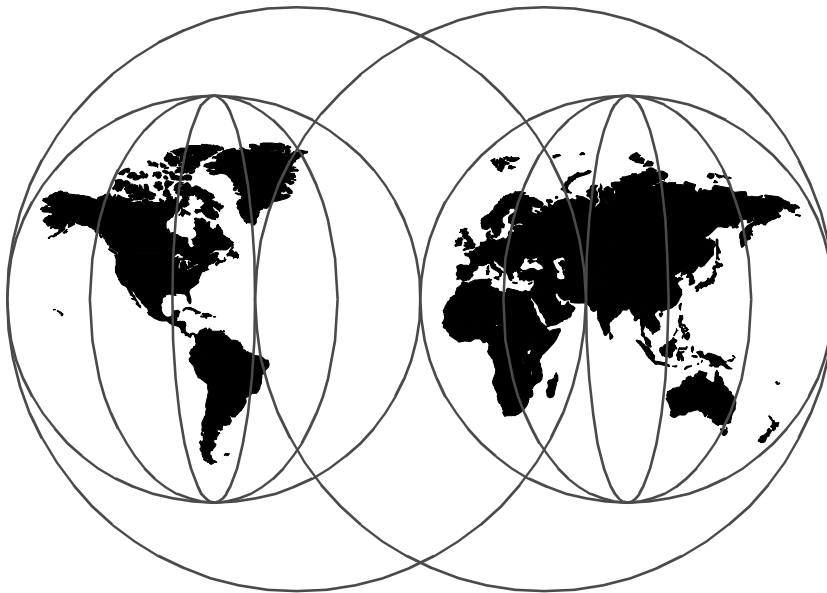


Netfinity to S/390 Connectivity using ESCON

Carla Sadler



International Technical Support Organization

<http://www.redbooks.ibm.com>

SG24-5284-00



International Technical Support Organization

Netfinity to S/390 Connectivity using ESCON

November 1998

Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix A, "Special Notices" on page 147.

First Edition (November 1998)

This edition applies to the IBM Netfinity ESCON adapter for use with the Windows NT Server Version 4.0 and Novell intraNetWare or NetWare 4.11 Operating Systems.

Comments may be addressed to:

IBM Corporation, International Technical Support Organization
Dept. HZ8 Building 678
P.O. Box 12195
Research Triangle Park, NC 27709-2195

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

© **Copyright International Business Machines Corporation 1998. All rights reserved**

Note to U.S Government Users – Documentation related to restricted rights – Use, duplication or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corp.

Contents

Preface	vii
The Team That Wrote This Redbook	vii
Comments Welcome	viii
Chapter 1. Introduction and Overview	1
1.1 Market Dynamics	2
1.2 Introduction to ESCON	3
1.3 Netfinity ESCON Adapter Overview	4
Chapter 2. Netfinity to S/390 Connectivity Options	7
2.1 SNA	7
2.1.1 Netfinity Server as a TN3270E Server	7
2.1.2 Netfinity Server as an SNA Gateway	8
2.1.3 AnyNet	10
2.1.4 Communications Server for Windows NT	10
2.1.5 Microsoft SNA Server	11
2.1.6 IntranetWare for SAA from IBM and Novell	12
2.2 TCP/IP	13
2.2.1 TCP/IP Passthrough	13
2.2.2 Virtual Point-to-Point Adapter (VPPA)	15
2.2.3 High Speed Access Services (HSAS)	15
Chapter 3. Applications of ESCON Connectivity	17
3.1 Network Server Consolidation	17
3.2 Web Access to SNA Applications	19
3.2.1 Host On-Demand	21
3.2.2 Host Publisher	22
3.3 Data Management	23
3.3.1 DB2	24
3.3.2 CICS	24
3.3.3 IMS	25
3.3.4 ADSM	26
3.4 Business Intelligence Systems	26
3.5 Enterprise Resource Planning	28
Chapter 4. Planning and Installation	31
4.1 Netfinity Hardware	31
4.2 Netfinity Software	35
4.3 S/390 Host Planning	37
4.4 Installation Planning	37
4.5 Host Hardware Definition	39

4.5.1	Defining the ESCON Connection to the S/390	39
4.5.2	ESCON Director	39
4.5.3	IOCP Definitions	40
4.6	ESCON Adapter Configuration	42
4.6.1	Windows NT	43
4.6.2	NetWare	44
Chapter 5.	High Availability	45
5.1	TCP/IP	45
5.1.1	VPPA	45
5.2	SNA	47
5.2.1	APPN	48
5.2.2	High Performance Routing (HPR)	48
5.2.3	Hot Standby for IP and IPX Clients	50
5.2.4	Backup Servers for SNA Clients	53
5.2.5	Single Server Backup	54
5.2.6	Server Load Balancing using SLP	56
5.2.7	TN3270 and SNA Gateway Load Balancing across Links	58
5.3	Host Recovery	59
5.3.1	SNA	60
5.3.2	TCP/IP	60
Chapter 6.	TCP/IP Passthrough	61
6.1	TCP/IP Passthrough Example	61
6.2	Planning	62
6.3	Installation	63
6.4	Host IOCP Definition	64
6.5	ESCON Adapter Configuration	65
6.6	Windows NT TCP/IP Passthrough Configuration	66
6.7	Host TCP/IP Definitions	69
6.7.1	TCP/IP Performance Tips	70
Chapter 7.	VPPA Example	71
7.1	VPPA Example	71
7.2	Planning	72
7.3	Installation	73
7.4	Host IOCP Definition	74
7.5	OS/390 Parmlib Updates	75
7.6	ESCON Adapter Configuration	75
7.7	VPPA Configuration	76
7.8	Windows NT TCP/IP Protocol Setup	78
7.9	HOST TCP/IP Definitions	80
7.9.1	TCP/IP Performance Tips	80
7.10	ADSM Client Setup	81

Chapter 8. HSAS Example	83
8.1 HSAS Example	83
8.2 Planning	84
8.3 Installation	85
8.4 Host IOCP Definition	86
8.5 ESCON Adapter Configuration	87
8.6 VPPA Adapter Configuration	88
8.7 Windows NT TCP/IP Configuration	91
8.8 MVS OpenEdition	92
8.9 HOST VTAM Definitions	93
8.10 Host TCP/IP Definitions	93
Chapter 9. CS/NT TN3270E Server Example	99
9.1 CS/NT TN3270E Server Example	99
9.2 Planning	101
9.3 Installation	101
9.4 Host IOCP Definition	102
9.5 ESCON Adapter Configuration	103
9.6 CS/NT Configuration	104
9.7 VTAM Definitions	115
9.8 Personal Communications Client Configuration	117
9.9 Host On-Demand	121
Chapter 10. CS/NT SNA Gateway Example	125
10.1 CS/NT SNA Gateway Example	126
10.2 Planning	127
10.3 Installation	128
10.4 Host IOCP Definition	129
10.5 ESCON Adapter Configuration	129
10.6 CS/NT Configuration	130
10.7 VTAM Definitions	138
10.8 Client CS/NT Configuration	141
10.9 Personal Communications Configuration	143
Appendix A. Special Notices	147
Appendix B. Related Publications	151
B.1 International Technical Support Organization Publications	151
B.2 Redbooks on CD-ROMs	151
B.3 Other Publications	152
How to Get ITSO Redbooks	153
How IBM Employees Can Get ITSO Redbooks	153
How Customers Can Get ITSO Redbooks	154

IBM Redbook Order Form	155
Index	157
ITSO Redbook Evaluation	159

Preface

This redbook will help you plan for, install, and configure the new IBM Netfinity ESCON adapter for connection to a mainframe. The IBM Netfinity ESCON adapter rounds out the connectivity capabilities of the Netfinity server in mainframe environments. The ESCON adapter allows direct TCP/IP and SNA connectivity over a high-speed, reliable link between applications on the Netfinity Server and the mainframe host. It also provides a high-speed gateway for SNA and TCP/IP applications on remote computers.

This redbook is intended to supplement the information in the *IBM Netfinity ESCON Adapter Installation Guide* by providing examples and performance tips. The examples are based on Windows NT.

The Team That Wrote This Redbook

This redbook was produced by a team of specialists from around the world working at the International Technical Support Organization, Raleigh Center.

Carla Sadtler is a Senior ITSO Specialist for Communications Server for AIX and network integration projects at the International Technical Support Organization, Raleigh Center. She has been with the ITSO for 13 years working in a number of areas including MVS, Communications Servers, Web-to-host integration, and Lotus Notes.

Thanks to the following people for their invaluable contributions to this project:

Bill Sadek
International Technical Support Organization, Raleigh Center.

Stanley Wojciechowski
IBM Raleigh

Victoria Vojnovich
Alliance of Professionals and Consultants, Inc.

Rick Bowman
Bus-Tech, Inc.

Mike Hill
Bus-Tech, Inc.

Al Brandt
Bus-Tech, Inc.

Ralph Armstrong
Bus-Tech, Inc.

Comments Welcome

Your comments are important to us!

We want our redbooks to be as helpful as possible. Please send us your comments about this or other redbooks in one of the following ways:

- Fax the evaluation form found in "ITSO Redbook Evaluation" on page 159 to the fax number shown on the form.
- Use the electronic evaluation form found on the Redbooks Web sites:

For Internet users <http://www.redbooks.ibm.com>

For IBM Intranet users <http://w3.itso.ibm.com>

- Send us a note at the following address:

redbook@us.ibm.com

Chapter 1. Introduction and Overview

With the recent announcement of the ESCON PCI Adapter for the Netfinity Server, it is now possible for IBM's Netfinity Server family to have direct ESCON (Enterprise System Connection) attachment to S/390 Enterprise Servers. This enables the Netfinity intermediate server to act as an SNA or multiprotocol gateway for 3270 emulators or browser-based clients, and allows these clients access to the wealth of data that is stored on enterprise servers without costly communications software residing on the clients.

The ESCON adapter also allows direct communication between applications on the Netfinity server and the mainframe, enhancing reliability and performance between the two.

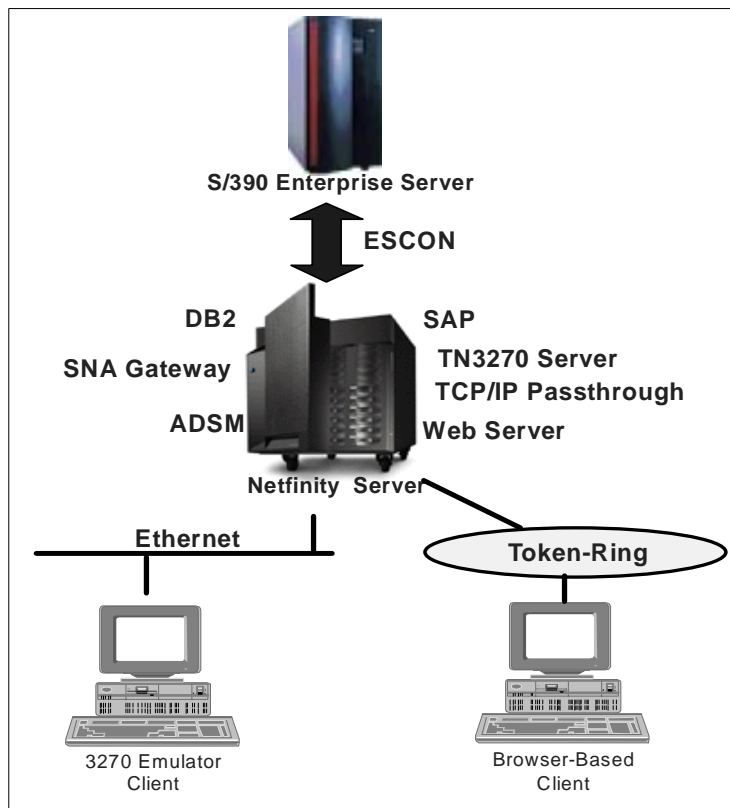


Figure 1. Netfinity Overview

To better understand why this announcement is so key, we need to first look at today's enterprise market.

1.1 Market Dynamics

When you look at today's enterprise market, the first thing that you discover is that a large amount of the world's data resides on S/390 mainframes. We need to find a model that allows us to access that data from the branch office. To that end, IBM has created a three-tier client/server model, including the S/390 Enterprise Server, a UNIX or Windows NT intermediate server and Windows or browser-based clients.

As we continue to expand the enterprise network, new applications are deployed on servers. In addition to these new applications, the clients need access to legacy data and applications, and they need Web enablement.

Netfinity-to-S/390 ESCON connections solve many needs in the enterprise network. First, clients need access to mainframe-based applications such as CICS and TSO. Secondly, in the enterprise network, clients need to pull down files from the mainframe. Additionally, client applications need access to data that is stored on the mainframe. Servers also need to retrieve and store files on the mainframe, and applications running on the servers need to access or update data that is stored on the mainframe. An ESCON connection from the Netfinity server to the S/390 solves the data access needs of both the clients and the servers in the enterprise network.

The IBM Netfinity ESCON adapter can provide that host access using any or all of the following network software:

- TCP/IP
- TCP/IP Passthrough for NetWare and Windows NT
- IBM's eNetwork Communications Server for Windows NT
- Microsoft's SNA Server for Windows NT
- IntranetWare for SAA from IBM and Novell
- High Speed Access Services (HSAS)
- Virtual Point-to-Point Adapter (VPPA)

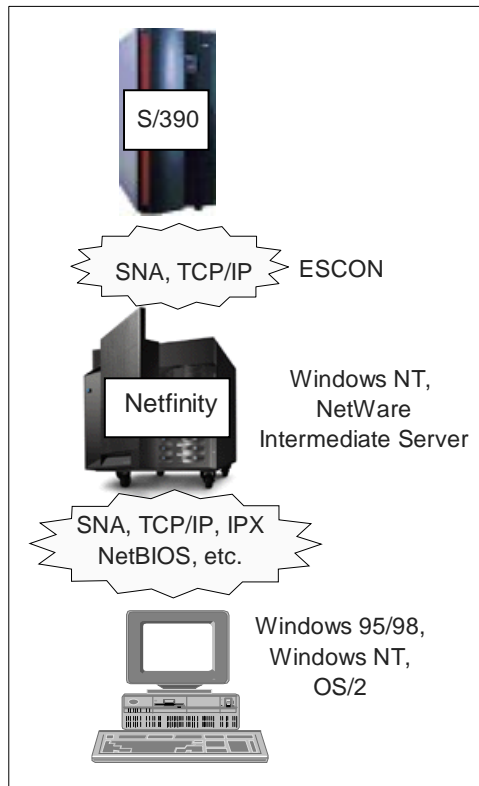


Figure 2. Netfinity ESCON Connectivity

When we look for a complete solution provider, IBM is the company of choice. IBM offers a complete, integrated solution, along with worldwide support for S/390, Netfinity, and the Windows NT software, and the superior performance of High Speed Access Services (HSAS) using MPC+.

1.2 Introduction to ESCON

ESCON is an acronym for Enterprise System Connection. It is a point-to-point dual fiber connection that runs at speeds up to 17 MBps. ESCON technology is used to connect controller devices to mainframes. The advantages of ESCON include lower cost, higher reliability, excellent performance, and a flexible environment for the enterprise system.

ESCON channels can be connected directly to the device in a point-to-point configuration, or through an ESCON Director. An ESCON Director allows multiple controllers to connect to one channel or a single controller to connect

to multiple channels. The ESCON Director temporarily connects ports for transmission. The connection can remain in effect while several frames are exchanged between the ports. This switching function provides a way of connecting multiple devices and channels without requiring permanent connections.

Using ESCON's Multiple Image Facility (EMIF), a single controller is able to connect to multiple Logical Partitions (LPARs) or system images.

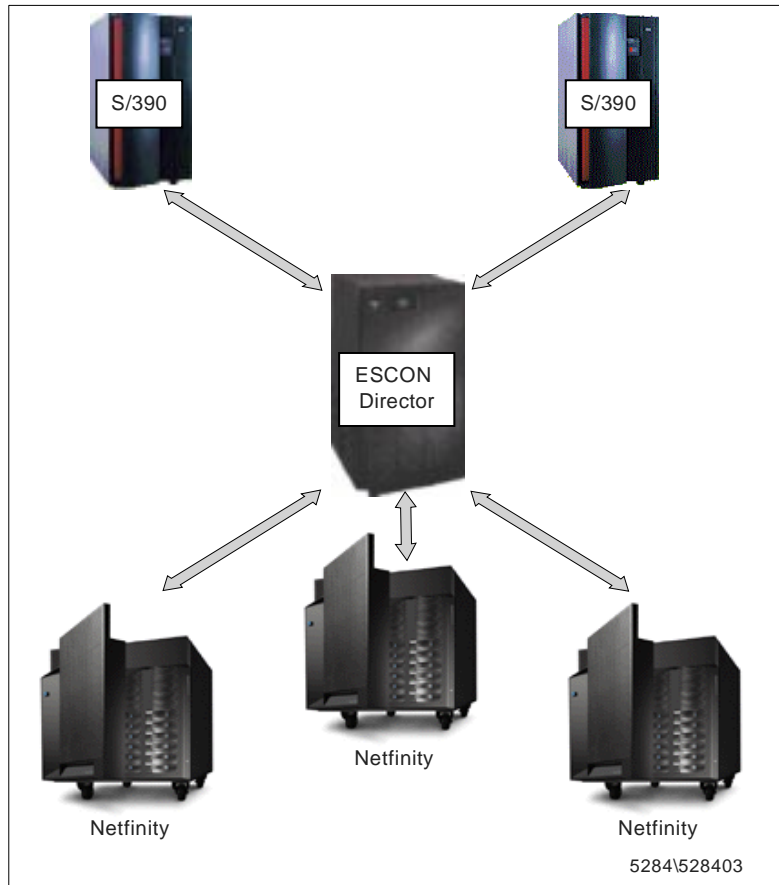


Figure 3. ESCON Director

1.3 Netfinity ESCON Adapter Overview

The Netfinity ESCON Adapter Kit contains the following components:

4 Netfinity to S/390 Connectivity using ESCON

- PCI ESCON adapter
- CD-ROM
- Installation manual
- ESCON wrap plug

The PCI ESCON adapter is a single full-size PCI adapter, requiring one full-length slot. A maximum of two adapters can be installed in a Netfinity server. The adapter has rear connectors for ESCON MIC and DB9 serial (engineering only RS232 serial port, used for hardware debug of the card), and has a dual LED status display. The adapter connects directly to the IBM ESCON channel and uses IBM's ESCON enabler technologies:

- Full 17 MBps throughput
- Complete ESCON protocol support
- ESCON Multiple Image Facility (EMIF).



Figure 4. ESCON Adapter

The hardware on the adapter includes:

- Intel 80960CA RISC processor running at 33 MHz
- 1 MB static memory used for control storage
- 1 MB flash PROM
- RS232 serial port controller (16550 UART)
- Intel 82C54 programmable timer
- 4 MB buffer memory
- 512 KB descriptor memory
- PLX PCI controller (PCI 9060)

The firmware on the PCI ESCON adapter supports three emulation modes, all of which support EMIF:

- 3174 Emulation: This mode emulates a 3174 local SNA controller, which is used for SNA connections to VTAM in the mainframe.
- 8232 Emulation: This mode emulates an IBM 8232 (or 3172) device and is used for TCP/IP passthrough to the IBM TCP/IP application in the mainframe.
- 3088 Emulation: This mode emulates a subset of the IBM 3088 (CTC) and is used with MPC+ and Virtual Point-to-Point Adapter (VPPA) applications.

The CD-ROM that is included with the Netfinity ESCON adapter includes the following:

- Adapter firmware and firmware utilities
- ESCON adapter (network) driver
- Channel driver for NetWare
- Data Link Control (DLC) for Communications Server for Windows NT
- Data Link Service for Microsoft's SNA Server
- TCP/IP Passthrough for Windows NT
- TCP/IP Passthrough for NetWare
- MPC+ Driver for Windows NT
- Virtual Point-to-Point Adapter (VPPA) driver

Chapter 2. Netfinity to S/390 Connectivity Options

The Netfinity server can communicate to the mainframe host over ESCON using TCP/IP or SNA protocol.

TCP/IP communication can be point-to-point, allowing communication between applications in the Netfinity server and the host, or it can be TCP/IP Passthrough, allowing the Netfinity server to act as a transparent gateway to the host.

SNA communications between the Netfinity server, using Communications Server for Windows NT, Microsoft's SNA server, or IntranetWare for SAA from IBM and Novell can be used to provide a multiprotocol gateway from a TCP/IP LAN environment to an SNA host. They can also provide SNA gateway functions allowing the Netfinity server to act as a PU concentrator.

2.1 SNA

SNA offers the enterprise a wide variety of connectivity methods that are designed for high availability and performance. Many enterprises have been built on an SNA backbone. As the importance of the World Wide Web grows, many enterprises are discovering a need to give Web users access to data that resides on SNA backbones. TN3270E server functions provide this access, not only to Web clients, but to clients with 3270 emulators on TCP/IP networks.

Large SNA networks have also found that using SNA PU concentrators, known as SNA gateways, eases the configuration and network maintenance tasks.

2.1.1 Netfinity Server as a TN3270E Server

The TN3270E server function enables TCP/IP users to access applications on a host machine in an SNA network. Downstream workstations telnet to the TN3270E server via TCP/IP. The TN3270E server will send the data over an SNA session to the host application.

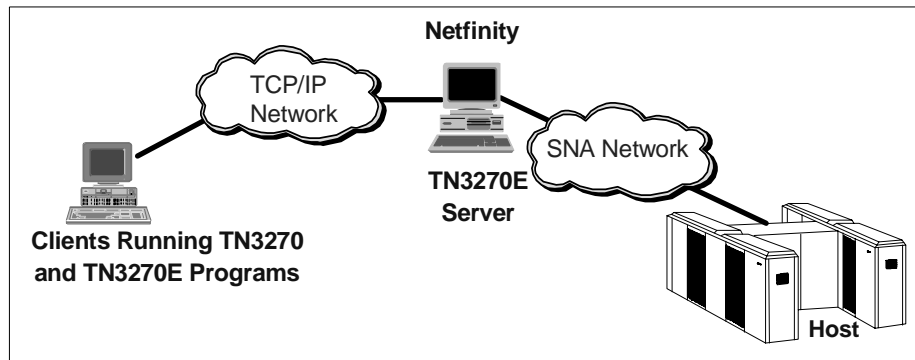


Figure 5. TN3270E Server

Included in the clients that will benefit from this are Web browsers. IBM offers Host On-Demand to allow easy access to 3270, 5250, and VT applications. Host On-Demand, running on a Web server, downloads a Java applet to the Web client. The applet uses the TN3270E server to make a direct connection to the host.

TN3270E server functions are available in eNetwork Communications Server for Windows NT, SNA Server, and IntranetWare for SAA.

2.1.2 Netfinity Server as an SNA Gateway

An SNA gateway enables supported workstation applications to access remote supported applications on a subarea network without requiring a separate direct connection to each host in each workstation. From a host point-of-view, the host has a single connection to the gateway.

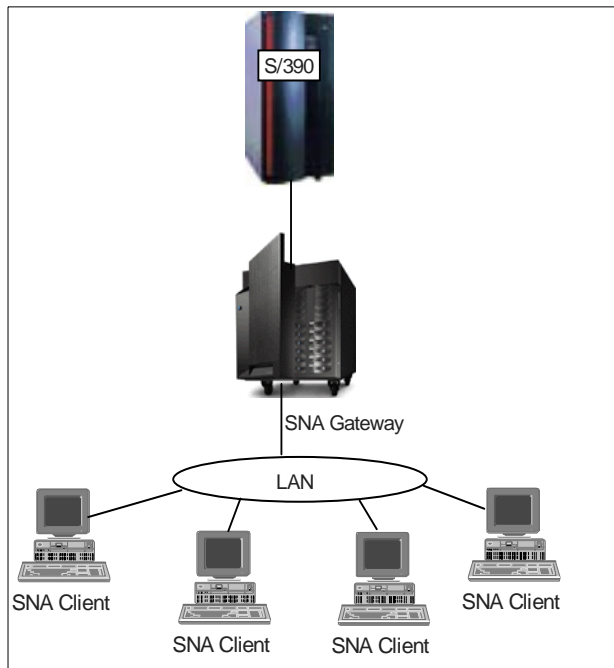


Figure 6. SNA Gateway

An SNA gateway can do the following:

- Enable workstations to share the same host link.
- Provide multiple host connectivity to workstations that do not have multiple PU capability.
- Act as a PU pool for dedicated PU downstream workstations.
- Act as a protocol converter between workstations that use DLCs on their links that are different from the DLC that is used on the host link.
- Reduce the amount of system definition at the host and workstations.
- Enable you to dynamically change network definitions and add workstations.
- Reduce host resources and reduce the number of host connections through the use of pooled LUs and by automatic logoff of sessions that are unused for a user-specified length of time.
- Improve reliability by using LU pools across multiple links, providing host backup capability.

SNA gateway functions are available in eNetwork Communications Server for Windows NT, SNA Server, and IntranetWare for SAA.

2.1.3 AnyNet

AnyNet is a family of software products consisting of multiprotocol access nodes and multiprotocol gateway nodes that are based on the multiprotocol transport networking (MPTN) architecture.

MPTN describes the logical structures, formats, protocols, and operating principles that allow applications to use networks other than the one originally written for, without any change to the existing application. Included among the implementations of MPTN are:

AnyNet Type	CS/NT V6	SNA Server	IntranetWare for SAA
Sockets over SNA access node	X		
SNA over TCP/IP access node	X		
Sockets over SNA gateway	X		
SNA over TCP/IP Gateway	X	X	
IPX over SNA gateway			X
IPX over TCP/IP gateway			X

2.1.4 Communications Server for Windows NT

IBM's eNetwork Communications Server for Windows NT V6 provides support for the ESCON adapter. Among the many connectivity options provided, those of most interest here include:

- SNA connectivity with full APPN network node support
- AnyNet
- TN3270E Server
- High Performance Routing (HPR) support
- Self Defining Dependent LU (SDDL) support
- SNA API client support for IP and IPX clients
- Load balancing using SLP
- Hot standby
- Branch Extender
- Enterprise Extender (HPR over IP)

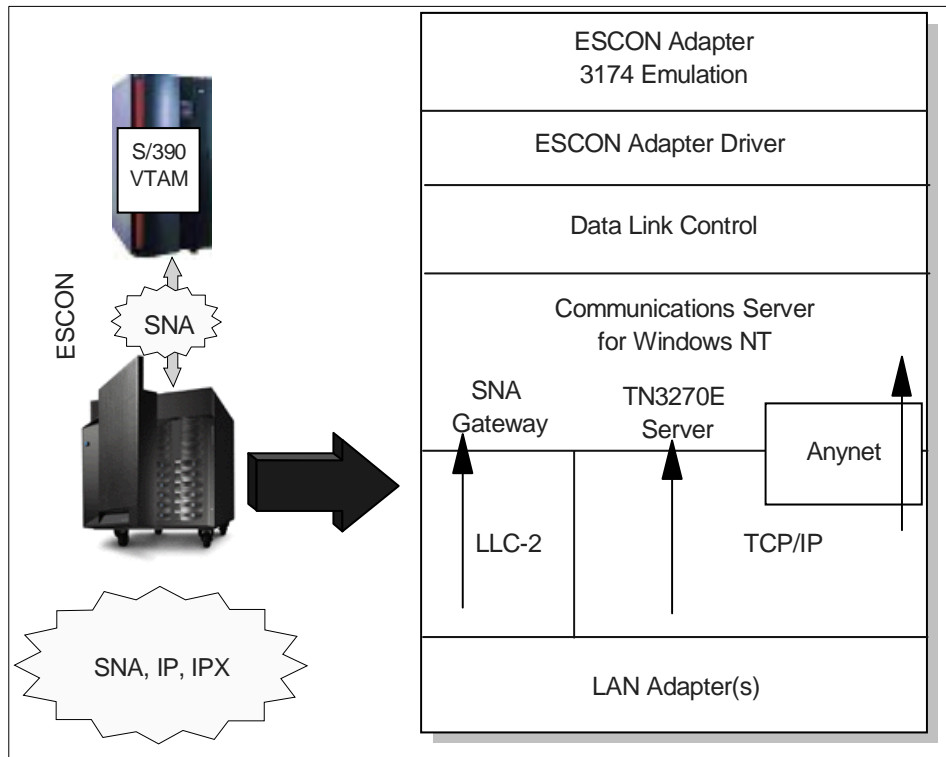


Figure 7. Communications Server for Windows NT

2.1.5 Microsoft SNA Server

Microsoft's SNA Server V4 is a LAN-to-SNA gateway that provides:

- SNA PU 2.0 and PU 2.1, APPN LEN
- TN3270E support, providing host access for LAN clients running 3270 emulation over a variety of networking protocols (IPX, NetBIOS, Banyan VINES IP, TCP/IP, AppleTalk, NetBEUI, etc.)
- SNA gateway
- APPC File Transfer Protocol (AFTP) for high-speed file transfer
- Interactive host data access with the StarSQL ODBC/DRDA client
- Hot backup
- Load balancing

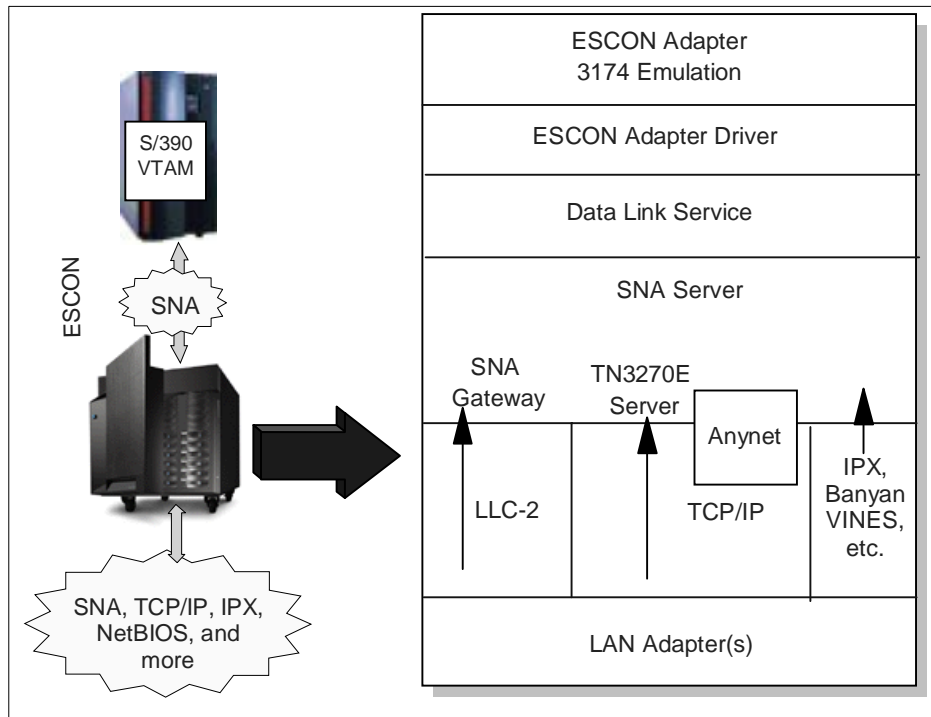


Figure 8. Microsoft SNA Server

2.1.6 IntranetWare for SAA from IBM and Novell

IntranetWare for SAA provides support for the ESCON adapter. Among the many connectivity options provided, those of most interest here include:

- SNA connectivity with full APPN network node support
- IPX clients
- IPX over SNA gateway AnyNet function
- TN3270E Server
- High Performance Routing (HPR) support
- Self Defining Dependent LU (SDDL) support
- 3270/LUA emulation
- Hot backup
- Load balancing using SLP

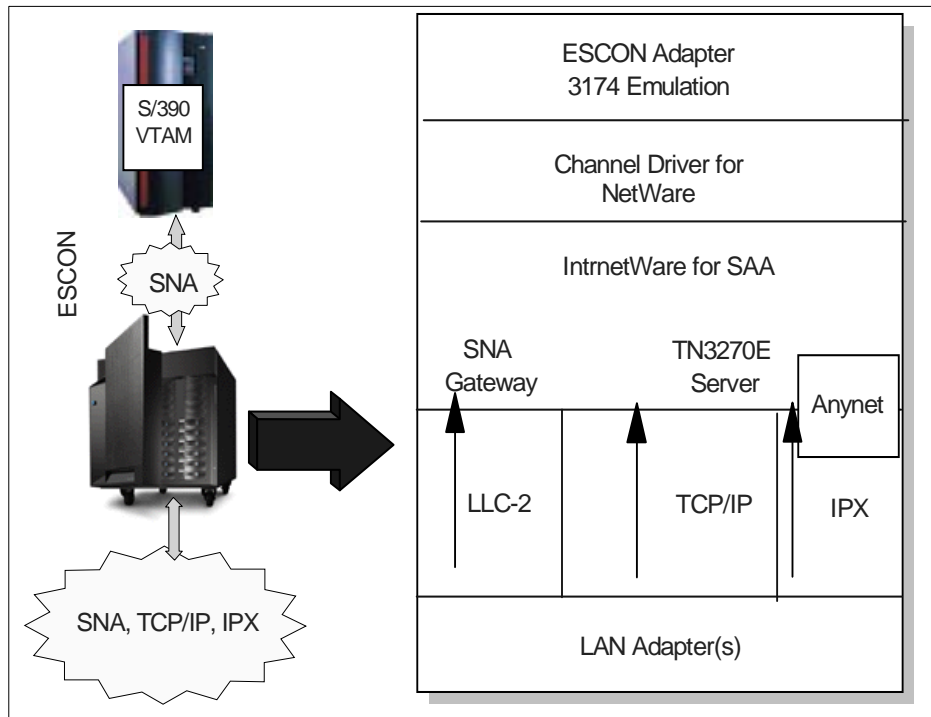


Figure 9. IntranetWare for SAA

2.2 TCP/IP

The Netfinity server can use the ESCON adapter for TCP/IP Passthrough services, Virtual Point-to-Point (VPPA) services, or High Speed Access Services (HSAS).

2.2.1 TCP/IP Passthrough

TCP/IP Passthrough allows the Netfinity server to act as a TCP/IP gateway to the host. The Netfinity server and ESCON adapter are transparent to the user. The Netfinity server passes TCP/IP traffic from the LAN adapters defined to TCP/IP Passthrough to the host over the ESCON channel. The LAN adapters themselves have no IP address. The host has an IP address defined for the ESCON link.

Ethernet, token-ring, and FDDI LAN adapters can be defined to the TCP/IP Passthrough protocol.

The CD-ROM shipped with the ESCON adapter contains TCP/IP Passthrough software for Windows for NT and for NetWare. The functions of these two are nearly identical.

The exception is that TCP/IP Passthrough for Windows NT has the ability to filter IP traffic based on the host IP address. By defining the host IP address to TCP/IP Passthrough, you only send traffic for the host over the ESCON link. TCP/IP Passthrough for NetWare will send all traffic over the ESCON channel, leaving it up to the host TCP/IP stack to recognize traffic destined for it.

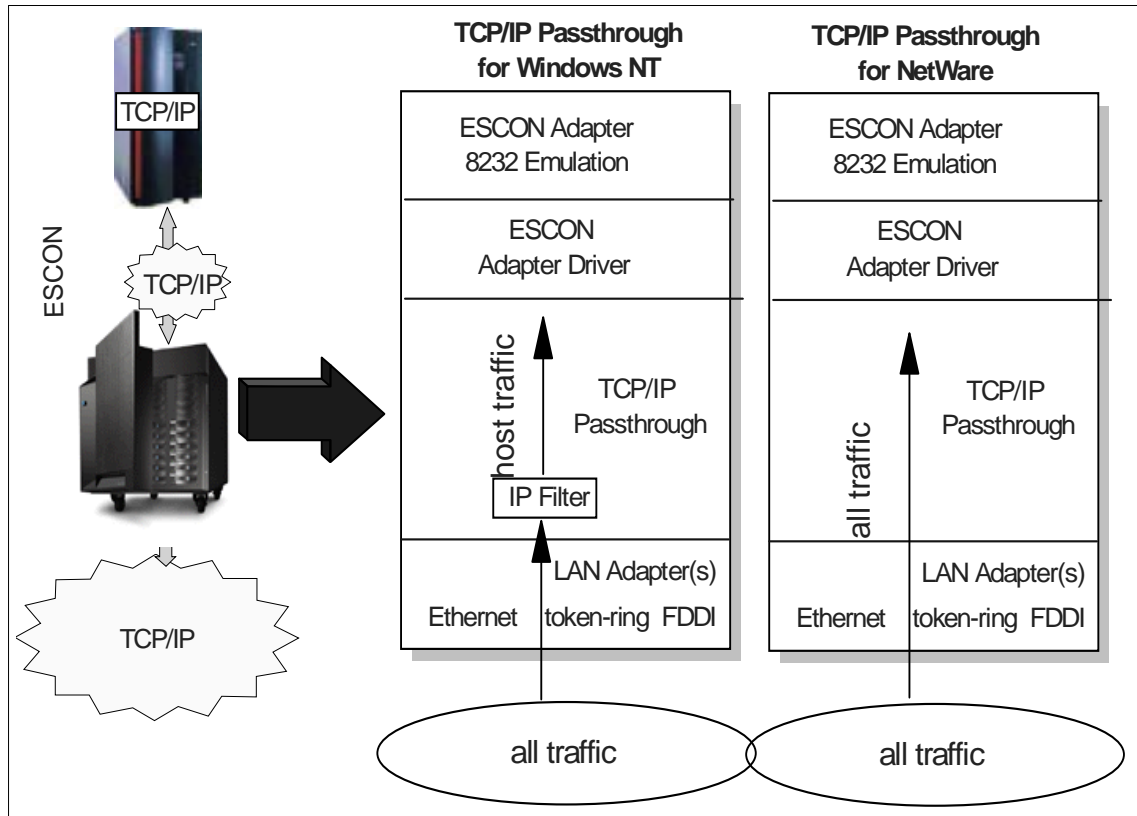


Figure 10. TCP/IP Passthrough

2.2.2 Virtual Point-to-Point Adapter (VPPA)

The Virtual Point-to-Point Adapter (VPPA) is a software driver for Windows NT that provides point-to-point TCP/IP connections between the mainframe TCP/IP stack and the Windows NT TCP/IP using 3088 channel extender protocols. It allows TCP/IP communication between sockets applications on the Netfinity server and the host, for example, ftp file transfers or ADSM client backup / restore operations to an ADSM server on the host.

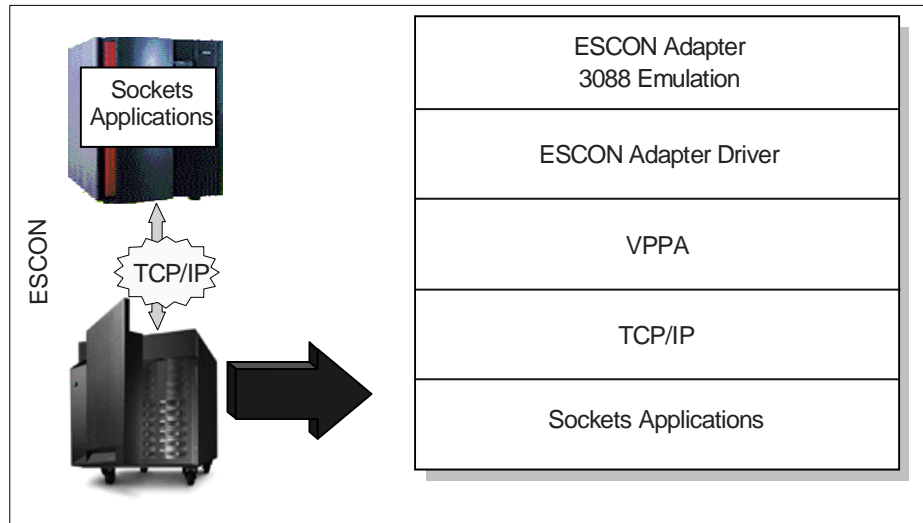


Figure 11. VPPA

2.2.3 High Speed Access Services (HSAS)

The High Speed Access Services (HSAS) functionality of eNetwork Communications Server for OS/390 (CS for OS/390) V2R5 consists of High Speed UDP (previously known as HPDT for UDP) and High Speed Web Access (new for OS/390 V2R5). High Speed UDP supports DCE, NFS, and SAP.

The HSAS option for the Netfinity ESCON adapter uses the HSAS function on CS for OS/390 and IBM's MPC+ protocol, a subset of the 3088 channel extender protocol. MPC+ channel protocol has been designed to minimize the OS/390 overhead to get data to, and from OS/390, while at the same time allowing the MPC+ resources to be shared by multiple communication stacks. It is the IBM strategic channel protocol and reduces mainframe CPU cycles. HSAS support is currently only for TCP/IP on Windows NT.

The Netfinity ESCON adapter HSAS support is designed for use with SAP R/3. SAP requires two distinct connections, one VPPA connection for file transfer and one HSAS connection.

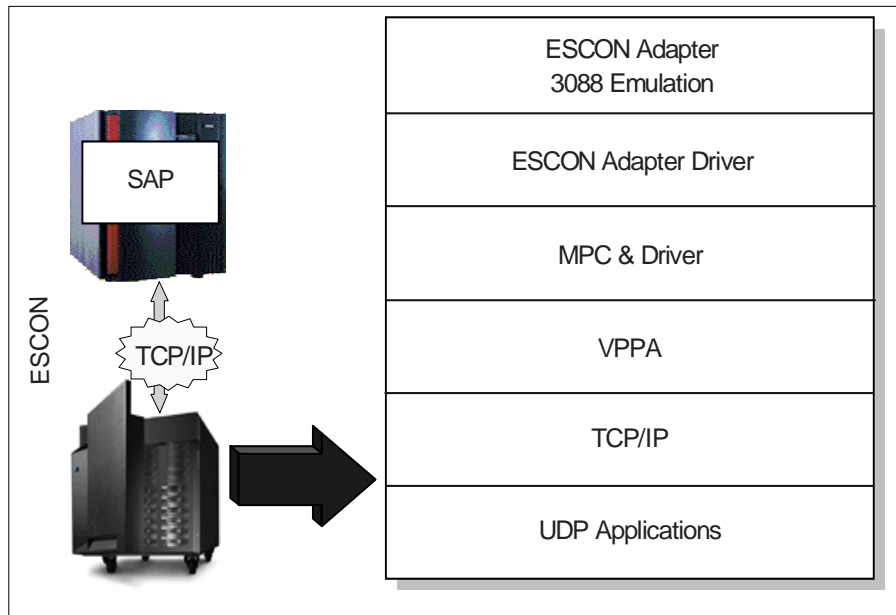


Figure 12. High Speed Access Services (HSAS)

Chapter 3. Applications of ESCON Connectivity

This chapter introduces some of the many uses of Netfinity to S/390 ESCON connectivity.

3.1 Network Server Consolidation

In many enterprise networks today, a typical network would include an IP backbone network along with several remote SNA gateways that run a variety of SNA programs. In the branch offices are many LAN-attached PCs and in many cases, these remote offices are looking to implement browser-based 3270 access for their activities.

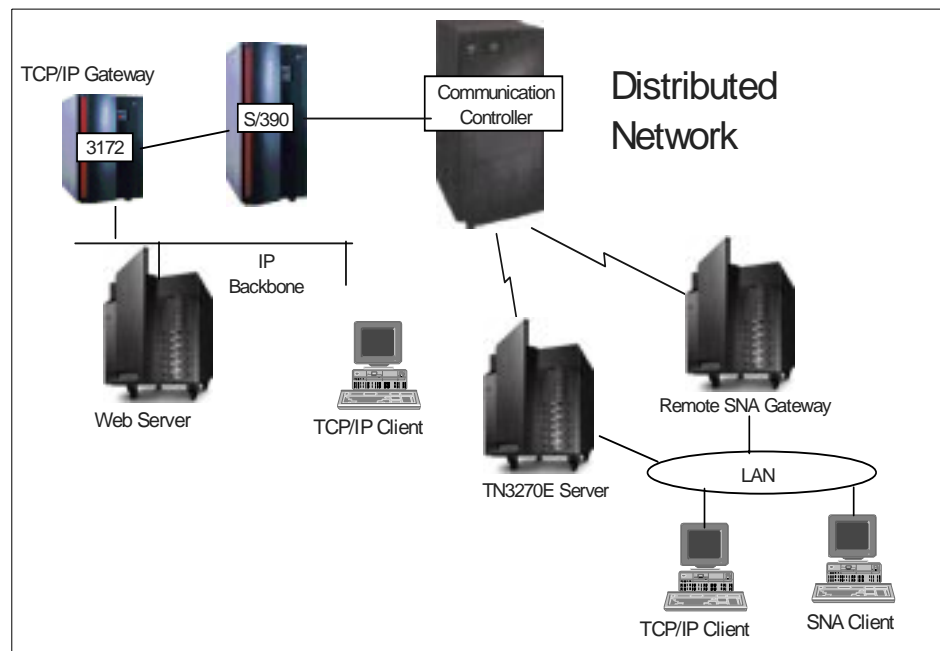


Figure 13. Distributed Enterprise Network

By consolidating the gateways to one ESCON attached Netfinity server, you can solve many concerns in today's remote office networks.

First, you can provide centralized management, service and control of the network. It is now simple to add new users and locations to the network. By providing centralized management, remote users often receive improved

support. Also, your network now has a unified architecture, which makes control of the network easier.

Second, by eliminating the remote office gateways, you eliminate the need for complex SNA gateway knowledge in the remote offices. You can therefore concentrate your IT professionals in one office, where they are also responsible for network security and access control.

Third, you can improve your server utilization. Typically, branch office gateways run at about 20% utilization. By eliminating the branch office gateways and consolidating them into one gateway, you will improve the utilization of the one server.

The Netfinity Server with the ESCON adapter is a perfect way to consolidate these networking services. eNetwork Communications Server for Windows NT, Microsoft SNA Server, and IntranetWare for SAA provide the SNA gateway and TN3270E function. Drivers for TCP/IP Passthrough are included for Windows NT and NetWare.

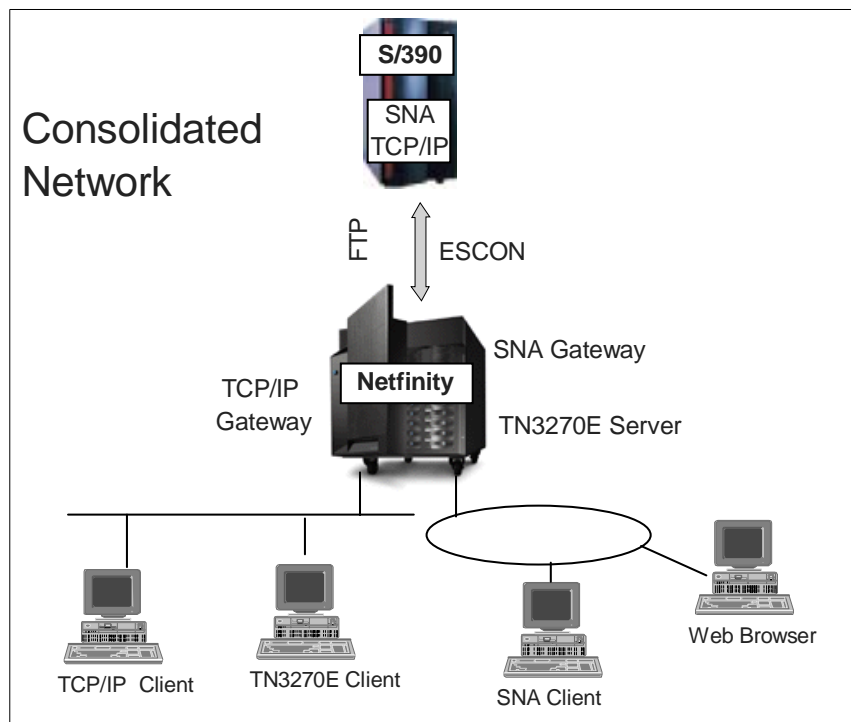


Figure 14. Consolidated Network Using Netfinity

To summarize, the advantages of server consolidation are:

- Centralized management, service, and control
- Eliminates the need for complex SNA gateway knowledge in the remote office
- Centralized security and access control by IT professionals
- Improved server utilization

3.2 Web Access to SNA Applications

Many enterprises have found the need to make traditional mainframe databases available to Web clients. Many IBM solutions exist to facilitate this move.

Products such as Host Publisher and Host On-Demand offer one solution to multiple data sources. Host Publisher provides interfaces for 3270, 5250, ActiveX, Java, and ODBC data access. Host On-Demand gives fast and easy access to 3270, 5250, or VT applications by emulating a terminal.

Other solutions are specific to a database type. These solutions are designed with one type of database product in mind and are tailored for easy access to the data. Examples of products like this are IMS Web and CICS Internet Gateway.

Browser-based access gives a wide variety of clients easy access to mission-critical applications, using the same Web browser that they use to access the Internet. In addition, such products as Host On-Demand support 3270-based printing and file transfer. Browser-based access makes SNA applications compatible without the need for modifications to the applications, "host" software, or the data-center SNA infrastructure. It can be viewed as the next generation or the future of TCP/IP-to-SNA internetworking.

The major advantage of this strategy is that it enables the Web browser to become the "Universal Client" for any and all types of applications and data access. This significantly reduces training cost and improves user productivity and satisfaction.

Well-architected browser-based access solutions, such as that offered by the Netfinity with ESCON connection, offer high levels of reliability, security, and data integrity by using persistent, end-to-end connections, automatic data encryption, and authorized user authentication. Efficiency is gained in that browser-based access relies on block mode data transfer, which like native 3270s, only transmits display fields that have been modified as opposed to the entire screen.

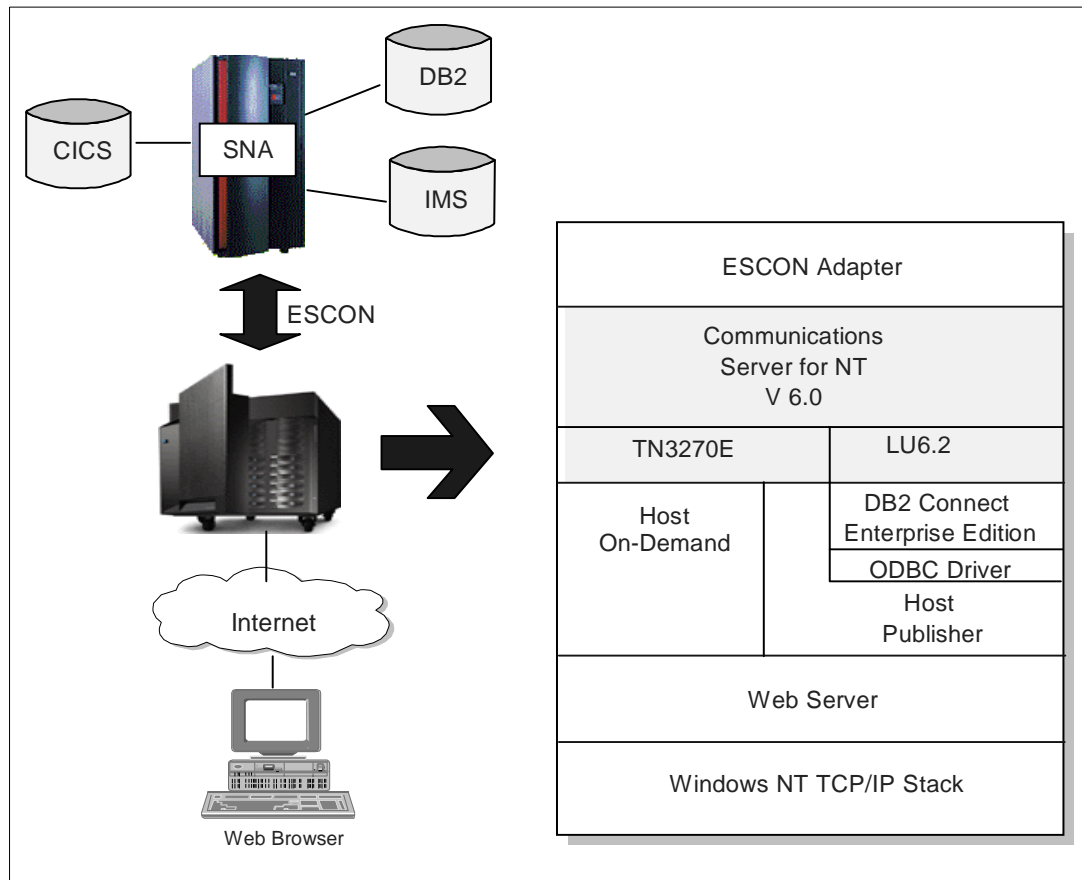


Figure 15. Web Access to SNA Applications

To summarize, advantages of browser-based access to mainframe data include:

- Direct and ready access to mission-critical SNA applications and print functions running on mainframes from a standard Web browser across TCP/IP based intranets or the Internet
- Low-cost, highly secure and reliable solution for mission-critical application access
- Enables non-traditional IBM clients to effortlessly and transparently use data that is managed by enterprise resident SNA applications as if the data were stored on a Web server.

- Enables the Web browser to become the "Universal Client" for any and all types of applications and data access irrespective of the source.

3.2.1 Host On-Demand

Host On-Demand is an IBM product that allows Web users to access host programs without installing a terminal emulator on their computer. The latest release, Host On-Demand Version 3, supports TN3270, TN5250, VT52, VT100, VT220 and CICS Java Gateway displays.

On a Netfinity Server, running either Windows NT or Novell NetWare, with an ESCON connection to the mainframe, Host On-Demand provides easy access to 3270 applications from Web browsers.

Host On-Demand can be installed in a client or server configuration. Any Java-enabled Web browser on any platform can be served from the server-based Host On-Demand by downloading the applet. Client code (no applet download needed) is available for Windows 95, Windows 98, or Windows NT 4.0 Workstation with SP3.

For 3270 emulation an applet running in the Web browser Java runtime environment establishes a connection with a TN3270E server that manages access to the host application. The user interface is identical to the host terminal, so the traditional 24x80 "green screen" is displayed. In addition, icons for PF keys, copy/paste, macro recording, file transfer, printing, and other basic operations are provided.

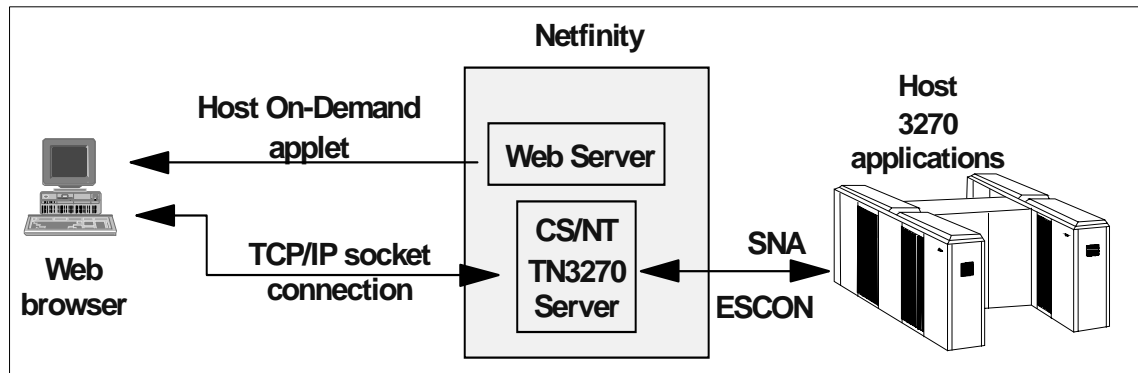


Figure 16. Host On-Demand

Host On-Demand also ships an Express Server and Express Client. These work on the server and the client computer, respectively, to optimize the data communication between client and server. They can reduce the amount of

data up to 80%, thanks to caching, data compression and protocol reduction. This is especially useful with slow connections.

An alternative to the traditional host-session "green screen" is provided by ResQ!Net/LE, which is included in some of the Host On-Demand clients. ResQ!Net/LE is a thin Java client. It interprets the host data stream that Host On-Demand sends to it and provides a default graphical presentation of the host screen. You can create a customized GUI for the host screens using the separate ResQ!Net for Host On-Demand Customization Studio. Users can view the customized screens using the ResQ!Net for Host On-Demand product. For users unfamiliar with the traditional 3270 screen, either of these would be a good option.

3.2.2 Host Publisher

The Host Publisher function of Communication Server for Windows NT V6.0 (CS/NT) provides a Web-to-host solution specifically designed to address the unique characteristics of the Internet.

Host Publisher allows you to easily integrate a wide variety of interactive host data types with the Web without having to change the existing application itself. Data types supported include 3270, 5250, ActiveX, ODBC databases, and Java applications. IBM has announced its plan to add VT support in the near future.

Host Publisher boasts a number of powerful features and benefits, such as:

- Security
- Scalability
- Load balancing
- Fault tolerance
- Wide range of existing application types

In the environment where you have a Web server and CS/NT residing on a Netfinity server connected to a mainframe over ESCON, Host Publisher offers Web browsers fast and reliable data access to 3270 and ODBC data.

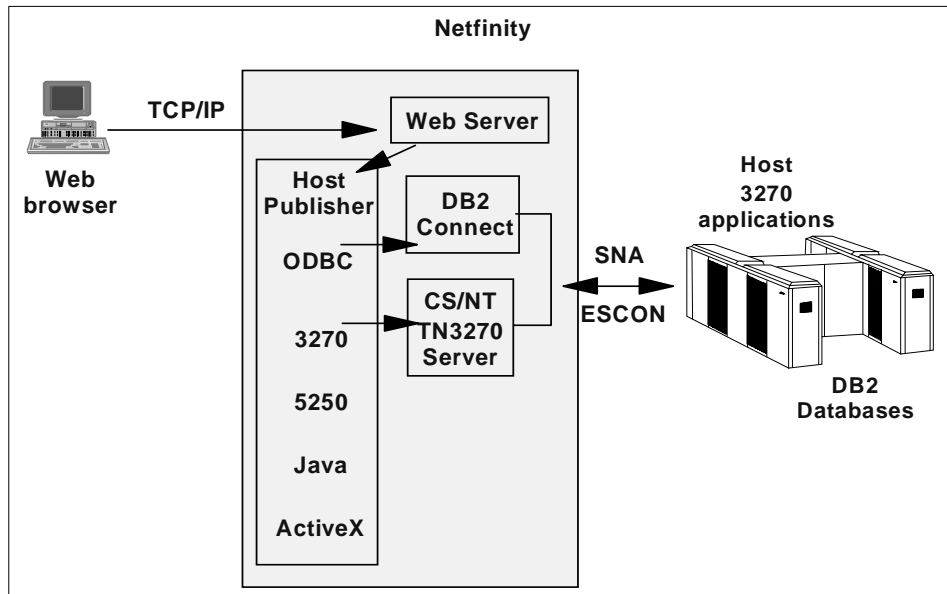


Figure 17. Host Publisher

3.3 Data Management

Intermediate servers in the enterprise, such as the Netfinity server, play an important role in the distribution of mainframe data to users. This is nothing new, with the Netfinity server accessing the host over a LAN network through a gateway. The ESCON connection to the host enhances this connectivity greatly, with higher performance and reliability.

By using an ESCON connection from the Netfinity intermediate server to a S/390 Enterprise Server and applications such as DB2 for OS/390, customers can set up enterprise database server access in the multiprotocol network. By using an integrated channel solution that allows SNA or TCP/IP traffic across the ESCON channel, customers can achieve some important goals in their networks, including lower cost, higher performance, and a flexible environment for their networks.

To summarize, the advantages of data management via Netfinity to S/390 ESCON connection are:

- Integrated channel for SNA and TCP/IP communication which provides a lower cost, higher performance, flexible environment for the customer

- Access to mission-critical S/390 legacy data throughout the multiprotocol network.

3.3.1 DB2

DB2 on OS/390 is easily accessible from a Netfinity server using DB2 Connect. DB2 Connect Enterprise Edition can act as a DB2 Connect gateway for ODBC applications and DB2 clients. It communicates with a DRDA server using SNA, or TCP/IP if the host application is DB2 V5.1 for OS/390.

By using the ESCON channel for SNA and TCP/IP traffic you can take advantage of the ESCON adapter's speed for high volume transfer such as with NotesPump, or for interactive traffic responsiveness such as needed with remote DB2 and Web clients.

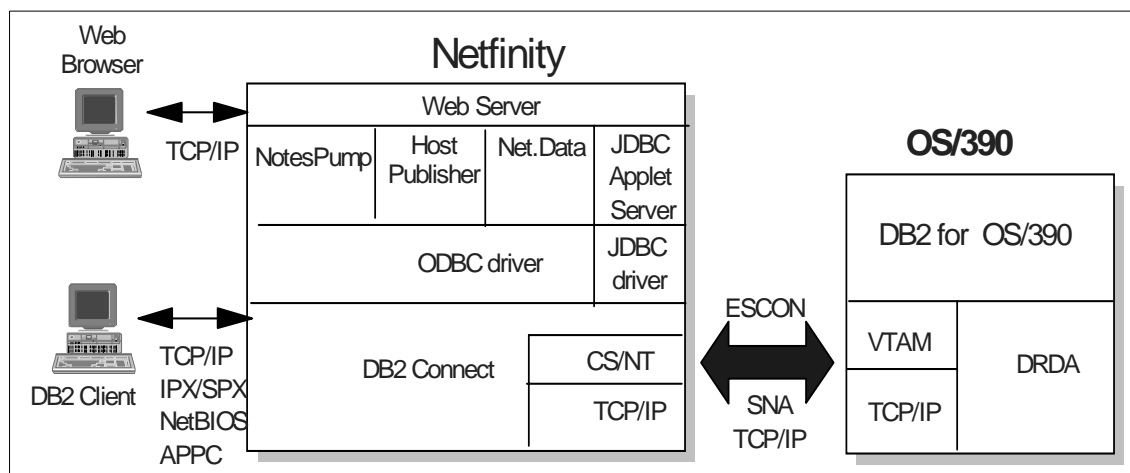


Figure 18. S/390 DB2 Access

3.3.2 CICS

Allowing access to CICS/390 data is easy when you use the IBM CICS Clients. CICS Clients connect workstations to CICS servers. They will connect to Lotus Domino with the CICS link for Lotus Notes and will connect to the Internet using CICS Internet Gateway or CICS Gateway for Java. Installing CICS Client on the Netfinity server gives Web browsers a gateway to access CICS for OS/390 over ESCON.

Host Publisher and Host On-Demand can be used to give Web browsers access to S/390 CICS 3270 applications using the TN3270E server over the ESCON connection to the host.

Other CICS Clients can take advantage of an SNA gateway on the Netfinity server to connect to the CICS/390 server over ESCON.

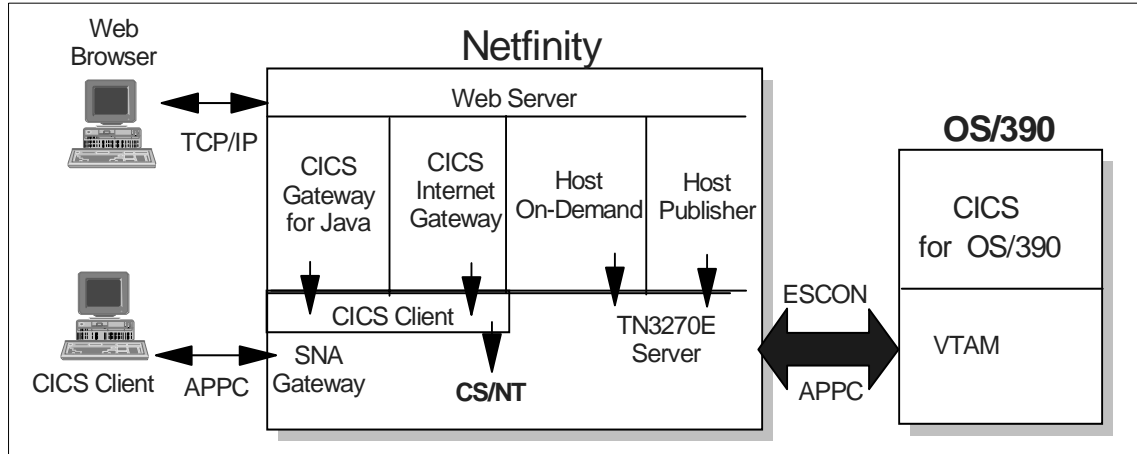


Figure 19. S/390 CICS Access

3.3.3 IMS

There are several products available to allow Web browsers access to IMS data. Putting the Web server on the Netfinity server and selecting one of these products gives Web clients easy access to IMS data taking advantage of the Netfinity server and ESCON connection. IMS Web and IMS Client for Java use TCP/IP connectivity to the S/390 IMS using the IMS TCP/IP OTMA Connection. IMS Object Connector and IMS WWW Templates use APPC connectivity.

Host Publisher and Host On-Demand can be used to give Web browsers access to S/390 IMS as a 3270 application using the TN3270E server over the ESCON connection to the host.

Other IMS clients can take advantage of a TN3270E server on the Netfinity server to connect to anIMS/390 server over ESCON.

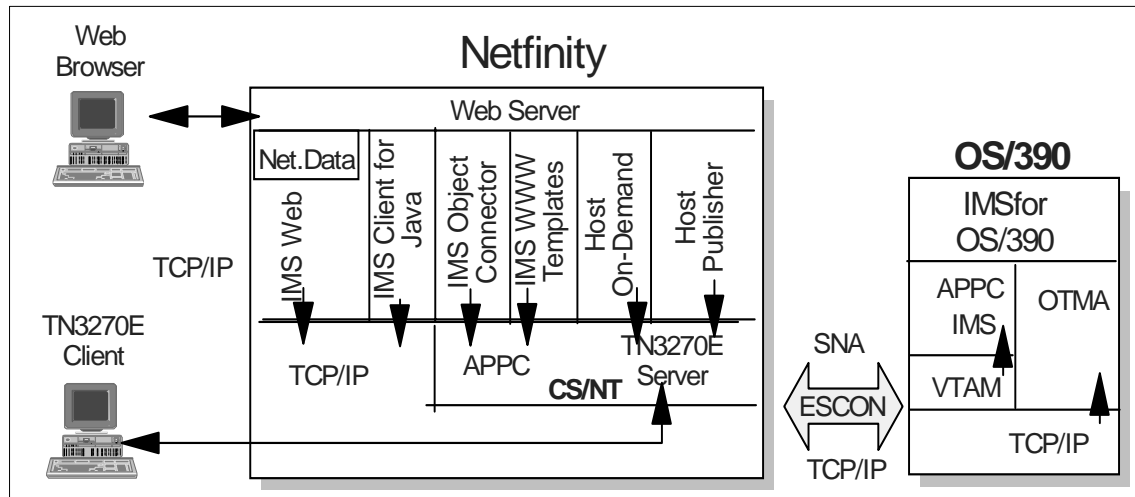


Figure 20. S/390 IMS Access

3.3.4 ADSM

For those of you who are looking for a backup scheme for your Netfinity server, using ADSM to back up to S/390 DASD is an excellent choice. ADSM offers scheduled background backups (full and incremental) and data archiving. Using S/390 DASD and tape provides a very stable environment for the backup data. ADSM backups run over the ESCON adapter show a significant improvement in performance over traditional LAN / gateway connectivity.

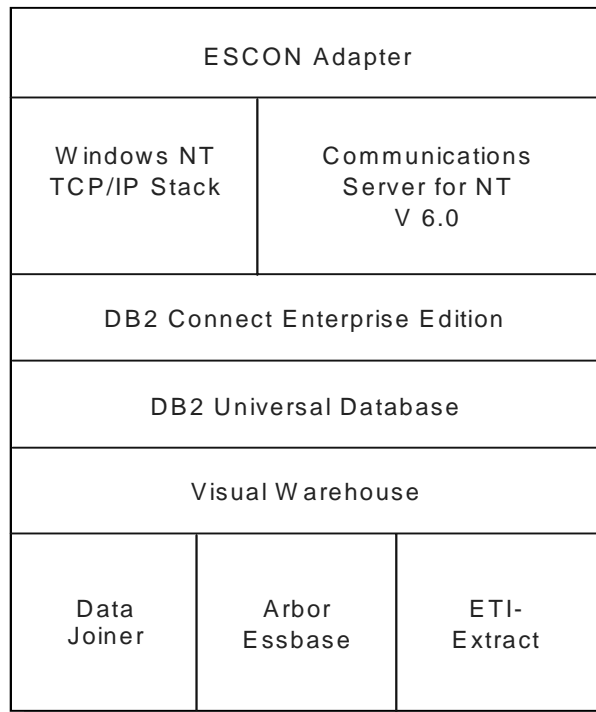
3.4 Business Intelligence Systems

As technology advances, it has become easier to collect and store data in all sorts of domains. This has led to huge databases of valuable information. Tools, such as query and reporting systems, and online analytical processing systems do exist that enable the users to extract some useful information from these mountains of data, but these tools require the user to take the initiative and drive the information discovery process.

Data mining is the automatic extraction of non-trivial, potentially useful, patterns from large databases. In data mining systems, the initiative is given to the computer, which uses a variety of statistical and artificial intelligence techniques to search vast amounts of data for interesting patterns and relationships. Data mining is becoming increasingly useful as a source of business intelligence.

Data warehousing is the integration of the various operational data stores in a business into a single consistent database to aid business reporting and decision making. For example, the telecommunication company may need to integrate information from its sales, billing and networking databases with external data on potential customers in order to generate reports that would help it optimize network traffic. Data warehousing would be used to create this new database.

Data mining and data warehousing along with decision support software are the keys to business intelligence solutions that could be provided by a Netfinity to S/390 ESCON connection. The S/390 server(s) would be able to hold the vast amounts of data while the Netfinity server could be the access point to get the information along with decision support to the clients running in the multiprotocol intranet.



5284\528421

Figure 21. Data Warehousing

3.5 Enterprise Resource Planning

As businesses continue to re-engineer their information systems, they find themselves relying on integrated software applications that provide the full suite of business functions in one package. SAP R/3 is becoming widely used as a complete information technology solution. SAP R/3 provides an integrated set of financial, distribution, HR, and manufacturing applications, thus offering virtually every business application needed by a typical enterprise.

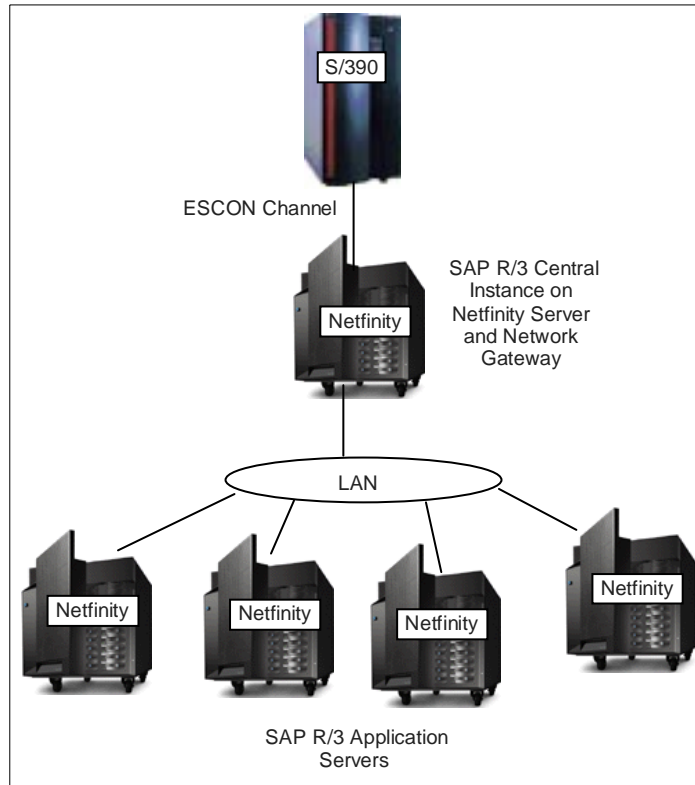


Figure 22. SAP R/3

Applications such as SAP R/3 are a perfect fit for an ESCON connection between a Netfinity and a S/390 Enterprise server. SAP has a three-tier model that maps to the three-tier client/server model. Database services would be found on the S/390 server(s) in the network. An ESCON-attached Netfinity intermediate server could run SAP R/3 applications or be a Windows NT server to get data to and from the S/390s, and would provide the SAP

application services. In the multiprotocol network, remotely attached clients could be running the SAP GUI application and provide the SAP presentation services.

Chapter 4. Planning and Installation

Planning to attach a Netfinity server and ESCON channel adapter to a mainframe requires several decisions:

- What type of Netfinity hardware is best for your environment?
- What operating system will best suit your needs?
- What emulation functions do you anticipate using?
- What else will the server be used for?
- How large is your network and how much traffic do you anticipate?
- What type of redundancy is required?

Hopefully, the first three chapters have helped you decide on the best way to use the ESCON connectivity.

The following topics will give you an idea of the capabilities of the Netfinity servers that support the ESCON adapter, the software required for each emulation type and an overview of the host preparation procedures.

4.1 Netfinity Hardware

The ESCON adapter is supported on all models of:

- Netfinity 5500 (8660)
- Netfinity 5500 M10 (8661)
- Netfinity 7000 (8651)
- Netfinity 7000 M10 (8680)

The Netfinity ESCON adapter requires a full-length PCI slot. There is a limit of two ESCON adapters per Netfinity server. A second slot should be left unoccupied in the server for each ESCON adapter.

Note: When installing two ESCON cards in one machine, it is important to make sure the interrupt levels (IRQs) are not shared with other adapters. One way to do this is to put the first card in the lowest number slot on the lowest number bus and put the second ESCON card in the next lowest numbered slot on the lowest numbered bus. Make sure there are no other adapters between the two ESCON cards. This assures that the ESCON adapters will be assigned unique IRQs.

The minimum processor and memory requirements are:

- Intel Pentium 133 Mhz Processor
- 64 MB RAM

Connectors:

- ESCON MIC
- DB9 Serial Port (engineering only RS232 port for hardware debug)

The following tables are an overview of the Netfinity server models that support the ESCON adapter.

Table 1. Netfinity 7000 M10 Models

Model	Processor STD/MAX	RAM STD/MAX	Slots total (avail)	Standard Network	Network Adapters
Netfinity 7000 M10 (Pentium II Xeon)					
86801RU Rack	400MHz 1/4	128MB / 8192MB	12(12)PCI	Optional	ARTIC (PCI) -ARTIC960 PCI Adapter -X.25 Interface Co-processor PCI Adapter -ARTIC960HX PCI Adapter -ARTIC960RX PCI Adapter ATM (PCI) -Interphase 5515 PCI UTP Ethernet (PCI) -10/100 EtherJet PCI -10/100 EtherJet PCI Wake on LAN Adapter -Netfinity 10/100 Fault Tolerant Adapter Multiprotocol -PCI Multiprotocol Adapter Token-Ring (PCI) -PCI Token-Ring Adapter (Diskette) -PCI Wake on LAN Token-Ring Adapter
86802RU Rack	400MHZ 1/4	256MB / 8192MB	12(12) PCI	Optional	
Current information at: http://www.pc.ibm.com/us/netfinity/ , click on the family, and go to model comparison charts. Click on each entry to get details.					

Table 2. Netfinity 7000 Models

Model	Processor STD/MAX	RAM STD/MAX	Slots total (avail)	Standard Network	Network Adapters
Netfinity 7000 (Pentium Pro)					
8651AAU Rack	200MHz 2/4	768MB / 4096MB	10 (6)	EtherJet	ARTIC (ISA) -ARTIC Multiport -X.25 Interface Co-Processor ARTIC(Other) -Multiport Adapter Model 2 -ARTIC Co-processor 512KB ARTIC (PCI) -ARTIC960 PCI Adapter ATM (PCI) -Interphase 5515 PCI UTP -Interphase 5515 PCI MMF Ethernet (PCI) -10/100 EtherJet PCI -10/100 EtherJet PCI Wake on LAN Adapter Token-Ring (PCI) -PCI Token-Ring Adapter (Diskette) -PCI Wake on LAN Token-Ring Adapter Routers 2210 Nways Router 12T 2210 Nways Router 12E 2210 Nways Router 14T
8651ABU Rack	200MHz 4/4	768MB / 4096MB	10 (6)	EtherJet	
8651CEU Rack	200MHz 4/4	1536MB / 4096MB	10 (6)	2x EtherJet	
8651CFU Rack	200MHz 3/4	1028MB / 4096MB	10 (6)	2x EtherJet	
8651RH0 Rack	200MHz 1/4	256MB / 4096MB	6 (6) PCI 4 (3) EISA	Optional	
8651RM0 Rack	200MHz 1/4	256MB / 4096MB	6 (6) PCI 4 (3) EISA	Optional	
8651TAU Rack	200MHz 1/4	512MB / 4096MB	10 (7)	EtherJet	
8651TBU Rack	200MHz 2/4	512MB / 4096MB	10 (7)	EtherJet	
8651TH0 Tower	200MHz 1/4	256MB / 4096MB	6 (6) PCI 4 (3) EISA	Optional	
8651TM0 Tower	200MHz 1/4	256MB / 4096MB	6 (6) PCI 4 (3) EISA	Optional	
Current information at: http://www.pc.ibm.com/us/netfinity/ , click on the family, and go to model comparison charts. Click on each entry to get details.					

Table 3. Netfinity 5500 Models

Model	Processor STD/MAX	RAM STD/MAX	Slots	Standard Network	Network Adapters
Netfinity 5500 (Pentium II)					
866042U Tower	400MHz 1/2	256MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	ARTIC -ARTIC960 PCI Adapter -ARTIC186 8-Port Adapter -ARTIC Multiport Model2 -X.25 Interface Co-processor PCI Adapter -X.25 Interface Co-Processor ISA Adapter Ethernet (PCI) -10/100 EtherJet PCI -10/100 EtherJet PCI Wake on LAN Adapter -Netfinity 10/100 Fault Tolerant Adapter Token-Ring (PCI) -PCI Token-Ring Adapter (Diskette) -PCI Wake on LAN Token-Ring Adapter ATM (PCI) -Interphase 5515 PCI UTP
86604SU Rack	400MHz 1/2	256MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	
866051U Tower	450MHz 1/2	128MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	
866052U Tower	450MHz 1/2	256MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	
86605RU Rack	450MHz 1/2	128MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	
86605SU Rack	450MHz 1/2	256MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	
866011U Tower	350MHz 1/2	128MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	
86601RU Rack	350MHz 1/2	128MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	
866041U Tower	400MHz 1/2	128MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	
86604RU Rack	400MHz 1/2	128MB / 1024MB	6 full PCI 1 full ISA	10/100 Ethernet	
Current information at: http://www.pc.ibm.com/us/netfinity/ , click on the family, and go to model comparison charts. Click on each entry to get details.					

Table 4. Netfinity 5000 M10 Models

Model	Processor STD/MAX	RAM STD/MAX	Slots	Standard Network	Network Adapters
Netfinity 5500 M10 (Pentium II)					
866111Y Tower	400MHz 1/2	128MB / 2000MB	6 full PCI 1 full ISA	10/100 Ethernet	ARTIC -X.25 Interface Co-Processor ISA Adapter -ARTIC186 8-Port Adapter -ARTIC Multiport Model2 -ARTIC960 PCI Adapter -X.25 Interface Co-processor PCI Adapter -ARTIC960HX PCI Adapter -ARTIC960RX PCI Adapter Ethernet (PCI) -10/100 EtherJet PCI -10/100 EtherJet PCI Wake on LAN Adapter -Netfinity 10/100 Fault Tolerant Adapter Token-Ring (PCI) -PCI Token-Ring Adapter (Diskette) -PCI Wake on LAN Token-Ring Adapter
86611RY Rack	400MHz 1/2	128MB / 2000MB	6 full PCI 1 full ISA	10/100 Ethernet	
86612YR Rack	400MHz 1/2	128MB / 2000MB	6 full PCI 1 full ISA	10/100 Ethernet	
Current information at: http://www.pc.ibm.com/us/netfinity/ , click on the family, and go to model comparison charts. Click on each entry to get details.					

4.2 Netfinity Software

One of the following operating systems are required to support the ESCON channel adapter:

- Novell NetWare (or intraNetWare) V4.11 with a minimum of Support Pack 5
- Windows NT V4.0, with a minimum of Service Pack 3

The following applications are compatible with the use of the ESCON Channel adapter:

- IBM Communications Server for Windows NT (CS/NT)
- Novell NetWare for SAA
- Microsoft SNA Server for Windows NT
- SAP
- Baan
- JD Edwards
- Oracle
- Peoplesoft

The ESCON adapter can be used in three emulation types:

- 3174 for SNA
- 3172 / 8232 for TCP/IP Passthrough
- 3088 for VPPA and MPC+

Not all operating systems support all emulations. The following table will help you determine the operating system you will need to install on the Netfinity server to support your environment.

Table 5. Operating System Support for the ESCON Adapter

Emulation Mode	Novell Requirements	Windows NT Requirements
SNA gateway, TN3270E server (3174 emulation)	Novell NetWare for SAA	IBM CS/NT or Microsoft SNA Server
HSAS (MPC+ driver) *1	Not available	The MPC+ driver for TCP/IP shipped with the adapter provides support for SAP R/3 **Support for CS/NT expected 3/31/99 **TCP/IP support expected 3/31/99
TCP/IP Passthrough	TCP/IP Passthrough for NetWare (shipped with adapter)	TCP/IP Passthrough for Windows NT (shipped with adapter)

Emulation Mode	Novell Requirements	Windows NT Requirements
VPPA		VPPA driver (shipped with adapter)
<p>*1 - To support HSAS, you must be running a minimum of OS/390 R3, TCP/IP V3R2 (+PTF UQ07222), TCP/IP OpenEdition (+PTF UQ07223), and VTAM 4.4. HSAS, known as HPDT for UDP in TCP/IP V3R2, is documented in the <i>OS/390 TCP/IP Update Guide</i> for TCP/IP V3R2. For OS/390 R5, it is documented as HSAS in the <i>High Speed Access Services User's Guide</i>.</p>		

4.3 S/390 Host Planning

Planning an ESCON attachment installation involves both the mainframe system programmers and the network administrators. The size of the network, number of users, and functions to support must be determined in order to prepare the host and Netfinity for ESCON connectivity.

4.4 Installation Planning

To successfully complete the ESCON attachment installation the following steps must be taken:

- Define the connection in the S/390 mainframe IOCP.
 - Note:** Currently, the EMIF support in the ESCON adapter requires a separate unit address for each LPAR. The channel can be shared between LPARS but you can not define one address to be shared among LPARs.
- For VPPA connections, update the MVS IECIOSxx parmlib member with the unit addresses to cancel missing interrupt handling for the connection.
- Define the TCP/IP and SNA definitions on the mainframe host.
- If MPC+ will be used, the MVS OpenEdition BPXPRMxx member must be updated.
- Physically cable the adapter from the Netfinity ESCON adapter to the mainframe, either direct or through an ESCON director.
- Physically install the ESCON adapter on the Netfinity server.

Note: Each ESCON adapter must have a unique interrupt level. After installation make sure the adapter is not sharing an IRQ with any other adapter. On Windows NT this can be seen by going to the Windows NT Diagnostics panel (**Start->Programs->Administration Tools->Windows NT Diagnostics**) and clicking on the **Resources** tab.

- Install the PCI ESCON Adapter Driver on Windows NT or the Channel Driver on NetWare.
- Install and configure the emulation drivers and adapters for VPPA, MPC+, and/or TCP/IP Passthrough on Windows NT. On NetWare, you must load the NetWare Loadable Modules (NLMs).

Details of each step can be found in the *IBM Netfinity ESCON Adapter Installation Guide* shipped with the adapter. Examples are shown later in this book.

The status of the ESCON card can be determined by the two LEDs on the back. When both LEDs are green, the adapter has been initialized correctly.

Note: The status of the link to the host does not affect the LEDs. The LEDs can be green, even if no ESCON cable is installed.

You must have defined and configured an emulator for the card to initialize properly. If you are using TCP/IP Passthrough, the LAN adapter associated with the ESCON adapter must be connected to the LAN.

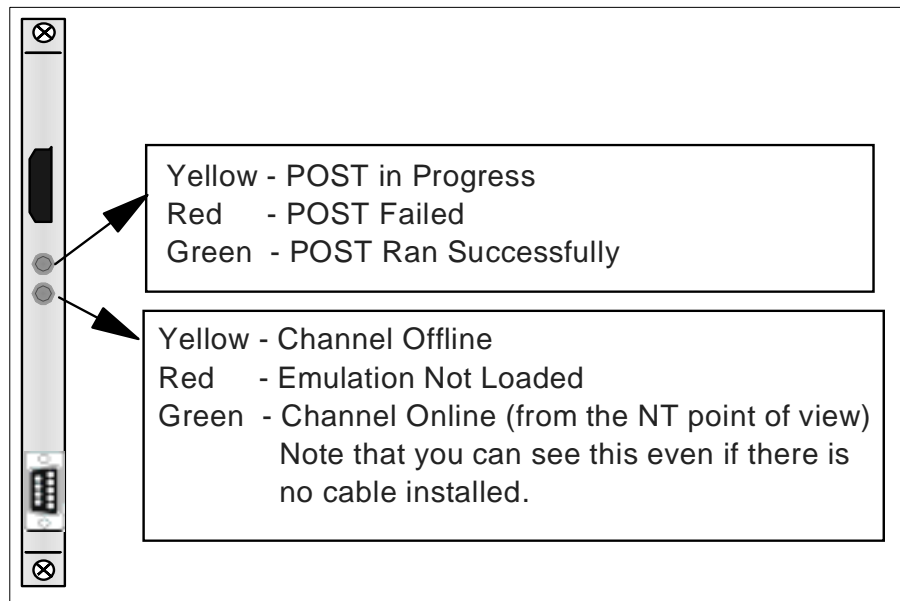


Figure 23. ESCON Adapter LEDs

4.5 Host Hardware Definition

In preparation for connecting the Netfinity server to the host over ESCON, the ESCON hardware connection must be defined to the S/390 mainframe channel subsystem and to the operating system.

4.5.1 Defining the ESCON Connection to the S/390

In MVS, depending on the level of the operating system, this is done by defining the hardware with IOCP and the operating system with the MVS Configuration Program (MVSCP). The same input data set could be used for both programs. MVS/ESA SP 4.3 is the last release that supports MVSCP.

Later releases of MVS introduced Hardware Configuration Definition (HCD), which takes care of both the hardware and operating system configurations. Although the presentation of the parameters is very different in these two methods, the parameters are the same. For simplicity, we will show an IOCP/MVSCP input data set.

In VM, the hardware definitions are done with IOCP and the operating system definitions are done with an HCPRIO file. With the newer levels of VM/ESA, most of the I/O can be dynamically sensed or can be coded in the SYSTEM CONFIG file. There is a small set of (old) I/O that has to be coded in HCPRIO. Most systems run with the base HCPRIO assembled without modifications.

With VSE the hardware definitions are done with IOCP and the operating system definitions are added to the IPL file.

In this book we will take a look at the hardware IOCP definitions. The operating system in the examples is MVS using HCD for both hardware and operating system definitions. For information on defining the ESCON channel to VM and VSE, please refer to the *IBM Netfinity ESCON Adapter Installation Guide* shipped with the adapter.

4.5.2 ESCON Director

ESCON channels are basically point-to-point connections. Attaching an ESCON device directly to the host mainframe ESCON channel allows only one physical device per host channel.

Using an ESCON director will allow multiple devices to be connected to one host channel and multiple channels to be connected to one device.

4.5.3 IOCP Definitions

The following IOCP is for a S/390 system that runs several LPARs, including operating systems running OS/390 R2 through OS/390 R6, and VM/ESA. When defining the IOCP keep the following in mind:

- Each ESCON adapter can support up to 64 subchannel addresses, but a maximum of 32 connections, which can be a mix of SNA and TCP/IP.
- For SNA each connection (PU) requires a separate I/O device address.
- For TCP/IP, connections are defined by a pair of addresses.

When creating the IOCP definitions you can create a range of subchannels that allow for future growth by defining more subchannel addresses than initially required.

```
CHPID PATH=((19)),TYPE=CNC,SWITCH=E1,SHARED
*
* Defined TCP/IP subchannels
*
CNTLUNIT CUNUMBR=200,UNIT=SCTC,PATH=(19),
        CUADD=1,LINK=(CD),UNITADD=((00,16))
DEV200  IODEVICE UNIT=SCTC,ADDRESS=(200,16),
        CUNUMBR=(200)
*
* Defined SNA subchannels
*
CNTLUNIT CUNUMBR=210,UNIT=3174,PATH=(19),
        CUADD=2,LINK=(CD),UNITADD=((10,16))
DEV210  IODEVICE UNIT=3174,ADDRESS=(210,16),
        CUNUMBR=(210)
```

Figure 24. IOCP Definition

4.5.3.1 Defining the Channel Path (CHPID Macro)

The host channel, identified by a channel path ID (CHPID), defined here is connected to an ESCON director, also known as a switch. The switch designation for this director is E1. The channel path will be shared between LPARs.

4.5.3.2 Defining the Control Unit (CNTLUNIT Macro)

The IOCP shows definitions to use the ESCON adapter for multiple purposes, both TCP/IP and SNA. One CNTLUNIT is defined for each use.

CUADD

To use the same physical connection to a device with two different control unit definitions, you must assign a logical control unit address (CUADD). For each CNTLUNIT macro using the same CHPID and LINK, you must assign a unique CUADD value between X'0' and X'F'. The ESCON device must be configured to use this value also. For the Netfinity ESCON adapter, this is done in the PCI ESCON Adapter Driver configuration in Windows NT or the ESCON configuration file in NetWare.

In the example in Figure 24 on page 40, the first control unit definition (CUNUMBER=200) is for the TCP/IP subchannel range. The CUADD is set to 1 and must match what is specified in the Windows NT ESCON adapter definitions for the TCP/IP (generic) subchannels.

The second control unit definition (CUNUMBER=210) is for the SNA subchannel range. The CUADD is set to 2 and must match what is specified in the Windows NT ESCON adapter definitions for the SNA (3174) subchannels.

UNIT

The UNIT parameter must be SCTC for TCP/IP. The UNIT parameter must be set to 3174 for SNA.

LINK

The LINK parameter tells the ESCON director which port to use to reach the Netfinity ESCON adapter. If the CHPID does not connect to an ESCON director, this keyword is optional. Omitting LINK or specifying LINK=(**) says the address is arbitrary and the channel subsystem will select an address.

If you are not using an ESCON director, it is recommended that you code CNTLUNIT LINK=02 in the IOCP and define 01 for the link address in the Netfinity ESCON adapter configuration.

UNITADD

The UNITADD parameter specifies the subchannel range for this control unit. A range of device addresses for the ESCON link are defined in the IODEVICE macro. A starting unit address (2-byte address), also called a subchannel address, is defined for this device address range in the CNTLUNIT macro. The MVS host will refer to the device by the device address. For example, if the IOCP defines the ESCON link with the following statement:

```
CNTLUNIT CUNUMBR=002,PATH(19),LINK=(CD),UNIT=SCTC,UNITADD=((00,16))
IODEVICE ADDRESS=(2F0,16),CUNUMBR=(002),UNIT=SCTC
```

Figure 25. IOCP Definition

The MVS system will have access to the ESCON link using an address range of 2F0-2FF (a range of 16 devices). The unit address range starts at 00 so device 2F0 has a unit address of 00, 2F1 has a unit address of 01, and so forth.

To avoid confusion it is always wise to make the subchannel address (UNITADD) and the last two digits of the device address match. For example, it would be better to use:

```
CNTLUNIT CUNUMBR=002,PATH(19),LINK=(CD),UNIT=SCTC,UNITADD=((F0,16))
IODEVICE ADDRESS=(2F0,16),CUNUMBR=(002),UNIT=SCTC
```

Figure 26. IOCP Definition

This way address 2F0 has a subchannel address of F0, and so forth.

4.5.3.3 Defining the Devices (IODEVICE Macro)

The IODEVICE statement specifies the address range the host will use.

ADDRESS

The starting address corresponds to the starting UNITADD (subchannel). In this instance MVS address 20A corresponds to subchannel 0A, address 20B corresponds to subchannel 0B, and so forth.

UNIT

- Specify UNIT=3174 for SNA
- Specify UNIT=SCTC for TCP/IP

CUNUMBR

The CUNUMBR value connects the IODEVICE macro to the correct CNTLUNIT definition.

4.6 ESCON Adapter Configuration

The next step is to define the ESCON adapter. This tells the ESCON adapter what subchannel address to use, the port on the ESCON director that leads to the host, the LPAR to go to, and the emulation type.

4.6.1 Windows NT

In Windows NT the ESCON adapter configuration is reached through the Network ICON on the Windows NT control panel. Click on **Adapters** and highlight the ESCON adapter entry. Then click on **Properties**.

Add one entry for each ESCON subchannel to be used. For example, TCP/IP connections require an even/odd address pair. Add one line for the even address and one for the odd address. SNA connections require only one subchannel, and therefore one entry.

Note: Currently, the EMIF support in the ESCON adapter requires a separate unit address for each LPAR. The channel can be shared between LPARS but you can not define one address to be shared among LPARS.

Changing the ESCON definitions require a shutdown of the machine. The ESCON card must be reset, which requires a power off / power on.

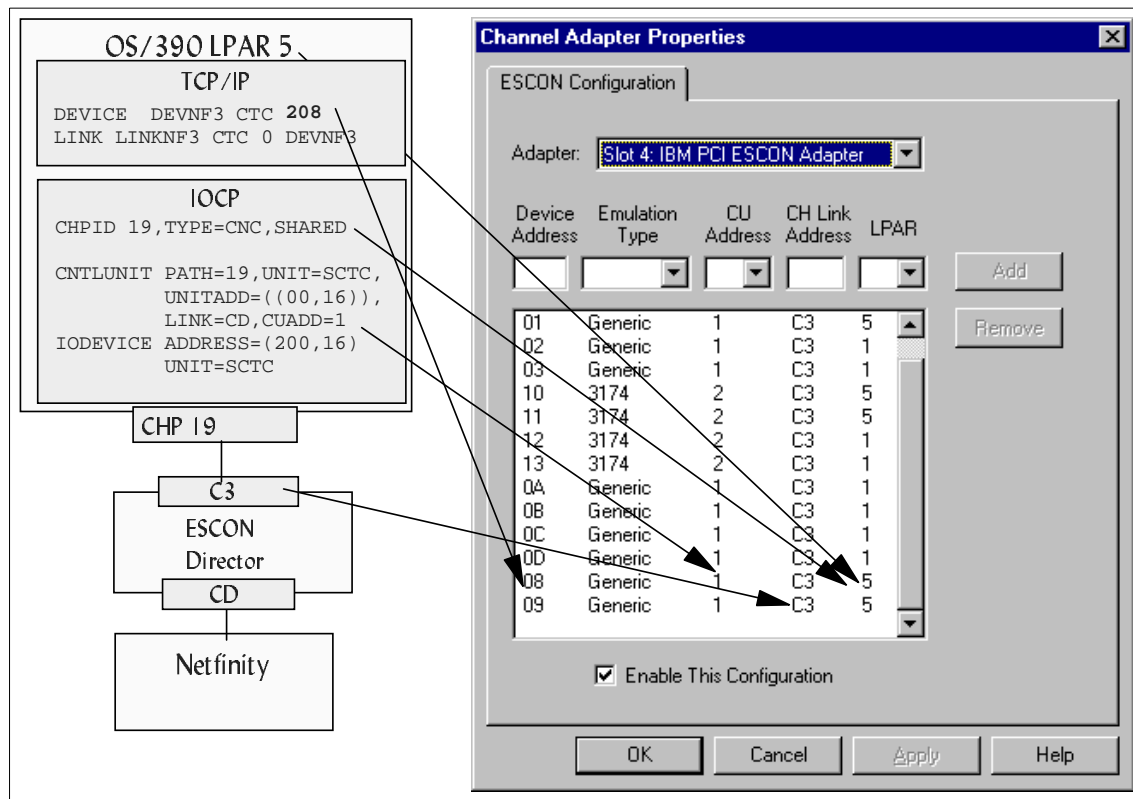


Figure 27. ESCON Adapter Definition

Device Address

The device address is the subchannel address associated with MVS address specified in the TCP/IP DEVICE statement.

Emulation Type

- TCP/IP implementations require Generic for the emulation type.
- SNA implementation require 3174 for the emulation type.

CU Address

The control unit address (CUADD) is found in the IOCP. This is optional and should be set to 0 if not used.

CU Link Address

This specifies the ESCON director port leading to the host. If you are using a direct connection (no ESCON director), it is recommended that you use 01 as the CH link address and code the S/390 IOCP link parameter as LINK=(02).

LPAR

If you are using the EMIF facility and the host channel path (CHPID) is defined as shared, meaning more than one LPAR may access it simultaneously, you must specify the LPAR this definition is for. If you are not using EMIF or if the channel is not defined as shared, this value should be set to 0.

4.6.2 NetWare

In NetWare the ESCON adapter configuration is done by building a configuration file for each ESCON adapter. The file is stored in a directory that can be accessed by AUTOEXEC.NCF during NetWare startup. You must include a NetWare LOAD command to process the configuration file each time NetWare is brought up.

The parameters in the configuration file are the same as shown in the example above for Windows NT. For more information on NetWare installation, see the *IBM Netfinity ESCON Adapter Installation Guide*.

Chapter 5. High Availability

In any network, high availability for the users is a top priority. This can be achieved in a variety of ways. The adequacy of any solution chosen depends on the resources available and the creativity of the people designing it.

This chapter gives a quick idea of techniques that can be employed in an environment that relies on connectivity between a Netfinity server and a host. We will take a look at server backup scenarios, both for SNA and TCP/IP, and server load balancing.

There are many variables to be considered in any enterprise environment. This chapter does not even begin to scratch the surface of viable options, but will hopefully give you a good start in your planning.

5.1 TCP/IP

Backup networking capability to TCP/IP on the host can be achieved by using multiple adapters on the server to reach the host. The primary path to the host over the ESCON adapter can be supplemented by providing another ESCON adapter or a slower LAN connection as a backup. Providing a secondary server would give even more protection against outages.

Virtual IP Addressing (VIPA) on the host, in conjunction with Routed provides fault-tolerant TCP connections for automatic and transparent recovery from controller and interface failure. VIPA allows you to define primary and alternate interfaces to the same subnet and will switch between these interfaces dynamically in case one malfunctions.

5.1.1 VPPA

Using two ESCON adapters to provide backup for VPPA connections requires using VIPA on the host. A VIPA address is created for the applications to use. This address is available over either of the ESCON VPPA connections. In the event that one adapter fails, traffic is routed over the other. Figure 28 shows an example of how to set this up.

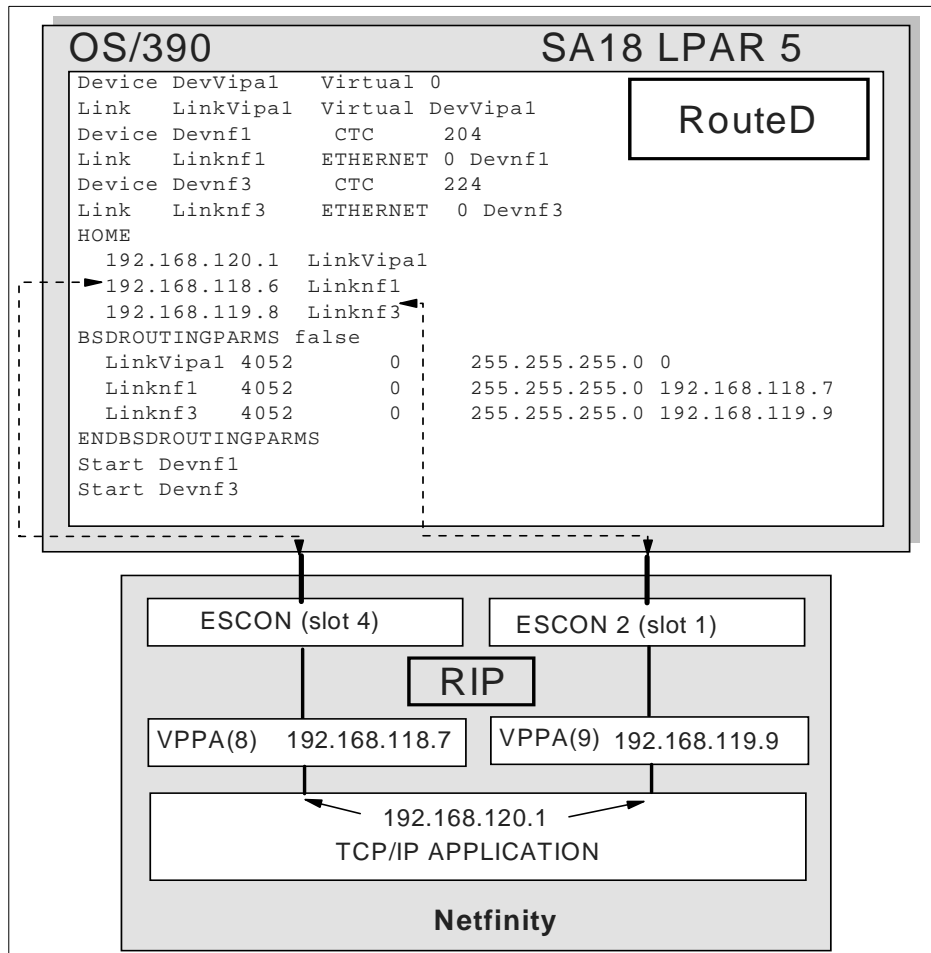


Figure 28. Using Two ESCON Adapters to Provide Redundancy with VPPA

The scenario:

- A Netfinity server is connected to a S/390 over two separate ESCON chapters.
- A separate VPPA connection is defined for each ESCON adapter to the host. Each connection uses a separate subnet.
- TCP/IP on the S/390 host is using Routed.
- RIP is installed on Windows NT.
- Applications reach the host by using the VIPA address 192.168.120.1.

Initially, Routed will advertise the VIPA address as being available over the first VPPA connection, to VPPA(8). The route in a netstat -r display on the Netfinity server will look like the following:

```
C:>netstat -r
Active Routes:

Network Address    Netmask          Gateway Address  Interface        Metric
192.168.120.0     255.255.255.0   192.168.118.6   192.168.118.7   2
```

Figure 29. netstat -r Display when Both Adapters Are Working

If the first VPPA connection goes down, Routed will advertise the VIPA address as being available over the second VPPA connection, to VPPA(9). After a short delay, the routing tables in the network will be updated and a netstat -r display on the Netfinity server will look like:

```
C:>netstat -r
Active Routes:

Network Address    Netmask          Gateway Address  Interface        Metric
192.168.120.0     255.255.255.0   192.168.119.8   192.168.119.9   2
```

Figure 30. netstat -r Display After ESCON Adapter 1 Goes Down

Note: When installing two ESCON cards in one machine, it is important to make sure the interrupt levels (IRQs) are not shared with other adapters. One way to do this is to put the first card in the lowest number slot on the lowest number bus and put the second ESCON card in the next lowest numbered slot on the lowest numbered bus. Make sure there are no other adapters between the two ESCON cards. This assures that the ESCON adapters will be assigned unique IRQs.

5.2 SNA

Two features of SNA networking provide built-in methods for high availability of sessions between nodes. APPN's routing functions allow nodes to take a variety of paths to reach another node, based on availability and link characteristics. If one path fails, sessions can be re-established over another route. High Performance Routing (HPR) goes one step further, in that it provides non-disruptive session routing in the case of link failure.

CS/NT and IntranetWare for SAA support hot standby, which provides automatic server backup for IP and IPX clients.

5.2.1 APPN

Communications Server for Windows NT and IntranetWare for SAA support APPN end node and network node communications. APPN provides a set of topology and routing functions that are used along with the directory functions to find resources and calculate routes for sessions. Local links must be defined to the nodes that own them, but routes over other links in the network can be learned dynamically.

VTAM provides automatic, preferred route selection based on dynamic network characteristics and requested class of service. An APPN network node calculates routes for sessions that originate at the LUs in it and at the end nodes it serves. Route selection is based on how the actual characteristics of each node and transmission group along the possible paths match the characteristics requested by the class of service. The network node will select the best route from the originating LU to the destination LU.

Providing multiple connections to the host, either directly over ESCON or indirectly through a LAN adapter, allows CS/NT or IntranetWare for SAA to be flexible in choosing a route to the host or other nodes. The choice will be made based on the best (fastest, lowest cost) path and the availability of the path.

If a path fails, sessions to the host are disrupted, but will be reconnected to VTAM over other paths if available. The users will need to re-establish connections to the applications.

5.2.2 High Performance Routing (HPR)

Both Communications Server for Windows NT and IntranetWare for SAA support High Performance Routing (HPR). HPR is a routing protocol for SNA APPN sessions. HPR transports data at very high speeds by using low-level intermediate routing and by minimizing the number of flows over the links for error recovery and flow control protocols. The flows are minimized by performing these functions at the endpoints rather than at each hop along the path. HPR is the most effective in networks where there are many nodes between end points. The main features of HPR are:

- Non-disruptive session routing
- Exploits high-speed network technologies, such as ATM and frame relay
- Extension of APPN providing a seamless migration path
- Improves reliability and throughput
- Runs on existing hardware
- Uses class of service for route calculation

HPR is divided into two functions:

- Automatic Network Routing (ANR) is a low-level routing mechanism that minimizes cycles and storage requirements for routing packets through intermediate nodes. It provides the transport path between any two RTP endpoints in the network.
- Rapid Transport Protocol (RTP) provides end-to-end recovery, selective transmission, and non-disruptive session routing. It is a connection-oriented, full-duplex protocol that piggybacks control information with data. There is minimal handshaking and fast connection setup and dissolution. It doesn't handle session or presentation protocols. RTP segments to the size needed for the smallest link, ensuring that intermediate nodes do not have to segment and reassemble packets. RTP reassembles segments, provides sequence checking, provides in-order delivery, and uses Adaptive Rate-Based (ARB) flow and congestion control. RTP uses connection time-outs to determine when to reroute a session. Path information is retained at RTP endpoints for management. More than one session can flow over the connection. The data is transported using ANR. The connection path can be automatically rerouted in case of path failure.

An HPR subnet is a group of contiguously interconnected HPR nodes. A node must be part of an HPR subnet before it can take advantage of HPR features.

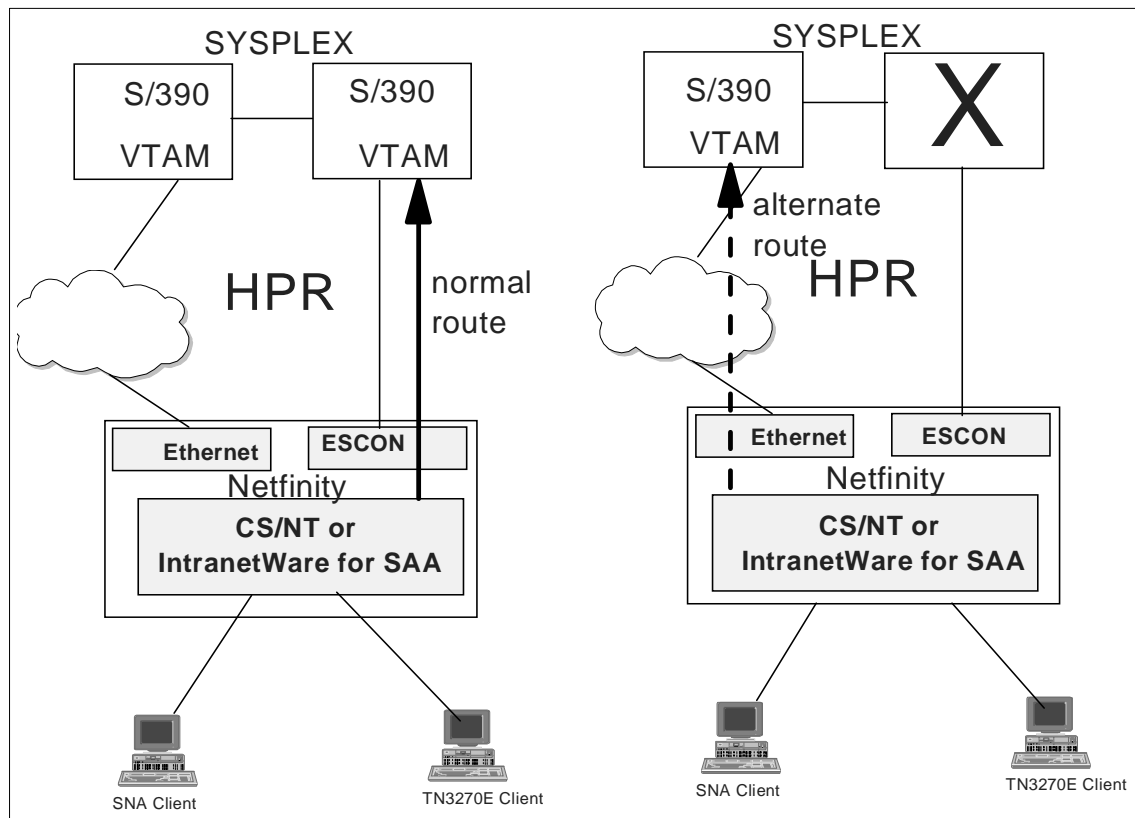


Figure 31. HPR

HPR is designed for high-volume traffic over several nodes. You may or may not see performance enhancements for one-hop traffic. However, one important thing to consider is the automatic re-routing of sessions. If you have two HPR routes to another node (for example, one ESCON and one Ethernet, or two ESCON from the Netfinity server to the mainframe) the failure of one path will not be noticed by the users. HPR will switch all traffic to the other path nondisruptively. No sessions are lost and the users do not know the switch has taken place.

5.2.3 Hot Standby for IP and IPX Clients

Communications Server for Windows NT V6.0 and IntranetWare for SAA provide two hot standby options to support IP and IPX clients with an alternate route to the host in case of a server failure. To implement these options, at least two servers are required, one critical (production) server and

one backup server. A server can be both a critical server and a backup server at the same time. Servers can back each other up.

No special configuration is needed on the critical server. The backup server is configured using the "Hot Standby Critical Servers" scenario. It must have a connection to the host comparable to the production server host connection. The backup host connection is inactive during normal operation. When the backup server detects a loss of contact with the production server, it activates host links automatically to provide an alternate path to the host. When the critical server is available again, the connections will not switch back automatically.

In general, clients do not require special support other than to be able to connect to the critical and backup servers. When contact is lost with the critical server, the client sessions will be interrupted. The client emulators must detect the server outage and provide support for alternate routing to the backup server using hot rollover or LU pools, or the users must configure alternate emulator sessions to use the backup server.

IBM Personal Communications support for TN3270E, TN5250, API, or QEL/MU emulator clients provide options for alternate routing through one or more of the hot rollover, LU pools, or multiple emulator sessions options. Some vendor emulator clients provide options for alternate routing.

Personal Communications clients can choose the auto-reconnect option and configure backup IP addresses or use LU pool names to take advantage of hot standby.

Hot rollover - This refers to support in an emulator client for configuration of multiple named servers to be contacted, in a specific order, to establish a connection through the server to the host machine for an emulator session. Hot rollover enables you to configure the backup server to be contacted when attempts to contact the critical server are unsuccessful. When the critical server fails and resources on the backup server are activated, the emulator client contacts the backup server and establishes an alternate route through it for connection to the host machine.

Personal Communications clients can choose one backup IP address. SNA API clients can configure up to four server IP addresses. In the example of configuring Personal Communications for TN3270 in "Personal Communications Client Configuration" on page 117, Figure 88 on page 119 shows a button to click to configure the backup address. The auto-reconnect option shown in Figure 89 on page 120 should also be selected.

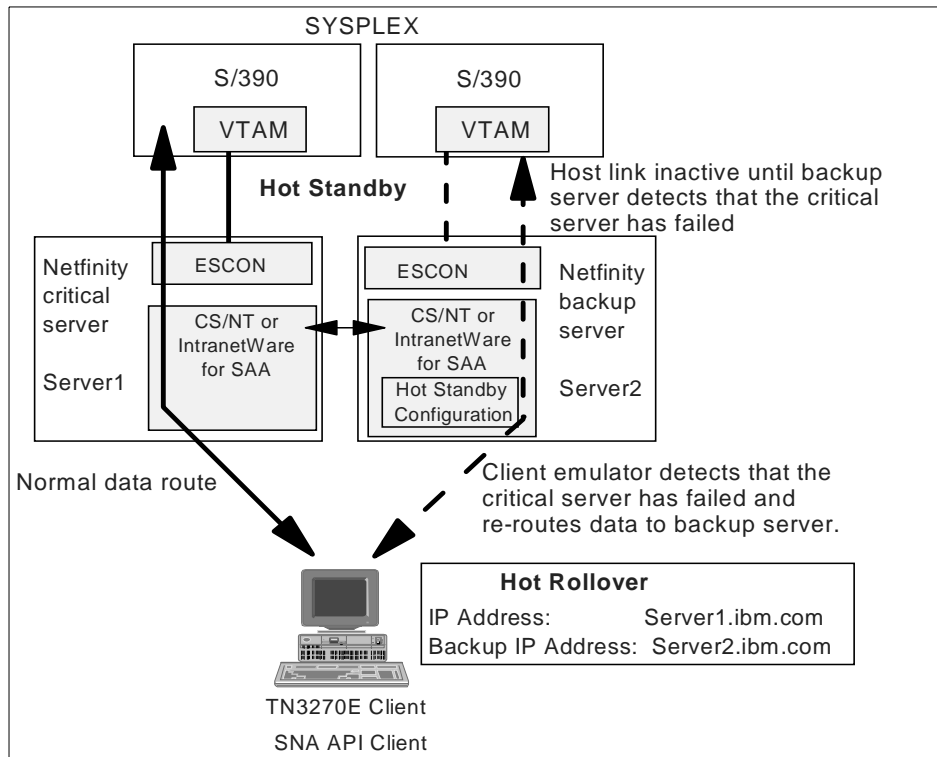


Figure 32. Hot Rollover

LU pools - This refers to support in an emulator client to dynamically establish the connection to the host machine for an emulator session through the server currently responding to queries for available LUs from a named pool. LU pools support enables the backup server and critical servers to provide LUs to the same pool. The backup server is initially defined but not active. When the critical server fails and the resources on the backup server are activated, the backup server responds to requests from the emulator client for an LU from the pool and establishes an alternate route to the host for connection of the client to the host machine.

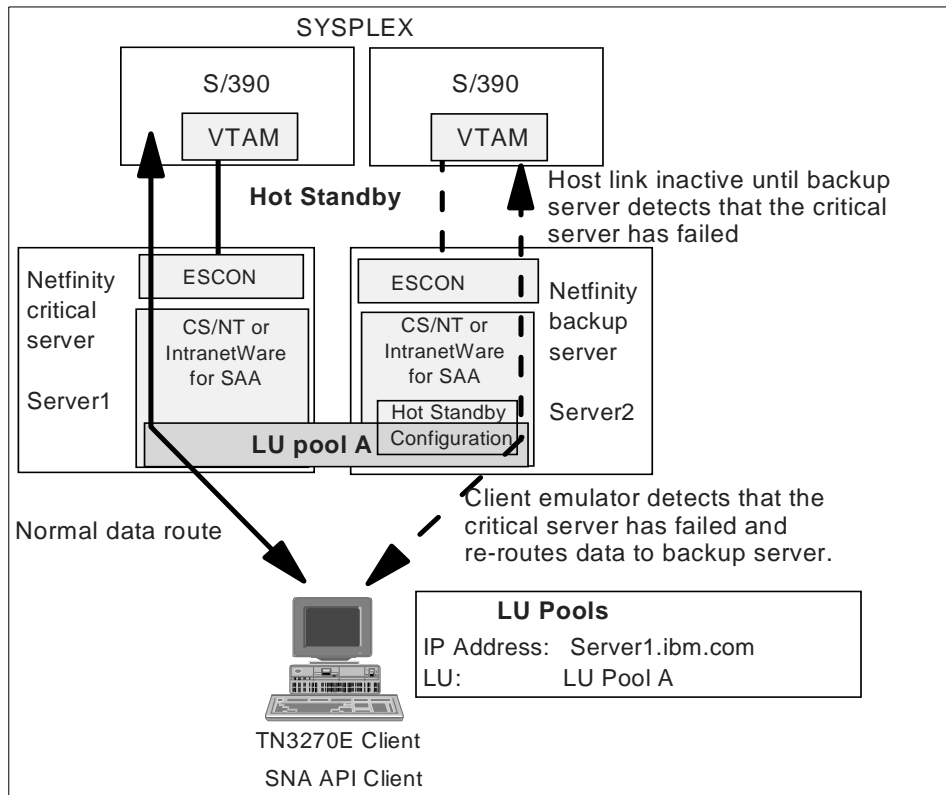


Figure 33. Hot Standby with LU Pools

Personal Communications clients can configure LU pools. An example of configuring Personal Communications for TN3270 can be seen in “Personal Communications Client Configuration” on page 117. The configuration panel shown in Figure 89 on page 120 has a field called “LU Name”. You may use a pool name in that field instead of an individual LU name. The auto-reconnect option should also be selected.

5.2.4 Backup Servers for SNA Clients

Hot standby is limited to servers supporting IP and IPX clients. For servers supporting an SNA environment, backup can be provided by a separate backup server, configured like the first. Clients must be configured to use the critical server for normal use, but be able to establish connections through the backup server if the critical server fails or is not available.

The host connections on the backup server are not normally active, but are automatically activated on demand upon receiving connection requests for the host from clients.

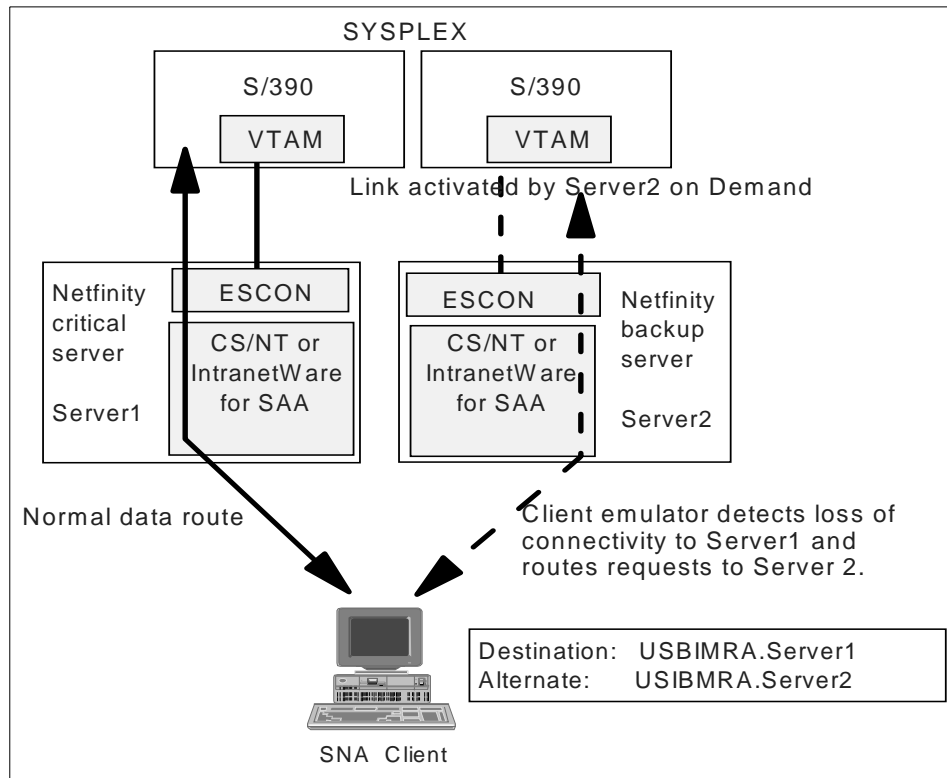


Figure 34. Backup Servers for SNA Clients

5.2.5 Single Server Backup

A simple backup configuration that would cover TN3270, SNA and SNA API clients using a single server can be created by using LU pools on the server and configuring clients to connect using an LU pool. Multiple connections to the host supply LUs to the pool, with the primary connection active. When the primary connection fails, requests to the LU pool will cause the backup connection to activate.

A CS/NT server provides support of LU pools for Personal Communications TN3270 clients, SNA API clients, and SNA gateway supporting full stack Personal Communications clients.

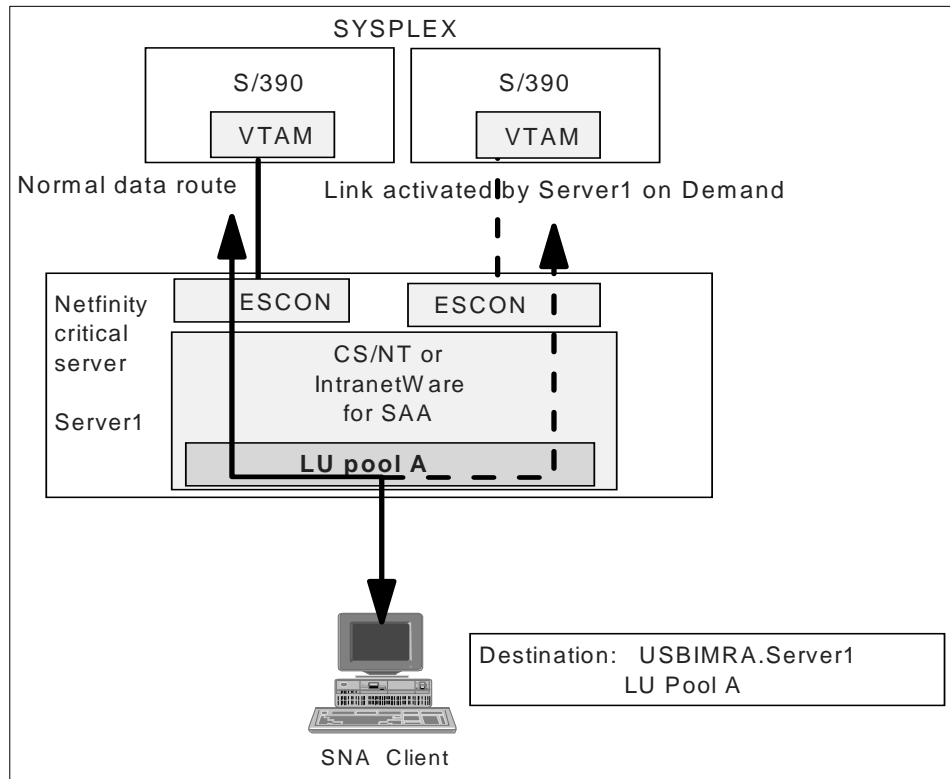


Figure 35. Single Server Backup

This option only covers the situation where a connection from the server to the host fails and with ESCON connections this is unlikely. With multiple servers, you have planned for outages of the server or any component.

On the other hand, this solution does not require any action from the emulator. The client always connects using an LU pool, regardless if the primary or backup host connection is being used.

Note: When installing two ESCON cards in one machine, it is important to make sure the interrupt levels (IRQs) are not shared with other adapters. One way to do this is to put the first card in the lowest number slot on the lowest number bus and put the second ESCON card in the next lowest numbered slot on the lowest numbered bus. Make sure there are no other adapters

between the two ESCON cards. This assures that the ESCON adapters will be assigned unique IRQs.

5.2.6 Server Load Balancing using SLP

CS/NT V6 and IntranetWare for SAA provide load balancing using the Service Location Protocol (SLP). SLP was designed by the Internet Engineering Task Force (IETF) to balance SNA sessions for dependent LUs (LU 0 to 3) and independent LU 6.2 (APPC and CPI-C) applications.

CS/NT V6 supports load balancing for:

- SNA API clients (split stack)
- NetWare QEL/MU 3270 clients

Note: Personal Communications full stack SNA clients do not support SLP, but used in conjunction with SNA API (split stack) they can take advantage of load balancing.

Load balancing enables you to distribute LU 0 to 3 and LU 6.2 sessions across Communications Server and IntranetWare for SAA servers. The server advertises services including load factors, which the clients or servers can gather and organize to select a server.

Load balancing dynamically balances dependent LU (host-to-workstation) sessions and independent LU 6.2 sessions by distributing them to the communications server with the smallest load.

Load balancing is available for CS/NT SNA API, TN3270, TN5250 and NetWare QEL/MU 3270 clients. The load balancing capabilities of Communications Server are built into the SNA client APIs.

For dependent LU sessions, emulators that use SNA client APIs can participate in load balancing. Otherwise, you must purchase third-party 3270, TN3270, or TN5250 emulator software that supports load balancing.

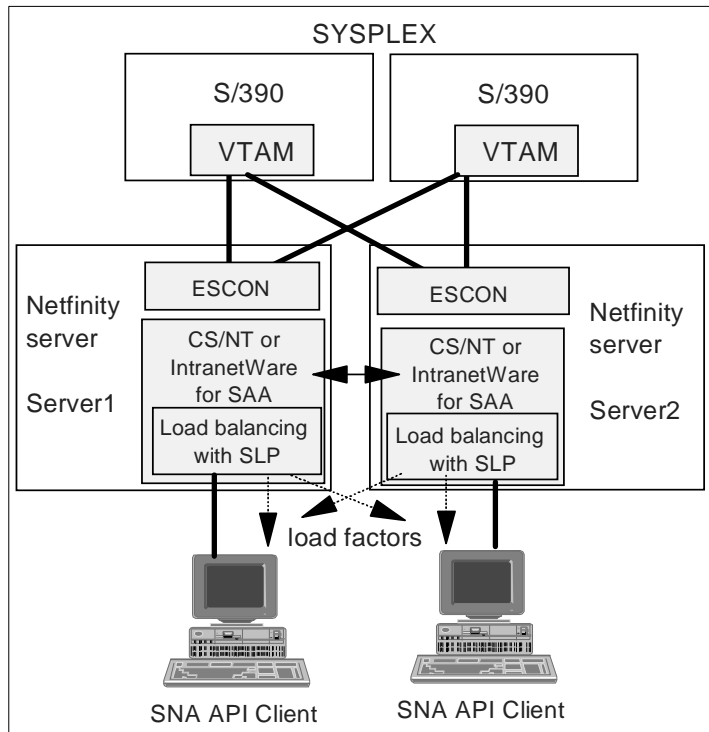


Figure 36. Load Balancing

Server configuration involves defining scope names. A scope name is used by the server to advertise its services. Client workstations will use a scope name to select one or more servers that provide the requested services. For example, you can define the same scope name in all servers providing 3270 session level encryption. By using the same scope name, client workstations can select encrypted sessions for their 3270 emulation session.

For dependent LU sessions, the load is distributed across servers within a named LU pool and a named scope.

For LU 6.2 sessions, the load is distributed across all available servers in a named scope or across selected servers within a named server list. The initial connection established by a SNA API client determines which server manages all subsequent LU 6.2 sessions.

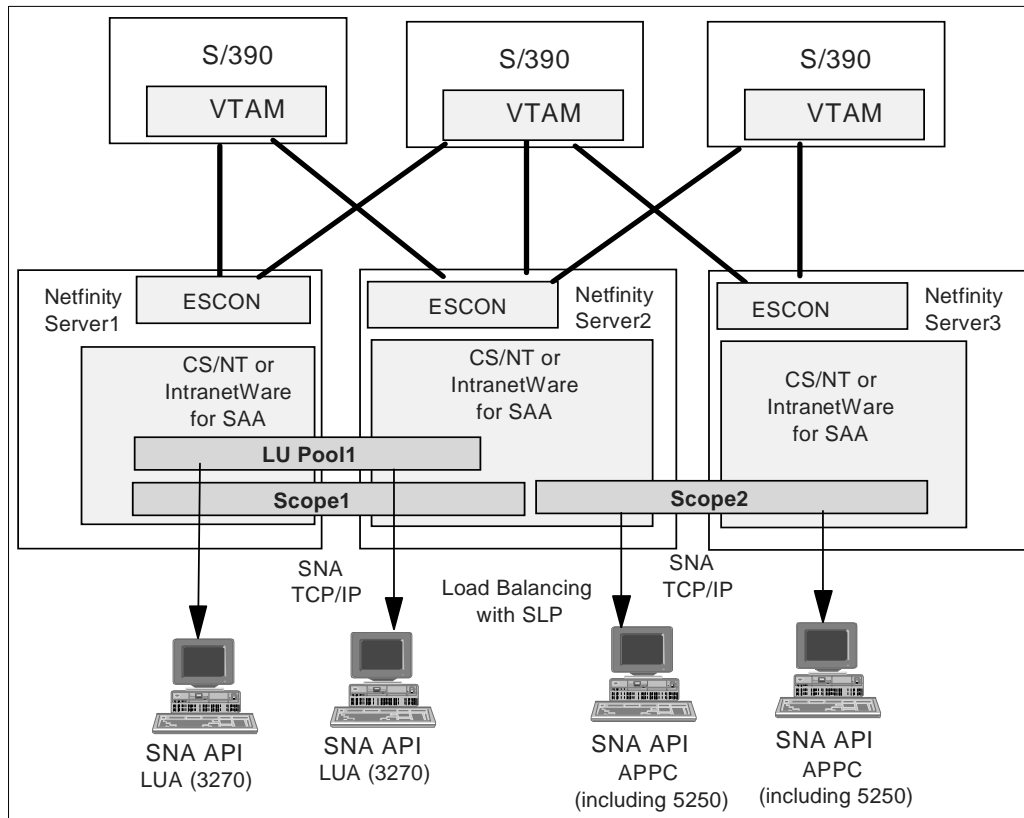


Figure 37. Load Balancing with Pools and Scopes

5.2.7 TN3270 and SNA Gateway Load Balancing across Links

For a single server serving SNA gateway and TN3270 clients, you can take advantage of the LU pool load balancing characteristics. This does not require SLP support. By defining a single LU pool and putting LUs from two different host connections in it, you provide a built-in load balancing function to the clients. Requests for LUs in the LU pool will be spread across host connections. For example, the first request for LU pool A will have the host connection established over host link 1, the second over host link 2, the third over host link 1, and so forth.

This also provides a built-in backup scheme in case one host link goes down. Future requests will be routed over the other link.

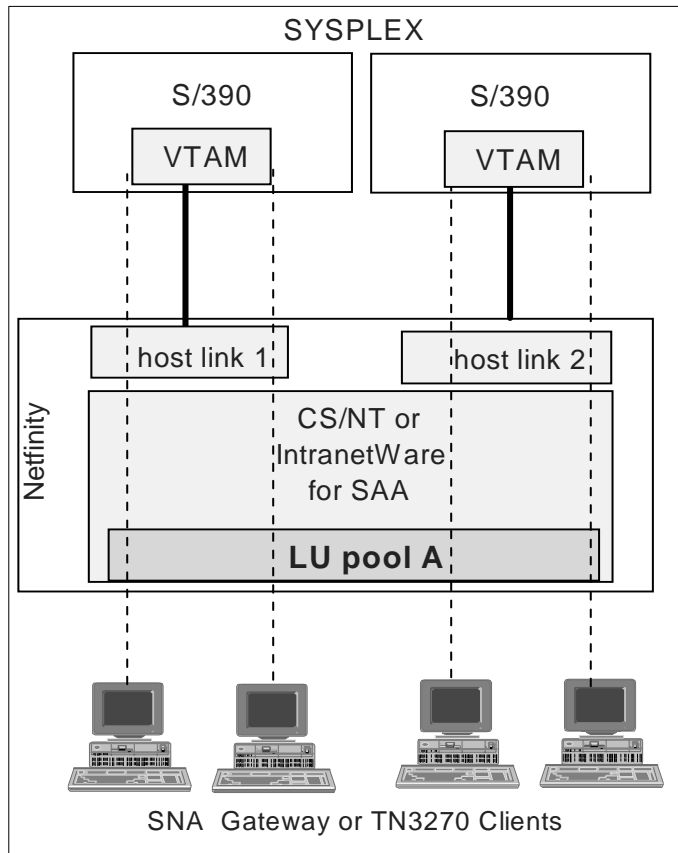


Figure 38. TN3270 and SNA Gateway LU Pool Load Balancing

Note: When installing two ESCON cards in one machine, it is important to make sure the interrupt levels (IRQs) are not shared with other adapters. One way to do this is to put the first card in the lowest number slot on the lowest number bus and put the second ESCON card in the next lowest numbered slot on the lowest numbered bus. Make sure there are no other adapters between the two ESCON cards. This assures that the ESCON adapters will be assigned unique IRQs.

5.3 Host Recovery

When the Netfinity server is rebooted the host only recognizes the link has failed. In some cases steps must be taken to manually re-activate the link from the host side.

5.3.1 SNA

When Communications Server recycles, or the link is deactivated, the VTAM PU on the host will go into PREQC state. As soon as the link is available again it automatically recovers.

When the Netfinity server is rebooted or powered off, the PU goes into an IINOP state and does not automatically recover. The best way to recover is to use network management techniques to recognize the link has failed and to re-activate the PU. This will put the PU in CONT state and as soon as the server recovers the PU will re-activate. Figure 39 shows the host messages generated when the Netfinity server is rebooted.

```
*IOS002A 0212,NO PATHS AVAILABLE
IST259I  INOP RECEIVED FOR RANFESC  CODE = 02
IST1416I  ID = RANFESC                FAILED - RECOVERY IN PROGRESS
IST1136I  VARY INACT RANFESC          SCHEDULED - UNRECOVERABLE ERROR
IST1133I  RANFESC                IS NOW INACTIVE, TYPE = PU_T2
D NET, ID=RANFESC
IST097I  DISPLAY ACCEPTED
IST075I  NAME = RANFESC, TYPE = PU_T2 254
IST486I  STATUS= IINOP, DESIRED STATE= INACT
IST1043I  CP NAME = ***NA***, CP NETID = USIBMRA, DYNAMIC LU = YES
IST1589I  XNETALS = YES
IST136I  LOCAL SNA MAJOR NODE = NETFGW
IST077I  SIO = *NA* CUA = 0212
IST654I  I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I  STATE TRACE = OFF
IST314I  END
```

Figure 39. SNA Link Failure Caused by Reboot of Netfinity Server

5.3.2 TCP/IP

When the Netfinity server or ESCON link is interrupted:

- For VPPA connections that have the missing interrupt handler turned off TCP/IP does not recognize the outage. To recover you must stop and start the device.
- For other connections, where the OS/390 missing interrupt handler recognizes the link is gone, TCP/IP recognizes the link is gone and the device is stopped. To recover you must start the device.

Either way, the link must be recovered manually.

Chapter 6. TCP/IP Passthrough

TCP/IP Passthrough allows the Netfinity PC to act as a gateway to the host, in much the same way as the 8232 or 3172 ICP function.

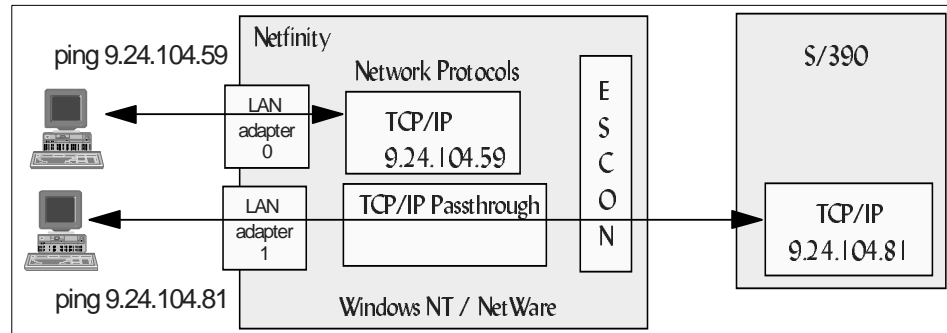


Figure 40. TCP/IP Passthrough

For normal Windows NT TCP/IP operation, a LAN adapter is given an IP address and bound to the TCP/IP protocol. For TCP/IP Passthrough, the LAN adapter is bound to the TCP/IP Passthrough network protocol and associated with an outbound adapter to the TCP/IP host. The IP address is supplied by the host.

IP traffic that crosses the LAN adapter is sent over the ESCON channel to the host. It is the host that answers to the IP address, not the PC. The TCP/IP Passthrough stack in the PC can be made aware of the host address and will filter IP traffic based on this address in order to prevent unnecessary traffic from passing over the link to the host.

Applications on the Netfinity machine cannot use the TCP/IP Passthrough capabilities without going through the second LAN adapter.

6.1 TCP/IP Passthrough Example

This example will illustrate using the Netfinity PC as a TCP/IP gateway to multiple hosts. The physical connection to the host is over the ESCON channel. The setup is:

- Two LPARS on a 9672, each running MVS and TCP/IP.
- One ESCON connection from the 9672 to the Netfinity PC via an ESCON Director. The connection will be shared among the two LPARs.

- The Netfinity server is running Windows NT.
- TCP/IP Passthrough will filter the TCP/IP traffic going to the host based on the destination IP address.

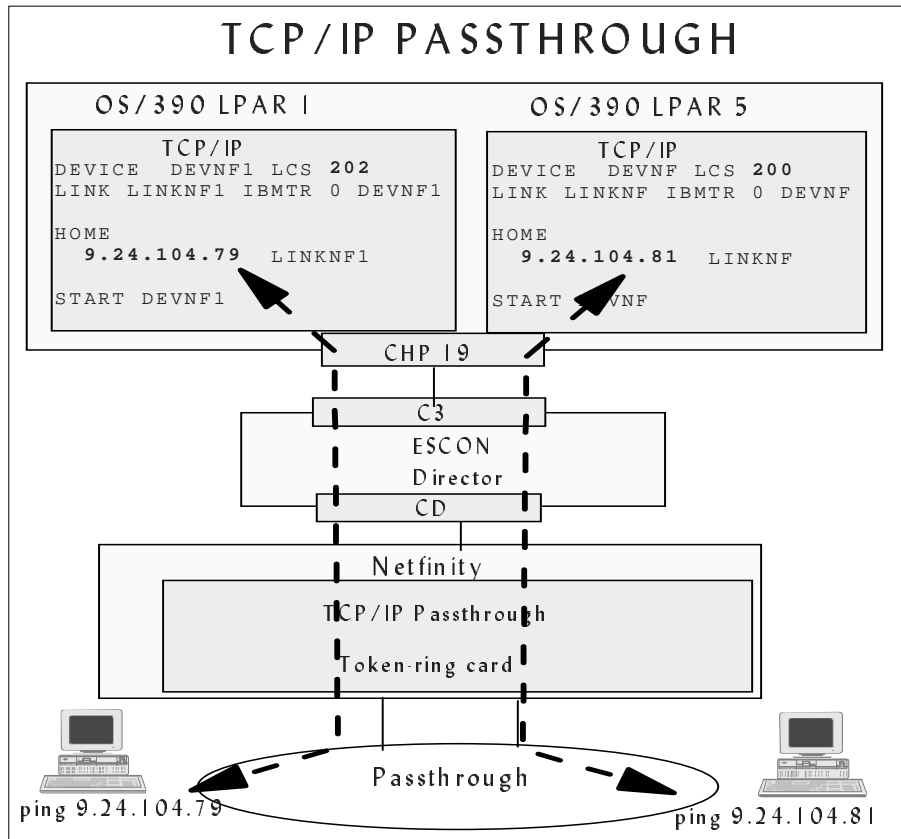


Figure 41. TCP/IP Passthrough Example

6.2 Planning

To define a TCP/IP Passthrough connection, the network administrator and system programmer must do some planning. Several things must be decided before the definitions can be created.

The network administrator must provide the following information:

Number of passthrough connections to be made and to which hosts	
IP address for each host TCP/IP Passthrough connection for IP filtering (Windows NT passthrough only)	

The system programmer must provide the following information:

One subchannel address pair (even/odd) to use for each host TCP/IP LCS connection	
ESCON director port leading to the host for each connection	
CUADD from the IOCP for each connection	
LPAR number for each connection	

6.3 Installation

When planning an ESCON adapter configuration, the first consideration should be the mainframe definitions. You will need information about these definitions to complete the Netfinity ESCON adapter installation. The steps to install and configure a TCP/IP connection are:

Mainframe Steps

- IOCP definitions

The IOCP definitions for this example are shown in “Host IOCP Definition” on page 64. For information on how to define the ESCON adapter to the mainframe see “IOCP Definitions” on page 40.

- Host TCP/IP definitions

See “Host TCP/IP Definitions” on page 69 for information on how to define the TCP/IP parameters.

Netfinity Steps

- Install the ESCON adapter.

Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.

- Install the PCI ESCON driver.

Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.

- Configure the ESCON adapter.

The ESCON adapter configuration for this example is shown in “ESCON Adapter Configuration” on page 65. For information on how to set up the adapter configuration see “ESCON Adapter Configuration” on page 42.

Note: The LAN adapter to be used for TCP/IP Passthrough must be installed and connected to the LAN before the ESCON adapter will initialize correctly.

- Install and configure the TCP/IP Passthrough protocol.

Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide* for installation. Configuration is covered in “Windows NT TCP/IP Passthrough Configuration” on page 66.

6.4 Host IOCP Definition

The IOCP definitions on the host for the Netfinity ESCON adapter are the same for all TCP/IP definitions. The IOCP definitions are discussed in “Host Hardware Definition” on page 39.

```
CHPID PATH=((19)),TYPE=CNC,SWITCH=E1,SHARED
*
* Defined TCP/IP subchannels
*
CNTRLUNIT CUNUMBR=200,UNIT=SCTC,PATH=(19),
          CUADD=1,LINK=(CD),UNITADD=((00,16))
DEV200   IODEVICE UNIT=SCTC,ADDRESS=(200,16),
          CUNUMBR=(200)
```

Figure 42. S/390 IOCP Definitions for TCP/IP

This example is going to use two separate passthrough connections to the host. The MVS addresses for this example are 200, 201, 202, and 203, which correspond to subchannels 00, 01, 02, and 03 respectively. The IOCP definition shown in Figure 42 define a range of 16 addresses that include these. A larger range than necessary was defined to allow for future growth. The ESCON channel is connected to the Netfinity server through an ESCON director.

6.5 ESCON Adapter Configuration

The ESCON adapter must be defined on the Windows NT side by configuring the PCI ESCON Driver. To do this, go to the Windows NT control panel and select **Networks**, then click on the **Adapters** tab. Select the correct adapter in the box at the top and click on **Properties**. You must define each subchannel that will be used by the host.

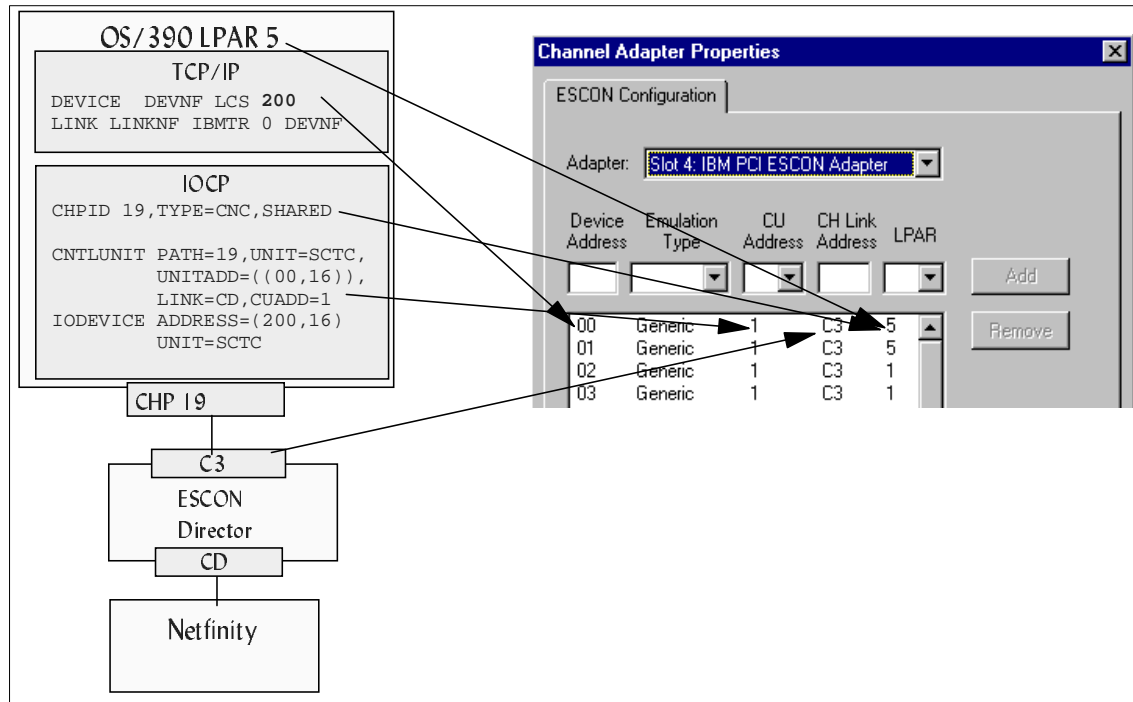


Figure 43. Windows NT ESCON Configuration

Parameters for the channel adapter properties are covered in “ESCON Adapter Configuration” on page 42.

TCP/IP implementations require Generic for the emulation type.

ESCON configuration changes do not take effect until the server has been hard reset (or power off, power on). However, the ESCON adapter will not initialize until it has been configured for at least one function, for example TCP/IP Passthrough, so you may want to postpone the power off until you have completed all the configuration tasks.

6.6 Windows NT TCP/IP Passthrough Configuration

For TCP/IP Passthrough you will be associating a LAN adapter with the ESCON adapter. One LAN adapter can support multiple passthrough connections.

In TCP/IP Passthrough the LAN adapter is transparent to the users, and is not addressable. For example, you could not ping the adapter by using the host address.

A separate LAN adapter is required for TCP/IP Passthrough. Using one LAN adapter for both the TCP/IP protocol stack in the Netfinity server and for TCP/IP Passthrough to the host is not supported.

If you are using TCP/IP Passthrough, the passthrough driver must be installed after the PCI ESCON adapter driver. The driver is included on the CD-ROM shipped with the ESCON adapter. Follow the instructions in the *IBM Netfinity ESCON Adapter Installation Guide* to install it. At the end of the installation you will be asked to configure the passthrough parameters. You may complete the configuration at that time or later.

If you define the TCP/IP Passthrough properties during install you will go directly to the configuration panels shown in Figure 45 on page 68.

Otherwise, to define or change the TCP/IP Passthrough connections later, go to the Network folder in the Windows NT control panel. Click on the **Protocols** tab, select **TCP/IP Passthrough** and click on **Properties**.

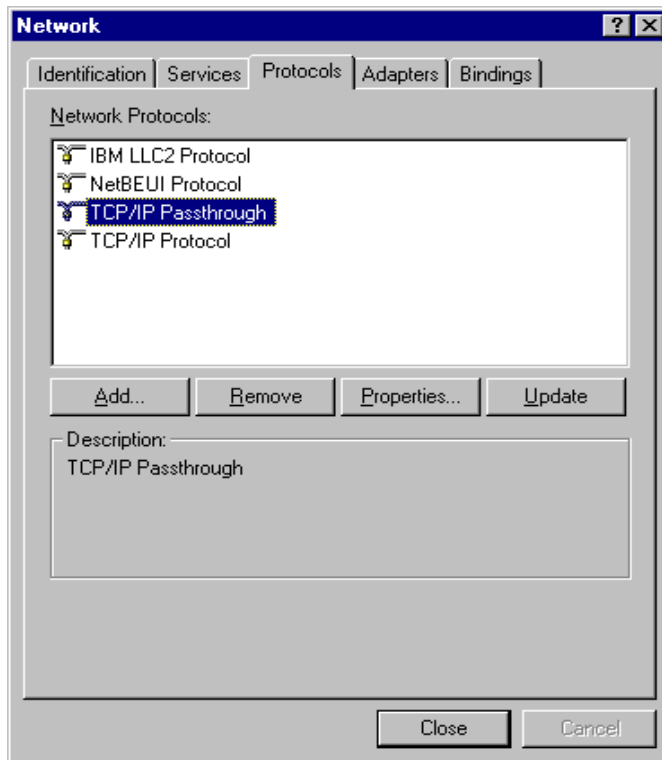


Figure 44. Protocols

The first panel will show you any existing passthrough definitions. Click on **Add** to define each passthrough connection to the host. In this example, there are two.

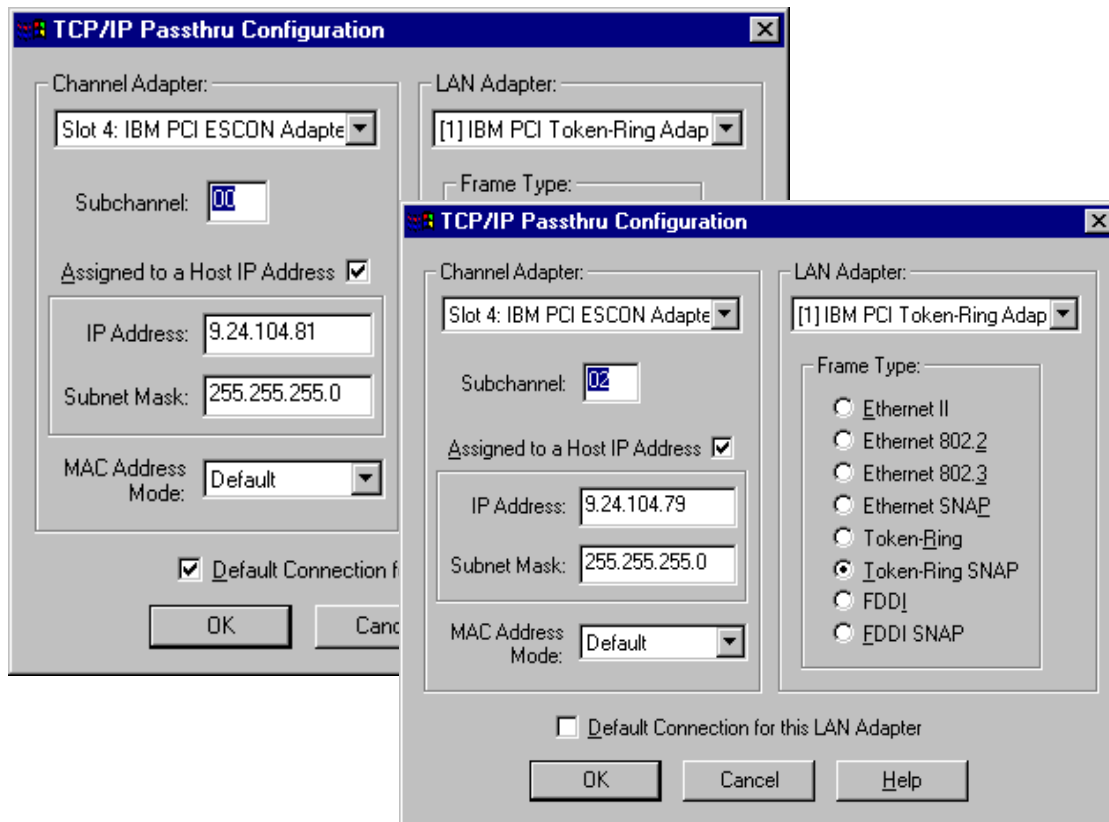


Figure 45. TCP/IP Passthrough Configuration

- This is where you associate the LAN adapter with the ESCON adapter. Choose the appropriate ESCON adapter and LAN adapter, in our case, the first token-ring adapter.
- Define the frame type. The common frame types used for the network adapter selected will be the default. The frame type is determined by the LAN adapter and the network type.
- Specify a subchannel address. This will be the two-digit unit address defined in the IOCP that corresponds to the MVS address TCP/IP will use and in the ESCON adapter configuration.
- To enable the ESCON adapter to filter the IP traffic, we associate the host IP address to the subchannel in the TCP/IP Passthrough definitions. By doing this, only broadcast packets and packets destined for this address

will be passed to the host. Otherwise, all packets would be transmitted to the host.

Click on **OK** to close the window and return to the TCP/IP Passthrough panel. You will see the definitions you just added.

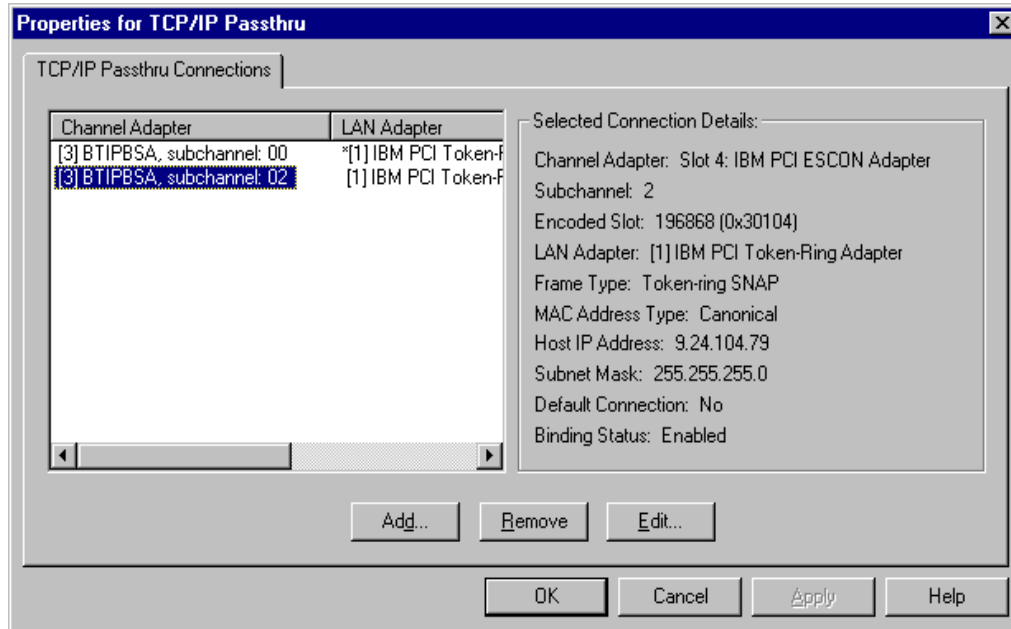


Figure 46. TCP/IP Passthrough Properties

Now you have completed the TCP/IP Passthrough definitions on Windows NT. Return to the Network panel by clicking **OK**, then **OK** again to exit.

From the Network panel, click on **Bindings** to cause Windows NT to bind the adapters to the TCP/IP Passthrough protocol.

Next, you must define the connection to the host and the host TCP/IP parameters.

6.7 Host TCP/IP Definitions

The TCP/IP Passthrough configuration is defined to the host TCP/IP as an LCS connection. The connection will require an even/odd address pair; in this case, addresses 200 and 201 will be used.

Figure 47 shows the TCP/IP definitions for the host in LPAR 5. A second connection is shown to illustrate the definitions for an Ethernet passthrough connection.

```

;-----
; Nefinity Token-Ring Passthrough Link
;-----
DEVICE DEVNF      LCS  200
LINK   LINKNF     IBMTR 0 DEVNF
;-----
; Netfinity Ethernet Passthrough Link
;-----
DEVICE DEVNF2     LCS  204
LINK   LINKNF2    ETHERNET 0 DEVNF2
;-----
HOME
9.24.104.81 LINKNF
9.24.105.88 LINKNF2
;-----
START DEVNF
START DEVNF2

```

Figure 47. Host TCP/IP Definitions for TCP/IP Passthrough

6.7.1 TCP/IP Performance Tips

The ESCON adapter is able to operate with large IP datagram sizes. There are general tuning parameters for the host TCP/IP that have an overall performance impact. With an ESCON adapter in the network, the following are some recommendations to consider:

- TCP/IP V3R2 and earlier:
 - Set LARGEENVELOPEPOOLSIZE to 65535.
 - Set DATABUFFERPOOLSIZE to 65536.
 - See the *TCP/IP: Performance Tuning Guide* for more information.
- For releases later than TCP/IP V3R2:
 - Set TCPSENBfrsize to 65536.
 - Set TCPRCVBufsize to 65536.
 - Set UDPSENDBFRSIZE to 65535.
 - Set UDPRCVBUFRSIZE to 65535.
 - Set NOUDPQUEUELIMIT.
 - See the OS/390 UNIX System Services performance tuning guidelines *OS/390 UNIX System Services Planning* or see <http://www.s390.ibm.com/products/oe/bpxa1tun.html> for more information.

Chapter 7. VPPA Example

For point-to-point TCP/IP access from the Netfinity PC to the host, install and configure the Virtual Point-to-Point Adapter (VPPA). This allows a link from the host to the Netfinity PC with a distinct TCP/IP address at each end. This would be a useful connection for applications such as ADSM, allowing fast backups of the Netfinity PC to an ADSM server on the host.

DB2 on Netfinity using DB2 Connect can also use TCP/IP DRDA connectivity to DB2 on the host, providing the host DB2 is DB2 for OS/390 V5.1. Previous releases of DB2 for OS/390 require SNA connectivity.

SAP uses a VPPA connection to provide FTP services between the mainframe and the Netfinity server. In addition, SAP requires an HSAS connection.

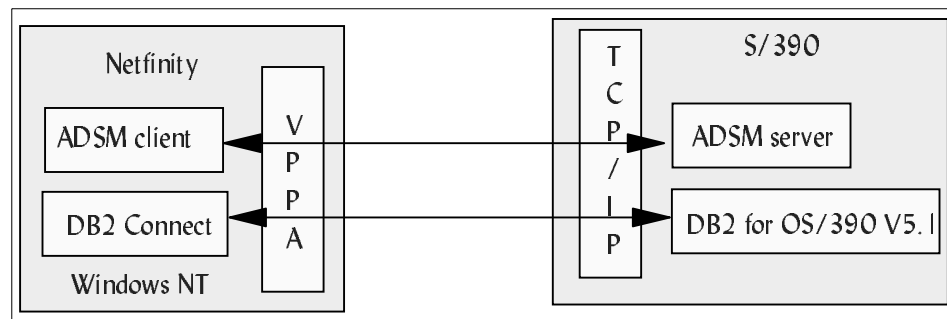


Figure 48. VPPA Overview

7.1 VPPA Example

This example illustrates using VPPA for an ADSM connection. The host is OS/390 R2 running an ADSM server. The Netfinity PC is running Windows NT and the Windows NT ADSM client.

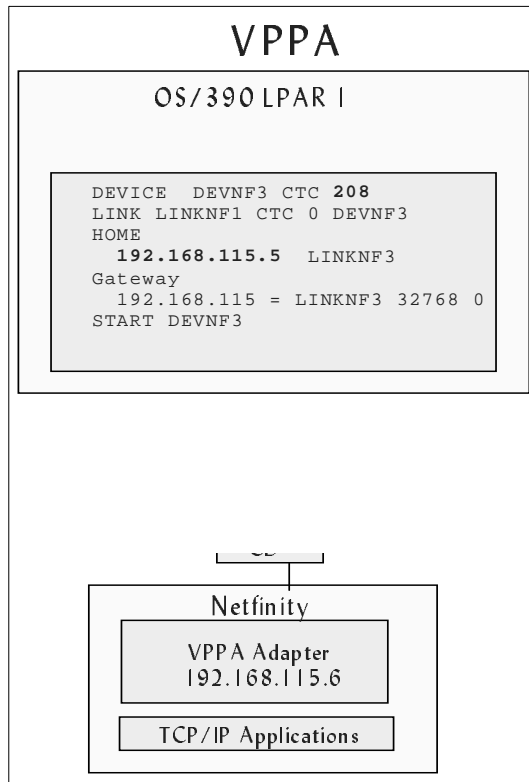


Figure 49. VPPA Example

7.2 Planning

Before you begin, you should do some planning with your host TCP/IP administrator and your host system programmer.

The TCP/IP administrator must provide the following:

IP address for VPPA on the Netfinity server	
IP address assigned to the host TCP/IP ESCON device definition	
LARGEENVELOPEPOOLSIZ parameter from the host TCP/IP profile (TCP/IP V3R2 or earlier) or the IOBUFFERSIZE parameter from the TCP/IP CTC device statement (releases later than V3R2).	

Subnet mask	
default gateway	

The host system programmer must provide the following:

Subchannel addresses (even/odd pair) to use for the host TCP/IP device	
ESCON director port leading to the host	
CUADD from the IOCP	

7.3 Installation

When planning an ESCON adapter configuration, the first consideration should be the mainframe definitions. You will need information about these definitions to complete the Netfinity ESCON adapter installation. The steps to install and configure a VPPA connection are:

Mainframe Steps

- IOCP definitions

The IOCP definitions for this example are shown in “Host IOCP Definition” on page 74. For information on how to define the ESCON adapter to the mainframe see “IOCP Definitions” on page 40.

- SYS1.PARMLIB(IECIOSxx)

For VPPA connections you should turn off the OS/390 missing interrupt handler by adding the device addresses to the IECIOSxx parmlib member with a time of 00:00.

- TCP/IP definitions

See “HOST TCP/IP Definitions” on page 80 for information on how to define the link to the VPPA adapter to TCP/IP on the host.

Netfinity Steps

- Install the ESCON adapter.

Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.

- Install the PCI ESCON driver.

Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.

- Configure the ESCON adapter.

The ESCON adapter configuration for this example is shown in “ESCON Adapter Configuration” on page 75. For information on how to set up the adapter configuration see “ESCON Adapter Configuration” on page 42.

- Install and configure VPPA.

The installation is covered in *IBM Netfinity ESCON Adapter Installation Guide*. See “VPPA Configuration” on page 76 for information on how to set up the configuration.

Note: the MPC+ driver is not required unless you are also setting up an HSAS connection for SAP. If your are going to use both, install the MPC+ driver before the VPPA driver.

7.4 Host IOCP Definition

The IOCP definitions on the host for the Netfinity ESCON adapter are the same for all TCP/IP definitions. The IOCP definitions are discussed in “Host Hardware Definition” on page 39.

```

CHPID PATH=((19)),TYPE=CNC,SWITCH=E1,SHARED
*
* Defined TCP/IP subchannels
*
CNTLUNIT CUNUMBR=200,UNIT=SCTC,PATH=(19),
        CUADD=1,LINK=(CD),UNITADD=((00,16))
DEV200   IODEVICE UNIT=SCTC,ADDRESS=(200,16),
        CUNUMBR=(200)

```

Figure 50. S/390 IOCP Definitions for TCP/IP

This example will use MVS addresses 208 and 209 which correspond to subchannels 08 and 09 respectively. The IOCP definitions in Figure 50 show a range of 16 addresses defined to allow for future growth. The ESCON channel is connected to the Netfinity server through an ESCON director.

7.5 OS/390 Parmlib Updates

To turn off the missing interrupt handling processes for the device addresses in OS/390, you add the devices to the SYS1.PARMLIB(IECIOSxx) member, as follows.

```
MIH TIME=00:00,DEV=(200-21F)
```

7.6 ESCON Adapter Configuration

The next step is to define the ESCON adapter. This tells the ESCON adapter what subchannel address to use, the port on the ESCON director that leads to the host, the LPAR to go to, and the emulation type. The ESCON adapter configuration is reached through the Network ICON on the Windows NT control panel. Click on **Adapters** and highlight the ESCON adapter entry. Then click on **Properties**.

The following figure shows the ESCON adapter definition for the Netfinity PC in this example. TCP/IP uses an even/odd address pair for CTC connections. The subchannel range used for this example is 08 and 09 so the only two definitions needed for this example are the last two lines where 08 and 09 are defined.

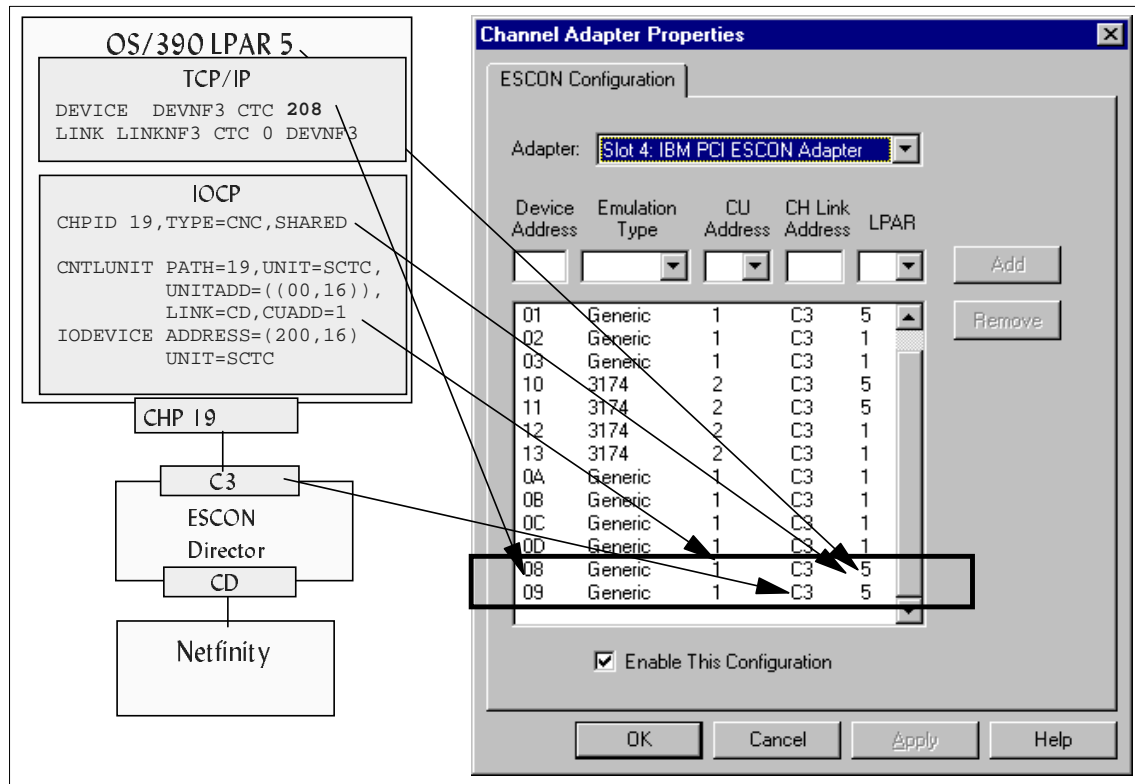


Figure 51. ESCON Adapter Definition

Parameters for the channel adapter definitions are covered in “ESCON Adapter Configuration” on page 42.

TCP/IP implementations require Generic for the emulation type.

7.7 VPPA Configuration

VPPA is a software adapter that will be bound to the TCP/IP protocol in Windows NT. The driver is installed from the CD-ROM shipped with the ESCON adapter. During the VPPA installation, you will be asked for information about the type of connection. This information can be found in the TCP/IP profile data set in the host.

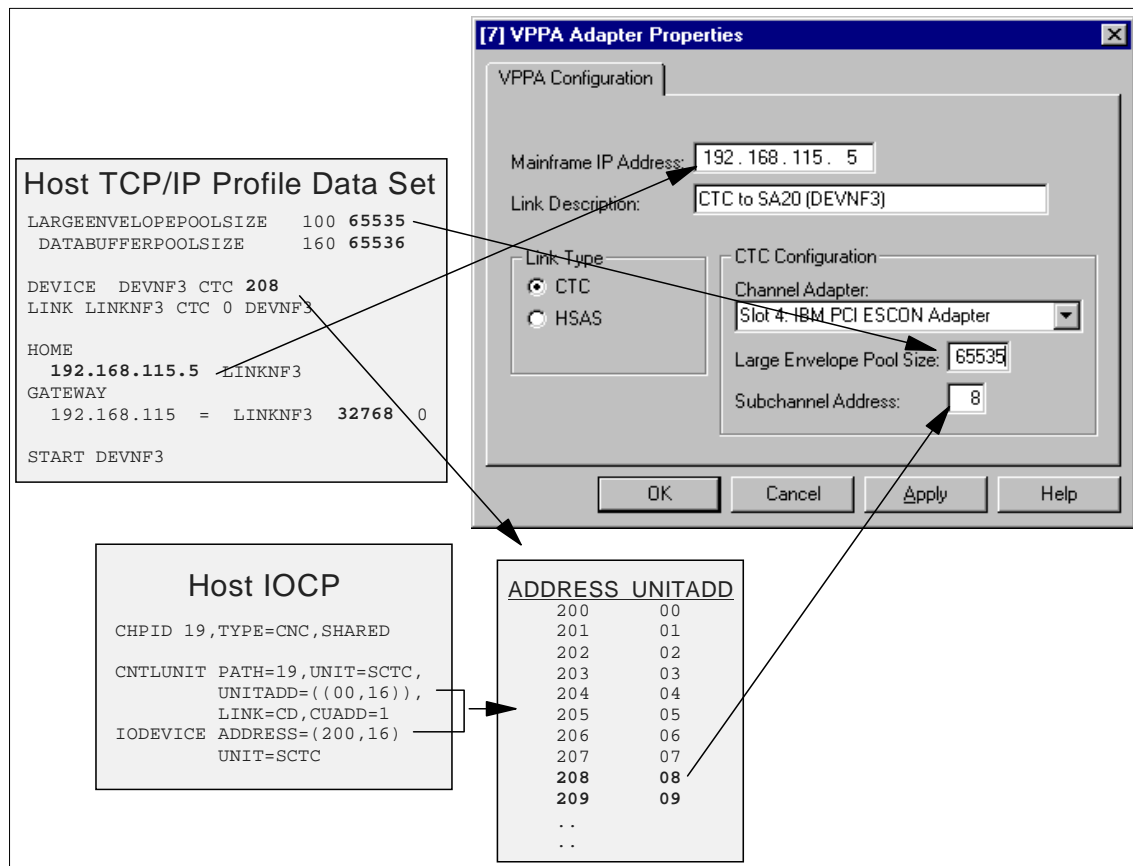


Figure 52. VPPA Adapter Configuration

Large Envelope Pool Size

An envelope is a storage area used to hold packets, datagrams, or fragments during TCP/IP processing.

The host LARGEENVELOPEPOOLSIZE parameter specifies the size and number of large envelopes. A large envelope is used only if a packet does not fit in a small envelope. Also, large envelopes are used to hold IP datagram fragments during reassembly because the datagram size is not known until reassembly is complete.

You can change the number of large envelopes from the default of 50. Running out of large envelopes causes TCP/IP to drop outgoing and incoming packets. The resulting retransmission of lost packets lowers performance.

The size of the large envelope can be any of the following byte amounts:

- 8192 (default)
- 16384
- 32768
- 65535 (MVS only)

A value of 65535 will allow the most efficient use of the ESCON adapter. The setting in the VPPA adapter configuration must match the definition in the host TCP/IP profile.

The packet size on the gateway definition should be set so the packet plus the header do not exceed the large envelope pool size. In this case we set it to 32768.

In OS/390 TCP/IP releases above V3R2, the LARGEENVELOPEPOOLSIZE is no longer a valid parameter. It has been replaced by the IOBUFFERSIZE parameter on the CTC device statement. Valid values are:

- 32K
- 32768
- 65535

Link Type

The VPPA adapter uses CTC.

Subchannel Address

The subchannel address to use is determined by the host system programmer. See "IOCP Definitions" on page 40 for more information on determining the subchannel address.

7.8 Windows NT TCP/IP Protocol Setup

After clicking OK in the VPPA Adapter Properties window, shown in Figure 52 on page 77 you will be asked to supply information for the TCP/IP stack. Windows NT will then bind the adapter to the TCP/IP protocol. The TCP/IP configuration for this example is shown in the following figure.

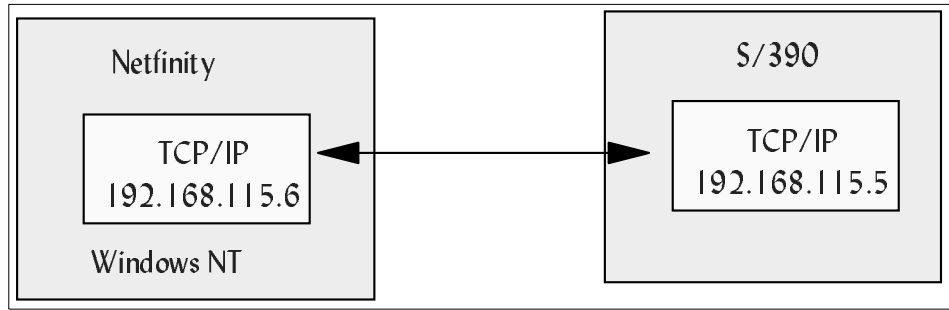


Figure 53. VPPA TCP/IP Configuration

The following window will be presented. You will need to fill in the TCP/IP address of the Netfinity box, the subnet mask for your TCP/IP network, and the default gateway to use to route traffic.

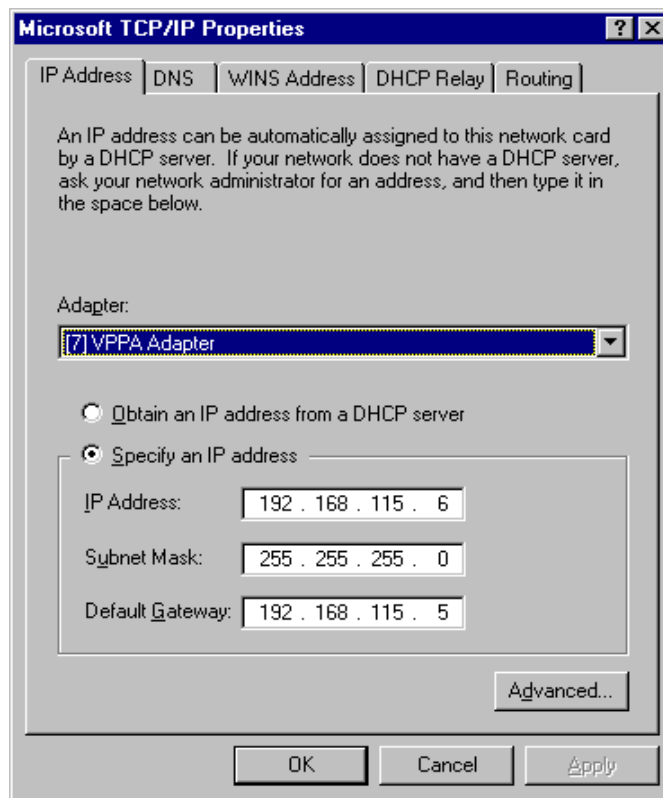


Figure 54. VPPA TCP/IP Properties

7.9 HOST TCP/IP Definitions

The following figure shows the S/390 TCP/IP profile definitions used in this example to create a link to the Netfinity ESCON adapter.

```
DEVICE DEVNF3    CTC  208
LINK  LINKNF3    CTC  0 DEVNF3
;
HOME
192.168.115.5    LINKNF3
;
GATEWAY
;
; Network    First Hop    Link Name Packet Size    Subnet Mask
192.168.115    =          LINKNF3  32768          0
;
START DEVNF3
```

Figure 55. Host TCP/IP Definitions

The connection will require an even/odd address pair; in this case, addresses 208 and 209 will be used.

7.9.1 TCP/IP Performance Tips

The VPPA ESCON adapter is able to operate with large IP datagram sizes. Applications running on Windows NT that are sensitive to performance should be configured to use large block sizes.

Even when block sizes are not configured large, the VPPA ESCON driver will bundle small packets into 64 KB blocks as data traffic increases.

If the Windows NT TCP/IP stack is busy enough that it starts to pass multiple packets at a time to the VPPA driver, VPPA will bundle those packets into a larger block (not greater than 64 KB) and forward it to the ESCON channel.

When the ESCON adapter itself is not taking packets readily (for example a busy host or ESCON media scenario) the VPPA driver will stack small packets up (again not greater than 64 KB) before sending them on to the ESCON channel.

General host TCP/IP tuning parameters to consider are:

- TCP/IP V3R2 and earlier:
 - Set LARGEENVELOPEPOOLSIZE to 65535.
 - Set DATABUFFERPOOLSIZE to 65536.
 - See the *TCP/IP: Performance Tuning Guide* for more information.
- For releases later than TCP/IP V3R2:
 - Set TCPSENBfrsize to 65536.
 - Set TCPRCVBufsize to 65536.
 - Set UDPSENBFRSIZE to 65535.
 - Set UDPRCVBUFRSIZE to 65535.
 - Set NOUDPQUEUELIMIT.
 - See the OS/390 UNIX System Services performance tuning guidelines in *OS/390 UNIX System Services Planning* or see <http://www.s390.ibm.com/products/oe/bpxa1tun.html> for more information.

7.10 ADSM Client Setup

Using the ESCON link from the ADSM client on Windows NT is like using any other TCP/IP link. Update the ADSM TCP/IP parameters in the `dsm.opt` file or through a GUI interface. The main TCP/IP options to consider are:

- TCPPOINT: The default is 1500.
- TCPSERVERADDRESS: Specify the IP address of the host ESCON TCP/IP port.
- TCPBUFFSIZE: The size you want to use for the ADSM internal TCP/IP communication buffer.
- TCPNODELAY: Specifies whether to have an ADSM transaction sent immediately to the server, rather than having small transactions (less than TXNBYTELIMIT) buffered before sending.
- TCPWINDOWSIZE: Specifies the size of the TCP/IP sliding window on the client. This is the size of the buffer used when sending data.
- TXNBYTELIMIT: The number of kilobytes ADSM should buffer before sending a transaction to the server.

We found we got the best performance over the ESCON adapter using the values in Figure 56. The parameter that seemed to have the most significant effect was the TCPWINDOWSIZE. The default for this on Windows NT is 32. By changing this to 2048 we significantly improved performance.

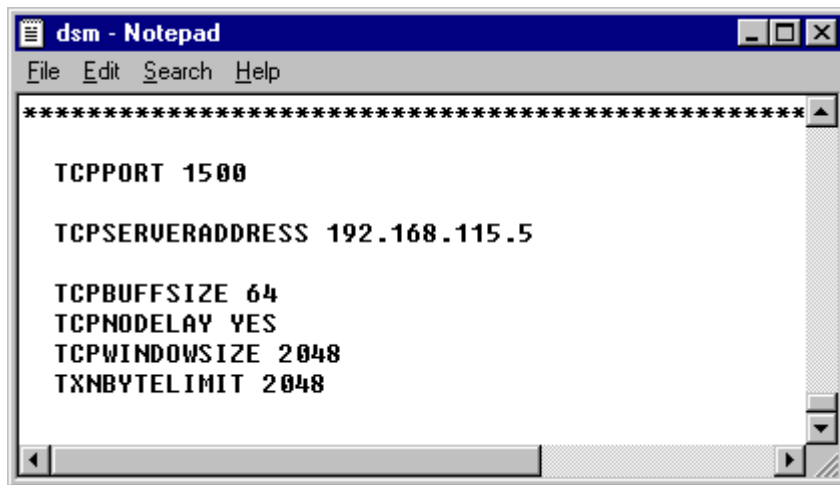


Figure 56. ADSM Client Options - dsm.opt File

Chapter 8. HSAS Example

The High Speed Access Services (HSAS) function of eNetwork Communications Server for OS/390 (CS for OS/390) V2R5 consists of High Speed UDP (previously documented as "HPDT for UDP") and High Speed Web Access (new for CS for OS/390 V2R5). High Speed UDP supports DCE, NFS and SAP.

HSAS exploits CS for OS/390's High Performance Data Transfer (HPDT) and Multiprotocol Channel with Common Storage Management (MPC+) and is tightly coupled with the OS/390 UNIX System Services kernel to achieve high performance and minimize CPU utilization. HSAS is managed through OS/390 OpenEdition UNIX commands and supports RIPv2 routing.

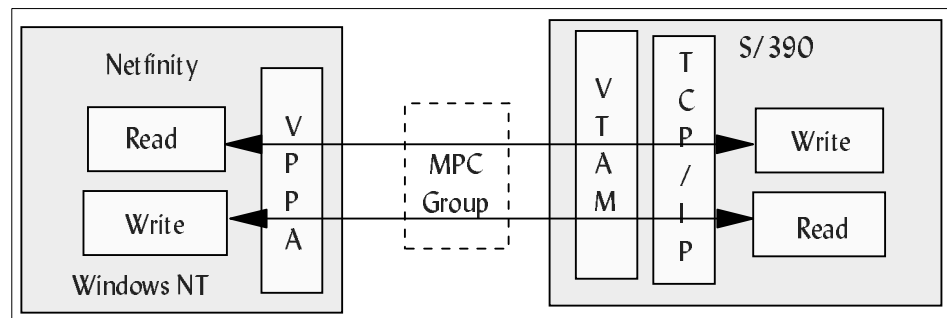


Figure 57. HSAS Overview

The Netfinity ESCON adapter is designed to use HSAS for connectivity to SAP on the mainframe. In addition, SAP requires a VPPA CTC connection (see "VPPA Example" on page 71) for FTP services.

8.1 HSAS Example

This example will illustrate setting up an HSAS connection from Netfinity to the S/390 host. HSAS connections are currently supported for SAP. TCP/IP HSAS connections on the S/390 host use VTAM to drive the physical connection.

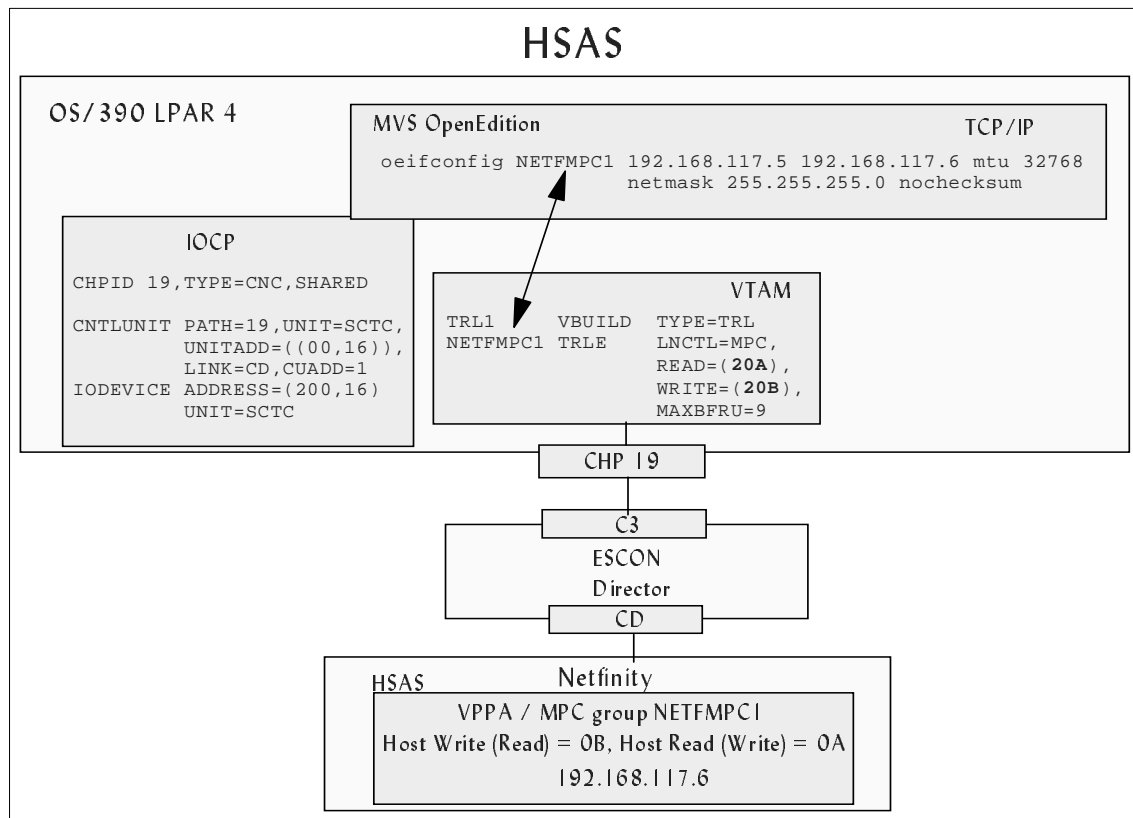


Figure 58. HSAS Example

8.2 Planning

Prerequisites:

To support HSAS, you must be running a minimum of OS/390 R3, TCP/IP V3R2 (+PTF UQ07222), TCP/IP OpenEdition (+PTF UQ07223), and VTAM 4.4.

HSAS, known as HPDT for UDP in TCP/IP V3R2, is documented in the *OS/390 TCP/IP Update Guide* for TCP/IP V3R2. For OS/390 R5, it is documented as HSAS in the *High Speed Access Services User's Guide*.

Preparing for Connection

Before you begin, you should do some planning with your host TCP/IP administrator and your host system programmer.

The TCP/IP administrator must provide the following:

IP address for the Netfinity MPC+ end	
IP address for the host MPC+ end	
MTU size	
Subnet mask	

The host system programmer must provide the following:

One pair of subchannel addresses to use for the host MPC connection	
ESCON director port leading to the host	
CUADD from the IOCP	
MPC Group name from VTAM TRLE definitions	

8.3 Installation

When planning an ESCON adapter configuration, the first consideration should be the mainframe definitions. You will need information about these definitions to complete the Netfinity ESCON adapter installation. The steps to install and configure a VPPA connection are:

Mainframe Steps

- IOCP definitions

The IOCP definitions for this example are shown in “Host IOCP Definition” on page 86. For information on how to define the ESCON adapter to the mainframe see “IOCP Definitions” on page 40.

- TCP/IP definitions

See “Host TCP/IP Definitions” on page 93 for information on how to define the link to the MPC+ connection to TCP/IP on the host.

- VTAM TRLE definitions

See “HOST VTAM Definitions” on page 93 for information on how to define the MPC+ connection to VTAM.

- Define the stack on the MVS OpenEdition parmlib member

See “MVS OpenEdition” on page 92 for information on adding the HSAS stack to OpenEdition.

Netfinity Steps

- Install the ESCON adapter.
Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.
- Install the PCI ESCON driver.
Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.
- Configure the ESCON adapter.
The ESCON adapter configuration for this example is shown in “ESCON Adapter Configuration” on page 87. For information on how to set up the adapter configuration, see “ESCON Adapter Configuration” on page 42.
- Install the MPC+ driver
The installation is covered in *IBM Netfinity ESCON Adapter Installation Guide*.
- Install and configure the VPPA driver.
The installation is covered in *IBM Netfinity ESCON Adapter Installation Guide*. See “VPPA Adapter Configuration” on page 88 for information on how to set up the configuration and “Windows NT TCP/IP Configuration” on page 91 to define the TCP/IP parameters for the adapter.

8.4 Host IOCP Definition

Even though the connection is driven by VTAM in the host, the connection is a TCP/IP connection and is defined as such. The IOCP definitions on the host for the Netfinity ESCON adapter are the same for all TCP/IP definitions. The IOCP definitions are discussed in “Host Hardware Definition” on page 39.


```
CHPID PATH=((19)),TYPE=CNC,SWITCH=E1,SHARED
*
* Defined TCP/IP subchannels
*
CNLUNIT CUNUMBR=200,UNIT=SCTC,PATH=(19),
      CUADD=1,LINK=(CD),UNITADD=((00,16))
DEV200  IODEVICE UNIT=SCTC,ADDRESS=(200,16),
      CUNUMBR=(200)
```

Figure 59. S/390 IOCP Definitions for TCP/IP

This example will use MVS addresses 20A and 20B, which correspond to subchannels 0A and 0B respectively. The ESCON channel is connected to the Netfinity server through an ESCON director.

8.5 ESCON Adapter Configuration

The next step is to define the ESCON adapter. This tells the ESCON adapter what subchannel addresses to use, the port on the ESCON director that leads to the host, the LPAR to go to, and the emulation type. The ESCON adapter configuration is reached through the Network ICON on the Windows NT control panel. Click on **Adapters** and highlight the ESCON adapter entry. Then click on **Properties**.

The following figure shows the ESCON adapter definition for the Netfinity PC in this example.

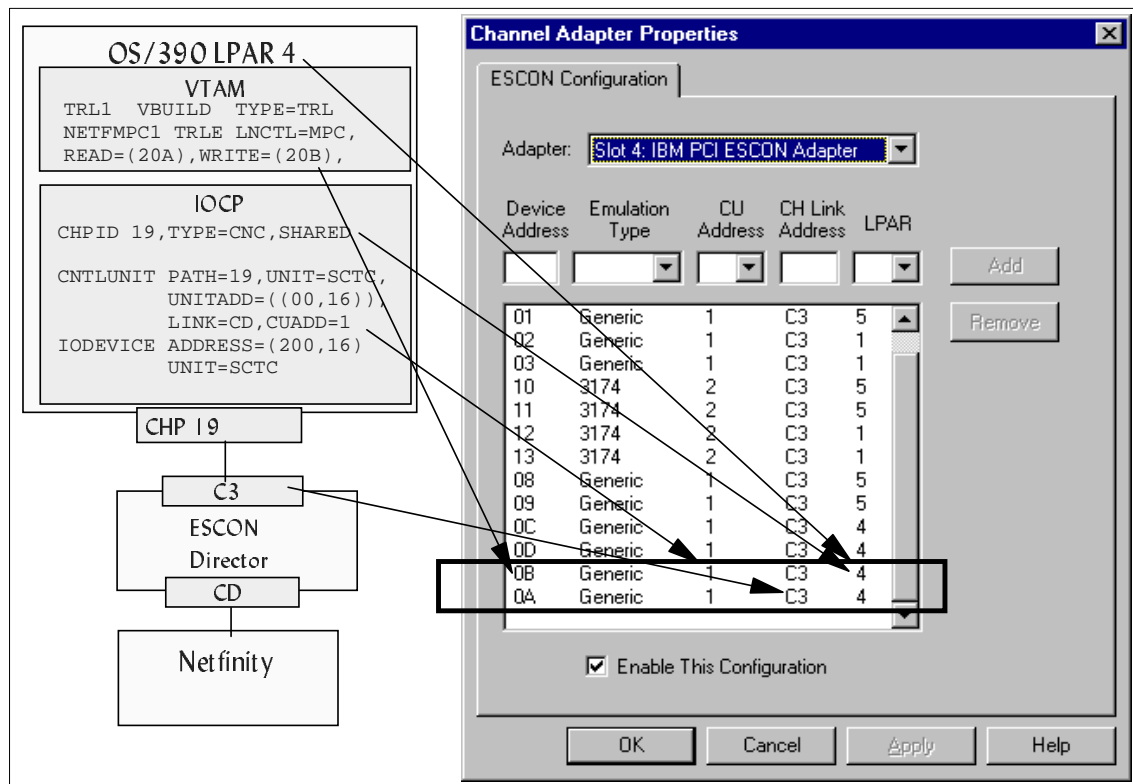


Figure 60. ESCON Adapter Definition

TCP/IP uses a single pair of addresses for HSAS connections. The subchannel range used for this example is 0A and 0B, so the only two definitions needed for this example are the two lines where 0A and 0B are defined.

Parameters for the channel adapter definitions are covered in “ESCON Adapter Configuration” on page 42.

TCP/IP implementations require Generic for the emulation type.

8.6 VPPA Adapter Configuration

The VPPA adapter is a software adapter. The driver is installed from the CD-ROM shipped with the ESCON adapter. The VPPA adapter is configured

to define the HSAS connection. The same connection is defined on the host end with the OS/390 UNIX `oeifconfig` command and the VTAM TRLE definitions. Several of the parameters used in these definitions must match what you specify during the VPPA adapter configuration.

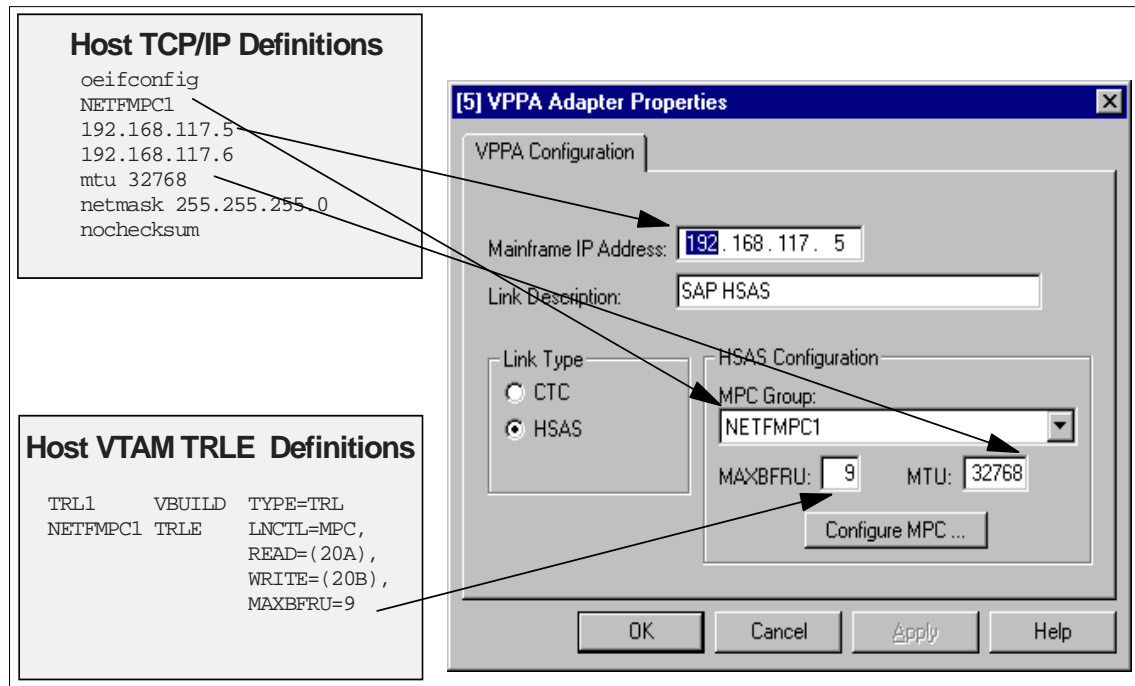


Figure 61. VPPA HSAS Adapter Configuration

Mainframe IP Address

This is the address used to address the mainframe. It must match the `source_ip_address` parameter in the `oeifconfig` command issued under MVS OpenEdition to define this link.

Link Type

Select HSAS for an MPC+ connection.

MTU Size

The maximum transmission unit (mtu) must be the same for the host (specified in the `oeifconfig` command) and the VPPA adapter. For ESCON-attached devices, the range is from 512 to 32768.

MAXBFRU

MAXBFRU must be 9 both here and in the host VTAM TRLE definition.

MPC Group

The MPC group must be configured before you can choose a name. This is the next step. Click on **Configure MPC** to configure the MPC group.

Note: The name you configure must match the name in the host VTAM TRLE definition.

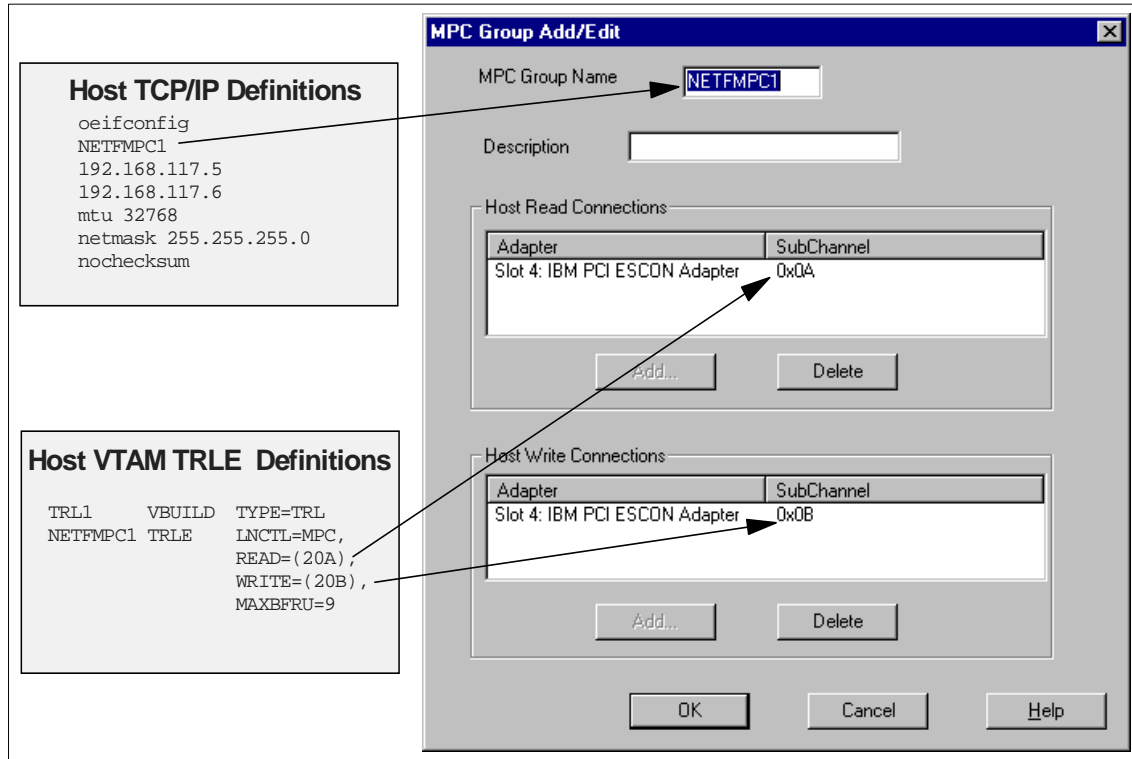


Figure 62. HSAS MPC Group Configuration

MPC Group Name

Once again, remember, this must match the host VTAM TRLE definitions and the value you specify in the oeifconfig command.

Host Connections

In the MPC group definitions you must tell the VPPA adapter which subchannel the host will read from and write to. The subchannel will correspond to an MVS device address coded in the VTAM TRLE definitions.

This may be a little confusing to anyone who has used other ESCON adapters to attach to the host. With MPC, you define a pair of subchannels to

use, one "read" subchannel and one "write" subchannel. The subchannel one end reads from is the subchannel the other writes to, and often the definitions will look reversed on each side. For example, on the RS/6000 ESCON adapter, you would define a subchannel as read on the RS/6000 and the corresponding MVS device address as write on the host end.

In the VPPA adapter, you define what the host will read from, not the VPPA adapter. So the subchannel you have under the Host Read column must match the corresponding MVS device address in VTAM defined as a read subchannel. The same goes for the write subchannel.

8.7 Windows NT TCP/IP Configuration

After the VPPA driver is installed and MPC configured, you need to configure the TCP/IP protocol parameters. When you close the VPPA adapter configuration, Windows NT will bind the adapter to the TCP/IP protocol and present a panel for the TCP/IP configuration parameters.

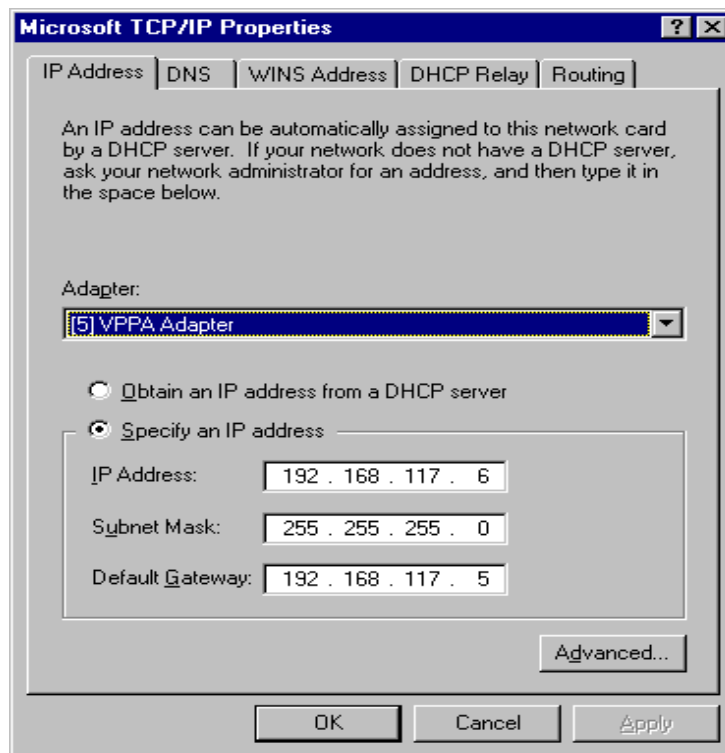


Figure 63. Windows NT TCP/IP Configuration for HSAS

Make sure the VPPA adapter you just added is selected, and enter the IP address and subnet mask for this interface. The IP address will be the same as the `destination_ip_address` in the `oeifconfig` command.

The default gateway will be the IP address configured for the host end. This is the same as the `source_ip_address` in the `oeifconfig` command.

8.8 MVS OpenEdition

Socket applications must use the OpenEdition socket library to access HSAS. The common INET feature provided by the OpenEdition socket library allows multiple AF_INET transport drivers to provide access to the IP network as if they were a single entity. From a socket application perspective, the existence of multiple transport drivers is entirely transparent. However, the HSAS transport driver must be configured, and administrated separately from the full-function stack.

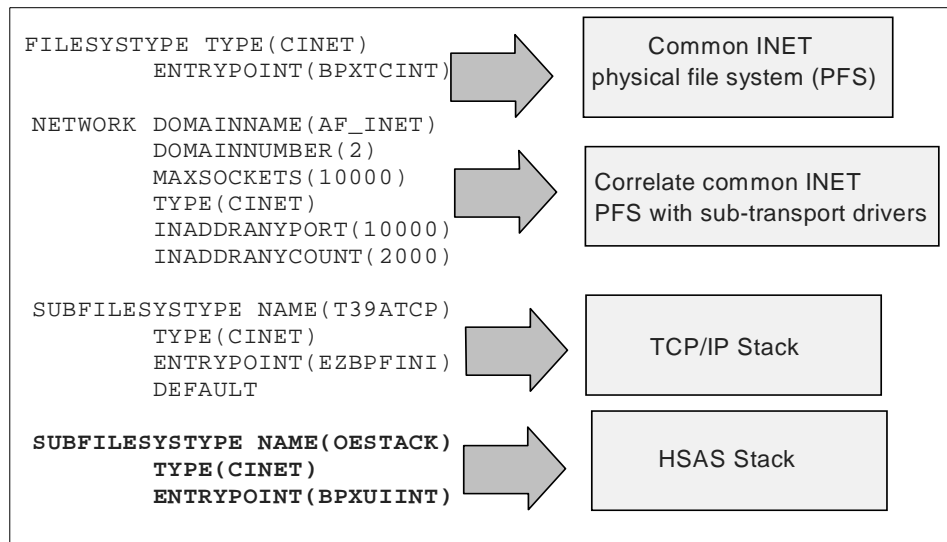


Figure 64. MVS OpenEdition Definition

To add the HSAS stack to the MVS OpenEdition parameters in the `BPXPRMxx` member in `SYS1.PARMLIB`, you must add the `OESTACK` `SUBFILESYSTYPE`. Code it exactly as shown in the highlighted portion of Figure 64.

8.9 HOST VTAM Definitions

VTAM on the host must have a transport resource list entry (TRLE) defined to identify the MPC channel parameters. The name given to the TRLE (NETFMPC1 in this case) must match the resource name in the oeifconfig command and the VPPA adapter MPC group name.

```
*****
*      DEFINITIONS FOR MPC CONNECTION TO NETFINITY ESCON      *
*****
TRL1      VBUILD  TYPE=TRL
NETFMPC1 TRLE      LNCTL=MPC,READ=( 20A) ,WRITE=( 20B) ,MAXBFRU=9
```

Figure 65. Host VTAM Definitions

MAXBFRU: specifies the number of 4K buffer pages VTAM uses to receive data when activating a multipath channel. The same MAXBFRU value is used for each of the READ subchannels. The resulting buffer size is number_of_pages multiplied by 4K. The total buffer space used is 4K multiplied by number_of_pages multiplied by the number of READ subchannels.

Note: For an HSAS connection to the Netfinity ESCON adapter card, this value must be 9.

MPCLEVEL=HPDT: indicates that HPDT MPC is to be used for the connection. This is required for HSAS and is the default.

8.10 Host TCP/IP Definitions

The TCP/IP definitions are entered on the host using UNIX commands under OpenEdition. After logging on to TSO, go to the TSO command option and enter OMVS. This will put you in an OpenEdition session. The oeifconfig command is used to define/delete, query, and activate/deactivate the HSAS connection.

Defining HSAS with oeifconfig:

The syntax for defining the HSAS session is:

```
oeifconfig trlename source_ip_address destination_ip_address mtu
mtu netmask mask nochecksum
```

- *trlname*: must match the VTAM TRLE name
- *source_ip_address*: the home IP address for the OS/390 host
- *destination_ip_address*: the IP address for the Netfinity side
- *mtu mtu*: the maximum transmission unit (mtu) must match the mtu specified in the VPPA configuration (see Figure 61).
- *netmask mask*: subnet mask for the interface
- *nochecksum*: says this is a reliable interface

Figure 66 shows the *oeifconfig* command for this example.

```

IBM
Licensed Material - Property of IBM
5647-A01 (C) Copyright IBM Corp. 1993, 1998
(C) Copyright Mortice Kern Systems, Inc., 1985, 1986.
(C) Copyright Software Development Group, University of Waterloo, 1989.

All Rights Reserved.

U.S. Government users - RESTRICTED RIGHTS - Use, Duplication, or
Disclosure restricted by GSA-RDP schedule contract with IBM Corp.

IBM is a registered trademark of the IBM Corp.

-----
- Improve performance by preventing the propagation -
- of TSO/E or ISPF STEPLIBs
-----

SADTLER # RA39: />oeifconfig netfmpc1 192.168.117.5 192.168.117.6 mtu 32768 netma
sk 255.255.255.0 nochecksum
SADTLER # RA39: />
===> _

INPUT
ESC=␣ 1=Help 2=SubCmd 3=HlpRetrn 4=Top 5=Bottom 6=TSO
7=BackScr 8=Scroll 9=NextSess 10=Refresh 11=FudRetr 12=Retrieve
21/087

```

Figure 66. Host TCP/IP Definitions

Displaying the Connection with *oeifconfig*

You can also display the mpc connection with the *oeifconfig* command:

```
oeifconfig trlname
```



```
SADTLER @ RA39: />oeifconfig netfmpc1
netfmpc1: flags= d0 < POINTOPOINT RUNNING NOARP >
        inet 192.168.117.5 netmask 0xffffffff destination 192.168.117.6
SADTLER @ RA39: />
```

Figure 67. Displaying with *oeifconfig*

The meaning of the flags, in this case d0, is spelled out in the <> beside it. Flag d0 means the link is point-to-point, running, and the interface does not use address resolution protocol.

An explanation of the flags is in the *High Speed Access Services User's Guide*.

Activating the Connection with *oeifconfig*

There may be occasions when you need to activate or inactivate the interface. In particular, after powering down the Netfinity PC, you may have to reactivate the link.

You can check the VTAM TRLE (D NET,TRL) to see if the VTAM interface is active. If it shows a status of INACT, you need to activate the TCP/IP interface. This will cause the TRLE to activate.

Or, if you see the link is not up by using the *oenetstat -i* command (no "UP" status at the end), you need to activate the link.

- *oeifconfig trlename up*
- *oeifconfig trlename down*

Removing the Definition with *oeifconfig*

If you need to remove the definition, use the *oeifconfig* command detach option:

```
oeifconfig trlename detach
```

Checking the Connection with *oeiping*

Use the *oeiping* command to check the MPC connection. The format is:

```
oeiping -c count address
```

There are other flags available, but this is the simplest form to verify the link is working. Use the -c flag to determine the number of times you want to ping. The default is to keep pinging until an interrupt is received.

```

SADTLER @ RA39: />oeping -c 5 192.168.117.6
OEPING 192.168.117.6 (192.168.117.6): 56 data bytes
64 bytes from 192.168.117.6: icmp_seq=0 ttl=54 time=251.387 ms
64 bytes from 192.168.117.6: icmp_seq=1 ttl=54 time=24.777 ms
64 bytes from 192.168.117.6: icmp_seq=2 ttl=54 time=4.966 ms
64 bytes from 192.168.117.6: icmp_seq=3 ttl=54 time=5.219 ms
64 bytes from 192.168.117.6: icmp_seq=4 ttl=54 time=4.723 ms

--- 192.168.117.6 oeping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 4.723/58.214/251.387 ms

```

Figure 68. oeping

For more information on the command and other flags see the *High Speed Access Services User's Guide*.

oenetstat

The oenetstat command displays HSAS network information from the internal data structures of the HSAS communication stack. It is normally used for diagnostic or tuning purposes.

- oenetstat -i shows the information about each interface
 - Interface Name
 - mtu size
 - Interface IP address
 - Number of incoming packets received and those in error
 - Number of outgoing packets sent and those in error
 - Interface stat
 - Maximum blocking factor attained for this interface
 - Current blocking factor for this interface

Blocking factor represents the output load on the interface. A higher value indicates a greater load.

- oenetstat -r shows the routing table

Flags:

- U - route is up
- G - route to destination is indirect (that is, a gateway is being used)
- H - route is to a host
- L - route is local to this host
- S - route is a static route added using the oeroute command

```

SADTLER @ RA39: /> oenetstat -r
Destination Gateway      Flags  Refs      Use Unreach Interface
192.168.117.5 *          UHL    0         0         0 NETFMPC1
192.168.117.6 192.168.117.6 UH     0         77        0 NETFMPC1
127.0.0.0      *          UL     0         0         0 LO0
SADTLER @ RA39: />
SADTLER @ RA39: />
SADTLER @ RA39: /> oenetstat -i
Name      Htu Address/      Ipkts  Ierrs    Opkts    Oerrs
          Network
LO0       32768 127.0.0.1     0       0         0         0 up
          127.0.0.0     1         1
NETFMPC1 32768 192.168.117.5 2       0    10527625    0 up
          192.168.117.5 1         1

```

Figure 69. oenetstat

Chapter 9. CS/NT TN3270E Server Example

With IBM's eNetwork Communication Server for Windows NT (CS/NT), Microsoft's SNA Server, or IntranetWare for SAA from IBM and Novell, you can use the Netfinity PC as a TN3270E server. The TN3270E server function enables TCP/IP users to access applications on a host machine in an SNA network. Any industry-standard TN3270 or TN3270E client workstation can connect to the TN3270E server for access to SNA networks. Downstream workstations will telnet 3270 to the TN3270E server via TCP/IP. In turn, the TN3270E server will use the LU-A interface upstream in order to access an SNA network.

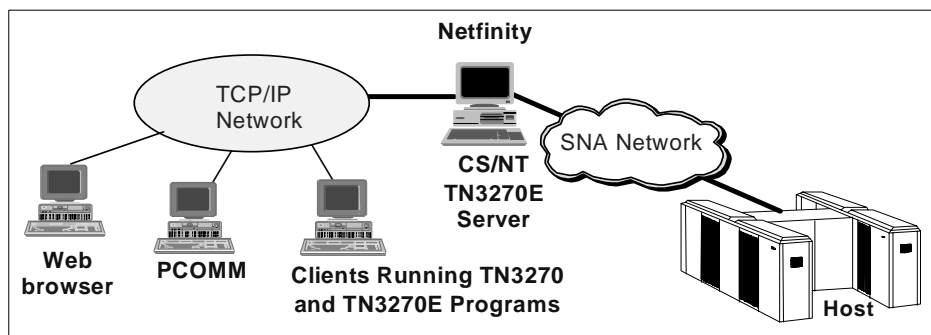


Figure 70. TN3270E Server

9.1 CS/NT TN3270E Server Example

This example will show the TN3270 function for IBM's Communications Server for Windows NT (CS/NT).

To illustrate the CS/NT TN3270E server functions we have set up an environment that assumes a customer with multiple LPARs running MVS with several key applications. The customer has a large user base, located on a TCP/IP network, that requires access to the host applications. The customer is able to determine, by the IP address of the client, the application needed.

The customer will set up a TN3270 environment, using the Netfinity server and ESCON connection to give quick, reliable access to the host applications. To accommodate Web clients, they will install Host On-Demand and a Web server in the Netfinity PC. The Host On-Demand will use the TN3270 environment to connect Web browsers to host applications.

Setup:

- Two LPARS on a 9672, each running MVS and VTAM.
- One ESCON connection from the 9672 to the Netfinity PC via an ESCON Director. The connection will be shared among the two LPARs for VTAM and TCP/IP functions.
- The Netfinity server is running Windows NT.
- MVS in LPAR 1 has two key applications, TSO and NetView Access. Two PUs are defined, each with a default logon to the appropriate application.
- MVS in LPAR 5 also has two key applications, IMS and CICS. Two PUs are defined, each with a default logon to the appropriate application.
- The CS/NT TN3270E server will be set up to take incoming telnet traffic and based on the client IP address, connect the user to the appropriate application.

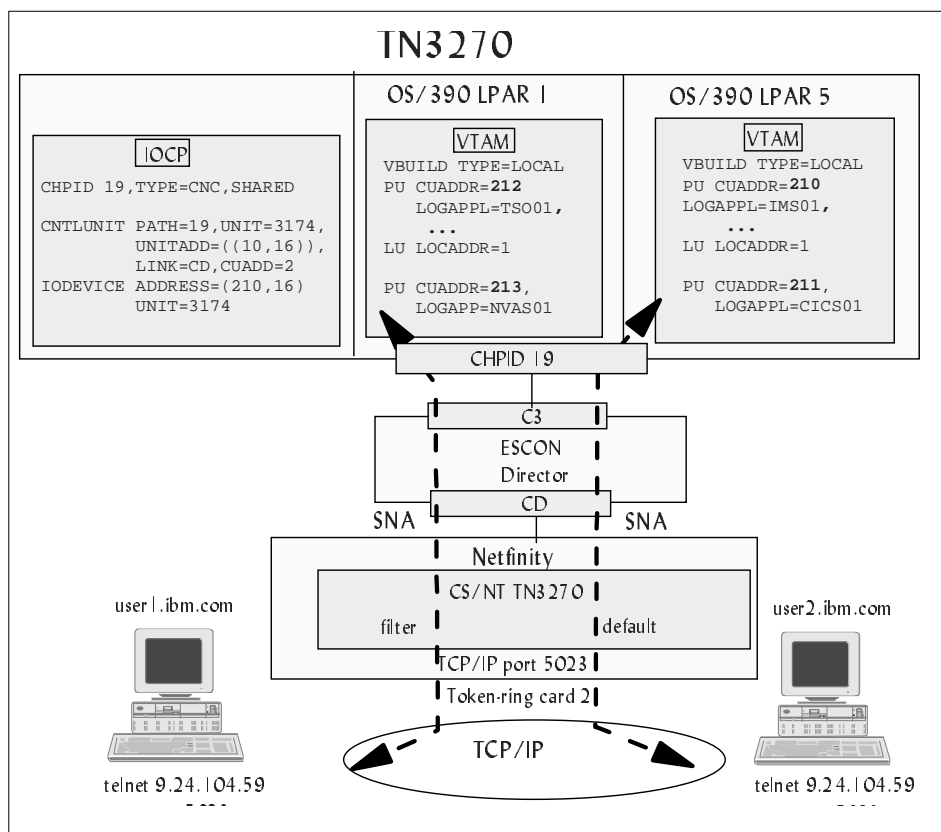


Figure 71. TN3270 Example

9.2 Planning

Before you begin, you should do some planning with your host TCP/IP administrator and your host system programmer.

The TCP/IP administrator must provide the following:

IP address for the Netfinity TCP/IP LAN adapter	
Decide on a port number for the TN3270E server	
Plan for TN3270E server filtering if desired	

The host system programmer must provide the following:

One subchannel address to use for each host PU (CS/NT link) to be defined	
ESCON director port leading to the host	
CUADD from the IOCP	

The host VTAM system programmer must provide the following:

Host CPNAME	
VTAM PU definitions	

You will need a LAN adapter for the incoming TCP/IP requests. Note that this adapter must be bound to the TCP/IP protocol, so if you are also using TCP/IP passthrough over the ESCON adapter, this must be a separate adapter.

9.3 Installation

When planning an ESCON adapter configuration, the first consideration should be the mainframe definitions. You will need information about these definitions to complete the Netfinity ESCON adapter installation. The steps to install and configure an SNA connection are:

Mainframe Steps

- IOCP definitions

The IOCP definitions for this example are shown in “Host IOCP Definition” on page 102. For information on how to define the ESCON adapter to the mainframe see “IOCP Definitions” on page 40.

- Host VTAM definitions

See “VTAM Definitions” on page 115 for information on how to define the VTAM parameters.

Netfinity Steps

- Install the ESCON adapter.
Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.
- Install the PCI ESCON driver.
Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.
- Configure the ESCON adapter.
The ESCON adapter configuration for this example is shown in “ESCON Adapter Configuration” on page 103. For information on how to set up the adapter configuration see “ESCON Adapter Configuration” on page 42.
- Install the Data Link Control (DLC) for Communications Server for Windows NT.
Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.
- Install Communications Server for Windows NT and configure it for the TN3270 scenario.
- Inform the users of the correct parameters (IP address and port) to use to reach the TN3270E server

9.4 Host IOCP Definition

The TN3270 connection to the host is an SNA connection. The IOCP definitions on the host for the Netfinity ESCON adapter are the same for all SNA functions. The IOCP definitions are discussed in “Host Hardware Definition” on page 39.


```
HPID PATH=((19)),TYPE=CNC,SWITCH=E1,SHARED
*
* Defined SNA subchannels
*
CNLUNIT CUNUMBR=210,UNIT=3174,PATH=(19),
      CUADD=2,LINK=(CD),UNITADD=((10,16))
DEV210  IODEVICE UNIT=3174,ADDRESS=(210,16),
      CUNUMBR=(210)
```

Figure 72. S/390 IOCP Definitions for TCP/IP

This example will use the four SNA PUs, requiring the four MVS addresses 210, 211, 212, and 213 which correspond to subchannels 10, 11, 12, and 13 respectively. The IOCP is defined with a range of 16 addresses, allowing for future growth. The ESCON channel is connected to the Netfinity server through an ESCON director.

9.5 ESCON Adapter Configuration

The next step is to define the ESCON adapter. This tells the ESCON adapter what sub-channel address to use, the port on the ESCON director that leads to the host, the LPAR to go to, and the emulation type. The ESCON adapter configuration is reached through the Network ICON on the Windows NT control panel. Click on **Adapters** and highlight the ESCON adapter entry. Then click on **Properties**.

The following figure shows the ESCON adapter definition for the Netfinity PC in this example. VTAM requires one address for each PU (CS/NT link). This example shows SNA definitions for four subchannels, 10,11,12, and 13.

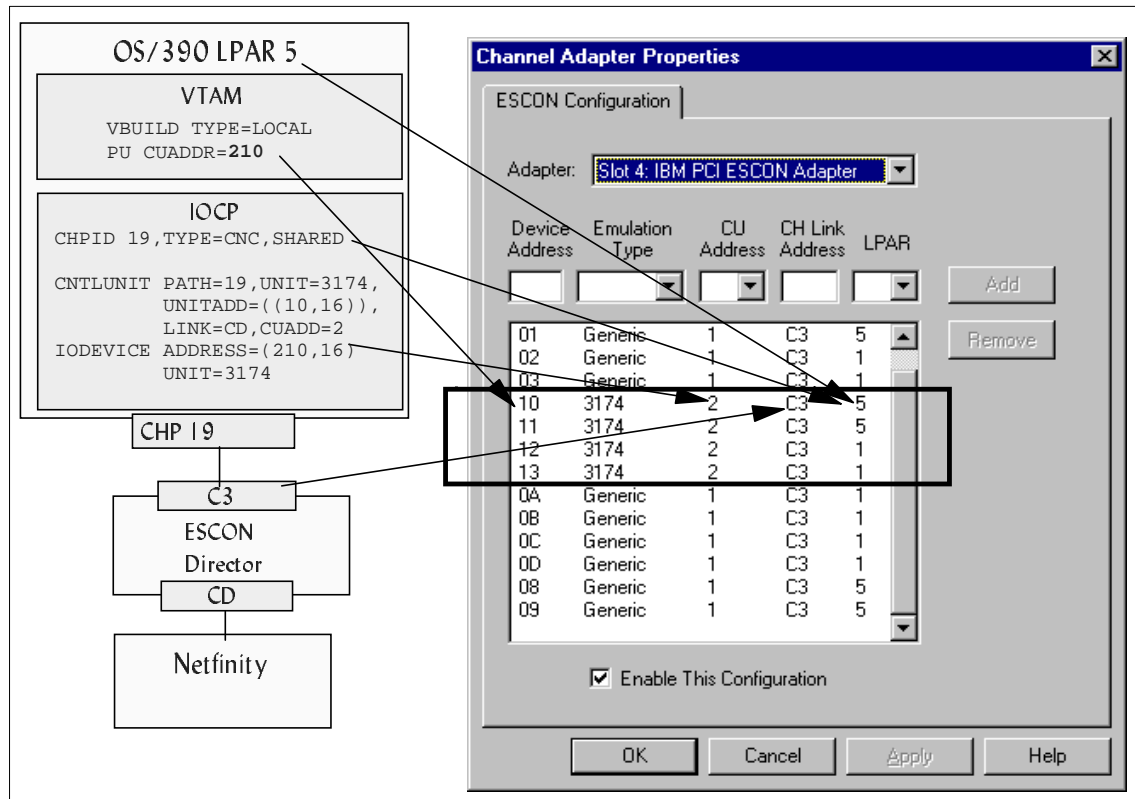


Figure 73. Escon Adapter Configuration

SNA implementations require 3174 for the emulation type.

Parameters for the channel adapter definitions are covered in “ESCON Adapter Configuration” on page 42.

9.6 CS/NT Configuration

To define the CS/NT environment, we use the TN3270E scenario in the CS/NT configuration panels. The following figure shows the scenario configuration options. The left panel shows the steps required to complete the configuration. The right panel shows the resource types to define, and the defined resources.

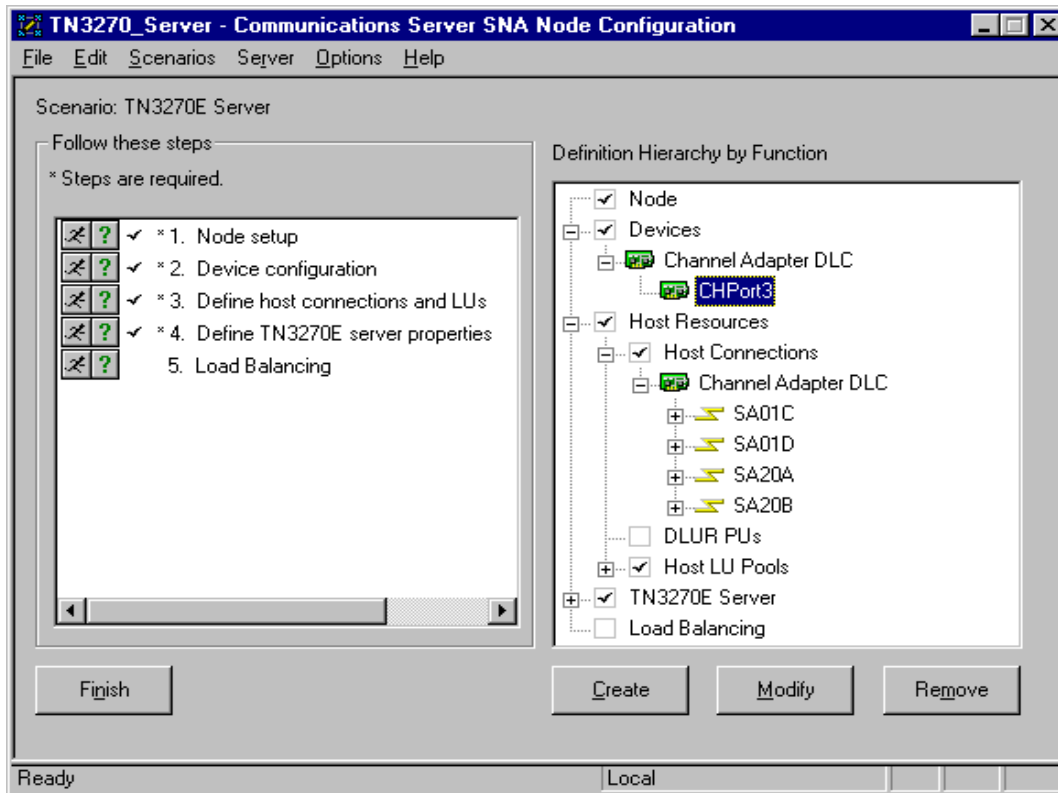


Figure 74. TN3270E Server Scenario

9.6.0.1 Define the Node

If the node has not been defined, you will need to do so. Our node is set up as a network node, but this is not necessary for TN3270 functions. It could also be an end node.

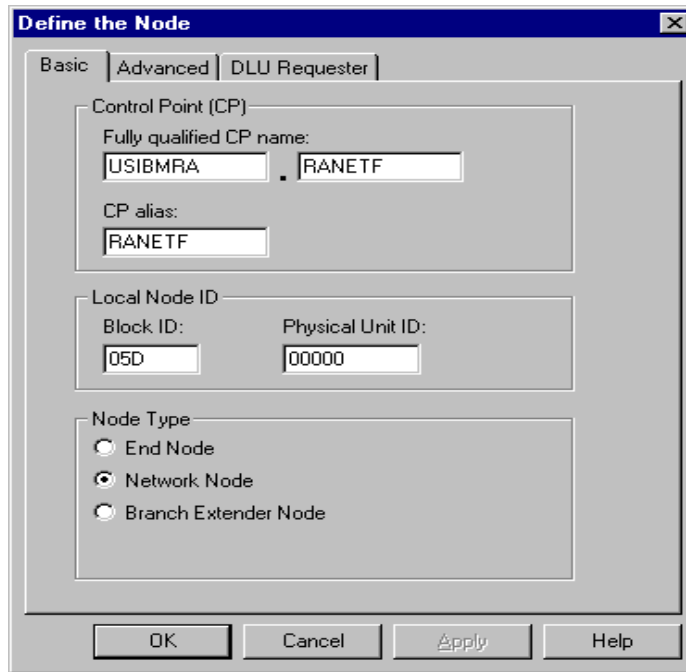


Figure 75. CS/NT Node Definition

9.6.0.2 Define the ESCON Adapter DLC

Once the node is defined, you must define the ESCON adapter as a device to CS/NT. The DLC driver must be installed first as mentioned in "Installation" on page 101. The DLC driver is shipped with the ESCON adapter. Once the DLC is installed, you have the option of choosing the ESCON adapter in the Available Adapters field. The figure below shows the definitions for our example.

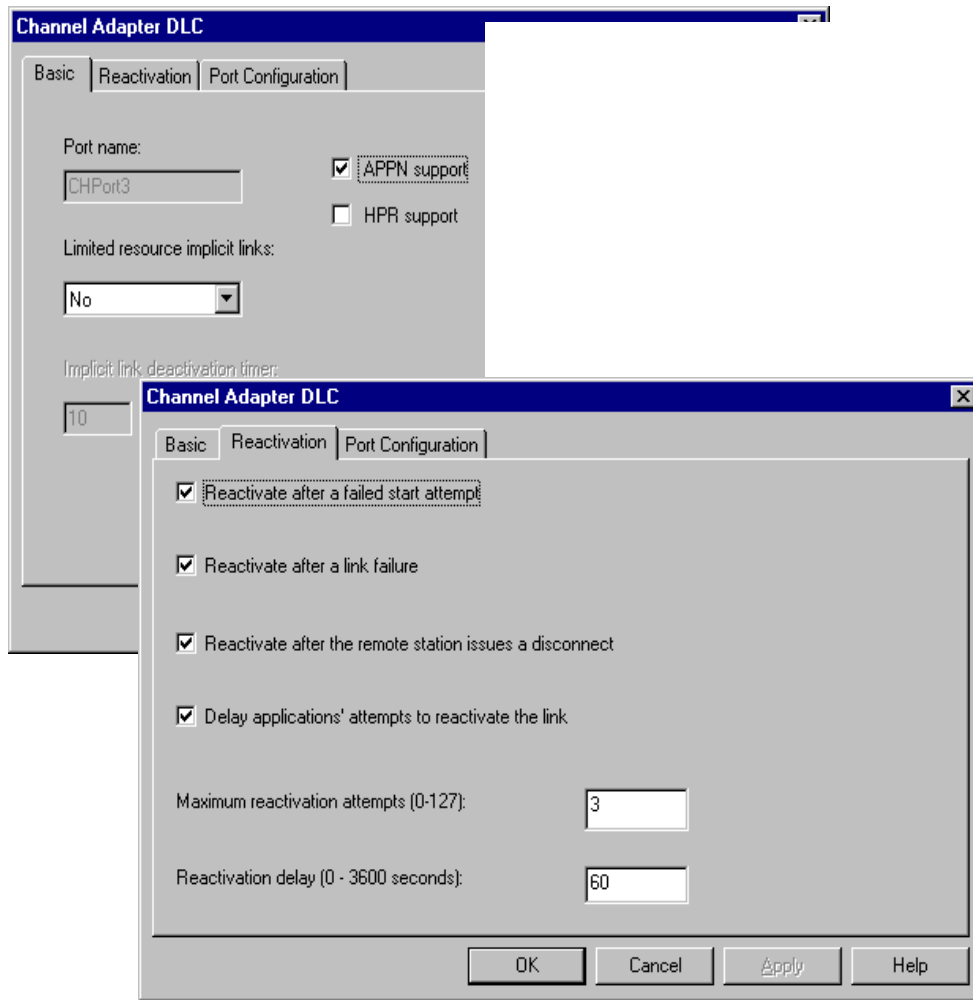


Figure 76. CS/NT Channel Adapter Device

9.6.0.3 Define the Host Connections

Next you will need to define the host connection to CS/NT:

- Use the Port name assigned in the device definition for the ESCON adapter.
- Assign a link station name. This name is arbitrary, but it helps later when you are monitoring connections to give it a meaningful name.
- We took all the defaults under the Advanced tab, and the Reactivation tab.

- The most important parameter is the PU address in the Link Configuration tab. This must match the subchannel address corresponding to the MVS device address coded in the VTAM PU. You can see the definitions for our example in Figure 73 on page 104.

In our example the MVS VTAM definitions will use MVS addresses 210, 211, 212, and 213. They correspond to subchannel addresses 10, 11, 12, and 13, respectively. Each channel adapter DLC host connection will use one subchannel address, which will correspond to one PU in the host.

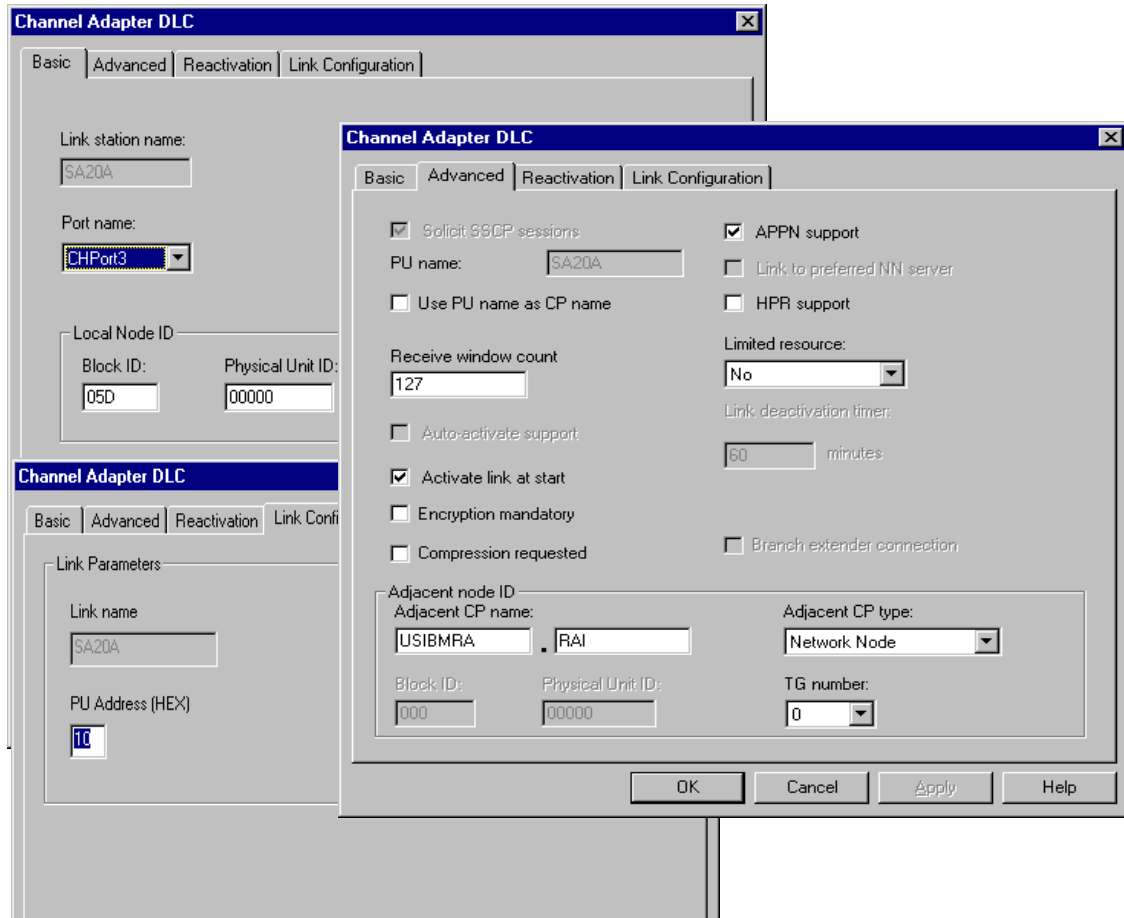


Figure 77. CS/NT Host Connection

Note that we increased the receive window count from the default, 7, to 127. The receive window count determines the maximum number of I frames that

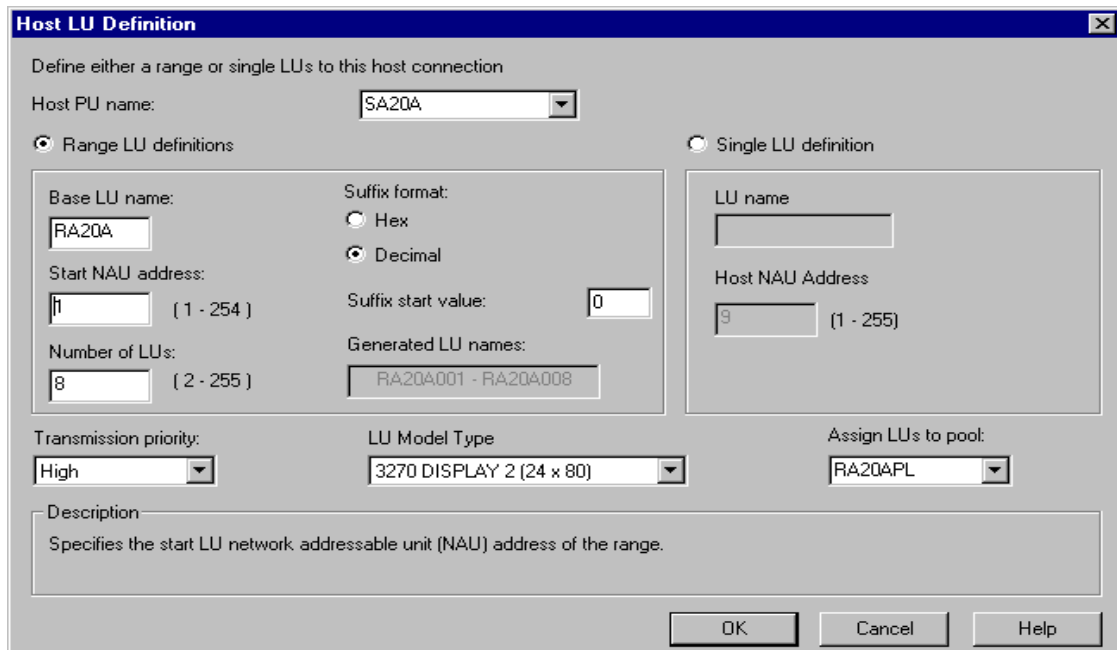
can be received by the local link stations before an acknowledgment is sent. 127 is the maximum.

On a direct connection to the host, used by TN3270 clients, HPR is not necessary. In fact, because HPR is designed for networks with many nodes between endpoints, enabling HPR in this instance may even slow down response time and lessen link utilization. However, HPR will provide non-disruptive route switching, and you may want to consider using it for high availability purposes.

9.6.0.4 Define LUs

When you finish a host connection definition, you will be asked if you want to define LUs for that connection. Each host connection/PU can have 255 LUs. The names chosen do not have to match the host LU names. You will be given the opportunity to define them individually or as a range (much easier!).

The LUs must have corresponding LUs defined on the host. CS/NT supports SDDL, which makes this very easy in VTAM. The LUs do not need to be individually coded but can be created using an exit shipped with VTAM when needed. This is explained in more detail in "VTAM SDDL" on page 139.



The image shows a Windows-style dialog box titled "Host LU Definition". The dialog has a close button (X) in the top right corner. The main text reads "Define either a range or single LUs to this host connection". Below this, there is a "Host PU name:" dropdown menu with "SA20A" selected. There are two radio buttons: "Range LU definitions" (which is selected) and "Single LU definition".

The "Range LU definitions" section contains several fields: "Base LU name:" with a text box containing "RA20A"; "Start NAU address:" with a text box containing "11" and a range "(1 - 254)"; "Number of LUs:" with a text box containing "8" and a range "(2 - 255)"; "Suffix format:" with radio buttons for "Hex" and "Decimal" (selected); "Suffix start value:" with a text box containing "0"; and "Generated LU names:" with a text box containing "RA20A001 - RA20A008".

The "Single LU definition" section contains: "LU name" with an empty text box; and "Host NAU Address" with a text box containing "9" and a range "(1 - 255)".

At the bottom of the dialog, there are three dropdown menus: "Transmission priority:" set to "High"; "LU Model Type" set to "3270 DISPLAY 2 (24 x 80)"; and "Assign LUs to pool:" set to "RA20APL". Below these is a "Description:" text area containing the text "Specifies the start LU network addressable unit (NAU) address of the range." At the very bottom are three buttons: "OK", "Cancel", and "Help".

Figure 78. CS/NT LU Definitions

For this example we defined a range of 8 LUs for each connection, starting with LOCADDR=1.

With functions like TN3270E server and SNA gateway, it is much easier to work with LUs in pools, rather than individual LUs. You may create LU pools before or after you create LUs. If creating the pool before the LUs, you simply do not add LUs to the pool during pool definition. Later, when defining the LUs, you will have the option of adding them to a pool. This is what we have done in Figure 78. We pre-defined the RA20APL pool and added the LUs to it in the LU definition panel.

You may also choose to create the LU pools later. In this case you would not assign the LUs to a pool when defining the LUs. You would create the LU pools and choose the LUs to add to it at that time.

The following figure shows the CS/NT configuration panel. You can see that we have defined several host connections over the ESCON channel. The LUs created will be listed under the host connection to be used for those LUs.

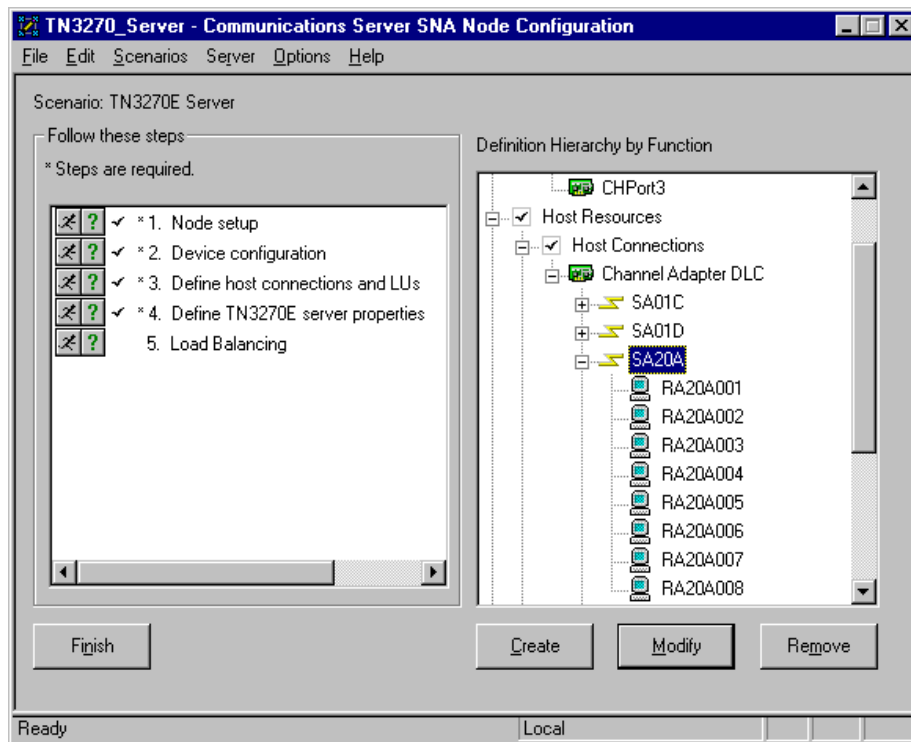


Figure 79. CS/NT TN3270E Scenario

9.6.0.5 TN3270E Server Configuration

The last thing to do is to define the TN3270 options. For TN3270 clients to connect to a host through this server, the TN3270E server must have available host LUs. The first step in TN3270E server configuration is to decide which LU pools will be used.

Clicking on **TN3270E Server** in the node configuration panel will give you a panel listing the available LU pools.

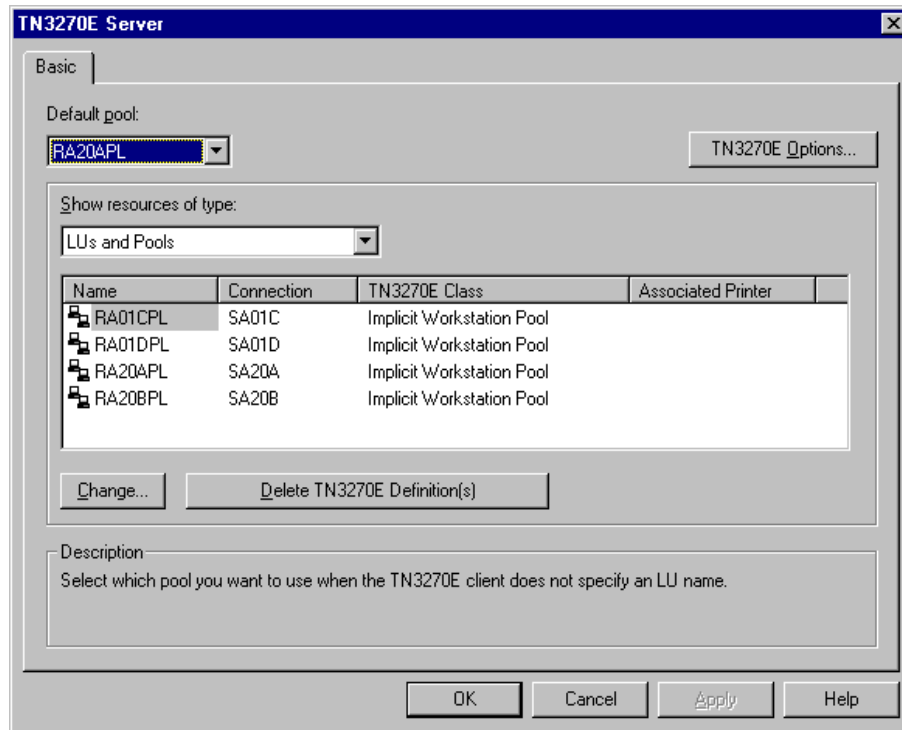


Figure 80. TN3270E Server LU Pools

They will initially be unassigned. Double click on a pool to add it for use to TN3270.

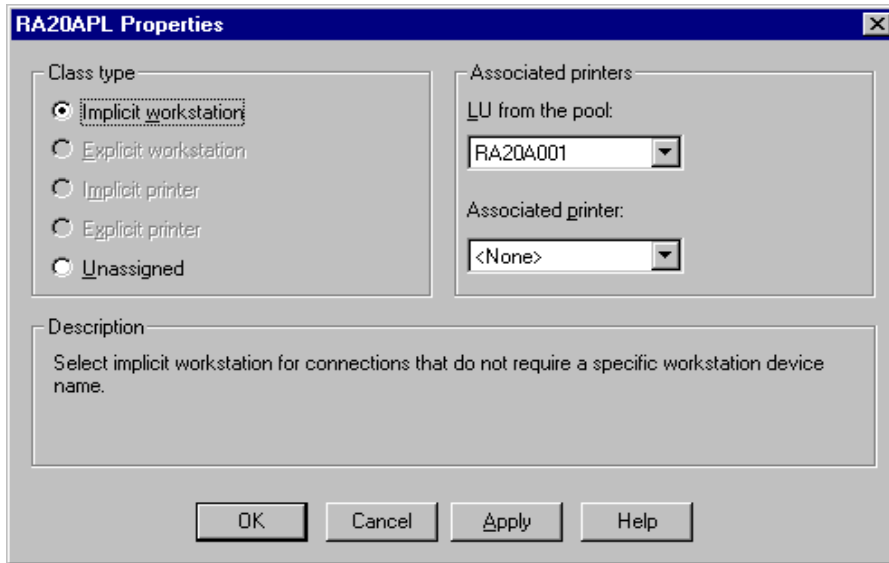


Figure 81. Assign a Pool for TN3270E Server Use

Click on **Apply** to add the pool. You will be returned to the panel in Figure 80. Next click on **TN3270E Options** to complete the TN3270E server definitions.

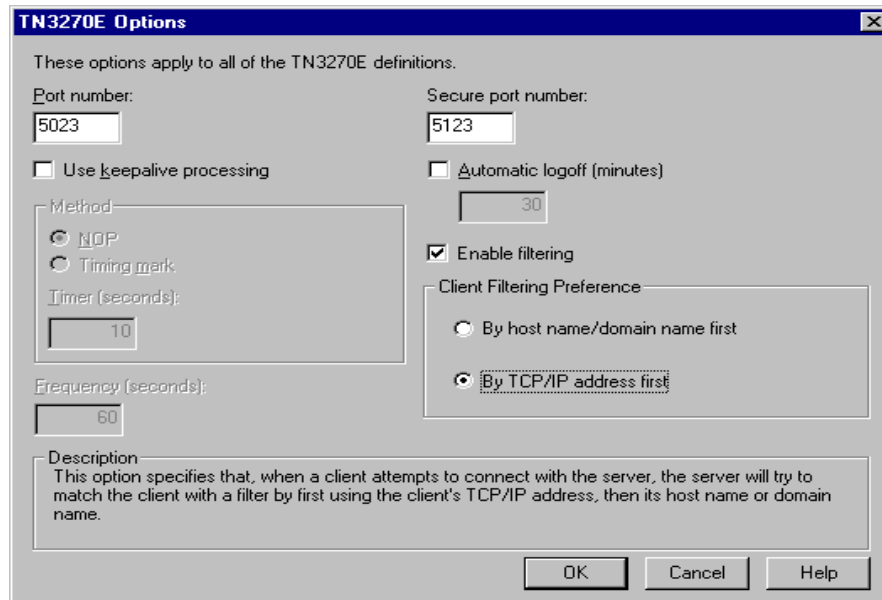


Figure 82. TN3270E Server Definitions

Default Port Number: The default port in TN3270E server is 23. Telnet typically uses port 23, too, so if TELNETD and TN3270E server are running and using the same port, one of the applications will fail. If you change the port number from 23, you should notify TN3270 client users, because they must change their configuration to use the number specified here. TN3270E server does not support multiple ports in CS/NT V6.

Automatic Logoff: This technique uses the amount of time that a connection is idle to determine when a connection is freed.

Keepalive Processing: This technique manages two ways to control the disconnection of unused TCP/IP connections. You can choose either:

- NOP processing

Use if it is not necessary to free connections after a specific amount of time. After a specified frequency the connection is tested to see if it is broken.

- Timing mark processing

Use if it is necessary to define when connections are freed and additional traffic on the network is acceptable. Detection and freeing of the connection will take place as defined by timer. After the specified time, if the client has not responded, the connection is freed.

Secure port number: Enter the port number to be used for encrypted Secure Sockets Layer (SSL) communications between a client workstation and this TN3270E server.

IP Filtering: If you select this check box, only TCP/IP workstations matching the IP address and subnet mask of at least one of the filter definitions will be allowed access to the host resources defined in the appropriate filter(s). If the check box is not selected, then any TCP/IP workstation will be granted access to available TN host resources.

Note: If the enable filtering check box is selected and you do not define any filters, then none of the TCP/IP workstations will be granted access to available TN3270E host resources.

You can select:

- By host name/domain name first

This option searches the filters using host name or domain name filtering first. If the client workstation does not match any of these filters, the other option is used.

- By TCP/IP address first

This option searches the filters using TCP/IP address filtering first. If the client workstation does not match any of these filters, the other option is used.

9.6.0.6 Filters

CS/NT has the ability to use filters on the server side to limit or restrict the use of host LUs and host LU pools to specific telnet client workstations. These filters can also be thought of as a default logon method. By routing specific users to specific LU pools, you can automatically determine the host PU and VTAM default logon application they will use. There are three different ways to filter clients:

- Client TCP/IP address
- Client TCP/IP host name
- Client TCP/IP domain name

To show a quick example of how filtering works, we have set up filters to identify clients by IP address. The following figure shows the configuration for this example.

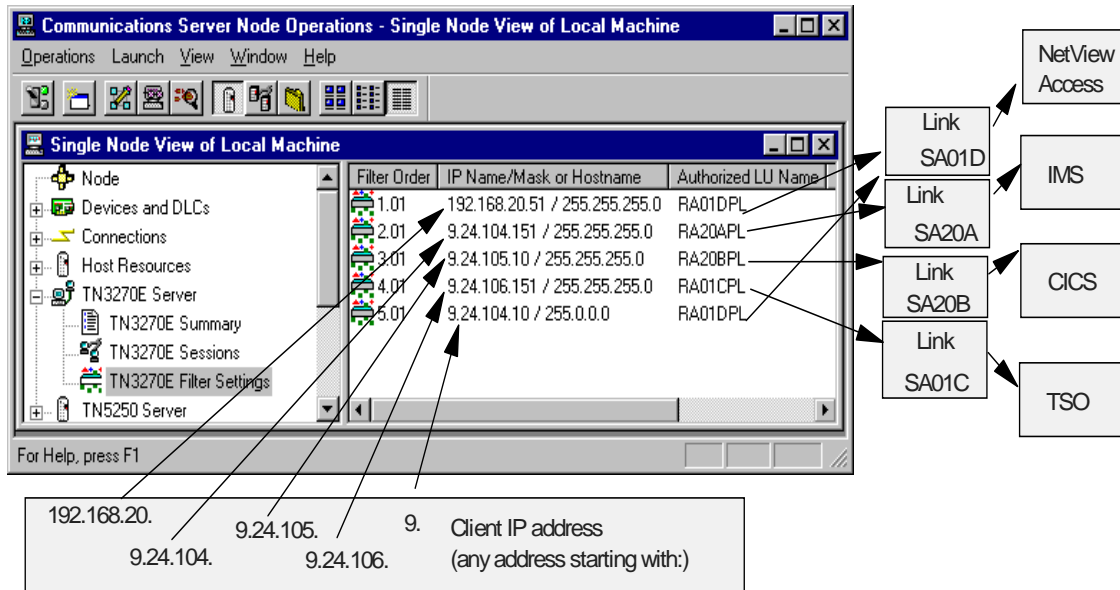


Figure 83. TN3270E Server Filtering

Using filtering we have defined the following:

- Clients with TCP/IP addresses starting with 192.168.20 will use the RA01DPL LU pool. This pool is associated with the SA01D link, which in turn uses a VTAM PU definition with a default logon to NetView Access.
- Clients with TCP/IP addresses starting with 9.24.104 will use the RA20APL LU pool. This pool is associated with the SA20A link, which in turn uses a VTAM PU definition with a default logon to IMS.
- Clients with TCP/IP addresses starting with 9.24.105 will use the RA20BPL LU pool. This pool is associated with the SA20B link, which in turn uses a VTAM PU definition with a default logon to CICS.
- Clients with TCP/IP addresses starting with 9.24.106 will use the RA01CPL LU pool. This pool is associated with the SA01C link, which in turn uses a VTAM PU definition with a default logon to TSO.
- All other clients with TCP/IP addresses starting with 9 will use the RA01DPL LU pool. This pool is associated with the RA01D link, which in turn uses a VTAM PU definition with a default logon to NetView Access.

9.7 VTAM Definitions

The VTAM definitions on the host are done with LOCAL major nodes. There must be one PU per CS/NT host connection.

The PU CUADDR value must be the device number corresponding to the subchannel specified in the CS/NT host connection definitions (see Figure 77).

The channel DLC uses a maximum frame size of 4105. It is recommended that the MAXBFRU value in the PU be set so that when multiplied by VTAM's I/O buffer size (IOBUF) the result is greater than 4109.

The following figures show the VTAM host definitions on the two LPARs used in this example.

```

RANFLOC VBUILD TYPE=LOCAL
RANFESA  PU      CUADDR=210,          SUBCHANNEL 10, LINK SA20A  * X
                                           DLOGMOD=D4C32XX3,        * X
                                           LOGAPPL=IMS01,          *
                                           LUGROUP=RSNTLU1,       *
                                           LUSEED=RANTA##,        *
                                           HPR=NO,                *
                                           MAXBFRU=11,           IOBUF(384) X 11 > 4109  * X
                                           MODETAB=ISTINCLM,      * X
                                           PUTYPE=2,              *
                                           SSCPFM=USSSCS,        *
                                           USSTAB=US327X,        *
                                           VPACING=63,           *
                                           XID=YES
**
RANFESB  PU      CUADDR=211,          SUBCHANNEL 11, LINK SA20B  * X
                                           DLOGMOD=D4C32XX3,        * X
                                           LOGAPPL=CICS01,         *
                                           LUGROUP=RSNTLU1,       *
                                           LUSEED=RANTA##,        *
                                           HPR=NO,                *
                                           MAXBFRU=11,           IOBUF(384) X 11 > 4109  * X
                                           MODETAB=ISTINCLM,      * X
                                           PUTYPE=2,              *
                                           SSCPFM=USSSCS,        *
                                           USSTAB=US327X,        *
                                           VPACING=63,           *
                                           XID=YES

```

Figure 84. Host VTAM Definitions for LPAR 5

```

RANFLOC VBUILD TYPE=LOCAL
RANFESC PU CUADDR=212, SUBCHANNEL 12, LINK SA01C * X
DLOGMOD=D4C32XX3, * X
LOGAPPL=TSO01, CONNECT USER TO TSO *
LUGROUP=RSNTLU1, USE SDDL TO DEFINE LUS X
LUSEED=RANTC##, NAME DYNAMIC LUS RANTAXX X
HPR=NO, X
MAXBF RU=11, IOBUF(384) X 11 > 4109 * X
MODETAB=ISTINCLM, * X
PUTYPE=2, *
SSCPFM=USSSCS, *
USSTAB=US327X, *
VPACING=63, *
XID=YES
**
RANFESC PU CUADDR=213, SUBCHANNEL 13, LINK SA01D * X
DLOGMOD=D4C32XX3, * X
LOGAPPL=NVA01, CONNECT USER TO NETVIEW ACC *
LUGROUP=RSNTLU1, USE SDDL TO DEFINE LUS X
LUSEED=RANTD##, NAME DYNAMIC LUS RANTAXX X
HPR=NO, X
MAXBF RU=11, IOBUF(384) X 11 > 4109 * X
MODETAB=ISTINCLM, * X
PUTYPE=2, *
SSCPFM=USSSCS, *
USSTAB=US327X, *
VPACING=63, *
XID=YES

```

Figure 85. Host VTAM Definitions for LPAR 1

Notice that no LUs have been defined to match the LUs defined in CS/NT. CS/NT supports Self-Defining Dependent LU (SDDL) which makes it very simple to accommodate LUs on a PU without coding them individually. An exit in VTAM will create the LUs as they are needed. This is explained in more detail in “VTAM SDDL” on page 139.

On a direct connection from CS/NT to the host, used by TN3270 clients, HPR is not necessary. In fact, enabling HPR in this instance may slow down response time and lessen link utilization. Since the default for this VTAM is HPR=RTP, we specifically turned it off for these PUs.

9.8 Personal Communications Client Configuration

Personal Communications is one of many products that provide TN3270 client capability. The key things the client must know are the IP address of the TN3270E server, in this case the TCP/IP token-ring adapter in the Netfinity PC.

Second, they must know the port number for the TN3270E server. This was set in the CS/NT configuration shown in Figure 82 on page 112.

For this example, the TCP/IP address of the Netfinity PC is 9.24.104.59. The port chosen for the TN3270E server is 5023.

To begin the Personal Communications configuration, go to the Personal Communications folder and click on **Start or Configure Session**.

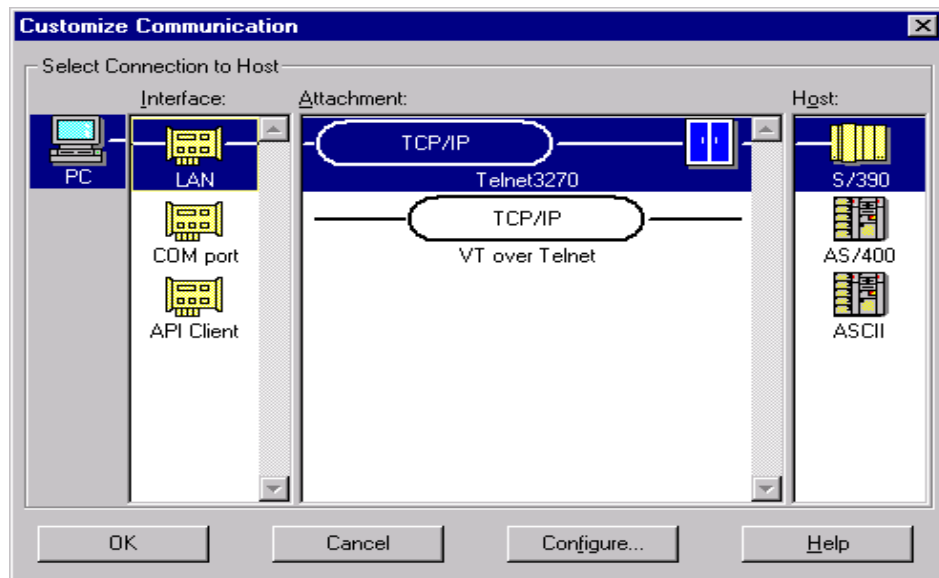


Figure 86. Personal Communications Configuration Panel 1

Choose **LAN->TCP/IP->S/390**.

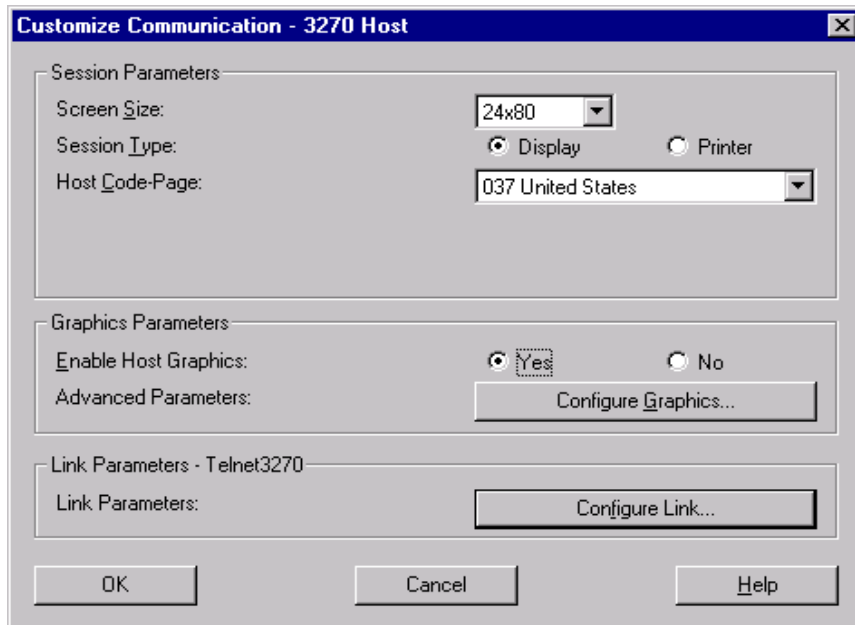


Figure 87. Personal Communications Configuration Panel 2

Select whether you want graphics support or not and the screen size. Click on **Configure Link** to reach the next panel.

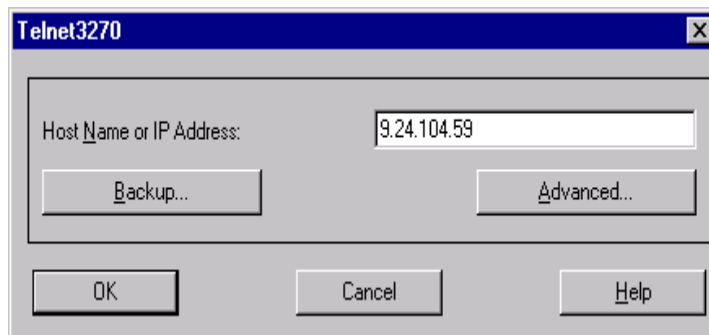


Figure 88. Personal Communications Panel 3

Fill in the TCP/IP host name or IP address of the CS/NT TN3270E server. This will be the IP address of a LAN adapter bound to the Windows NT TCP/IP protocol.

The Backup button can be used to define a second server, either for load balancing or for hot standby.

Click on **Advanced** to change the port number.

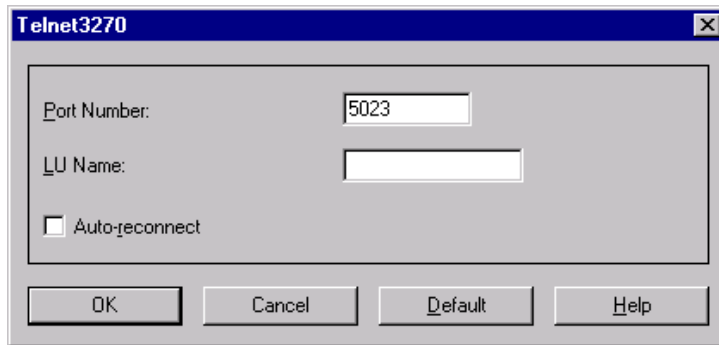


Figure 89. Personal Communications Panel 4

The port number must match the TN3270E server configuration. The default will be 23.

Click on Auto-reconnect if using hot standby.

The configuration is now complete. Click on **OK** to return to the previous screens. Once you have exited the configuration, Personal Communications will initiate the session to the host over TCP/IP.

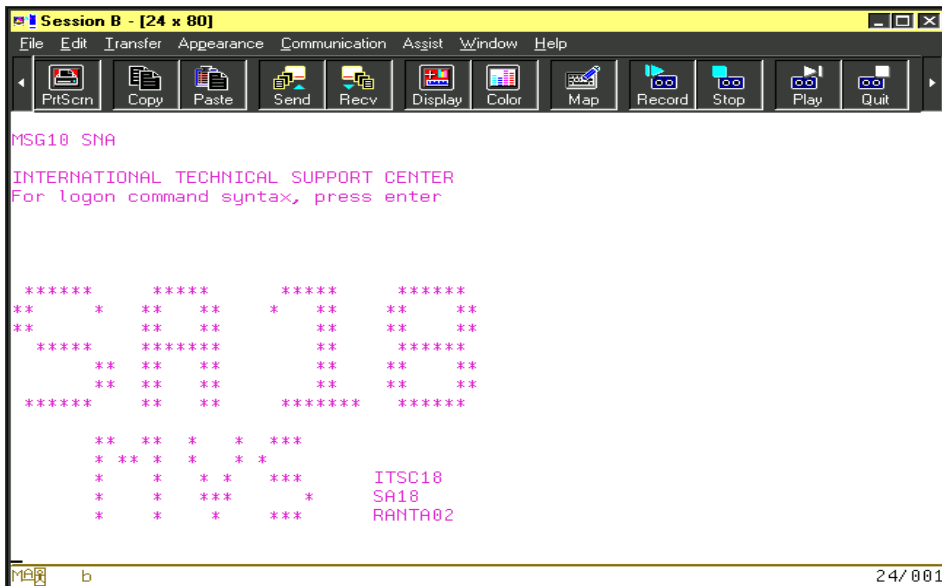


Figure 90. Connection to the Host Using TN3270

9.9 Host On-Demand

To take this one step further, let's take a look at Host On-Demand. A typical application for a powerful PC like the Netfinity server would be as a Web server. In an enterprise where much of the critical data is stored in mainframe databases and accessible via 3270 interfaces, you can see where a high-powered connection to the host over an ESCON channel would be a definite advantage.

Using Host On-Demand, users are able to access host applications using a TN3270E server with only a Web browser. The user opens a browser, enters the URL of Host On-Demand and is connected to the host.

There are several ways to build a Host On-Demand environment, but to keep this simple, let's look at a typical scenario.

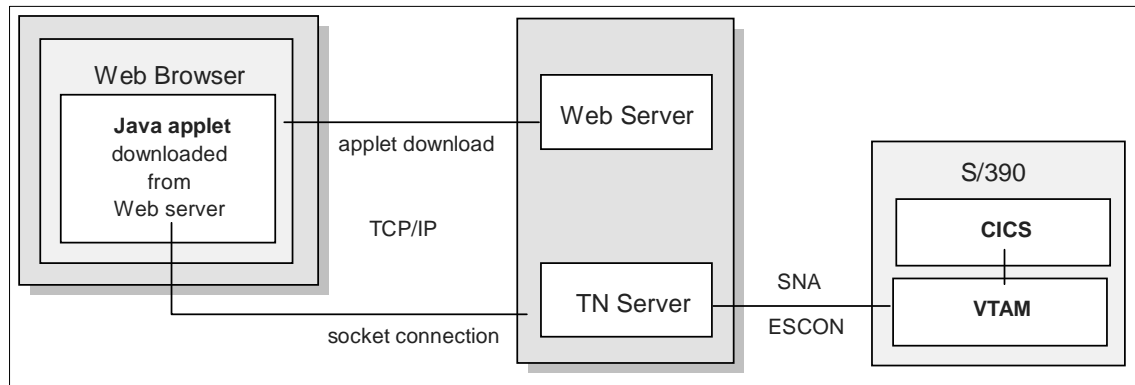


Figure 91. Host On-Demand

In this scenario, the Host On-Demand code resides on a Web server. The user enters the URL of the Host On-Demand server and a Java applet is downloaded to the user's Web browser. The Java applet establishes a connection with the TN3270E server, which in turn establishes a session with the host. In the Netfinity server with an ESCON connection, this session can be established from the TN3270E server to VTAM over ESCON.

The interface for the user looks much like the "green screen" presented with Personal Communications.

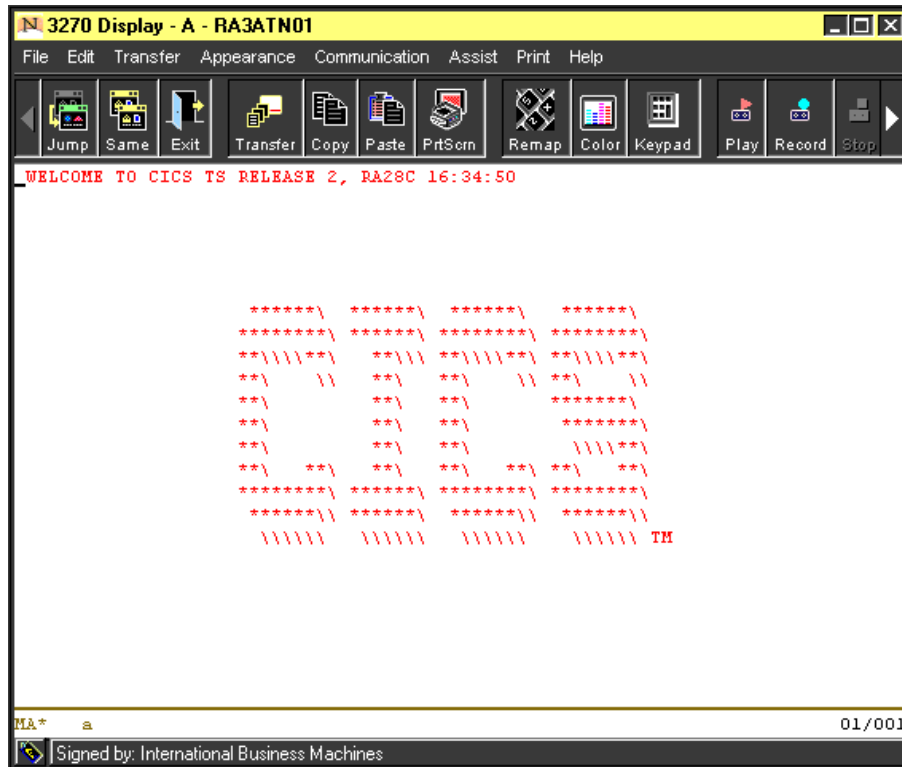


Figure 92. Host On-Demand Terminal Emulation Window

Host On-Demand provides another interface called ResQ!Net/LE. This takes the screen above and creates a graphical presentation, giving the user a more Web-like interface.

Chapter 10. CS/NT SNA Gateway Example

An SNA gateway enables supported workstation applications to access remote supported applications on a subarea or APPN network without requiring a separate direct connection to each host in each workstation. From a host point of view, the host has a single connection to the gateway. In a subarea network, a single connection to the host is a PU and can support 255 LUs. Multiple PUs must be defined to support more than 255 LUs. In an APPN network the SNA gateway can be defined as a dependent LU requester (DLUR).

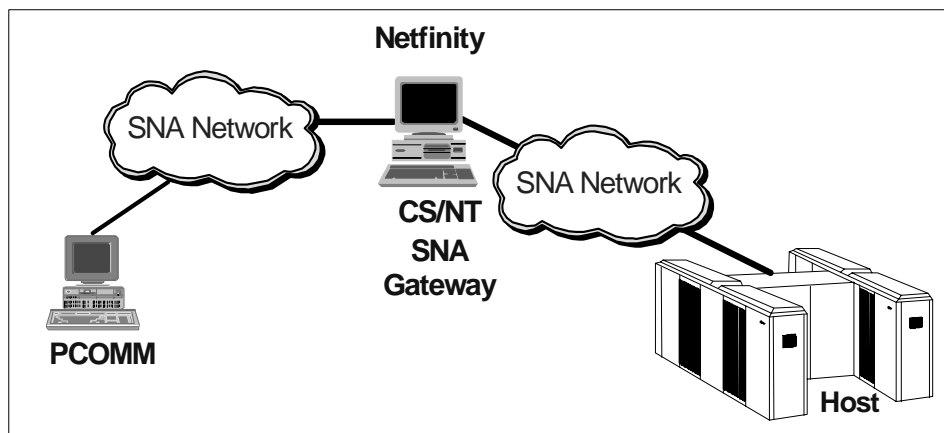


Figure 93. SNA Gateway

Each host views the SNA gateway as an SNA PU 2.0 node, supporting one or more LUs per workstation. As far as the host is concerned, all LUs belong to the SNA gateway PU. The SNA gateway can have multiple host connections simultaneously and direct different workstation sessions to specified hosts. However, only one host can act as the focal point, and the control point name is appended to all network management vector transports (NMVTs) routed through the gateway.

To the supported workstations, the SNA gateway looks like an SNA PU 4 communications controller and forwards such host messages as BIND and UNBIND. The network LUs are not aware of the SNA gateway. The SNA gateway, however, is aware of all LUs at the workstations.

In reality, the SNA gateway is a special type of PU 2.0. As long as a dependent workstation is inactive, the SNA gateway implements the LU functions for the workstation, just as a real PU 2.0 would. However, as soon

as a workstation is online to the host, the SNA gateway enables the workstation to implement LU functions and merely passes data between workstations and the host.

10.1 CS/NT SNA Gateway Example

The SNA gateway environment in this example is built on the basis of the example for the TN3270E server in Chapter 9, “CS/NT TN3270E Server Example” on page 99. We took two LU pools (RA20APL and RA20BPL) from the TN3270E server definitions and used them for the SNA gateway function.

Setup:

- Two LPARS on a 9672, each running MVS and VTAM.
- One ESCON connection from the 9672 to the Netfinity PC via an ESCON Director. The connection will be shared among the two LPARs for VTAM and TCP/IP functions.
- The Netfinity server is running Windows NT.
- One token-ring LAN device for TCP/IP and SNA protocol use.
- Two host connections for TN3270E exist for MVS in LPAR 1.
- SNA gateway definitions have been added to allow the Netfinity PC to act as a PU concentrator to the MVS in LPAR 5. Two host connections (PUs) have been defined for this.

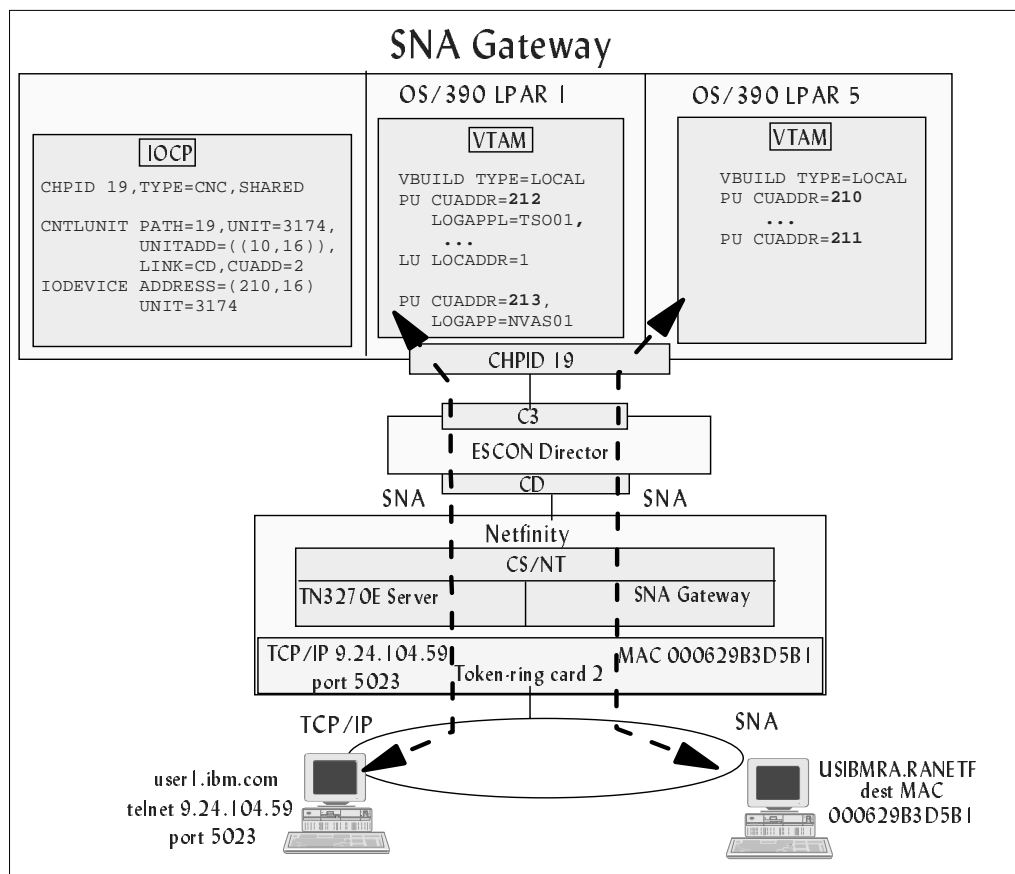


Figure 94. SNA Gateway Example

10.2 Planning

Before you begin, you should do some planning with network administrator and your host system programmer.

The network administrator must provide the following:

MAC address for the Netfinity TCP/IP LAN adapter (burnt in or locally administered)	
Number of LUs (gateway clients) you need to support	

The host system programmer must provide the following:

One subchannel address to use for each host PU (CS/NT link) to be defined	
ESCON director port leading to the host	
CUADD from the IOCP	

The host VTAM system programmer must provide the following:

Host CP Name	
VTAM PU definitions	

10.3 Installation

When planning an ESCON adapter configuration, the first consideration should be the mainframe definitions. You will need information about these definitions to complete the Netfinity ESCON adapter installation. The steps to install and configure an SNA connection are:

Mainframe Steps

- IOCP definitions

The IOCP definitions for this example are shown in “Host IOCP Definition” on page 129. For information on how to define the ESCON adapter to the mainframe see “IOCP Definitions” on page 40.

- Host VTAM definitions

See “VTAM Definitions” on page 138 for information on how to define the VTAM parameters.

Netfinity Steps

- Install the ESCON adapter.

Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.

- Install the PCI ESCON driver.

Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.

- Configure the ESCON adapter.

The ESCON adapter configuration for this example is shown in “ESCON Adapter Configuration” on page 129. For information on how to set up the adapter configuration see “ESCON Adapter Configuration” on page 42.

- Install the Data Link Control (DLC) for Communications Server for Windows NT.
Follow the directions in the *IBM Netfinity ESCON Adapter Installation Guide*.
- Install Communications Server for Windows NT and configure the SNA gateway

10.4 Host IOCP Definition

The SNA gateway connection to the host is an SNA connection. The IOCP definitions on the host for the Netfinity ESCON adapter are the same for all SNA functions. The IOCP definitions are discussed in “Host Hardware Definition” on page 39.

```

CHPID PATH=((19)),TYPE=CNC,SWITCH=E1,SHARED
*
* Defined SNA subchannels
*
CNTLUNIT CUNUMBR=210,UNIT=3174,PATH=(19),
        CUADD=2,LINK=(CD),UNITADD=((10,16))
DEV210  IODEVICE UNIT=3174,ADDRESS=(210,16),
        CUNUMBR=(210)

```

Figure 95. S/390 IOCP Definitions for TCP/IP

This example will use MVS addresses 210 and 211, which correspond to subchannels 10 and 11 respectively. In the IOCP, we have defined a range of 16 addresses to allow for future growth. This range covers both the TN3270E server definitions in the TN3270E server example, and the SNA gateway definitions. The ESCON channel is connected to the Netfinity server through an ESCON director.

10.5 ESCON Adapter Configuration

The next step is to define the ESCON adapter. This tells the ESCON adapter what subchannel address to use, the port on the ESCON director that leads to the host, the LPAR to go to, and the emulation type. The ESCON adapter configuration is reached through the Network ICON on the Windows NT control panel. Click on **Adapters** and highlight the ESCON adapter entry. Then click on **Properties**.

The following figure shows the ESCON adapter definition for the Netfinity PC in this example. VTAM requires one address for each PU (CS/NT link). This example shows SNA definitions for two subchannels, 10 and 11. These definitions are the same as those used in the TN3270E server example.

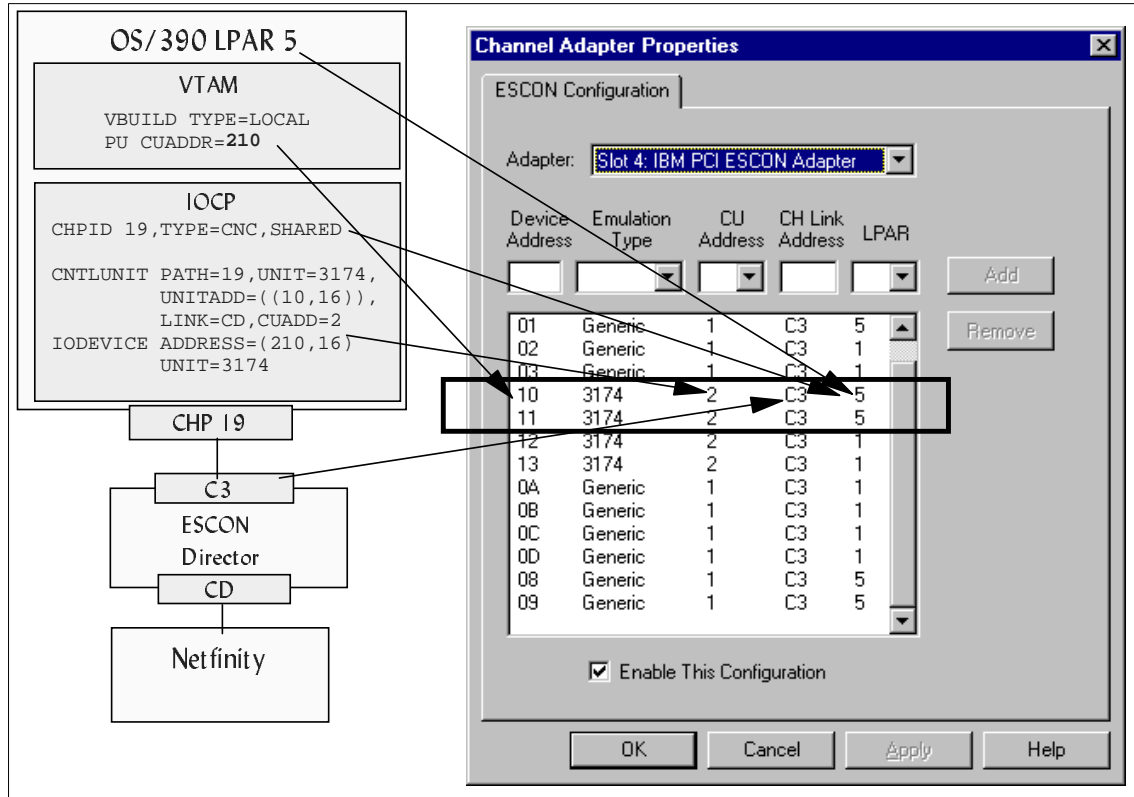


Figure 96. Esccon Adapter Configuration

Parameters for the channel adapter definitions are covered in “ESCON Adapter Configuration” on page 42.

SNA implementations require 3174 for the emulation type.

10.6 CS/NT Configuration

To define the CS/NT environment, we use the SNA gateway scenario in the CS/NT configuration panels. The following figure shows the scenario configuration options. The left panel shows the steps required to complete the

configuration. The right panel shows the resource types to define, and the defined resources.

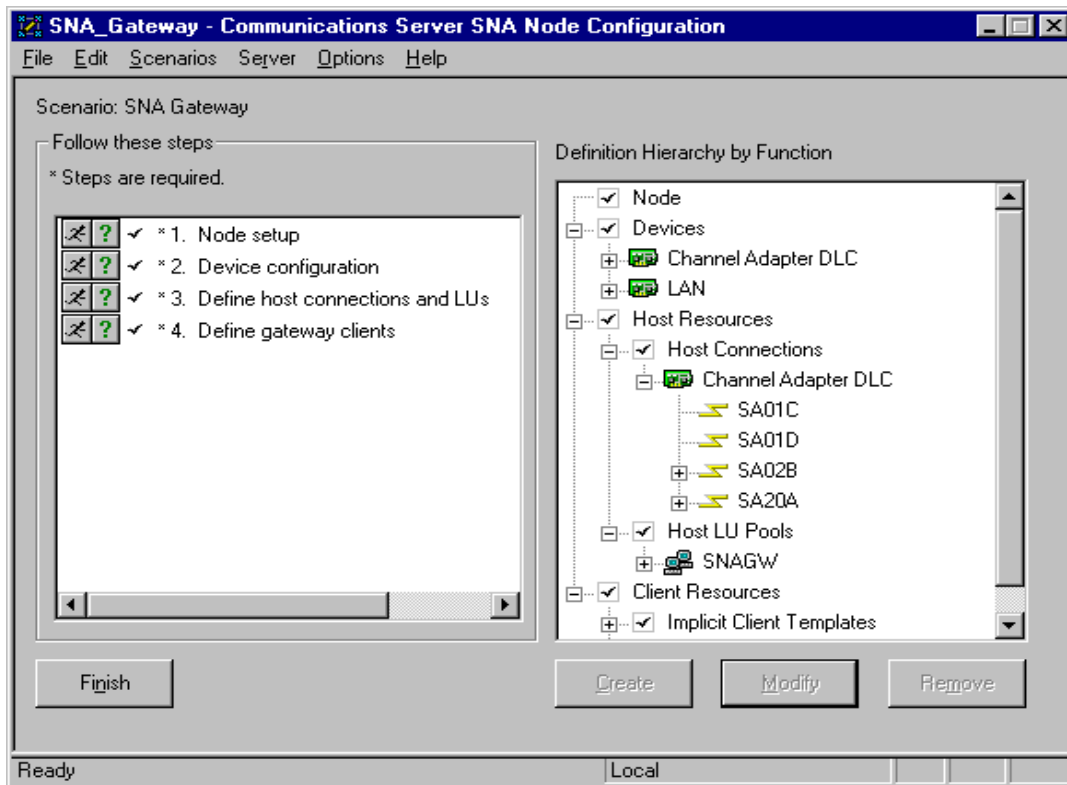


Figure 97. SNA Gateway Scenario

10.6.0.1 Define the Node

If the node has not been defined, you will need to do so. Our node is set up as a network node, but this is not necessary for SNA gateway functions. It could also be an end node.

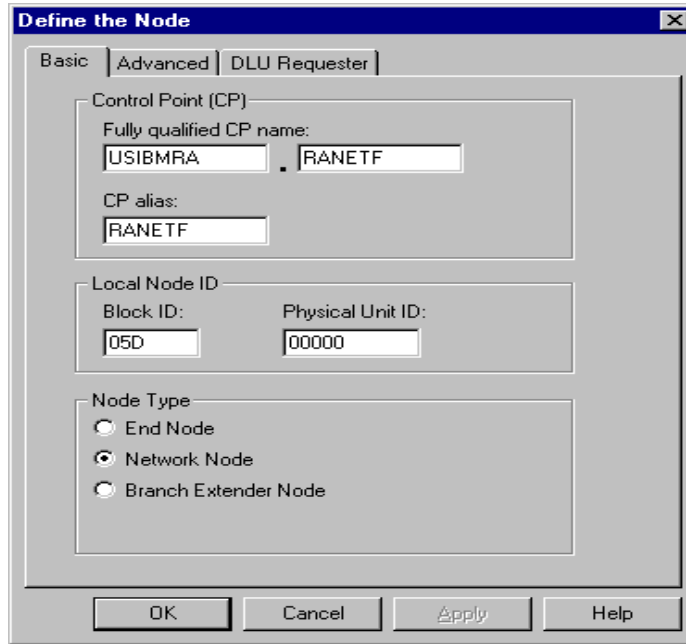


Figure 98. CS/NT Node Definition

10.6.0.2 Define the ESCON Adapter DLC

Once the node is defined, you must define the ESCON adapter under the Devices category. The DLC driver must be installed first as mentioned in “Installation” on page 128. The DLC driver is shipped with the ESCON adapter. Once the DLC is installed, you have the option of choosing the ESCON adapter in the Available Adapters field. The figure below shows the definitions for our example.

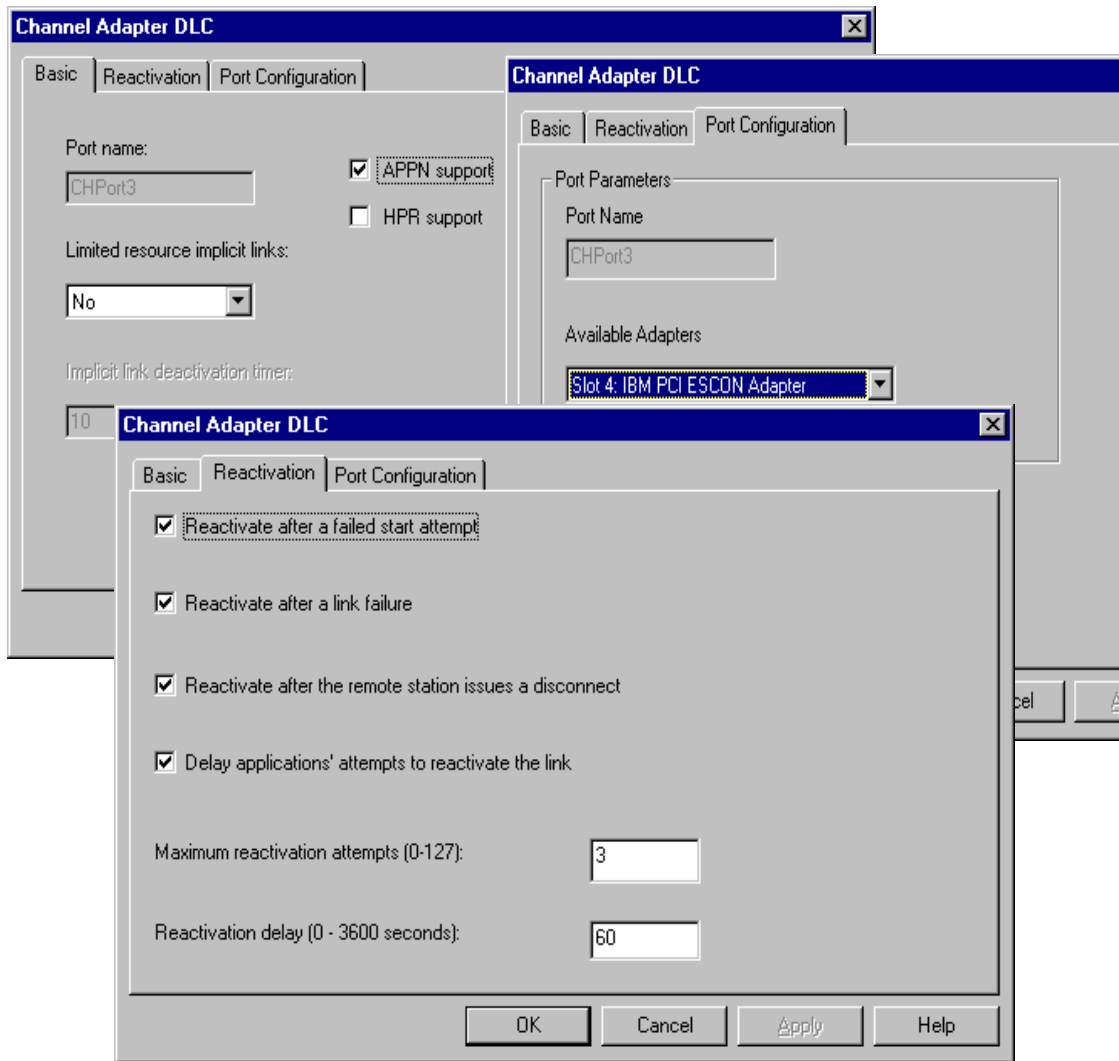


Figure 99. CS/NT Channel Adapter Device

10.6.0.3 Define the LAN Adapter Device

Also under the Devices category, you will need to define the LAN adapter the client requests will be coming in on. In this case, it is a token-ring adapter.

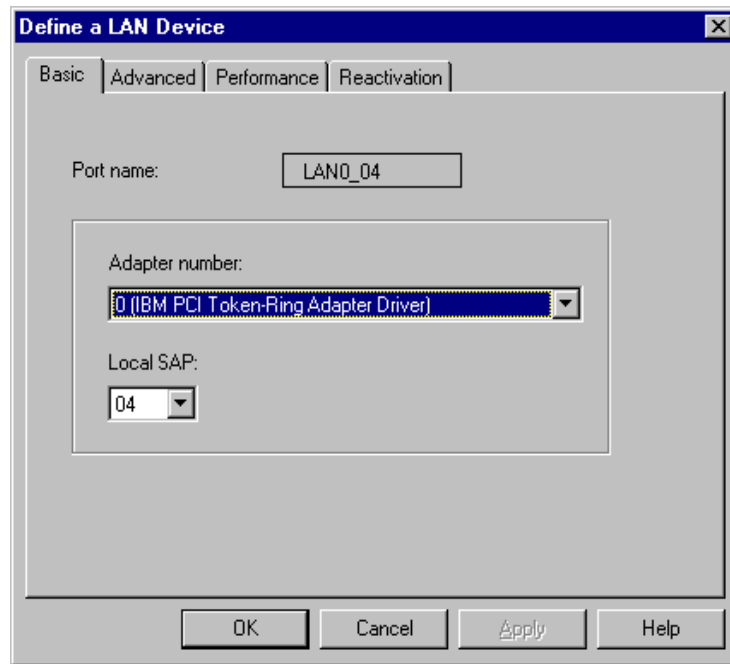


Figure 100. CS/NT LAN Device

10.6.0.4 Define the Host Connections

Next you will need to define the host connection. These are defined under the Host Resources category. The host connections defined will be listed under the port type.

- Use the Port name assigned in the device definition for the ESCON adapter.
- Assign a link station name. This name is arbitrary, but it helps later when you are monitoring connections to give it a meaningful name.
- We took all the defaults under the Advanced tab, and the Reactivation tab.
- The most important parameter is the PU address in the Link Configuration tab. This must match the subchannel address corresponding to the MVS device address coded in the VTAM PU.

In our example the MVS VTAM definitions will use MVS addresses 210 and 211, which correspond to subchannel address 10 and 11. Each channel adapter DLC host connection will use one subchannel address, which will correspond to one PU in the host.

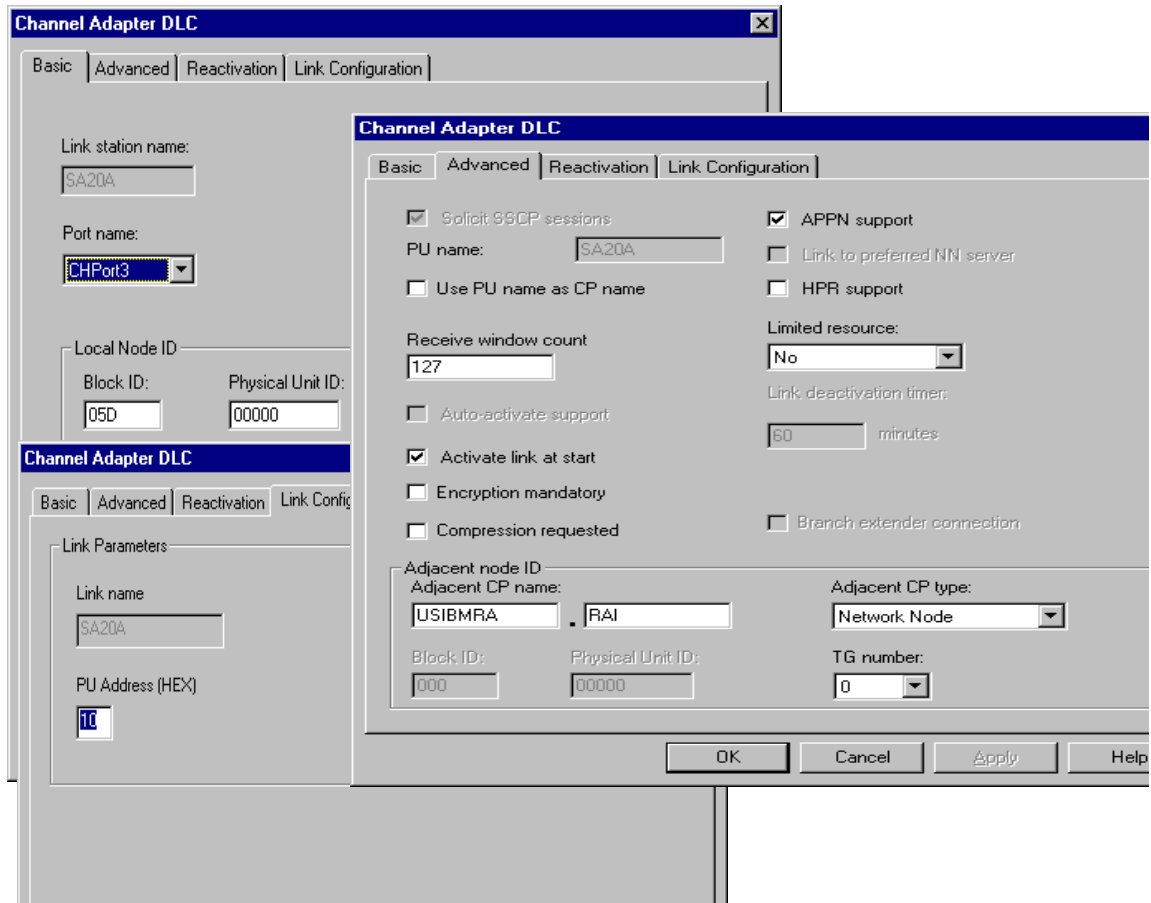


Figure 101. CS/NT Host Connection

Note that we increased the receive window count from the default, 7, to 127. The receive window count determines the maximum number of I-frames that can be received by the local link stations before an acknowledgment is sent. 127 is the maximum.

10.6.0.5 Define LUs

When you finish a host connection definition, you will be asked if you want to define LUs for that connection.

Each host connection/PU can have 254 LUs. Since we want to support more than 254 gateway sessions, we have defined two host connections to the host and will add 254 LUs to each. By putting them in the same LU pool, we

can make them available to the SNA gateway function. The requests will be balanced among the two host connections. This effectively gives you load balancing among PUs.

The names chosen do not have to match the host LU names. You will be given the opportunity to define them individually or as a range (much easier!).

The LUs must have corresponding LUs defined on the host. CS/NT supports SDDL, which makes this very easy in VTAM. The LUs do not need to be individually coded but can be created using an exit shipped with VTAM when needed. This is explained in more detail in "VTAM SDDL" on page 139.

The image shows a Windows-style dialog box titled "Host LU Definition". It contains the following fields and controls:

- Host PU name: SA20A (dropdown menu)
- Radio buttons for "Range LU definitions" (selected) and "Single LU definition".
- Under "Range LU definitions":
 - Base LU name: RA20A (text box)
 - Start NAU address: 1 (text box) with "(1 - 254)" next to it.
 - Number of LUs: 255 (text box) with "(2 - 255)" next to it.
 - Suffix format: Radio buttons for "Hex" and "Decimal" (selected).
 - Suffix start value: 0 (text box)
 - Generated LU names: RA20A001 - RA20A255 (text box)
- Under "Single LU definition":
 - LU name: (empty text box)
 - Host NAU Address: 1 (text box) with "(1 - 255)" next to it.
- Transmission priority: High (dropdown menu)
- LU Model Type: 3270 DISPLAY 2 (24 x 80) (dropdown menu)
- Assign LUs to pool: SNAGW (dropdown menu)
- Description: A text area containing the text "This list shows the available pools into which the LU(s) may be added."
- Buttons: OK, Cancel, Help

Figure 102. CS/NT LU Definitions

For this example we defined a range of 254 LUs for each host connection, starting with LOCADDR=1.

With functions like TN3270E server and SNA gateway, it is much easier to work with LUs in pools, rather than individual LUs. You may create LU pools before or after you create LUs. If creating the pool before the LUs, use the Host LU Pools option and simply do not add LUs to the pool during pool

definition. Later, when defining the LUs, you will have the option of adding them to a pool. This is what we have done in Figure 102. We predefined the SNAGW pool and added the LUs to it in the LU definition panel.

You may also choose to create the LU pools later. In this case you would not assign the LUs to a pool when defining the LUs. You would create the LU pools and choose the LUs to add to it at that time.

We now have 508 LUs defined, spanning two host connections.

10.6.0.6 SNA Gateway Definitions

The last thing to do is to define the SNA gateway options. These options are listed under the Client Resources category. SNA gateway clients can be implicit or explicit.

Implicit clients are workstations that are not defined in the gateway. Until the downstream workstation contacts the gateway, it is totally unknown to the gateway. Implicit clients must use LU pools. A single SNA gateway definition can support hundreds of workstations, making it much easier to define if using implicit clients.

Explicit clients are workstations that are predefined to the SNA gateway. This gives you more control over the workstation definitions but is impractical in an environment with a large number of clients.

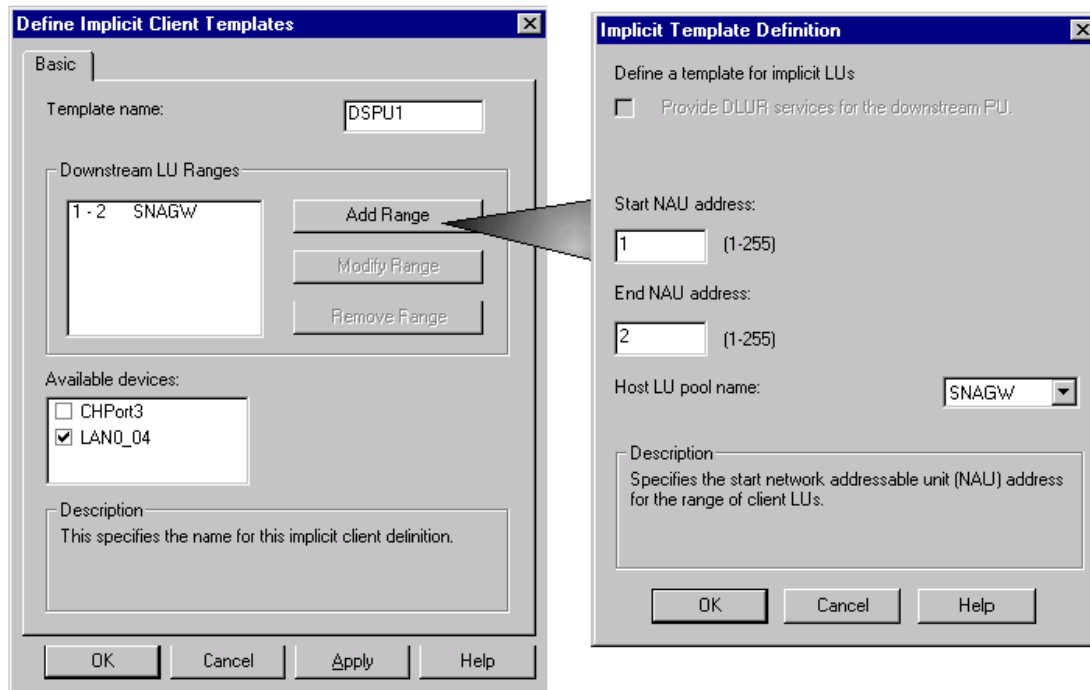


Figure 103. SNA Gateway Implicit Definitions

In this example, we used implicit definitions. To define this, you choose the port to receive incoming client requests (LAN), and click on **Add Range** to choose an LU pool.

The start and end NAU represent the addresses you expect the client to request. In this case, we assume our clients will always request a local address of 1 or 2. These NAUs will be mapped to the host NAU assigned for the session.

10.7 VTAM Definitions

The VTAM definitions on the host are done with LOCAL major nodes. There must be one PU per CS/NT host connection.

The PU CUADDR value must be the device number corresponding to the subchannel specified in the CS/NT host connection definitions (see the PU Address field in Figure 101 on page 135).

The channel DLC uses a maximum frame size of 4105. It is recommended that the MAXBFRU value in the PU be set so that when multiplied by VTAM's I/O buffer size (IOBUF) the result is greater than 4109.

The following figures show the VTAM host definition on the LPAR used in this example.

```

RANFLOC VBUILD TYPE=LOCAL
RANFESA PU CUADDR=210, SUBCHANNEL 10, LINK SA20A * X
          DLOGMOD=D4C32XX3, * X
          LUGROUP=RSNTLU1, USE SDDL U TO DEFINE LUS X
          LUSEED=RANTA##, NAME DYNAMIC LUS RANTAXX X
          HPR=NO, X
          MAXBFRU=11, IOBUF(384) X 11 > 4109 * X
          MODETAB=ISTINCLM, * X
          PUTYPE=2, *
          SSCPFM=USSSCS, *
          USSTAB=US327X, *
          VPACING=63, *
          XID=YES
**
RANFESB PU CUADDR=211, SUBCHANNEL 11, LINK SA20B * X
          DLOGMOD=D4C32XX3, * X
          LUGROUP=RSNTLU1, USE SDDL U TO DEFINE LUS X
          LUSEED=RANTB##, NAME DYNAMIC LUS RANTBXX X
          HPR=NO, X
          MAXBFRU=11, IOBUF(384) X 11 > 4109 * X
          MODETAB=ISTINCLM, * X
          PUTYPE=2, *
          SSCPFM=USSSCS, *
          USSTAB=US327X, *
          VPACING=63, *
          XID=YES

```

Figure 104. Host VTAM Definitions for LPAR 5

Notice that no LUs have been defined to match the LUs defined in CS/NT. CS/NT supports Self-Defining Dependent LU (SDDL U), which makes it very simple to accommodate LUs on a PU without coding them individually. An exit in VTAM will create the LUs as they are needed. These definitions are the same as used in the TN3270E server example.

10.7.0.1 VTAM SDDL U

The above definitions work fine in a test environment, but in the real world, would be difficult to manage. Defining 255 LUs per PU can get pretty cumbersome, considering the amount of typing to be done. SDDL U solves this for you. To use SDDL U, you make no changes on the CS/NT side. SDDL U is automatically supported and each LU must still be defined to CS/NT. With the use of LU ranges, this can be done in one panel.

On the host, you must activate the ISTEXCSD exit. This exit is shipped with VTAM. You define a model for the LUs (TYPE=LUGROUP), change the PU definitions to point to it (LUGROUP=), and define a template (LUSEED=) for the LU names. The next figure gives you an idea of how SDDL U works.

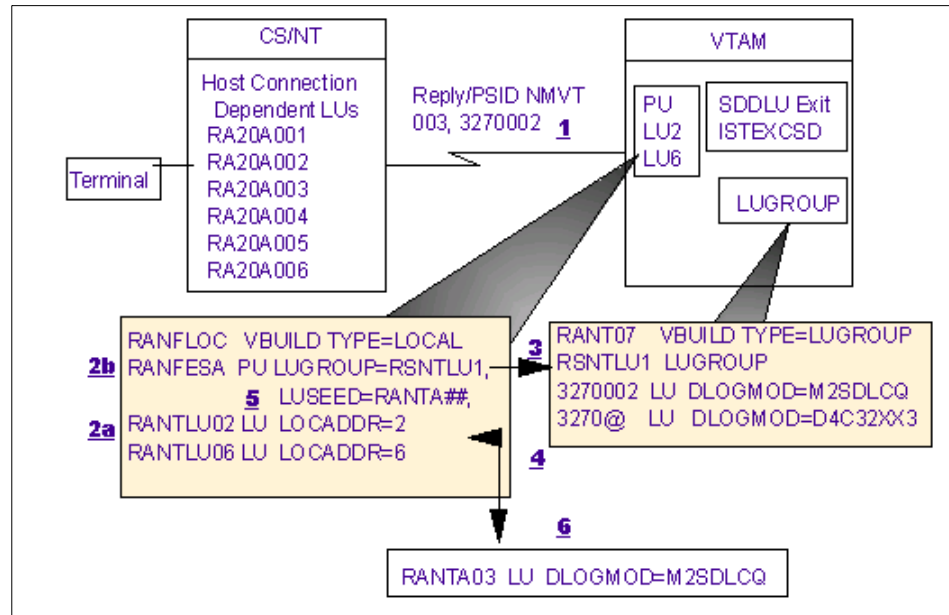


Figure 105. SDDL U Overview

1. CS/NT requires an LU, for example, an SNA gateway connection is being requested. The next LU in CS/NT's SNA gateway pool has NAU 03. CS/NT sends a Reply PSID NMVT to VTAM indicating that it needs an LU with LOCADDR 03 emulating a device type 3270 Model 002.

2. VTAM uses the Reply PSID NMVT to:

- 2a.** Check the PU definition for an LU at address 03, and if it is not predefined,
- 2b.** Determine if the PU has LUGROUP coded, indicating SDDL U support

3. VTAM matches the name in the PU's LUGROUP parameter with an active LUGROUP definition.

4. The default VTAM SDDL U exit routine (ISTEXCSD) uses the device and model type (3270002 in this case) to find a matching model LU statement in the appropriate LUGROUP.

5. The SDDLUEXIT uses the LUSEED value to generate an LU name. The # symbols indicate how many positions to fill in with a numeric value. In this case, using the default SDDLUEXIT routine, the LU name will be RANTA01.

6. VTAM builds a dynamic definition for the LU.

10.8 Client CS/NT Configuration

CS/NT on the client needs to be configured using the 3270/LUA scenario.

You must define the node, LAN device, host connections, and LUs.

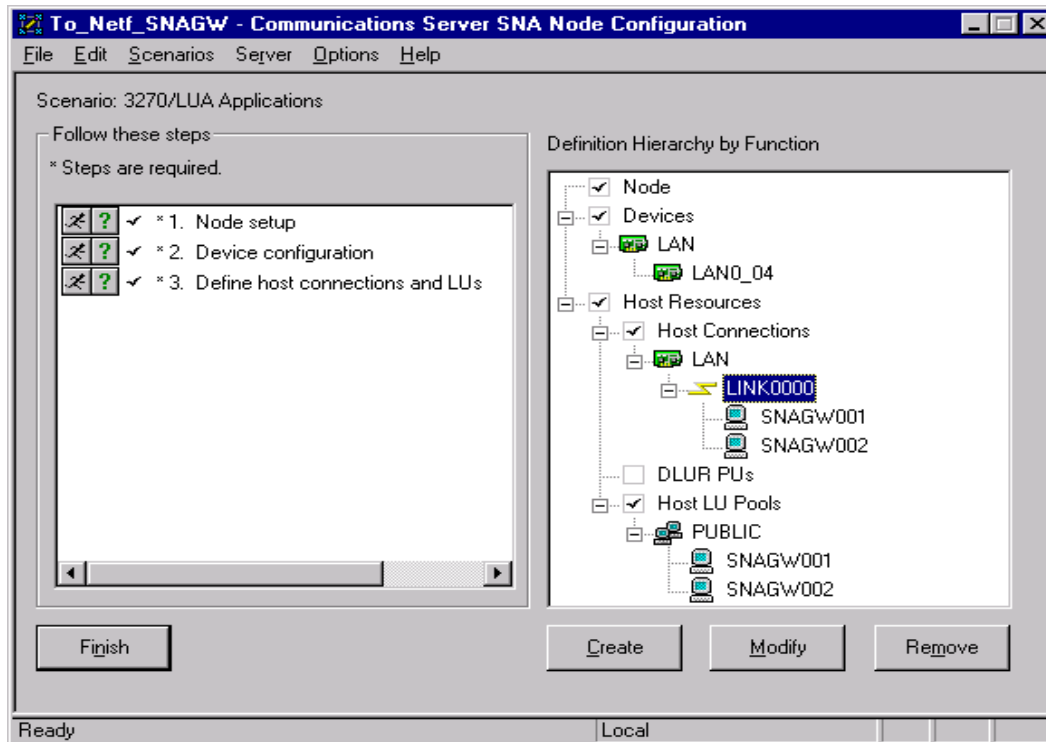


Figure 106. 3270/LUA Scenario

When defining the host connection, use the LAN device. The destination address is the LAN adapter address of the Netfinity PC.

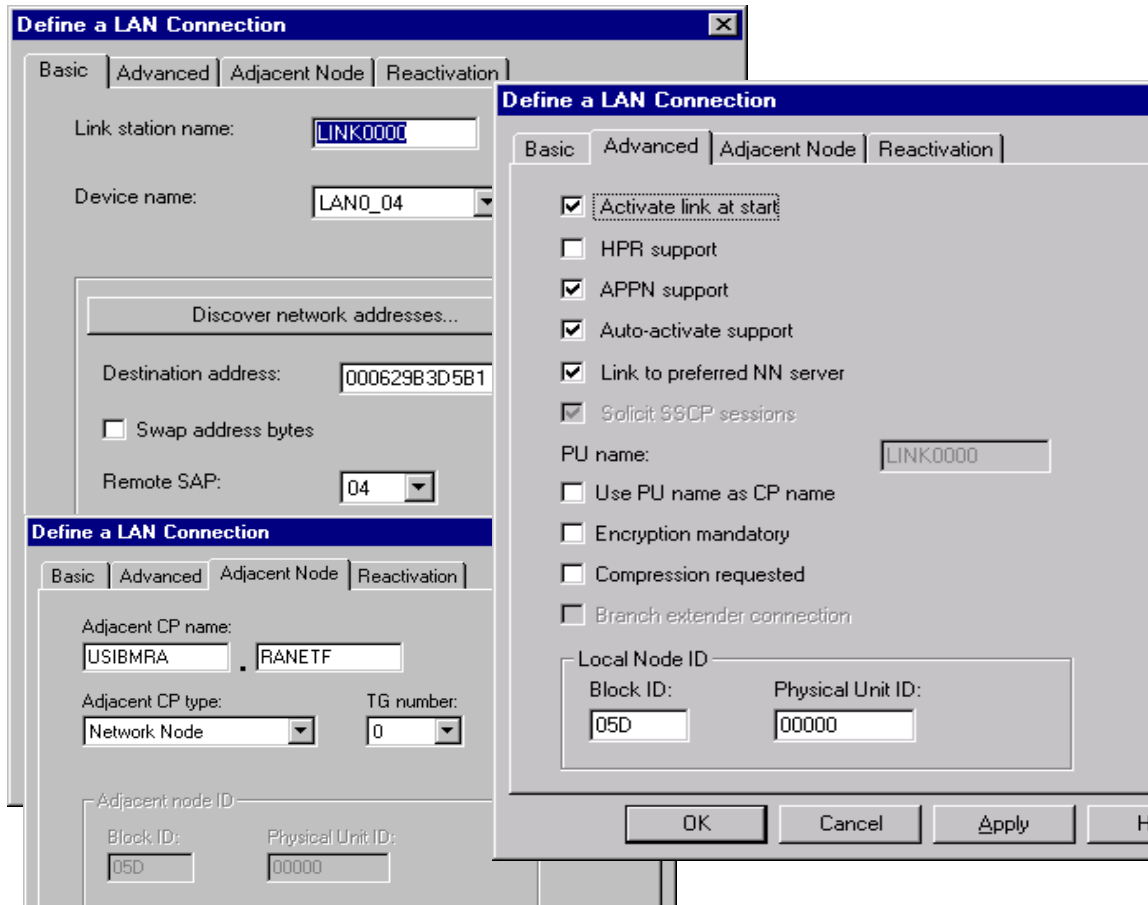


Figure 107. Host Connection Definition for SNA Gateway Client

When you define the LAN connection, CS/NT will ask you if you want to define any LUs. Define as many LUs as you want to have host sessions (not to exceed the range defined in the server). In our case, the server only recognizes addresses 1 and 2, so you should only define two LUs. This does not mean the server will only handle two client sessions, but it does mean that each workstation can only have two client sessions. The server will map the client addresses (1 and 2) to whatever NAU is next available on the host.

Host LU Definition [X]

Define either a range or single LUs to this host connection

Host PU name: LINK0000

Range LU definitions Single LU definition

Base LU name: SNAGW	Suffix format: <input type="radio"/> Hex <input checked="" type="radio"/> Decimal	LU name []
Start NAU address: 1 (1 - 254)	Suffix start value: 0	Host NAU Address 3 (1 - 255)
Number of LUs: 2 (2 - 255)	Generated LU names: SNAGW001 - SNAGW002	

Transmission priority: High LU Model Type: 3270 DISPLAY 2 (24 x 80) Assign LUs to pool: PUBLIC

Description:
This list shows the available pools into which the LU(s) may be added.

OK Cancel Help

Figure 108. Client LUs

10.9 Personal Communications Configuration

Personal Communications is used for the client 3270 emulation. You only need to define the API client, using LUA.

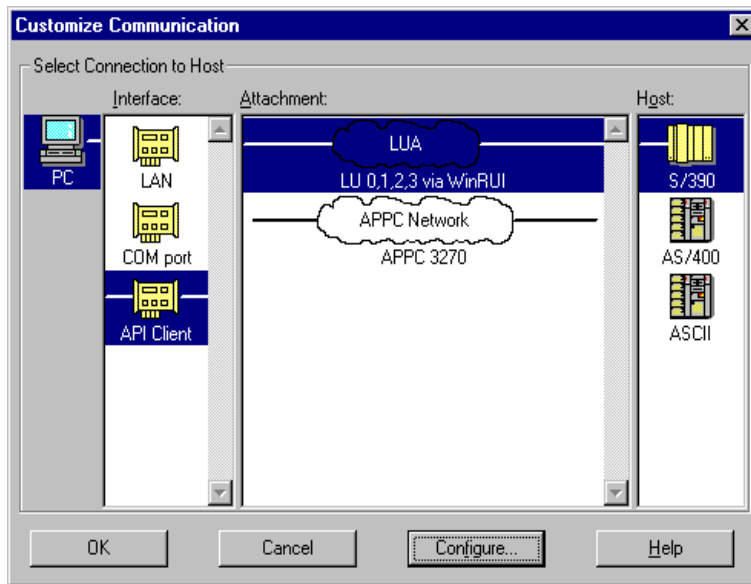


Figure 109. Personal Communications Client

You will be asked for the screen size. If you are using SDDL definitions at the host, this is where you determine the 3270 model number sent in the NMVT.

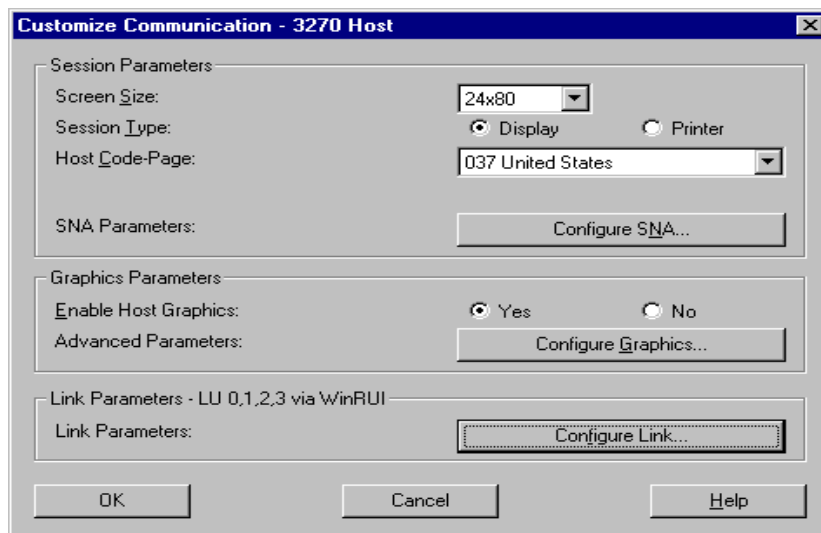


Figure 110. Personal Communications Configuration

Click on **Configure Link** and choose an LU you defined in the Communications Server configuration.

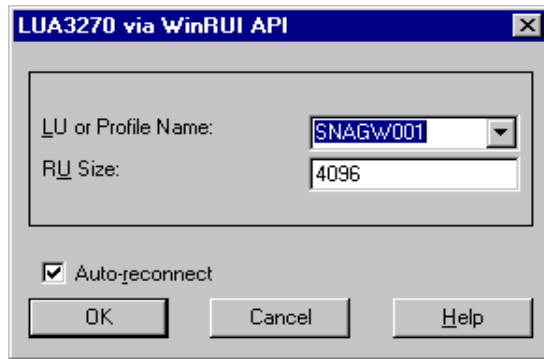


Figure 111. Personal Communications Configuration

The client can now connect to the host over an ESCON connection using the SNA gateway.

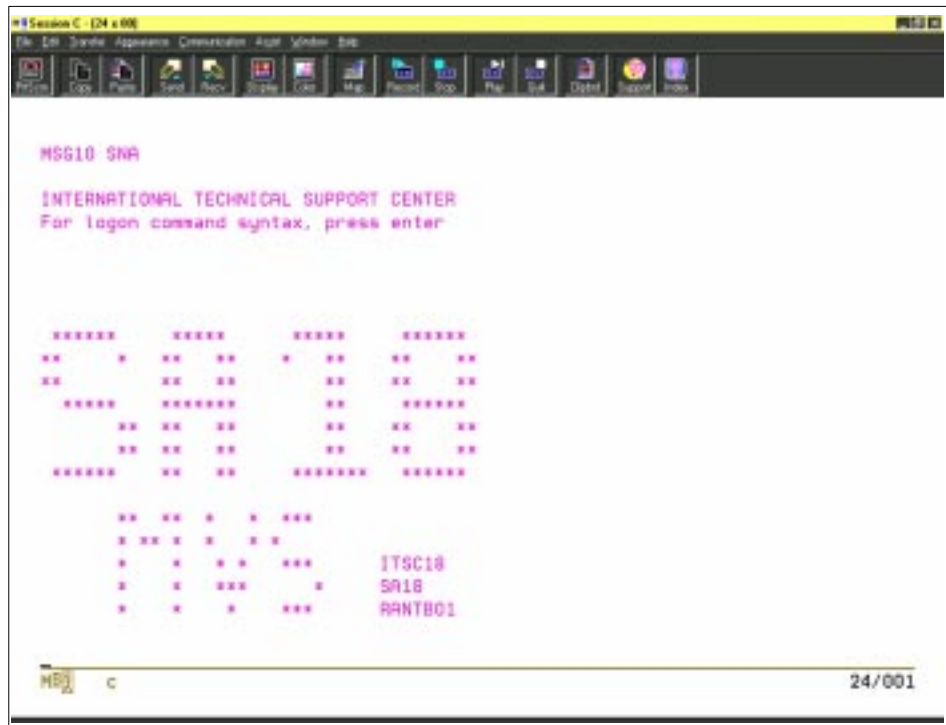


Figure 112. Personal Communications Client SNA Gateway Connection

The MSG10 VTAM screen presented to the client in this case, has the LU name assigned on the front. You can see the name created by SDDL, RANTB01, for this session. Each LU session created will alternate between host links.

Appendix A. Special Notices

This publication is intended to help network and system administrators plan for, install, and implement an ESCON connection between the IBM Netfinity server and a mainframe host. The information in this publication is not intended as the specification of any programming interfaces that are provided by any products mentioned. See the PUBLICATIONS section of the IBM Programming Announcement for the IBM Netfinity ESCON adapter for more information about what publications are considered to be product documentation.

References in this publication to IBM products, programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent program that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program or service.

Information in this book was developed in conjunction with use of the equipment specified, and is limited in application to those specific hardware and software products and levels.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, Thornwood, NY 10594 USA.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact IBM Corporation, Dept. 600A, Mail Drop 1329, Somers, NY 10589 USA.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The information contained in this document has not been submitted to any formal IBM test and is distributed AS IS. The information about non-IBM ("vendor") products in this manual has been supplied by the vendor and IBM assumes no responsibility for its accuracy or completeness. The use of this information or the implementation of any of these techniques is a customer responsibility and depends on the customer's ability to evaluate and integrate

them into the customer's operational environment. While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Customers attempting to adapt these techniques to their own environments do so at their own risk.

Any pointers in this publication to external Web sites are provided for convenience only and do not in any manner serve as an endorsement of these Web sites.

Any performance data contained in this document was determined in a controlled environment, and therefore, the results that may be obtained in other operating environments may vary significantly. Users of this document should verify the applicable data for their specific environment.

The following document contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples contain the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Reference to PTF numbers that have not been released through the normal distribution process does not imply general availability. The purpose of including these reference numbers is to alert IBM customers to specific information relative to the implementation of the PTF when it becomes available to each customer according to the normal IBM PTF distribution process.

The following terms are trademarks of the International Business Machines Corporation in the United States and/or other countries:

IBM ®	DRDA
DB2	OS/390
DB2 Connect	MVS
Netfinity	eNetwork
S/390	SAA
ESCON	VTAM
NetView	IMS
CICS	EtherJet
Wake on LAN	Nways
OpenEdition	MVS/ESA
Hardware Configuration Definition	VM/ESA
APPN	RS/6000
AnyNet	

The following terms are trademarks of other companies:

C-bus is a trademark of Corollary, Inc.

Java and HotJava are trademarks of Sun Microsystems, Incorporated.

Microsoft, Windows, Windows NT, and the Windows 95 logo are trademarks or registered trademarks of Microsoft Corporation.

PC Direct is a trademark of Ziff Communications Company and is used by IBM Corporation under license.

Pentium, MMX, ProShare, LANDesk, and ActionMedia are trademarks or registered trademarks of Intel Corporation in the U.S. and other countries.

UNIX is a registered trademark in the United States and other countries licensed exclusively through X/Open Company Limited.

Other company, product, and service names may be trademarks or service marks of others.

Appendix B. Related Publications

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

B.1 International Technical Support Organization Publications

For information on ordering these ITSO publications see "How to Get ITSO Redbooks" on page 153.

- *Web-to-Host Integration Solutions*, SG24-5237
- *IBM Communications Server for Windows NT Version 5.0*, SG24-2099
- *IBM eNetwork Communications Server for Windows NT Version 6.0 Enhancements*, SG24-5232
- *IBM TCP/IP Version 3 Release 2 for MVS Implementation Guide*, SG24-3687
- *OS/390 eNetwork Communications Server V2R5 TCP/IP Implementation Guide Volume 1: Configuration and Routing*, SG24-5227
- *OS/390 eNetwork Communications Server V2R5 TCP/IP Implementation Guide Volume 2: OpenEdition Applications*, SG24-5228

B.2 Redbooks on CD-ROMs

Redbooks are also available on CD-ROMs. **Order a subscription** and receive updates 2-4 times a year at significant savings.

CD-ROM Title	Subscription Number	Collection Kit Number
System/390 Redbooks Collection	SBOF-7201	SK2T-2177
Networking and Systems Management Redbooks Collection	SBOF-7370	SK2T-6022
Transaction Processing and Data Management Redbook	SBOF-7240	SK2T-8038
Lotus Redbooks Collection	SBOF-6899	SK2T-8039
Tivoli Redbooks Collection	SBOF-6898	SK2T-8044
AS/400 Redbooks Collection	SBOF-7270	SK2T-2849
RS/6000 Redbooks Collection (HTML, BkMgr)	SBOF-7230	SK2T-8040
RS/6000 Redbooks Collection (PostScript)	SBOF-7205	SK2T-8041
RS/6000 Redbooks Collection (PDF Format)	SBOF-8700	SK2T-8043
Application Development Redbooks Collection	SBOF-7290	SK2T-8037

B.3 Other Publications

These publications are also relevant as further information sources:

- *OS/390 eNetwork Communications Server: High Speed Access Services User's Guide*, GC31-8676
- *OS/390 UNIX System Services Planning*, SC28-1890
- *TCP/IP: Performance Tuning Guide*, SC31-7188
- *OS/390 TCP/IP Update Guide*, GC31-8553
- *IBM Netfinity ESCON Adapter Installation Guide*, shipped with the ESCON adapter. Also currently available on the Web at <http://www.pc.ibm.com/qtechinfo/VLAR-3ZGM69.html>

How to Get ITSO Redbooks

This section explains how both customers and IBM employees can find out about ITSO redbooks, CD-ROMs, workshops, and residencies. A form for ordering books and CD-ROMs is also provided.

This information was current at the time of publication, but is continually subject to change. The latest information may be found at <http://www.redbooks.ibm.com/>.

How IBM Employees Can Get ITSO Redbooks

Employees may request ITSO deliverables (redbooks, BookManager BOOKs, and CD-ROMs) and information about redbooks, workshops, and residencies in the following ways:

- **Redbooks Web Site on the World Wide Web**

<http://w3.itso.ibm.com/>

- **PUBORDER** – to order hardcopies in the United States
- **Tools Disks**

To get LIST3820s of redbooks, type one of the following commands:

```
TOOLCAT REDPRINT
TOOLS SENDTO EHONE4 TOOLS2 REDPRINT GET SG24xxxx PACKAGE
TOOLS SENDTO CANVM2 TOOLS REDPRINT GET SG24xxxx PACKAGE (Canadian users only)
```

To get BokkManager BOOKs of redbooks, type the following command:

```
TOOLCAT REDBOOKS
```

To get lists of redbooks, type the following command:

```
TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET ITSOCAT TXT
```

To register for information on workshops, residencies, and redbooks, type the following command:

```
TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ITSOREGI 1998
```

- **REDBOOKS Category on INEWS**
- **Online** – send orders to: USIB6FPL at IBMMAIL or DKIBMBSH at IBMMAIL

Redpieces

For information so current it is still in the process of being written, look at "Redpieces" on the Redbooks Web Site (<http://www.redbooks.ibm.com/redpieces.html>). Redpieces are redbooks in progress; not all redbooks become redpieces, and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

How Customers Can Get ITSO Redbooks

Customers may request ITSO deliverables (redbooks, BookManager BOOKs, and CD-ROMs) and information about redbooks, workshops, and residencies in the following ways:

- **Online Orders** – send orders to:

	IBMMAIL	Internet
In United States	usib6fpl at ibmmail	usib6fpl@ibmmail.com
In Canada	caibmbkz at ibmmail	lmannix@vnet.ibm.com
Outside North America	dkibmbsh at ibmmail	bookshop@dk.ibm.com

- **Telephone Orders**

United States (toll free)	1-800-879-2755
Canada (toll free)	1-800-IBM-4YOU
Outside North America	(long distance charges apply)
(+45) 4810-1320 - Danish	(+45) 4810-1020 - German
(+45) 4810-1420 - Dutch	(+45) 4810-1620 - Italian
(+45) 4810-1540 - English	(+45) 4810-1270 - Norwegian
(+45) 4810-1670 - Finnish	(+45) 4810-1120 - Spanish
(+45) 4810-1220 - French	(+45) 4810-1170 - Swedish

- **Mail Orders** – send orders to:

IBM Publications Publications Customer Support P.O. Box 29570 Raleigh, NC 27626-0570 USA	IBM Publications 144-4th Avenue, S.W. Calgary, Alberta T2P 3N5 Canada	IBM Direct Services Sortemosevej 21 DK-3450 Allerød Denmark
--	--	--

- **Fax** – send orders to:

United States (toll free)	1-800-445-9269
Canada	1-800-267-4455
Outside North America	(+45) 48 14 2207 (long distance charge)

- **1-800-IBM-4FAX (United States) or (+1) 408 256 5422 (Outside USA)** – ask for:

Index # 4421 Abstracts of new redbooks
Index # 4422 IBM redbooks
Index # 4420 Redbooks for last six months

- **On the World Wide Web**

Redbooks Web Site	http://www.redbooks.ibm.com
IBM Direct Publications Catalog	http://www.elink.ibm.link.ibm.com/pbl/pbl

Redpieces

For information so current it is still in the process of being written, look at "Redpieces" on the Redbooks Web Site (<http://www.redbooks.ibm.com/redpieces.html>). Redpieces are redbooks in progress; not all redbooks become redpieces, and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

IBM Redbook Order Form

Please send me the following:

Title	Order Number	Quantity

First name Last name

Company

Address

City Postal code Country

Telephone number Telefax number VAT number

Invoice to customer number _____

Credit card number _____

Credit card expiration date Card issued to Signature

We accept American Express, Diners, Eurocard, Master Card, and Visa. Payment by credit card not available in all countries. Signature mandatory for credit card payment.

Index

A

ADSM 15, 26, 71, 81
AnyNet 10, 12

B

Baan 36
BPXPRMxx 37, 92

C

CICS 24
CICS Gateway for Java 24
CICS Internet Gateway 19, 24
CICS Java Gateway 21

D

Data Link Control 6, 102, 129
data mining 26
data warehousing 27
DATABUFFERPOOLSIZE 70, 81
DB2 23, 24, 71
DLC 6, 102, 106, 108, 115, 129, 132, 134, 139

E

EMIF 4, 5, 44

F

FTP 71, 83

H

HCD 39
HCPRIO 39
Host On-Demand 8, 19, 21, 25, 99, 121, 123
Host Publisher 19, 22, 25
hot backup 11, 12
hot rollover 51
hot standby 10, 47, 50
HPDT for UDP 15, 83
HPR 10, 12, 47, 48, 49, 50, 109, 117
HSAS 2, 3, 13, 15, 16, 74, 83, 88, 89, 92, 93, 96

I

IMS 25
IMS Client for Java 25

IMS Object Connector 25
IMS Web 19, 25
IMS WWW Templates 25
IOBUF 115
IOBUFFERSIZE 72, 78
IOCP 39, 40, 63, 64, 73, 74, 85, 86, 101, 102, 128, 129
ISTEXCSD 140

J

JD Edwards 36

L

LARGEENVELOPEPOOLSIZE 70, 77, 78, 81
LEDs 38
load balancing 10, 11, 12, 45, 56, 58
Lotus Domino 24
LU pool 51, 52, 53, 57, 58, 135, 136, 137

M

MPC+ 3, 6, 15, 36, 37, 74, 83, 86, 89
mtu 89, 94, 96
MVSCP 39

N

named scope 57
NotesPump 24
NOUDPQUEUELIMIT 70, 81

O

oeifconfig 89, 93, 94, 95
oenetstat 95, 96
oeping 95
OpenEdition 85, 92, 93
Oracle 36

P

Peoplesoft 36

Q

QEL/MU 51, 56

R

ResQ!Net 22

ResQ!Net/LE 123
RIP 46, 83
RouteD 45, 46, 47

S

SAP 15, 16, 28, 36, 71, 74, 83
SDDL 10, 12, 109, 117, 136, 139, 140, 144, 146
SLP 56, 58
SNA API 10, 51, 54, 55, 56, 57
SNA gateway 8, 9, 11, 18, 25, 36, 55, 58, 110,
125, 126, 129, 130, 136, 137, 140, 145
SSL 113

T

TCP/IP Passthrough 2, 6, 14, 18, 36, 38, 61, 62,
64, 65, 66, 67, 68, 69
TCPRCVBufsize 70, 81
TCPSENBfsize 70, 81
TN3270 21, 53, 54, 56, 58, 99, 102, 105, 109, 111,
113, 117
TN3270E 7, 8, 10, 11, 12, 21, 25, 36, 51, 99, 100,
101, 102, 104, 110, 111, 112, 113, 118, 119, 122,
126, 129, 130, 136, 139
TN5250 56
TRLE 85, 89, 90, 93, 95

U

UDPRCVBUFRSIZE 70, 81
UDPSENBFRSIZE 70, 81

V

VIPA 45, 46, 47
VPPA 2, 6, 13, 15, 16, 36, 37, 45, 46, 47, 71, 73,
74, 76, 78, 80, 86, 89, 90, 91, 92, 93
VTAM 83, 85, 89, 90, 95, 102, 103, 108, 109, 114,
115, 122, 128, 130, 134, 136, 138, 139, 140, 146

ITSO Redbook Evaluation

Netfinity to S/390 Connectivity using ESCON
SG24-5284-00

Your feedback is very important to help us maintain the quality of ITSO redbooks. **Please complete this questionnaire and return it using one of the following methods:**

- Use the online evaluation form found at <http://www.redbooks.ibm.com>
- Fax this form to: USA International Access Code + 1 914 432 8264
- Send your comments in an Internet note to redbook@us.ibm.com

Which of the following best describes you?

Customer **Business Partner** **Solution Developer** **IBM employee**
 None of the above

Please rate your overall satisfaction with this book using the scale:
(1 = very good, 2 = good, 3 = average, 4 = poor, 5 = very poor)

Overall Satisfaction _____

Please answer the following questions:

Was this redbook published in time for your needs? Yes___ No___

If no, please explain:

What other redbooks would you like to see published?

Comments/Suggestions: (THANK YOU FOR YOUR FEEDBACK!)

