not shown here. The relevant items from the startup options are: NETID=USIBMRA and SSCPNAME=RAI.

Next, we create a controller description on RALYAS4A with LINKTYPE *ANYNW.

```
                         Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > ANYNWMVSI     Name
 Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > RAIANYNT      Name, *ANY
 User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
 Text 'description' . . . . . . . > 'To AnyNet Gateway'




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

Figure 213. APPC over TCP/IP Gateway Scenario: AS/400 APPC Controller Description

In the following panel we add the APPC over TCP/IP entries to the APPN remote location list at RALYAS4A.

```
                             Change Configuration List                  RALYAS4A
                                                              03/07/95  14:06:54
 Configuration list  . . :   QAPPNRMT
 Configuration list type :   *APPNRMT
 Text  . . . . . . . . . :

 Type changes, press Enter.

 --------------------------APPN Remote Locations---------------------------
           Remote              Remote    Control
 Remote    Network   Local     Control   Point     Location          Secure
 Location  ID        Location  Point     Net ID    Password           Loc
 RAI_____  *NETATR   *NETATR   RAIANYNT  *NETATR   _______________    *NO
 RALYAS4B  *NETATR   *NETATR   RAIANYNT  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
                                                                        More...
 F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 214. APPC over TCP/IP Gateway Scenario: AS/400 APPN Remote Locations - RALYAS4A

While the first entry is not required for the correct operation of this scenario, it will allow us to test to the gateway prior to trying to establish a connection through the gateway.

The host table at RALYAS4A, shown following, has had the APPC over TCP/IP entries added.

```
                     Work with TCP/IP Host Table Entries
                                                               System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Rename

      Internet         Host
 Opt  Address          Name

  _   _______________
  _   9.24.104.56      RALYAS4A
                       RALYAS4A.ITSO.RAL.IBM.COM
  _   9.24.104.74      RAI
                       RAI.ITSO.RAL.IBM.COM
                       RAI.USIBMRA.SNA.IBM.COM
                       RALYAS4B.USIBMRA.SNA.IBM.COM




 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 215. APPC over TCP/IP Gateway Scenario: AS/400 TCP/IP Host Table

Note

The AS/400 TCP/IP Host Table will allow a maximum of four host names to be entered against a single host internet address. This may become a restriction when using AnyNet/400 APPC over TCP/IP with an AnyNet SNA over TCP/IP gateway. Although, in fact, only the last host table entry shown is actually required for the correct operation of this scenario. One possible alternative is to use a name server rather than the AS/400 host table when the requirement is to communicate with more than four hosts via an AnyNet SNA over TCP/IP gateway.

RALYAS4B Configuration

Only a subset of the configuration for RALYAS4B is shown.

```
                      Create Ctl Desc (SNA Host) (CRTCTLHOST)

 Type choices, press Enter.

 Controller description . . . . . > RAOP08       Name
 Link type  . . . . . . . . . . . > *SDLC        *IDLC, *FR, *LAN, *SDLC, *X25
 Online at IPL  . . . . . . . . .   *YES         *YES, *NO
 Switched connection  . . . . . .   *NO          *NO, *YES
 Switched network backup  . . . .   *NO          *NO, *YES
 APPN-capable . . . . . . . . . .   *YES         *YES, *NO
 Attached nonswitched line  . . . > RAOL0022     Name
 Maximum frame size . . . . . . .   *LINKTYPE    265-16393, 256, 265, 512...
 Remote network identifier  . . .   *NETATR      Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > RAK          Name, *ANY
 SSCP identifier  . . . . . . . .                050000000000-05FFFFFFFFFF
 Local exchange identifier  . . .   *LIND        05600000-056FFFFF, *LIND
 Station address  . . . . . . . . > 01           01-FE
 APPN CP session support  . . . . > *NO          *YES, *NO
 APPN node type . . . . . . . . . > *LENNODE     *ENDNODE, *LENNODE...
 APPN transmission group number     1            1-20, *CALC
                                                                      More...
:F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
:F24=More keys
```

Figure 216. APPC over TCP/IP Gateway Scenario: AS/400 Host Controller Description - RALYAS4B

```
                          Change Configuration List                  RALYAS4B
                                                            03/07/95  15:03:04
 Configuration list  . . :   QAPPNRMT
 Configuration list type :   *APPNRMT
 Text  . . . . . . . . . :

 Type changes, press Enter.

 --------------------------APPN Remote Locations---------------------------
           Remote              Remote    Control
 Remote    Network   Local     Control   Point     Location          Secure
 Location  ID        Location  Point     Net ID    Password           Loc
 RALYAS4A  *NETATR   *NETATR   RAK_____  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
                                                                      More...
 F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 217. APPC over TCP/IP Gateway Scenario: AS/400 APPN Remote Locations - RALYAS4B

AnyNet/MVS Configuration

The AnyNet/MVS configuration for this scenario is identical to that for APPC over TCP/IP scenario 5. There are no special configuration requirements for AnyNet/MVS SNA over TCP/IP to act as a gateway.

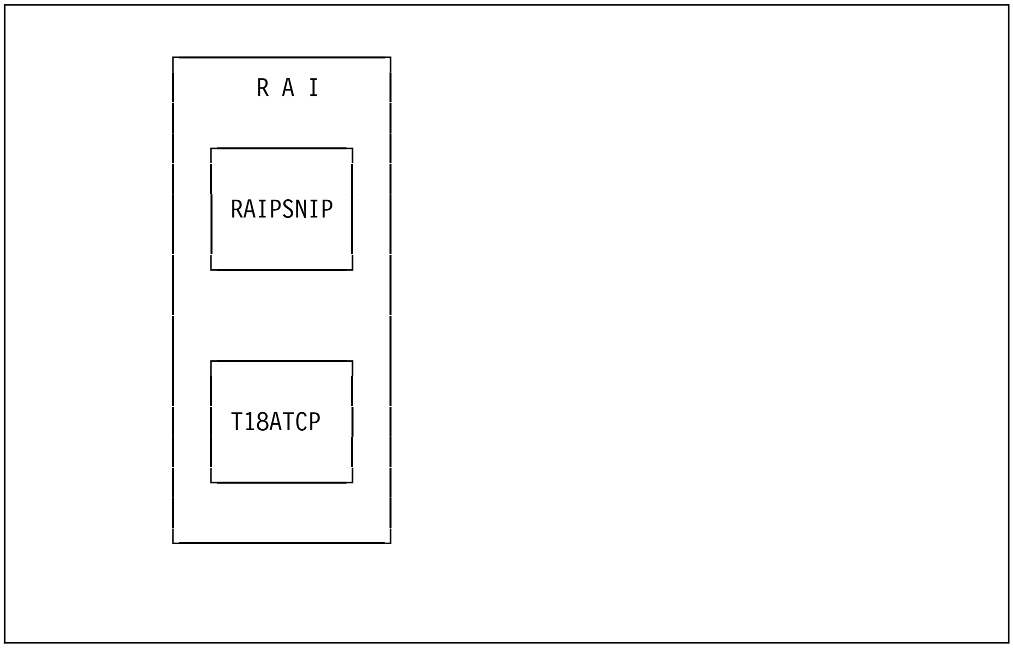

Figure 218. APPC over TCP/IP Gateway Scenario: AnyNet/MVS Gateway Configuration

The IP network is represented to VTAM as a TCP/IP major node using a VBUILD TYPE=TCP as shown in Figure 219.

```
EDIT       RISC.VTAMLST(RAIBSNIP) - 01.03                  Columns 00001 00072
****** ***************************** Top of Data ******************************
==MSG> -Warning- The UNDO command is not available until you change
==MSG>           your edit profile using the command RECOVERY ON.
000001 *********************************************************************
000002 *                                                                   *
000003 *           VTAM 42   ANYNET   -      SNA OVER TCP/IP               *
000004 *                                                                   *
000005 *                      SA 18  DEFINITIONS                           *
000006 *                                                                   *
000007 *********************************************************************
000008 RAIBSNIP VBUILD  TYPE=TCP,                                            X
000009                CONTIMER=30,            WAIT FOR MPTN TO COME UP       X
000010                DGTIMER=30,             INTERVAL BETWEEN RETRIES       X
000011                DNSUFX=IBM.COM,         DOMAIN NAME SUFFIX             X
000012                EXTIMER=3,              BETW. SEND SNA EXPEDITED DATA  X
000013                IATIMER=120,            TIME BEFORE MPTN KEEPALIVE     X
000014                PORT=397,               WELLKNOWN PORT FOR ANYNET      X
000015                TCB=10,                 NUMBER MVS SUBTASKS            X
000016                TCPIPJOB=T18ATCP        TCP/IP JOBNAME
000017 RAIGSNIP GROUP ISTATUS=ACTIVE          GROUPNAME
000018 RAILSNIP LINE  ISTATUS=ACTIVE          LINENAME
000019 RAIPSNIP PU    ISTATUS=ACTIVE          PUNAME
****** **************************** Bottom of Data ****************************
```

Figure 219. APPC over TCP/IP Gateway Scenario: IP Network Representation to VTAM

When using APPC over TCP/IP, VTAM sees any remote LUs as independent LUs, which are defined as CDRSCs.

```
EDIT       RISC.VTAMLST(RAIRSNIP) - 01.07                 Columns 00001 00072
****** ***************************** Top of Data ******************************
==MSG> -Warning- The UNDO command is not available until you change
==MSG>           your edit profile using the command RECOVERY ON.
000001 *********************************************************************
000002 *                           UPDATE LOG                               *
000003 *                                                                    *
000004 * 03/07/95 MCLI MODIFY COMMENTS                                      *
000003 *                                                                    *
000003 *                                                                    *
000008 * ------------------------------------------------------------------ *
000009 *        VTAM  42  ANYNET SNA OVER TCP/IP                            *
000010 *                                                                    *
000011 *                      SA 18  DEFINITIONS                            *
000012 *                                                                    *
000013 * NAME   CDRSC ALSLIST=.....NAME OF THE PU STATEMENT DEFINED         *
000014 *                           WITHIN THE VBUILD TYPE=TCP               *
000015 *                                                                    *
000016 *     - THE NAME LABEL OF THE CDRSC DEFINITION STATEMENT MUST BE     *
000017 *       THE REMOTE ILU NAME.                                         *
000018 *                                                                    *
000019 *     - WE MUST CODE ALSREQ=YES TO USE THE PREDEFINED LIST.          *
000020 *                                                                    *
000021 *     - WE USE SOME CDRSC WITH THE NETID NOT CODED IN ORDER TO       *
000022 *       THE CDRMNAME AS AN ADJSSCP.                                  *
000023 *                                                                    *
000024 ************************************************************************
000025          VBUILD  TYPE=CDRSC
000026 *
000027          NETWORK NETID=USIBMRA
000028 *
000034 RALYAS4A CDRSC ALSLIST=RAIPSNIP,ALSREQ=YES     AS400
****** **************************** Bottom of Data ****************************
```

Figure 220. APPC over TCP/IP Gateway Scenario: LU Representation to VTAM

The TCP/IP Host Table used by AnyNet/MVS SNA over TCP/IP is the normal host table.

```
EDIT       TCPIP.ITSC.HOSTS.LOCAL                          Columns 00001 00072
****** ***************************** Top of Data ******************************
==MSG> -Warning- The UNDO command is not available until you change
==MSG>           your edit profile using the command RECOVERY ON.
000001 ; ----------------------------------------------------------------------
000002 ;                          Update log
000003 ; 01/31/95 mcli  Change 9.67.38.3 to 9.67.38.20
000004 ;
000005 ; ----------------------------------------------------------------------
000006 ;                          WATSON IP ADDRESSES
000007 ; NOTES:
000008 ;  1. To request additions, changes, or deletions from this file please
000009 ;     use the WATIP REQUEST online form which can be found on the
000010 ;     CMSSYS 19f disk (also known as the U disk). Follow further
000011 ;     instructions within WATIP REQUEST.
000012 ;  2. This file should NOT contain any blank lines.
000013 ; ----------------------------------------------------------------------
000014 ;
000015 ;  Ring 9.2.1.0 - Netmask 255.255.255.128 - Hawthorne I 16Mb
000016 ;  Begin 9.2.1.0
000017 HOST : 14.0.0.0  : YKTVMV , CIAMPA, GARY , GTC, ME , TEST ::::
000018 HOST:9.67.38.36:WTR05221.USIBMRA.IBM.COM,ISNIPJL1.USIBMRA.IBM.COM ::::
000019 HOST:9.67.38.36:ISNIPJL2.USIBMRA.IBM.COM,ISNIPJL3.USIBMRA.IBM.COM ::::
000020 HOST:9.67.38.36:ISNIPJL4.USIBMRA.IBM.COM ::::
000021 HOST:9.67.38.37:WTR05115.USIBMRA.IBM.COM,ISNIPML1.USIBMRA.IBM.COM ::::
000022 HOST:9.67.38.37:ISNIPML2.USIBMRA.IBM.COM,ISNIPML3.USIBMRA.IBM.COM ::::
000023 HOST:9.67.38.37:ISNIPML4.USIBMRA.IBM.COM ::::
000024 HOST : 9.67.38.35 : WTR05222.USIBMSC.IBM.COM ::::
000025 HOST : 9.67.38.20 : RAIAC.USIBMRA.IBM.COM ::::
000026 HOST : 9.67.38.11 : RABAT.USIBMRA.IBM.COM ::::
000027 HOST : 9.67.38.20 : RAPAC.USIBMRA.IBM.COM ::::
000028 HOST : 9.67.38.11 : RA3AC.USIBMRA.IBM.COM ::::
000029 HOST : 9.67.38.11 : RABAC.USIBMRA.IBM.COM ::::
000030 HOST : 9.24.104.56: RALYAS4A.USIBMRA.IBM.COM ::::
000032 ;
****** **************************** Bottom of Data ****************************
```

Figure 221. APPC over TCP/IP Gateway Scenario: VTAM TCP/IP Host Table

The last entry in the table is the SNA over TCP/IP entry added for RALYAS4A.

No matching parameter table was created for this scenario.

Verifying the APPC over TCP/IP Gateway Scenario

In order to prove that the APPC over TCP/IP connection is working we can follow a step-by-step verification process. In a failing environment, this step-by-step process should help locate the failing area. Verification is shown for the following:

- AnyNet/400 via APPC over TCP/IP Gateway
- AnyNet/MVS SNA over TCP/IP Gateway

AnyNet/400 via APPC over TCP/IP Gateway Verification

The verification of APPC over TCP/IP via an AnyNet SNA over TCP/IP Gateway should be carried out in the following stages:

- Verify the TCP/IP configuration between the AnyNet/400 system and the gateway.
- Verify the APPC over TCP/IP configuration between the AnyNet/400 system and the gateway.
- Verify the SNA configuration between the native SNA system and the gateway.
- Verify the end-to-end APPC over TCP/IP Gateway configuration from either end.

Verify the TCP/IP configuration between the AnyNet/400 system and the gateway.

AnyNet/400 APPC over TCP/IP requires a TCP/IP configuration between the systems. This TCP/IP configuration is established as if it were to be used by native TCP/IP applications; there are no special TCP/IP configuration requirements to allow APPC over TCP/IP to use the TCP/IP configuration. Before we verify the APPC over TCP/IP configuration, we should verify the native TCP/IP configuration. This can be done in such a way that it also verifies part of the APPC over TCP/IP configuration. For example, the following will verify the TCP/IP configuration between RALYAS4A and RAI via the APPC over TCP/IP host table entry:

```
ping rai.usimbra.sna.ibm.com

Verifying connection to host system RAI.USIBMRA.SNA.IBM.COM at address
  9.24.104.74.
Connection verification 1 took .171 seconds.  1 successful connection
  verifications.
Connection verification 2 took .161 seconds.  2 successful connection
  verifications.
Connection verification 3 took .042 seconds.  3 successful connection
  verifications.
Connection verification 4 took .062 seconds.  4 successful connection
  verifications.
Connection verification 5 took .038 seconds.  5 successful connection
  verifications.
Round-trip (in milliseconds) min/avg/max = 38/94/171
Connection verification statistics: 5 of 5 successful (100 %).
```

Figure 222. AS/400 PING Command Job Log Information

Once we are satisfied that the TCP/IP configuration is working fine, we can move on to verify the APPC over TCP/IP configuration.

Verify the APPC over TCP/IP configuration between the AnyNet/400 system and the gateway.

Having verified the native TCP/IP configuration to the gateway, we can now verify the APPC over TCP/IP configuration to the gateway.

First we should check that the APPC over TCP/IP job is running. The command WRKACTJOB SBS(QSYSWRK) will display the active jobs in the QSYSWRK subsystem. The APPC over TCP/IP job QAPPCTCP should be active as shown in the following figure.

```
                             Work with Active Jobs                     RALYAS4A
                                                             03/09/95  16:04:02
CPU %:     .0     Elapsed time:   00:00:00     Active jobs:   63

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
_5     QAPPCTCP     QSYS        BCH      .0  PGM-QZPAIJOB     TIMW
__     QECS         QSVSM       BCH      .0  PGM-QNSECSJB     DEQW
__     QMSF         QMSF        BCH      .0                   DEQW
__     QNSCRMON     QSVSM       BCH      .0  PGM-QNSCRMON     DEQW
__     QTCPIP       QTCP        BCH      .0                   DEQW
__     QTFTP00619   QTCP        BCH      .0                   DEQW
__     QTFTP00734   QTCP        BCH      .0                   DEQW
__     QTFTP02472   QTCP        BCH      .0                   TIMW
                                                                        More...
Parameters or command
===> _________________________________________________________________________
F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
F12=Cancel   F23=More options   F24=More keys
```

Figure 223. Work with Active Jobs Panel

If we look at the job log associated with QAPPCTCP, we see the following:

```
                              Display Job Log
                                                             System:   RALYAS4A
Job . . :   QAPPCTCP      User . . :   QSYS         Number . . . :   011338

 >> CALL QSYS/QZPAIJOB
    APPC over TCP/IP job started.



                                                                         Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F10=Display detailed messages   F12=Cancel
F16=Job menu           F24=More keys
```

Figure 224. Display Job Log (QAPPCTCP) Panel

Note

The APPC over TCP/IP job (QAPPCTCP) is initially started when the Allow AnyNet support (ALWANYNET) network attribute is changed to *YES. If the job fails for any reason, it is necessary to stop TCP/IP (ENDTCP) and start TCP/IP (STRTCP) again to re-start the job.

Before we can use the AS/400 APPC over TCP/IP configuration, we must Vary on the APPC controller description we created for the APPC over TCP/IP connection. The Work with Configuration Status command can be used to show the status of the controller. For example, the following command resulted in the display shown in Figure 225.

```
WRKCFGSTS *CTL ANYNWMVSI
```

```
                         Work with Configuration Status                RALYAS4A
                                                              03/07/95  14:47:01
 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--------------
 __   ANYNWMVSI         VARIED OFF

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

Figure 225. Work with Configuration Status for Controller ANYNWMVSI (1 of 2)

To make the configuration available, use option 1 (Vary on). The configuration should then go to a VARIED ON status.

When the first controller with link type *ANYNW is varied on, two TCP/IP connections will be started; one is a TCP connection that goes to LISTEN state to allow the system to accept incoming APPC over TCP/IP sessions; while the other is a UDP connection to handle out-of-band data for all APPC over TCP/IP activity. NETSTAT option 3 can be used to display all TCP/IP sessions (native TCP/IP and APPC over TCP/IP). Figure 226 shows NETSTAT option 3 prior to any APPC over TCP/IP sessions being established.

```
                      Work with TCP/IP Connection Status
                                                            System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  026:45:25  Listen
     *                *          telnet     025:04:38  Listen
     *                *          APPCove >  000:09:55  Listen
     *                *          APPCove >  000:09:55  *UDP
     *                *          lpd        026:44:24  Listen






                                                                        Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 226. NETSTAT Option 3 - TCP/IP Connection Status (1 of 2)

If the APPC over TCP/IP connections (APPCove) fail for any reason, it is necessary to stop TCP/IP (ENDTCP) and start TCP/IP (STRTCP) again to re-start the jobs.

We can use the STRMOD AS/400 command to verify the APPC over TCP/IP configuration to the gateway.

```
strmod rai
Command STRMOD completed successfully for mode BLANK device RAI.
The STRMOD command completed successfully for all modes.
```

With a session active, WRKCFGSTS shows the autocreated device description for RAI.

```
                         Work with Configuration Status                RALYAS4A
                                                             03/07/95  15:14:20
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--------------
__   ANYNWMVSI         ACTIVE
__     RAI             ACTIVE









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

Figure 227. Work with Configuration Status for Controller ANYNWMVSI (2 of 2)

The NETSTAT option 3 display in Figure 228 shows the associated TCP/IP session.

```
                       Work with TCP/IP Connection Status
                                                             System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
 _   *                *          ftp-con >  006:02:37  Listen
 _   *                *          telnet     006:02:41  Listen
 _   *                *          APPCove >  000:31:50  Listen
 _   *                *          APPCove >  000:30:55  *UDP
 _   *                *          lpd        006:02:24  Listen
 _   9.24.104.74      APPCove >  1042       000:00:43  Established






                                                                         Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 228. NETSTAT Option 3 - TCP/IP Connection Status (2 of 2)

Verify the SNA configuration between the native SNA system and the gateway.

We can use the STRMOD AS/400 command to verify this SNA configuration also.

```
strmod rak
Command STRMOD completed successfully for mode BLANK device RAK.
The STRMOD command completed successfully for all modes.
```

With a session active, WRKCFGSTS shows the autocreated device description for RAK.

```
                         Work with Configuration Status               RALYAS4B
                                                             03/07/95  15:42:43
 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--------------
 __   RAOP08         ACTIVE
        RAK          ACTIVE



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

Figure 229. Work with Configuration Status for Controller RAOP08 (1 of 2)

Verify the end-to-end APPC over TCP/IP Gateway configuration from either end.

We can use the STRPASTHR command (Start 5250 Pass-Through) to verify the end-to-end configuration (first from RALYAS4B).

```
STRPASTHR RALYAS4A
```

With the passthrough session active, WRKCFGSTS of the host controller at RALYAS4B shows the autocreated device description for RALYAS4A.

```
                         Work with Configuration Status              RALYAS4B
                                                           03/07/95  16:07:44
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--------------
__   RAOP08          ACTIVE
__     RALYAS4A      ACTIVE
__       BLANK       ACTIVE/SOURCE         WTR0520OD   MICK        000222
__     RAK           ACTIVE




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

Figure 230. Work with Configuration Status for Controller RAOP08 (2 of 2)

With the passthrough session still active, WRKCFGSTS of the APPC controller at RALYAS4A shows the autocreated device description for RALYAS4B.

```
                         Work with Configuration Status              RALYAS4A
                                                           03/07/95  16:00:08
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--------------
__   ANYNWMVSI         ACTIVE
__     RAI             ACTIVE
__     RALYAS4B        ACTIVE
__       BLANK         ACTIVE/TARGET        RALYAS4B    QUSER       015622




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

Figure 231. Work with Configuration Status for Controller ANYNWMVSI (1 of 2)

The NETSTAT option 3 display in Figure 232 shows the associated TCP/IP sessions; one is for the SNA service manager (SNASVCMG) and the other is for the user session.

```
                    Work with TCP/IP Connection Status
                                                          System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
 _   *                *          ftp-con >  006:02:37  Listen
 _   *                *          telnet     006:02:41  Listen
 _   *                *          APPCove >  000:31:50  Listen
 _   *                *          APPCove >  000:30:55  *UDP
 _   *                *          lpd        006:02:24  Listen
 _   9.24.104.74      APPCove >  1043       000:21:40  Established
 _   9.24.104.74      1049       APPCove >  000:21:29  Established




                                                                      Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 232. NETSTAT Option 3 - TCP/IP Connection Status (1 of 2)

Note

If we had first tried to establish the connection from RALYAS4A, the connection attempt would have failed; the reason being that dynamic LU definition is being used at the host in this instance. Only when RALYAS4B connects to the host will the LU name be known to it.

If we now use the STRPASTHR command (Start 5250 Pass-Through) from RALYAS4A as follows:

```
STRPASTHR RALYAS4B
```

With this passthrough session active, WRKCFGSTS of the APPC controller at RALYAS4A shows the following status:

```
                     Work with Configuration Status                RALYAS4A
                                                          03/07/95  16:16:26
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--------------
__   ANYNWMVSI        ACTIVE
__     RAI            ACTIVE
__     RALYAS4B       ACTIVE
__       BLANK        ACTIVE/SOURCE         WTR0520OC   MICK        015602

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

Figure 233. Work with Configuration Status for Controller ANYNWMVSI (2 of 2)

The NETSTAT option 3 display in Figure 234 shows the associated TCP/IP sessions; one is for the SNA service manager (SNASVCMG) and the other is for the user session.

```
                   Work with TCP/IP Connection Status
                                                          System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port         Idle Time  State
 _   *                *          ftp-con >    007:00:11  Listen
 _   *                *          telnet       000:09:41  Listen
 _   *                *          APPCove >    000:39:40  Listen
 _   *                *          APPCove >    000:01:30  *UDP
 _   *                *          lpd          006:59:58  Listen
 _   9.24.104.74      APPCove >  1044         000:11:54  Established
 _   9.24.104.74      APPCove >  1045         000:10:15  Established

                                                                      Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 234. NETSTAT Option 3 - TCP/IP Connection Status (2 of 2)

AnyNet/MVS SNA over TCP/IP Gateway Verification

If we use NetView to display the status of the AnyNet PU with the RALYAS4A to RALYAS4B passthrough session active, we see the following:

```
* RAIAN    D NET,E,ID=RAIPSNIP
  RAIAN    IST097I  DISPLAY  ACCEPTED
' RAIAN
IST075I  NAME = RAIPSNIP         , TYPE = PU_T2.1
IST486I  STATUS= ACTIV--L--, DESIRED STATE= ACTIV
IST1043I  CP NAME = ***NA***, CP NETID = USIBMRA , DYNAMIC LU = YES
IST081I  LINE NAME = RAILSNIP, LINE GROUP = RAIGSNIP, MAJNOD = RAIBSNIP
IST654I  I/O TRACE = OFF, BUFFER TRACE = OFF
IST355I  LOGICAL UNITS:
IST080I  RALYAS4A ACT/S      WTR05115 ACT/S
IST314I  END
```

Figure 235. NetView AnyNet PU status

If we use NetView to display the VTAM status of RALYAS4A with the RALYAS4A to RALYAS4B passthrough session still active, we see the following:

```
* RAIAN    D NET,E,ID=RALYAS4A
  RAIAN    IST097I  DISPLAY  ACCEPTED
' RAIAN
IST075I  NAME = USIBMRA.RALYAS4A , TYPE = CDRSC
IST486I  STATUS= ACT/S     , DESIRED STATE= ACTIV
IST977I  MDLTAB=***NA*** ASLTAB=***NA***
IST1333I  ADJLIST = ***NA***
IST861I  MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I  DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I  CAPABILITY-PLU ENABLED  ,SLU ENABLED  ,SESSION LIMIT NONE
IST231I  CDRSC    MAJOR NODE = RAIRSNIP
IST1184I  CPNAME = USIBMRA.RAI       - NETSRVR = ***NA***
IST1044I  ALSLIST = RAIPSNIP
IST082I  DEVTYPE = INDEPENDENT LU / CDRSC
IST654I  I/O TRACE = OFF, BUFFER TRACE = OFF
IST171I  ACTIVE SESSIONS = 0000000002, SESSION REQUESTS = 0000000000
IST206I  SESSIONS:
IST1081I  ADJACENT LINK STATION = RAIPSNIP
IST634I  NAME     STATUS         SID          SEND RECV VR TP NETID
IST635I  RALYAS4B ACTIV-S    F64B0D2BCC7DF3FF           0  0 USIBMRA
IST635I  RALYAS4B ACTIV-S    F64B0D2BCC7DF3FE           0  0 USIBMRA
IST924I  -------------------------------------------------------------
IST075I  NAME = USIBMRA.RALYAS4A , TYPE = DIRECTORY ENTRY
IST1186I  DIRECTORY ENTRY = DYNAMIC    NN
IST1184I  CPNAME = USIBMRA.RALYAS4A  - NETSRVR = ***NA***
IST314I  END
```

Figure 236. NetView AnyNet LU status

5494 over TCP/IP Using SNA over TCP/IP Gateway Scenario

Systems do not have to support AnyNet for them to be able to use AnyNet. In this scenario a 5494 remote workstation controller is communicating with an AS/400 via a TCP/IP network. It does this by using the services of an AnyNet SNA over TCP/IP Gateway.

The following figure shows the systems used and their respective IP addresses for this scenario. A TCP/IP configuration is already in place between RALYAS4A and RALSNAGW using the internet addresses shown.

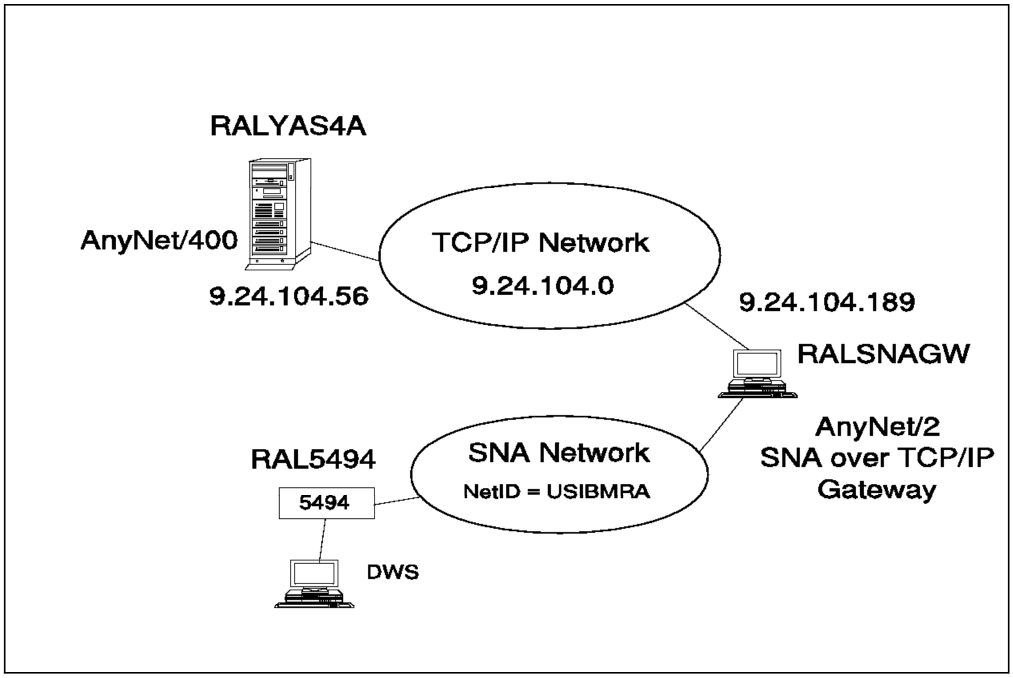

Figure 237. Systems Used for 5494 over TCP/IP Gateway Scenario

The following series of panels show the configuration screens taken from the RALYAS4A and RALSNAGW systems and the 5494 configuration panels. They illustrate the configuration steps required for this APPC over TCP/IP Gateway scenario.

Please note that only the key AnyNet/2 configuration displays are shown in this section.

PS/2 Software Installed

The following software was installed on RALSNAGW:

- OS/2 Version 2.1
- CM/2 Version 1.11 with AnyNet/2 support installed (additional functions) plus the fix for APAR JR08244
- TCP/IP Version 2.0 for OS/2 Base kit plus CSD UN64092
- AnyNet/2 SNA over TCP/IP Gateway Version 1.0

The software was installed in the above order.

RALYAS4A Configuration

First we must check that Allow ANYNET Support is set to *YES in the network attributes of RALYAS4A. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Before we can configure the APPC controller description and add the APPN remote location list entry, and configure the 5494, we need to display the network attributes on RALYAS4A.

```
                          Display Network Attributes
                                                         System:   RALYAS4A
 Current system name . . . . . . . . . . . . . . :   RALYAS4A
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4A
 Default local location . . . . . . . . . . . . . :   RALYAS4A
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression  . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions  . . . . :   200
 Route addition resistance  . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY


                                                                   More...
```

Figure 238. 5494 over TCP/IP Gateway Scenario: AS/400 Network Attributes

Next, we create an APPC controller description on RALYAS4A with LINKTYPE *ANYNW.

```
                      Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > ANYNWPSGW     Name
 Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > RALSNAGW      Name, *ANY
 User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
 Text 'description' . . . . . . . > 'To AnyNet Gateway'



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

Figure 239. 5494 over TCP/IP Gateway Scenario: AS/400 APPC Controller Description

In the following panel we create a remote workstation controller description on RALYAS4A.

```
                     Create Ctl Desc (Remote WS) (CRTCTLRWS)

 Type choices, press Enter.

 Controller description . . . . . > RAL5494       Name
 Controller type  . . . . . . . . > 5494          3174, 3274, 5251, 5294...
 Controller model . . . . . . . . > 2             0, 1, 0001, 2, 0002, 12, 0012
 Link type  . . . . . . . . . . . > *NONE         *IDLC, *LAN, *NONE, *SDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote location  . . . . . . . . > RAL5494       Name
 Local location . . . . . . . . .   *NETATR       Name, *NETATR
 Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE
 Autocreate device  . . . . . . .   *ALL          *ALL, *NONE
 Switched disconnect  . . . . . .   *YES          *YES, *NO
 Text 'description' . . . . . . . > 'AnyNet Connected 5494'




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

Figure 240. 5494 over TCP/IP Gateway Scenario: AS/400 RWS Controller Description

Note: With OS/400 V3R1 and 5494 Microcode Release 3.0, the remaining 5494 definitions (device descriptions, etc.) will be autocreated.

Now we add the APPC over TCP/IP entries to the APPN remote location list at RALYAS4A.

```
                         Change Configuration List                   RALYAS4A
                                                           03/06/95  10:47:23
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote              Remote    Control
Remote    Network   Local     Control   Point     Location         Secure
Location  ID        Location  Point     Net ID    Password          Loc
RALSNAGW  *NETATR   *NETATR   RALSNAGW  *NETATR   _______________   *NO
RAL5494_  *NETATR   *NETATR   RALSNAGW  *NETATR   _______________   *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________   *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________   *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________   *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________   *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________   *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________   *NO
                                                                     More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 241. 5494 over TCP/IP Gateway Scenario: AS/400 APPN Remote Locations List

While the first entry is not required for the correct operation of this scenario, it will allow us to test to the gateway prior to trying to establish a connection through the gateway.

The host table at RALYAS4A, shown following, has had the APPC over TCP/IP entries added.

```
                      Work with TCP/IP Host Table Entries
                                                           System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   7=Rename

     Internet         Host
Opt  Address          Name

 _   _______________
 _   9.24.104.56      RALYAS4A
                      RALYAS4A.ITSO.RAL.IBM.COM
 _   9.24.104.189     RALSNAGW
                      RALSNAGW.ITSO.RAL.IBM.COM
                      RALSNAGW.USIBMRA.SNA.IBM.COM
                      RAL5494.USIBMRA.SNA.IBM.COM




F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 242. 5494 over TCP/IP Gateway Scenario: AS/400 TCP/IP Host Table

Note

The AS/400 TCP/IP Host Table will allow a maximum of four host names to be entered against a single host internet address. As can be seen from the example in Figure 242 on page 188, where we have already used all four entries for 9.24.104.189, this may become a restriction when using AnyNet/400 APPC over TCP/IP with an AnyNet SNA over TCP/IP gateway. Although, in fact, only the last entry is actually required for the correct operation of this scenario. One possible alternative is to use a name server rather than the AS/400 host table when the requirement is to communicate with more than four hosts via an AnyNet SNA over TCP/IP gateway.

RALSNAGW Configuration

A suitable Communications Manager/2 configuration environment for this scenario can be created from the single screen shown next.

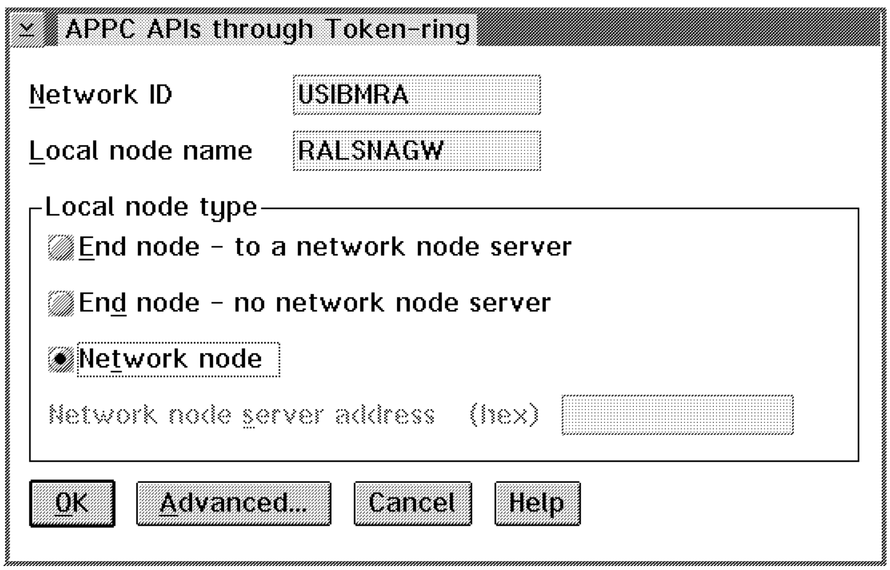

Figure 243. 5494 over TCP/IP Gateway Scenario: Communications Manager/2 Configuration Panel

To configure AnyNet/2 SNA over TCP/IP Gateway, we define the following:

- SNA Domain Name Suffix
- Routing Preference

The SNA Domain Name Suffix is used when SNA over TCP/IP creates an IP domain name from an SNA LU name, network ID and this suffix. The IP domain name for SNA over TCP/IP has the format luname.netid.snasuffix and is defined as follows:

- luname is the SNA LU name.
- netid is the SNA network ID (NETID).
- snasuffix is the SNA domain name suffix.

To define the SNA Domain Name Suffix, we use the AnyNet/2 SNA over TCP/IP Gateway configuration tool. To access the AnyNet/2 SNA over TCP/IP Gateway configuration tool, select the **AnyNet Configuration Tool** icon from the AnyNet/2 folder. The folder icon should be displayed on the OS/2 desktop, if the AnyNet/2 code has been installed correctly.

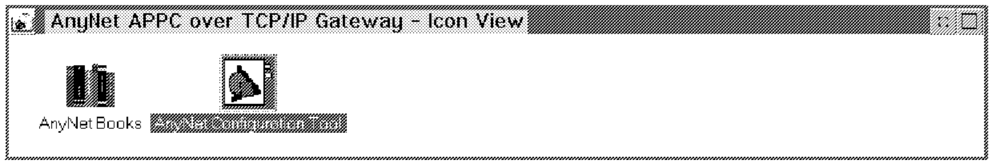

Figure 244. AnyNet/2 SNA over TCP/IP Gateway Folder

The copy of AnyNet/2 SNA over TCP/IP Gateway being used was an early copy, hence the incorrect wording on the folder.

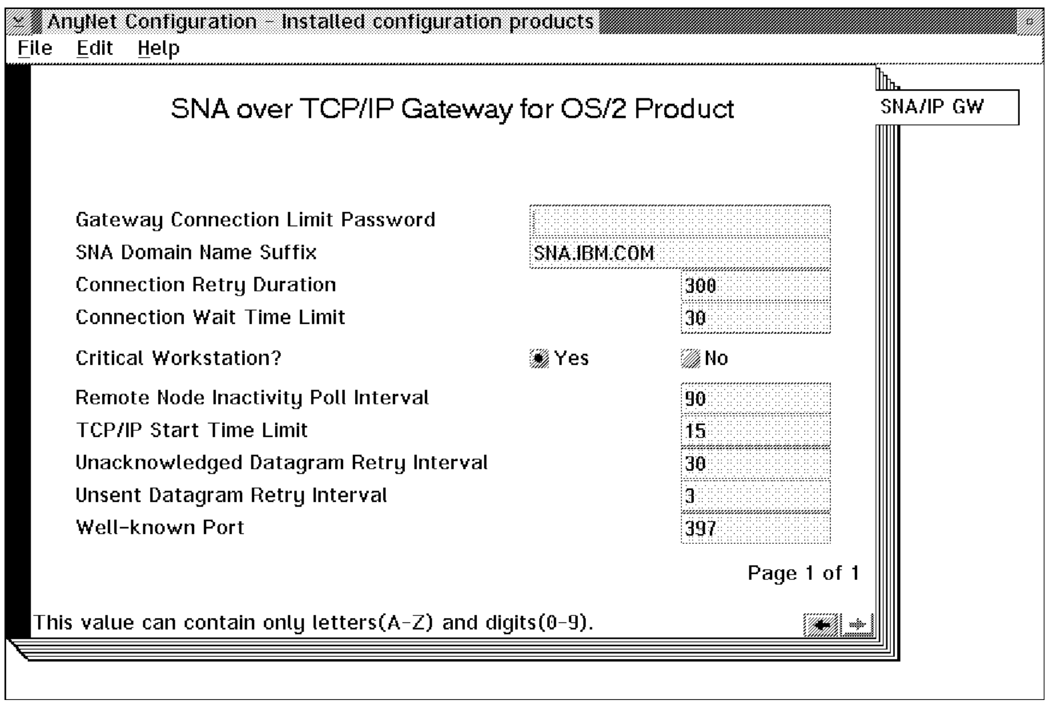

Figure 245. 5494 over TCP/IP Gateway Scenario: AnyNet/2 SNA over TCP/IP Gateway Configuration Panel

When initiating a session, AnyNet/2 SNA over TCP/IP Gateway uses a preference table to determine whether native SNA or SNA over TCP/IP (non-native) will be used for that session. If no routing preference table is configured, the default is to first try to establish the session over native SNA. If this session setup fails, SNA over TCP/IP will be used.

To customize the routing preference table, we can use the LULIST AnyNet/2 command. When entered, the command prompts with the following information:

```
OS2 C:\>lulist
usage: lulist {a|r|l|p|f|c|d|u|h} argument(s).
    Arguments by function:.
    a netid.luname flag ( ADD LUNAME    ).
    r netid.luname      ( REMOVE LUNAME ).
    l netid.luname      ( LOOKUP LUNAME ).
    p                   ( PRINT TABLE   ).
    f                   ( FLUSH TABLE   ).
    c netid.luname flag ( CHANGE LUNAME ).
    d                   ( PRINT DEFAULT ).
    d flag              ( SET DEFAULT   ).
    u                   ( UPDATE TABLE  ).
    h                   ( HELP          ).
flag: 0=Native, 1=Non-Native, 2=Native Only, 3=Non-Native Only.
```

Figure 246. AnyNet/2 LULIST Command Prompts

The options available for the table default and table entries are as follows:

Native: SNA will be tried first. If the session request fails, SNA over TCP/IP will be used.

Non-native: SNA over TCP/IP will be tried first. If the session fails, SNA will be used.

Native only: Only SNA will be used.

Non-native only: Only SNA over TCP/IP will be used.

For the connection to RALYAS4A to *only* use the SNA over TCP/IP connection, we would enter the following command:

```
OS2 C:\>lulist a usibmra.ralyas4a 3
Luname usibmra.ralyas4a added to table.
```

To verify the above change we could use the following command:

```
OS2 C:\>lulist l usibmra.ralyas4a
usibmra.ralyas4a  NON-NATIVE_ONLY
```

As for AnyNet/400, AnyNet/2 SNA over TCP/IP Gateway uses the native TCP/IP host table to map SNA LU names to internet addresses. The OS/2 TCP/IP host table is changed either via the TCP/IP Configuration tool (page 3 of the Services section) or by editing the HOSTS file (\tcpip\etc\hosts).

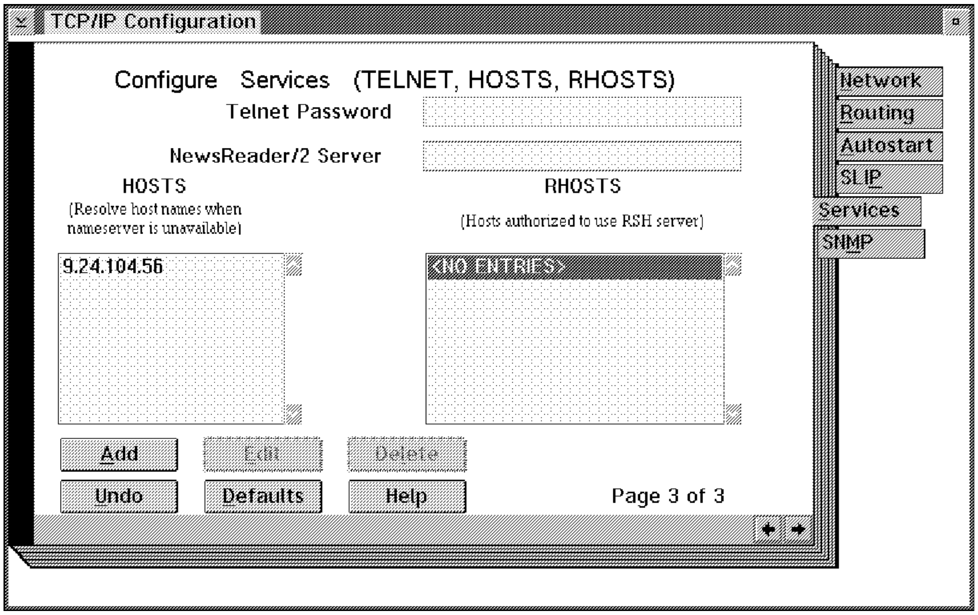

Figure 247. 5494 over TCP/IP Gateway Scenario: OS/2 TCP/IP Host Table Menu

Update the table with the required mapping, as shown in Figure 248.

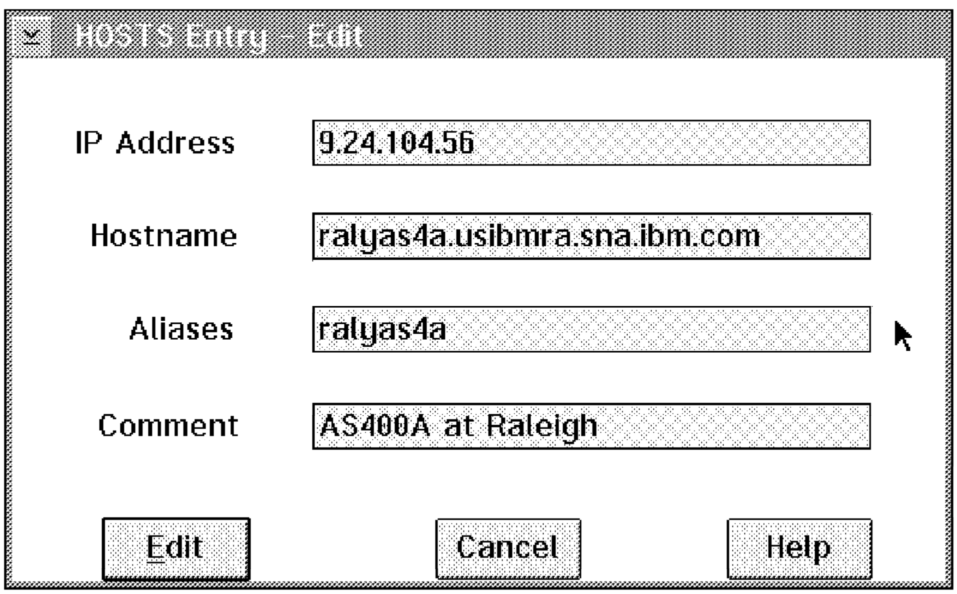

Figure 248. 5494 over TCP/IP Gateway Scenario: OS/2 TCP/IP Host Table Entry

The Aliases field in an OS/2 TCP/IP host table entry can contain multiple host names. This would have allowed us to enter the long TCP/IP host name for RALYAS4A in addition to the short one shown.

5494 Configuration

5494 Software Installed

5494 Microcode Release 3.0 was installed.

```
          0         1         2         3         4         5         6
          ----------------------------------------------------------------
      0/  00        00        00        00        00        00        00
      1/  00        00        00        00        00        00        00
      2/  00        00        00        00        00        00        00
      3/  00        00        00        00        00        00        00


      4/  00        00        00        00        00        00        00
      5/  00        00        00        00        00        00        00
      6/  00        00        00        00        00        00        00
      7/  00        00        00        00        00        00        00


5494 LICENSED INTERNAL CODE (C) COPYRIGHT IBM CORP. 1988, 1994.  ALL RIGHTS
RESERVED.  US GOVERNMENT USERS RESTRICTED RIGHTS - USE, DUPLICATION OR
DISCLOSURE RESTRICTED BY GSA ADP SCHEDULE CONTRACT WITH IBM CORP.


AA-> 4
1-> 00
F-> 04  G-> 01  H-> 30  I-> 030  J-> 08

                                                                P->  - -
```

Figure 249. 5494 over TCP/IP Gateway Scenario: 5494 Configuration Screen 1

The 5494 configuration screen 1 parameters are defined as follows:

AA - Communications mode (4=Token-ring)

1 - Keyboard translation

F - Local token-ring services access point (SAP)

G - Token-ring response timer (T1)

H - Token-ring inactivity timer (Ti)

I - Token-ring receiver acknowledgement timer (T2)

J - Token-ring retry count (N2)

```
11-> USIBMRA    12-> RAL5494    13-> RAL5494    14-> QRMTWSC
15-> 40005494E000  16-> 010 06 1  17-> 00-00000  18-> ______
19-> *____

H1:1-> RALYAS4A  H1:2-> USIBMRA  H1:3-> USIBMRA  H1:4-> QRMTWSC
H1:5->   400052005185
                 H1:7-> 04  H1:8-> 2   H1:9-> 1


H2:1-> ________  H2:2-> ________ H2:3-> ________ H2:4-> ________
H2:5->   ____________
                 H2:7-> __  H2:8-> _   H2:9-> _


H3:1-> ________  H3:2-> ________ H3:3-> ________ H3:4-> ________
H3:5->   ____________
                 H3:7-> __  H3:8-> _   H3:9-> _


H4:1-> ________  H4:2-> ________ H4:3-> ________ H4:4-> ________
H4:5->   ____________
                 H4:7-> __  H4:8-> _   H4:9-> _


                                                       P->  - -
```

Figure 250. 5494 over TCP/IP Gateway Scenario: 5494 Configuration Screen 2

The 5494 configuration screen 2 parameters are defined as follows:

11 - Default network ID

12 - 5494 LU name

13 - 5494 CP name

14 - Default mode name

15 - 5494 token-ring address

16 - Logical connection retry parameters

17 - 5494 serial number

18 - 5494 system Password

19 - 5494 ID number

H1:1 - AS/400 LU name

H1:2 - AS/400 network ID

H1:3 - 5494 network ID

H1:4 - AS/400 mode name

H1:5 - SNA over TCP/IP Gateway token-ring address

H1:7 - SNA over TCP/IP Gateway token-ring SAP

H1:8 - SNA over TCP/IP Gateway token-ring maximum out

H1:9 - SNA over TCP/IP Gateway token-ring maximum in

Shown next are the matching parameters between all the systems.

```
5494                                 SYSTEM                                   SYSTEM
RAL5494                              RALSNAGW                                 RALYAS4A
*******                              ********                                 ********

DWS Config Screen 2
12 RAL5494 - 5494 LU name                                                     Network Attributes
13 RAL5494 - 5494 CP name                                                     ------------------
14 QRMTWSC - 5494 Default mode name                                           ALWANYNET *YES
15 40005494E00 - 5494 TR address                                              LCLLOCNAME RALYAS4A
H1:1 RALYAS4A - AS/400 LU name                                                LCLNETID USIBMRA
H1:2 USIBMRA - AS/400 network ID
H1:3 USIBMRA - 5494 network ID
H1:4 QRMTWSC - AS/400 mode name
H1:5 400052005185 - Gateway TR addr  TR Addr 400052005185                     APPC Controller Description
                                                                              ---------------------------
                                                                              CTLD ANYNWPSGW
                                                                              LINKTYPE *ANYNW
                                                                              RMTCPNAME RALSNAGW
                                                                              RMTNETID USIBMRA
                                     CM/2 APPC APIs DEFINITION
                                     -------------------------                RWS Controller Decsription
                                     LOCAL NODE NAME    RALSNAGW              --------------------------
                                     NETWORK ID         USIBMRA               CTLD RAL5494
                                                                              RMTLOCNAME RAL5494
                                                                              LCLLOCNAME RALYAS4A
                                     SNA over TCP/IP                          RMTNETID USIBMRA
                                     ---------------
                                     SNA Domain Name
                                      Suffix     SNA.IBM.COM                  Remote Location List
                                                                              --------------------
                                                                              CPNETID USIBMRA
                                                                              RMTCPNAME RALSNAGW
                                                                              RMTLOCNAME RAL5494
                                                                              RMTNETID USIBMRA
                                                                              LCLLOCNAME RALYAS4A

                                      TCP/IP Host Table                       TCP/IP Host Table
                                      -----------------                       -----------------
                                      INTERNET ADR: 9.24.104.56               INTERNET ADR: 9.24.104.189
                                      HOSTNAME: RALYAS4A                      HOSTNAME: RAL5494
                                                USIBMRA                                 USIBMRA
                                                SNA.IBM.COM                             SNA.IBM.COM

                                      TCP/IP Interface                        TCP/IP Interface
                                      ----------------                        ----------------
                                      INTERNET ADR: 9.24.104.189              INTERNET ADR: 9.24.104.56
```

Figure 251. 5494 over TCP/IP Gateway Scenario: Matching Parameters Table

Verifying the 5494 over TCP/IP Using SNA over TCP/IP Gateway Scenario

In order to prove that the 5494 connection is working we can follow a step-by-step verification process. In a failing environment, this step-by-step process should help locate the failing area. Verification is shown for the following:

- 5494 over TCP/IP using SNA over TCP/IP Gateway
- AnyNet/2 SNA over TCP/IP Gateway

5494 over TCP/IP Using SNA over TCP/IP Gateway Verification

The verification of 5494 over TCP/IP via an AnyNet SNA over TCP/IP gateway should be carried out in the following stages:

- Verify the TCP/IP configuration between the AnyNet/400 system and the gateway.
- Verify the APPC over TCP/IP configuration between the AnyNet/400 system and the gateway.
- Verify the SNA configuration between the 5494 and the gateway.
- Verify the end-to-end 5494 over TCP/IP Gateway configuration.

Verify the TCP/IP configuration between the AnyNet/400 system and the gateway.

AnyNet/400 APPC over TCP/IP requires a TCP/IP configuration between the systems. This TCP/IP configuration is established as if it were to be used by native TCP/IP applications; there are no special TCP/IP configuration requirements to allow APPC over TCP/IP to use the TCP/IP configuration. Before we verify the APPC over TCP/IP configuration, we should verify the native TCP/IP configuration. This can be done in such a way that it also verifies part of the APPC over TCP/IP configuration. For example, the following will verify the TCP/IP configuration between RALYAS4A and RALSNAGW via the APPC over TCP/IP host table entry:

```
ping ralsnagw.usibmra.sna.ibm.com

Verifying connection to host system RALSNAGW at address 9.24.104.189.
Connection verification 1 took .212 seconds.  1 successful connection
  verifications.
Connection verification 2 took .016 seconds.  2 successful connection
  verifications.
Connection verification 3 took .016 seconds.  3 successful connection
  verifications.
Connection verification 4 took .018 seconds.  4 successful connection
  verifications.
Connection verification 5 took .016 seconds.  5 successful connection
  verifications.
Round-trip (in milliseconds) min/avg/max = 16/55/212
Connection verification statistics: 5 of 5 successful (100 %).
```

Figure 252. AS/400 PING Command Job Log Information

Once we are satisfied that the TCP/IP configuration is working fine, we can move on to verify the APPC over TCP/IP configuration.

Verify the APPC over TCP/IP configuration between the AnyNet/400 system and the gateway.

Having verified the native TCP/IP configuration to the gateway, we can now verify the APPC over TCP/IP configuration to the gateway.

First we should check that the APPC over TCP/IP job is running. The command WRKACTJOB SBS(QSYSWRK) will display the active jobs in the QSYSWRK subsystem. The APPC over TCP/IP job QAPPCTCP should be active as shown in the following figure.

```
                           Work with Active Jobs                      RALYAS4A
                                                            03/06/95  17:24:02
CPU %:     .0     Elapsed time:   00:00:00     Active jobs:   63

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
_5     QAPPCTCP     QSYS        BCH      .0  PGM-QZPAIJOB     TIMW
__     QECS         QSVSM       BCH      .0  PGM-QNSECSJB     DEQW
__     QMSF         QMSF        BCH      .0                   DEQW
__     QNSCRMON     QSVSM       BCH      .0  PGM-QNSCRMON     DEQW
__     QTCPIP       QTCP        BCH      .0                   DEQW
__     QTFTP00619   QTCP        BCH      .0                   DEQW
__     QTFTP00734   QTCP        BCH      .0                   DEQW
__     QTFTP02472   QTCP        BCH      .0                   TIMW
                                                                       More...
Parameters or command
===> _________________________________________________________________________
F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
F12=Cancel   F23=More options   F24=More keys
```

Figure 253. Work with Active Jobs Panel

If we look at the job log associated with QAPPCTCP, we see the following:

```
                             Display Job Log
                                                            System:   RALYAS4A
Job . . :   QAPPCTCP      User . . :   QSYS         Number . . . :   011338

 >> CALL QSYS/QZPAIJOB
    APPC over TCP/IP job started.








                                                                        Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F10=Display detailed messages   F12=Cancel
F16=Job menu           F24=More keys
```

Figure 254. Display Job Log (QAPPCTCP) Panel

Note

The APPC over TCP/IP job (QAPPCTCP) is initially started when the Allow AnyNet support (ALWANYNET) network attribute is changed to *YES. If the job fails for any reason, it is necessary to stop TCP/IP (ENDTCP) and start TCP/IP (STRTCP) again to re-start the job.

Before we can use the AS/400 APPC over TCP/IP configuration, we must Vary on the APPC controller description we created for the APPC over TCP/IP connection. The Work with Configuration Status command can be used to show the status of the controller. For example, the following command resulted in the display shown in Figure 255.

```
WRKCFGSTS *CTL ANYNWPSGW
```

```
                       Work with Configuration Status              RALYAS4A
                                                          03/06/95  15:07:53
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--------------
__   ANYNWPSGW         VARIED OFF









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

Figure 255. Work with Configuration Status for Controller ANYNWPSGW (1 of 3)

To make the configuration available, use option 1 (Vary on). The configuration should then go to a VARIED ON status.

When the first controller with link type *ANYNW is varied on, two TCP/IP connections will be started; one is a TCP connection that goes to LISTEN state to allow the system to accept incoming APPC over TCP/IP sessions; while the other is a UDP connection to handle out-of-band data for all APPC over TCP/IP activity. NETSTAT option 3 can be used to display all TCP/IP sessions (native TCP/IP and APPC over TCP/IP). Figure 256 shows NETSTAT option 3 prior to any APPC over TCP/IP sessions being established.

```
                      Work with TCP/IP Connection Status
                                                          System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  026:45:25  Listen
     *                *          telnet     025:04:38  Listen
     *                *          APPCove >  000:09:55  Listen
     *                *          APPCove >  000:09:55  *UDP
     *                *          lpd        026:44:24  Listen








                                                                      Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 256. NETSTAT Option 3 - TCP/IP Connection Status (1 of 3)

If the APPC over TCP/IP connections (APPCove) fail for any reason, it is necessary to stop TCP/IP (ENDTCP) and start TCP/IP (STRTCP) again to re-start the jobs.

We can use the STRMOD AS/400 command shown following to verify the APPC over TCP/IP connection to the gateway:

```
strmod ralsnagw
Command STRMOD completed successfully for mode BLANK device RALSNAGW.
The STRMOD command completed successfully for all modes.
```

With a session active, WRKCFGSTS shows the autocreated device description for RALSNAGW.

```
                    Work with Configuration Status                RALYAS4A
                                                         03/06/95  15:55:48
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--------------
__   ANYNWPSGW        ACTIVE
__     RALSNAGW       ACTIVE










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

Figure 257. Work with Configuration Status for Controller ANYNWPSGW (2 of 3)

The NETSTAT option 3 display in Figure 258 shows the associated TCP/IP session.

```
                  Work with TCP/IP Connection Status
                                                      System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
 _   *                *          ftp-con >  001:35:46  Listen
 _   *                *          telnet     001:35:53  Listen
 _   *                *          APPCove >  001:36:19  Listen
 _   *                *          APPCove >  000:01:50  *UDP
 _   *                *          lpd        001:35:12  Listen
 _   9.24.104.189     APPCove >  1025       000:07:25  Established








                                                                    Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 258. NETSTAT Option 3 - TCP/IP Connection Status (2 of 3)

Verify the SNA configuration between the 5494 and the gateway.

When the 5494 is powered on, it will call-out to the Gateway PS/2. The CM/2 CMLINKS command can be used to verify this connection.

```
OS2 C:\>cmlinks


      Link         DLC             Partner
      Name     Name   #       FQName      Type  Sess      State
    -------- -------- - ---------------- ----- ---- ---------------
*   @ANYGW   $ANYNET  0 $ANYNET.$GWCP      LEN  0    Active
*   @AAAAAAB IBMTRNET 0 USIBMRA.RAL5494    LEN  3    Active
```

Figure 259. Communications Manager/2 CMLINKS Command Output

The first entry is a system added AnyNet entry. The second entry was dynamically added when the 5494 contacted the PS/2.

Verify the end-to-end 5494 over TCP/IP Gateway configuration.

We have now verified the configuration to the gateway from either end.

We should now vary on the AS/400 Workstation controller for the 5494. With this controller in a Vary On Pending state, we can verify the end-to-end connection by powering on the 5494. With an active 5494 connection, WRKCFGSTS now shows the following:

```
                        Work with Configuration Status               RALYAS4A
                                                           03/06/95  16:49:33
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--------------
__   ANYNWPSGW         ACTIVE
__     RALSNAGW        ACTIVE
__     RAL5494         ACTIVE
__       QRMTWSC       ACTIVE/TARGET         RAL5494     QUSER       015594
__       QRMTWSC       ACTIVE/SOURCE         RAL5494     QUSER       015594




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

Figure 260. Work with Configuration Status for Controller ANYNWPSGW (3 of 3)

The NETSTAT option 3 display in Figure 261 shows the associated TCP/IP sessions.

```
                        Work with TCP/IP Connection Status
                                                            System:   RALYAS4A
 Local internet address  . . . . . . . . . . . :   *ALL

 Type options, press Enter.
   4=End   5=Display details

      Remote           Remote     Local
 Opt  Address          Port       Port       Idle Time  State
  _   *                *          ftp-con >  002:28:34  Listen
  _   *                *          telnet     002:28:41  Listen
  _   *                *          APPCove >  000:10:05  Listen
  _   *                *          APPCove >  000:00:22  *UDP
  _   *                *          lpd        002:27:59  Listen
  _   9.24.104.189     APPCove >  1033       000:09:39  Established
  _   9.24.104.189     1061       APPCove >  000:09:55  Established




                                                                        Bottom
 F5=Refresh   F11=Display byte counts   F13=Sort by column
 F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 261. NETSTAT Option 3 - TCP/IP Connection Status (3 of 3)

Figure 262 shows the status of the remote workstation controller description for RAL5494.

```
                          Work with Configuration Status              RALYAS4A
                                                            03/07/95  09:30:49
 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--------------
 __   RAL5494           ACTIVE
 __     RAL5DSP15       SIGNON DISPLAY







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

Figure 262. Work with Configuration Status for Controller RAL5494

AnyNet/2 SNA over TCP/IP Gateway Verification

The following information shows the same active 5494 session as the AS/400 panels in the previous section.

To check whether Communication Manager/2 is running, we can use the CMQUERY command:

```
OS2 C:\>cmquery

               Communications Manager Query Services

    Workstation Type      : Single User
    Default configuration : RALSNAGW
    Active configuration  : RALSNAGW

     Service                        Status
    ==============================================================
      CM Kernel                    ACTIVE
      SNA Services                 ACTIVE
      SRPI                          *** Stopped ***
      X.25                          *** Stopped ***
      SNA Phone Connect             *** Stopped ***
      ACDI                          *** Stopped ***
      3270 Emulator                 *** Stopped ***
      5250 Emulator                 *** Stopped ***
    ==============================================================
    Monday, 03/06/95 17:17:45   End of Program - CMQuery
```

Figure 263. Communications Manager/2 CMQUERY Command Output

From this output, you can see that the kernel and SNA services are active.

Each time Communication Manager/2 is started, it determines whether it is enabled to route SNA frames over the IP network. If the SNA over TCP/IP files are not in place, Communication Manager/2 assumes that SNA over TCP/IP is not available and routes all SNA frames over the SNA network.

To verify that AnyNet/2 SNA over TCP/IP has initialized, we can use NETSTAT -s command as in the following panel:

```
OS2 C:\>netstat -s
SOCK      TYPE        FOREIGN         LOCAL        FOREIGN      STATE
                         PORT          PORT           HOST
==== ==========    ==========    ==========     ========== ==========
81       STREAM          1033      mptn..397    9.24.104.56   ESTABLISHED
80       STREAM     mptn..397           1061    9.24.104.56   ESTABLISHED
79        DGRAM             0           1041        0.0.0.0   UDP
57        DGRAM             0      mptn..397        0.0.0.0   UDP
56        DGRAM             0           1033        0.0.0.0   UDP
55       STREAM          1051           1050   9.24.104.189   ESTABLISHED
54       STREAM          1050           1051   9.24.104.189   ESTABLISHED
52       STREAM          1049           1048   9.24.104.189   ESTABLISHED
51       STREAM          1048           1049   9.24.104.189   ESTABLISHED
49       STREAM             0      mptn..397        0.0.0.0   LISTEN
6        STREAM             0        ftp..21        0.0.0.0   LISTEN
```

Figure 264. OS/2 TCP/IP NETSTAT -s Command Output

From the netstat -s display, we can see that the SNA over TCP/IP Gateway is enabled because sockets are bound to the well-known port for SNA over TCP/IP (port 397). The four stream sockets 55,54,52 and 51 are used for internal SNA over TCP/IP connections. An SNA over TCP/IP session was active when this information was captured; it is using the first two ports shown.

The active Communications Manager/2 APPN sessions can be displayed as follows:

1. Open the **Communication Manager/2** icon.
2. Select **Subsystem Management**.
3. Select **SNA Subsystem**.
4. Select **Display active configuration**.
5. Select **APPN**.
6. Select **Intermediate Sessions**.

```
**************************************
* Intermediate Sessions Information  *
**************************************
Number of intermediate sessions             2

1>Primary side adjacent CP name             USIBMRA.RAL5494
  Secondary side adjacent CP name           $ANYNET.$GWCP
  Primary side link name                    @AAAAAAE
  Secondary side link name                  @ANYGW
  Procedure correlator ID (PCID)            X'F0AB0F127FD45AA4'
  PCID generator CP name                    USIBMRA.RAL5494
  Primary LU name                           USIBMRA.RAL5494
  Secondary LU name                         USIBMRA.RALYAS4A
  FMD PIUs sent by primary LU               12
  FMD PIUs sent by secondary LU             16
  Non-FMD PIUs sent by primary LU           4
  Non-FMD PIUs sent by secondary LU         4
```

```
  Bytes sent by primary LU                634
  Bytes sent by secondary LU              1254

2>Primary side adjacent CP name           $ANYNET.$GWCP
  Secondary side adjacent CP name         USIBMRA.RAL5494
  Primary side link name                  @ANYGW
  Secondary side link name                @AAAAAAE
  Procedure correlator ID (PCID)          X'F64B0D2BCC7DF3ED'
  PCID generator CP name                  USIBMRA.RALYAS4A
  Primary LU name                         USIBMRA.RALYAS4A
  Secondary LU name                       USIBMRA.RAL5494
  FMD PIUs sent by primary LU             12
  FMD PIUs sent by secondary LU           9
  Non-FMD PIUs sent by primary LU         1
  Non-FMD PIUs sent by secondary LU       1
  Bytes sent by primary LU                1503
  Bytes sent by secondary LU              367
```

The Communications Manager/2 APPN topology can be displayed as follows:

1. Open the **Communication Manager/2** icon.
2. Select **Subsystem Management**.
3. Select **SNA Subsystem**.
4. Select **Display active configuration**.
5. Select **APPN**.
6. Select **Toplogy**.

```
**************************************
*        Topology Information        *
**************************************
Number of network nodes                   1

1>Network node CP name                    USIBMRA.RALSNAGW
  Route additional resistance             128
  Congested?                              No
  Quiescing?                              No
  ISR depleted?                           No
  Number of TGs                           2

1.1>TG partner CP name                    USIBMRA.RAL5494
    Transmission group number             0
    TG partner node type                  Real
    Quiescing?                            No
    Topology                              Local
    Effective capacity                    3.99 megabits per second
    Cost per connect time                 0
    Cost per byte                         0
    Propagation delay                     384.00 microseconds (local area network)
    User defined parameter 1              128
    User defined parameter 2              128
    User defined parameter 3              128
    Security                              Nonsecure

1.2>TG partner CP name                    $ANYNET.$GWCNET
    Transmission group number             1
```

TG partner node type	Virtual (connection network)
Quiescing?	No
Topology	Network
Effective capacity	2.76 megabits per second
Cost per connect time	254
Cost per byte	254
Propagation delay	9.22 milliseconds (telephone)
User defined parameter 1	128
User defined parameter 2	128
User defined parameter 3	128
Security	Nonsecure

AnyNet/400 APPC over IPX

This chapter presents the process of configuring AnyNet/400 APPC over IPX at the International Technical Support Organization in Raleigh.

The information is presented in the following sections:

1. Introduction to AnyNet/400 APPC over IPX
2. Using AnyNet/400 APPC over IPX
3. Configuring AnyNet/400 APPC over IPX
4. Verifying the Scenario

For further information on AnyNet/400 APPC over IPX refer to *AS/400 International Packet Exchange Support*, SC41-3400.

Introduction to APPC over IPX

Until recently the AS/400 has been largely an SNA-based system. Because of this, the majority of the applications (IBM-supplied and non IBM-supplied) are APPC (Advanced Program-to-Program Communications) based. Providing the network is SNA-based, these applications can communicate with each other in a very reliable manner. However, more and more networks are becoming router-based. While many routers in the market place today can handle APPC traffic, in many situations companies are reluctant to turn on the router function that accomplishes this. Many companies would also like to see only IPX across their networks. This was a problem in the past but with the announcement of the AnyNet family of products, companies can use APPC (ICF) or CPI-C applications across IPX networks. AnyNet allows a company to choose the application programs that best meet the needs of their business without having to worry about the transport protocol they are using over their network. 5250 Display Station Passthrough, etc. can, using AnyNet/400 APPC over IPX, run over an IPX network.

AnyNet/400 is one member of the AnyNet family of products. AnyNet/400 is included with the base OS/400 Version 3 Release 1 or higher. Network Extensions (5733-SA1) provides OS/400 Version 3 Release 1 with IPX support. Network Extensions also provides AnyNet/400 support to allow APPC applications to run over IPX and sockets applications to run over IPX. In this chapter we look at APPC applications over IPX.

AnyNet/400 APPC over IPX can be used by those customers who want the following:

- To run existing APPC applications across an IPX network
- To simplify their network by reducing the number of protocols being used

Specifically, APPC over IPX support in AnyNet/400, allows APPC programs to communicate between systems over an IPX network.

AnyNet/400 APPC over IPX makes it possible to use existing APPC (ICF) or CPI-C applications over an IPX network. For example, 5250 Display Station Passthrough, and SNADS (SNA Distribution Services) can all run, unchanged, over an IPX network.

Using AnyNet/400 APPC over IPX

The AnyNet/400 APPC over IPX code requires the following:

- 5733-SA1, Network Extensions
- PTF Cumulative C5304310 or later
- Informational PTF II08907 for the Network Extensions feature. This contains pre and post installation instructions and lists other prerequisite PTF requirements.

Once AnyNet/400 APPC over IPX has been configured, you will be able to run APPC (ICF) or CPI-C applications across an IPX network. At the time that this book was written, the following APPC applications were supported under AnyNet/400:

- CICS/400
- DB2/400
- 5250 Display Station Passthrough
- DRDA
- SNADS
- ICF or CPI-C user-written APPC applications

The running of these applications is transparent to the user regardless of what transport protocol is being used. The user may, however, notice a performance degradation when using an APPC application via AnyNet/400 as opposed to running the same application natively under SNA. Applications running on their native protocols may run faster than those running on a non-native protocol. The flexibility of the AnyNet/400 product should, however, outweigh any performance degradation. It is important to note that if your system implements AnyNet/400 (the Network Attribute ALWANYNET is set to *YES) any Sockets applications running natively over IP will run slower. All of these points need to be considered when deciding whether to use the AnyNet/400 support. If not using AnyNet, ALWANYNET should be set to *NO.

Configuring AnyNet/400 APPC over IPX

In order to run APPC over IPX on your AS/400, the following OS/400 configuration steps are required:

1. Establish an IPX configuration between the systems.
2. Change the Network Attribute ALWANYNET to *YES.

3. Create an APPC controller with LINKTYPE(*ANYNW).
4. Add an entry to the APPN remote location list.
5. Add an SNA over IPX Location.

Network Extensions Installation

Please note that we do not cover the installation of NetWork Extensions (5733-SA1) in this book. Please refer to *AS/400 International Packet Exchange Support*, SC41-3400 for information on this.

The user ID, under which the APPC over IPX configuration is created, must have sufficient authority to access the relevant commands. Some of the commands require the user ID to have the IOSYSCFG authority. The examples shown here were created using a profile with QSECOFR authority.

1. **Establish an IPX configuration between the systems**

   A prerequisite for APPC over IPX is an IPX configuration between the systems. In this step we show the basic steps to establishing an IPX configuration between two systems. If your system already has an IPX configuration to the remote system with which you want to communicate via APPC over IPX, then you can skip this step and proceed to step 2 on page 216 in this section.

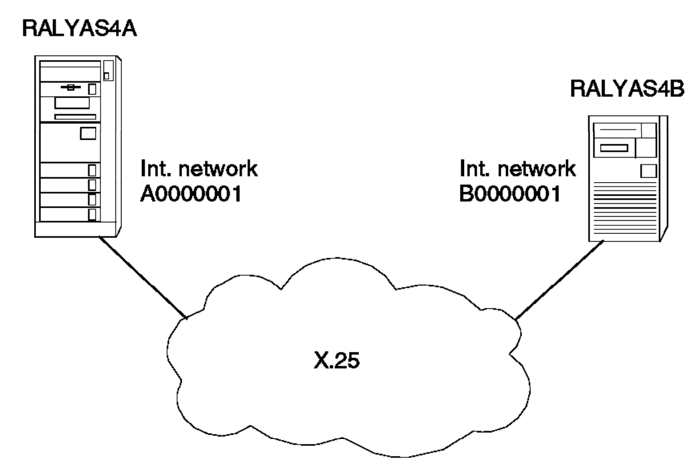

Figure 265. Two Systems Connected Using IPX

In the following panels we create the IPX configuration for RALYAS4A in Figure 265. The configuration steps for RALYAS4B will be the same except where noted throughout this chapter. Also, panels for RALYAS4B will be shown when relevant.

Line Description

The AS/400 line description defines the physical interface to the network. If an appropriate line description does not already exist (they can be shared), you need to create one. Here we use the CRTLINX25 command to create an X.25 line description. The parameters that will be different on RALYAS4B will be the Resource name and the Local network address.

```
                      Create Line Desc (X.25) (CRTLINX25)

 Type choices, press Enter.

 Line description . . . . . . . . > X25LINE       Name
 Resource name  . . . . . . . . . > LIN072        Name, *NWID
 Logical channel entries:
   Logical channel identifier . . > 001           001-FFF, *PROMPT
   Logical channel type . . . . . > *PVC          *PVC, *SVCIN, *SVCBOTH...
   PVC controller . . . . . . . .                 Name
              + for more values
 Local network address  . . . . . > 312
 Connection initiation  . . . . . > *LOCAL        *LOCAL, *REMOTE, *WAIT...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Physical interface . . . . . . .   *X21BISV24    *X21BISV24, *X21BISV35...
 Connection type  . . . . . . . .   *NONSWTPP     *NONSWTPP, *SWTPP
 Vary on wait . . . . . . . . . .   *NOWAIT       *NOWAIT, 15-180 (1 second)
 Line speed . . . . . . . . . . .   9600          *CALC, 600, 1200, 2400...
 Exchange identifier  . . . . . .   *SYSGEN       05600000-056FFFFF, *SYSGEN
 Extended network addressing  . .   *NO           *YES, *NO
                                                                    More...
```

```
                      Create Line Desc (X.25) (CRTLINX25)

 Type choices, press Enter.

 Maximum frame size . . . . . . .   1024          1024, 2048, 4096
 Default packet size:
   Transmit value . . . . . . . .   128           64, 128, 256, 512, 1024...
   Receive value  . . . . . . . .   *TRANSMIT     *TRANSMIT, 64, 128, 256...
 Maximum packet size:
   Transmit value . . . . . . . .   *DFTPKTSIZE   *DFTPKTSIZE, 64, 128,256...
   Receive value  . . . . . . . .   *TRANSMIT     *DFTPKTSIZE, *TRANSMIT,64...
 Modulus  . . . . . . . . . . . .   8             8, 128
 Default window size:
   Transmit value . . . . . . . .   2             1-15
   Receive value  . . . . . . . .   *TRANSMIT     1-15, *TRANSMIT
 Insert net address in packets  .   *YES          *YES, *NO
 Text 'description' . . . . . . .   Back-to-back X.25 to RALYAS4B

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

Figure 266. Configure X.25 Line

Note: In our test environment we did not use an actual X.25 network. We used a back-to-back X.25 connection with X.25 DCE support *YES specified in the X.25 line description of one system.

For an IPX configuration, there is no need to create controller and device descriptions, they are automatically created when IPX first uses the X.25 line.

The IPX configuration can be created with commands or by choosing options from the CFGIPX menu as shown in Figure 267 on page 211. Enter GO CFGIPX to access this menu.

```
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 267. Configure IPX Menu

IPX Description

An IPX description defines the characteristics of the local IPX node. Multiple IPX descriptions can be configured but only one can be active at a time. Use the command CRTIPXD or choose option 2 from the menu shown in Figure 267. The panel presented is shown in Figure 268 on page 212.

```
                         Create IPX Description (CRTIPXD)

Type choices, press Enter.

IPX description  . . . . . . . . > IPXDSRVCFG    Name
IPX internal network number  . . > A0000001      00000001-FFFFFFFE, *RANDOM
IPX routing protocol . . . . . .   *RIP          *NLSP, *RIP
IPX router name  . . . . . . . .   *NONE

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


                             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
F24=More keys
```

```
                         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
F24=More keys
```

Figure 268. Create IPX Description - RALYAS4A

```
                         Create IPX Description (CRTIPXD)

Type choices, press Enter.

IPX description  . . . . . . . . > IPXDCTLCFG    Name
IPX internal network number  . . > B0000001      00000001-FFFFFFFE, *RANDOM
IPX routing protocol . . . . . .   *RIP          *NLSP, *RIP
IPX router name  . . . . . . . .   *NONE

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


                             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
F24=More keys
```

Figure 269. Create IPX Description - RALYAS4B

The IPX internal network number represents the internal IPX network on this AS/400. It controls all of the services under the IPX protocol stack. The IPX internal network number must be unique within the whole network. We chose A0000001 for RALYAS4A and B0000001 for RALYAS4B. There is no default for this parameter.

The IPX routing protocol parameter controls 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 would specify *RIP.

IPX Circuit

An IPX circuit is a logical representation of a path for IPX communications. For a local area network (LAN), it defines the path or point of attachment from the IPX protocol layer to the IPX network. For a wide area network (WAN), it defines the path from the IPX protocol layer to a remote IPX node or system. Circuits are not physical objects. There must be at least one circuit defined for every line description with which you want to use IPX processing. To create a circuit, enter the command ADDIPXCCT or choose option 1 from the CFGIPX menu followed by option 1 (Work with IPX circuits) from the Configure IPX Circuits menu. The panels shown in Figure 270 on page 214 will be presented.

```
                           Add IPX Circuit (ADDIPXCCT)

Type choices, press Enter.

Circuit name . . . . . . . . . . > X25SRVCFG
Line description . . . . . . . . > X25LINE       Name
IPX network number . . . . . . . > 00000001      00000001-FFFFFFFD
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 . . . . .   *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
Cost override for NLSP . . . . .   *CALC         1-63, *CALC
                                                                      More...
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

```
                           Add IPX Circuit (ADDIPXCCT)

Type choices, press Enter.

Enable for IW2 . . . . . . . . .   *YES          *YES, *NO

                            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  . . . . . . . . . . .   *OFF          *ON, *OFF, *AUTO
RIP update interval  . . . . . .   60            30-300000
RIP age multiplier . . . . . . .   4             1-10
SAP state  . . . . . . . . . . .   *OFF          *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 270. Create IPX Circuit - RALYAS4A

```
                        Add IPX Circuit (ADDIPXCCT)

Type choices, press Enter.

Circuit name . . . . . . . . . . > X25CTLCFG
Line description . . . . . . . . > X25LINE       Name
IPX network number . . . . . . . > 00000001      00000001-FFFFFFFD
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 . . . . .   *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
Cost override for NLSP . . . . .   *CALC         1-63, *CALC
                                                                     More...
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

```
                        Add IPX Circuit (ADDIPXCCT)

Type choices, press Enter.

Enable for IW2 . . . . . . . . .   *YES          *YES, *NO

                           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  . . . . . . . . . . .   *OFF          *ON, *OFF, *AUTO
RIP update interval  . . . . . .   60            30-300000
RIP age multiplier . . . . . . .   4             1-10
SAP state  . . . . . . . . . . .   *OFF          *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 271. Create IPX Circuit - RALYAS4B

The circuit name uniquely identifies the circuit.

For an X.25 PVC connection (as in this example), the IPX Network number must be the same on both systems.

Specifying *OFF for RIP and SAP state will disable RIP and SAP on this circuit. The connection to the remote system will only be established for data.

Parameters are the same on both systems except for the circuit name.

IPX Circuit Route

An IPX circuit route is required because we have specified *OFF for RIP and SAP in the IPX circuits. A circuit route defines a static route to a circuit in the IPX configuration. A static route is associated with a certain circuit. It shows how to reach a remote node or network through that circuit. It also defines attributes needed for routing to that remote IPX node or network.

To create a circuit route, enter the command ADDCCTRTE, or take option 1 from the CFGIPX menu, followed by option 2 (Work with IPX circuit routes) from the Configure IPX Circuits menu to get the following panel.

```
                          Add Circuit Route (ADDCCTRTE)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > X25SRVCFG
 Remote IPX network number  . . . > B0000001      00000001-FFFFFFFE
 Number of hops . . . . . . . . .   1             1-127
 Number of ticks  . . . . . . . . > 30            1-32767




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

Figure 272. Create IPX Circuit Route - RALYAS4A

```
                          Add Circuit Route (ADDCCTRTE)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > X25CTLCFG
 Remote IPX network number  . . . > A0000001      00000001-FFFFFFFE
 Number of hops . . . . . . . . .   1             1-127
 Number of ticks  . . . . . . . . > 30            1-32767




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

Figure 273. Create IPX Circuit Route - RALYAS4B

The Circuit name specifies the IPX circuit to be used for this static route.

The Remote IPX network number specifies the remote IPX network number of the system that this route connects to.

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

Number of ticks specifies the number of ticks needed to reach the remote network. A tick equals 1/18th of a second.

2. Change the Network Attribute ALWANYNET to *YES

Now we start the AnyNet specific configuration steps. First we must change the ALWANYNET network attribute to *YES. Changing this attribute will allow support on your system for APPC over IPX, Sockets over SNA, APPC over IP and Sockets over IPX. The default for this value, when V3R1 is initially installed, is *NO. Use the DSPNETA command see what your system is set to. If it is set to *NO, use the command:

```
CHGNETA ALWANYNET(*YES)
```

After changing this attribute, you can verify the change by entering the DSPNETA command. The resulting displays are shown in the following figure.

```
                            Display Network Attributes
                                                               System:   RALYAS4A
Current system name  . . . . . . . . . . . . . . :   RALYAS4A
  Pending system name  . . . . . . . . . . . . . :
Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
Local control point name . . . . . . . . . . . . :   RALYAS4A
Default local location . . . . . . . . . . . . . :   RALYAS4A
Default mode . . . . . . . . . . . . . . . . . . :   BLANK
APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
Data compression . . . . . . . . . . . . . . . . :   *NONE
Intermediate data compression  . . . . . . . . . :   *NONE
Maximum number of intermediate sessions  . . . . :   200
Route addition resistance  . . . . . . . . . . . :   128
Server network ID/control point name . . . . . . :   *LCLNETID   *ANY

                                                                          More...
```

```
                            Display Network Attributes
                                                               System:   RALYAS4A
Alert status . . . . . . . . . . . . . . . . . . :   *ON
Alert logging status . . . . . . . . . . . . . . :   *ALL
Alert primary focal point  . . . . . . . . . . . :   *YES
Alert default focal point  . . . . . . . . . . . :   *NO
Alert backup focal point . . . . . . . . . . . . :
  Network ID . . . . . . . . . . . . . . . . . . :     *NONE
Alert focal point to request . . . . . . . . . . :   RAK
  Network ID . . . . . . . . . . . . . . . . . . :     USIBMRA
Alert controller description . . . . . . . . . . :   *NONE
Alert hold count . . . . . . . . . . . . . . . . :   0
Alert filter . . . . . . . . . . . . . . . . . . :   AS400NET
  Library  . . . . . . . . . . . . . . . . . . . :     QALSNDA
Message queue  . . . . . . . . . . . . . . . . . :   QSYSOPR
  Library  . . . . . . . . . . . . . . . . . . . :     QSYS
Output queue . . . . . . . . . . . . . . . . . . :   QPRINT
  Library  . . . . . . . . . . . . . . . . . . . :     QGPL
Job action . . . . . . . . . . . . . . . . . . . :   *FILE
                                                                          More...
```

```
                            Display Network Attributes
                                                               System:   RALYAS4A
Maximum hop count  . . . . . . . . . . . . . . . :   16
DDM request access . . . . . . . . . . . . . . . :   *OBJAUT
Client request access  . . . . . . . . . . . . . :   *OBJAUT
Default ISDN network type  . . . . . . . . . . . :
Default ISDN connection list . . . . . . . . . . :   QDCCNNLANY
Allow ANYNET support . . . . . . . . . . . . . . :   *YES
Network Server Domain  . . . . . . . . . . . . . :   RALYAS4A

                                                                         Bottom
Press Enter to continue.

F3=Exit   F12=Cancel
```

*Figure 274. Display of Network Attributes with ALWANYNET(*YES)*

Changing the ALWANYNET network attribute to *YES will result in the APPC over IPX job (QAPPCIPX) being started in the QSYSWRK subsystem.

3. **Create an APPC controller with LINKTYPE(*ANYNW)**

The AS/400 controller description defines the remote system. A new LINKTYPE has been added to the APPC controller description for AnyNet. With AnyNet, the APPC controller is no longer directly attached to a line description. Use the CRTCTLAPPC (Create APPC Controller Description) command to create an APPC controller with LINKTYPE(*ANYNW).

```
                    Create Ctl Desc (APPC) (CRTCTLAPPC)

Type choices, press Enter.

Controller description . . . . . > CTLAPPCIPX    Name
Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
Online at IPL  . . . . . . . . .   *YES          *YES, *NO
Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
Remote control point . . . . . . > IPXCPB        Name, *ANY
User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
Text 'description' . . . . . . . > APPC CTLD for SNA over IPX



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

*Figure 275. Create Controller Description with LINKTYPE(*ANYNW) - RALYAS4A*

```
                    Create Ctl Desc (APPC) (CRTCTLAPPC)

Type choices, press Enter.

Controller description . . . . . > CTLAPPCIPX    Name
Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
Online at IPL  . . . . . . . . .   *YES          *YES, *NO
Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
Remote control point . . . . . . > IPXCPA        Name, *ANY
User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
Text 'description' . . . . . . . > APPC CTLD for SNA over IPX



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

*Figure 276. Create Controller Description with LINKTYPE(*ANYNW) - RALYAS4B*

The Remote network identifier should match the local network identifier on the remote system. *NETATR indicates that the value in the network attributes should be used, that the local system and remote system have the same network ID. The Remote control point name, however, is not used external to the system. The remote control point name entered should match the value entered in the APPN remote location list.

APPC Device Description and Mode Description

The APPC device description will be automatically created when the above controller is activated.

Note: It is *not* possible to map an APPC mode to an IP type of service.

4. **Add an entry to the APPN remote location list**

   To communicate using APPC over IPX, the system requires an APPN remote location list entry for each remote system to which APPC over IPX will connect. APPC over IPX communications needs the information in the APPN remote location list to determine which controller description to use when it activates the session. Furthermore, the entry allows the AS/400 system to automatically configure the APPC device description.

   To update the APPN remote location list, use the following command:

   ```
   CHGCFGL *APPNRMT
   ```

```
                          Change Configuration List                    RALYAS4A
                                                                03/08/95  16:31:11
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote                Remote    Control
Remote    Network   Local       Control   Point     Location          Secure
Location  ID        Location    Point     Net ID    Password           Loc
RALYAS4B  *NETATR   RALYAS4A    IPXCPB    *NETATR   _______________    *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________    *NO
                                                                        More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 277. APPN Remote Location List Panel - RALYAS4A

```
                         Change Configuration List                 RALYAS4A
                                                         03/08/95  16:31:14
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote              Remote    Control
Remote    Network   Local     Control   Point     Location           Secure
Location  ID        Location  Point     Net ID    Password            Loc
RALYAS4A  *NETATR   RALYAS4B  IPXCPA    *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
                                                                    More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 278. APPN Remote Location List Panel - RALYAS4B

AS/400 APPN requires that all remote location names be unique. Thus, it cannot have the same remote location name and remote network ID in both its SNA network and its TCP/IP or IPX network.

- The Remote Location name should match the local location (LU) name at the remote system.
- The Local Location name should match the remote location (LU) name at the remote system.
- The Remote Network ID and Control Point Net ID should match the remote network identifier in the APPC controller with a LINKTYPE(*ANYNW). *NETATR indicates that the value in the network attributes should be used.
- The Remote Control Point name should match the remote control name in the APPC controller with a LINKTYPE(*ANYNW).

Any entry added to the APPN remote location list results in an entry in the local APPN topology database. However, the APPC over IPX entry will not be propagated to other systems in the APPN network; the entry is as an end node, only information on attached network nodes is propagated. No topology updates will flow as a result of adding the APPC over IPX entry. In addition to being used locally, the APPC over IPX entries will allow this system to respond to APPN search requests received for these LU names.

5. **Add an SNA over IPX Location**

   The add SNA over IPX location command is used to add a location name mapping entry. SNA over IPX location name mappings define the IPX addresses that are associated with each remote SNA location (LU Name and Network ID). They create a mapping from a remote SNA location to an IPX address. Enter the command `ADDSNILOC` or take option 20 from the CFGIPX menu.

```
                    Add SNA over IPX Location (ADDSNILOC)

Type choices, press Enter.

Remote location  . . . . . . . . > RALYAS4B      Name
Remote network identifier  . . . > *NETATR       Name, *NETATR
Remote IPX network number  . . . > B0000001      00000001-FFFFFFFD
Remote IPX node address  . . . . > *AS400        000000000001-FFFFFFFFFFFE...



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

Figure 279. Add an SNA over IPX Location - RALYAS4A

```
                    Add SNA over IPX Location (ADDSNILOC)

Type choices, press Enter.

Remote location  . . . . . . . . > RALYAS4A      Name
Remote network identifier  . . . > *NETATR       Name, *NETATR
Remote IPX network number  . . . > A0000001      00000001-FFFFFFFD
Remote IPX node address  . . . . > *AS400        000000000001-FFFFFFFFFFFE...



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

Figure 280. Add an SNA over IPX Location - RALYAS4B

The remote location name specifies the remote location to be associated with a specific remote IPX network number and remote IPX node address.

The remote network ID specifies the SNA remote network identifier to be associated with a specific remote IPX network number and remote IPX address. The remote location name and the remote network ID must match the APPC over IPX entry in the APPN remote configuration list.

The remote IPX network number specifies the remote IPX network to be associated with this SNA remote location.

The remote IPX node address specifies the remote IPX node to be associated with this SNA remote location. If the remote destination is an AS/400 this value must be *AS400.

APPC over IPX Addresses CL Commands

For those users that prefer to use CL commands, the following is a list of the CL commands that can be used to manage SNA over IPX locations:

- ADDSNILOC - Add SNA over IPX location
- CHGSNILOC - Change SNA over IPX location
- RMVSNILOC - Remove SNA over IPX location

Verifying the Scenario

In order to prove that the APPC over IPX connection is working, we can follow a step-by-step verification process. In a failing environment, this step-by-step process should help identify the failing area. Verification is shown in the following steps:

- AS/400 IPX Verification
- AS/400 APPC over IPX Verification

AS/400 IPX Verification

AnyNet/400 APPC over IPX requires an IPX configuration between the systems. This IPX configuration is established as if it were to be used by native IPX applications. There are no special IPX configuration requirements to allow APPC over IPX to use the native IPX configuration. Before we verify the APPC over IPX configuration, we will first verify the IPX native configuration.

The IPXPING command (also known as the VFYIPXCNN command) tests the Internetwork Packet Exchange (IPX) connection from a local system to a remote IPX system specified by the remote network number and remote node address parameters.

The verifications in this section was carried out between the RALYAS4A and RALYAS4B as shown in Figure 265 on page 209.

The command used is:

```
IPXPING RMTNETNBR(B0000001) RMTNDEADR(*AS400)
```

This command produces Figure 281 in the job log.

```
IPXPING RMTNETNBR(B0000001) RMTNDEADR(*AS400)
Verifying connection to remote system at network number B0000001, node
  address 000000000001.
Connection verification 1 took .281 seconds.  1 successful connection
  verifications.
Connection verification 2 took .280 seconds.  2 successful connection
  verifications.
Connection verification 3 took .283 seconds.  3 successful connection
  verifications.
Connection verification 4 took .280 seconds.  4 successful connection
  verifications.
Connection verification 5 took .279 seconds.  5 successful connection
  verifications.
Round-trip (in milliseconds) min/avg/max = 279/280/283
Connection verification statistics: 5 of 5 successful (100 %).
```

Figure 281. AS/400 IPXPING Command Job Log Information

Once we are satisfied that the IPX configuration is working fine, we can move on to verify the APPC over IPX configuration.

AS/400 APPC over IPX Verification

Having verified the native IPX configuration to the remote system, we can now verify the APPC over IPX configuration.

First we should check that the APPC over IPX job is running. The command WRKACTJOB SBS(QSYSWRK) will display the active jobs in the QSYSWRK subsystem. The APPC over IPX job QAPPCIPX should be active as shown in the following figure.

```
                              Work with Active Jobs                     RALYAS4A
                                                               03/08/95  17:24:02
CPU %:     .0     Elapsed time:   00:00:00     Active jobs:   63

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
_5     QAPPCIPX     QSYS        BCH      .0                    TIMW
__     QCQEPMON     QSVMSS      BCH      .0  PGM-QCQEPMON     MSGW
__     QCQRCVDS     QSVMSS      BCH      .0  PGM-QCQAPDRM     MSGW
__     QECS         QSVSM       BCH      .0  PGM-QNSECSJB     DEQW
__     QIPX         QSYS        BCH      .0                   DEQW
__     QMSF         QMSF        BCH      .0                   DEQW
__     QNSCRMON     QSVSM       BCH      .0  PGM-QNSCRMON     DEQW
__     QVARRCV      QSVMSS      BCH      .0  PGM-QVARRCV      DEQW
                                                                         More...
Parameters or command
===> _________________________________________________________________________
F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
F12=Cancel   F23=More options   F24=More keys
```

Figure 282. Work with Active Jobs Panel

If we look at the job log associated with QAPPCIPX, we see the following:

```
                                Display Job Log
                                                          System:   RALYAS4A
Job . . :   QAPPCIPX      User . . :   QSYS         Number . . . :   011338

 Job 034770/QSYS/QAPPCIPX started on 12/13/95 at 12:36:31 in subsystem
   QSYSWRK in QSYS. Job entered system on 12/13/95 at 12:36:30.
 Job 034770/QSYS/QAPPCIPX submitted.
 SNA over IPX job QAPPCIPX successfully started.




                                                                          Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F10=Display detailed messages   F12=Cancel
F16=Job menu           F24=More keys
```

Figure 283. Display Job Log (QAPPCIPX) Panel

Note

The APPC over IPX job (QAPPCIPX) is initially started when the Allow AnyNet support (ALWANYNET) network attribute is changed to *YES. If the job fails for any reason, it is necessary to stop IPX (ENDIPX), and start IPX (STRIPX) again to re-start the job.

Before we can use the AS/400 APPC over IPX configuration, we must Vary on the APPC controller description we created for the APPC over IPX connection. The Work with Configuration Status command can be used to show the status of the controller. For example, the following command resulted in the display shown in Figure 284.

```
WRKCFGSTS *CTL CTLAPPCIPX
```

```
                     Work with Configuration Status              RALYAS4A
                                                       03/08/95  16:30:11
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--------------
__   CTLAPPCIPX       VARIED OFF







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

Figure 284. Work with Configuration Status for Controller at RALYAS4A

To make the configuration available, use option 1 (Vary on). The configuration should then go to a VARIED ON status.

If the remote system is another AS/400, then STRPASTHR can be used to verify the configuration. For example:

```
STRPASTHR RMTLOCNAME(RALYAS4B) RMTNETID(USIBMRA)
```

An AS/400 command that can be used to verify an APPC configuration to *any* remote APPC system is STRMOD. For example:

```
STRMOD RMTLOCNAME(RALYAS4B) RMTNETID(USIBMRA)
Command STRMOD completed successfully for mode BLANK device RALYAS4B.
The STRMOD command completed successfully for all modes.
```

If the remote system was an AS/400 and the Allow AnyNet support Network attribute (ALWANYNET) was set to *NO, then STRMOD would fail in the following manner:

```
STRMOD RMTLOCNAME(RALYAS4B) RMTNETID(USIBMRA)
Session maximum not changed.  Command STRMOD failed.
The STRMOD command failed for one or more modes.
```

The QSYSOPR message queue message provided the following additional information:

```
BIND sense code X'80140000' received for mode BLANK device RALYAS4B.
```

With a session active, WRKCFGSTS shows the active session in the normal way.

```
                        Work with Configuration Status                RALYAS4A
                                                            03/08/95  16:40:03
 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--------------
 __   CTLAPPCIPX        ACTIVE
 __     RALYAS4B        ACTIVE
 __       BLANK         ACTIVE/SOURCE         WTR05207F   USERB       011387




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

Figure 285. Work with Configuration Status for Controller at RALYAS4A

The device description RALYAS4B was autocreated.

The ability to establish APPC over IPX sessions can be verified in many ways. Above we show the use of STRMOD, which results in a CNOS (Change Number of Sessions) LU6.2 command flowing to the remote system.

Another means of verifying the configuration is to use APING; this test tool is available for all IBM platforms and many non-IBM platforms. It functions, in an APPC environment, in a very similar way to PING in an IPX environment. See Appendix B, “APING” on page 349 for details of AS/400 APING. Figure 286 on page 227 shows the output from the command:

```
CALL APING RALYAS4A
```

```
  APING version 2.39 APPC echo test with timings.
    by Peter J. Schwaller (pjs@ralvm6.vnet.ibm.com)

  Allocate duration:                            0 ms

  Connected to a partner running on: OS/400

  Program startup and Confirm duration:      8000 ms

          Duration        Data Sent        Data Rate        Data Rate
          (msec)          (bytes)          (KB/s)           (Mb/s)
          --------        ---------        ---------        ---------
              1000              200              0.2            0.002
                 0              200
  Totals:     1000              400              0.4            0.003

  Duration statistics:   Min = 0   Ave = 500   Max = 1000


===> ____________________________________________________________________

F3=Exit F4=End of File F6=Print F9=Retrieve F17=Top
F18=Bottom  F19=Left   F20=Right F21=User Window
```

Figure 286. APING Sample Output between AS/400s

The APING example above was carried out from RALYAS4B in APPC over IPX scenario 1.

Following are the matching parameters between the systems.

RALYAS4A		RALYASB	
Network Attributes		**Network Attributes**	
ALWANYNET	*YES	ALWANYNET	*YES
LCLLOCNAME	RALYAS4A	LCLLOCNAME	RALYAS4B
LCLNETID	USIBMRA	LCLNETID	USIBMRA
IPX Description		**IPX Description**	
IPXD	IPXDSRVCFG	IPXD	IPXDCTLCFG
IPXNETNBR	A0000001	IPXNETNBR	B0000001
SNA over IPX Location		**SNA over IPX Location**	
RMTLOCNAME	RALYAS4B	RMTLOCNAME	RALYAS4A
RMTNETID	USIBMRA	RMTNETID	USIBMRA
RMTNETNBR	B0000001	RMTNETNBR	A0000001
RMTNDEADR	*AS400	RMTNDEADR	*AS400
APPC Controller Description		**APPC Controller Description**	
CTLD	CTLAPPCIPX	CTLD	CTLAPPCIPX
LINKTYPE	*ANYNW	LINKTYPE	*ANYNW
RMTNETID	USIBMRA	RMTNETID	USIBMRA
RMCPNAME	IPXCPB	RMCPNAME	IPXCPA
APPN Remote Location List		**APPN Remote Location List**	
RMTLOCNAME	RALYAS4B	RMTLOCNAME	RALYAS4A
RMTNETID	USIBMRA	RMTNETID	USIBMRA
LCLLOCNAME	RALYAS4A	LCLLOCNAME	RALYAS4B
RMCPNAME	IPXCPB	RMCPNAME	IPXCPA
CPNETID	USIBMRA	CPNETID	USIBMRA

Figure 287. APPC over IPX Matching Parameters Table

AnyNet/400 Sockets over IPX

This chapter presents the process of defining and verifying AnyNet/400 Sockets over IPX at the International Technical Support Organization in Raleigh.

The information is presented in the following sections:

1. Introduction to OS/400 Sockets over IPX
2. Using AnyNet/400 Sockets over IPX
3. Configuring AnyNet/400 Sockets over IPX
4. Sockets over IPX Scenarios
   - Sockets over IPX Scenario 1: AS/400 to AS/400 - Same Subnetwork
   - Sockets over IPX Scenario 2: AS/400 to AS/400 - Different Subnetworks
5. Verifying the Scenarios

For further information on AnyNet/400 IP over IPX refer to *AS/400 Internetwork Packet Exchange Support*, SC41-3400.

Introduction to OS/400 Sockets over IPX

In today's computing world, the consumer is able to choose from a vast number of application programs to help run and maintain their businesses. However, these applications are normally developed to run on a specific transport protocol. For example, the File Transfer Protocol (FTP) application was written to be used with the TCP/IP protocol. A company running IPX on their network would need to use an application developed for IPX protocols. A problem arises if this company finds that the FTP application is better suited to their file transfer needs than any IPX application. This was a problem in the past, but with the announcement of the AnyNet family of products, they can use the FTP application across their IPX network. AnyNet allows a company to choose the application programs that best meet the needs of their business without having to worry about the transport protocol they are using over their network.

AnyNet/400 is one member of the AnyNet family of products. AnyNet/400 is included with the base OS/400 Version 3 Release 1 Modification 0 or higher. Network Extensions (5733-SA1) provides OS/400 Version 3 Release 1 with IPX support. Network Extensions also provides AnyNet/400 support to allow sockets applications to run over IPX and APPC applications to run over IPX. In this chapter we look at sockets applications over IPX.

AnyNet/400 Sockets over IPX can be used by those customers who want to do the following:

- To run existing socket applications written to the AF_INET family over an existing IPX network
- To simplify their network by reducing the number of protocols being used

Specifically, Sockets over IPX support in AnyNet/400 allows sockets application programs to communicate between systems over an IPX network.

AnyNet/400 Sockets over IPX makes it possible to add BSD (Berkeley Software Distribution) sockets applications to existing IPX networks. This allows OS/400 users to use most sockets applications (for example, FTP, SMTP and SNMP) across an IPX network.

Using AnyNet/400 Sockets over IPX

The AnyNet/400 Sockets over IPX code requires the following:

- Network Extensions feature 5733-SA1.
- PTF Cumulative C5304310 (or later).
- Informational PTF II08907 for the Network Extensions feature. This contains pre and post installation instructions and lists other prerequisite PTF requirements.

Once AnyNet/400 Sockets over IPX has been configured, you will be able to run sockets applications over your existing IPX network. At the time that this book was written, the following sockets applications were supported under AnyNet/400:

- File Transfer Protocol (FTP)
- Remote Printing (LPD and LPR)
- Simple Network Management Protocol (SNMP)
- Simple Mail Transfer Protocol (SMTP)
- AS/400 DCE Base Services/400
- PING Server
- Any customer application written to AF_INET using sock_stream or sock_dgram (see below)

The following were not supported:

- TELNET - Still written in PASCAL interface
- PING client - Written to sock_raw

So, TELNET and PING client are not supported by AnyNet/400.

PING client

An OS/400 V3R1 PTF is now available which makes it possible to use the OS/400 PING client with AnyNet. The PTF number is SF25273.

AF_INET sockets applications using either the sock_stream or sock_dgram socket types will work but not those that use the sock_raw interface. The characteristics of a socket are determined by the following:

- Socket type
- Address family
- Protocol

The AS/400 sockets API will support the following three type of sockets:

- Sock_stream
- Sock_dgram
- Sock_raw

The AS/400 will also support the following two address families:

- AF_INET
- AF_UNIX

When we say AF_INET over IPX, we mean any AF_INET sockets application that uses sock_stream or sock_dgram will be supported by AnyNet/400. Note that sock_raw is *not* supported at this time.

The running of these applications is transparent to the user regardless of what transport protocol is being used. The user may, however, notice a performance degradation when using a sockets application via AnyNet/400 as opposed to running the same application natively under TCP/IP. Applications running on their native protocols may run faster than those running on a non-native protocol. The flexibility of the AnyNet/400 product should, however, outweigh any performance degradation.

It is important to note that if your system implements AnyNet/400 (the Network Attribute ALWANYNET is set to *YES), any sockets applications running natively over TCP/IP will run slower.

All of these points need to be considered when deciding whether to use the AnyNet/400 support. If not using AnyNet, ALWANYNET should be set to *NO.

Note

To use AnyNet/400 Sockets over IPX it is not necessary to have the TCP/IP Connectivity Utilities (5763-TC1) installed on your system. However, it is necessary to have this licensed program installed before we can use the FTP, LPD/LPR and SMTP TCP/IP applications. To see if this licensed program is installed on your system, enter the command `GO LICPGM` and take option 10.

Configuring AnyNet/400 Sockets over IPX

In order to run Sockets over IPX on your AS/400, the following OS/400 configuration steps are required:

1. Establish an IPX configuration between the systems.
2. Change the Network Attribute ALWANYNET to *YES.
3. Assign an IP address to your system for Sockets over IPX.
4. Define routes (if necessary) to the system(s) to which you will communicate.
5. Establish IP to IPX address mapping.

Note

Configuring AnyNet/400 Sockets over IPX can be a simple three-step process. In many situations steps 2, 3 and 5 only will be required.

Network Extensions Installation

Please note that we do not cover the installation of NetWork Extensions (5733-SA1) in this book. Please refer to *AS/400 International Packet Exchange Support*, SC41-3400 for information on this.

The user ID, under which the Sockets over IPX configuration is created, must have sufficient authority to access the relevant commands. Some of the commands require the user ID to have the IOSYSCFG authority. The examples shown here were created using a profile with QSECOFR authority.

1. **Establish an IPX configuration between the systems**

   A prerequisite for Sockets over IPX is an IPX configuration between the systems. In this step we show the basic steps to establishing an IPX configuration between two systems.

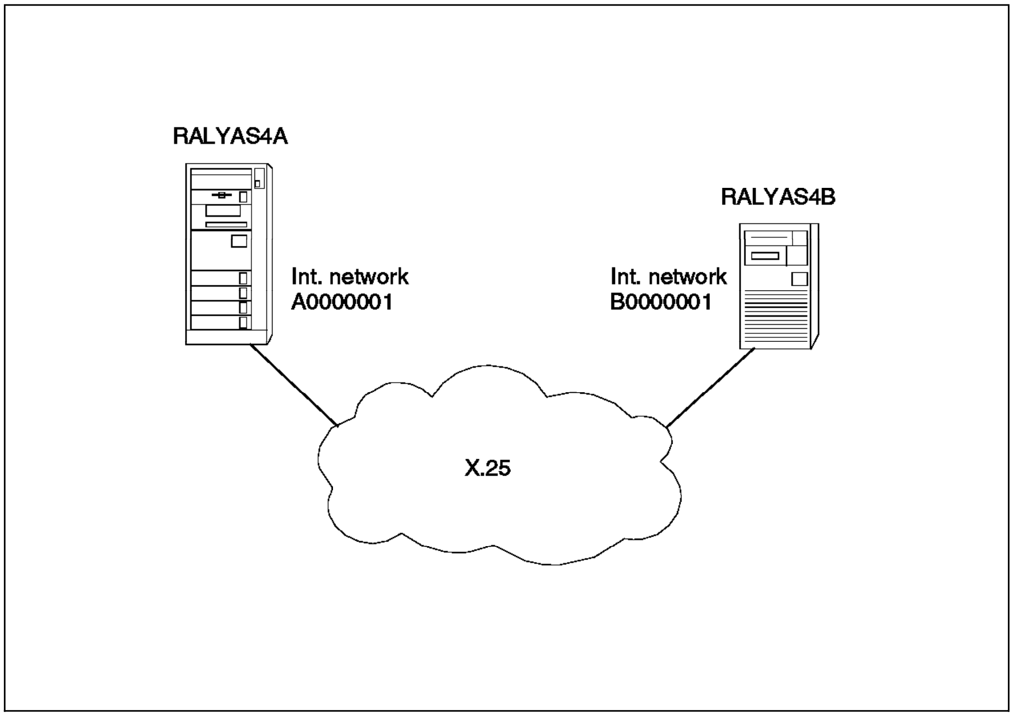

Figure 288. Two Systems Connected Using IPX

   In the following panels we create the IPX configuration for RALYAS4A in Figure 288. The configuration steps for RALYAS4B will be the same except where noted throughout this chapter. Also, panels for RALYAS4B will be shown when relevant.

   Line Description

   The AS/400 line description defines the physical interface to the network. If an appropriate line description does not already exist (they can be shared), you need to create one. Here we use the CRTLINX25 command to create an X.25 line description. The parameters that will be different on RALYAS4B will be the Resource Name and the Local network address.

```
                      Create Line Desc (X.25) (CRTLINX25)

Type choices, press Enter.

Line description . . . . . . . . > X25LINE       Name
Resource name  . . . . . . . . . > LIN072        Name, *NWID
Logical channel entries:
  Logical channel identifier . . > 001           001-FFF, *PROMPT
  Logical channel type . . . . . > *PVC          *PVC, *SVCIN, *SVCBOTH...
  PVC controller . . . . . . . .                 Name
             + for more values
Local network address  . . . . . > 312
Connection initiation  . . . . . > *LOCAL        *LOCAL, *REMOTE, *WAIT...
Online at IPL  . . . . . . . . .   *YES          *YES, *NO
Physical interface . . . . . . .   *X21BISV24    *X21BISV24, *X21BISV35...
Connection type  . . . . . . . .   *NONSWTPP     *NONSWTPP, *SWTPP
Vary on wait . . . . . . . . . .   *NOWAIT       *NOWAIT, 15-180 (1 second)
Line speed . . . . . . . . . . .   9600          *CALC, 600, 1200, 2400...
Exchange identifier  . . . . . .   *SYSGEN       05600000-056FFFFF, *SYSGEN
Extended network addressing  . .   *NO           *YES, *NO
                                                                   More...
```

```
                      Create Line Desc (X.25) (CRTLINX25)

Type choices, press Enter.

Maximum frame size . . . . . . .   1024          1024, 2048, 4096
Default packet size:
  Transmit value . . . . . . . .   128           64, 128, 256, 512, 1024...
  Receive value  . . . . . . . .   *TRANSMIT     *TRANSMIT, 64, 128, 256...
Maximum packet size:
  Transmit value . . . . . . . .   *DFTPKTSIZE   *DFTPKTSIZE, 64, 128,256...
  Receive value  . . . . . . . .   *TRANSMIT     *DFTPKTSIZE, *TRANSMIT,64...
Modulus  . . . . . . . . . . . .   8             8, 128
Default window size:
  Transmit value . . . . . . . .   2             1-15
  Receive value  . . . . . . . .   *TRANSMIT     1-15, *TRANSMIT
Insert net address in packets  .   *YES          *YES, *NO
Text 'description' . . . . . . .   Back-to-back X.25 to RALYAS4B

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

Figure 289. Configure X.25 Line

Note: In our test environment we did not use an actual X.25 network. We used a back-to-back X.25 connection with the X.25 DCE support (X25DCE) *YES specified in the X.25 line description on one of our systems.

For an IPX configuration, there is no need to create controller and device descriptions, they are automatically created when IPX first uses the X.25 line.

The IPX configuration can be created with commands or by choosing options from the CFGIPX Menu as shown in Figure 290 on page 234. Enter GO CFGIPX to access this menu.

```
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 290. Configure IPX Menu

IPX Description

An IPX description defines the characteristics of the local IPX node. Multiple IPX descriptions can be configured but only one can be active at a time. Use the command CRTIPXD or choose option 2 from the CFGIPX menu shown in Figure 290. The panel presented is shown in Figure 291 on page 235.

```
                          Create IPX Description (CRTIPXD)

 Type choices, press Enter.

 IPX description  . . . . . . . . > IPXDSRVCFG    Name
 IPX internal network number  . . > A0000001      00000001-FFFFFFFE, *RANDOM
 IPX routing protocol . . . . . .   *RIP          *NLSP, *RIP
 IPX router name  . . . . . . . .   *NONE

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


                              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
 F24=More keys
```

```
                          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
 F24=More keys
```

Figure 291. Create IPX Description - RALYAS4A

```
                         Create IPX Description (CRTIPXD)

Type choices, press Enter.

IPX description  . . . . . . . . > IPXDCTLCFG    Name
IPX internal network number  . . > B0000001      00000001-FFFFFFFE, *RANDOM
IPX routing protocol . . . . . .   *RIP          *NLSP, *RIP
IPX router name  . . . . . . . .   *NONE

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


                            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
F24=More keys
```

Figure 292. Create IPX Description - RALYAS4B

The IPX internal network number represents the internal IPX network on this AS/400. It controls all of the services under the IPX protocol stack. The IPX internal network number must be unique within the whole network. We chose A0000001 for RALYAS4A and B0000001 for RALYAS4B. There is no default for this parameter.

The IPX routing protocol parameter controls 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 would specify *RIP.

IPX Circuit

An IPX circuit is a logical representation of a path for IPX communications. For a local area network (LAN), it defines the path or point of attachment from the IPX protocol layer to the IPX network. For a wide area network (WAN), it defines the path from the IPX protocol layer to a remote IPX node or system. Circuits are not physical objects. There must be at least one circuit defined for every line description with which you want to use IPX processing. Type ADDIPXCCT or choose option 1 from the CFGIPX menu. followed by option 1 (Work with IPX circuits) from the Configure IPX Circuits menu. The panels shown in Figure 293 on page 237 will be presented.

```
                        Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Circuit name . . . . . . . . . . > X25SRVCFG
 Line description . . . . . . . . > X25LINE       Name
 IPX network number . . . . . . . > 00000001      00000001-FFFFFFFD
 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 . . . . .   *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
 Cost override for NLSP . . . . .   *CALC         1-63, *CALC
                                                                       More...
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

```
                        Add IPX Circuit (ADDIPXCCT)

 Type choices, press Enter.

 Enable for IW2 . . . . . . . . .   *YES          *YES, *NO

                           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  . . . . . . . . . . .   *OFF          *ON, *OFF, *AUTO
 RIP update interval  . . . . . .   60            30-300000
 RIP age multiplier . . . . . . .   4             1-10
 SAP state  . . . . . . . . . . .   *OFF          *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 293. Create IPX Circuit - RALYAS4A

```
                           Add IPX Circuit (ADDIPXCCT)

Type choices, press Enter.

Circuit name . . . . . . . . . . > X25CTLCFG
Line description . . . . . . . . > X25LINE       Name
IPX network number . . . . . . . > 00000001      00000001-FFFFFFFD
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 . . . . .   *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
Cost override for NLSP . . . . .   *CALC         1-63, *CALC
                                                                    More...
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

```
                           Add IPX Circuit (ADDIPXCCT)

Type choices, press Enter.

Enable for IW2 . . . . . . . . .   *YES          *YES, *NO

                            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  . . . . . . . . . . .   *OFF          *ON, *OFF, *AUTO
RIP update interval  . . . . . .   60            30-300000
RIP age multiplier . . . . . . .   4             1-10
SAP state  . . . . . . . . . . .   *OFF          *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 294. Create IPX Circuit - RALYAS4B

The circuit name uniquely identifies the circuit.

For an X.25 PVC connection (as in this example), the IPX Network number must be the same on both systems.

Specifying *OFF for RIP and SAP state will disable RIP and SAP on this circuit. The connection to the remote system will only be established for data.

Parameters are the same on both systems except for the circuit name.

IPX Circuit Route

An IPX circuit route is required because we have specified *OFF for RIP and SAP in the IPX circuits. A circuit route defines a static route to a circuit in the IPX configuration. A static route is associated with a certain circuit. It shows how to reach a remote node or network through that circuit. It also defines attributes needed for routing to that remote IPX node or network. To create a circuit route, Enter the command ADDCCTRTE, or take option 1 from the CFGIPX menu, followed by option 2 (Work with IPX circuit routes) from the Configure IPX Circuits menu to get the following panel.

```
                         Add Circuit Route (ADDCCTRTE)

Type choices, press Enter.

Circuit name . . . . . . . . . . > X25SRVCFG
Remote IPX network number  . . . > B0000001      00000001-FFFFFFFE
Number of hops . . . . . . . . .   1             1-127
Number of ticks  . . . . . . . . > 30            1-32767




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

Figure 295. Create IPX Circuit Route - RALYAS4A

```
                         Add Circuit Route (ADDCCTRTE)

Type choices, press Enter.

Circuit name . . . . . . . . . . > X25CTLCFG
Remote IPX network number  . . . > A0000001      00000001-FFFFFFFE
Number of hops . . . . . . . . .   1             1-127
Number of ticks  . . . . . . . . > 30            1-32767





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

Figure 296. Create IPX Circuit Route - RALYAS4B

The Circuit name specifies the IPX circuit to be used for this static route.

The Remote IPX network number specifies the remote IPX network number of the system that this route connects to.

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

Number of ticks specifies the number of ticks needed to reach the remote network. A tick equals 1/18th of a second.

2. **Change the Network Attribute ALWANYNET to *YES**

Now we start the AnyNet specific configuration steps. First we must change the ALWANYNET network attribute to *YES. Changing this attribute will allow Sockets over SNA, APPC over TCP/IP, Sockets over IPX, and APPC over IPX to run on your system. The default value, when V3R1 is initially installed, is *NO. Use the DSPNETA command to see what your system is set to. If it is set to *NO, use the following command:

```
CHGNETA ALWANYNET(*YES)
```

After changing this attribute, you can verify the change by entering the DSPNETA command. The resulting displays are shown next.

```
                         Display Network Attributes
                                                       System:   RALYAS4A
 Current system name . . . . . . . . . . . . . . :   RALYAS4A
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4A
 Default local location . . . . . . . . . . . . . :   RALYAS4A
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions . . . . :   200
 Route addition resistance . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY
                                                                  More...
```

```
                         Display Network Attributes
                                                       System:   RALYAS4A
 Alert status . . . . . . . . . . . . . . . . . . :   *ON
 Alert logging status . . . . . . . . . . . . . . :   *ALL
 Alert primary focal point . . . . . . . . . . . :   *YES
 Alert default focal point . . . . . . . . . . . :   *NO
 Alert backup focal point . . . . . . . . . . . . :
   Network ID . . . . . . . . . . . . . . . . . . :     *NONE
 Alert focal point to request . . . . . . . . . . :   RAK
   Network ID . . . . . . . . . . . . . . . . . . :     USIBMRA
 Alert controller description . . . . . . . . . . :   *NONE
 Alert hold count . . . . . . . . . . . . . . . . :   0
 Alert filter . . . . . . . . . . . . . . . . . . :   AS400NET
   Library . . . . . . . . . . . . . . . . . . . :     QALSNDA
 Message queue . . . . . . . . . . . . . . . . . :   QSYSOPR
   Library . . . . . . . . . . . . . . . . . . . :     QSYS
 Output queue . . . . . . . . . . . . . . . . . . :   QPRINT
   Library . . . . . . . . . . . . . . . . . . . :     QGPL
 Job action . . . . . . . . . . . . . . . . . . . :   *FILE
                                                                  More...
```

```
                         Display Network Attributes
                                                       System:   RALYAS4A
 Maximum hop count . . . . . . . . . . . . . . . :   16
 DDM request access . . . . . . . . . . . . . . . :   *OBJAUT
 Client request access . . . . . . . . . . . . . :   *OBJAUT
 Default ISDN network type . . . . . . . . . . . :
 Default ISDN connection list . . . . . . . . . . :   QDCCNNLANY
 Allow ANYNET support . . . . . . . . . . . . . . :   *YES
 Network Server Domain . . . . . . . . . . . . . :   RALYAS4A



                                                                   Bottom
 Press Enter to continue.

 F3=Exit   F12=Cancel
```

Figure 297. AS/400 Network Attributes - System RALYAS4A

3. **Assign an IP address to your local system for Sockets over IPX**

   We have to define a logical internet address on the system for use with Sockets over IPX. We do this by entering GO CFGIPX and taking option 10.

```
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
===> 10
_____________________________________________________________________________
F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 298. Configure Sockets over IPX - System RALYAS4A

```
                         Work with IP over IPX Interfaces
                                                            System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   9=Start   10=End

        Internet            Subnet              Interface
Opt     Address             Mask                Status
1_      9.67.60.20_____

  (No interfaces)


                                                                        Bottom
F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
F12=Cancel   F17=Top      F18=Bottom
```

Figure 299. AS/400 Work with IP over IPX Interfaces (1 of 2)

   Add an entry by entering 1 in the option field and typing in an IP address for Sockets over IPX. Your system administrator should help you determine what IP address to give to the system for use with Sockets over IPX.

   Note

   Your IP over IPX addresses must use a separate network (or subnetwork) to any other networks (or subnetworks) that you use. For example, if you already have a native TCP/IP network, Sockets over IPX must be allocated a separate network (or subnetwork) to this.

After entering the IP address, you will be prompted for a Subnet mask.

```
                    Add IP over IPX Interface (ADDIPIIFC)

Type choices, press Enter.

Internet address . . . . . . . . > '9.67.60.20'_____
Subnet mask  . . . . . . . . . .   255.255.255.0____





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

Figure 300. AS/400 Add IP over IPX Interface

Here again, your system administrator should be able to help you determine what subnet mask to use for your Sockets over IPX network.

In our case, we have chosen to use 9.67.60 for our Sockets over IPX network (subnet mask 255.255.255.0). Our system has a native TCP/IP connection to network 9.24.104 (subnet mask 255.255.255.0). The native TCP/IP address can be seen using the CFGTCP command and taking option 1. Shown in the following figure is the AS/400's IP over IPX interface. After creating this interface, it is automatically started and shows a status of ACTIVE.

```
                      Work with IP over IPX Interfaces
                                                          System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

        Internet            Subnet              Interface
 Opt    Address             Mask                Status


 _      _______________
 _      9.67.60.20          255.255.255.0       Active




                                                                      Bottom
 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 301. AS/400 Work with IP over IPX Interfaces (2 of 2)

Along with adding a new interface, the panel above allows you to either change, remove, start or end an existing interface.

This interface defines a logical interface and not a physical interface. It is not associated with any line description or network interface. This is illustrated in Figure 302 on page 243. The second entry represents our system's IP over IPX interface. Unlike the native TCP/IP interface (9.24.104.56), there is no line description associated with the Sockets over IPX interface (9.67.60.20). The value of *IPI indicates that this interface is used by Sockets over IPX.

NETSTAT Interface Information

The NETSTAT command gives network status information for all network types (native TCP/IP and Sockets over IPX). NETSTAT option 1 (Work with TCP/IP Interface Status) gives interface information for all interfaces (native TCP/IP and Sockets over IPX). The panel also shows whether or not the interface is active.

```
                      Work with TCP/IP Interface Status
                                                              System:   RALYAS4A
Type options, press Enter.
  5=Display details   8=Display associated routes   9=Start   10=End
  12=Work with configuration status

     Internet         Network           Line      Interface
Opt  Address          Address          Description  Status
__   9.24.104.56      9.24.104.0       TRN2619      Active
__   9.67.60.20       9.67.60.0        *IPI         Active
__   127.0.0.1        127.0.0.0        *LOOPBACK    Active




                                                                        Bottom
F3=Exit   F4=Prompt   F5=Refresh   F11=Display line information   F12=Cancel
F13=Sort by column    F24=More keys
```

Figure 302. Work with TCP/IP Interface Status - System RALYAS4A

From this display you can start or end any of the interfaces listed. This screen is a quick way of viewing the status of both your TCP/IP interfaces and your IP over IPX interfaces.

IP over IPX Interface CL Commands

For those users that prefer to use CL commands, the following is a list of the CL commands that can be used to manage IP over IPX interfaces:

- ADDIPIIFC - Add IP over IPX interface
- CHGIPIIFC - Change IP over IPX interface
- RMVIPIIFC - Remove IP over IPX interface
- STRIPIIFC - Start IP over IPX interface
- ENDIPIIFC - End IP over IPX interface

4. **Define routes (if necessary) to the systems to which you will communicate**

   It may be necessary to define a route to the remote system for IP over IPX.

   As with native TCP/IP, a route definition is required when the remote system is in a different network (or subnetwork) to the local system.

   The system automatically builds a route that gives access to systems that are in the same network as the local system.

   A route is assigned by entering the GO CFGIPX command and taking option 11.

```
                         Work with IP over IPX Routes
                                                          System:   RALYAS4A
 Type options, press Enter.
   1=Add   4=Remove

         Route               Subnet              Next
 Opt     Destination         Mask                Hop
 1_      xxx.xxx.xxx.xxx     _______________     _______________

   (No Routes)







                                                                      Bottom
 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 303. AS/400 Work with IP over IPX Routes

The Route Destination can be the address of a network, subnetwork or a specific host. For example, a Route Destination for all hosts in the 112.2.3 subnetwork would be identified by entering 112.2.3.0 for the Route destination with a Subnet Mask of 255.255.255.0. A Subnet Mask value of *HOST indicates that the internet address value specified in the Route Destination field is a host address; the Subnet Mask value is calculated to be 255.255.255.255. If the Internet address value specified for the Route Destination field is the address of a network or subnetwork, you must specify a value other than *HOST for the Subnet Mask field.

Note

Where the dominant network is Sockets over IPX or where there is Sockets over IPX on a system with no native TCP/IP interface, it is possible to use the default route entry (*DFTROUTE) for Sockets over IPX.

Remote System in a Different Network to Local System

In Figure 304, the remote system is in a different Sockets over IPX network (subnetwork) to the local system, it is therefore necessary to define a route to that system.

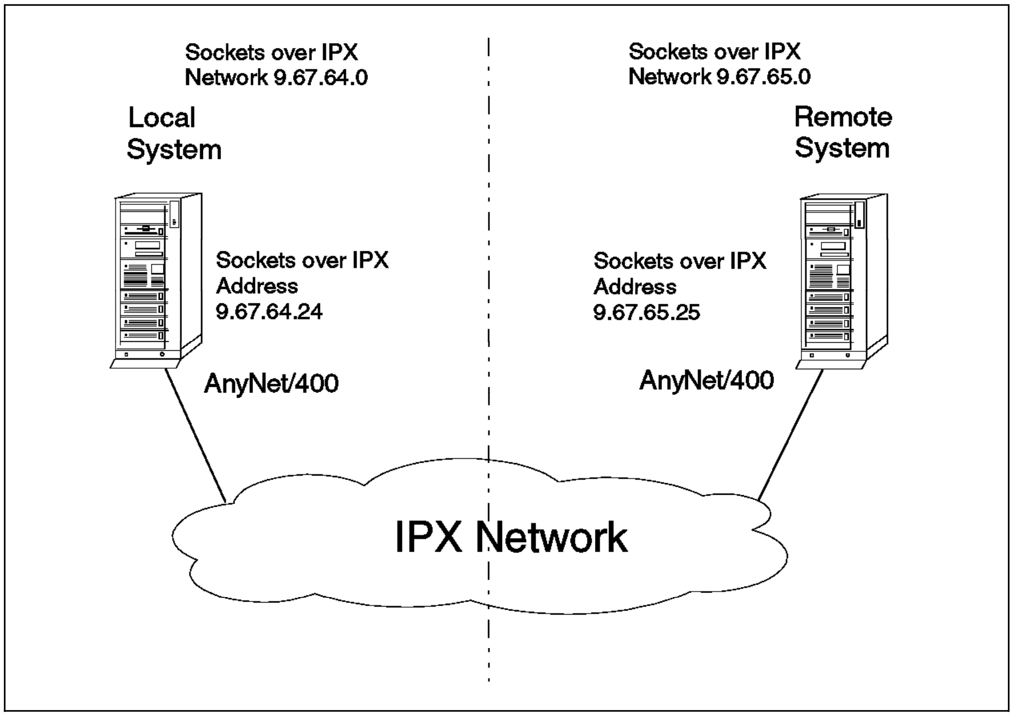

Figure 304. Two Systems Connected Via IPX - Using Different IP over IPX Subnets

The following displays show the route entries that should be entered on both systems. These routes will enable each system to access the other, via Sockets over IPX. Route entry for local system:

```
                        Work with IP over IPX Routes
                                                          System:   LOCALSYS
Type options, press Enter.
  1=Add   4=Remove

       Route              Subnet             Next
Opt    Destination        Mask               Hop
 _     _______________    _______________    _______________
 _     9.67.65.0          255.255.255.0      9.67.64.24




                                                                      Bottom
F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
F12=Cancel   F17=Top      F18=Bottom
```

Figure 305. IP over IPX Route Entry for Local System

The above entry allows the local system to communicate with any host in the 9.67.65 network. We could have used a Route Destination of 9.67.65.25 with a Subnet Mask of *HOST, but this would only allow this system to communicate with the single remote system.

Route entry for remote system:

```
                          Work with IP over IPX Routes
                                                             System:   REMOTSYS
 Type options, press Enter.
   1=Add   4=Remove

         Route               Subnet              Next
 Opt     Destination         Mask                Hop
  _      _______________     _______________     _______________
  _      9.67.64.0           255.255.255.0       9.67.65.25




                                                                          Bottom
 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 306. IP over IPX Route Entry for Remote System

The above entry allows the remote system to communicate with any host in the 9.67.64 network. We could have used a Route Destination of 9.67.64.24 with a Subnet Mask of *HOST, but this would only allow this system to communicate with the single remote system.

Note that in both cases the Next Hop is the local IP over IPX interface internet address.

IP over IPX Route CL Commands

For those users that prefer to use CL commands, the following is a list of the CL commands that can be used to manage IP over SNA routes:

- ADDIPIRTE - Add IP over IPX route
- RMVIPIRTE - Remove IP over IPX route

5. **Establish IP address to IPX address mapping**

We now map the logical IP over IPX addresses to IPX addresses. To do this, take option 12 from the CFGIPX menu, to work with IP over IPX addresses.

```
                        Work with IP over IPX Addresses
                                                             System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove


         Remote              Subnet              Remote IPX    Remote IPX
 Opt     Destination         Mask                 Network      Node Address
  1     9.67.60.21_____     *HOST__________




 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 307. AS/400 Work with IP over IPX Addresses (1 of 2)

The Work with IP over IPX Addresses display is used to add IP to IPX address mapping. It can also be used to change or remove the mappings and display the existing IP to IPX address mappings.

The Remote destination specifies the logical IP address of the remote host or network. In combination with the subnet mask, the remote destination will be identified as a system or network.

The subnet mask is used to indicate whether the Remote Destination is a system or a network. If the remote destination is a system, *HOST is specified. If the remote destination is a network, the subnet mask associated with that network should be specified.

Add an entry by entering 1 in the option field and typing in the logical IP address of the remote destination and a subnet mask entry. Your system administrator should help you determine what IP address and subnet mask to give to the system to use with Sockets over IPX.

After entering the IP address and subnet mask you will be presented with the following display.

```
                      Add IP over IPX Address (ADDIPIADR)

Type choices, press Enter.

Remote destination . . . . . . . > '9.67.60.21'
Subnet mask  . . . . . . . . . . > *HOST
Remote IPX network number  . . .   *CALC        00000001-FFFFFFFD, *CALC
Remote IPX node address  . . . .   *CALC        000000000001-FFFFFFFFFFFE...









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

Figure 308. Adding an IP over IPX Address

The remote IPX network number specifies the remote IPX network number associated with this IP network or IP address. When the remote system is an AS/400, the internal IPX network number configured in that system's IPX description would be entered for this parameter.

The Remote IPX node address specifies the remote IPX node number associated with this IP network, subnetwork or IP host. When configuring an IP over IPX address mapping entry and the remote destination is an AS/400, the remote node address value must be equal to *CALC. If the remote destination is actually a network with one or more AS/400s on that network, any valid remote node address value may be entered.

Mapping Algorithm

The *CALC parameter is used to indicate that the mapping is algorithmic. When *CALC is used for remote IPX network number or remote IPX node address mapping, the IPX source node address is equal to 4000. This is concatenated with the remote destination IP address which is converted into the character representation of its hexadecimal form.

For example, if the IP address 9.5.1.69 is configured, then the IPX node would be calculated to be 400009050145.

This mapping algorithm is widely used in current Novell Networks.

In our case, the remote system is an AS/400 with an internal IPX network number of B0000001 so we entered the following:

```
                   Add IP over IPX Address (ADDIPIADR)

Type choices, press Enter.

Remote destination . . . . . . . > '9.67.60.21'_____
Subnet mask  . . . . . . . . . . > *HOST____________
Remote IPX network number  . . .   B0000001      00000001-F FFFFFFD, *CALC
Remote IPX node address  . . . .   *CALC_______  0000000000 01-FFFFFFFFFFFE...








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

Figure 309. Adding an IP over IPX Address

Pressing the Enter key results in the following panel:

```
                     Work with IP over IPX Addresses
                                                        System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove

        Remote              Subnet              Remote IPX     Remote IPX
 Opt    Destination         Mask                 Network       Node Address
  _     _______________     _______________
  _     9.67.60.21          *HOST                B0000001      *CALC










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

Figure 310. Work with IP over IPX Addresses (2 of 2)

IP over IPX Addresses CL Commands

For those users that prefer to use CL commands, the following is a list of the CL commands that can be used to manage IP over IPX addresses:

- ADDIPIADR - Add IP over IPX addresses
- CHGIPIADR - Change IP over IPX addresses
- RMVIPIADR - Remove IP over IPX addresses

With all of the configuration steps completed, you are now ready to use the Sockets over IPX support of AnyNet/400. The next section shows specific Sockets over IPX configuration scenarios.

Sockets over IPX Scenarios

This section presents the scenarios we used to verify the different Sockets over IPX implementations. Each scenario contains a diagram showing the actual environment, AS/400 configuration displays and a matching parameters list.

The following scenarios will be covered in this section:

- Sockets over IPX Scenario 1: AS/400 to AS/400 - Same Subnetwork
- Sockets over IPX Scenario 2: AS/400 to AS/400 - Different Subnetworks

Sockets over IPX Scenario 1: AS/400 to AS/400 - Same Subnetwork

This configuration is the simplest and likely to be the most common. It is also an example of a configuration that should be set up prior to moving on to a more complex configuration.

Shown in the following figure are the two systems used in this scenario and their respective IP over IPX internet addresses. An IPX configuration is already in place between the systems using the IPX addresses shown.

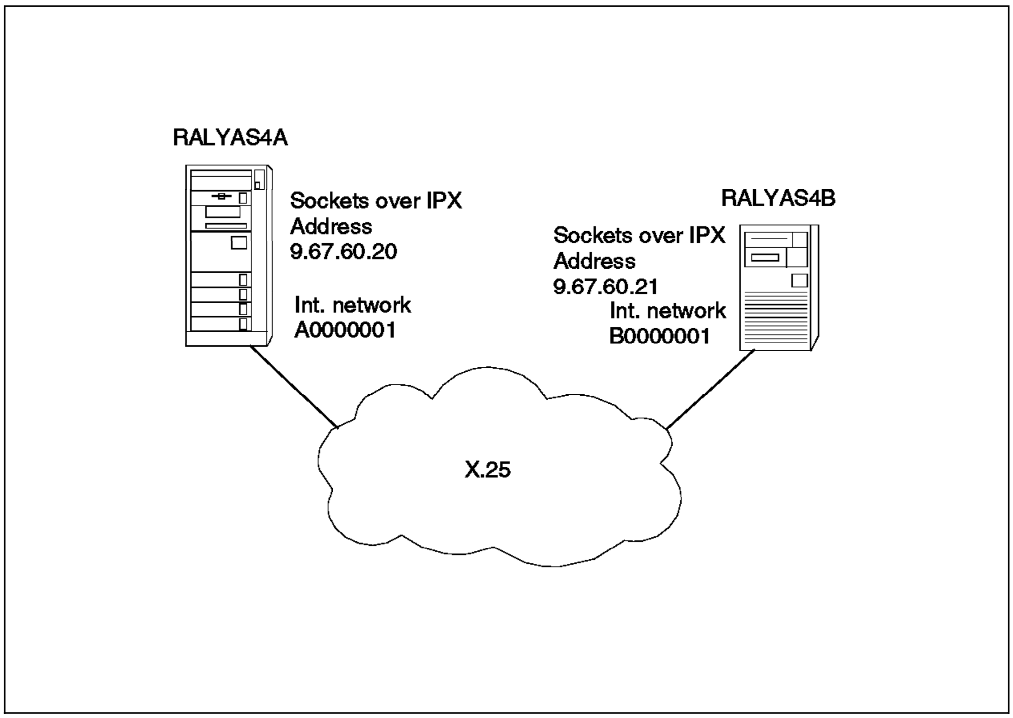

Figure 311. Addresses Used for Sockets over IPX Scenario 1

The following series of panels show the AS/400 configuration screens taken from the RALYAS4A and RALYAS4B systems. They illustrate the configuration steps required for this Sockets over IPX scenario.

First we must check that Allow ANYNET Support is set to *YES in the network attributes of each system. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Next, we configure an IP over IPX interface on RALYAS4A.

```
                         Work with IP over IPX Interfaces
                                                            System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   9=Start   10=End

        Internet            Subnet              Interface
Opt     Address             Mask                Status
__      _______________
__      9.67.60.20          255.255.255.0       Active




                                                                        Bottom

F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
F12=Cancel   F17=Top      F18=Bottom
```

Figure 312. Scenario 1: Work with IP over IPX Interfaces - System RALYAS4A

The subnet mask of 255.255.255.0 indicates that the first three bytes of the internet address (9.67.60) is the network ID.

In the following panel we configure an IP over IPX interface on RALYAS4B.

```
                         Work with IP over IPX Interfaces
                                                            System:   RALYAS4B
Type options, press Enter.
  1=Add   2=Change   4=Remove   9=Start   10=End

        Internet            Subnet              Interface
Opt     Address             Mask                Status
__      _______________
__      9.67.60.21          255.255.255.0       Active




                                                                        Bottom

F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
F12=Cancel   F17=Top      F18=Bottom
```

Figure 313. Scenario 1: Work with IP over IPX Interfaces - System RALYAS4B

No routes are required in this scenario; both systems are in the same Sockets over IPX network (9.67.60).

In the following panels we have configured the IP over IPX addresses for both systems.

```
                        Work with IP over IPX Addresses
                                                           System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove


        Remote              Subnet              Remote IPX      Remote IPX
 Opt    Destination         Mask                 Network        Node Address
  _     _______________     _______________
  _     9.67.60.21          *HOST                B0000001       *CALC






                                                                      Bottom

 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 314. Scenario 1: Work with IP over IPX Addresses - System RALYAS4A

```
                        Work with IP over IPX Addresses
                                                           System:   RALYAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove


        Remote              Subnet              Remote IPX      Remote IPX
 Opt    Destination         Mask                 Network        Node Address
  _     _______________     _______________
  _     9.67.60.20          *HOST                A0000001       *CALC








 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
 (C) COPYRIGHT IBM CORP. 1980, 1994.
```

Figure 315. Scenario 1: Work with IP over IPX Addresses - System RALYAS4B

Shown next are the matching parameters between systems RALYAS4A and RALYAS4B.

RALYAS4A		RALYAS4B	
Network Attributes		Network Attributes	
ALWANYNET	*YES	ALWANYNET	*YES
IPX Description		IPX Description	
IPXD	RALYAS4A	IPXD	RALYAS4B
IPXNETNBR	A0000001	IPXNETNBR	B0000001
Add IP over IPX Interface		Add IP over IPX Interface	
INTNETADR	9.67.60.20	INTNETADR	9.67.60.21
SUBNETMASK	255.255.255.0	SUBNETMASK	255.255.255.
Add IP over IPX Address		Add IP over IPX Address	
RMTDEST	9.67.60.21	RMTDEST	9.67.60.20
SUBNETMASK	*HOST	SUBNETMASK	*HOST
RMTNETNBR	B0000001	RMTNETNBR	A0000001
RMTNDEADR	*CALC	RMTNDEADR	*CALC

Figure 316. Sockets over IPX Scenario 1: Matching Parameters Table

Sockets over IPX Scenario 2: AS/400 to AS/400 - Different Subnetworks

In this scenario, two AS/400s communicate with each other via Sockets over IPX but from different IP networks (subnetworks).

Shown in the following figure are the two systems used in this scenario and their respective IP over IPX internet addresses. An IPX configuration is already in place between the systems using the IPX addresses shown.

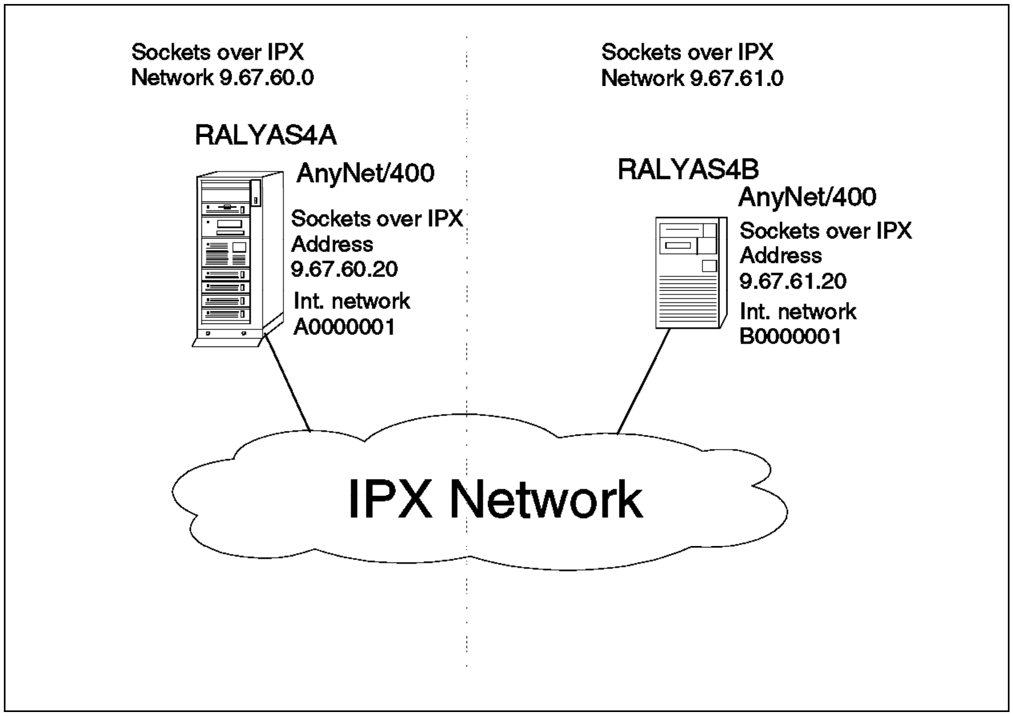

Figure 317. Systems and Addresses Used for Sockets over IPX Scenario 2

The following series of panels show the AS/400 configuration screens taken from the RALYAS4A and RALYAS4B systems. They illustrate the configuration steps required for this Sockets over IPX scenario.

First we must check that Allow ANYNET Support is set to *YES in the network attributes of each system. Use DSPNETA to determine this, and if necessary, use CHGNETA ALWANYNET(*YES) to change.

Next, we configure an IP over IPX interface on RALYAS4A.

```
                         Work with IP over IPX Interfaces
                                                             System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

         Internet            Subnet              Interface
 Opt     Address             Mask                Status

 __      _______________
 __      9.67.60.20          255.255.255.0       Active




                                                                         Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 318. Scenario 2: Work with IP over IPX Interfaces - System RALYAS4A

The subnet mask of 255.255.255.0 indicates that the first three bytes (9.67.60) of the internet address is the network ID.

Next, we configure an IP over IPX interface on RALYAS4B.

```
                         Work with IP over IPX Interfaces
                                                             System:   RALYAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove   9=Start   10=End

         Internet            Subnet              Interface
 Opt     Address             Mask                Status

 __      _______________
 __      9.67.61.20          255.255.255.0       Active




                                                                         Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP interfaces
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 319. Scenario 2: Work with IP over IPX Interfaces - System RALYAS4B

The subnet mask of 255.255.255.0 indicates that the first three bytes (9.67.61) of the internet address is the network ID.

In this scenario RALYAS4A and RALYAS4B are in different Sockets over IPX networks (subnetworks). We must therefore define a route on each system.

First we configure an IP over IPX route on RALYAS4A.

```
                          Work with IP over IPX Routes
                                                                System:   RALYAS4A
 Type options, press Enter.
   1=Add   4=Remove

         Route                Subnet               Next
 Opt     Destination          Mask                 Hop
  _      _______________      _______________      _______________
  _      9.67.61.0            255.255.255.0        9.67.60.20




                                                                            Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 320. Scenario 2: Work with IP over IPX Routes - RALYAS4A

In the following panel we configure an IP over IPX route on RALYAS4B.

```
                          Work with IP over IPX Routes
                                                                System:   RALYAS4B
 Type options, press Enter.
   1=Add   4=Remove

         Route                Subnet               Next
 Opt     Destination          Mask                 Hop
  _      _______________      _______________      _______________
  _      9.67.60.0            255.255.255.0        9.67.61.20




                                                                            Bottom

 F3=Exit      F5=Refresh   F6=Print list   F10=Work with TCP/IP routes
 F12=Cancel   F17=Top      F18=Bottom
```

Figure 321. Scenario 2: Work with IP over IPX Routes - RALYAS4B

The route examples shown allow each system to communicate with any system in the remote Sockets over IPX network. Instead of the examples shown, we could have entered specific entries that *only* allowed communications between the two systems shown. These specific entries would have the following values:

```
RALYAS4A
        Route               Subnet              Next
        Destination         Mask                Hop

        9.67.61.20          *HOST               9.67.60.20

RALYAS4B
        Route               Subnet              Next
        Destination         Mask                Hop

        9.67.60.20          *HOST               9.67.61.20
```

Lastly we configure the IP over IPX Addresses on each system.

```
                         Work with IP over IPX Addresses
                                                              System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove


         Remote              Subnet              Remote IPX    Remote IPX
 Opt     Destination         Mask                 Network      Node address
  _      _______________     _______________
  _      9.67.61.20          *HOST               B0000001     *CALC





                                                                          Bottom

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

Figure 322. Scenario 2: Work with IP over IPX Addresses - System RALYAS4A

```
                         Work with IP over IPX Addresses
                                                              System:   RALYAS4B
 Type options, press Enter.
   1=Add   2=Change   4=Remove


         Remote              Subnet              Remote IPX    Remote IPX
 Opt     Destination         Mask                 Network      Node address
  _      _______________     _______________
  _      9.67.60.20          *HOST               A0000001      *CALC







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

Figure 323. Scenario 2: Work with IP over IPX Addresses - System RALYAS4B

Shown next are the matching parameters between systems RALYAS4A and RALYAS4B.

```
RALYAS4A                               RALYAS4B

Network Attributes                     Network Attributes
   ALWANYNET     *YES                     ALWANYNET    *YES

IPX Description                        IPX Description
   IPXD          RALYAS4A                 IPXD         RALYAS4B
   IPXNETNBR     A0000001                 IPXNETNBR    B0000001

Add IP over IPX Interface              Add IP over IPX Interface
   INTNETADR     9.67.60.20               INTNETADR    9.67.61.20
   SUBNETMASK    255.255.255.0            SUBNETMASK   255.255.255.0

Add IP over IPX Route                  Add IP over IPX Route
   RTEDEST       9.67.61.0                RTEDEST      9.67.60.0
   SUBNETMASK    255.255.255.0            SUBNETMASK   255.255.255.0
   NEXTHOP       9.67.60.20               NEXTHOP      9.67.61.20


Add IP over IPX Address                Add IP over IPX Address
   RMTDEST       9.67.61.20               RMTDEST      9.67.60.20
   SUBNETMASK    *HOST                    SUBNETMASK   *HOST
   RMTNETNBR     B0000001                 RMTNETNBR    A0000001
   RMTNDEADR     *CALC                    RMTNDEADR    *CALC
```

Figure 324. Sockets over IPX Scenario 2: Matching Parameters Table

Verifying the Scenarios

In order to prove that the Sockets over IPX connection is working we can follow a step-by-step verification process. In a failing environment, this step-by-step process should help identify the failing area.

AnyNet/400 Sockets over IPX Verification

The verification of Sockets over IPX should be carried out in the following stages:

- AS/400 IPX Verification
- AS/400 Sockets over IPX Verification

Note

The verifications shown in this section were carried out from RALYAS4A in Sockets over IPX scenario 1.

AS/400 IPX Verification

AnyNet/400 Sockets over IPX requires an IPX configuration between the systems. This IPX configuration is established as if it were to be used by native IPX applications. There are no special IPX configuration requirements to allow Sockets over IPX to use the IPX configuration. Before we verify the Sockets over IPX configuration, we should verify the native IPX configuration. In our example we will use the IPXPING command on to verify the configuration. The results of the IPXPING can be displayed by entering the DSPJOBLOG command and using F10 to display the detailed messages. The following shows IPXPING has been run on RALYAS4A to verify that RALYAS4B can be reached.

```
IPXPING RMTNETNBR(B0000001) RMTNDEADR(*AS400)
Verifying connection to remote system at network number B0000001, node
  address 000000000001.
Connection verification 1 took .280 seconds.  1 successful connection
  verifications.
Connection verification 2 took .279 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 .280 seconds.  5 successful connection
   verifications.
 Round-trip (in milliseconds) min/avg/max = 279/279/280
 Connection verification statistics: 5 of 5 successful (100 %).
```

Figure 325. AS/400 IPXPING Job Log Information

AS/400 Sockets over IPX Verification

Having verified the native IPX configuration to the remote system, we can now verify the Sockets over IPX configuration.

Before we can use an AS/400 TCP/IP application with Sockets over IPX, we must start the server for that application on the AS/400. To start the FTP application server (the application we use in this verification), enter the command:

```
STRTCPSVR SERVER(*FTP)
```

Alternatively we can start TCP/IP on the AS/400. To do this, enter the command STRTCP. In the examples that follow we have used the STRTCP command. By default, STRTCP will start the FTP server.

The NETSTAT (Network Status) command can be used to display the status of Sockets over IPX interfaces, routes and connections in addition to native TCP/IP network status. We can use NETSTAT option 1 (Work with TCP/IP Interface Status) to verify that the Sockets over IPX interface is active.

```
                      Work with TCP/IP Interface Status
                                                              System:   RALYAS4A
 Type options, press Enter.
   5=Display details   8=Display associated routes   9=Start   10=End
   12=Work with configuration status

      Internet          Network             Line      Interface
 Opt  Address           Address          Description  Status
      9.24.104.56       9.24.104.0       TRN2619      Active
      9.67.60.20        9.67.60.0        *IPI         Active
      127.0.0.1         127.0.0.0        *LOOPBACK    Active










                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F11=Display line information   F12=Cancel
 F13=Sort by column    F24=More keys
```

Figure 326. NETSTAT Work with TCP/IP Interface Status

Figure 326 shows the status of both the native TCP/IP interface (9.24.104.56) and the Sockets over IPX interface (9.67.60.20). From this display we can verify that the local IP over IPX interface is active and hence available for use. If not available (Inactive), we can use option 9 to make it available.

NETSTAT option 2 (Display TCP/IP route information) gives route information for all routes (native TCP/IP and Sockets over IPX). The display also shows whether or not the route is available.

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

      Route            Subnet           Next              Route
 Opt  Destination      Mask             Hop             Available
  _   9.67.60.0        255.255.255.0    *DIRECT           *YES
  _   9.24.104.0       255.255.255.0    *DIRECT           *YES
  _   9.67.61.0        255.255.255.0    9.67.60.20        *YES
  _   127.0.0.0        255.0.0.0        *DIRECT           *YES
  _   *DFTROUTE        *NONE            9.24.104.1        *YES




                                                                        Bottom
 F3=Exit   F5=Refresh   F6=Print list   F11=Display route type   F12=Cancel
 F13=Sort by column     F17=Top         F18=Bottom
```

Figure 327. NETSTAT Display TCP/IP Route Information

The NETSTAT option 2 example in Figure 327 is from a system with both a native TCP/IP configuration and a Sockets over IPX configuration. The first two entries were automatically added when the native TCP/IP and Sockets over IPX interfaces were added (a native TCP/IP interface with an internet address of 9.24.104.56 and a subnet mask of 255.255.255.0, a Sockets over IPX interface with an internet address of 9.67.60.20 and a subnet mask of 255.255.255.0). These entries give access to systems in the same network as the local system. Note that the next hop for these entries is *DIRECT, go use the local interface. The third entry is the result of adding a Sockets over IPX route with a route destination of 9.67.61.0, subnet mask of 255.255.255.0 and next hop of 9.67.60.20. Note that the next hop for this entry is the address of the local IP over IPX interface. The fourth entry is the loopback entry. The last entry is the default route on the system; in this example, the default route is for native TCP/IP with a next hop of 9.24.104.1. We can use this display to verify that a route is available to the remote system with which we want to communicate using Sockets over SNA. The example in Figure 327 is from Sockets over IPX scenario 2.

Note

The NETSTAT option 2 route information above is how the system will decide whether to use native TCP/IP or Sockets over IPX for a connection. For the system to use Sockets over IPX, the route selected must have a next hop that specifies either *DIRECT where this maps to *IPI (as in the 9.67.60.0 route destination in Figure 327, NETSTAT option 1 can be used to verify that this route destination maps to a network address against which *IPI is specified) or the address of the local IP over IPX interface (as in the 9.67.61.0 route destination in Figure 327). When choosing a route to use, the system will select the most specific entry. You should *not* have duplicate route entries.

Having verified that the local IP over IPX interface is active and that a route is available to the remote system, we can now try to establish a Sockets over IPX session to that system. Under native TCP/IP we would normally use the PING application to initially test a configuration. However, under OS/400 Sockets over IPX, PING Server only is supported. This, therefore, does not make a good test tool to use in this environment. Since the FTP (File Transfer Protocol) application is universally supported by TCP/IP systems, we have used this application here to verify the Sockets over IPX configurations.

PING client

An OS/400 V3R1 PTF is now available that makes it possible to use the OS/400 PING client with AnyNet. The PTF number is SF25273.

We must first make sure that Sockets over IPX and any application we want to use are started on the remote system. In the example that follows, we will FTP from RALYAS4A to RALYAS4B. We therefore need to start Sockets over IPX and the FTP application server on the RALYAS4B system.

In Figure 328, we have used the following command to access the RALYAS4B system via Sockets over IPX:

```
ftp '9.67.60.21'
```

```
                              File Transfer Protocol

Previous FTP subcommands and messages:
  Connecting to host name RALYIPB at address 9.67.60.21 using port 21.
  220-QTCP at 9.67.60.21.
  220 Connection will close if idle more than 5 minutes.
  215  OS/400 is the remote operating system. The TCP/IP version is "V3R
> anyuser
  331 Enter password.
  230 ANYUSER logged on.
  250  Now using naming format "0".
  257 "QGPL" is current library.




Enter an FTP subcommand.
===> ____________________________________________________________________



F3=Exit     F6=Print       F9=Retrieve
F17=Top    F18=Bottom    F21=CL command line
```

Figure 328. FTP via Sockets over IPX to Another AS/400 System

Note

We could, of course, have added 9.67.60.21 to the local TCP/IP host table (or to the name server being used) which would have allowed us to use a host name rather than the internet address with the FTP command.

Having established a Sockets over IPX connection, if we now use NETSTAT option 3 (Work with TCP/IP Connection Status), it will show this active session from an IP address perspective, as shown in Figure 329.

```
                      Work with TCP/IP Connection Status
                                                             System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  000:04:36  Listen
     *                *          telnet     000:05:14  Listen
     *                *          lpd        000:04:41  Listen
     9.67.60.21       ftp-con >  1025       000:00:01  Established



                                                                         Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 329. NETSTAT Work with TCP/IP Connection Status (1 of 2)

If instead the AS/400 was the target of the Sockets over IPX FTP connection, NETSTAT option 3 would show the following:

```
                      Work with TCP/IP Connection Status
                                                             System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  000:04:36  Listen
     *                *          telnet     000:05:14  Listen
     *                *          lpd        000:04:41  Listen
     9.67.60.21       1034       ftp-con >  000:04:24  Established





                                                                         Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 330. NETSTAT Work with TCP/IP Connection Status (2 of 2)

Client Access/400 for Windows 3.1 over TCP/IP

This chapter presents the installing and configuration of V3R1M1 Client Access/400 for Windows 3.1 over TCP/IP on a Personal Computer at the International Technical Support Organization in Raleigh.

Because a TCP/IP protocol stack is required to be installed and configured prior to the installation of Client Access/400 for Windows 3.1, the installation of a subset of IBM TCP/IP for DOS (provided with Client Access/400 for Windows 3.1) is also covered.

The information is presented in the following sections:

1. Introduction to V3R1M1 Client Access/400 for Windows 3.1 over TCP/IP
2. Using Client Access/400 for Windows 3.1 over TCP/IP
3. Configuring AnyNet/400 APPC over TCP/IP on the AS/400
4. Installing and Configuring TCP/IP for DOS
5. Using PING to verify the TCP/IP configuration
6. Interim AS/400 APPC over TCP/IP verification
7. Installing and Configuring Client Access/400 for Windows 3.1
8. Ending Client Access/400 for Windows 3.1 over TCP/IP and exiting windows
9. Help with problem determination

For further information on AnyNet/400 APPC over TCP/IP, refer to *AS/400 Communications Configuration*, SC41-3401. For further information on Client Access/400 for Windows 3.1 TCP/IP setup, refer to *Client Access/400 for Windows 3.1 TCP/IP Setup*, SC41-3580.

There are also several informational PTFs available listing current information on known problems (supported TCP/IP protocol stacks, etc.). Informational PTF II08677 is an index to all other Client Access/400 for Windows 3.1 informational PTFs.

Introduction to Client Access/400 for Windows 3.1 over TCP/IP

Client Access/400 for Windows 3.1 is an APPC program that operated only in SNA networks until the availability of OS/400 V3R1 and V3R1M1 Client Access/400 for Windows 3.1. Now Client Access/400 for Windows 3.1 includes the IBM AnyNet programs which use the Multiprotocol Transport Networking Architecture (MPTN). This communications technology defines a transparent layer between Client Access/400 for Windows 3.1 on the PC and the network protocol. This allows Client Access/400 for Windows 3.1 to fully function in a TCP/IP network. Some of the other Client Access/400 for Windows 3.1 functional enhancements provided by V3R1M1 include:

- Graphical User Interface to AS/400: This is in the form of System Object Access, Graphical Access for OS/400 and Graphical Operations.
- Multiple Terminal and Print Emulators: RUMBA/400 or Personal Communications/5250.

- Database Access facility: A graphical interface that allows a user to easily select and retrieve AS/400 database records.
- Virtual Print: You can print PC documents on an AS/400 printer or PC printer defined as an AS/400 printer.
- Shared Folders: Network drives can be assigned to any part of the IFS namespace therefore allowing you to view the entire file structure on the AS/400.
- Application Programming Interfaces (APIs).

The benefits of Client Access/400 for Windows 3.1 operating in either a TCP/IP or SNA network are as follows:

- Customers no longer need to make PC connectivity decisions based on the underlying network protocol.
- Broadens access to applications.
- Investment in existing and future applications is protected through application independence.

Using Client Access/400 for Windows 3.1 over TCP/IP

V3R1M1 Client Access/400 for Windows 3.1 allows all the Client Access/400 for Windows 3.1 functions to be used in a TCP/IP environment.

PC software requirements are as follows:

- DOS version 5.0 or later
- Microsoft Windows version 3.1 or Microsoft Windows for Workgroups version 3.11
- A supported TCP/IP protocol stack. A subset of TCP/IP for DOS is provided with Client Access/400 for Windows 3.1

The following TCP/IP protocol stacks are supported by Client Access/400 for Windows 3.1:

- IBM TCP/IP for DOS, Version 2.1.1 with CSD UB10718
- Walker Richer Quinn (WRQ) TCP Connection for Windows, Version 4.02
- FTP PC/TCP OnNet 1.1 for DOS/Windows (Windows VxD Kernel)
- Novell LAN WorkPlace for DOS, Version 5
- Microsoft TCP/IP-32 3.11a for Windows for Workgroups, Version 3.11 (VxD)
- NetManage Chameleon TCP/IP for Windows, Version 4.5.1

V3R1M1 Client Access/400 for Windows 3.1 over TCP/IP requires OS/400 Version 3.0 Release 1.0 and the following program options to be installed on the AS/400:

- 5763 SS1 Host Servers V3R1M0
- 5763 XA1 Client Access/400 Family - Base V3R1M1
- 5763 XC1 Client Access/400 for Windows 3.1 V3R1M1
- 5763 XC1 Client Access/400 - Windows 3.1 (SBCS or DBCS) V3R1M1

The following may be optionally installed:

- 5763 XC1 Client Access/400 - Windows 3.1 RUMBA (SBCS or DBCS) V3R1M1

- 5763 XC1   Client Access/400 - Windows 3.1 PC5250 (SBCS or DBCS) V3R1M1
- 5763 XC1   Client Access/400 - GraphicsOps for Windows V3R1M1
- 5763 XC1   Client Access/400 - Ultimedia Facilities V3R1M1

You should also ensure that the latest Cumulative PTF package is installed. We used V3R1M1 Client Access/400 for Windows 3.1 with Cumulative PTF package C5304310.

Configuring AnyNet/400 APPC over TCP/IP

In order to run APPC over TCP/IP on your AS/400, the following OS/400 configuration steps are required:

1. Establish a TCP/IP configuration.
2. Change the Network Attribute ALWANYNET to *YES.
3. Add an entry to the APPN remote location list.
4. Create an APPC controller with LINKTYPE(*ANYNW).
5. Map the APPC LU name to an internet address.

The user ID, under which the APPC over TCP/IP configuration is created, must have sufficient authority to access the relevant commands. Some of the commands require the user ID to have the IOSYSCFG authority. The examples shown here were created using a profile with QSECOFR authority.

1. Establish a TCP/IP configuration

A prerequisite for APPC over TCP/IP is a TCP/IP configuration between the systems. In this step we show the basic steps to establishing a TCP/IP configuration. If your system already has a TCP/IP configuration to the remote system with which you want to communicate via APPC over TCP/IP then you can skip this step and proceed to step 2 on page 270 in this section.

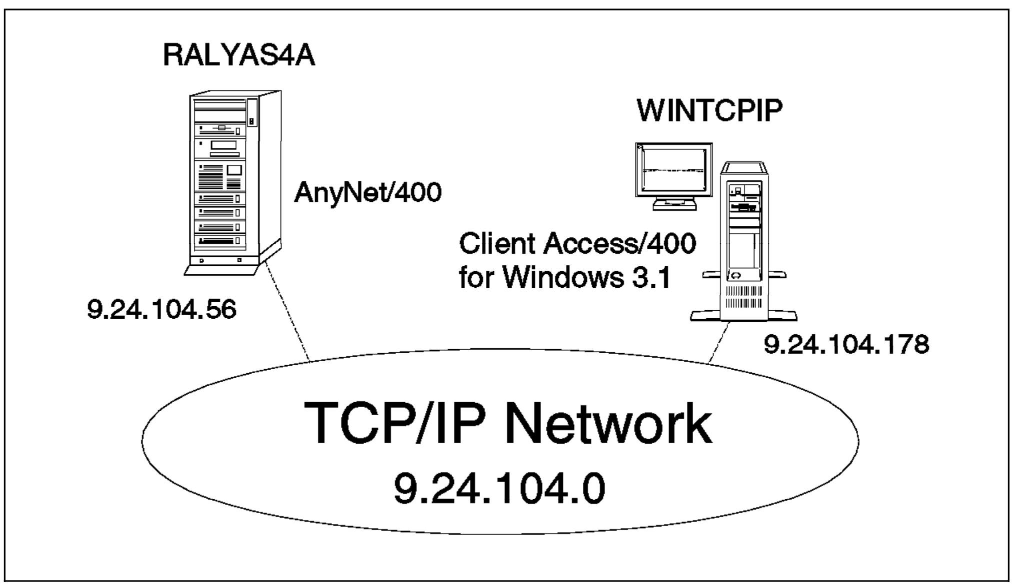

Figure 331. An AS/400 and PC Connected Using Client Access/400 for Windows 3.1 over TCP/IP

In the following panels we create the TCP/IP configuration for RALYAS4A.

The following panels show the configuration screens for a token-ring configuration. If you require help in establishing a TCP/IP configuration over another type of interface, refer to the manual *AS/400 TCP/IP Configuration and Reference* SC41-3420.

Line Description

The AS/400 line description defines the physical interface to the network. If an appropriate line description does not already exist (they can be shared), you need to create one. Here we use the CRTLINTRN command to create a token-ring line description.

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

 Type choices, press Enter.

 Line description . . . . . . . . > TRN2619       Name
 Resource name  . . . . . . . . . > LIN041        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 description for LIN041'

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

Figure 332. Create Token-Ring Line Description - System RALYAS4A

For a TCP/IP configuration, there is no need to create controller and device descriptions, they are automatically created when TCP/IP first uses the token-ring line.

TCP/IP Interface

The TCP/IP interface defines this AS/400 on the TCP/IP network. Enter the CFGTCP command to access the Configure TCP/IP panel, and take option 1 to work with TCP/IP interfaces.

```
CFGTCP                         Configure TCP/IP
                                                             System:   RALYAS4A
Select one of the following:

     1. Work with TCP/IP interfaces
     2. Work with TCP/IP routes
     3. Change TCP/IP attributes
     4. Work with TCP/IP port restrictions
     5. Work with TCP/IP remote system information

    10. Work with TCP/IP host table entries
    11. Merge TCP/IP host table
    12. Change local domain and host names
    13. Change remote name server

    20. Configure TCP/IP applications
    21. Configure related tables


Selection or command
===> 1

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

Figure 333. TCP/IP Configuration Menu

```
                          Work with TCP/IP Interfaces
                                                             System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   9=Start   10=End

     Internet         Subnet            Line        Line
Opt  Address          Mask              Description Type

__   _______________
__   9.24.104.56      255.255.255.0     TRN2619     *TRLAN
__   127.0.0.1        255.0.0.0         *LOOPBACK   *NONE



                                                                        Bottom
F3=Exit   F5=Refresh   F6=Print list   F10=Work with IP over SNA interfaces
F11=Display interface status           F12=Cancel   F17=Top   F18=Bottom
```

Figure 334. TCP/IP Interface Definition - System RALYAS4A

If a TCP/IP interface does not already exist, add an entry using the internet address allocated to this system and the mask of the subnet in which the system resides.

Besides allowing you to add, change and remove TCP/IP interfaces, this screen also allows you to start and end these interfaces.

TCP/IP Route

If the route to the remote host is via a gateway or the remote host resides in a different network or subnetwork to the local host, it will be necessary to use option 2 from the Configure TCP/IP screen to configure a route. This is not the case in this simple scenario.

TCP/IP Host table

The local host table on the AS/400 contains a list of the internet addresses and associated host names for this network. To access the AS/400 host table enter the CFGTCP command and take option 10 (Work with TCP/IP Host Table Entries).

```
                     Work with TCP/IP Host Table Entries
                                                         System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   7=Rename

     Internet         Host
Opt  Address          Name
 _   _______________
 _   9.24.104.56      RALYAS4A
                      RALYAS4A.ITSO.RAL.IBM.COM
 _   9.24.104.178     WINTCPIP
                      WINTCPIP.ITSO.RAL.IBM.COM






F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 335. TCP/IP Host Table Entries - System RALYAS4A

Unless you are planning to use a name server, add an entry for the local system and any remote system(s) to which TCP/IP is to be used. In the above example, both the short and long names have been entered.

2. **Change the Network Attribute ALWANYNET to *YES**

   Now we start the AnyNet specific configuration steps. First we must change the ALWANYNET network attribute to *YES. Changing this attribute will allow both APPC over TCP/IP and Sockets over SNA support to run on your system. This attribute also enables APPC over IPX and Sockets over IPX on your system. The default for this value, when V3R1 is initially installed, is *NO. Use the DSPNETA command see what your system is set to. If it is set to *NO, use the command:

   ```
   CHGNETA ALWANYNET(*YES)
   ```

   After changing this attribute, you can verify the change by entering the DSPNETA command. The resulting displays are shown in the following figure.

```
                       Display Network Attributes
                                                        System:   RALYAS4A
 Current system name . . . . . . . . . . . . . . :   RALYAS4A
   Pending system name . . . . . . . . . . . . . :
 Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
 Local control point name . . . . . . . . . . . . :   RALYAS4A
 Default local location . . . . . . . . . . . . . :   RALYAS4A
 Default mode . . . . . . . . . . . . . . . . . . :   BLANK
 APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
 Data compression . . . . . . . . . . . . . . . . :   *NONE
 Intermediate data compression  . . . . . . . . . :   *NONE
 Maximum number of intermediate sessions  . . . . :   200
 Route addition resistance  . . . . . . . . . . . :   128
 Server network ID/control point name . . . . . . :   *LCLNETID   *ANY

                                                                More...
```

```
                       Display Network Attributes
                                                        System:   RALYAS4A
 Alert status . . . . . . . . . . . . . . . . . . :   *ON
 Alert logging status . . . . . . . . . . . . . . :   *ALL
 Alert primary focal point  . . . . . . . . . . . :   *YES
 Alert default focal point  . . . . . . . . . . . :   *NO
 Alert backup focal point . . . . . . . . . . . . :
   Network ID . . . . . . . . . . . . . . . . . . :     *NONE
 Alert focal point to request . . . . . . . . . . :   RAK
   Network ID . . . . . . . . . . . . . . . . . . :     USIBMRA
 Alert controller description . . . . . . . . . . :   *NONE
 Alert hold count . . . . . . . . . . . . . . . . :   0
 Alert filter . . . . . . . . . . . . . . . . . . :   AS400NET
   Library  . . . . . . . . . . . . . . . . . . . :     QALSNDA
 Message queue  . . . . . . . . . . . . . . . . . :   QSYSOPR
   Library  . . . . . . . . . . . . . . . . . . . :     QSYS
 Output queue . . . . . . . . . . . . . . . . . . :   QPRINT
   Library  . . . . . . . . . . . . . . . . . . . :     QGPL
 Job action . . . . . . . . . . . . . . . . . . . :   *FILE
                                                                More...
```

```

                       Display Network Attributes
                                                        System:   RALYAS4A
 Maximum hop count  . . . . . . . . . . . . . . . :   16
 DDM request access . . . . . . . . . . . . . . . :   *OBJAUT
 Client request access  . . . . . . . . . . . . . :   *OBJAUT
 Default ISDN network type  . . . . . . . . . . . :
 Default ISDN connection list . . . . . . . . . . :   QDCCNNLANY
 Allow ANYNET support . . . . . . . . . . . . . . :   *YES
 Network Server Domain  . . . . . . . . . . . . . :   RALYAS4A

                                                                Bottom
 Press Enter to continue.

 F3=Exit   F12=Cancel
```

*Figure 336. Display of Network Attributes with ALWANYNET(*YES)*

Changing the ALWANYNET network attribute to *YES will result in the APPC over TCP/IP job (QAPPCTCP) being started in the QSYSWRK subsystem.

3. **Create an APPC controller with LINKTYPE(*ANYNW)**

The AS/400 controller description defines the remote system. A new LINKTYPE has been added to the APPC controller description for AnyNet. With AnyNet, the APPC controller is no longer directly attached to a line description. Use the CRTCTLAPPC (Create APPC Controller Description) command to create an APPC controller with LINKTYPE(*ANYNW).

```
                    Create Ctl Desc (APPC) (CRTCTLAPPC)

Type choices, press Enter.

Controller description . . . . . > APPCOVRTCP    Name
Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
Online at IPL  . . . . . . . . .   *YES          *YES, *NO
Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
Remote control point . . . . . . > TCPIP         Name, *ANY
User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
Text 'description' . . . . . . . > 'Client Access AnyNet Controller'



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

*Figure 337. Create Controller Description with LINKTYPE(*ANYNW)*

The Remote network identifier should match the local network identifier on the remote system, *NETATR indicates that the value in the network attributes should be used - that the local system and remote system have the same network ID. The remote control point name, however, is not used external to the system. The remote control point name entered should match the value entered in the APPN remote location list (see below).

APPC Device Description and Mode Description

The APPC device description is automatically created when the PC initially connects with the AS/400.

APPC over TCP/IP uses mode descriptions in the same way that APPC over SNA does.

Note: It is not possible to map an APPC mode to an IP type of service.

Additional Technical Information for APPC Controller

The following technical information describes the differences between an AnyNet connection and a normal SNA connection:

- The name of the *ANYNW controller and the remote control point name have no relationship to the name of the PC coming in.
- Each *ANYNW controller can handle up to 254 PCs at a time, and since the PCs may have different control point names and LU names, again, there is no relationship.
- The remote control point name in the *ANYNW controller is only used internally to the AS/400 system, as you see later when we add an entry to the configuration list.

- When the BIND comes in for a PC through AnyNet, the code on the AS/400 system looks at the NETID.LUNAME part of the domain name of the PC. If there is a device already created with the NETID.LUNAME on any *ANYNW controller, and it is varied on, this device is used. If no match for the NETID.LUNAME is found on the *ANYNW controllers, the controller with the least number of devices attached is used to attach the newly created device.
- An *ANYNW controller must be varied on for APPC over TCP/IP to function.
- The device description that is created for your PC on the AS/400 system remains in status Active even if you disconnect your PC from the AS/400 system.

Note

In most cases, you only need to create one *ANYNW controller since you can have up to 254 PCs coming through that controller. If you have several *ANYNW controllers, there is no way to predict under which controller the device corresponding to your PC will appear, unless you manually create the device description associated with that PC.

4. **Add an entry to the APPN Remote Location List**

For most Client Access/400 for Windows 3.1 users this step is *not* required and can be skipped. However, the CPI-C interface provided with V3R1M1 Client Access/400 for Windows 3.1 supports incoming Allocates. The AS/400 system will require a APPN remote location list entry for each PC using Client Access/400 for Windows 3.1 and this function. This is because APPC over TCP/IP communications needs the information in the APPN remote location list to determine which controller description to use when it activates the session.

To update the APPN remote location list, use the following command:

```
CHGCFGL *APPNRMT
```

The resulting display is as in Figure 338 on page 274.

```
                           Change Configuration List                   RCHAS040
                                                             11/10/94  10:47:23
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote                Remote    Control
Remote    Network   Local       Control   Point     Location           Secure
Location  ID        Location    Point     Net ID    Password            Loc
WINTCPIP  USIBMRA   RALYAS4A    TCPIP     *NETATR   _______________     *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR     ________  *NETATR   _______________     *NO
                                                                     More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 338. APPN Remote Location List Panel

AS/400 APPN requires that all remote location names be unique. For this reason, it cannot have the same remote location name and remote network ID in both its SNA network and its TCP/IP network.

- The Remote Location name should match the local location (LU) name at the remote system. This will be the PC location name on the Common Options menu shown in Figure 356 on page 290.
- The Local Location name should match the remote location (LU) name at the remote system.This will be the System name on the TCP/IP Configuration menu shown in Figure 357 on page 291.
- The Remote Network ID and Control Point Net ID should match the remote network identifier in the APPC controller with a LINKTYPE(*ANYNW). *NETATR indicates that the value in the network attributes should be used.
- The Remote Control Point name should match the remote control name in the APPC controller with a LINKTYPE(*ANYNW).

Any entry added to the APPN remote location list results in an entry in the local APPN topology database. However, the APPC over TCP/IP entries are not propagated to other systems in the APPN network; the entry is used as an end node, only information on attached network nodes is propagated. No topology updates flow as a result of adding the APPC over TCP/IP entries. In addition to being used locally, the APPC over TCP/IP entries allows this system to respond to APPN search requests received for these LU names. It is this function that allows the AS/400 system to act as a bridge.

Additional Technical Information for the APPN Remote Location List

- A configuration list entry is only necessary if your application does an allocate out of the AS/400 system. We recommend that you include the necessary entries in this list in order to have your AnyNet configuration complete and ready for possible future use should an application wish to call out to a PC.

- You need to be able to attach an APPC controller to a PC LU name. If your PCs have similar LU names, you can use generic entries in the configuration list as shown in Figure 339.

```
                         Change Configuration List                   RALYAS4A
                                                            11/10/94  11:12:24
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations-----------------------
          Remote              Remote    Control
Remote    Network   Local     Control   Point     Location          Secure
Location  ID        Location  Point     Net ID    Password           Loc
WINTCP*   USIBMRA   RALYAS4A  TCPIP     USIBMRA   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO

F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 339. APPN Remote Location List Panel with a Generic Name Entry

- It is possible that an incoming conversation (such as Client Access) produces a device description on one *ANYNW controller, while an outgoing conversation to the same PC (such as data queues) produces a device on another controller as specified in the configuration list. This means that there may be two device descriptions for the same PC!

> **Hint**
>
> To keep the administration as simple as possible, try to create only the necessary number of APPC controllers of type *ANYNW. Remember, each controller can support up to 254 PCs.

5. **Map the APPC LU name to an internet address**

The TCP/IP host table provides the mapping between host name and internet address. Here it is providing the mapping between the SNA remote location name/remote network ID and the remote internet address.

Enter the CFGTCP command to access the Configure TCP/IP panel, and take option 10 to work with the TCP/IP host table.

```
                       Work with TCP/IP Host Table Entries
                                                                System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Rename

      Internet          Host
 Opt  Address           Name

  _   _______________
  _   9.24.104.56       RALYAS4A
                        RALYAS4A.ITSO.RAL.IBM.COM
                        RALYAS4A.USIBMRA.SNA.IBM.COM
  _   9.24.104.178      WINTCPIP
                        WINTCPIP.ITSO.RAL.IBM.COM
                        WINTCPIP.USIBMRA.SNA.IBM.COM


 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 340. TCP/IP Host Table Entries

For APPC over TCP/IP, the host name entries are made up as follows:

- WINTCPIP - Remote SNA location (LU) name
- USIBMRA - Remote SNA network ID
- SNA.IBM.COM - SNA Domain Name Suffix

Add an entry for each remote system to which APPC over TCP/IP will be used. The remote SNA location names and SNA network IDs should be as specified in the APPN remote location list.

Note

A PTF is now available to allow the AS/400 to use an SNA domain name suffix of other than SNA.IBM.COM. The PTF is shipped in two parts: MF08352 and SF21042. Both PTFs are on Cumulative C5157310 or later.

When communicating between systems using APPC over TCP/IP, both systems must use the same SNA Domain Name Suffix.

This host table will be used by native TCP/IP and APPC over TCP/IP. The entries *without* the extension SNA.IBM.COM are for native TCP/IP.

Note

The AS/400 TCP/IP Host Table will allow a maximum of four host names to be entered against a single host internet address. This may become a restriction when using AnyNet/400 APPC over TCP/IP. One possible alternative is to use a name server rather than the AS/400 host table.

With all of the configuration steps completed, you are now ready to use the APPC over TCP/IP support of AnyNet/400. The next section shows how to set up the PC side of the configuration.

Installing and Configuring TCP/IP for DOS

This section presents the installation of the TCP/IP for DOS subset provided with Client Access/400 for Windows 3.1. The following steps need to be performed:

1. Install TCP/IP for DOS on the PC.
2. Configure TCP/IP for DOS.
3. Install TCP/IP for DOS fix.
4. Update the TCP/IP for DOS host file on the PC.
5. Update the CONFIG.SYS and AUTOEXEC.BAT files.

Please note that we have only shown the key TCP/IP for DOS configuration displays in this section. For further help, refer to *Client Access/400 for Windows 3.1 TCP/IP Setup*, SC41-3580.

PC Software Installed

The following software was installed on WINTCPIP:

- IBM DOS 7.0
- Microsoft Windows 3.1
- The TCP/IP for DOS subset provided with V3R1M1 Client Access/400 for Windows 3.1. We used diskettes provided with Client Access/400 for Windows 3.1 by specifying Feature 8540. You can also create these diskettes from the QIWSTOOL folder if PTFs SF23551,SF23552, SF23553, and SF24028 are applied to your system.
- The fix for TCP/IP for DOS APAR HB60120.

The software was installed in the above order.

1. Install TCP/IP for DOS on the PC.

a. Insert the TCP/IP for DOS Installation diskette in Drive A.

b. Type `a:/install` at the DOS prompt and press Enter.

c. When the `Installation Complete` message is displayed, reboot the PC to make the changes to the AUTOEXEC.BAT and the CONFIG.SYS effective.

2. Configure TCP/IP for DOS.

a. Type `custom` at the DOS prompt and press Enter.

b. Select the **CONFIGURE** pull-down menu.

c. Select the **Physical Connection Type** from the pull-down menu. In our case this is the NDIS interface. For our PC, the following entries were made:

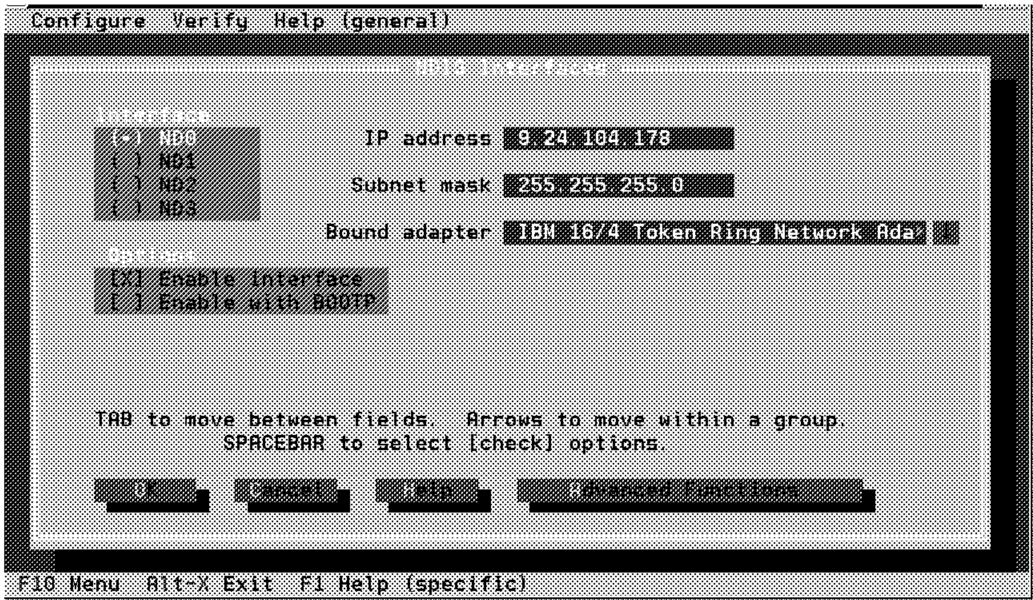

Figure 341. Configuration of the NDIS Interface

Select **OK**. You will need to insert the TCP/IP driver diskette (D1 or D2) when requested.

d. Next, **Name Resolution** will need to be selected. We did not use a Domain name server in our configuration. Because of this, we will need to update the TCP/IP for DOS hosts table in a later step. On our PC we entered the following entries:

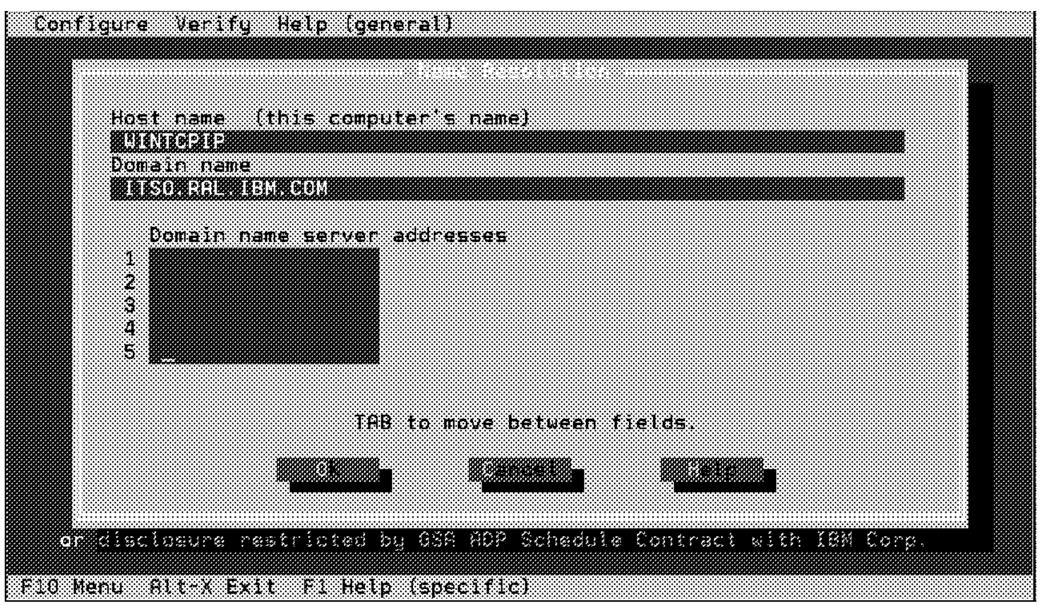

Figure 342. Name Resolution Configuration

Note: The values entered in Figure 341 and Figure 342 match the host table entry shown in Figure 335 on page 270.

e. Next we selected **Autostart** and enabled TCP/IP. This allows TCP/IP to start automatically when the PC is started.

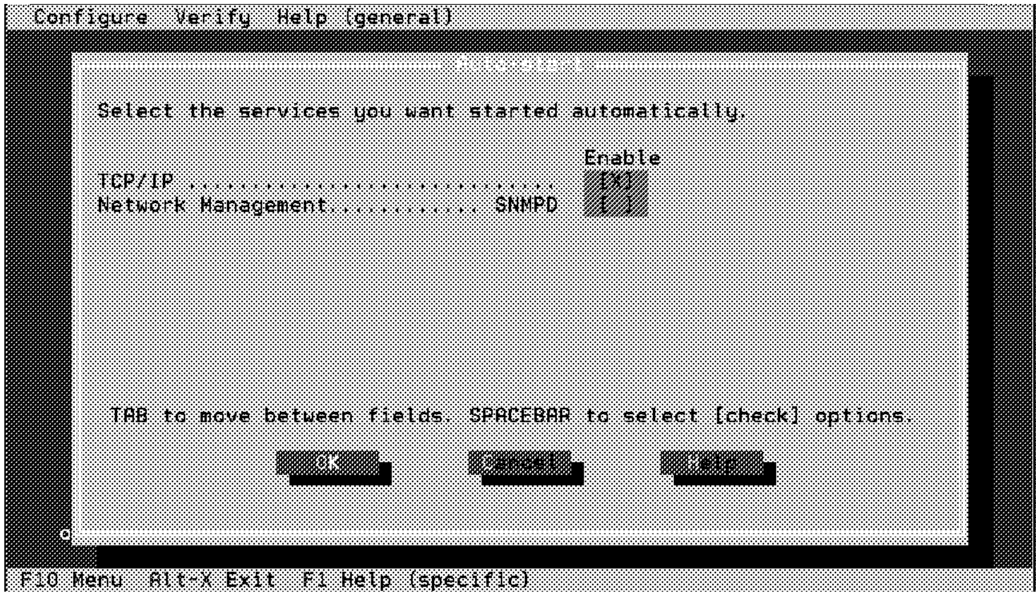

Figure 343. Selecting Autostart of TCP/IP for DOS

f. Next take the option to **Exit and Save**. You will be requested to increase the FILES entry in the config.sys. This needs to be a high number. We recommend 255.

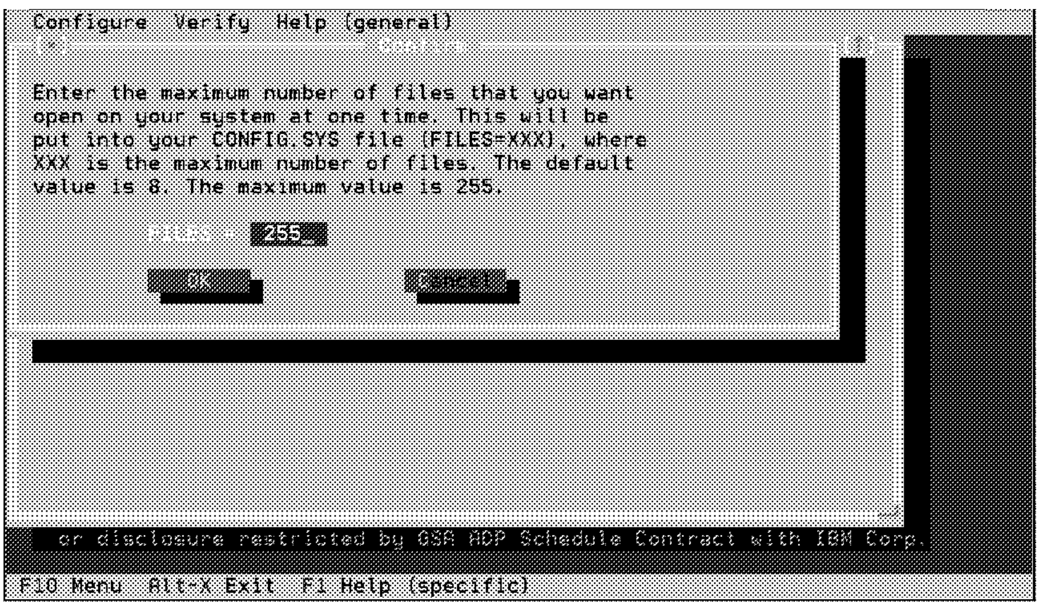

Figure 344. Increasing the Files= Statement

You may also be may need additional statements added to your SYSTEM.INI file. You should allow custom to add these statements.

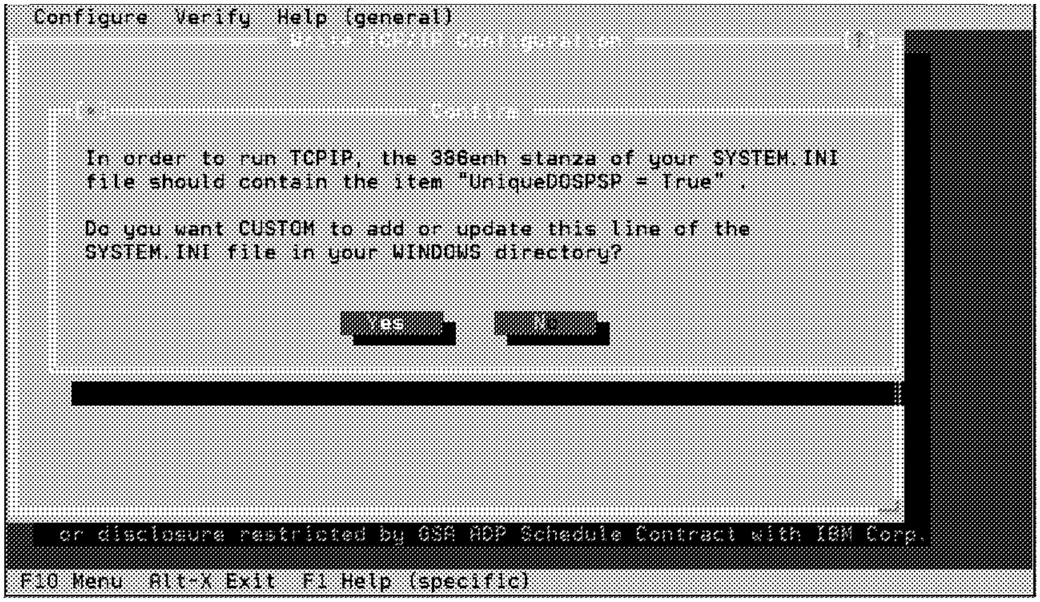

Figure 345. Adding UniqueDOSPSP=True setting to SYSTEM.INI

Figure 346. Adding InDOSPolling=True to SYSTEM.INI

Note

We did not need to configure Routing Information in our configuration because we are on the same IP network as the AS/400. If the AS/400 is not on the same IP network then Routing Information will need to be configured.

3. **Apply TCP/IP for DOS fix.**

   On our PC we had DOS 7.0 installed. When using TCP/IP for DOS with DOS 7.0, an updated DOSTCP.SYS file is required.

We obtained the update by calling 1-800-992-4777 and requesting the TCP/IP for DOS fix for APAR HB60120.

If you have Internet access, as an alternative you can do the following:

a. Go to The IBM Personal Computers home page located at `http://www.pc.ibm.com/`.

b. Select **Files**.

c. Select **TCP/IP Support Files** in the Networking File Areas category.

d. Download the DOSTCP.ZIP file.

e. Use PKUNZIP.exe to decompress the file and copy the DOSTCP.SYS file to the TCPDOS\BIN directory.

The PC should now be restarted.

4. **Update the TCP/IP for DOS hosts file.**

The entries to the hosts file on the PC are only needed if you do not have a name server, or if your name server cannot hold the long name required for AnyNet communications. In our configuration a name server was not used.

The hosts file is located in the \TCPIP\ETC directory on the PC. The following three entries need to be added:

a. The AnyNet name for the AS/400

b. The TCP/IP name for the AS/400

c. The TCP/IP name for the PC

On our PC, the DOS 7.0 editor was used to update the hosts file as shown in Figure 347. The values entered match those entered in Figure 340 on page 276.

```
#########################################################################
#
# hosts
#
# This file contains the hostnames and their address for hosts in the network
# This file is used to resolve a hostname into an Internet address
#
# The format of this file is
# Internet Address        Hostname [ Aliases ]      # Comments
# Items are seperated by any number of blanks. A # indicates the begining
# of a comment.
#
# Internet Address    Hostname    Alias         # Comments
# 192.1.1.1           mentor_n1   mether        # Address of mentor in Network1
# 128.5.5.3           mentor_n2   m802_3 wise   # Address of mentor in Network2
# 9.5.2.201           mentor_n3   mtok          # Address of mentor in Network3
# 9.5.2.205           babbage                   # Address of mentor in Network3

9.24.104.56           RALYAS4A.USIBMRA.SNA.IBM.COM  # AS/400 ANYNET Name
9.24.104.56           RALYAS4A                      # AS/400 TCPIP Name
9.24.104.178          WINTCPIP                      # This PC's Name

C:\TCPDOS\ETC\HOSTS                          Line     12 Col     1  Insert    E 3.12
F1=Help  2=Save  3=Quit  4=File               6=Draw  7=Name  8=Edit  9=Undo  10=Next
```

Figure 347. The Updated HOSTS File

5. **Update the CONFIG.SYS and AUTOEXEC.BAT.**

a. Add the following to the CONFIG.SYS file:

```
SHELL=C:\DOS\COMMAND.COM C:\DOS /P /e:512
```

If the CONFIG.SYS already has the SHELL statement, make sure that the /e: variable is 512 or greater.

b. Make sure that all PATH statements in the AUTOEXEC.BAT file are 80 or less characters long. Long PATH statements may cause problems when using Client Access/400 for Windows 3.1 over AnyNet.

Tip

Using %PATH% to append an extra PATH to the existing PATH will shorten the PATH statement.

Using PING to Verify the TCP/IP Configuration

You should be able to verify the TCP/IP configuration done so far by using the PING command to check the network connections. This should be done from both the PC and the AS/400. The following commands were issued for our configuration:

1. To test the TCP/IP for DOS connections from the PC, you should be able to PING the three names added to the hosts file as shown in Figure 347 on page 281. On our PC we entered the following PING commands:

   ```
   PING RALYAS4A.USIBMRA.SNA.IBM.COM
   ```

   ```
   PING RALYAS4A
   ```

   ```
   PING WINTCPIP
   ```

   Tip

   PING is a never-ending command in TCP/IP for DOS. To stop the PING command you must press the Ctrl + Break or Ctrl + C keys.

2. On the AS/400 the following PING commands should run successfully:

   ```
   PING RALYAS4A
   PING WINTCPIP.USIBMRA.SNA.IBM.COM
   PING WINTCPIP
   ```

Note: NETSTAT is also available with TCP/IP for DOS if additional verification is required. Refer to *Client Access/400 for Windows 3.1 TCP/IP Setup*, SC41-3580 for information on NETSTAT.

Interim AS/400 APPC over TCP/IP Verification

In the following section we install Client Access/400 for Windows 3.1 over TCP/IP. During the installation, the PC connects to the AS/400 and downloads further Client Access/400 for Windows 3.1 files to the PC. Because of this, it is a good idea to verify as much of the AS/400 APPC over TCP/IP configuration as is possible at this point.

First, we should check that the APPC over TCP/IP job is running. The command `WRKACTJOB SBS(QSYSWRK)` displays the active jobs in the QSYSWRK subsystem. The APPC over TCP/IP job QAPPCTCP should be active as shown in the following figure.

```
                         Work with Active Jobs                        RALYAS4A
                                                            03/08/95  17:24:02
CPU %:     .0     Elapsed time:   00:00:00     Active jobs:   63

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
_5     QAPPCTCP     QSYS        BCH      .0  PGM-QZPAIJOB     TIMW
__     QECS         QSVSM       BCH      .0  PGM-QNSECSJB     DEQW
__     QMSF         QMSF        BCH      .0                   DEQW
__     QNSCRMON     QSVSM       BCH      .0  PGM-QNSCRMON     DEQW
__     QTCPIP       QTCP        BCH      .0                   DEQW
__     QTFTP00619   QTCP        BCH      .0                   DEQW
__     QTFTP00734   QTCP        BCH      .0                   DEQW
__     QTFTP02472   QTCP        BCH      .0                   TIMW
                                                                       More...
Parameters or command
===> _________________________________________________________________________
F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
F12=Cancel   F23=More options   F24=More keys
```

Figure 348. Work with Active Jobs Panel

If we look at the job log associated with QAPPCTCP, we see the following:

```
                             Display Job Log
                                                           System:   RALYAS4A
Job . . :   QAPPCTCP      User . . :   QSYS         Number . . . :   011338

 >> CALL QSYS/QZPAIJOB
    APPC over TCP/IP job started.




                                                                        Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F10=Display detailed messages   F12=Cancel
F16=Job menu           F24=More keys
```

Figure 349. Display Job Log (QAPPCTCP) Panel

Note

The APPC over TCP/IP job (QAPPCTCP) is initially started when the Allow AnyNet support (ALWANYNET) network attribute is changed to *YES. If the job fails for any reason, it is necessary to stop TCP/IP (ENDTCP), and start TCP/IP (STRTCP) again to re-start the job.

Before we can use the AS/400 APPC over TCP/IP configuration, we must Vary on the APPC controller description we created for the APPC over TCP/IP connection. The Work with Configuration Status command can be used to show the status of the controller. For example, the following command resulted in the display shown in Figure 350 on page 284:

```
WRKCFGSTS *CTL APPCOVRTCP
```

```
                        Work with Configuration Status                RALYAS4A
                                                               03/08/95  16:30:11
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--------------
__   APPCOVRTCP        VARIED OFF







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

Figure 350. Work with Configuration Status for Controller at RALYAS4A

To make the configuration available, use option 1 (Vary on). The configuration should then go to a VARIED ON status.

When the first controller with link type *ANYNW is varied on, two TCP/IP connections will be started; one is a TCP connection that goes to LISTEN state to allow the system to accept incoming APPC over TCP/IP sessions; while the other is a UDP connection to handle out-of-band data for all APPC over TCP/IP activity. NETSTAT option 3 can be used to display all TCP/IP sessions (native TCP/IP and APPC over TCP/IP). Figure 351 shows NETSTAT option 3 prior to any APPC over TCP/IP sessions being established.

```
                      Work with TCP/IP Connection Status
                                                              System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  026:45:25  Listen
     *                *          telnet     025:04:38  Listen
     *                *          APPCove >  000:09:55  Listen
     *                *          APPCove >  000:09:55  *UDP
     *                *          lpd        026:44:24  Listen




                                                                          Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 351. NETSTAT Option 3 - TCP/IP Connection Status

If the APPC over TCP/IP connections (APPCove) fail for any reason, it is necessary to stop TCP/IP (ENDTCP) and start TCP/IP (STRTCP) again to re-start the jobs.

You should now be ready to install V3R1M1 Client Access/400 for Windows 3.1 on the PC.

Installing and Configuring Client Access/400 for Windows 3.1 on the PC

This section describes how to install and configure Client Access/400 for Windows 3.1 over TCP/IP on the PC.

1. Insert the Client Access/400 for Windows 3.1 Disk 1 in drive A.
2. Start Windows.
3. In Program Manager select **Run** from the FILE pull-down menu.
4. Type `a:\install` in the Run Command Box and press Enter.
5. On the Install-directories panel, select the type of connections you plan to use. We chose the **Select all** button in our installation as shown in Figure 352 on page 286.

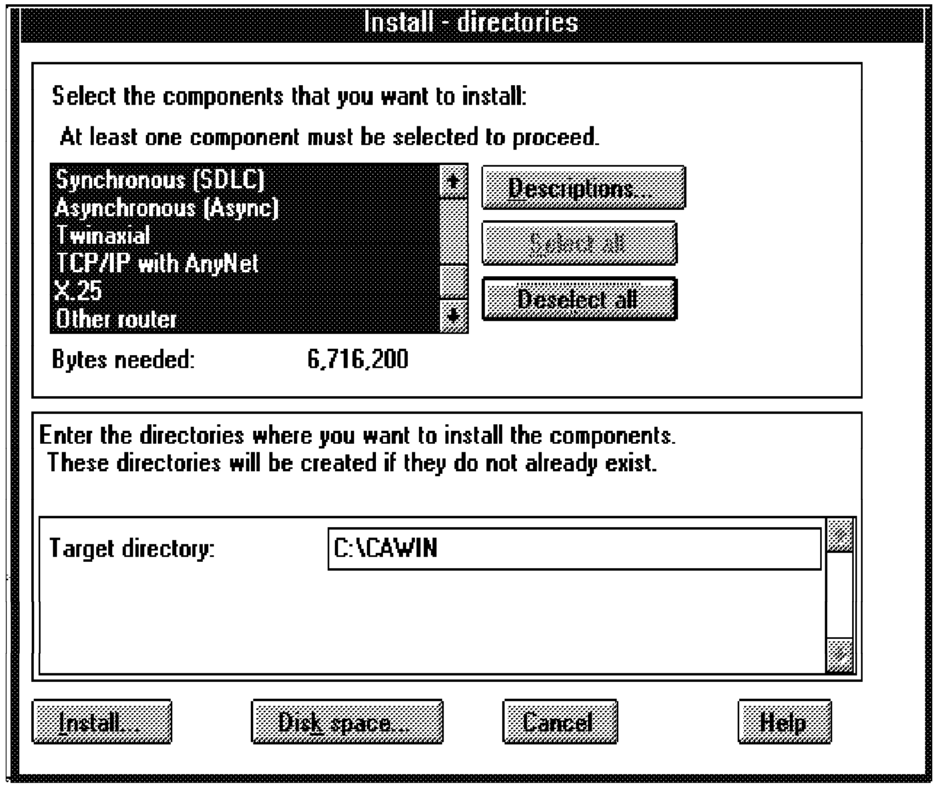

Figure 352. Selecting the Location of the CAWIN Directory

Tip

Clicking the **Select all** button at this point will allow you to change the connection type at a later date without running the install program again.

6. Type in the Target Directory and click on the **Install** button.
7. Insert diskettes as requested.

8. Click on the **OK** button when the Initial installation complete message is displayed.

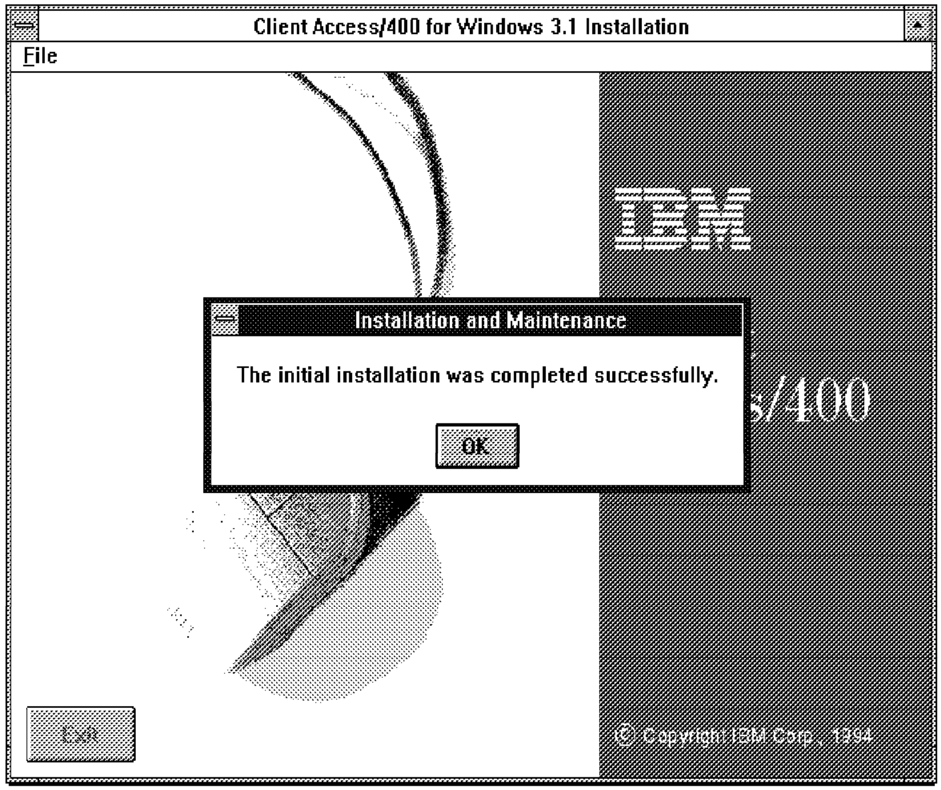

Figure 353. Initial Installation Complete Message

9. Click on the **OK** button when the message to restart Window displayed.

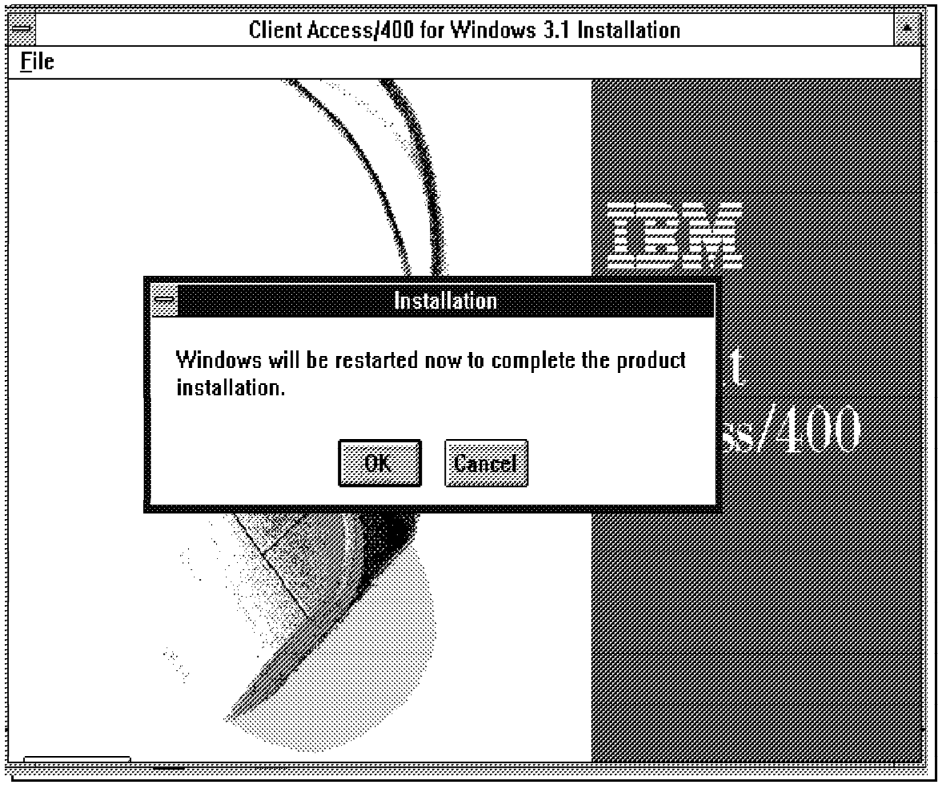

Figure 354. Restart Windows

10. Click on the **Continue** button when the Welcome to Setup window is displayed.

Figure 355. Welcome to Setup Window

11. In the Common Options panel we entered the parameters as shown in Figure 356.

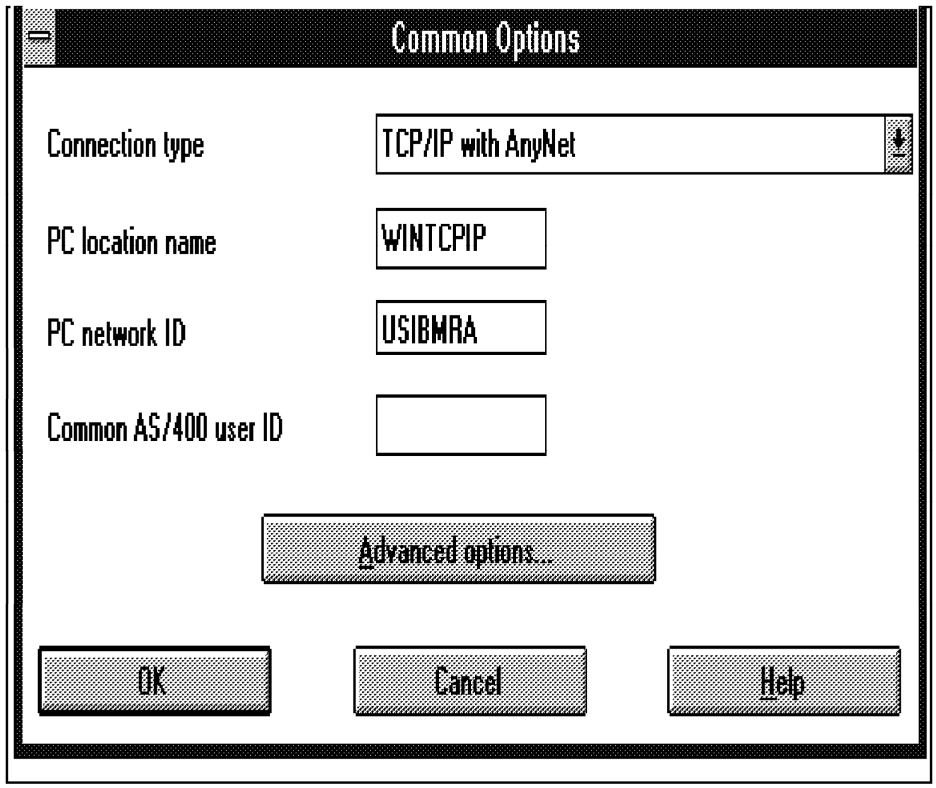

Figure 356. Entering the COMMON OPTIONS

The PC location name should match the remote location name specified in Figure 338 on page 274.

The PC network ID should match the remote network identifier specified in Figure 337 on page 272.

12. Click on **OK** to continue.

13. Click on the **Add** button.

14. The TCP/IP Configuration panel appears. For our PC we entered the parameters shown in Figure 357.

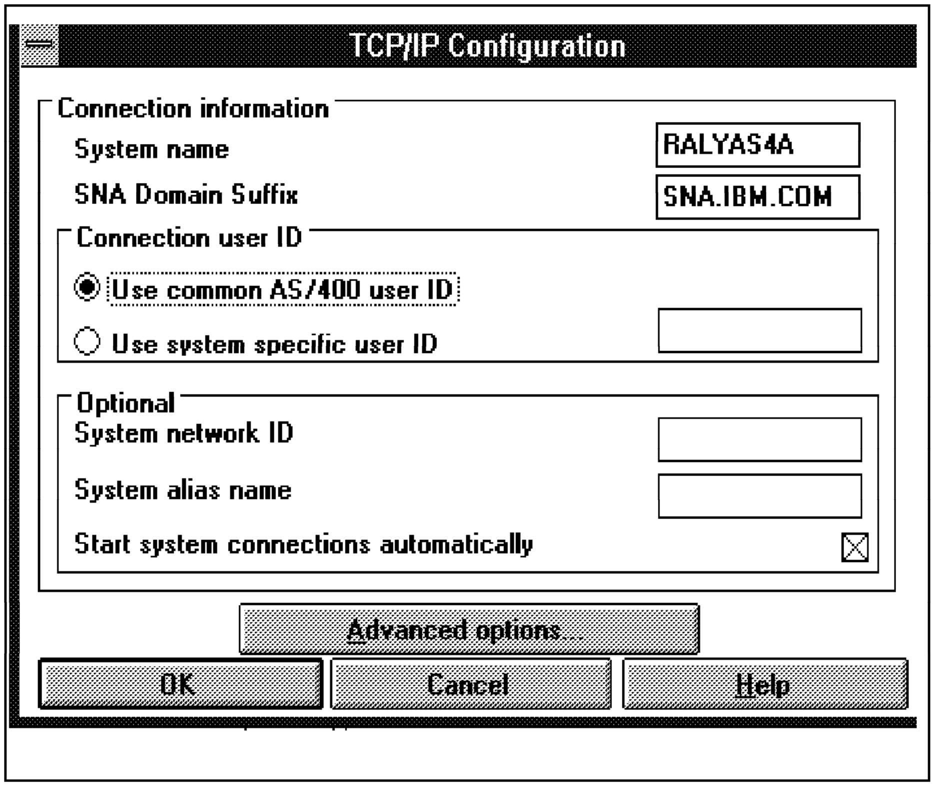

Figure 357. Entering the TCP/IP Configuration Options

The System name should match the local location name specified in Figure 338 on page 274.

The SNA Domain Suffix should match the SNA Domain Name Suffix specified in Figure 340 on page 276.

15. Click on **OK** to continue.

16. When the message to restart your PC is displayed, remove any diskettes in the diskette drive and click on the **Yes** button.

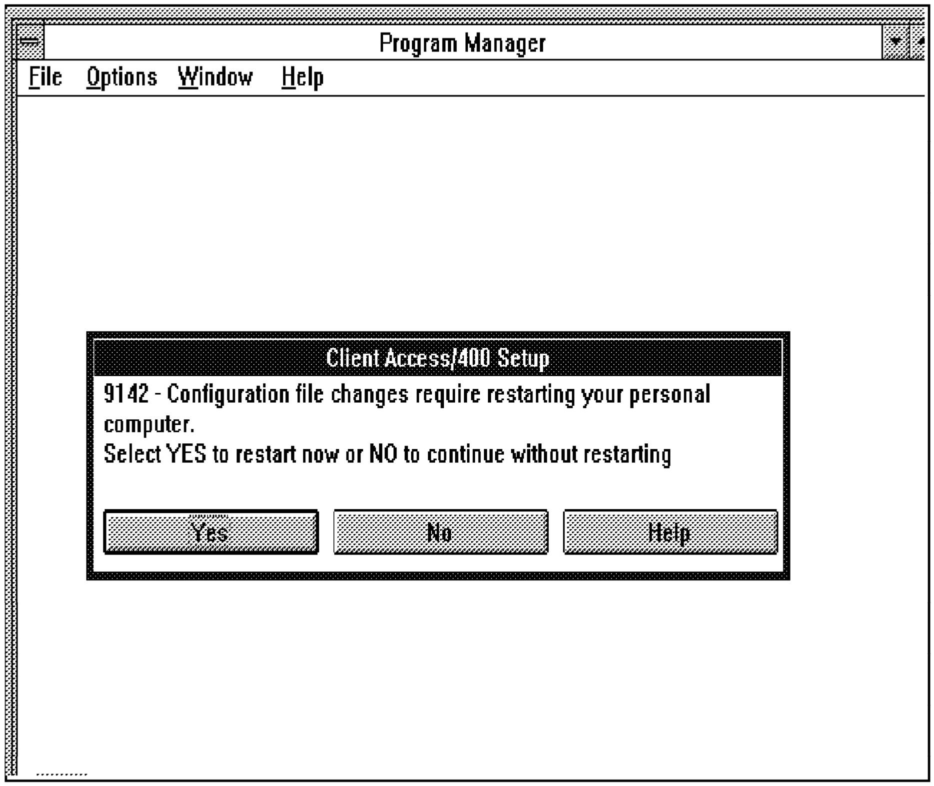

Figure 358. Windows Needs to Be Restarted After Configuration of CA/400

17. Press Ctrl-Alt-Del to reboot the PC when the reboot message is displayed. If you want to change the window group name for Client Access/400 for Windows 3.1, type in the new name and click on the **OK** button. Otherwise just click on the **OK** button to accept the default name.

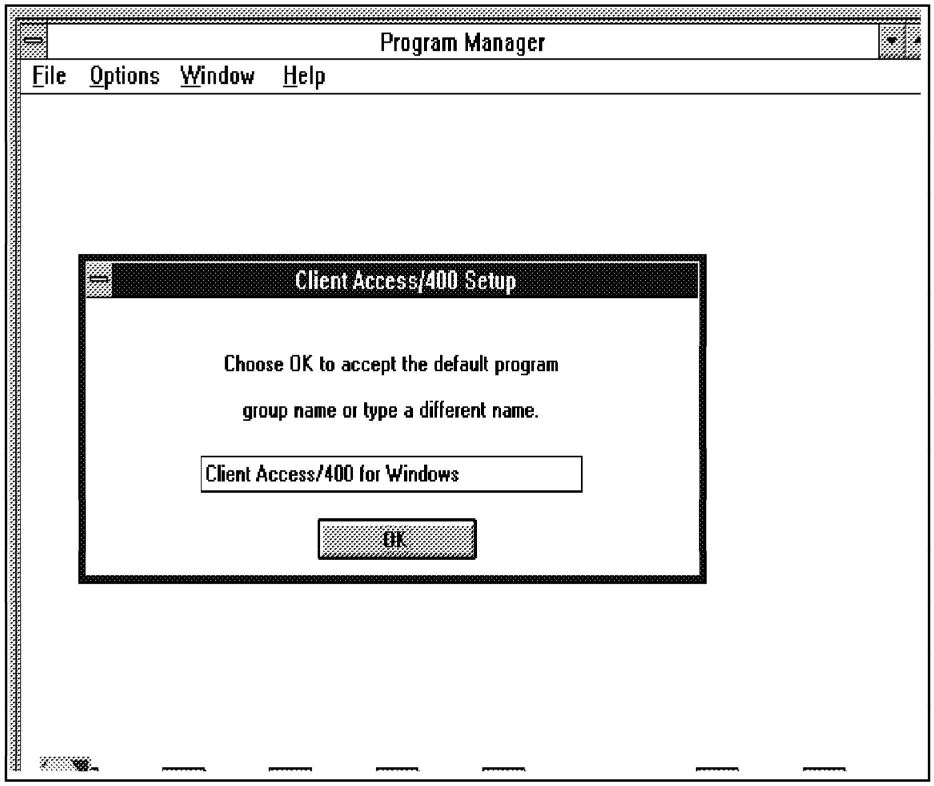

Figure 359. The Program Group Name Window

18. At the AS/400 Connection-Basic panel enter a valid Client Access User ID and Password.

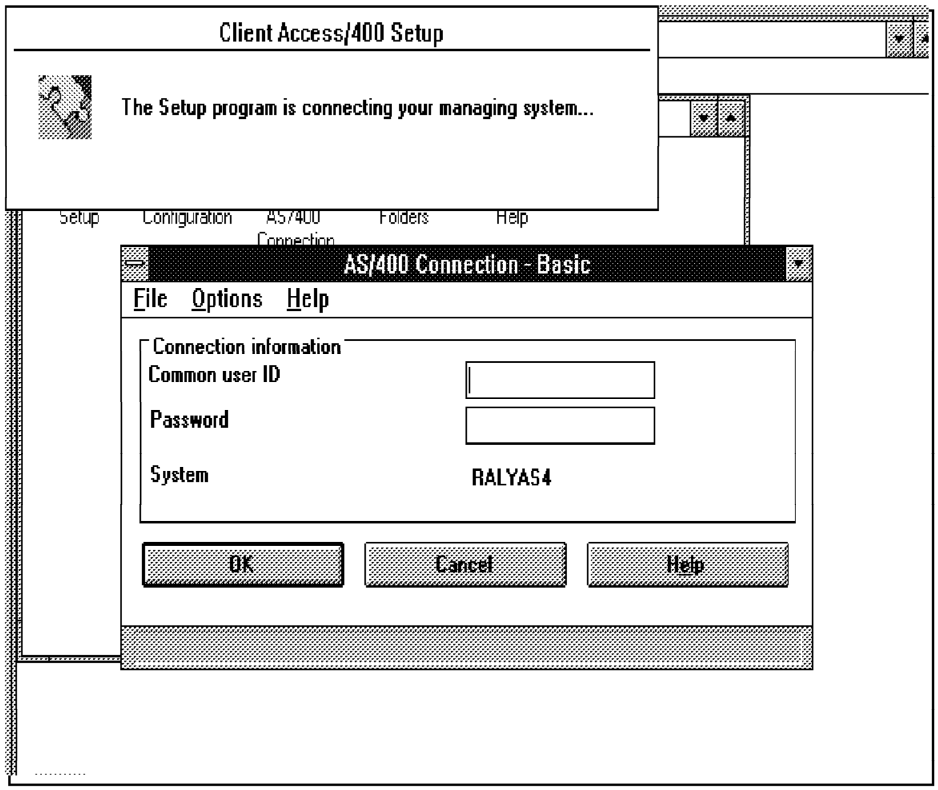

Figure 360. The AS/400 Connection-Basic Panel

19. At this point Client Access/400 for Windows 3.1 will connect to the AS/400 and the Client Access/400 Setup list box will be displayed.

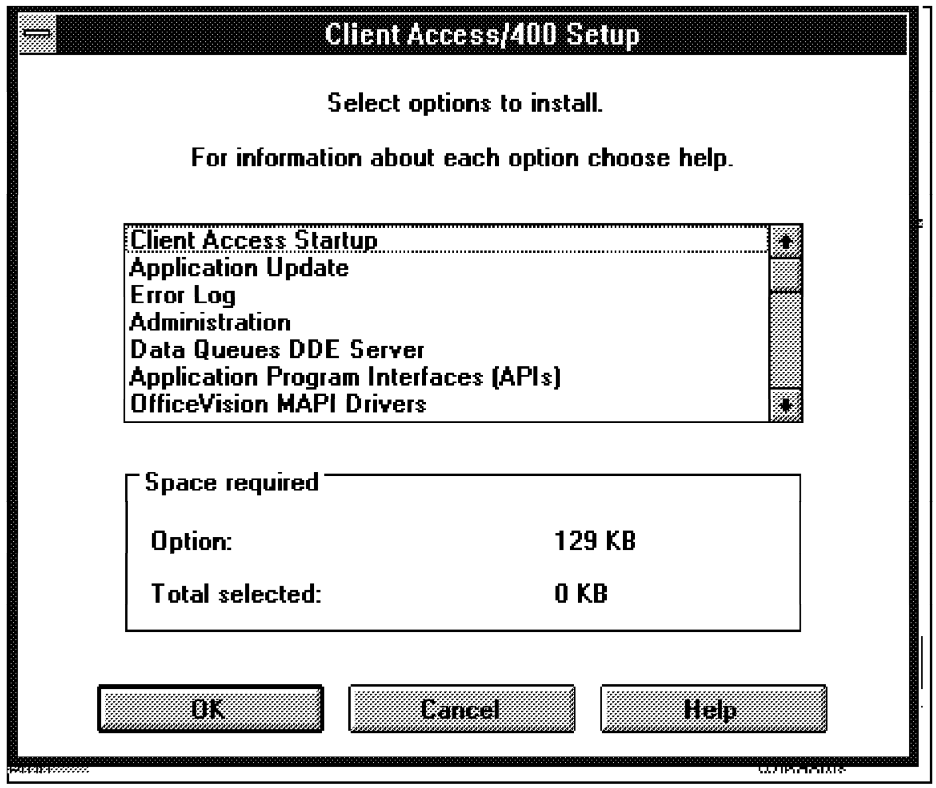

Figure 361. Client Access/400 Setup List Box

20. Select the features you want to install and click on **OK**. At this point you have a successful connection to the AS/400.

Show next are the matching parameters between WINTCPIP and RALYAS4A.

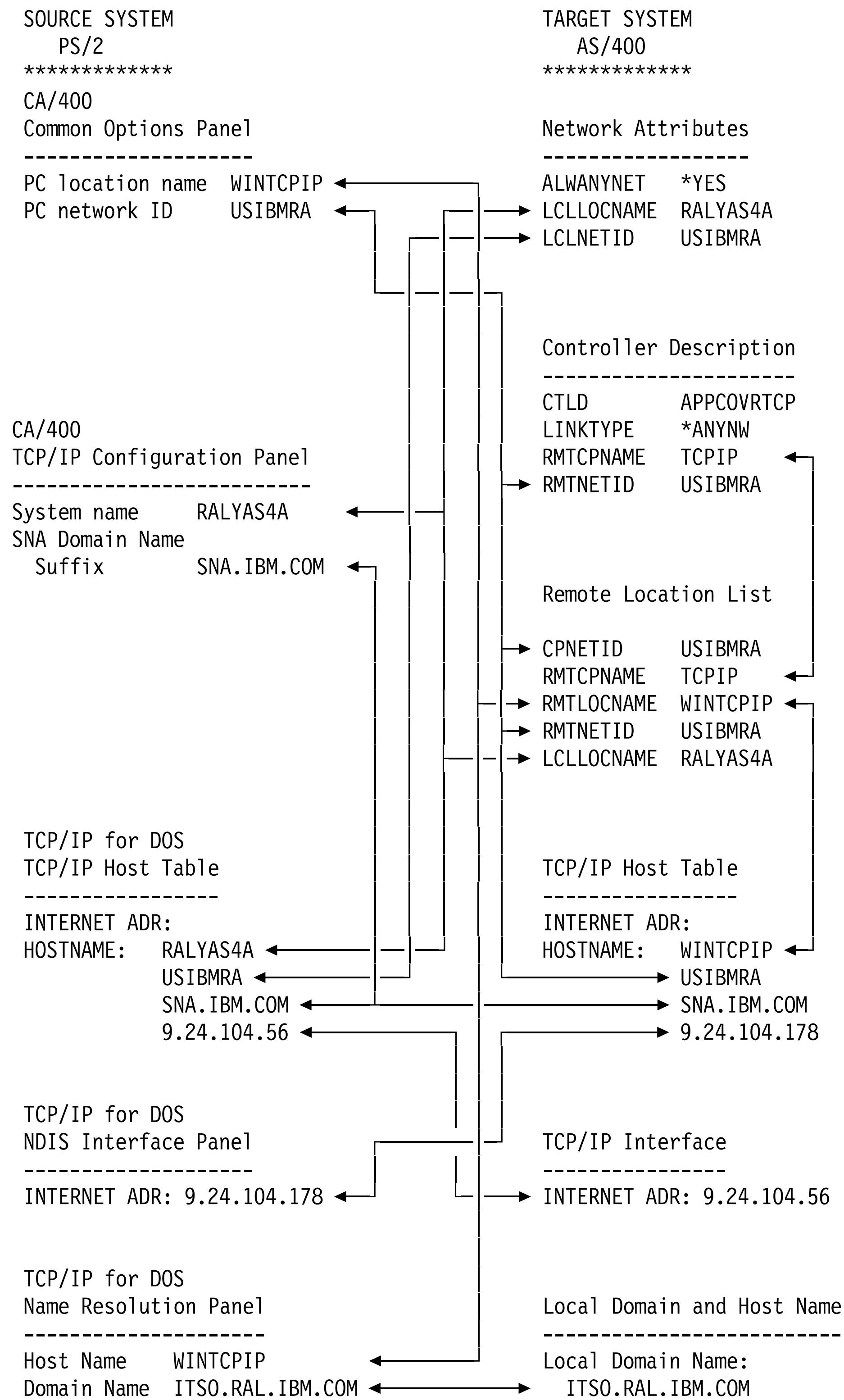

Figure 362. Client Access/400 for Windows 3.1 over TCP/IP: Matching Parameters Table

Ending Client Access/400 for Windows 3.1 over TCP/IP and Exiting Windows

One of the requirements of using Client Access/400 for Windows 3.1 over TCP/IP is that before you exit Windows, you must end communications.

> **IMPORTANT**
>
> Any time that you exit Windows, or a Windows program wants to restart Windows for you, Client Access/400 for Windows 3.1 over TCP/IP communications must be ended. If it is not ended, Windows will abort the exit.

To end Client Access/400 for Windows 3.1 over TCP/IP and exit Windows, do the following:

1. Double-click on the **AS/400 Connections** icon in the Client Access group window.
2. Select **Options** from the menu bar and choose **End Communications**.
3. Confirm with a **Yes** to End Communications.
4. Exit from Windows.

If a Windows program has displayed a Restart Windows Dialog box, do the following:

1. Before answering the dialog, go to the Client Access group and double-click on the **AS/400 connections** icon.
2. Select **Options** from the menu bar and choose **End Communications**.
3. Confirm with **Yes** to End Communications.
4. Go back to the dialog Box and choose **Yes** to restart windows.

   Note: The Client Access Update program will require these steps if files need to be updated.

Help with Problem Determination

This section covers some of the common problems encountered when installing Client Access/400 for Windows 3.1 over TCP/IP.

Message 9125 Connection Failed, return code = 0x32

The following problems could be causing this message:

- The host name used on the AS/400 or the host name referred to in the PC′s hosts file does not match the local location name (LCLLOCNAME) value in the network attributes (DSPNETA).

  In this case the PC returns the 9125 message and the a ANY0005E message is logged in the MSGLOG.NSD file in the \CAWIN directory.

- The host table entry on the AS/400 is incorrect.
- Only one, or neither of the AnyNet TCP/IP jobs are running. Normally, two jobs should be running at all times (see Figure 351 on page 285).

  If either job is *not* running on the AS/400, enter the ENDTCP command followed by the STRTCP command. This will restart both jobs. Remember, ending TCP/IP affects all TCP/IP users on the AS/400.

- Previous AS/400 connections have not ended. To fix this problem, enter NETSTAT on the AS/400 and choose option 3. Find the IP address of your PC and end any jobs running for it. This is usually caused when a PC is restarted without properly ending the Client Access/400 for Windows 3.1 over TCP/IP connections. The AnyNet jobs require a 6 minute wait period before ending. This means you have to either wait 6 minutes before reconnecting, or end the jobs for the PC.
- The DOS environment space is not big enough. The CONFIG.SYS file needs to have a SHELL statement with a /e: variable of 512 or greater. Also, the SHELL statement should have the correct path for the COMMAND.COM program.
- The PATH statement is more than 80 characters long. Long path statements may cause problems when using Client Access/400 for Windows 3.1 over TCP/IP. Use the %PATH% append to shorten the PATH.

Message 5239 Adapter Handler not Installed

This means that something is wrong with the TCP/IP stack. The following are possible causes:

- TCP/IP is not installed on the PC. Client Access ships with a version of TCP/IP for DOS. It needs to be installed and started before starting Client Access/400 for Windows 3.1.
- TCP/IP is not running on the PC. TCP/IP is started by the TCPSTART command. Check that it starts successfully.
- TCP/IP is not configured correctly on the PC. The following are common mistakes:
  - The hosts file wasn′t updated correctly.
  - The Domain Name is incorrect.
  - The Route is incorrect (it may not be needed).
  - The Name Server IP address is incorrect, or could not be reached.

Error: The route you are attempting to add already exists

If you are using IBM DOS 7.0, you must obtain an updated DOSTCP.SYS file. The DOSTCP.SYS file that is on the TCP/IP for DOS install diskettes provided with Client Access/400 for Windows 3.1 V3R1M1 will not work with DOS 7.0 and will cause the above message to display. See step 3 on page 280 for information on obtaining this fix.

Client Access/400 Optimized for OS/2 over TCP/IP

This chapter presents the process of configuring Client Access/400 Optimized for OS/2 over TCP/IP at the International Technical Support Organization in Raleigh.

The information is presented in the following sections:

1. Introduction to Client Access/400 Optimized for OS/2 over TCP/IP
2. Using Client Access/400 Optimized for OS/2 over TCP/IP
3. Configuring AnyNet/400 on the AS/400
4. Configuring Client Access/400 Optimized for OS/2 over TCP/IP - Part 1
5. Interim APPC over TCP/IP verification
6. Configuring Client Access/400 Optimized for OS/2 over TCP/IP - Part 2
7. Installation Hints and Tips

For further information on Client Access/400 Optimized for OS/2 over TCP/IP refer to the README.CA4 file which is contained on the first install diskette. If you have another install media, the document is in the QPWXGOS2 directory. This file contains information supplementary to the online Help and other publications. It includes newly added function, hints, tips, restrictions and corrections.

For further information on Client Access/400 Optimized for OS/2 TCP/IP setup, refer to: *Client Access/400 Optimized for OS/2 Getting Started*, SC41-3510 and Redbook: *Inside Client Access/400 Optimized for OS/2*, SG24-2587.

Introduction to Client Access/400 Optimized for OS/2 over TCP/IP

Client Access/400 Optimized for OS/2 is an APPC program that operated only in SNA networks until the arrival of OS/400 V3R1. Now Client Access/400 Optimized for OS/2 includes the IBM AnyNet programs that use the Multiprotocol Transport Networking architecture (MPTN). This communications technology defines a transparent layer between Client Access/400 Optimized for OS/2 on the PC and the network protocol. This allows Client Access/400 Optimized for OS/2 to fully function in a TCP/IP network. Some of the other Client Access/400 Optimized for OS/2 functional enhancements provided by V3R1 include the following:

- Client Management: The integration of AnyNet/2 into Client Access/400 Optimized for OS/2 provides Simple Network Management Protocol (SNMP) support for managing client workstations (host resources MIB). SNMP allows for installed product information and problem reports from the client workstation to be sent to the AS/400 directly for analysis.
- Graphical User Interface to AS/400: This is in the form of Graphical Access for OS/400 and Graphical Operations.
- Multiple Terminal and Print Emulators: RUMBA/400 or Personal Communications/5250.
- Data Access facility: A graphical interface which allows a user to easily select and retrieve AS/400 database records.
- Network Print: This replaces the Virtual Print function provided by PC Support/400. You can print PC documents on an AS/400 printer or a PC printer defined as an AS/400 printer.

- Network Drive: This replaces Shared Folders as provided by PC Support/400. Client Access/400 Optimized for OS/2 network drives can be assigned to any part of the IFS namespace therefore allowing you to view the entire file structure on the AS/400.
- Application Programming Interfaces (APIs).

The benefits of Client Access/400 Optimized for OS/2 operating in either a TCP/IP or SNA network are as follows:

- Customers no longer need to make PC connectivity decisions based on the underlying network protocol.
- Broadens access to applications.
- Investment in existing and future applications is protected through application independence.

Using Client Access/400 Optimized for OS/2 over TCP/IP

Client Access/400 Optimized for OS/2 is the first 32-bit client of the Client Access/400 Family. Developed using object-oriented programming principles, Client Access/400 Optimized for OS/2 provides automated installation, enhanced service functions, and improved configuration.

PC Software Requirements

Client Access/400 Optimized for OS/2 requires one of the following:

- OS/2 2.11 or higher
- OS/2 Version 2.11 for Windows
- OS/2 Warp Version 3.0
- OS/2 Warp Connect

Note: We used Client Access/400 Optimized for OS/2 V3R1M1 with OS/2 Warp Version 3.0 and the communications components provided by Client Access/400 Optimized for OS/2.

Client Access/400 Optimized for OS/2 contains a subset of AnyNet/2 and Communications Manager/2 1.11. No other communications software is required. These programs allow the APPC protocol to run over an SNA connection or a TCP/IP connection. The complete list of protocols supported are the following:

- APPC
- CPI-C
- Sockets

Note

The Client Access/400 OS/2 Client (16-bit) also includes a subset of IBM Communications Manager/2 1.11 but does not include AnyNet/2, therefore, it can only be used in SNA networks.

AS/400 Software Requirements

V3R1M1 Client Access/400 Optimized for OS/2 over TCP/IP requires OS/400 Version 3.0 Release 1.0 and the following program options to be installed on the AS/400:

- 5763 SS1 Host Servers
- 5763 XA1 Client Access/400 - Base V3.1.0 or later
- 5763 XG1 Client Access/400 Optimized for OS/2

The following may be optionally installed:

- 5763 XG1 Client Access/400 - RUMBA Optimized for OS/2 V3.1.0 or later
- 5763 XG1 Client Access/400 - PC5250 Optimized for OS/2 V3.1.0 or later
- 5763 XG1 Client Access/400 - GraphicOps for OS/2 V3.1.0 or later

Also ensure that the latest Cumulative PTF Package is installed. We used the Client Access/400 Optimized for OS/2 Refresh Version 3.1.1 with Cumulative C5304310. The refresh code for Client Access/400 Optimized for OS/2 became available in 3rd Quarter 1995 and offers enhancements for ODBC Level 2, NLV support, AFP Workbench, subset native SDLC and asynchronous connectivity, and Ultimedia system facilities.

Installing in an existing environment

If you plan on installing Client Access/400 Optimized for OS/2 in an existing setup, please refer to the README.CA4 file on the first install diskette or in the QPWXGOS2 directory. The scenarios covered are the following:

- Installing over an original OS/2 Client
- Installing using Communications Manager/2 1.11
- Installing over NetWare
- Installing with Warp Connect

Configuring AnyNet/400 APPC over TCP/IP

In order to run APPC over TCP/IP on your AS/400, the following OS/400 configuration steps are required:

1. Establish a TCP/IP configuration.
2. Change the Network Attribute ALWANYNET to *YES.
3. Create an APPC controller with LINKTYPE(*ANYNW).
4. Add an entry to the APPN remote location list.
5. Map the APPC LU name to an internet address.

The user ID, under which the APPC over TCP/IP configuration is created, must have sufficient authority to access the relevant commands. Some of the commands require the user ID to have the IOSYSCFG authority. The examples shown here were created using a profile with QSECOFR authority.

1. **Establish a TCP/IP configuration**

   A prerequisite for APPC over TCP/IP is a TCP/IP configuration between the AS/400 and the PC. In this step we will show the how to configure the TCP/IP connection. If your system already has a TCP/IP configuration to the remote system with which you want to communicate via APPC over TCP/IP, then you can skip this step and proceed to step 2 on page 305 in this section.

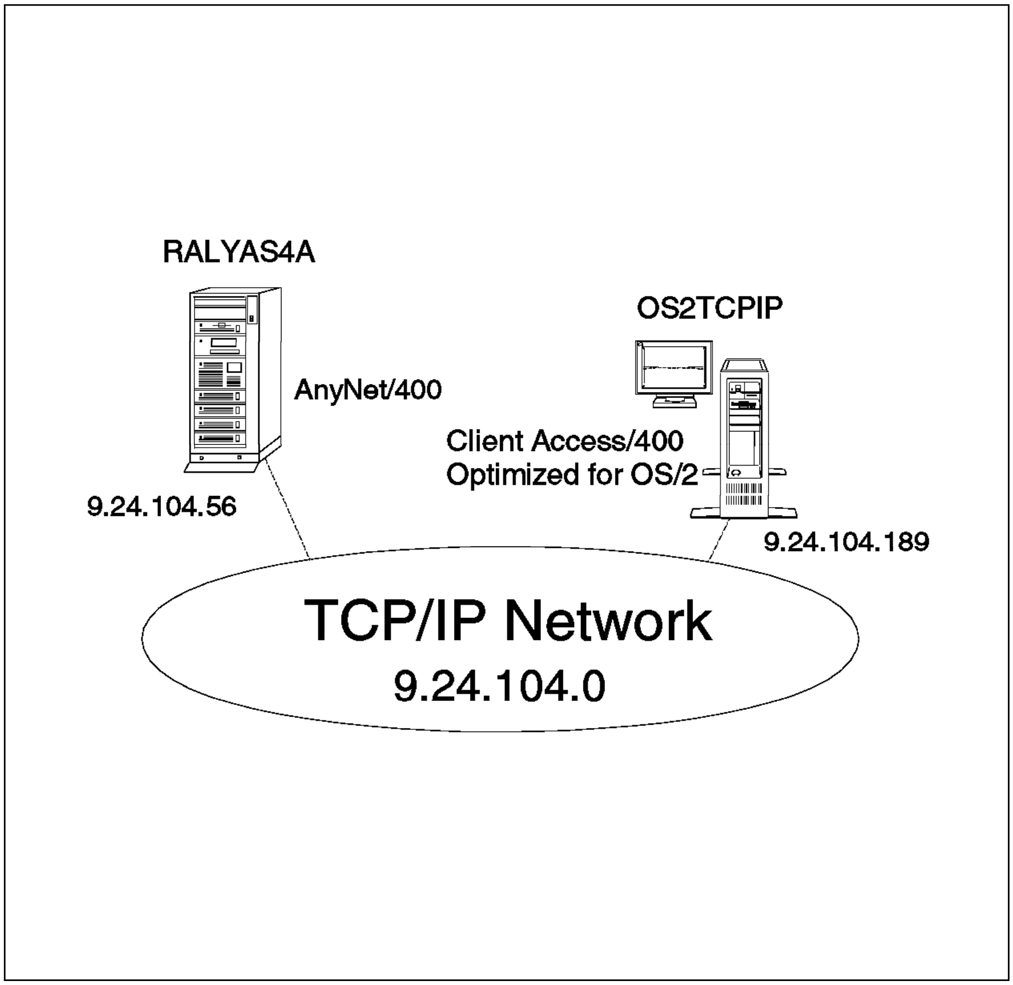

Figure 363. An AS/400 and PC Connected Using Client Access/400 Optimized for OS/2 over TCP/IP

In the following panels we create the TCP/IP configuration for RALYAS4A in Figure 363. The configuration steps for OS2TCPIP (the Client Access/400 Optimized for OS/2 PC) are discussed in "Configuring Client Access/400 Optimized for OS/2 over TCP/IP" on page 312.

The following panels show the configuration screens for a token-ring configuration. If you require help in establishing a TCP/IP configuration over another type of interface, refer to the manual *AS/400 TCP/IP Configuration and Reference* SC41-3420.

The AS/400 line description defines the physical interface to the network. If an appropriate line description does not already exist (they can be shared), you need to create one. Here we use the CRTLINTRN command to create a token-ring line description.

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

 Type choices, press Enter.

 Line description . . . . . . . . > TRN2619       Name
 Resource name  . . . . . . . . . > LIN041        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 description for LIN041'

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

Figure 364. Create Token-Ring Line Description - System RALYAS4A

For a TCP/IP configuration, there is no need to create controller and device descriptions, they are automatically created when TCP/IP first uses the token-ring line.

TCP/IP Interface

The TCP/IP interface defines this AS/400 on the TCP/IP network. Enter the CFGTCP command to access the Configure TCP/IP panel, and take option 1 to work with TCP/IP interfaces.

```
CFGTCP                          Configure TCP/IP
                                                             System:   RALYAS4A
Select one of the following:

     1. Work with TCP/IP interfaces
     2. Work with TCP/IP routes
     3. Change TCP/IP attributes
     4. Work with TCP/IP port restrictions
     5. Work with TCP/IP remote system information

    10. Work with TCP/IP host table entries
    11. Merge TCP/IP host table
    12. Change local domain and host names
    13. Change remote name server

    20. Configure TCP/IP applications
    21. Configure related tables


Selection or command
===> 1

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

Figure 365. TCP/IP Configuration Menu

```
                          Work with TCP/IP Interfaces
                                                             System:   RALYAS4A
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   9=Start   10=End

     Internet         Subnet              Line      Line
Opt  Address          Mask                Description  Type

__   _______________
__   9.24.104.56      255.255.255.0    TRN2619     *TRLAN
__   127.0.0.1        255.0.0.0        *LOOPBACK   *NONE



                                                                        Bottom
F3=Exit   F5=Refresh   F6=Print list   F10=Work with IP over SNA interfaces
F11=Display interface status           F12=Cancel   F17=Top   F18=Bottom
```

Figure 366. TCP/IP Interface Definition - System RALYAS4A

If a TCP/IP interface does not already exist, add an entry using the internet address allocated to this system and the mask of the subnet in which the system resides.

Besides allowing you to add, change and remove TCP/IP interfaces, this screen also allows you to start and end these interfaces.

TCP/IP Route

If the route to the remote host is via a gateway or the remote host resides in a different network or subnetwork to the local host, it will be necessary to use option 2 from the Configure TCP/IP screen to configure a route. This is not the case in this simple scenario.

TCP/IP Host table

The local host table on the AS/400 contains a list of the internet addresses and associated host names for this network. To access the AS/400 host table enter the CFGTCP command and take option 10 (Work with TCP/IP Host Table Entries).

```
                      Work with TCP/IP Host Table Entries
                                                              System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Rename

      Internet         Host
 Opt  Address          Name
  _   _______________
  _   9.24.104.56      RALYAS4A
                       RALYAS4A.ITSO.RAL.IBM.COM
  _   9.24.104.189     OS2TCPIP
                       OS2TCPIP.ITSO.RAL.IBM.COM




 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 367. TCP/IP Host Table Entries - System RALYAS4A

Unless you are planning to use a name server, add an entry for the local system and any remote system(s) to which TCP/IP is to be used. In the above example, both the short and long names have been entered.

2. **Change the Network Attribute ALWANYNET to *YES**

Now we start the AnyNet specific configuration steps. First we must change the ALWANYNET network attribute to *YES. Changing this attribute will allow support on your system for APPC over TCP/IP, Sockets over SNA, APPC over IPX and Sockets over IPX. The default for this value, when V3R1 is initially installed, is *NO. Use the DSPNETA command to see what your system is set to. If it is set to *NO, use the command:

```
CHGNETA ALWANYNET(*YES)
```

After changing this attribute, you can verify the change by entering the DSPNETA command. The resulting displays are shown in the following figure.

```
                    Display Network Attributes
                                                    System:   RALYAS4A
Current system name . . . . . . . . . . . . . . :   RALYAS4A
  Pending system name . . . . . . . . . . . . . :
Local network ID . . . . . . . . . . . . . . . . :   USIBMRA
Local control point name . . . . . . . . . . . . :   RALYAS4A
Default local location . . . . . . . . . . . . . :   RALYAS4A
Default mode . . . . . . . . . . . . . . . . . . :   BLANK
APPN node type . . . . . . . . . . . . . . . . . :   *NETNODE
Data compression . . . . . . . . . . . . . . . . :   *NONE
Intermediate data compression . . . . . . . . . :   *NONE
Maximum number of intermediate sessions . . . . :   200
Route addition resistance . . . . . . . . . . . :   128
Server network ID/control point name . . . . . . :   *LCLNETID   *ANY

                                                               More...
```

```
                    Display Network Attributes
                                                    System:   RALYAS4A
Alert status . . . . . . . . . . . . . . . . . . :   *ON
Alert logging status . . . . . . . . . . . . . . :   *ALL
Alert primary focal point . . . . . . . . . . . :   *YES
Alert default focal point . . . . . . . . . . . :   *NO
Alert backup focal point . . . . . . . . . . . . :
  Network ID . . . . . . . . . . . . . . . . . . :     *NONE
Alert focal point to request . . . . . . . . . . :   RAK
  Network ID . . . . . . . . . . . . . . . . . . :     USIBMRA
Alert controller description . . . . . . . . . . :   *NONE
Alert hold count . . . . . . . . . . . . . . . . :   0
Alert filter . . . . . . . . . . . . . . . . . . :   AS400NET
  Library . . . . . . . . . . . . . . . . . . . :     QALSNDA
Message queue . . . . . . . . . . . . . . . . . :   QSYSOPR
  Library . . . . . . . . . . . . . . . . . . . :     QSYS
Output queue . . . . . . . . . . . . . . . . . . :   QPRINT
  Library . . . . . . . . . . . . . . . . . . . :     QGPL
Job action . . . . . . . . . . . . . . . . . . . :   *FILE
                                                               More...
```

```
                    Display Network Attributes
                                                    System:   RALYAS4A
Maximum hop count . . . . . . . . . . . . . . . :   16
DDM request access . . . . . . . . . . . . . . . :   *OBJAUT
Client request access . . . . . . . . . . . . . :   *OBJAUT
Default ISDN network type . . . . . . . . . . . :
Default ISDN connection list . . . . . . . . . . :   QDCCNNLANY
Allow ANYNET support . . . . . . . . . . . . . . :   *YES
Network Server Domain . . . . . . . . . . . . . :   RALYAS4A

                                                              Bottom
Press Enter to continue.

F3=Exit   F12=Cancel
```

*Figure 368. Display of Network Attributes with ALWANYNET(*YES)*

Changing the ALWANYNET network attribute to *YES will result in the APPC over TCP/IP job (QAPPCTCP) being started in the QSYSWRK subsystem.

3. **Create an APPC controller with LINKTYPE(*ANYNW)**

The AS/400 controller description defines the remote system. A new LINKTYPE has been added to the APPC controller description for AnyNet. With AnyNet, the APPC controller is no longer directly attached to a line description. Use the CRTCTLAPPC (Create APPC Controller Description) command to create an APPC controller with LINKTYPE(*ANYNW).

```
                      Create Ctl Desc (APPC) (CRTCTLAPPC)

 Type choices, press Enter.

 Controller description . . . . . > APPCOVRTCP    Name
 Link type  . . . . . . . . . . . > *ANYNW        *ANYNW, *FAX, *FR, *IDLC...
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Remote network identifier  . . .   *NETATR       Name, *NETATR, *NONE, *ANY
 Remote control point . . . . . . > TCPIP         Name, *ANY
 User-defined 1 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 2 . . . . . . . . .   *LIND         0-255, *LIND
 User-defined 3 . . . . . . . . .   *LIND         0-255, *LIND
 Text 'description' . . . . . . . > 'Client Access AnyNet Controller'



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

*Figure 369. Create Controller Description with LINKTYPE(*ANYNW)*

The Remote network identifier should match the local network identifier on the remote system. *NETATR indicates that the value in the network attributes should be used, that the local system and remote system have the same network ID. The Remote control point name, however, is not used external to the system. The remote control point name entered should match the value entered in the APPN remote location list.

APPC Device Description and Mode Description

The APPC device description is automatically created when the PC initially connects with the AS/400.

APPC over TCP/IP uses mode descriptions in the same way that APPC over SNA does.

Note: It is not possible to map an APPC mode to an IP type of service.

Additional Technical Information for APPC Controller

The following technical information describes the difference between a TCP/IP APPC Controller and an SNA APPC Controller:

- The name of the *ANYNW controller and the remote control point name have no relationship to the name of the PC coming in.
- Each *ANYNW controller can handle up to 254 PCs at a time, and since the PCs may have different control point names and LU names, again, there is no relationship.
- The remote control point name in the *ANYNW controller is only used internally to the AS/400 system, as you see later when we add an entry to the configuration list.

- When the BIND comes in for a PC through AnyNet, the code on the AS/400 system looks at the NETID.LUNAME part of the domain name of the PC. If there is a device already created with the NETID.LUNAME on any *ANYNW controller, and it is varied on, this device is used. If no match for the NETID.LUNAME is found on the *ANYNW controllers, the controller with the least number of devices attached is used to attach the newly created device. This balances the load on each of the *ANYNW controllers.
- An *ANYNW controller must be varied on for APPC over TCP/IP to function.
- The device description that is created for your PC on the AS/400 system remains in status Active even if you disconnect your PC from the AS/400 system.

Note

In most cases, you only need to create one *ANYNW controller since you can have up to 254 PCs coming through that controller. If you have several *ANYNW controllers, there is no way to predict under which controller the device corresponding for your PC will appear, unless you manually create the device description associated with that PC.

4. **Add an Entry to the APPN Remote Location List**

For functions that are initiated from the AS/400 system, such as RUNRMTCMD and data queues, the AS/400 system requires an APPN remote location list entry for each remote system where APPC over TCP/IP is used. APPC over TCP/IP communications needs the information in the APPN remote location list to determine which controller description to use when it activates the session.

To update the APPN remote location list, use the following command:

```
CHGCFGL *APPNRMT
```

The resulting display is in Figure 370 on page 309.

```
                          Change Configuration List              RALYAS4A
                                                        11/10/94  10:47:23
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

--------------------------APPN Remote Locations---------------------------
          Remote              Remote    Control
Remote    Network   Local     Control   Point     Location           Secure
Location  ID        Location  Point     Net ID    Password            Loc
OS2TCPIP  USIBMRA   RALYAS4A  TCPIP     *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
________  *NETATR   *NETATR   ________  *NETATR   _______________     *NO
                                                                     More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 370. APPN Remote Location List Panel

AS/400 APPN requires that all remote location names be unique. Thus, it cannot have the same remote location name and remote network ID in both its SNA network and its TCP/IP or IPX network.

- The Remote Location name should match the local location (LU) name at the remote system. Use the PC Location name as shown in Figure 385 on page 322.
- The Local Location name should match the remote location (LU) name at the remote system. Use the System Name shown in Figure 392 on page 327.
- The Remote Network ID and Control Point Net ID should match the remote network identifier in the APPC controller with a LINKTYPE(*ANYNW). *NETATR indicates that the value in the network attributes should be used.
- The Remote Control Point name should match the remote control name in the APPC controller with a LINKTYPE(*ANYNW).

Any entry added to the APPN remote location list results in an entry in the local APPN topology database. However, the APPC over TCP/IP entry is not propagated to other systems in the APPN network; the entry is used as an end node, only information on attached network nodes is propagated. No topology updates flow as a result of adding the APPC over TCP/IP entry. In addition to being used locally, the APPC over TCP/IP entry allows this system to respond to APPN search requests received for these LU names. It is this function that allows the AS/400 system to act as a bridge.

Additional Technical Information for the APPN Remote Location List

- A configuration list entry is only necessary if your application does an allocate out of the AS/400 system. We recommend that you include the necessary entries in this list in order to have your AnyNet configuration complete and ready for possible future use should an AS/400 application need to call out to a PC.

- You need to be able to attach an APPC controller to a PC LU name. Therefore, if your PCs have similar LU names, you can use generic entries in the configuration list as shown in Figure 371 on page 310.

```
                          Change Configuration List                     RALYAS4A
                                                              12/04/95  11:12:24
 Configuration list  . . :   QAPPNRMT
 Configuration list type :   *APPNRMT
 Text  . . . . . . . . . :

 Type changes, press Enter.

 --------------------------APPN Remote Locations------------------------
           Remote              Remote    Control
 Remote    Network   Local     Control   Point     Location          Secure
 Location  ID        Location  Point     Net ID    Password           Loc
 OS2TCP*   USIBMRA   RALYAS4A  TCPIP     USIBMRA   __________
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
 ________  *NETATR   *NETATR   ________  *NETATR   _______________    *NO
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 371. APPN Remote Location List Panel with Generic Name

- It is possible that an incoming conversation (such as Client Access/400) produces a device description on one *ANYNW controller, while an outgoing conversation to the same PC (such as data queues) produces a device on another controller as specified in the configuration list. This means that there may be two device descriptions for the same PC!

Hint

To keep the administration as simple as possible, try to create only the necessary number of APPC controllers of type *ANYNW. Remember, each controller can support up to 254 PCs.

5. Map the APPC LU name to an internet address

The TCP/IP host table provides the mapping between host name and internet address. Here it is providing the mapping between the SNA remote location name/remote network ID and the remote internet address.

Enter the CFGTCP command to access the Configure TCP/IP panel, and take option 10 to work with the TCP/IP host table.

```
                     Work with TCP/IP Host Table Entries
                                                            System:   RALYAS4A
 Type options, press Enter.
   1=Add   2=Change   4=Remove   5=Display   7=Rename

      Internet          Host
 Opt  Address           Name

  _   _______________
  _   9.24.104.56       RALYAS4A
                        RALYAS4A.ITSO.RAL.IBM.COM
                        RALYAS4A.USIBMRA.SNA.IBM.COM
  _   9.24.104.189      OS2TCPIP
                        OS2TCPIP.ITSO.RAL.IBM.COM
                        OS2TCPIP.USIBMRA.SNA.IBM.COM


 F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 372. TCP/IP Host Table Entries

For APPC over TCP/IP, the host name entries are made up as follows:

- OS2TCPIP - Remote SNA location (LU) name
- USIBMRA - Remote SNA network ID
- SNA.IBM.COM - SNA Domain Name Suffix

Add an entry for each remote system to which APPC over TCP/IP will be used. The remote SNA location names and SNA network IDs should be as specified in the APPN remote location list.

Note

A PTF is now available to allow the AS/400 to use an SNA domain name suffix of other than SNA.IBM.COM. The PTF is shipped in two parts: MF08352 and SF21042. Both PTFs are on Cumulative C5157310 or later.

When communicating between systems using APPC over TCP/IP, both systems must use the same SNA Domain Name Suffix.

This host table will be used by native TCP/IP and APPC over TCP/IP. The entries *without* the extension SNA.IBM.COM are for native TCP/IP.

Note

The AS/400 TCP/IP Host Table will allow a maximum of four host names to be entered against a single host internet address. This may become a restriction when using AnyNet/400 APPC over TCP/IP. One possible alternative is to use a name server rather than the AS/400 host table.

With all of the configuration steps completed, you are now ready to use the APPC over TCP/IP support of AnyNet/400. The next section shows how to set up the PC side of the configuration.

Configuring Client Access/400 Optimized for OS/2 over TCP/IP

The installation and configuration of Client Access/400 Optimized for OS/2 will be carried out in the following phases:

1. Client Access/400 Optimized for OS/2 Installation - TCP/IP Part 1
2. Interim APPC over TCP/IP verification
3. Client Access/400 Optimized for OS/2 Installation - TCP/IP Part 2

Client Access/400 Optimized for OS/2 Installation - TCP/IP, Part 1

1. Before you start the installation process on the PC, there are some adjustments that you need to make to CONFIG.SYS. We suggest you make the following adjustments now:

   - RESTARTOBJECTS

     We recommend that you add a restart objects statement or change the existing restart objects statement in CONFIG.SYS to:

     ```
     SET RESTARTOBJECTS=STARTUPFOLDERSONLY
     ```

     Doing this tells OS/2 to start only the objects in the OS/2 Startup Folder when the Workplace Shell is started, thereby keeping applications that need Client Access/400 functions from starting before Client Access/400 is started.

   - The CONNECTIONS option of SET AUTOSTART

     The CONNECTIONS option of AUTOSTART is not supported. Remove the CONNECTIONS statement from the following line:

     ```
     SET AUTOSTART=PROGRAMS,TASKLIST,FOLDERS,CONNECTIONS,LAUNCHPAD
     ```

     Having CONNECTIONS on the OS/2 SET AUTOSTART statement tells OS/2 to reconnect remote printer connections that were active when OS/2 shut down. Client Access/400 connections cannot be restarted at the time OS/2 connects these drives and printers.

     After Client Access/400 Optimized for OS/2 installation, you can use Client Access/400s startup configuration folder to automatically start network drives and printers. You can automatically start Client Access/400 by dragging a shadow of the Start Client Access/400 icon to OS/2′s startup folder.

   - Backing up CONFIG.SYS

     In case you need to remove Client Access/400 Optimized for OS/2, make a backup copy of CONFIG.SYS before you start the installation process.

2. The installation program, INSTALL.EXE, is located on the first installation diskette, or in the QPWXGOS2 directory on the drive you are going to install from. Enter the following command at an OS/2 prompt:

   ```
   A:\INSTALL
   ```

   for diskette installation, or if you are installing from other than diskettes:

   ```
   d:\path\QPWXGOS2\INSTALL
   ```

   where d:\path represents the drive and path that contains the QPWXGXXX directories.

3. On the Client Access Part 1 panel, select **Install**.

4. If you have Communications Manager/2 and NTS/2 already installed on your PC, please refer to the README.CA4 document on the first install diskette before you continue with the installation of Client Access/400 Optimized for OS/2.

5. Select **Custom** for the type of installation followed by **OK** to continue.

6. On the panel shown in Figure 373, you can change the installation location Drive and Path and the installation temporary storage Drive. The default location is `C:\CAOS2\` even if you are starting OS/2 from the D: drive. In this example, we install on the D: drive.

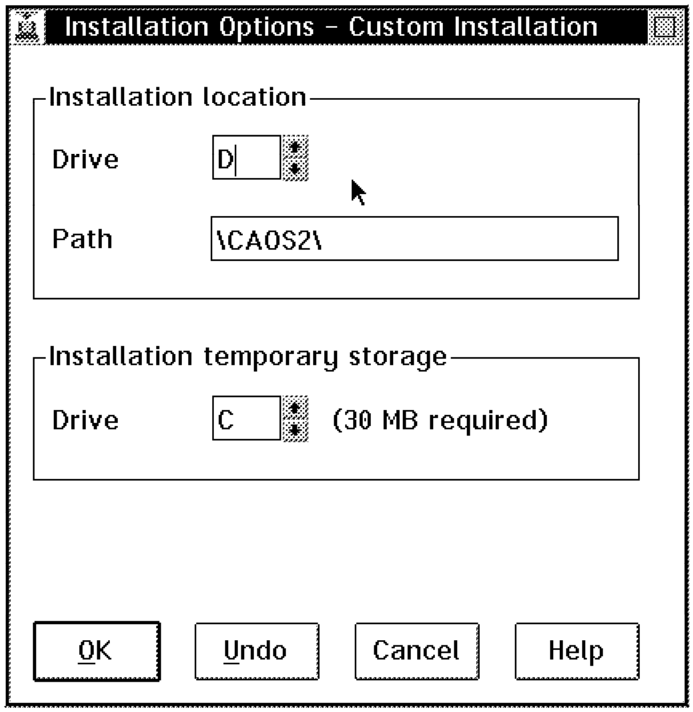

Figure 373. Installation Options - Custom Installation Panel

The Installation temporary drive storage is used by the installation program to store programs and files during the installation process. The temporary space needed is approximately 30 MB when all options are installed. The space is freed when the installation is completed.

Select **OK**.

7. On the Communications Support Options panel shown in Figure 374 on page 314, choose **TCP/IP** for the Network type parameter, and then choose **OK**.

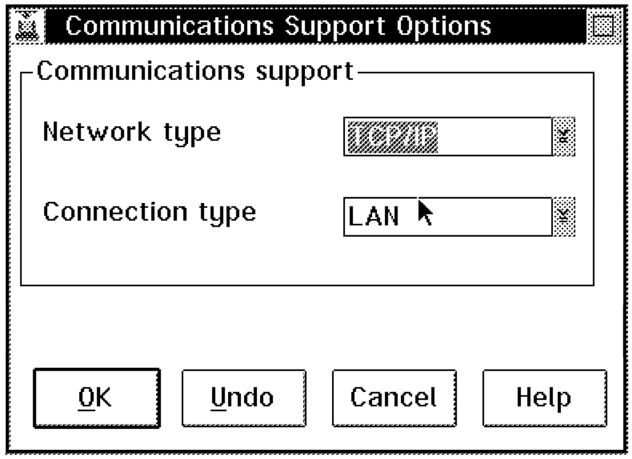

Figure 374. Communication Support Options - Panel

8. On the next panel (shown in Figure 375 on page 315), enter the LAN adapter information. Use the pull-down button to select the LAN adapter type installed in your PC.

Attention

If you are connected on token-ring, ensure that you select the appropriate adapter from the list instead of just taking the default IBM Token Ring Network Adapters entry. In our test case the default matched the type of card we used.

If you have an adapter installed that is not on the list, and already have LAN Adapter Protocol Support installed on the PC, choose **Other** from the list. A panel is displayed that tells you to configure the adapter using the LAPS configuration program at the end of installation part 1. For those adapters that are included on the list, Client Access/400 Optimized for OS/2 automatically installs and configures LAPS with the appropriate information. If you do not have LAPS already installed, and you are installing the V3R1M0 version of the client, you *must* first choose an adapter from the list, and then reconfigure LAPS to replace the adapter with the correct one following part 1 of the installation process.

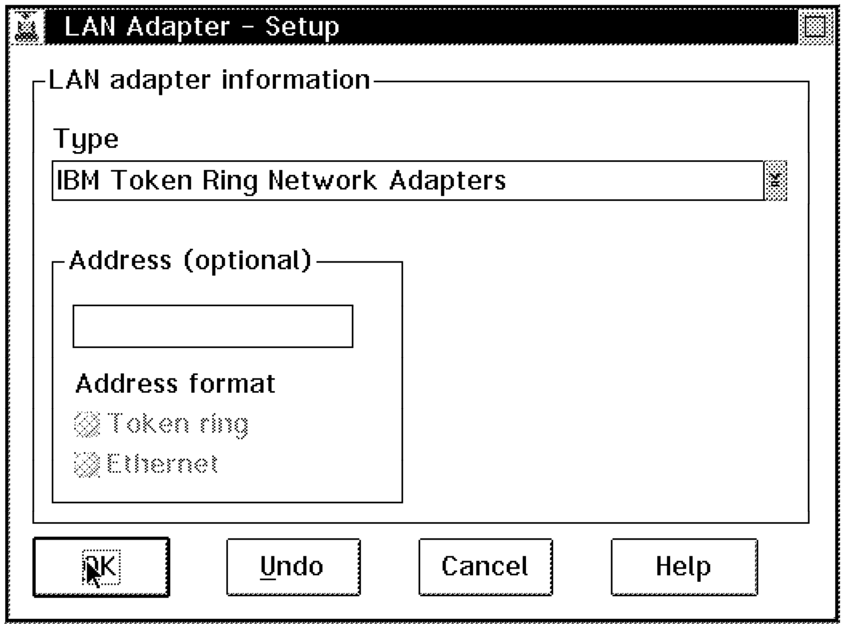

Figure 375. LAN Adapter - Setup Panel

Address (optional)
All LAN adapters cards have a burnt-in or encoded address that is used as the default when connecting to networks. The installation program uses this encoded address as the default unless you choose to override the address. To override the address in the LAN adapter card, enter a 12-digit hexadecimal number to use as the LAN address for the personal computer. Use the following ranges for the LAN adapter address:

- IBM token-ring network format:

  Use range 400000000000 - 7FFFFFFFFFFF.

- IEEE standard notation, Ethernet address format:

  Use range 020000000000 - FFFFFFFFFFFF.

  The address you use must be unique on the local area network.

Address format
Defines the address format of the LAN destination address at the workstation. Select the address format from the radio buttons. The two address formats are token-ring or Ethernet. The default is token-ring.

9. Select **OK** to continue.

10. The Communications Components panel lists the components that are installed on your workstation during part 1 of the installation process:

    - NTS/2 (when LAN)
    - Communications Manager
    - User Profile Management
    - AnyNet: Sockets over SNA
    - Systems Management
    - System Information Agent
    - Desktop Management Interface

It is possible to change the drive where some of the components are installed by selecting **Installation Path**.

Selecting **Check disk space** displays the required disk space for each of the components.

11. To continue, select **OK** from the Communications Components panel, and the panel shown in Figure 376 is displayed. The required parameters are in Figure 372 on page 311.

    - Local TCP host name
    - Domain name
    - SNA domain name suffix

Important: SNA Domain Suffix

The default value for the SNA Domain Suffix is SNA.IBM.COM. If you wish to change SNA Domain name suffix from the default, you need the following two PTFs - SF21042 and MF08352. They are on PTF cumulative C5157310 or later. This value must be the same as the value that is defined on the AS/400 system for the APPC applications that communicate with the AS/400 system.

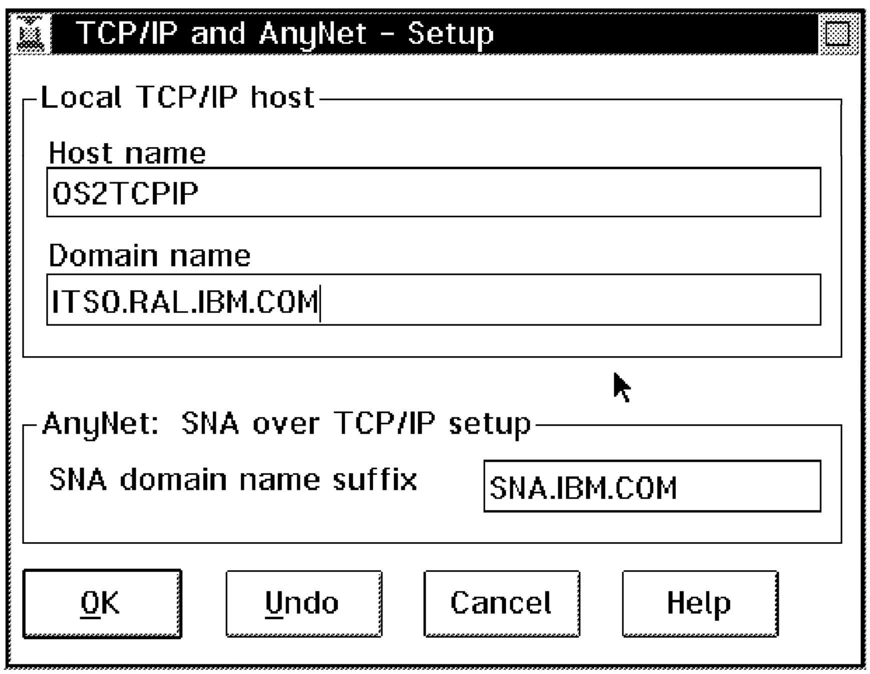

Figure 376. TCP/IP and AnyNet - Setup Panel

12. Select **OK** to continue.

13. On the Selective Install panel shown in Figure 377 on page 317, you can choose the functions that are installed during part 2 of the installation program. If you want to change the installation drive for the PC5250 or RUMBA/400 component, select the corresponding **Installation path** button.

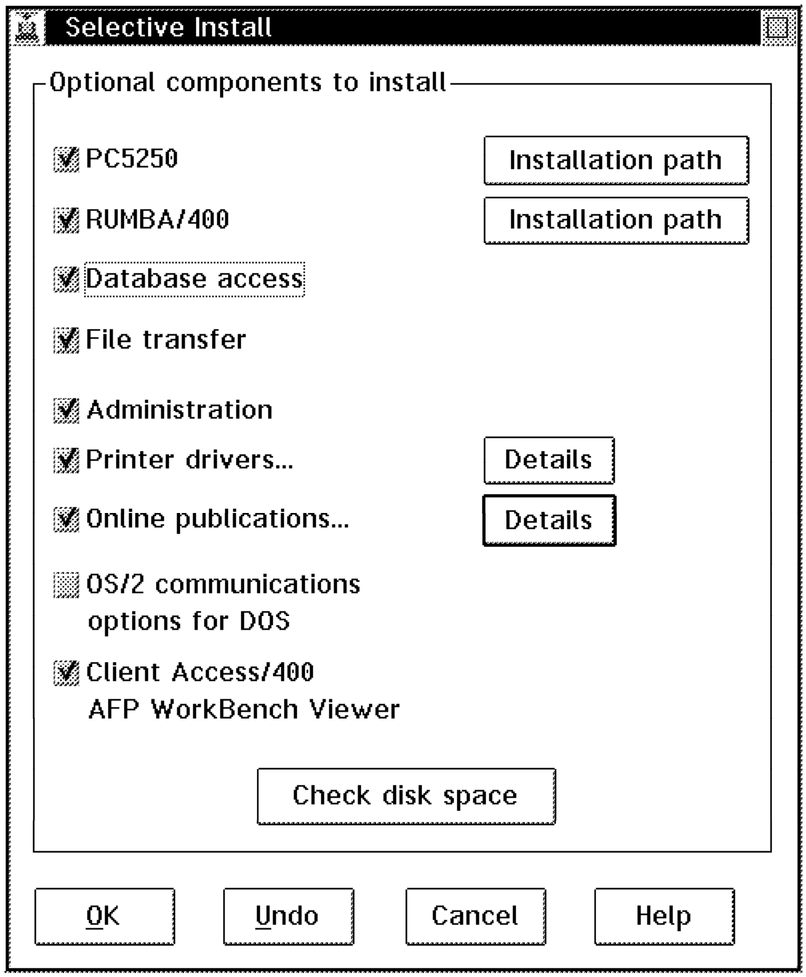

Figure 377. Selective Install Panel

14. If you want to change which printer drivers or online publications you are going to install, select the appropriate **Details** button. On the Printer Drivers - Details panel, select or deselect:

    - OS/2 AFP printer driver
    - OS/2 SCS printer driver
    - Windows AFP printer driver

    Make your choices and then select **OK**.

    On the Online Publications - Details panel, select or deselect:

    - Command and message references
    - Communication books

    Make your choices and select **OK**.

15. The Check disk space button allows you to review the disk space required for each of the components that are to be installed.

16. To continue, select **OK** from the Selective Install panel.

17. Select **Yes** on the Begin Client Access/400 Installation? panel to continue, or select **No** to go back and make corrections. When you select **Yes**, you see the Client Access/400 - Install in Progress panel shown in Figure 378 on page 318. This panel details the files that are being copied on your PC, and gives an indication of the time remaining to install each component.

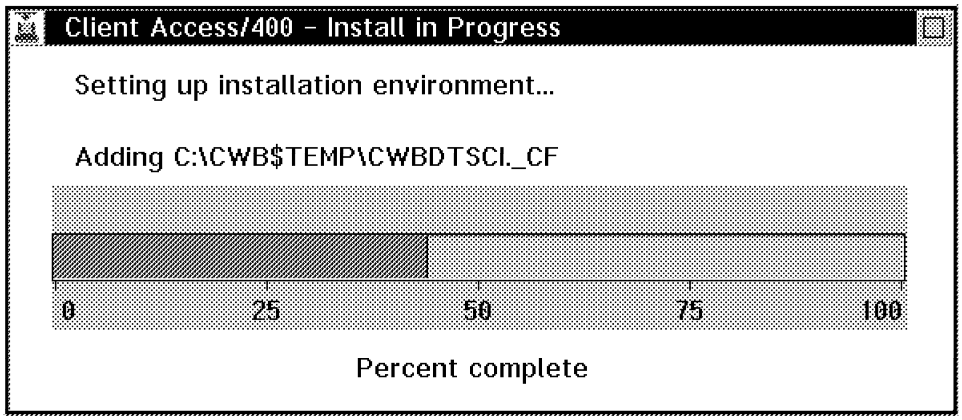

Figure 378. Client Access/400 Install in Process Panel

If you are installing from diskettes, you are prompted to insert diskettes when needed.

18. Select **Close** from the panel shown in Figure 379 to complete part 1 of the installation on the PC.

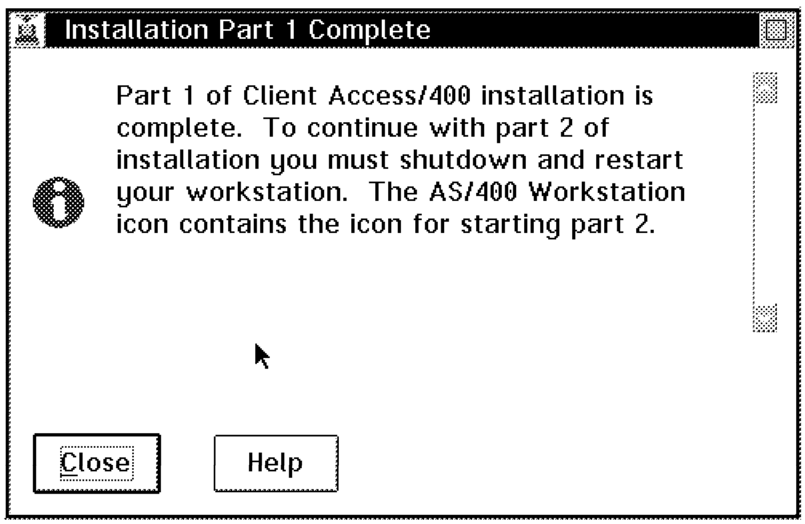

Figure 379. Installation Part 1 Complete - Panel

Note:

If you are going to install Part 2 using an alternative source to diskettes or the AS/400 system, such as CD-ROM or a LAN server, you must ensure that you have the line `SET CAINSTALL_SOURCE=d:\path\` in CONFIG.SYS, where `d:\path\` is the path containing the QPWXGxxx directories.

19. Shut down and restart the PC.

Interim AS/400 APPC over TCP/IP Verification

In the following section we install Client Access/400 Optimized for OS/2 over TCP/IP. During the installation, the PC connects to the AS/400 and downloads further Client Access/400 Optimized for OS/2 files to the PC. Because of this, it is a good idea to verify as much of the AS/400 APPC over TCP/IP configuration as is possible at this point.

First we should check that the APPC over TCP/IP job is running. The command WRKACTJOB SBS(QSYSWRK) will display the active jobs in the QSYSWRK subsystem. The APPC over TCP/IP job QAPPCTCP should be active as shown in the following figure.

```
                           Work with Active Jobs                   RALYAS4A
                                                          03/08/95  17:24:02
CPU %:     .0     Elapsed time:   00:00:00     Active jobs:   63

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
 _5    QAPPCTCP     QSYS        BCH      .0  PGM-QZPAIJOB     TIMW
 __    QECS         QSVSM       BCH      .0  PGM-QNSECSJB     DEQW
 __    QMSF         QMSF        BCH      .0                   DEQW
 __    QNSCRMON     QSVSM       BCH      .0  PGM-QNSCRMON     DEQW
 __    QTCPIP       QTCP        BCH      .0                   DEQW
 __    QTFTP00619   QTCP        BCH      .0                   DEQW
 __    QTFTP00734   QTCP        BCH      .0                   DEQW
 __    QTFTP02472   QTCP        BCH      .0                   TIMW
                                                                    More...
Parameters or command
===> _________________________________________________________________________
F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
F12=Cancel   F23=More options   F24=More keys
```

Figure 380. Work with Active Jobs Panel

If we look at the job log associated with QAPPCTCP, we see the following:

```
                             Display Job Log
                                                          System:   RALYAS4A
Job . . :   QAPPCTCP      User . . :   QSYS         Number . . . :   011338

 >> CALL QSYS/QZPAIJOB
    APPC over TCP/IP job started.



                                                                     Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F10=Display detailed messages   F12=Cancel
F16=Job menu           F24=More keys
```

Figure 381. Display Job Log (QAPPCTCP) Panel

Note

The APPC over TCP/IP job (QAPPCTCP) is initially started when the Allow AnyNet support (ALWANYNET) network attribute is changed to *YES. If the job fails for any reason, it is necessary to stop TCP/IP (ENDTCP), and start TCP/IP (STRTCP) again to re-start the job.

Before we can use the AS/400 APPC over TCP/IP configuration, we must Vary on the APPC controller description we created for the APPC over TCP/IP connection. The Work with Configuration Status command can be used to show the status of the controller. For example, the following command resulted in the display shown in Figure 382:

```
WRKCFGSTS *CTL APPCOVRTCP
```

```
                      Work with Configuration Status              RALYAS4A
                                                        03/08/95  16:30:11
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--------------
__   APPCOVRTCP        VARIED OFF








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

Figure 382. Work with Configuration Status for Controller at RALYAS4A

To make the configuration available, use option 1 (Vary on). The configuration should then go to a VARIED ON status.

When the first controller with link type *ANYNW is varied on, two TCP/IP connections will be started; one is a TCP connection that goes to LISTEN state to allow the system to accept incoming APPC over TCP/IP sessions; while the other is a UDP connection to handle out-of-band data for all APPC over TCP/IP activity. NETSTAT option 3 can be used to display all TCP/IP sessions (native TCP/IP and APPC over TCP/IP). Figure 383 shows NETSTAT option 3 prior to any APPC over TCP/IP sessions being established.

```
                     Work with TCP/IP Connection Status
                                                             System:   RALYAS4A
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote           Remote     Local
Opt  Address          Port       Port       Idle Time  State
     *                *          ftp-con >  026:45:25  Listen
     *                *          telnet     025:04:38  Listen
     *                *          APPCove >  000:09:55  Listen
     *                *          APPCove >  000:09:55  *UDP
     *                *          lpd        026:44:24  Listen




                                                                         Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 383. NETSTAT Option 3 - TCP/IP Connection Status

If the APPC over TCP/IP connections (APPCove) fail for any reason, it is necessary to stop TCP/IP (ENDTCP) and start TCP/IP (STRTCP) again to re-start the jobs.

You should now be ready to install Client Access/400 Optimized for OS/2, part 2, on the PC.

Client Access/400 Optimized for OS/2 Installation - TCP/IP, Part 2

When you restart the PC following part 1 of the installation program, you see the  AS/400 Workstation icon on the OS/2 desktop.

Note

If you chose **Other** from the list in panel Figure 375 on page 315 and have not yet configured 802.2 for your adapter, you must do so at this point, by entering the LAPS command at an OS/2 command prompt.

1. Double-click on the **AS/400 Workstation** icon  .

2. Select the **Client Access/400 Install part 2**  icon to start part 2 of the installation.

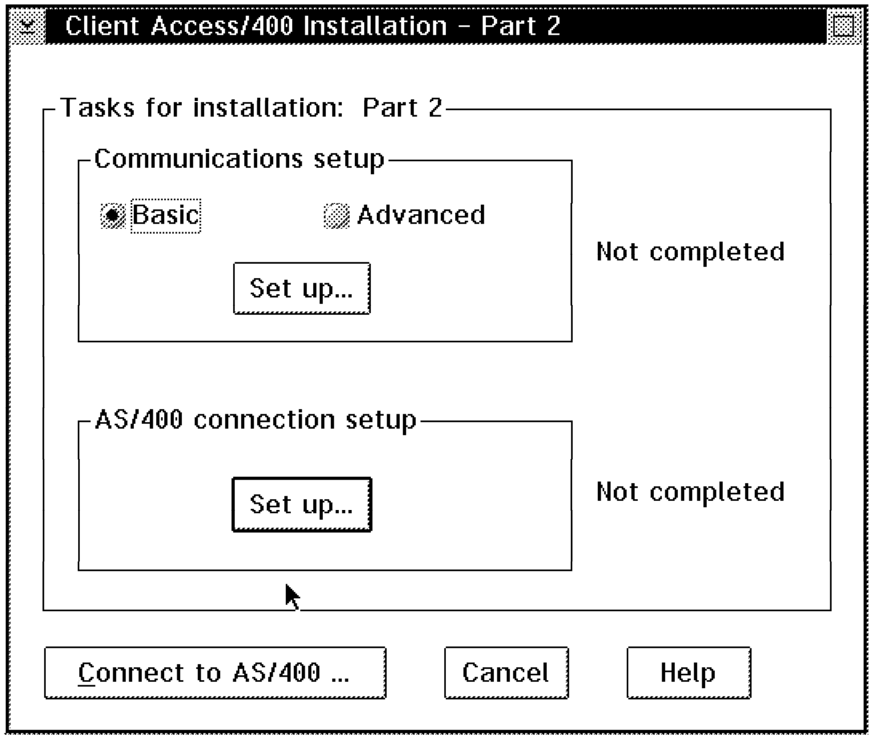

Figure 384. Client Access/400 Installation - Part 2 Panel

3. On the first panel shown in Figure 384, you can choose between basic or advanced communications setup.

   The option for *basic* setup allows all but the most detailed parameters to be configured, and that is the method that we use here. If you need to change details such as retry defaults you will need to use the Advanced Options. This is not covered in this chapter.

4. Choose **Basic** and select **Set up...** from the Communication Setup box, and the panel shown in Figure 385 is displayed.

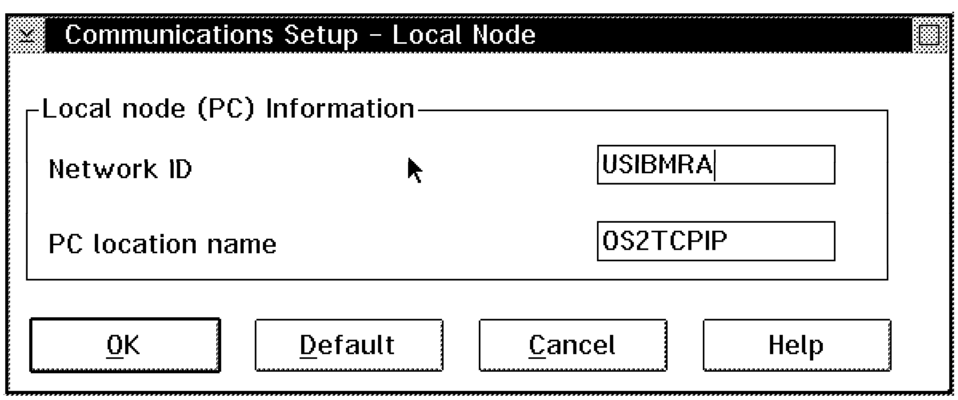

Figure 385. Client Access/400 Communication Setup - Local Node

5. The required parameters are as follows:

   - The PC network ID should match the remote network identifier specified in Figure 369 on page 307.

- The PC location name should match the remote location name specified in Figure 370 on page 309.
- Choose **OK** to continue.

6. The next panel is the Communication Setup - SNMP panel. If you want to enable the client management support, you must select **Enable SNMP system and problem management**, and supply the IP address of the AS/400 system as the system to notify. You can also fill in information for the system location (a building or office number, for example), and the system contact (the administrator or owner of the machine, for example).

7. Select **OK** and the Communication Setup - TCP/IP Network panel shown in Figure 386 is displayed.

   Note: If you already have TCP/IP installed on your PC, this information is already completed for you.

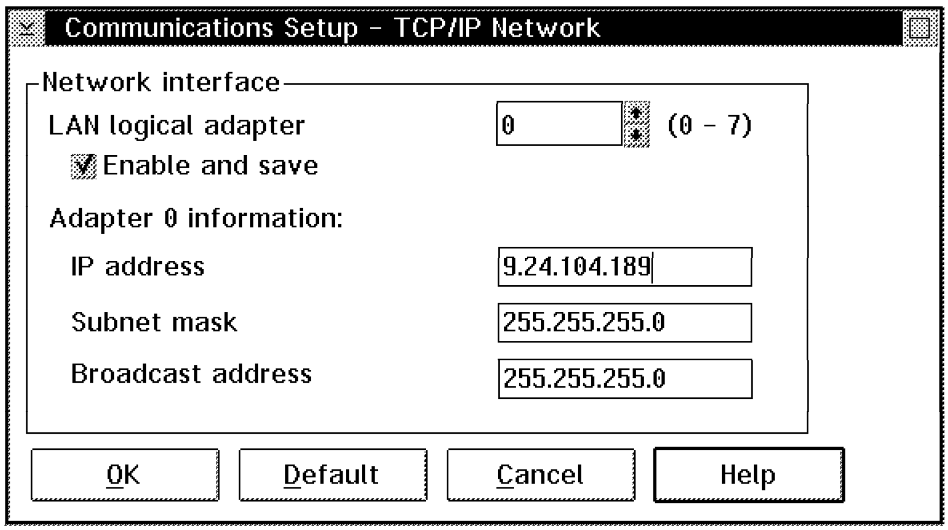

Figure 386. Communication Setup - TCP/IP Network Panel

Adapter number
: Select the LAN logical adapter number. If you only have one LAN adapter in your PC, the adapter number is 0.

IP Address
: Internet protocol address of your PC as entered in Figure 372 on page 311.

Subnet mask
: This field specifies how much of the local address portion of the internet address (IP address) to reserve for a subnetwork address. In our example, the subnet mask is 255.255.255.0. Leaving this field blank means that you are not using a subnetwork.

  If you are not sure what to use for your subnet mask, contact your network administrator.

Broadcast address
: This field defaults to 255.255.255.0. If you want to receive simultaneous transmission of data packets, enter the broadcast address using the same format as in the IP address.

Be sure that the broadcast address is correct. An incorrect broadcast address creates extra traffic on the network, which can cause network performance problems.

If you are not sure of the broadcast address ask your network administrator or leave the default.

8. Choose **OK**, and the TCP/IP Routers panel shown in Figure 387 is displayed. If the TCP/IP network where your PC is attached is connected to other networks through routers or gateways, you must configure the routing information in order to be able to communicate with TCP/IP hosts in the other networks. If your network is not connected to other TCP/IP networks, you can leave this parameter blank.

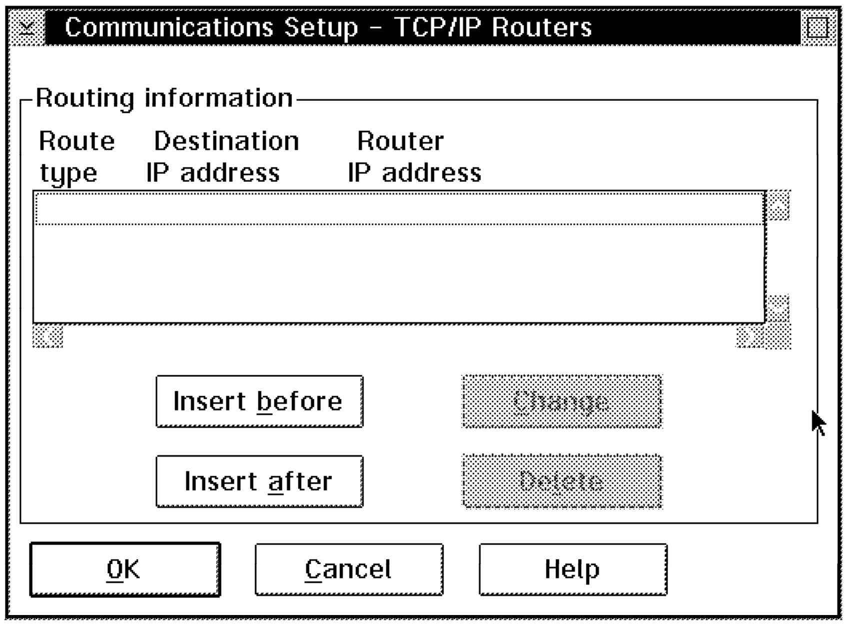

Figure 387. Communication Setup - TCP/IP Routers Panel

You can add the routing information by choosing one of the **Insert** buttons. If you are not sure of this parameter ask your network administrator.

Choose **OK** to continue.

9. You are then prompted with the TCP/IP Name Servers panel shown in Figure 388 on page 325. By choosing **Add**, insert the IP address of the name servers in your network that resolve domain names to IP addresses. If you are not sure of this information ask your network administrator.

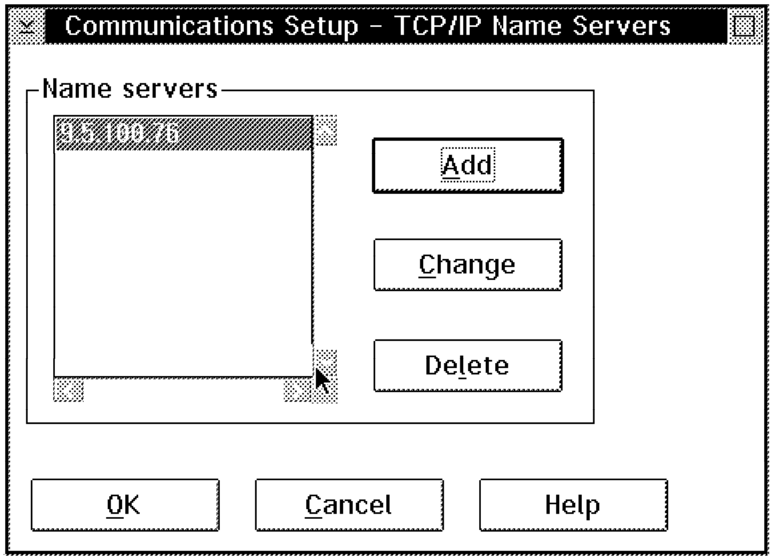

Figure 388. Communication Setup - Name Servers

10. Choose **OK** to continue and the TCP/IP Hosts panel is displayed as shown in Figure 389. Figure 389 is an example of how the panel looks when information has been added.

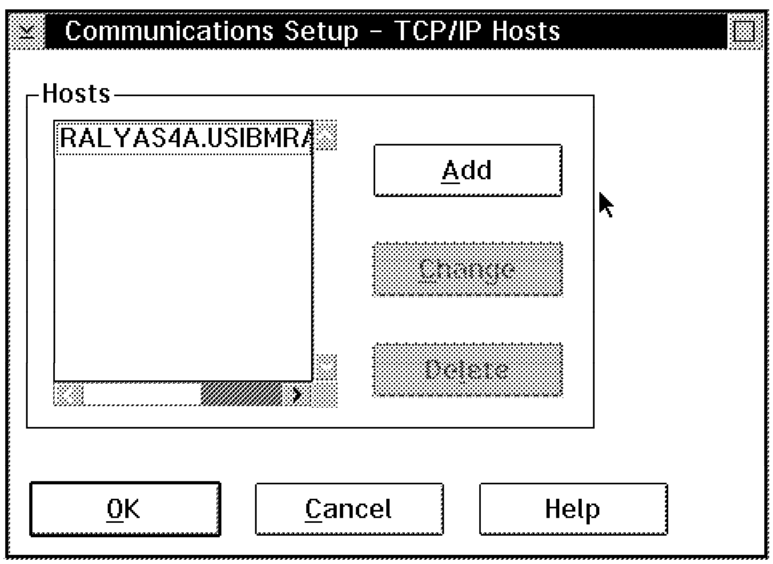

Figure 389. Communication Setup - Hosts Panel

Select **Add**, and the panel in Figure 390 on page 326 is presented.

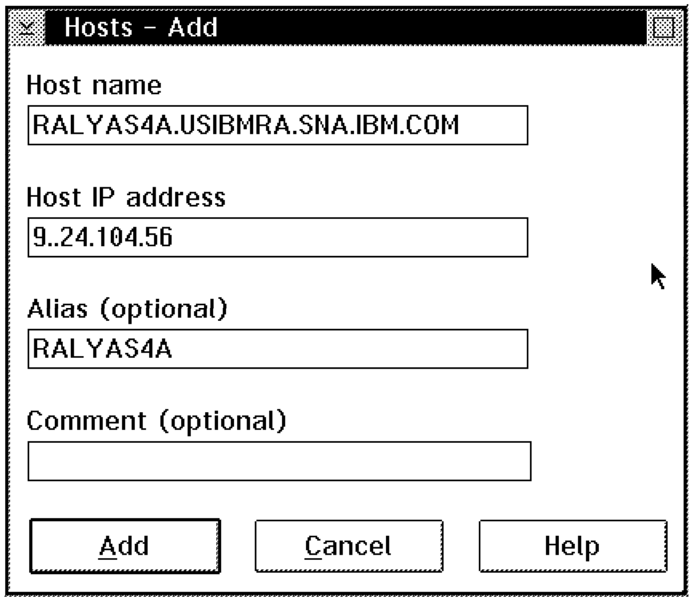

Figure 390. Communication Setup - Add Host Panel

11. Enter the following information:

Host name
Enter the complete host name of the AS/400 system including the SNA domain suffix.

Host IP address
Enter the IP address of the AS/400 system.

Alias
The alias allows you to enter a short form of the name for the AS/400 system. This can be the same as the normal AS/400 system name, for example.

The parameters are as shown in Figure 372 on page 311.

Note:

An alias name is required for some functions when running over TCP/IP (RUMBA/400 display and printer emulation, Database Access GUI and file transfer, for example).

12. Choose **Add** and the TCP/IP Hosts panel shown in Figure 389 on page 325 is re-displayed.

13. Select **OK** to return to the Client Access/400 Installation - Part 2 panel, shown in Figure 391 on page 327. Notice that this time the communication setup task is labeled as completed. Now you have to complete the AS/400 connection setup task.

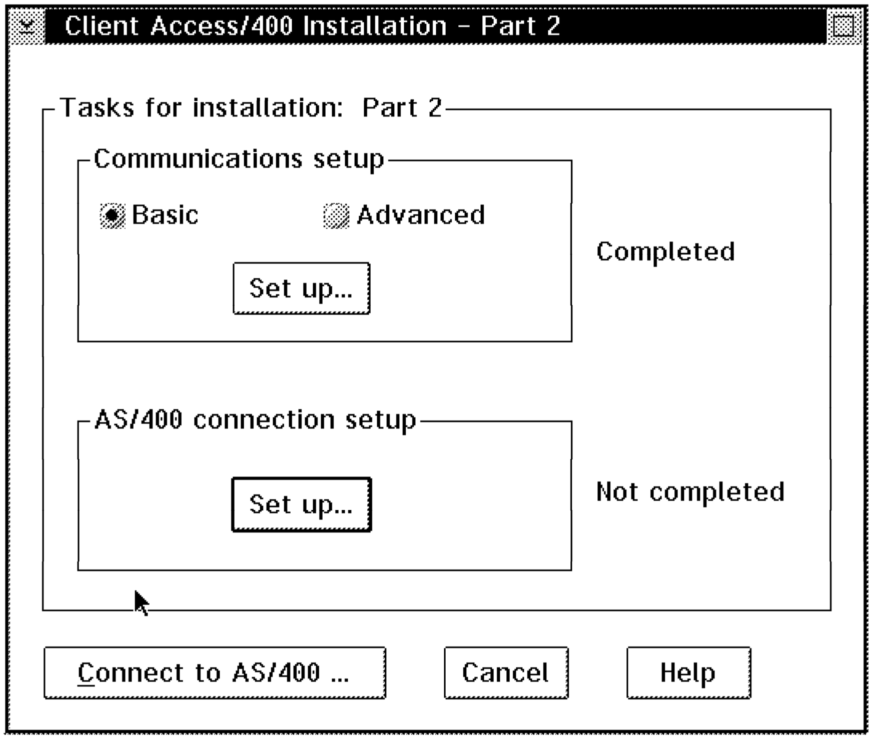

Figure 391. Installation Part 2 - Panel

14. In the AS/400 connection setup box, select **Set up** and the AS/400 Connection Setup panel shown in Figure 392 is displayed.

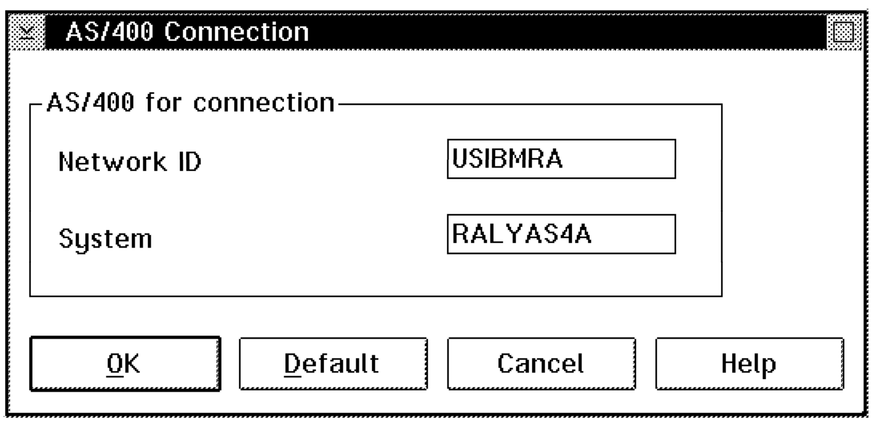

Figure 392. AS/400 Communication Setup - Panel

15. Enter the AS/400 Network ID. The default is APPN. This parameter should match the remote network identifier defined in Figure 369 on page 307.

16. Enter the system name of the AS/400 system that you want to connect to. This parameter should match the local location name defined in Figure 370 on page 309.

17. Choose **OK** to return to the Client Access/400 Installation - Part 2 panel.

    Both setup tasks on the communication setup panel are now marked as completed.

18. Select the **Connect to AS/400 ...** button, and the panel shown in Figure 393 on page 328 is displayed.

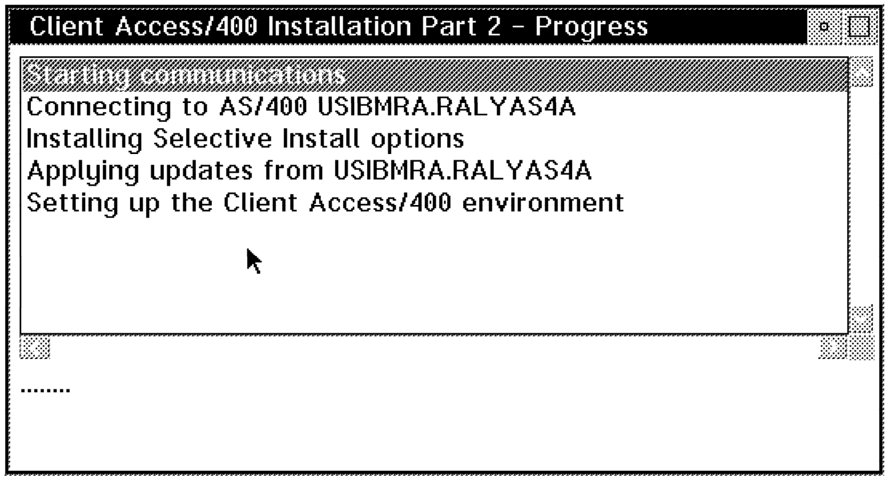

Figure 393. Installation Part 2 Progress - Panel

19. After communications has been started, a connection is made to the AS/400 system, and the AS/400 Logon panel is displayed. Enter the user ID and password, and select **OK**.

    The panel shown in Figure 393 keeps you informed of the status of the installation.

20. The options that you chose to install during part 1 of the installation in step 13 on page 316 are now installed and the update function is run from the AS/400 system. If you chose to install RUMBA/400 or PC/5250 during part 1 of the installation, the panel shown in Figure 394 is displayed.

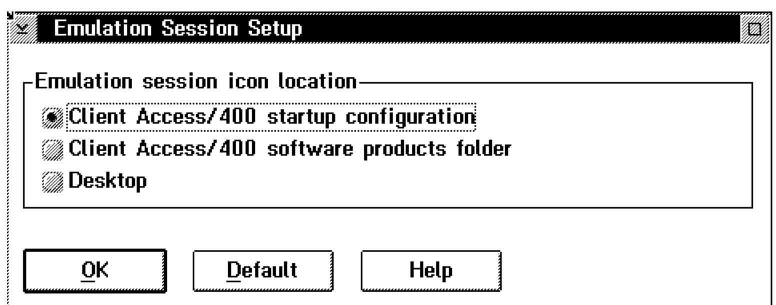

Figure 394. Emulation Session Setup

21. Choose the location of the emulation session icon from the panel. If you choose **Client Access/400 startup configuration**, the emulation session icon is placed in the Client Access/400 startup configuration folder, which causes the emulator to start when Client Access/400 is started.

    Select **OK** to continue.

22. After a successful installation, you see the Installation Part 2 Complete panel shown in Figure 395 on page 329.

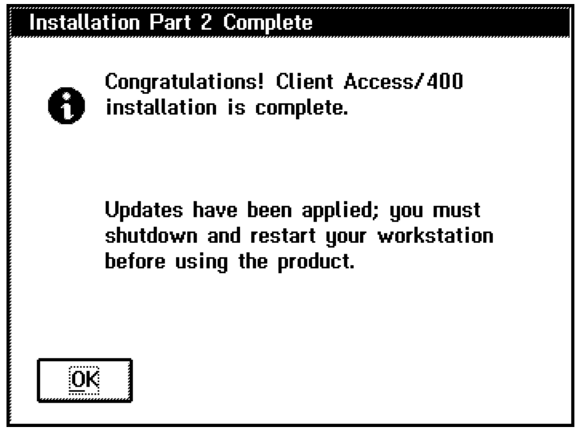

Figure 395. Congratulations - Panel

Select **OK**.

23. Shut down the PC using OS/2 shut down.
24. When you restart the PC, the second pass of the update function is started automatically to copy files from a temporary directory on the PC into the correct component directories.
25. When the update has finished, you must shut down and restart the PC before you can use Client Access/400 Optimized for OS/2.

To Continue

This completes the initial installation of Client Access/400 Optimized for OS/2 on the PC.

Shown next are the matching parameters between the two systems.

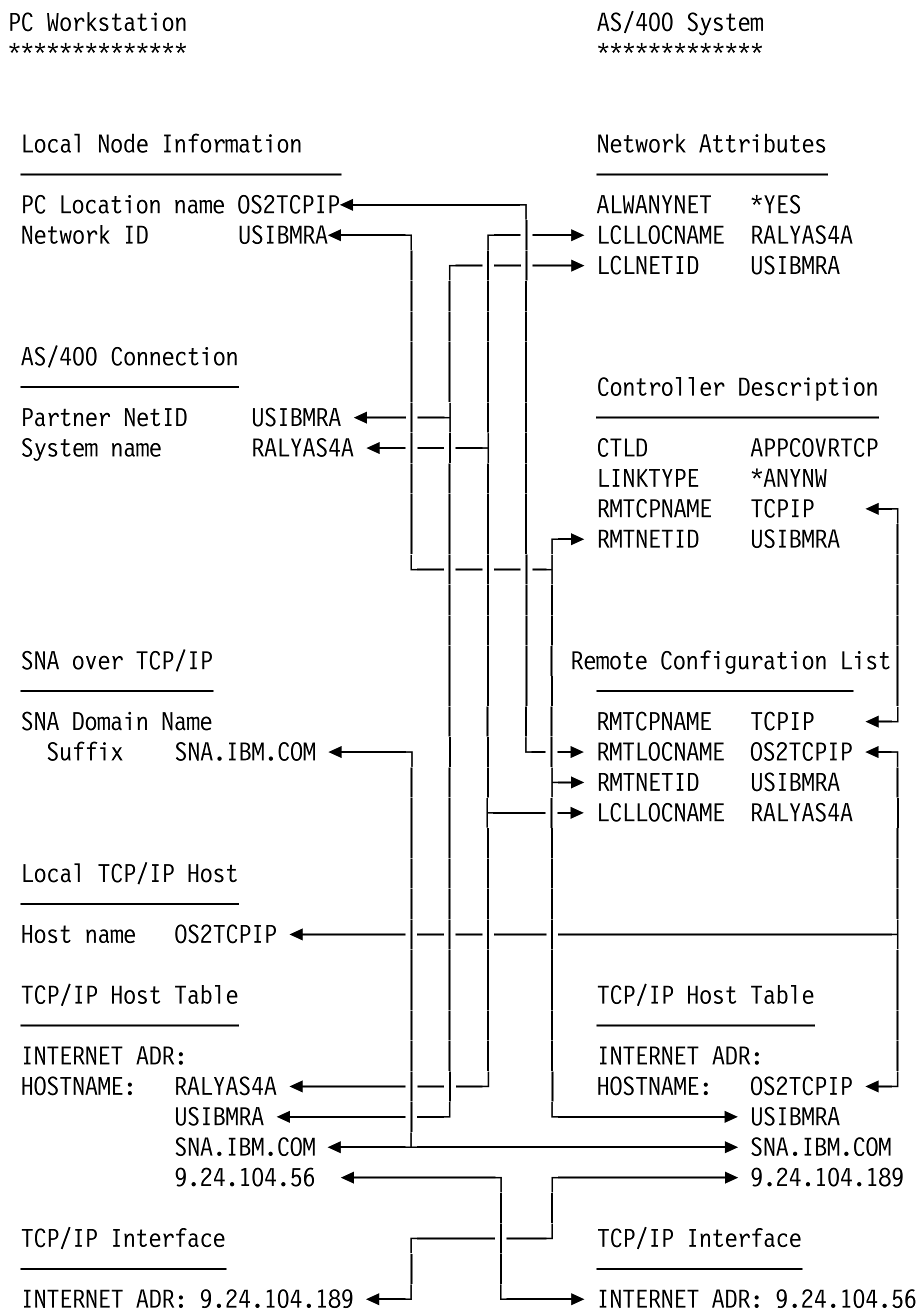

Figure 396. TCP/IP Matching Parameters Table

Installation Hints and Tips

The following installation hints and tips might be useful when looking for problems related to the use of Client Access/400 Optimized for OS/2 in a TCP/IP environment.

README.CA4

Print the README.CA4 file before installing Client Access/400 Optimized for OS/2. It is located in the QPWXGOS2 directory. This file contains hints and tips, restrictions, and changes to the product which you may not find in other documentation.

Performance

You can make a change to the AS/400 TCP/IP interface and router configuration which should increase performance. Currently the AS/400 system defaults to a Maximum Transmission Unit (MTU) of 576 when a new route is added via ADDTCPRTE. This value ensures packets are not dropped over the route as all TCP/IP implementations have to support at least a 576-byte transmission unit. However, in many cases this value is unnecessarily small since there are no intermediate hops that only support a 576-byte packet. If this is the case, you should change the MTU from 576 to *IFC. The MTU now defaults to the line description frame size. This is approximately 2000 for token-ring and 1500 for Ethernet.

Ending Client Access/400 Optimized for OS/2

There is no Stop icon provided with Client Access/400 Optimized for OS/2. In order to stop it correctly take the following steps:

1. Manually end all open emulators, file transfer sessions, database access sessions, etc.

2. If any of the above were started in the Client Access Startup Configuration folder you can close them down by using the Disconnect option associated with this folder.

3. As an alternative to the above, you can build a command file to shut down Client Access/400 Optimized for OS/2. You can decide if Communications Manager is to stop as part of this process. The command file will look like this:

```
REM   Command file to shut down Client Access/400 Optimized for OS/2
REM   Do a controlled shut down of net printers
NET400 RELEASE * /F=CTRL
REM   Do a forced shut down of net drives
NET400 RELEASE * /F
REM   Remove the net drive background task
NET400 SHUTDOWN
REM   Stop the router
STOPRTR
REM   Stop service tasks
CWBLOG SHUTDOWN
REM   Stops Communications manager.  This statement is optional.
STOPCM
```

All of the above statements are documented in the online command reference in the Information folder except the NET400 SHUTDOWN.

Note: This command file will stop most processes but there may be some still left running.

Reinstalling PC5250

If you wish to reinstall PC5250, first make sure to remove it via the Client Access/400 Selective Install. If you do not do this and then try to reinstall again, you can get access violations to certain files.

You may need to reboot the system before PC5250 is fully removed. Check the subdirectory PCOMOS2 is gone or empty before you start any reinstall options.

When Things Go Wrong

Here is a list of useful OS/2 commands and logs that could help in problem determination:

- \IBMCOM\LANTRAN.LOG - Gives information about the starting of communications.
- History Log and Problem log are both found behind the Service icon of Client Access/400 Optimized for OS/2.
- NETSTAT command with its various options gives useful information about the status TCP/IP.
- SET command shows the environment variables that the PC is using.
- CAINSTL1.LOG gives information on the Client Access/400 Optimized for OS/2 installation.

Verifying the TCP/IP Configuration

If you have fully installed Client Access/400 Optimized for OS/2 and you are having problems connecting to the AS/400 you can manually verify the TCP/IP connection to ensure that TCP/IP is functioning correctly by using the PING command. This should be done from both the PC and the AS/400. The following commands were issued for our configuration:

1. To test the TCP/IP connection from the PC you need to open an OS/2 window and start TCP/IP manually. Client Access/400 Optimized for OS/2 when fully installed will automatically start TCP/IP. Type TCPSTART. This command is found in the TCPIP\BIN directory. Type PING followed by the host name or address as seen in the host table entries in Figure 390 on page 326. On our PC we could have entered any of the following commands to verify the connection:

   ```
   PING RALYAS4A
   PING RALYAS4A.USIBMRA.SNA.IBM.COM
   PING 9.24.104.56
   ```

   Any of the above should prove a connection to the AS/400. If the connection fails there may be a problem with the TCP/IP configuration.

2. On the AS/400 the following PING commands should also run successfully:

   ```
   PING OS2TCPIP.USIBMRA.SNA.IBM.COM
   PING OS2TCPIP
   PING '9.24.104.189'
   ```

   The addresses used above were defined in Figure 367 on page 305.

Appendix A. Communications Traces

To aid problem determination, two communications traces have been formatted in this section and analyzed to a degree. One trace is for Sockets over SNA and the other for APPC over TCP/IP. Particular attention has been paid to the AnyNet (MPTN) parts of the traces.

Sockets over SNA Communications Trace

The communications trace below was taken from Sockets over SNA scenario 3. The trace shows the establishment of an FTP session from RALYAS4A to RALYPS2B: sign on, enter password then quit.

The communications trace has been formatted twice, once with Data representation 2 (EBCDIC) and once with Data representation 1 (ASCII). The two traces were then combined: the FTP records being taken from the ASCII trace, all other trace records from the EBCDIC trace. Other than Data representation =1 and Format SNA data only=N, the trace format parameters for the ASCII formatted trace were as for the EBCDIC formatted trace, as shown following.

```
  Trace Description  . . . . . :   FTP SOCSNA TO PS/2
  Configuration object . . . . :   L41TR
  Type . . . . . . . . . . . . :   1            1=Line, 2=Network Interface
                                                3=Network server
  Object protocol  . . . . . . :   TRN
  Start date/Time  . . . . . . :   03/14/95  10:45:44
  End date/Time  . . . . . . . :   03/14/95  10:47:17
  Bytes collected  . . . . . . :   220546
  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  . . . . . . :   RALYPS2B     *ALL, name
  Data representation  . . . . :   2            1=ASCII, 2=EBCDIC, 3=*CALC
  Format SNA data only . . . . :   Y            Y=Yes, N=No
  Format RR, RNR commands  . . :   N            Y=Yes, N=No
  Format TCP/IP data only  . . :   N            Y=Yes, N=No
  Format UI data only  . . . . :   N            Y=Yes, N=No
  Format MAC or SMT data only  :   N            Y=Yes, N=No
  Format Broadcast data  . . . :   Y            Y=Yes, N=No
Record Number . . . .  Number of record in trace buffer (decimal)
S/R . . . . . . . . .  S=Sent   R=Received    M=Modem Change
Controller name . . .  Name of controller associated with record
Data Type . . . . . .  EBCDIC data, ASCII data or Blank=Unknown
SNA Data  . . . . . .  NHDR, THDR, TH, RH and RU for record
NHDR  . . . . . . . .  Network Layer Header
THDR  . . . . . . . .  Rapid Transit Protocol Transport Header
TH  . . . . . . . . .  Transmission Header
RH  . . . . . . . . .  Request/Response Header
RU  . . . . . . . . .  Request/Response Unit
NHDR Parameter Descriptions:
  TPF . . . . . . . . .  Transmission Priority Field (LOW, MEDIUM,
                          HIGH, NETWORK)
  ANR . . . . . . . . .  Automatic Network Routing Field
THDR Parameter Descriptions:
  TCID  . . . . . . . .  Transport Connection Identifier
  SETUPI  . . . . . . .  Connection Setup Indicator
  SOMI  . . . . . . . .  Start of Message Indicator
  EOMI  . . . . . . . .  End of Message Indicator
  SRI . . . . . . . . .  Status Requested Indicator
  RASAPI  . . . . . . .  Respond ASAP Indicator
  RETRYI  . . . . . . .  Retry Indicator
  LMI . . . . . . . . .  Last Message Indicator
  CQFI  . . . . . . . .  Connection Qualifier Field Indicator
  OSI . . . . . . . . .  Optional Segments Indicator
```

```
TH Parameter Descriptions:
  FID . . . . . . . . .  Format Identification
  MPF . . . . . . . . .  Mapping Field (segment of Basic Information
                          Unit (BIU) - ONLY, FIRST, MIDDLE, LAST)
  OAF . . . . . . . . .  Origination Address Field
  DAF . . . . . . . . .  Destination Address Field
  SNF . . . . . . . . .  Sequence Number Field
  DCF . . . . . . . . .  Data Count Field
  LA  . . . . . . . . .  Local Address
  ODAI  . . . . . . . .  OAF-DAF Assignor Indicator
  EFI . . . . . . . . .  Expedited Flow Indicator
  LU  . . . . . . . . .  Logical Unit
  SSCP  . . . . . . . .  System Services Control Point
  PU  . . . . . . . . .  Physical Unit
  SA  . . . . . . . . .  Session Address
RH Parameter Descriptions:
  REQ . . . . . . . .  Request
  RSP . . . . . . . .  Response
  RH Category Descriptions:
    NC . . . . . . . .  Network Control
    SC . . . . . . . .  Session Control
    DFC  . . . . . . .  Data Flow Control
    NC . . . . . . . .  Network Control
    FMD  . . . . . . .  Function Management Data
    FMH  . . . . . . .  Function Management Header
  RH Indicators:
    FI   . . . . . . .  Format Indicator
    SDI  . . . . . . .  Sense Data Included Indicator
    BCI  . . . . . . .  Begin Chain Indicator
    ECI  . . . . . . .  End Chain Indicator
    DR1  . . . . . . .  Definite Response 1 Indicator
    LCCI . . . . . . .  Length-Checked Compression Indicator
    DR2  . . . . . . .  Definite Response 2 Indicator
    ERI  . . . . . . .  Exception Response Indicator
    RTI  . . . . . . .  Response Type Indicator
    QRI  . . . . . . .  Queued Response Indicator
    EBI  . . . . . . .  End Bracket Indicator
    CDI  . . . . . . .  Change Direction Indicator
    PI   . . . . . . .  Pacing Indicator
    BBI  . . . . . . .  Begin  Bracket Indicator
    CSI  . . . . . . .  Code Selection Indicator
    EDI  . . . . . . .  Enciphered Data Indicator
    PDI  . . . . . . .  Padded Data Indicator
    CEBI . . . . . . .  Conditional End Bracket Indicator
    RLWI . . . . . . .  Request Larger Window Indicator
```

Trace records 464-502 show the APPN ′FIND′ (GDS′12CA′) from the AS/400 to the PS/2 for LU USIBMRA.RALYPS2B, the response from the PS/2 and the establishment (BIND and BIND response) of the SNA service manager (SNASVCMG) session between the two.

Trace records 507-519 show the CNOS (Change number of Sessions) exchange for mode SNACKETS and then the establishment (BIND and BIND response) of this session. The session over which the Sockets over SNA data will flow.

Trace records 534 and 537 show an attach and response. This attach and response is for the MTPN_Connect. The trace records have been broken down. An MPTN_Connect request is the first message sent over a transport provider connection in order to establish a non-native MPTN connection. An MPTN_Connect response acknowledges that request and indicates whether or not the connection was accepted.

Further information on the MPTN Formats can be found in: *Multiprotocol Transport Networking (MPTN) Architecture: Formats*.

Trace record 1178 shows the UNBIND for the SNACKETS session.

```
Record        Controller  Data
Number  S/R   Name        Type      SNA Data: NHDR, THDR, TH, RH, RU
------  ---   ----------  ------    -----------------------------------------------------------------------------------------------
   464   S    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=01, OAF′=02, SNF′=0003
                                    RH :  (′0B9181′X)  REQ FMD, FI, BCI, ECI, DR1, ERI, PI, BBI, CEBI
              RU Command . . . . :  FMH- 5=110502FF0003D000000422F0F0F3000000                  *......}....003...             *
              RU Data . . . . . :   004312CA038080148200F3E4E2C9C2D4D9C14BD9C1D3E8D7E2F2C2143C00   *........B.3USIBMRA.RALYPS2B...*
                                    F6E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C1143D00F3E4E2C9C2D4D9C14BD9   *6USIBMRA.RALYAS4A...3USIBMRA.R*
                                    C1D3E8C1E2F4C1002112C500000100000008E2D5C1C3D2C5E3E200000C2C   *ALYAS4A...E.......SNACKETS....*
                                    01087BC3D6D5D5C5C3E3002712C480000000001B60F64B0D2BCC86C0FD10   *..#CONNECT...D......-6....F{..*
                                    E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C1038200                         *USIBMRA.RALYAS4A.B.           *
   465   R    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=02, OAF′=01, SNF′=0000, EFI
                                    RH :  (′830100′X)  RSP  FMD, PI
              RU Data . . . . . :   000001                                                         *...                           *
   467   R    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=0, DAF′=01, OAF′=02, SNF′=0004
                                    RH :  (′0B9181′X)  REQ FMD, FI, BCI, ECI, DR1, ERI, PI, BBI, CEBI
              RU Command . . . . :  FMH- 5=320502FF0003D000000422F0F0F3001910E4E2C9C2D4D9C1      *......}....003...USIBMRA      *
                                    4BD9C1D3E8D7E2F2C2DDDDDDDDDDE30001084C0A67A69496CF36           *.RALYPS2B.....T...<..WMO..    *
              RU Data . . . . . :   002712C440000000001B60F64B0D2BCC86C0FD10E4E2C9C2D4D9C14BD9C1   *...D .....-6....F{..USIBMRA.RA*
                                    D3E8C1E2F4C1038200002F12CB038080143C00F4E4E2C9C2D4D9C14BD9C1   *LYAS4A.B..........4USIBMRA.RA*
                                    D3E8D7E2F2C2143D00F3E4E2C9C2D4D9C14BD9C1D3E8D7E2F2C200A012C5   *LYPS2B...3USIBMRA.RALYPS2B...E*
                                    00000100000008E2D5C1C3D2C5E3E200001B461480010F5BC1D5E8D5C5E3   *.......SNACKETS........$ANYNET*
                                    4B5BC7E6C3D5C5E3800582F0F0F01647000000000907100000000000FEFE00 *.$GWCNET..B000................*
                                    01710080808017461580151 0E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C10016   *............USIBMRA.RALYAS4A..*
                                    470000000C80750000000000000000014C00808080174615801510E4E2C9   *...............<..........USI*
                                    C2D4D9C14BD9C1D3E8C1E2F4C10016470000000C80750000000000000000   *BMRA.RALYAS4A.................*
                                    014C00808080                                                   *.<....                        *
   470   S    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=0, DAF′=02, OAF′=01, SNF′=0000, EFI
                                    RH :  (′830100′X)  RSP  FMD, PI
              RU Data . . . . . :   000001                                                         *...                           *
   499   S    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=02, OAF′=02, SNF′=0000, EFI
                                    RH :  (′6B8100′X)  REQ  SC, FI, BCI, ECI, DR1, PI
              RU Command . . . . :  BIND
              RU Data . . . . . :   31001307B0B0513307878686870706020000000000000009443400010E4E2   *.........GFFG..........M. ..US*
                                    C9C2D4D9C14BD9C1D3E8C1E2F4C132000902E2D5C1E2E5C3D4C709030163   *IBMRA.RALYAS4A....SNASVCMG....*
                                    4921A1C000501104E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C10A1300776349   *...{.&..USIBMRA.RALYAS4A......*
                                    21A1C000500010E4E2C9C2D4D9C14BD9C1D3E8D7E2F2C26019F64B0D2BCC   *..{.&..USIBMRA.RALYPS2B-.6....*
                                    86C0FD10E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C12C0A04087BC3D6D5D5C5   *F{..USIBMRA.RALYAS4A....#CONNE*
                                    C3E32B190101174615801510E4E2C9C2D4D9C14BD9C1D3E8D7E2F2C200     *CT..........USIBMRA.RALYPS2B. *
   500   R    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=0, DAF′=00, OAF′=01, SNF′=0000, EFI
                                    RH :  (′830100′X)  RSP  FMD, PI
              RU Data . . . . . :   000001                                                         *...                           *
   502   R    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=02, OAF′=02, SNF′=0000, EFI
                                    RH :  (′EB8000′X)  RSP  SC,  FI, DR1
              RU Command . . . . :  BIND
              RU Data . . . . . :   31001307B0B05033008086868000060200000000000000014234000002B00   *......&...FF............. ....*
                                    0902E2D5C1E2E5C3D4C70203021105E4E2C9C2D4D9C14BD9C1D3E8D7E2F2   *..SNASVCMG.....USIBMRA.RALYPS2*
                                    C20A130086AB3C8B9E650E1500006019F64B0D2BCC86C0FD10E4E2C9C2D4   *B...F.........-.6....F{..USIBM*
                                    D9C14BD9C1D3E8C1E2F4C12B190101174615801510E4E2C9C2D4D9C14BD9   *RA.RALYAS4A..........USIBMRA.R*
                                    C1D3E8D7E2F2C200                                               *ALYPS2B.                      *
   507   S    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=02, OAF′=02, SNF′=0001
                                    RH :  (′0B9120′X)  REQ FMD, FI, BCI, ECI, DR1, ERI, PI, CDI
              RU Command . . . . :  FMH- 5=0C0502FF0003D000000206F1                            *......}....1                  *
              RU Data . . . . . :   0019121002000000000001E0002001C0008E2D5C1C3D2C5E3E2             *.................SNACKETS     *
   508   R    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=02, OAF′=02, SNF′=0001
                                    RH :  (′039101′X)  REQ FMD, BCI, ECI, DR1, ERI, PI, CEBI
              RU Data . . . . . :   001912100A00000000001E0002001C0008E2D5C1C3D2C5E3E2             *.................SNACKETS     *
   509   R    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=02, OAF′=02, SNF′=0000, EFI
                                    RH :  (′830100′X)  RSP  FMD, PI
              RU Data . . . . . :   000001                                                         *...                           *
   512   S    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=02, OAF′=02, SNF′=0000, EFI
                                    RH :  (′830100′X)  RSP  FMD, PI
              RU Data . . . . . :   000002                                                         *...                           *
   516   S    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=03, OAF′=02, SNF′=0000, EFI
                                    RH :  (′6B8100′X)  REQ  SC, FI, BCI, ECI, DR1, PI
              RU Command . . . . :  BIND
              RU Data . . . . . :   31001307B0B051330787F7F787070602000000000000000009443400010E4E2 *.........G77G..........M. ..US*
                                    C9C2D4D9C14BD9C1D3E8C1E2F4C132000902E2D5C1C3D2C5E3E209030163   *IBMRA.RALYAS4A....SNACKETS....*
                                    4923110000021104E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C10A1300776349   *........USIBMRA.RALYAS4A......*
                                    23110000020010E4E2C9C2D4D9C14BD9C1D3E8D7E2F2C26019F64B0D2BCC   *.......USIBMRA.RALYPS2B-.6....*
                                    86C0FE10E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C12C0A01087BC3D6D5D5C5   *F{..USIBMRA.RALYAS4A....#CONNE*
                                    C3E32B190101174615801510E4E2C9C2D4D9C14BD9C1D3E8D7E2F2C200     *CT..........USIBMRA.RALYPS2B. *
   517   R    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=0, DAF′=00, OAF′=01, SNF′=0000, EFI
                                    RH :  (′830100′X)  RSP  FMD, PI
              RU Data . . . . . :   000001                                                         *...                           *
   519   R    RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF′=02, OAF′=03, SNF′=0000, EFI
                                    RH :  (′EB8000′X)  RSP  SC,  FI, DR1
              RU Command . . . . :  BIND
              RU Data . . . . . :   31001307B0B050330080F7F78000060200000000000000014234000002B00   *......&...77............. ....*
                                    0902E2D5C1C3D2C5E3E20203021105E4E2C9C2D4D9C14BD9C1D3E8D7E2F2   *..SNACKETS.....USIBMRA.RALYPS2*
                                    C20A13003856FB0DD875A01F00006019F64B0D2BCC86C0FE10E4E2C9C2D4   *B.......Q.....-.6....F{..USIBM*
                                    D9C14BD9C1D3E8C1E2F4C12B190101174615801510E4E2C9C2D4D9C14BD9   *RA.RALYAS4A..........USIBMRA.R*
                                    C1D3E8D7E2F2C200                                               *ALYPS2B.                      *
```

```
Record       Controller  Data
Number  S/R  Name        Type      SNA Data: NHDR, THDR, TH, RH, RU
------  ---  ----------  ------   -------------------------------------------------------------------------------------------------
   521   S   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=02, OAF′=02, SNF′=0002
                                   RH :  (′4B9100′X)  REQ  DFC, FI, BCI, ECI, DR1, ERI, PI
             RU Command . . . . :  BIS
             RU Data . . . . .  :  70                                                             *.                             *
   522   R   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=02, OAF′=02, SNF′=0002
                                   RH :  (′4BB100′X)  REQ  DFC, FI, BCI, ECI, DR1, DR2, ERI, PI
             RU Command . . . . :  BIS
             RU Data . . . . .  :  70                                                             *.                             *
   523   R   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=02, OAF′=02, SNF′=0000, EFI
                                   RH :  (′830100′X)  RSP  FMD, PI
             RU Data . . . . .  :  000001                                                         *...                           *
   526   S   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=02, OAF′=02, SNF′=0000, EFI
                                   RH :  (′830100′X)  RSP  FMD, PI
             RU Data . . . . .  :  000003                                                         *...                           *
   530   S   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=02, OAF′=02, SNF′=0000, EFI
                                   RH :  (′6B8000′X)  REQ  SC, FI, BCI, ECI, DR1
             RU Command . . . . :  UNBIND
             RU Data . . . . .  :  3201000000006019F64B0D2BCC86C0FD10E4E2C9C2D4D9C14BD9C1D3E8C1   *......-.6....F{..USIBMRA.RALYA*
                                   E2F4C1                                                         *S4A                           *
   531   R   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=02, OAF′=02, SNF′=0000, EFI
                                   RH :  (′EB8000′X)  RSP  SC,  FI, DR1
             RU Command . . . . :  UNBIND
             RU Data . . . . .  :  32                                                             *.                             *
   534   S   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=03, OAF′=02, SNF′=0001
                                   RH :  (′0A9100′X)  REQ FMD, FI, BCI, DR1, ERI, PI
             RU Command . . . . :  FMH- 5=0E0502FF0003D200000428F0F0F1                            *......K....001                *
                                              ||||            ||||||||
   Attach-------------------------------------++++            ||||||||
   TP (Transaction Program) name (28F0F0F1=Sockets over SNA)--++++++++

             RU Data . . . . .  :  0037800A00354002010509433C1803001502010509433C14030405050000   *...... .......................*
                                   ::::||||::::  ||  ||||||||||::::::||  ||||||||||::::::
   Record length (binary)----------++++||||::::  ||  ||||||||||::::::||  ||||||||||::::::
                                       ||||::::  ||  ||||||||||::::::||  ||||||||||::::::
   MPTN_Connect------------------------++||::::  ||  ||||||||||::::::||  ||||||||||::::::
   Request (bit 0 in this byte=0)--------++::::  ||  ||||||||||::::::||  ||||||||||::::::
                                           ::::  ||  ||||||||||::::::||  ||||||||||::::::
   Command length (binary)-----------------++++  ||  ||||||||||::::::||  ||||||||||::::::
                                                 ||  ||||||||||::::::||  ||||||||||::::::
                                                 ||  ||||||||||::::::||  ||||||||||::::::
   MPTN qualifier for dest addr (02=IP addr)-----++  ||||||||||::::::||  ||||||||||::::::
   Destination address length (including this byte)--++||||||||::::::||  ||||||||||::::::
   Destination address in hex (9.67.60.24)-------------++++++++::::::||  ||||||||||::::::
                                                               ::::::||  ||||||||||::::::
   Destination port length (including this byte)---------------++::::||  ||||||||||::::::
   Destination port in hex (decimal 21 - port FTP listens on)----++++||  ||||||||||::::::
                                                                     ||  ||||||||||::::::
   MPTN qualifier for source addr (02=IP addr)-----------------------++  ||||||||||::::::
   Source address length (including this byte)---------------------------++||||||||::::::
   Source address in hex (9.67.60.20)--------------------------------------++++++++::::::
                                                                                   ::::::
   Source port length--------------------------------------------------------------++::::
   Source port in hex----------------------------------------------------------------++++

                                   00000F00000000000000001000000007001190A00080001141C            *.........................     *
   535   R   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=02, OAF′=03, SNF′=0000, EFI
                                   RH :  (′830100′X)  RSP  FMD, PI
             RU Data . . . . .  :  000007                                                         *...                           *
   537   R   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=02, OAF′=03, SNF′=0001
                                   RH :  (′029120′X)  REQ FMD, BCI, DR1, ERI, PI, CDI
             RU Data . . . . .  :  003780800035400201050943 3C1803001502010509433C14030405050000   *...... .......................*
                                   ::::||||
   Record length (binary)----------++++||||
                                       ||||
   MPTN_Connect------------------------++||
   Response (bit 0 in this byte=1)-------++
   (bit 2=1 in this byte would indicate a negative response)

   The remainder of the response is an echo
   of the contents of the MPTN_Connect request.

                                   00000F00000000000000001000000007001190A00080001141C            *.........................     *
   539   S   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only         ODAI=1, DAF′=03, OAF′=02, SNF′=0000, EFI
                                   RH :  (′830100′X)  RSP  FMD, PI
             RU Data . . . . .  :  00000E                                                         *...                           *
```

```
*************************************************************************************************************************************
*       Trace records 992 to 1151 formatted in ASCII - FTP Data                                                                     *
*************************************************************************************************************************************
 Record       Data   Record     Data    Controller  Destination   Source        Frame                Number  Number    Poll/
 Number  S/R  Length Timer      Type    Name        MAC Address   MAC Address   Format  Command  Sent    Received  Final  DSAP SSAP
 ------  ---  ------ ---------  ------  ----------  ------------  ------------  ------  -------  ------  --------  -----  ---- ----
    992   R       93 2757.1     EBCDIC  RALYPS2B    400010020001  C00052005185   LLC      I          31        28  OFF     04   04
                     Routing Information . . . . . . . . . :  02F0
                     Data . . . :  2E0002030002009120005400323230206173347073326320494 24D205443   *.......* .T.220 AS4PS2C IBM TC*
                                   502F495020666F72204F532F32202D20465450205365727665722076 6572   *P/IP FOR OS/2 - FTP SERVER VER*
                                   2031323A35383A3037206F6E204D617220313620313939342072656164 79   * 12:58:07 ON MAR 16 1994 READY*
                                   2E0D0A                                                           *...                          *
    994   S       12 2757.1     EBCDIC  RALYPS2B    400052005185  C00010020001   LLC      I          28        32  OFF     04   04
                     Routing Information . . . . . . . . . :  0270
                     Data . . . :  2F00030200008301000000 0E                                        */.....*.....                 *
   1009   S       18 2760.5     EBCDIC  RALYPS2B    400052005185  C00010020001   LLC      I          29        32  OFF     04   04
                     Routing Information . . . . . . . . . :  0270
                     Data . . . :  2E000302000200912000090053595354 0D0A                            *.......* ...SYST..           *
   1010   R       12 2760.5     EBCDIC  RALYPS2B    400010020001  C00052005185   LLC      I          32        30  OFF     04   04
                     Routing Information . . . . . . . . . :  02F0
                     Data . . . :  2F000203000083010000000 7                                        */.....*.....                 *
   1012   R       39 2760.5     EBCDIC  RALYPS2B    400010020001  C00052005185   LLC      I          33        30  OFF     04   04
                     Routing Information . . . . . . . . . :  02F0
                     Data . . . :  2E0002030003009020001E00323135204F532F32206F7065726174696E67   *.......* ...215 OS/2 OPERATING*
                                   2073797374656D0D0A                                               * SYSTEM..                    *
   1059   S       26 2765.2     EBCDIC  RALYPS2B    400052005185  C00010020001   LLC      I          30        34  OFF     04   04
                     Routing Information . . . . . . . . . :  0270
                     Data . . . :  2E000302000300902000110055534552 20616E79757365720D0A            *.......* ...USER ANYUSER..   *
   1060   R       48 2765.3     EBCDIC  RALYPS2B    400010020001  C00052005185   LLC      I          34        31  OFF     04   04
                     Routing Information . . . . . . . . . :  02F0
                     Data . . . :  2E000203000400902000270033333120506173737776F7264207265717569   *.......* .'.331 PASSWORD REQUI*
                                   72656420666F7220616E79757365722E0D0A                             *RED FOR ANYUSER...           *
   1116   S       25 2770.6     EBCDIC  RALYPS2B    400052005185  C00010020001   LLC      I          31        35  OFF     04   04
                     Routing Information . . . . . . . . . :  0270
                     Data . . . :  2E000302000400902000100050415353 20616E797077640D0A              *.......* ...PASS ANYPWD..    *
   1117   R       41 2770.6     EBCDIC  RALYPS2B    400010020001  C00052005185   LLC      I          35        32  OFF     04   04
                     Routing Information . . . . . . . . . :  02F0
                     Data . . . :  2E0002030005009020002000323330205573657220616E7975736572206C   *.......* . .230 USER ANYUSER L*
                                   6F6767656420696E2E0D0A                                           *OGGED IN...                  *
   1150   S       18 2774.5     EBCDIC  RALYPS2B    400052005185  C00010020001   LLC      I          32        36  OFF     04   04
                     Routing Information . . . . . . . . . :  0270
                     Data . . . :  2E000302000500902000090051554954 0D0A                            *.......* ...QUIT..           *
   1151   R       26 2774.5     EBCDIC  RALYPS2B    400010020001  C00052005185   LLC      I          36        33  OFF     04   04
                     Routing Information . . . . . . . . . :  02F0
                     Data . . . :  2E000203000600902000110032323120476F6F646279652E0D0A             *.......* ...221 GOODBYE...   *
*************************************************************************************************************************************
*       Back to EBCDIC                                                                                                              *
*************************************************************************************************************************************
 Record       Controller  Data
 Number  S/R  Name        Type      SNA Data: NHDR, THDR, TH, RH, RU
 ------  ---  ----------  ------   -------------------------------------------------------------------------------------------------
   1152   R   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF'=02, OAF'=03, SNF'=0007
                                    RH :  ('009020'X)  REQ FMD, DR1, ERI, CDI
              RU Data . . . . . :   000314                                                          *...                          *
   1153   R   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF'=02, OAF'=03, SNF'=0008
                                    RH :  ('019001'X)  REQ FMD, ECI, DR1, ERI, CEBI
                                    No RU data
   1165   S   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF'=03, OAF'=02, SNF'=0006
                                    RH :  ('019001'X)  REQ FMD, ECI, DR1, ERI, CEBI
                                    No RU data
   1175   S   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF'=03, OAF'=02, SNF'=0007
                                    RH :  ('4B9000'X)  REQ  DFC, FI, BCI, ECI, DR1, ERI
              RU Command . . . . :  BIS
              RU Data . . . . . :   70                                                              *.                            *
   1176   R   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF'=02, OAF'=03, SNF'=0009
                                    RH :  ('4BB000'X)  REQ  DFC, FI, BCI, ECI, DR1, DR2, ERI
              RU Command . . . . :  BIS
              RU Data . . . . . :   70                                                              *.                            *
   1178   S   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF'=03, OAF'=02, SNF'=0000, EFI
                                    RH :  ('6B8000'X)  REQ  SC, FI, BCI, ECI, DR1
              RU Command . . . . :  UNBIND
              RU Data . . . . . :   3201000000006019F64B0D2BCC86C0FE10E4E2C9C2D4D9C14BD9C1D3E8C1   *......-.6....F{..USIBMRA.RALYA*
                                    E2F4C1                                                          *S4A                          *
   1181   R   RALYPS2B    EBCDIC    TH :  FID=2,  MPF=Only        ODAI=1, DAF'=02, OAF'=03, SNF'=0000, EFI
                                    RH :  ('EB8000'X)  RSP  SC,  FI, DR1
              RU Command . . . . :  UNBIND
              RU Data . . . . . :   32                                                              *.                            *
* * * * *   E N D   O F   C O M P U T E R   P R I N T O U T   * * * * *
```

APPC over TCP/IP Communications Trace

The communications trace below was taken from APPC over TCP/IP scenario 1. The trace shows the establishment of a 5250 Pass-Through session from RALYAS4A to RALYAS4B: sign on, enter password then ENDPASTHR.

Note that the communications trace has been formatted in EBCDIC, Data representation =2.

```
COMMUNICATIONS TRACE       Title: DSPT APPCOVE AS4B                03/15/95  11:12:02                           Page:       1
  Trace Description  . . . . . :   DSPT APPCOVE AS4B
  Configuration object . . . . :   L41TR
  Type . . . . . . . . . . . . :   1            1=Line, 2=Network Interface
                                                3=Network server
  Object protocol  . . . . . . :   TRN
  Start date/Time  . . . . . . :   03/15/95  11:09:31
  End date/Time  . . . . . . . :   03/15/95  11:11:06
  Bytes collected  . . . . . . :   526071
  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  . . . . :   2            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  . . :   Y            Y=Yes, N=No
    IP address . . . . . . . . :   9.24.104.56      *ALL, address
    IP address . . . . . . . . :   9.24.104.57      *ALL, address
  Format UI data only  . . . . :   N            Y=Yes, N=No
  Format MAC or SMT data only  :   N            Y=Yes, N=No
  Format Broadcast data  . . . :   Y            Y=Yes, N=No
COMMUNICATIONS TRACE       Title: DSPT APPCOVE AS4B                03/15/95  11:12:02                           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)
Record Status . . . .  Status of record
Record Timer  . . . .  Time stamp (Seconds, 100 millisecond resolution,
                       decimal).  Range is 0 to 6553.5 seconds
Data Type . . . . . .  EBCDIC data, ASCII data or Blank=Unknown
Controller name . . .  Name of controller associated with record
Command . . . . . . .  Command/Response information
Number sent . . . . .  Count of records sent
Number received . . .  Count of records received
Poll/Final  . . . . .  ON=Poll for Commands, Final for Responses
Destination MAC Address . . . . Physical address of destination
Source MAC Address  . . . . . . Physical address of source
DSAP  . . . . . . . .  Destination Service Access Point
SSAP  . . . . . . . .  Source Service Access Point
Frame Format  . . . .  LLC (Logical Link Control) or MAC (Media
                       Access Control)
  Commands/Responses:
  ------------------
   I  . . . . . . . .  Information
   RR . . . . . . . .  Receive Ready
   RNR  . . . . . . .  Receive Not Ready
   REJ  . . . . . . .  Reject
   UI . . . . . . . .  Unnumbered Information
   UA . . . . . . . .  Unnumbered Acknowledgment
   DISC . . . . . . .  Disconnect/Request Disconnect
   TEST . . . . . . .  Test
   SIM  . . . . . . .  Set Initialization Mode
   FRMR . . . . . . .  Frame Reject
   DM . . . . . . . .  Disconnected Mode
   XID  . . . . . . .  Exchange ID
   SABME  . . . . . .  Set Asynchronous Balanced Mode Extended
   *****  . . . . . .  Command/Response Not Valid
```

Trace records 390-392 show the ARP (TCP/IP Address Resolution Protocol) processing. Record 391 is the initial ARP REQUEST sent by RALYAS4A, record 392 is the ARP RESPONSE from RALYAS4B. Although shown in the trace as arriving first, record 390 is RALYAS4A receiving its own ARP REQUEST.

Trace records 393-395 show the TCP/IP connection establishment between RALYAS4A and RALYAS4B - the three-way handshake.

Trace records 397 and 411 show the MPTN_Connect and response. The trace records have been broken down. An MPTN_Connect request is the first message sent over a transport provider connection in order to establish a non-native MPTN connection. An MPTN_Connect response acknowledges that request and indicates whether or not the connection was accepted.

Trace record 420 shows the MPTN header. The trace record has also been broken down.

Further information on the MPTN Formats can be found in: *Multiprotocol Transport Networking (MPTN) Architecture: Formats*.

Note that the destination port when sending is 397, APPC/TCP.

```
Record       Data   Record     Data    Controller  Destination   Source        Frame           Number  Number    Poll/
Number  S/R  Length Timer      Type    Name        MAC Address   MAC Address   Format  Command Sent    Received  Final  DSAP SSAP
------  ---  ------ ---------  ------  ----------  ------------  ------------  ------  ------- ------  --------  -----  ---- ----
   390   R       33 5117.4                         FFFFFFFFFFFF  C00010020001   LLC     UI                       OFF     AA   AA
                    Routing Information . . . . . . . . :  0270
                    Frame Type :  ARP          Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Operation: REQUEST
                    ARP Header :  000608000604000140001002000109186838000000000000009186839
   391   S       33 5117.4                         FFFFFFFFFFFF  C00010020001   LLC     UI                       OFF     AA   AA
                    Routing Information . . . . . . . . :  0270
                    Frame Type :  ARP          Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Operation: REQUEST
                    ARP Header :  000608000604000140001002000109186838000000000000009186839
   392   R       33 5117.5                         400010020001  C00010020002   LLC     UI                       OFF     AA   AA
                    Routing Information . . . . . . . . :  02F0
                    Frame Type :  ARP          Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Operation: RESPONSE
                    ARP Header :  000608000604000240001002000209186839000000000000009186838
   393   S       49 5117.5                         400010020002  C00010020001   LLC     UI                       OFF     AA   AA
                    Routing Information . . . . . . . . :  0270
                    Frame Type :  IP           TOS: NORMAL           Length:    44  Protocol: TCP          Datagram ID: 31F5
                                  Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                    SNAP Header:  0000000800
                    IP Header  :  4500002C31F50000400666360918683809186839
                    IP Options :  NONE
                    TCP  . . . :  Src Port:  1034,Unassigned    Dest Port:   397,APPC/TCP
                                  SEQ Number:  1091843732 ('41143694'X)  ACK Number:          0 ('00000000'X)
                                  Code Bits: SYN                      Window:  8192  TCP Option: MSS= 1949
                    TCP Header :  040A018D4114369400000000600220000165D00000204079D
   394   R       49 5117.5                         400010020001  C00010020002   LLC     UI                       OFF     AA   AA
                    Routing Information . . . . . . . . :  02F0
                    Frame Type :  IP           TOS: NORMAL           Length:    44  Protocol: TCP          Datagram ID: 02A7
                                  Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                    SNAP Header:  0000000800
                    IP Header  :  4500002C02A70000400695840918683909186838
                    IP Options :  NONE
                    TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1034,Unassigned
                                  SEQ Number:  1302184593 ('4D9DC291'X)  ACK Number: 1091843733 ('41143695'X)
                                  Code Bits: SYN ACK                  Window:  8192  TCP Option: MSS= 1949
                    TCP Header :  018D040A4D9DC29141143695601220000061D00000204079D
   395   S       45 5117.6                         400010020002  C00010020001   LLC     UI                       OFF     AA   AA
                    Routing Information . . . . . . . . :  0270
                    Frame Type :  IP           TOS: NORMAL           Length:    40  Protocol: TCP          Datagram ID: 31F6
                                  Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                    SNAP Header:  0000000800
                    IP Header  :  4500002831F60000400666390918683809186839
                    IP Options :  NONE
                    TCP  . . . :  Src Port:  1034,Unassigned    Dest Port:   397,APPC/TCP
                                  SEQ Number:  1091843733 ('41143695'X)  ACK Number: 1302184594 ('4D9DC292'X)
                                  Code Bits: ACK                      Window:  8192  TCP Option: NONE
                    TCP Header :  040A018D411436954D9DC292501020001FC30000
```

```
Record       Data    Record     Data   Controller  Destination   Source        Frame            Number  Number    Poll/
Number  S/R  Length  Timer      Type   Name        MAC Address   MAC Address   Format  Command  Sent    Received  Final  DSAP SSAP
------  ---  ------  ---------  ------ ----------  ------------  ------------  ------  -------  ------  --------  -----  ---- ----
   397   S      332  5117.9                        400010020002  C00010020001   LLC     UI                        OFF     AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP            TOS: NORMAL            Length:   327  Protocol: TCP           Datagram ID: 31F8
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500014731F80000400665180918683809186839
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1034,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1091843733 ('41143695'X)  ACK Number: 1302184594 ('4D9DC292'X)
                                   Code Bits: ACK PSH                 Window:  8192  TCP Option: NONE
                     TCP Header :  040A018D411436954D9DC29250182000949E0000
                     Data . . . :  0000011F800A011B2A0B0111E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C2010B   *...........USIBMRA.RALYAS4B..*
                                       ::::||||::::  ||  ||||||||||||||||||||||||||||||||||  ||
   Record length (binary)--------------++++||||::::  ||  ||||||||||||||||||||||||||||||||||  ||
                                           ||||::::  ||  ||||||||||||||||||||||||||||||||||  ||
   MPTN_Connect----------------------------++||::::  ||  ||||||||||||||||||||||||||||||||||  ||
   Request (bit 0 in this byte=0)------------++::::  ||  ||||||||||||||||||||||||||||||||||  ||
                                               ::::  ||  ||||||||||||||||||||||||||||||||||  ||
   Command length (binary)---------------------++++  ||  ||||||||||||||||||||||||||||||||||  ||
                                                     ||  ||||||||||||||||||||||||||||||||||  ||
                                                     ||  ||||||||||||||||||||||||||||||||||  ||
   MPTN qualifier for dest addr (OB=SNA addr)--------++  ||||||||||||||||||||||||||||||||||  ||
   Destination address length (including this byte)------++||||||||||||||||||||||||||||||||  ||
   Destination address in hex (USIBMRA.RALYAS4B)---------++++++++++++++++++++++++++++++++  ||
                                                                                             ||
   MPTN qualifier for source addr (OB=SNA addr)----------------------------------------------++

                                   0111E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C1010977649045714000C90F00   *..USIBMRA.RALYAS4A....... .I..*
                                     ||||||||||||||||||||||||||||||||||
   Source addr len (incl this byte)--++||||||||||||||||||||||||||||||||
   Source addr hex (USIBMRA.RALYAS4A)--++++++++++++++++++++++++++++++++

                                   00020500000076000000762000050800060101 0A0200BC00006B80003100   *.........................,....*
                                   1307B0B0513307878686870706020000000000000009443000010E4E2C9C2   *.......GFFG..........M....USIB*
                                   D4D9C14BD9C1D3E8C1E2F4C132000902E2D5C1E2E5C3D4C7090301649041   *MRA.RALYAS4A....SNASVCMG......*
                                   09C0002D1104E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C10A13007764904109   *.{....USIBMRA.RALYAS4A........*
                                   C0002D0010E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C26019F64B0D2BCC86C1   *{....USIBMRA.RALYAS4B-.6....FA*
                                   0510E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C12C0A04087BC3D6D5D5C5C3E3   *..USIBMRA.RALYAS4A....#CONNECT*
                                   2B19010117461580011 0E4E2C9C2D4D9C14BC1E2F4C2C1D5E8E300180000   *..........USIBMRA.AS4BANYT....*
                                   0501190A000A0020010310831A00000584                             *...........C....D             *
   401   R       45  5118.0                        400010020001  C00010020002   LLC     UI                        OFF     AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP            TOS: NORMAL            Length:    40  Protocol: TCP           Datagram ID: 02A8
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002802A80000400695870918683909186838
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1034,Unassigned
                                   SEQ Number:  1302184594 ('4D9DC292'X)  ACK Number: 1091844020 ('411437B4'X)
                                   Code Bits: ACK                     Window:  7905  TCP Option: NONE
                     TCP Header :  018D040A4D9DC292411437B450101EE11FC30000
   411   R      281  5120.5                        400010020001  C00010020002   LLC     UI                        OFF     AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP            TOS: NORMAL            Length:   276  Protocol: TCP           Datagram ID: 02A9
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500011402A900004006949A0918683909186838
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1034,Unassigned
                                   SEQ Number:  1302184594 ('4D9DC292'X)  ACK Number: 1091844020 ('411437B4'X)
                                   Code Bits: ACK PSH                 Window:  7905  TCP Option: NONE
                     TCP Header :  018D040A4D9DC292411437B450181EE1CBEC0000
                     Data . . . :  000000EC808A00E82A0B0111E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C2010B   *.......Y....USIBMRA.RALYAS4B..*
                                       ::::||||
   Record length (binary)--------------++++||||
                                           ||||
   MPTN_Connect----------------------------++||
   Response (bit 0 in this byte=1)-----------++
   (bit 2=1 in this byte would indicate a negative response)

   The formatted MPTN_Connect request data above
   is echoed back in this MPTN_Connect response.

                                   0111E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C1010977649045714000C90F00   *..USIBMRA.RALYAS4A....... .I..*
                                   000205000000760000007620000508000601010A0200890000EB80003100   *.....................I.......*
                                   1307B0B05133000786868700060200000000000000094430000002B000902   *........FFG..........M........*
                                   E2D5C1E2E5C3D4C70203021105E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C20A   *SNASVCMG.....USIBMRA.RALYAS4B.*
                                   13007764936A380000B900006019F64B0D2BCC86C10510E4E2C9C2D4D9C1   *....L.......-.6....FA..USIBMRA*
                                   4BD9C1D3E8C1E2F4C12B190101174615800110E4E2C9C2D4D9C14BC1E2F4   *.RALYAS4A..........USIBMRA.AS4*
                                   C2C1D5E8E3001800000501190A000A0020010310831A00000584           *BANYT...............C....D    *
```

```
Record       Data    Record      Data    Controller  Destination   Source        Frame          Number  Number    Poll/
Number  S/R  Length  Timer       Type    Name        MAC Address   MAC Address   Format Command Sent    Received  Final  DSAP SSAP
------  ---  ------  ---------   ------  ----------  ------------  ------------  ------ ------- ------  --------  -----  ---- ----
   414   S      45   5121.1                          400010020002  C00010020001   LLC    UI                       OFF     AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP            TOS: NORMAL            Length:    40  Protocol: TCP           Datagram ID: 31F9
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002831F9000040066636091868380918683 9
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1034,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1091844020 ('411437B4'X)  ACK Number: 1302184830 ('4D9DC37E'X)
                                   Code Bits: ACK PSH                 Window:  7956  TCP Option: NONE
                     TCP Header :  040A018D411437B44D9DC37E50181F141E9C0000
   420   S      92   5121.9                          400010020002  C00010020001   LLC    UI                       OFF     AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP            TOS: NORMAL            Length:    87  Protocol: TCP           Datagram ID: 31FA
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500005731FA00004006660609186838091868 39
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1034,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1091844020 ('411437B4'X)  ACK Number: 1302184830 ('4D9DC37E'X)
                                   Code Bits: ACK PSH                 Window:  7956  TCP Option: NONE
                     TCP Header :  040A018D411437B44D9DC37E50181F1479ED0000
                     Data . . . :  0000002F0000010B90200C0502FF0003D000000206F10019121002000000   *...............}....1........*
                                   ||||||||::||||::::::
   Record length (binary)----------++++++++::||||::::::  Normal SNA data follows: the remainder of this record is a CNOS
                                           ::||||::::::  request for mode BLANK
   MPTN Header (x'00'= no compensation)----++||||::::::
                                             ||||::::::
   SNA TH sequence number--------------------++++::::::
                                                 ::::::
   SNA RH----------------------------------------++++++

                                   000008000400040008404040404040404040                           *.........                     *
   421   R      45   5122.1                          400010020001  C00010020002   LLC    UI                       OFF     AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP            TOS: NORMAL            Length:    40  Protocol: TCP           Datagram ID: 02AA
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002802AA0000400695850918683909186838
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1034,Unassigned
                                   SEQ Number:  1302184830 ('4D9DC37E'X)  ACK Number: 1091844067 ('411437E3'X)
                                   Code Bits: ACK PSH                 Window:  7858  TCP Option: NONE
                     TCP Header :  018D040A4D9DC37E411437E350181EB21ECF0000
   425   R      80   5122.7                          400010020001  C00010020002   LLC    UI                       OFF     AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP            TOS: NORMAL            Length:    75  Protocol: TCP           Datagram ID: 02AB
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500004B02AB0000400695610918683909186838
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1034,Unassigned
                                   SEQ Number:  1302184830 ('4D9DC37E'X)  ACK Number: 1091844067 ('411437E3'X)
                                   Code Bits: ACK PSH                 Window:  7858  TCP Option: NONE
                     TCP Header :  018D040A4D9DC37E411437E350181EB2585A0000
                     Data . . . :  0000002300000103900100191210 0A000000000008000400040008404040   *...........................   *
                                   4040404040                                                     *                              *
   426   S      45   5123.1                          400010020002  C00010020001   LLC    UI                       OFF     AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP            TOS: NORMAL            Length:    40  Protocol: TCP           Datagram ID: 31FB
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002831FB0000400666340918683809186839
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1034,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1091844067 ('411437E3'X)  ACK Number: 1302184865 ('4D9DC3A1'X)
                                   Code Bits: ACK PSH                 Window:  7921  TCP Option: NONE
                     TCP Header :  040A018D411437E34D9DC3A150181EF11E6D0000
   427   S      49   5123.4                          400010020002  C00010020001   LLC    UI                       OFF     AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP            TOS: NORMAL            Length:    44  Protocol: TCP           Datagram ID: 31FC
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002C31FC00004006662F0918683809186839
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1093377745 ('412B9ED1'X)  ACK Number:          0 ('00000000'X)
                                   Code Bits: SYN                     Window:  8192  TCP Option: MSS= 1949
                     TCP Header :  040B018D412B9ED10000000060022000AE0700000204079D
```

```
Record        Data   Record     Data    Controller  Destination   Source        Frame            Number  Number    Poll/
Number  S/R  Length  Timer      Type    Name        MAC Address   MAC Address   Format  Command  Sent    Received  Final  DSAP SSAP
------  ---  ------  ---------  ------  ----------  ------------  ------------  ------  -------  ------  --------  -----  ---- ----
   428   R       49  5123.4                         400010020001  C00010020002   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP           TOS: NORMAL           Length:    44  Protocol: TCP           Datagram ID: 02AC
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002C02AC00004006957F0918683909186838
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                   SEQ Number:  1303677193 ('4DB48909'X)  ACK Number: 1093377746 ('412B9ED2'X)
                                   Code Bits: SYN ACK                Window:  8192  TCP Option: MSS= 1949
                     TCP Header :  018D040B4DB48909412B9ED260122000D73800000204079D
   430   S       45  5123.5                         400010020002  C00010020001   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP           TOS: NORMAL           Length:    40  Protocol: TCP           Datagram ID: 31FD
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002831FD00004006663209186838091868 39
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1093377746 ('412B9ED2'X)  ACK Number: 1303677194 ('4DB4890A'X)
                                   Code Bits: ACK                    Window:  8192  TCP Option: NONE
                     TCP Header :  040B018D412B9ED24DB4890A50102000F0DE0000
   432   S      332  5123.5                         400010020002  C00010020001   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP           TOS: NORMAL           Length:   327  Protocol: TCP           Datagram ID: 31FE
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500014731FE0000400665120918683809186839
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1093377746 ('412B9ED2'X)  ACK Number: 1303677194 ('4DB4890A'X)
                                   Code Bits: ACK PSH                Window:  8192  TCP Option: NONE
                     TCP Header :  040B018D412B9ED24DB4890A50182000E6020000
                     Data . . . :  0000011F800A011B2A0B0111E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C2010B   *...........USIBMRA.RALYAS4B..*
                                   0111E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C101097764904B004000F00F00   *..USIBMRA.RALYAS4A....... .0..*
                                   0080050000007600000076200005080006010 10A0200BC00006B80003100   *.........................,....*
                                   1307B0B0513303838C8C830306020000000000000009443000010E4E2C9C2   *.......C..C..........M....USIB*
                                   D4D9C14BD9C1D3E8C1E2F4C1320009024040404040404040009030164904A   *MRA.RALYAS4A....        .....¢*
                                   A200009D1104E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C10A13007764904AA2   *S.....USIBMRA.RALYAS4A......¢S*
                                   00009D0010E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C26019F64B0D2BCC86C1   *.....USIBMRA.RALYAS4B-.6....FA*
                                   0610E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C12C0A01087BC3D6D5D5C5C3E3   *..USIBMRA.RALYAS4A....#CONNECT*
                                   2B19010117461580011 0E4E2C9C2D4D9C14BC1E2F4C2C1D5E8E300180000   *..........USIBMRA.AS4BANYT....*
                                   0501190A000A0020010310831A00000584                             *...........C....D            *
   433   R      281  5123.6                         400010020001  C00010020002   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP           TOS: NORMAL           Length:   276  Protocol: TCP           Datagram ID: 02AD
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500011402AD000040069496091868390918 6838
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                   SEQ Number:  1303677194 ('4DB4890A'X)  ACK Number: 1093378033 ('412B9FF1'X)
                                   Code Bits: ACK PSH                Window:  7905  TCP Option: NONE
                     TCP Header :  018D040B4DB4890A412B9FF150181EE15C0E0000
                     Data . . . :  000000EC808A00E82A0B0111E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C2010B   *.......Y....USIBMRA.RALYAS4B..*
                                   0111E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C101097764904B004000F00F00   *..USIBMRA.RALYAS4A....... .0..*
                                   008005000000760000007620000508000601010A0200890000EB80003100   *.....................I.......*
                                   1307B0B0513300038C8C8300060200000000000000094430000002B000902   *..........C..........M........*
                                   404040404040404002030211 05E4E2C9C2D4D9C14BD9C1D3E8C1E2F4C20A   *       .....USIBMRA.RALYAS4B.*
                                   13007764936D4600004600006019F64B0D2BCC86C10610E4E2C9C2D4D9C1   *....L_......-.6....FA..USIBMRA*
                                   4BD9C1D3E8C1E2F4C12B19010117461580011 0E4E2C9C2D4D9C14BC1E2F4   *.RALYAS4A..........USIBMRA.AS4*
                                   C2C1D5E8E30018000005011 90A000A0020010310831A00000584           *BANYT...............C....D    *
   437   S       45  5124.2                         400010020002  C00010020001   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP           TOS: NORMAL           Length:    40  Protocol: TCP           Datagram ID: 31FF
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002831FF0000400666300918683809186839
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1093378033 ('412B9FF1'X)  ACK Number: 1303677430 ('4DB489F6'X)
                                   Code Bits: ACK PSH                Window:  7956  TCP Option: NONE
                     TCP Header :  040B018D412B9FF14DB489F650181F14EFB70000
```

```
Record        Data    Record     Data    Controller  Destination    Source         Frame             Number  Number     Poll/
Number  S/R  Length  Timer      Type    Name        MAC Address    MAC Address    Format  Command   Sent    Received   Final  DSAP SSAP
------  ---  ------  ---------  ------  ----------  ------------   ------------   ------  -------   ------  --------   -----  ---- ----
   441   S      293  5124.9                         400010020002   C00010020001   LLC     UI                           OFF     AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP           TOS: NORMAL            Length:   288  Protocol: TCP          Datagram ID: 3200
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  45000120320000004006653709186838091868 39
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1093378033 ('412B9FF1'X)  ACK Number: 1303677430 ('4DB489F6'X)
                                   Code Bits: ACK PSH                  Window:  7956  TCP Option: NONE
                     TCP Header :  040B018D412B9FF14DB489F650181F1474250000
                     Data . . . :  000000F80000010B9020290502FF0803D000400430F0F0F5001910E4E2C9   *...8............}. ..005...USI*
                                   C2D4D9C14BD9C1D3E8C1E2F4C1AAC581A43EE9000100C512F500C112E200   *BMRA.RALYAS4A.EAU.Z...E.5.A.S.*
                                   BD12A0200003E00500400623E6E3D9F0F5F2F0F0C340F3F1F8F0F0F0F0F2   *......... ..WTR05200C 31800002*
                                   02B90025009208C000200000000000000000DC3D8D7C1C3E3D3F0F0404000   *.....K.{..........CQPACTL00  .*
                                   2FC4F6C00001E4E2C20202B9002502B90025F3F2F7F440404040F3F1F8F0   *.D6{..USB.........3274    3180*
                                   F0F0F0F24040404040404040056006000007E300000000004BC108000000   *0002          .-....T......A....*
                                   D9C1D3E8C1E2F4C1D4C9C3D24040404040404040404040404040404040404040   *RALYAS4AMICK                  *
                                   40404040404040404040404040404040404040404040404040404040D9C1   *                            RA*
                                   D3E8C1E2F4C14040                                             *LYAS4A                        *
   443   R       45  5125.0                         400010020001   C00010020002   LLC     UI                           OFF     AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP           TOS: NORMAL            Length:    40  Protocol: TCP          Datagram ID: 02AE
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002802AE00004006958109186839091868 38
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                   SEQ Number:  1303677430 ('4DB489F6'X)  ACK Number: 1093378281 ('412BA0E9'X)
                                   Code Bits: ACK PSH                  Window:  7657  TCP Option: NONE
                     TCP Header :  018D040B4DB489F6412BA0E950181DE9EFEA0000
   447   R      128  5126.6                         400010020001   C00010020002   LLC     UI                           OFF     AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP           TOS: NORMAL            Length:   123  Protocol: TCP          Datagram ID: 02AF
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500007B02AF00004006952D09186839091868 38
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                   SEQ Number:  1303677430 ('4DB489F6'X)  ACK Number: 1093378281 ('412BA0E9'X)
                                   Code Bits: ACK PSH                  Window:  7657  TCP Option: NONE
                     TCP Header :  018D040B4DB489F6412BA0E950181DE91B570000
                     Data . . . :  0000005300000103A000004912A090000560060020C0003D0000C9F9F0F3   *.................-...{....I903*
                                   D9C1D3E8C1E2F4C2D8D7C1C4C5E5F0F0F0F1000000000000000000000000   *RALYAS4BQPADEV0001............*
                                   000000000000000000000000000000000000000000002                 *.......................       *
   450   S       55  5126.7                         400010020002   C00010020001   LLC     UI                           OFF     AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP           TOS: NORMAL            Length:    50  Protocol: TCP          Datagram ID: 3201
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500003232010000400666624091868380918 6839
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1093378281 ('412BA0E9'X)  ACK Number: 1303677513 ('4DB48A49'X)
                                   Code Bits: ACK PSH                  Window:  7873  TCP Option: NONE
                     TCP Header :  040B018D412BA0E94DB48A4950181EC14DA80000
                     Data . . . :  0000000A00800083A000                                         *.......C..                    *
   451   R       45  5126.8                         400010020001   C00010020002   LLC     UI                           OFF     AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP           TOS: NORMAL            Length:    40  Protocol: TCP          Datagram ID: 02B0
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002802B000004006957F09186839091868 38
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                   SEQ Number:  1303677513 ('4DB48A49'X)  ACK Number: 1093378291 ('412BA0F3'X)
                                   Code Bits: ACK PSH                  Window:  7647  TCP Option: NONE
                     TCP Header :  018D040B4DB48A49412BA0F350181DDFEF970000
```

```
Record        Data   Record     Data    Controller  Destination   Source        Frame            Number  Number    Poll/
Number  S/R  Length  Timer      Type    Name        MAC Address   MAC Address   Format  Command  Sent    Received  Final  DSAP SSAP
------  ---  ------  ---------  ------  ----------  ------------  ------------  ------  -------  ------  --------  -----  ---- ----
   452   R      579  5127.0                         400010020001  C00010020002   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP          TOS: NORMAL           Length:   574  Protocol: TCP           Datagram ID: 02B1
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500023E02B10000400693680918683909186838
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                   SEQ Number:  1303677513 ('4DB48A49'X)  ACK Number: 1093378291 ('412BA0F3'X)
                                   Code Bits: ACK PSH                  Window:  7647  TCP Option: NONE
                     TCP Header :  018D040B4DB48A49412BA0F350181DDF42BB0000
                     Data . . . :  00000216000002039020020C12A00000041080030E180000000000000000   *..............................*
                                   00000000044004110018110101110101110101010700000019000000 1101   *..... ........................*
                                   16224040404040404040404040404040E289879540D69502013740201102 2F   *..                SIGN ON... ....*
                                   20E2A8A2A3859440404B404B404B404B404B407A2011024520D9C1D3E8C1   *.SYSTEM  . . . . . :.....RALYA*
                                   E2F4C22011032F20E2A482A2A8A2A38594404B404B404B404B407A201103   *S4B.....SUBSYSTEM . . . . . :...*
                                   4520D8C9D5E3C5D9404040402011042F20C489A2979381A8404B404B404B   *..QINTER    .....DISPLAY . . .*
                                   404B404B407A2011044520D8D7C1C4C5E5F0F0F0F12011061020E4A28599   * . . :.....QPADEV0001.....USER*
                                   40404B404B404B404B404B404B404B404B404B404B404B404B404B404B20   *  . . . . . . . . . . . . . . .*
                                   1106341D402024000A0000000000000000000001107341D402027000A1108   *.... .................. ......*
                                   1020D79996879981946197999683858 4A49985404B404B404B404B404B40   *..PROGRAM/PROCEDURE . . . . . *
                                   4B404B404B201108341D400024000A0000000000000000000001109 1020D4   *. . ...... .................M*
                                   8595A440404B404B404B404B404B404B404B404B404B404B404B404B404B   *ENU  . . . . . . . . . . . . . .*
                                   404B201109341D400024000A00000000000000000000110A1020C3A49999   * ...... ..................CURR*
                                   8595A340938982998199A8404B404B404B404B404B404B404B404B404B20   *ENT LIBRARY . . . . . . . . . .*
                                   110A341D400024000A00000000000000000000011071020D781A2A2A69699   *.... ..................PASSWOR*
                                   8440404B404B404B404B404B404B404B404B404B404B404B404B20110734   *D  . . . . . . . . . . . .....*
                                   2702073E0011182722404DC35D40C3D6D7E8D9C9C7C8E340C9C2D440C3D6   *......... (C) COPYRIGHT IBM CO*
                                   D9D74B40F1F9F8F06B40F1F9F9F44B404040402004520000              *RP. 1980, 1994.    .....      *
   457   S       45  5127.2                         400010020002  C00010020001   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP          TOS: NORMAL           Length:    40  Protocol: TCP           Datagram ID: 3202
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  45000028320200004006662D0918683809186839
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1093378291 ('412BA0F3'X)  ACK Number: 1303678047 ('4DB48C5F'X)
                                   Code Bits: ACK PSH                  Window:  7339  TCP Option: NONE
                     TCP Header :  040B018D412BA0F34DB48C5F50181CABEEB50000
   858   S       93  5141.2                         400010020002  C00010020001   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  0270
                     Frame Type :  IP          TOS: NORMAL           Length:    88  Protocol: TCP           Datagram ID: 3204
                                   Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  450000583204000040066 5FB0918683809186839
                     IP Options :  NONE
                     TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                   SEQ Number:  1093378291 ('412BA0F3'X)  ACK Number: 1303678047 ('4DB48C5F'X)
                                   Code Bits: ACK PSH                  Window:  7339  TCP Option: NONE
                     TCP Header :  040B018D412BA0F34DB48C5F50181CAB85B40000
                     Data . . . :  0000003000000203902000 2612A000000400800306073BF10000073BF111   *........................1....1.*
                                   0635C1D5E8E4E2C5D9110735C1D5E8D7E6C4                          *..ANYUSER...ANYPWD            *
   860   R       45  5141.3                         400010020001  C00010020002   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP          TOS: NORMAL           Length:    40  Protocol: TCP           Datagram ID: 02B3
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500002802B300004006957C0918683909186838
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                   SEQ Number:  1303678047 ('4DB48C5F'X)  ACK Number: 1093378339 ('412BA123'X)
                                   Code Bits: ACK PSH                  Window:  7599  TCP Option: NONE
                     TCP Header :  018D040B4DB48C5F412BA12350181DAFED810000
   864   R       86  5142.0                         400010020001  C00010020002   LLC     UI                         OFF    AA   AA
                     Routing Information . . . . . . . . :  02F0
                     Frame Type :  IP          TOS: NORMAL           Length:    81  Protocol: TCP           Datagram ID: 02B4
                                   Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                     SNAP Header:  0000000800
                     IP Header  :  4500005102B40000400695520918683909186838
                     IP Options :  NONE
                     TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                   SEQ Number:  1303678047 ('4DB48C5F'X)  ACK Number: 1093378339 ('412BA123'X)
                                   Code Bits: ACK PSH                  Window:  7599  TCP Option: NONE
                     TCP Header :  018D040B4DB48C5F412BA12350181DAFD6C80000
                     Data . . . :  00000029000003039020001F12A00000040080030E180000000000000000   *..............................*
                                   0000000004F30005D97000                                        *.....3..R..                   *
```

```
Record        Data   Record    Data   Controller Destination   Source        Frame           Number Number   Poll/
Number S/R  Length Timer     Type   Name       MAC Address   MAC Address   Format Command Sent   Received Final  DSAP SSAP
------ ---  ------ --------- ------ ---------- ------------  ------------  ------ ------- ------ -------- -----  ---- ----
   872  S      132 5142.1                      400010020002  C00010020001   LLC     UI                     OFF     AA   AA
                   Routing Information . . . . . . . . :  0270
                   Frame Type :  IP           TOS: NORMAL           Length:   127  Protocol: TCP          Datagram ID: 3205
                                 Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  4500007F32050000400665D30918683809186839
                   IP Options :  NONE
                   TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                 SEQ Number:  1093378339 ('412BA123'X)  ACK Number: 1303678088 ('4DB48C88'X)
                                 Code Bits: ACK PSH                  Window:  7298  TCP Option: NONE
                   TCP Header :  040B018D412BA1234DB48C8850181C82A63E0000
                   Data . . . :  0000005700000303902000 4D12A0000004008003090000880000000000000   *...........(...........H......*
                                 3AD970800300020200000000000000000000000000000000100000000   *.R............................*
                                 000000000000000000001000000007F31D00051300000000000000       *..............".}.........   *
   873  R       65 5142.3                      400010020001  C00010020002   LLC     UI                     OFF     AA   AA
                   Routing Information . . . . . . . . :  02F0
                   Frame Type :  IP           TOS: NORMAL           Length:    60  Protocol: TCP          Datagram ID: 02B5
                                 Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  4500003C02B50000400695660918683909186838
                   IP Options :  NONE
                   TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                 SEQ Number:  1303678088 ('4DB48C88'X)  ACK Number: 1093378426 ('412BA17A'X)
                                 Code Bits: ACK PSH                  Window:  7512  TCP Option: NONE
                   TCP Header :  018D040B4DB48C88412BA17A50181D5842570000
                   Data . . . :  000000140000040390200000A12A0000004000000C                    *....................          *
   878  S       45 5142.4                      400010020002  C00010020001   LLC     UI                     OFF     AA   AA
                   Routing Information . . . . . . . . :  0270
                   Frame Type :  IP           TOS: NORMAL           Length:    40  Protocol: TCP          Datagram ID: 3206
                                 Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  45000028320600004006662909186838091868 39
                   IP Options :  NONE
                   TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                 SEQ Number:  1093378426 ('412BA17A'X)  ACK Number: 1303678108 ('4DB48C9C'X)
                                 Code Bits: ACK PSH                  Window:  7278  TCP Option: NONE
                   TCP Header :  040B018D412BA17A4DB48C9C50181C6EEE2E0000
   879  R       60 5142.7                      400010020001  C00010020002   LLC     UI                     OFF     AA   AA
                   Routing Information . . . . . . . . :  02F0
                   Frame Type :  IP           TOS: NORMAL           Length:    55  Protocol: TCP          Datagram ID: 02B6
                                 Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  4500003702B600004006956A0918683909186838
                   IP Options :  NONE
                   TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                 SEQ Number:  1303678108 ('4DB48C9C'X)  ACK Number: 1093378426 ('412BA17A'X)
                                 Code Bits: ACK PSH                  Window:  7512  TCP Option: NONE
                   TCP Header :  018D040B4DB48C9C412BA17A50181D58A05A0000
                   Data . . . :  0000000F0180004B8000C900010001                                 *..........I....              *
   880  S       45 5142.8                      400010020002  C00010020001   LLC     UI                     OFF     AA   AA
                   Routing Information . . . . . . . . :  0270
                   Frame Type :  IP           TOS: NORMAL           Length:    40  Protocol: TCP          Datagram ID: 3207
                                 Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  4500002832070000400666280918683809186839
                   IP Options :  NONE
                   TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                 SEQ Number:  1093378426 ('412BA17A'X)  ACK Number: 1303678123 ('4DB48CAB'X)
                                 Code Bits: ACK PSH                  Window:  7263  TCP Option: NONE
                   TCP Header :  040B018D412BA17A4DB48CAB50181C5FEE2E0000
   881  S       56 5142.9                      400010020002  C00010020001   LLC     UI                     OFF     AA   AA
                   Routing Information . . . . . . . . :  0270
                   Frame Type :  IP           TOS: NORMAL           Length:    51  Protocol: TCP          Datagram ID: 3208
                                 Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  450000333208000040066 61C0918683809186839
                   IP Options :  NONE
                   TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                 SEQ Number:  1093378426 ('412BA17A'X)  ACK Number: 1303678123 ('4DB48CAB'X)
                                 Code Bits: ACK PSH                  Window:  7263  TCP Option: NONE
                   TCP Header :  040B018D412BA17A4DB48CAB50181C5FA2CC0000
                   Data . . . :  0000000B018000CB8000C9                                         *..........I                  *
```

```
Record        Data   Record    Data   Controller Destination  Source       Frame           Number Number   Poll/
Number  S/R Length Timer     Type   Name       MAC Address  MAC Address  Format Command Sent   Received Final DSAP SSAP
------  --- ------ --------- ------ ---------- ------------ ------------ ------ ------- ------ -------- ----- ---- ----
   883   R      50 5142.9                      400010020001 C00010020002  LLC     UI                     OFF    AA   AA
                   Routing Information . . . . . . . . :  02F0
                   Frame Type :  IP          TOS: NORMAL          Length:    45  Protocol: TCP          Datagram ID: 02B7
                                 Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  4500002D02B70000400695730918683909186838
                   IP Options :  NONE
                   TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                 SEQ Number:  1303678123 ('4DB48CAB'X)  ACK Number: 1093378437 ('412BA185'X)
                                 Code Bits: ACK PSH                 Window:  7501  TCP Option: NONE
                   TCP Header :  018D040B4DB48CAB412BA18550181D4DEA2B0000
                   Data . . . :  0000000503                                             *.....                          *
   884   S      65 5143.0                      400010020002 C00010020001  LLC     UI                     OFF    AA   AA
                   Routing Information . . . . . . . . :  0270
                   Frame Type :  IP          TOS: NORMAL          Length:    60  Protocol: TCP          Datagram ID: 3209
                                 Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  4500003C32090000400666120918683809186839
                   IP Options :  NONE
                   TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                 SEQ Number:  1093378437 ('412BA185'X)  ACK Number: 1303678128 ('4DB48CB0'X)
                                 Code Bits: ACK PSH                 Window:  7258  TCP Option: NONE
                   TCP Header :  040B018D412BA1854DB48CB050181C5A4A920000
                   Data . . . :  0000000F0000044B9020040006000000000000503              *....................           *
   886   R     746 5143.0                      400010020001 C00010020002  LLC     UI                     OFF    AA   AA
                   Routing Information . . . . . . . . :  02F0
                   Frame Type :  IP          TOS: NORMAL          Length:   741  Protocol: TCP          Datagram ID: 02B8
                                 Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  450002E502B80000400692BA0918683909186838
                   IP Options :  NONE
                   TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                 SEQ Number:  1303678128 ('4DB48CB0'X)  ACK Number: 1093378457 ('412BA199'X)
                                 Code Bits: ACK PSH                 Window:  7481  TCP Option: NONE
                   TCP Header :  018D040B4DB48CB0412BA19950181D3927EC0000
                   Data . . . :  000002BD00000503902002B312A00000041080030E180000000000000000  *..............................*
                                 0000000004400411000011114061D50002000991101012 0D4C1C9D5000000  *..... ........&...R....MAIN...*
                                 0000002000000000000000000000000000000000000022C1E261F4F0F0  *........................AS/400*
                                 40D481899540D48595A42011023D20E2A8A2A385947A200020D9C1D3E8C1  * MAIN MENU.....SYSTEM:...RALYA*
                                 E2F4C22011030120E285938583A34096958540968640A388854086969393  *S4B.....SELECT ONE OF THE FOLL*
                                 96A68995877A2011050620F14B00E4A2859940A381A292A22011060620F2  *OWING:.....1..USER TASKS.....2*
                                 4B00D6868689838540A381A292A22011070620F34B00C785958599819340  *..OFFICE TASKS.....3..GENERAL *
                                 A2A8A2A3859440A381A292A22011080620F44B00C6899385A26B40938982  *SYSTEM TASKS.....4..FILES, LIB*
                                 9981998985A26B408195844086969384859 9A22011090620F54B00D79996  *RARIES, AND FOLDERS.....5..PRO*
                                 8799819494899587 20110A0620F64B00C3969494A495898381A3899695A2  *GRAMMING.....6..COMMUNICATIONS*
                                 20110B0620F74B00C485868995854096994083888195878540A3888540A2  *.....7..DEFINE OR CHANGE THE S*
                                 A8A2A3859420110C0620F84B00D79996829385944088819584938995 8720  *YSTEM.....8..PROBLEM HANDLING.*
                                 110D0620F94B00C489A2979381A8408140948595A420110E0520F1F04B00  *....9..DISPLAY A MENU.....10..*
                                 C9958696999481A389969540C1A2A289A2A38195A3409697A3899695A220  *INFORMATION ASSISTANT OPTIONS.*
                                 110F0520F1F14B00C393898595A340C1838385A2A240A381A292A2201111  *....11..CLIENT ACCESS TASKS...*
                                 0520F9F04B00E2898795409686862011130120E285938583A38996954096  *..90..SIGN OFF.....SELECTION O*
                                 99408396949481958420111401207E7E7E6E241115502011160120C6F37E  *R COMMAND.....===>...&.....F3=*
                                 C5A789A3200020C6F47ED799969497A3200020C6F97ED985A3998985A585  *EXIT...F4=PROMPT...F9=RETRIEVE*
                                 200020C6F1F27EC3819583859320 0020C6F1F37EC9958696999481A38996  *...F12=CANCEL...F13=INFORMATIO*
                                 9540C1A2A289A2A38195A32011170120C6F2F37EE285A340899589A38981  *N ASSISTANT.....F23=SET INITIA*
                                 9340948595A420111801224DC35D40C3D6D7E8D9C9C7C8E340C9C2D440C3  *L MENU.....(C) COPYRIGHT IBM C*
                                 D6D9D74B40F1F9F8F06B40F1F9F9F44B000000000000000000000000000  *ORP. 1980, 1994...............*
                                 000000000000000000000000000000000000000000000000000000220020  *..............................*
                                 1314070411001804520000                                       *...........                   *
   889   S      45 5143.2                      400010020002 C00010020001  LLC     UI                     OFF    AA   AA
                   Routing Information . . . . . . . . :  0270
                   Frame Type :  IP          TOS: NORMAL          Length:    40  Protocol: TCP          Datagram ID: 320A
                                 Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  45000028320A0000400666250918683809186839
                   IP Options :  NONE
                   TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                 SEQ Number:  1093378457 ('412BA199'X)  ACK Number: 1303678829 ('4DB48F6D'X)
                                 Code Bits: ACK PSH                 Window:  6557  TCP Option: NONE
                   TCP Header :  040B018D412BA1994DB48F6D5018199DEE0F0000
```

```
Record       Data   Record     Data   Controller Destination  Source        Frame           Number Number   Poll/
Number S/R  Length Timer      Type   Name       MAC Address  MAC Address   Format Command  Sent   Received Final  DSAP SSAP
------ ---  ------ ---------  ------ ---------- ------------ ------------  ------ -------  ------ -------- -----  ---- ----
  1672  S      86  5150.6                       400010020002 C00010020001   LLC     UI                      OFF     AA   AA
                   Routing Information . . . . . . . . :  0270
                   Frame Type :  IP          TOS: NORMAL           Length:    81  Protocol: TCP          Datagram ID: 320B
                                 Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  45000051320B0000400665FB0918683809186839
                   IP Options :  NONE
                   TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                 SEQ Number:  1093378457 ('412BA199'X)  ACK Number: 1303678829 ('4DB48F6D'X)
                                 Code Bits: ACK PSH                 Window:  6557  TCP Option: NONE
                   TCP Header :  040B018D412BA1994DB48F6D5018199DC9500000
                   Data . . . :  000000290000050390200001F12A0000004008003061410F100001410F111   *.......................1....1.*
                                 14078595849781A2A38899                                        *..ENDPASTHR                    *
  1673  R     121  5150.7                       400010020001 C00010020002   LLC     UI                      OFF     AA   AA
                   Routing Information . . . . . . . . :  02F0
                   Frame Type :  IP          TOS: NORMAL           Length:   116  Protocol: TCP          Datagram ID: 02BB
                                 Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  4500007402BB0000400695280918683909186838
                   IP Options :  NONE
                   TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                 SEQ Number:  1303678829 ('4DB48F6D'X)  ACK Number: 1093378498 ('412BA1C2'X)
                                 Code Bits: ACK PSH                 Window:  7440  TCP Option: NONE
                   TCP Header :  018D040B4DB48F6D412BA1C250181D101B050000
                   Data . . . :  0000004C000006039001004212A05000003C000000000000D9C1D3E8C1E2   *...<..........&.........RALYAS*
                                 F4C2D9C1D3E8C1E2F4C14040D9C1D3E8C1E2F4C14040F0F0F0F4F0F1D8E4   *4BRALYAS4A  RALYAS4A  000401QU*
                                 E2C5D94040404040000000000000004000                             *SER     ...... .              *
  1675  R      45  5150.8                       400010020001 C00010020002   LLC     UI                      OFF     AA   AA
                   Routing Information . . . . . . . . :  02F0
                   Frame Type :  IP          TOS: NORMAL           Length:    40  Protocol: TCP          Datagram ID: 02BA
                                 Src Addr: 9.24.104.57      Dest Addr: 9.24.104.56      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  4500002802BA0000400695750918683909186838
                   IP Options :  NONE
                   TCP  . . . :  Src Port:   397,APPC/TCP      Dest Port:  1035,Unassigned
                                 SEQ Number:  1303678829 ('4DB48F6D'X)  ACK Number: 1093378498 ('412BA1C2'X)
                                 Code Bits: ACK PSH                 Window:  7440  TCP Option: NONE
                   TCP Header :  018D040B4DB48F6D412BA1C250181D10EA730000
  1677  S      45  5150.8                       400010020002 C00010020001   LLC     UI                      OFF     AA   AA
                   Routing Information . . . . . . . . :  0270
                   Frame Type :  IP          TOS: NORMAL           Length:    40  Protocol: TCP          Datagram ID: 320C
                                 Src Addr: 9.24.104.56      Dest Addr: 9.24.104.57      Fragment Flags: MAY  ,LAST
                   SNAP Header:  0000000800
                   IP Header  :  45000028320C000040066623091868380918683 9
                   IP Options :  NONE
                   TCP  . . . :  Src Port:  1035,Unassigned    Dest Port:   397,APPC/TCP
                                 SEQ Number:  1093378498 ('412BA1C2'X)  ACK Number: 1303678905 ('4DB48FB9'X)
                                 Code Bits: ACK PSH                 Window:  6481  TCP Option: NONE
                   TCP Header :  040B018D412BA1C24DB48FB950181951EDE60000
```

***** END OF COMPUTER PRINTOUT *****

Appendix B. APING

APING is a small APPC program that sends data across a network and receives data back. APING is used to test connectivity between two systems in an SNA network in a similar way to PING in a TCP/IP network. APING must be running on both systems (client and server). Like PING, APING times how long the data transfer takes. The APING package is available on the following:

- CompuServe

  There is an APPC Info Exchange forum on CompuServe (type GO APPC to access this forum). In the Sample Program Library section, there are several packages related to APING:

  – APING.ZIP - The OS/2 APING executables, C source code, and makefiles for many platforms

  – APINGS.ZIP - The C source portion of the APING.ZIP package

  – PNGFAM.ZIP - The executables from the APING.ZIP package

  – APINGC.ZIP - The CICS COBOL source for the APINGD server

- MKTTOOLS

  MKTTOOLS is an IBM-internal bulletin board containing packages that can be distributed to customers. The packages related to APING are the following:

  – APING PACKAGE: The OS/2 APING executables, C sourcecode, and makefiles for many platforms

  – APINGCIC PACKAGE: The CICS COBOL source for the APINGD server

- OS2BBS

  OS2BBS is a bulletin board accessible through the IBM Information Network. The APING package is available on the OS2BBS.

  – APING.ZIP: The OS/2 APING executables, C source code, and makefiles for many platforms

The APING program consists of two sides: the client side and the server side. On the client side, the user starts up the APING program and specifies what actions should be taken. As a result, the APINGD program is started on the server side. The APING and APINGD programs then communicate using CPI-C and complete the transaction.

APING for OS/400

The C source for APING and APINGD is shipped with OS/400 V3R1. It is shipped as part of QUSRTOOL. The OS/400 APING we used during our residency was created from this source.

For further information on OS/400 APING, see *OS/400 APPC Programming,* SC41-3443.

Installing OS/400 APING

If the tool does not already exist, you must create it by creating a CL program that compiles and builds the objects you need.

> **Note**
>
> ILE C/400 (5763-CX2) must be installed on the system on which APING and APINGD are created.

To create the APING and APINGD tools do the following:

1. Unpackage QUSRTOOL.

   To reduce the amount of time it takes to install the QUSRTOOL library and reduce the amount of storage used by the QUSRTOOL library, all source physical files, except QATTINFO, are now distributed as save files. Each source physical files is now contained within a save file of the same name.

   Two programs that convert save files to source physical files (UNPACKAGE) and source physical files to save files (PACKAGE) have been provided. Before any tools can be compiled and run, you must unpackage the appropriate save files.

   To unpackage the QUSRTOOL library, enter:

   ```
   CALL QUSRTOOL/UNPACKAGE ('*ALL' 1)
   ```

2. To create the CL install program TLPCRT in library MYLIB, enter:

   ```
   CRTCLPGM PGM(MYLIB/TLPCRT) SRCFILE(QUSRTOOL/QATTCL) SRCMBR(TLPCRT)
   ```

   Where MYLIB is the library in which you want the CL program to exist.

3. To call the installation program, enter:

   ```
   CALL PGM(MYLIB/TLPCRT) PARM(APING)
   ```

   Where APING is the library in which you want the tools APING and APINGD to exist. If this library does not already exist it will be created.

4. Add the library in which APING and APIND reside to the User Library List. To change the User Library List:

   a. Enter the WRKSYSVAL command.

   b. Page down until you find the QUSRLIBL system value, select 2 for change.

   c. Add the library that you used when creating the tools (usually APING) to the list.

Deleting OS/400 APING

To delete the APING tool, create the CL delete program TLPDLT in library MYLIB:

```
CRTCLPGM PGM(MYLIB/TLPDLT) SRCFILE(QUSRTOOL/QATTCL)
```

Where MYLIB is the library in which you want the CL program to exist.

Once the delete program is created, you can do one of the following:

1. If you want to delete only the source members in QUSRTOOL, enter:

   ```
   CALL MYLIB/TLPDLT (*YES *NONE)
   ```

2. If you want to delete only the library APING, enter:

```
CALL MYLIB/TLPDLT (*NO APING)
```

   Where APING is the library in which you created the tools APING and APINGD.

3. If you want to delete both the source members in QUSRTOOL and the library APING, enter:

```
CALL MYLIB/TLPDLT (*YES APING)
```

   Where APING is the library in which you created the tools APING and APINGD.

Using OS/400 APING

The simplest way to use APING is to specify only the partner destination name. For example, you can start APING with:

```
===> call aping destination
```

Running the APING program with the default parameters will result in a session allocation, which will be timed. Then APING will send 100 bytes to the partner, and receive the same number of bytes, which will also be timed. This will be done twice, since the first timing is likely to include process start up time on the partner side.

The following describes all of the APING parameters:

APING destination optional parameters

The destination is the only required parameter. You may specify any number of the additional parameters. If you specify any parameter more than once, only the last parameter value will be used.

destination

This identifies the partner system on which the APINGD server program runs.

It may be either a CPI-C symbolic destination name or a partner LU name.

If the destination is a CPI-C symbolic destination name, it must be 1 to 8 characters and must be configured in your platform's symbolic destination name table.

-m mode_name

Mode name (default: "#INTER").

-t tp_name

The TP name to start on the partner (default: "APINGD").

-s N

N is the size of the packet transmitted (default: 100 bytes).

This is the number of bytes sent in each Send call by each side. You may specify a value from 0 to 32767.

-i N

N is the number of iterations done (default: 2).

The number of iterations will be seen in the output as the number of sets of timing information. You may want to increase this number to get a larger sample of timings. You may specify a value from 1 to 32767.

-c N

N is the number of consecutive packets sent by each side (default: 1).

This is the number of Send calls issued by each side before giving the partner permission to send. For each iteration, each side will make this number of Sends, each of the specified packet size. You may specify a value from 1 to 32767.

-u userid

This is the user ID that will be sent to the partner. The user ID can be 1-8 characters in length. You should use this parameter when the destination transaction program has been configured to require security. One indication that the destination transaction program requires security is a CPI-C return code of

```
XC_SECURITY_NOT_VALID.
```

Specifying this parameter implies the conversation will use CPI-C security=PROGRAM. A password must also be specified. If a user ID is specified without a password, APING will prompt the user for a password.

-p password

This is the password that will be sent to the partner. The password can be 1-8 characters in length.

-n

This parameter forces APING to use NO security on the conversation. (CPI-C security=NONE). This should be used when you receive a CPI-C return code of XC_SECURITY_NOT_VALID, but the destination transaction program is not configured to require security.

-1

Only send data from client to server (no echo). Note that the flag is a numeral one, not the letter L.

APING Output

The following illustrates the simplified line flows that result when APING is started with the following parameters:

```
APING destination -s 10000 -i 2 -c 4

LOCAL COMPUTER                     PARTNER COMPUTER
Allocate         ---------------> Accept Conversation
Confirm          ---------------> Confirmed
Send(10000)      ---------------> Receive
Send(10000)      ---------------> Receive
Send(10000)      ---------------> Receive
Send(10000)      ---------------> Receive
Receive          <--------------- Send(10000)
 Receive          <--------------- Send(10000)
 Receive          <--------------- Send(10000)
 Receive          <--------------- Send(10000)
 Send(10000)      ---------------> Receive
 Send(10000)      ---------------> Receive
 Send(10000)      ---------------> Receive
 Send(10000)      ---------------> Receive
```

```
Receive         <--------------- Send(10000)
Receive         <--------------- Send(10000)
Receive         <--------------- Send(10000)
Receive         <--------------- Send(10000)
Deallocate
```

The output from the APING program is similar to the following:

```
APING version 2.36 APPC echo test with timings.
  by Peter J. Schwaller (pjs@ralvm6.vnet.ibm.com)

Allocate duration:                         0 ms

Program startup and Confirm duration:    720 ms

        Duration       Data Sent       Data Rate       Data Rate
        (msec)         (bytes)         (KB/s)          (Mb/s)
        --------       ---------       ---------       ---------
              60           64000          1041.7           8.333
              30           64000          2083.3          16.667
Totals:       90          128000          1388.9          11.111

 Duration statistics:   Min = 30   Ave = 45   Max = 60
```

Figure 397. APING Sample Output

The Allocate duration is how long it takes for the Allocate call to return to the program. The next call in APING is a Confirm call, which is timed to determine the approximate program start up time of the partner transaction program.

The number of APING duration lines will be equal to the number of iterations requested (see the -i parameter above). In this case, the default of 2 was used.

The last output line provides a summary of the APING duration lines already displayed. The minimum, maximum and average APING duration is displayed in milliseconds. The overall data rate for all APINGs is calculated and displayed.

Note that on some platforms the timer resolution is one second, or 1000 milliseconds.

Examples of APING Use between AS/400s

In the following example we use APING between RALYAS4A and RALYAS4B with neither a user ID or password specified:

```
CALL PGM(APING) PARM('RALYAS4B')
```

When a user ID (-u) is not specified, the user ID from QCMN subsystem will be used, for example QUSER from:

```
                         Display Communications Entries
                                                           System:   RALYAS4B
 Subsystem description:   QCMN          Status:   ACTIVE

                                Job                          Default        Max
 Device        Mode         Description    Library         User           Active
 *ALL          QCASERVR     *USRPRF                        *NONE          *NOMAX
 *ALL          QPCSUPP      *USRPRF                        *SYS           *NOMAX
 *APPC         *ANY         *USRPRF                        QUSER          *NOMAX
```

Figure 398. QCMN Subsystem Communications Entries

In the following example we use APING between RALYAS4A and RALYAS4B with both a user ID and password specified:

```
CALL PGM(APING) PARM('RALYAS4B' '-uUSERID' '-pPASSWORD')
```

Note: User ID and password *must* be in upper case.

During the residency we used OS/400 APING in conjunction with OS/2 and MVS APING.

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