3745 Communication Controller Models A
3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:

Multiaccess Enclosure Planning

GA27-4240-01

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GA27-4240-01

Note!

Before using this information and the product it supports, be sure to read the general information under “Notices” on page xi.

Second Edition (September 2000)

This edition applies to the 3745 Communication Controller Models A and 3746 Nways® Multiprotocol Controller Models 900 and 950.

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Contents

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Figures

© Copyright IBM Corp. 1988, 2000

Tables

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The 3745 and 3746 controllers require a certain level of microcode to be Year 2000 ready. For more detailed information, access one of the following URLs and click **Support**.

`http://www.ibm.com/networking/3745`
`http://www.ibm.com/networking/3746`

What Is New in This Edition

This book has been revised to include

- Reference to the white paper containing MAE implementation scenarios
- Shipping the Licensed Internal Code (LIC), along with the 3745/3746 library, on the CD-ROM, thus providing the ability to configure the Multiaccess Enclosure from a workstation running the Controller Configuration and Management (CCM) program
- Addition of Appendix B, “Helpful Books To Read” on page 125, which provides a list of useful publications for supporting various MAE situations

The technical changes and additions are indicated by a vertical line (|) to the left of the change.

About This Guide

The *3745/3746 Planning Series* is designed to help you plan the installation and configuration of the IBM 3745 Communication Controller Models A and IBM 3746 Nways® Multiprotocol Controller Models 900 and 950. The *Planning Series* also describes the information you must gather to install and integrate 3746 Controllers into Advanced Peer-to-Peer Networking®/High-Performance Routing (APPN®/HPR) and Internet Protocol (IP) environments.

The *3745/3746 Planning Series* consists of a set of Planning Guides that replace, update and obsolete the *Planning Guide*.

Important:

1. If you already use the existing *Planning Guide*, IBM recommends that you read the new *Planning Series* to learn about new features and to become familiar with the new structure in which planning information is presented.
2. When planning the installation and configuration of 3746 controllers you must use the *IBM 3745 Communication Controller Models A, IBM 3746 Nways Multiprotocol Controller, Models 900 and 950: Overview* along with the *3745/3746 Planning Series* to have all required information.
3. The 3745/3746 documentation is updated periodically in response to your needs and to reflect product evolutions. Because of the time delay necessary to update hard media (books that are printed and available on CD-ROM), it is highly recommended that you check periodically the IBM 3745/3746 documentation on the Web for the latest versions of the documents (see "Additional Information on the Web" on page xxi).

Refer to the appropriate Planning Guide for the parameters to be customized for the installation and operation of:

- 3745 Communication Controller Models A
- 3746 Nways Multiprotocol Controller Models 900 and 950
- Network Node Processor (NNP)
- Multiaccess Enclosure (MAE)
- Service processor
- Distributed Console Access Facility (DCAF) and TME® 10 remote consoles
- Java™ Console
- Network management

When you define 3746 resources controlled by NCP, record the information in the worksheets provided for the Controller Configuration and Management application.

The *3745/3746 Planning Series* consists of the following planning guides:

Overview, Installation, and Integration

Starts with a general overview of 3746 planning and then explains the various 3745 and 3746 installation and upgrade scenarios.

The guide also explains the options available for the basic integration of the controller and its service processor into your network. There are MOSS-E worksheets for these options, which are to be filled out for the IBM service representative who does the actual controller installation or upgrade. The appendixes:

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- Shows the panels of the MOSS-E service processor customization function
- Support offered by each level of the 3746 Licensed Internal Code.

ESCON Channels

After an overview of ESCON® and the adapters, the guide explains the configuration and tuning. This can be done with either the ESCON Generation Assistant (EGA) tool or the Controller Configuration Management (CCM) tool.

The guide also includes examples of various types of ESCON configurations.

Note: For information about using ESCON adapters on the MAE, refer to the *Multiaccess Enclosure Planning* guide.

Token Ring and Ethernet

Helps you with the configuration and definitions of your 3746 Network Node token-ring adapters (TRAs) for APPN/HPR-, IP-, and NCP-controlled traffic.

There are MOSS-E worksheets for the token-ring information needed by the IBM service representative to install or update your machine.

Although no longer available from IBM, the guide explains 3746 Ethernet support and Ethernet adapter configuration.

The token-ring (IEEE 802.5) and Ethernet (IEEE 802.3) standards are discussed in the appendixes.

Note: For Multiaccess Enclosure Ethernet information, refer to the *Multiaccess Enclosure Planning* guide.

Serial Line Adapters

Starts with an overview of the serial line adapters. Next X.25, frame-relay, PPP, and SDLC support are covered.

The two ways that the 3746 supports ISDN (LIC16 adapter[1] and terminal adapters) are explained, including how ISDN lines can be used as backups for other types of lines.

There is an appendix that gives the frame-relay support in each NCP level since frame relay was introduced in NCP Version 6.

Note: For Multiaccess Enclosure ISDN information, refer to the *Multiaccess Enclosure Planning* guide.

Physical Planning

Gives information to help you plan the physical site used by the 3745/3746s frames, service processor, and network node processor: the physical dimensions, electrical characteristics, and so on. It also gives this information for the various components of the 3745/3646, such as the Multiaccess Enclosure, Controller Extension, LICs, LCBs, ARCs, and so on.

The cable descriptions include feature codes (FCs) and part numbers used when ordering them.

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[1] No longer being manufactured

The guide includes and explains the controller installation sheets, which show what IBM has installed on your machines.

Plugging sheets for keeping track of your installed LICs, ARCs, and cables are provided along with examples and explanations of their use.

Note: This type of information for the Multiaccess Enclosure is in the *Multiaccess Enclosure Planning* guide.

Management Planning

Starts with a management overview covering:

- Tivoli® NetView®
- Performance Management
- Service processor
- Network Node Processor
- APPN Topology Integrator

Then there are chapters about:

- APPN/HPR Network Node management
- NetView Performance Monitor
- Remote console support
- IBM Remote Support Facility
- 3746 IP router management
- Multiaccess Enclosure APPN/HPR Network Node management
- X.25 network

There are MOSS-E worksheets for the network management parameters needed by the IBM service representative to install or upgrade your machine.

The guide explains the use of the MOSS-E Service Processor Customization.

There is an example of ESCON management information base (MIB) definitions.

Note: For Multiaccess Enclosure management information, refer to the *Multiaccess Enclosure Planning* guide.

Multiaccess Enclosure Planning

Provides information about the Multiaccess Enclosure and its adapters (ATM, ESCON, and so on) and how to configure them.

For information about:

- Multiaccess Enclosure APPN/HPR Network Node management, refer to the *3745/3746 Planning Series: Management Planning*
- Physical site planning and the cables, refer to the *3745/3746 Planning Series: Physical Planning*

Protocols Description

Is an in depth description of these protocols used by the 3746:

- APPN/HPR
- IP

The detailed discussions of how the 3746 and Multiaccess Enclosure support these protocols help you understand the purpose of the protocol parameter definitions and what types of information are needed for the most efficient operation of your 3745/3746-connected networks.

CCM Planning Worksheets, (Online)

These example worksheets for the 3746 and MAE can be used to plan the actual definitions of the many CCM parameters you need to configure your 3746.

This guides is available (in PDF format) on the Web at

`http://www.ibm.com/networking/did/3746bks.html#Customer`

Who Should Use the 3745/3746 Planning Series

The *3745/3746 Planning Series* is intended for network planners, network specialists, and system programmers responsible for collecting the information required for the installation and network integration of 3745 Communication Controller Models A and 3746 Expansion Unit Model 900 in an SNA environment, as well as the 3746-950 and 3746-900 as APPN/HPR network nodes and IP routers.

Where to Find More Information

While planning a migration, you must use the following documents in addition to the *3745/3746 Planning Series* guides:

- IBM *3745 Communication Controller Models A and 170, 3746 Nways Multiprotocol Controller Models 900 and 950: Overview*, GA33-0180
- IBM *3745 Communication Controller All Models, 3746 Nways Multiprotocol Controller Model 900: Console Setup Guide*, SA33-0158 (This guide contains information about remote console access to 3745/3746-900s via an SNA/subarea, APPN, or TCP/IP path and using a modem.)

Also, you may need to use the following additional documents:

- IBM *3746 Nways Multiprotocol Controller Model 900 and 950: Controller Configuration and Management: User's Guide*, SH11-3081 (IBM recommends that you prepare controller definitions before installing a 3746. To obtain a stand-alone version of the Controller Configuration and Management that runs on an OS/2® workstation, contact your IBM marketing representative.)
- *3746 Nways Multiprotocol Controller Model 950: User's Guide*, SA33-0356. (This guide contains information about routine operations, installing and testing the communication line adapters, service processor, and remote consoles.)
- *Planning for Integrated Networks*.

Be sure to use the latest editions of these documents. This will ensure that you have up-to-date and complete information about the 3746 controllers.

The following *IBM International Technical Support Organization* redbooks provide useful information about 3746 implementation:

- *APPN Architecture and Product Implementations Tutorial*, GG24-3669
- *IBM 3746 Nways Multiprotocol Controller Model 950 and IBM Model 900: APPN Implementation Guide*, GG24-2536
- *Subarea Network to APPN Network Migration Guide*, SG24-4656
- *IBM 3746 Nways Multiprotocol Controller Model 950 and IBM Model 900: IP Implementation Guide*, SG24-4845 (an IBM redbook).

Be sure to see the other relevant documents listed in the bibliography at the back of this guide.

Additional Information on the Web

You can access the latest news and information about IBM network products, customer service and support, and information about microcode upgrades at:

```
http://www.ibm.com/
```

The latest versions of the *Planning Series* and other 3745/3746 documentation are available in PDF format at:

```
http://www.ibm.com/networking/did/3746bks.html#Customer
```

CD-ROM

Starting with engineering change F12380, the Licensed Internal Code (LIC) is shipped on a CD-ROM. The complete 3745/3746 documentation set is also included on the CD-ROM.

Examples: 3745 Models A and 3746 *Planning Series*, 3746 NNP and Service Processor Installation and Maintenance Guides, CCM *User's Guide*, 3746-950 *User's Guide*, and others. See the bibliography for the complete name and form number of the books.

3745/3746 documentation is in PDF format. Acrobat Reader for OS/2® is included on the CD-ROM to allow you to read the .PDF files and print all or part of a book.

Accessing CD-ROM Information

To access the CD-ROM from a service processor equipped with a CD-ROM drive, do the following:

Step 1. Install the CD-ROM in the service processor CD-ROM drive.

Step 2. In the MOSS-E main panel, open the **View** menu and select **Information**.

Step 3. Double-click **CD-ROM documentation**. Your browser automatically opens and displays the documentation home page.

Step 4. Click any highlighted text (blue and underlined) to go to the material that interests you:

a. Click **Documentation** to access 3745/3746 books.

b. Click the icon marked PDF that corresponds to the item that interests you.

The Acrobat Reader automatically opens and displays the file in the full panel mode. Use the **Page Up** and **Page Down** keys to move through the document.

Press **Esc** to display the Reader menus that allow you to print all or part of the file.

When you close the Acrobat Reader, you return to the browser.

When you close the browser, you return to the MOSS-E Documentation menu.

Each document file has one or more of the following identifiers:

- Date
- Form number
- Engineering change level
- Revision code.

Check these identifiers on future releases of the CD-ROM to see if the documents that you use have been updated.

How to Use the 3745/3746 Planning Series

Your Responsibility as a Customer

You are responsible for performing the tasks listed in Table 1. These tasks are not performed by IBM personnel as part of the machine installation and basic operations. They can, however, be performed by IBM on a fee basis.

Table 1 (Page 1 of 3). Customer Tasks

Task	Where to Find Information
Network design:	Network design is not covered in this book. Refer to the following IBM books for SNA, APPN/HPR, and IP network planning guidance: • *Planning for Integrated Networks* • IBM redbooks: – *Subarea Network to APPN Network Migration Guide* – *IBM 3746 Nways Multiprotocol Controller Model 950 and IBM Model 900: APPN Implementation Guide* – *IBM 3746 Nways Multiprotocol Controller Model 950 and IBM Model 900: IP Implementation Guide* – *IBM Nways 2216 Multiaccess Connector Description* – *IBM 2216 Multiaccess Connector ESCON Solutions*
Physical planning: Before the IBM service representative arrives to install your controller, make sure that you have met the necessary requirements for the following: • Electric power • Floor space with service clearances • Space for the cables • The RSF switched line • The Controller Expansion (FC 5023) • Other components (such as the service processor).	"Physical Planning Details" chapter in the *3745/3746 Planning Series: Physical Planning*
Controller hardware configuration definitions: Decide what type of attachments (lines) and how many of each type you need.	This input is necessary for the IBM ordering system (CF3745). For more information, refer to the *3745/3746 Planning Series: Physical Planning*.

Table 1 (Page 2 of 3). Customer Tasks	
Task	**Where to Find Information**
Software definitions and tuning: • ESCON port, host link, and station definitions; ESCON resource, TCP/IP, and VTAM® tuning	Refer to: • "ESCON Adapters" chapter in the *3745/3746 Planning Series: ESCON Channels* • "ESCON Channel Adapter" chapter in the *3745/3746 Planning Series: Multiaccess Enclosure Planning* • "ESCON Configuration Examples" chapter in the *3745/3746 Planning Series: ESCON Channels*
• Token-ring port and station definitions; PU and LU maximum limits; port sharing with NCP-controlled traffic; duplicate addresses; token-ring APPN, IP, and/or NCP resource tuning and VTAM tuning	• "Token-Ring Adapters" chapter in the *3745/3746 Planning Series: Token Ring and Ethernet*
• Serial line (SDLC, PPP, frame-relay, and X.25) port and station definitions; location of CLPs, LICs, LCBs, and ARCs; maximum CLA line connectivity; CLP backups	• "Serial Line Adapters" chapter in the *3745/3746 Planning Series: Serial Line Adapters* • "3746 SDLC Support" chapter in the *3745/3746 Planning Series: Serial Line Adapters*
• Multiaccess Enclosure: hardware planning and configuration; software configuration and tuning	• *3745/3746 Planning Series: Multiaccess Enclosure Planning* • *3745/3746 Planning Series: Physical Planning*
• Use of the Controller Configuration and Management (CCM) application.	• *IBM Controller Configuration and Management User's Guide*, SH11-3081. Also refer to: • *IBM 3746 Nways Multiprotocol Controller Model 950 and IBM Model 900: APPN Implementation Guide* (an IBM redbook) • *IBM 3746 Nways Multiprotocol Controller Model 950 and IBM Model 900: IP Implementation Guide* (an IBM redbook).
Filling out: • 3746 plugging sheets To keep a record of the processors and couplers (and their addresses) installed in the 3746 frame.	Refer to: • "Plugging Sheets for 3745 and 3746" chapter in the *3745/3746 Planning Series: Physical Planning*
• *CCM User's Guide*, SH11-3081 worksheets To plan the 3746 and MAE logical resource definitions. They can then be used when configuring the 3746 and MAE via the CCM.	• *3745/3746 Planning Series: CCM Planning Worksheets*

Table 1 (Page 3 of 3). Customer Tasks	
Task	**Where to Find Information**
NetView definitions in VTAM, the MOSS-E, NPM, CCM, NetView/360, and Tivoli NetView® (formerly NetView for AIX) for: • APPN traffic • IP traffic • NetView alert path.	Refer to: • "3746 Management Overview" chapter in the *3745/3746 Planning Series: Management Planning* • "3746 APPN/HPR Network Node Management" chapter in the *3745/3746 Planning Series: Management Planning* • "3746 IP Router Management" chapter in the *3745/3746 Planning Series: Management Planning*.
Controller, service processor, and network node processor definitions. For example: • Link IPL port information • Password management • NetView alert reporting path definitions • DCAF LU definitions • Ethernet port definitions for SNMP • Service processor token-ring and IP LAN addresses.	Refer to "Controller and Service Processor Integration" chapter in the *3745/3746 Planning Series: Overview, Installation, and Integration*. Fill out the worksheets in the various *Planning Series* guides. These worksheets are used by the IBM service representative during installation.
Remote console definitions (using DCAF): • Ensure that the necessary hardware and software is available for the type of console attachment chosen • Service processor definitions for DCAF • DCAF installation and configuration on the remote console.	Refer to: • "Remote Customer Consoles" chapter in the *3745/3746 Planning Series: Management Planning* • For the 3746-900, refer to the *3745 Console Setup Guide* • For the 3746-950, refer to the *IBM 3746 Nways Multiprotocol Controller Model 950 User's Guide*
Connection to the IBM remote support facility (RSF): • Service processor connection (modem) definitions • Customer definitions for RSF records.	Refer to the "Connecting to the IBM Remote Support Facility" chapter in the *3745/3746 Planning Series: Management Planning*
Problem determination through the MOSS-E and NetView	For the 3746-900, refer to: • *Problem Analysis Guide* accessed online from the MOSS-E • *3745 Models A: Alert Reference Guide* • *3745 All Models: Advanced Operators Guide*

Finding Your Way Around in the New Planning Series

If you are familiar with the layout of the old *3745 Communication Controller Models A and 3746 Models 900 and 950: Planning Guide*, GA33-0457, Table 2 should help you find which of the eight new books of the planning series contains the information that you need.

Note: Some of the chapters in the *Planning Guide* have been split into two or more new chapters in one or more new guides.

Table 2 (Page 1 of 2). Location of Old Planning Guide Chapters in New Planning Guides

Old Planning Guide		New Planning Series Book	
Chapter	**Chapter Name**	**Chapters**	**Guide Name**
1	3745 and 3746 General Information	--	Not included in the new guides
2	APPN/HPR Overview	1	*Protocols Description*
3	Internet Protocol (IP) Overview	2	*Protocols Description*
4	3746 ATM Support	4	*Multiaccess Enclosure Planning*
5	Token-Ring/802.5	B	*Token-Ring and Ethernet*
6	Ethernet Overview	C	*Token-Ring and Ethernet*
7	Frame Relay Overview	4, 5	*Serial Line Adapters*
8	Point-to-Point Protocol (PPP) Overview	4	*Serial Line Adapters*
9	X.25 Overview	2, 3, 5, 7	*Serial Line Adapters* *Management Planning*
10	ISDN Adapters	8	*Serial Line Adapters*
11	ESCON Overview	1	*ESCON Channels*
12	3745 and 3746 Installation and Upgrade Scenarios	2	*Overview, Installation, and Integration*
13	Configuration Scenarios	6	*Multiaccess Enclosure Planning*
14	3746 Planning Overview	1	*Overview, Installation, and Integration*
15	ESCON Adapters	1, 2, 3	*ESCON Channels*
16	Token-Ring Adapters	1, 2, 3	*Token-Ring and Ethernet*
17	Ethernet Adapters	4, 5	*Token-Ring and Ethernet*
18	Serial Line Adapters	1	*Serial Line Adapters*
19	3746 SDLC Support	3, 4	*Serial Line Adapters*
20	Multiaccess Enclosure	1	*Multiaccess Enclosure Planning*
21	Multiaccess Enclosure Adapters Overview	2	*Multiaccess Enclosure Planning*
22	ESCON Channel Adapter	8	*Multiaccess Enclosure Planning*
23	Multiaccess Enclosure ISDN Support	5	*Multiaccess Enclosure Planning*
24	3746 Configuration Overview	--	Not included in the new guides
25	Welcome to the CCM	--	Not included in the new guides
26	Multiaccess Enclosure Configuration	7	*Multiaccess Enclosure Planning*
27	3746 Base Frame ESCON Configuration Examples	1	*ESCON Channels*
28	Configuring the MAE ESCON Channel Adapter	8	*Multiaccess Enclosure Planning*

Table 2 (Page 2 of 2). Location of Old Planning Guide Chapters in New Planning Guides

Old Planning Guide		New Planning Series Book	
Chapter	**Chapter Name**	**Chapters**	**Guide Name**
29	3746 Management Overview	1	*Management Planning*
30	3746 APPN/HPR Network Node Management	2	*Management Planning*
31	3746 IP Router Management	6	*Management Planning*
32	MAE APPN/HPR Network Node Management	2	*Management Planning*
33	MAE IP Router Management	6	*Management Planning*
34	Controller and Service Processor	3	*Overview, Installation, and Integration*
35	Customer Consoles and DCAF	4 1 1	*Management Planning* *Overview, Installation, and Integration* *Token-Ring and Ethernet*
36	Connecting to the IBM Remote Support Facility	5	*Management Planning*
37	Performance Management with NetView Performance Monitor	3	*Management Planning*
37	3746 IP Router Management	6	*Management Planning*
38	MOSS-E Worksheets for Controller Installation (3745)	A A A	*Overview, Installation, and Integration* *Management Planning* *Token-Ring and Ethernet*
39	Parameter Cross-Reference Table	B	*Overview, Installation, and Integration*
40	CCM Worksheets for Controller Configuration Definitions	1	*CCM Planning Worksheets* (online)
41	Multiaccess Enclosure Worksheets	2	*CCM Planning Worksheets* (online)
42	Familiarizing Yourself with the Installation Sheets	2	*Physical Planning*
43	Plugging Sheets for the 3746 Nways Multiprotocol Controller	3	*Physical Planning*
44	Physical Planning Details	1	*Physical Planning*
A	3746-9x0 Microcode Levels (EC)	D	*Overview, Installation, and Integration*
B	ESCOM MIB	A	*Management Planning*
C	MOSS-E Service Processor Customization Function	C	*Overview, Installation, and Integration*

Chapter 1. Multiaccess Enclosure

Figure 1. The 3746-950 with the Multiaccess Enclosure Installed in the First Controller Expansion.

This chapter introduces the Multiaccess Enclosure, what it consists of, what the options are, and what the prerequisites are for installation.

Physical planning information for the MAE is available in the *3745 Communication Controller Models A, 3746 Nways Multiprotocol Controller Models 900 and 950: 3745/3746 Planning Series: Physical Planning*, GA27-4238.

The Multiaccess Enclosure is an extension to the 3746 Models 900 and 950. It expands the connectivity of the 3746 by offering eight new adapter slots. These new adapters are based on PCI technology and offer:

- A broad range of high-speed lines for ATM LAN emulation clients and classical IP
- Increased token-ring and Ethernet LAN interfaces
- Additional E1/T1 and low-speed lines
- New ESCON adapters.

The MAE is housed in a Controller Expansion. The controller expansion can be bolted to the 3746 or is within 6 m (20 ft) of the 3746.

The Multiaccess Enclosure is primarily an APPN, HPR, APPN/DLUR, and IP router. It also provides new specific functions such as IPX, DLSw support, MPC+ (the latest IBM channel protocol, which requires VTAM® V4 R4 or higher) for very high-throughput HPR traffic, and brings additional high performance ESCON adapters for IP and SNA/APPN.

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MAE FC 3001

The Multiaccess Enclosure with Direct Attachment is attached directly to the 3746 Connectivity Switch through a special cable from its Switch Access card to the Switch Interface Extended card located in a 3746 processor slot, refer to Figure 2. This connection increases the throughput for IP traffic between the 3746-9x0 adapters and the 3746 Multiaccess Enclosure adapters.

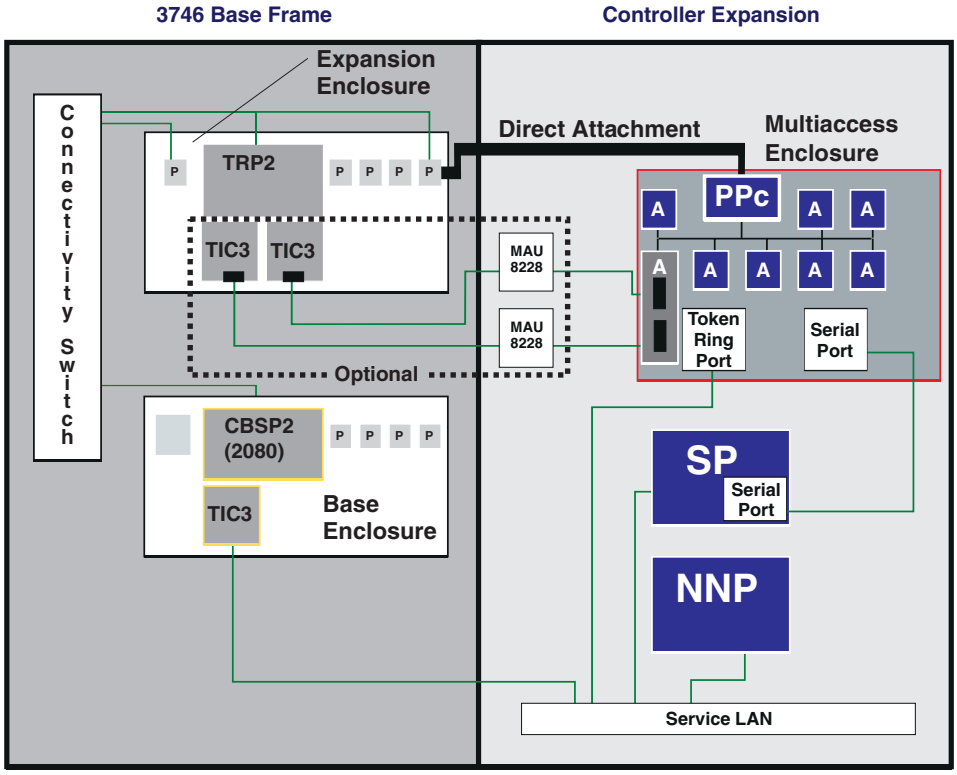

Figure 2. Block Diagram Showing the Components Used to Attach the Multiaccess Enclosure FC 3001

When the Multiaccess Enclosure FC 3001 is installed, the 3746 has a single IP control point and two APPN/HPR control points (NNP, MAE).

MAE FC 3000

The first version of the Multiaccess Enclosure (FC 3000[2]) connects to the 3746 and the MAE via zero, one or two dedicated token-ring attachments (FC 9713[2]), refer to Figure 3. It appears as separate APPN/HPR and IP control points.

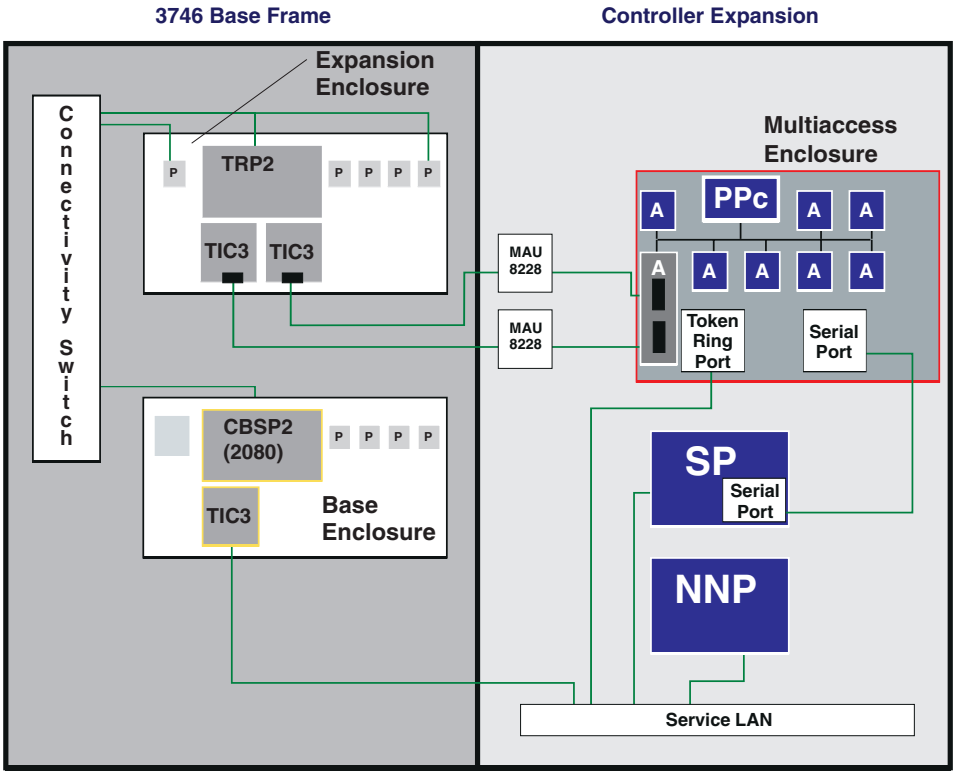

Figure 3. Block Diagram Showing the Components Used to Attach the Multiaccess Enclosure FC 3000

Additional Documentation

The IBM 2216 Nways Multiaccess Controller documents are very helpful for MAE installation and configuration planning, even though the MAE does not support all the functions of the IBM 2216 Nways Multiaccess Controller. The 2216 documentation is online at:

`http://www.networking.ibm.com/support/docs.nsf/2216docs?OpenView`

An overview of the helpful 2216 documentation is provided in Appendix B, "Helpful Books To Read" on page 125.

MAE implementation scenarios are published in the IBM networking white paper *3746-900 Installation Scenarios*, which is available from the IBM networking hardware web page at:

`http://www.networking.ibm.com/nethard.html`

under the Documentation/Technical white pages section.

[2] No longer manufactured.

This white paper provides working examples of some of the most common configurations (for example, TN32703) using a 3746-900 with MAE to connect to an S/390 and includes:

- A presentation documenting the test environment and the different scenarios tested
- Text files with VTAM and NCP sources that reflect the different elements used in the tests
- CCM files with the 3746-900 configurations for each scenario

Note: Although the document is based on a 3746 Model 900 environment, most of the descriptions also apply to the 3746 Model 950.

Description

The base Multiaccess Enclosure (FC 3001), refer to Figure 5 on page 9, consists of:

- A base enclosure
- Switch Access card, used for the Direct Attachment to the 3746 Switch Interface Extended
- One power supply (a second redundant power supply, FC 3500, is optional)
- A cooling fan tray assembly
- A system backplane
- A system card containing:
  - A 200-Mhz PowerPC microprocessor
  - 64-MB DRAM
  - A PCMCIA token-ring card and cable.
- Eight adapter slots
- A cable to connect the Multiaccess Enclosure maintenance serial port to the service processor.

The base Multiaccess Enclosure FC 3000 is similar to the base Multiaccess Enclosure FC 3001, except that it does not contain a Switch Access Card. The following may be configured for MAE traffic with the other enclosures (refer to Figure 3 on page 3):

- A 2-port token-ring card (FC 3280) for slot 1 (dedicated to the traffic with the other enclosures)
- MAE FC 3000 Token-Ring kit (FC 8713[3])
  - Two IBM 8228 Service Processor Access Units
  - Two cables (P/N 43G3953) for the 8228 connection to the token-ring card of the Multiaccess Enclosure.

These card and cables are optional for the Multiaccess Enclosure FC 3001 (refer to Figure 2 on page 2) and only required for APPN/HPR and SNA (NCP) traffic that flows between the MAE and the other enclosures.

The MAE FC 3001 Token-Ring Kit is available via the feature code 5713.

The required operational software is shipped preloaded on each Multiaccess Enclosure.

[3] No longer manufactured.

Prerequisites

Hardware Requirements

You must provide the following hardware to integrate and operate the 3746 Multiaccess Enclosure with the 3746:

- Service Processor FC 5021 3172 Pentium 90 minimum (P/N 55H7630) with FC 5051 or FC 5052. For more information, see "Controller and Service Processor Integration" in the *3745/3746 Planning Series: Overview, Installation, and Integration*.
- Network Node Processor (FC 5022)
- 3746 IP Feature (FC 5033) enabled on the Network Node Processor if you want IP traffic on the Multiaccess Enclosure to communicate with 3746-9x0 base frame adapters.
- Any cables required for the Multiaccess Enclosure Adapters, refer to the "Physical Planning Details" chapter in the *3745/3746 Planning Series: Physical Planning*, GA27-4238. for a list of IBM cable feature numbers.
- The controller expansion (FC 5023) used to house the service processor and network node processor, or the second controller expansion (FC 5023).

To route traffic between the 3746 and the MAE FC, the following is optional for FC 3001 and required for FC 3000:

- Two TIC3 interfaces in the 3746-9x0 (dedicated for Multiaccess Enclosure connection). These TIC3s connect to the 3746 Multiaccess Enclosure slot 1 token-ring card via two 8228s.
- Two IBM 8228 Service Processor Access Units
- Two cables to connect the 8228 MAUs to the 3746-9x0 TIC3s (Cable Group 7003).

Note: Processors controlling the TIC3s connecting the 3746-9x0 and Multiaccess Enclosure must be TYPE2 (for example TRP2). The TIC3s may be connected to a single TRP2, or on two separate TRP2s.

Configuration Requirements

The following resources must be configured with IP addresses to allow the Multiaccess Enclosure to communicate with the 3746-9x0 hardware. This can be done using the 3746 Multiaccess Enclosure configuration tool, or during initial hardware install by the IBM service representative:

- Multiaccess Enclosure service token-ring IP address (same subnet as the service processor, NNPs, 3746-9x0 port 2080). For more information, see "Controller and Service Processor Integration" in the *3745/3746 Planning Series: Overview, Installation, and Integration*.
- Multiaccess Enclosure IP address for both PORT 0 and 1 on the token-ring card in adapter slot 1, if APPN/HPR and IP traffic is to flow between the MAE and the 3746 adapters (required for MAE FC 3000).

Multiaccess Enclosure Support

LANs

The following LANs are supported by the Multiaccess Enclosure:

- Token-ring (IEEE 802.5) with STP or UTP connection
- Ethernet or IEEE 802.3 with 10BASE2 or 10BASE-T connection
- Fast Ethernet (100 Mbps)
- ATM LAN emulation (client).

WAN and Channel Interfaces

The interfaces supported by the Multiaccess Enclosure are:

- EIA-232E/V.24
- V.35
- V.36
- X.21
- ISDN Primary (T1/J1)
- ISDN Primary (E1)
- ATM 155-Mbps multimode fiber
- ATM 155-Mbps single-mode fiber
- ESCON
- Parallel channel.

Protocols

The protocols supported by the Multiaccess Enclosure are shown in the following table:

Table 3. Multiaccess Enclosure Connectivity and Major Routing Protocols

Protocols		IP	SNA	APPN (ISR)	HPR
CHANNEL	ESCON	LCS, MPC+	LSA	LSA	MPC+
	Parallel	LCs, MPC+	LSA	LSA	MPC+
LAN	Ethernet	yes	yes	yes	yes
	Token-Ring	yes	yes	no	no
WAN	ISDN (PRI)	yes	DLUR/DLSW[4]	yes	yes
	Frame Relay (RFC1490)	yes	DLUR/DLSW	yes	yes
	X.25	yes	DLUR/DLSW	no	no
	SDLC	_	DLUR/DLSW	yes	yes
	PPP (Leased Switched)	yes	DLSW	yes	yes
	ATM 155Mbps	Clasical IP	LANe	LANe	LANe, Native HPR

[4] DLUR only for frame relay over ISDN.

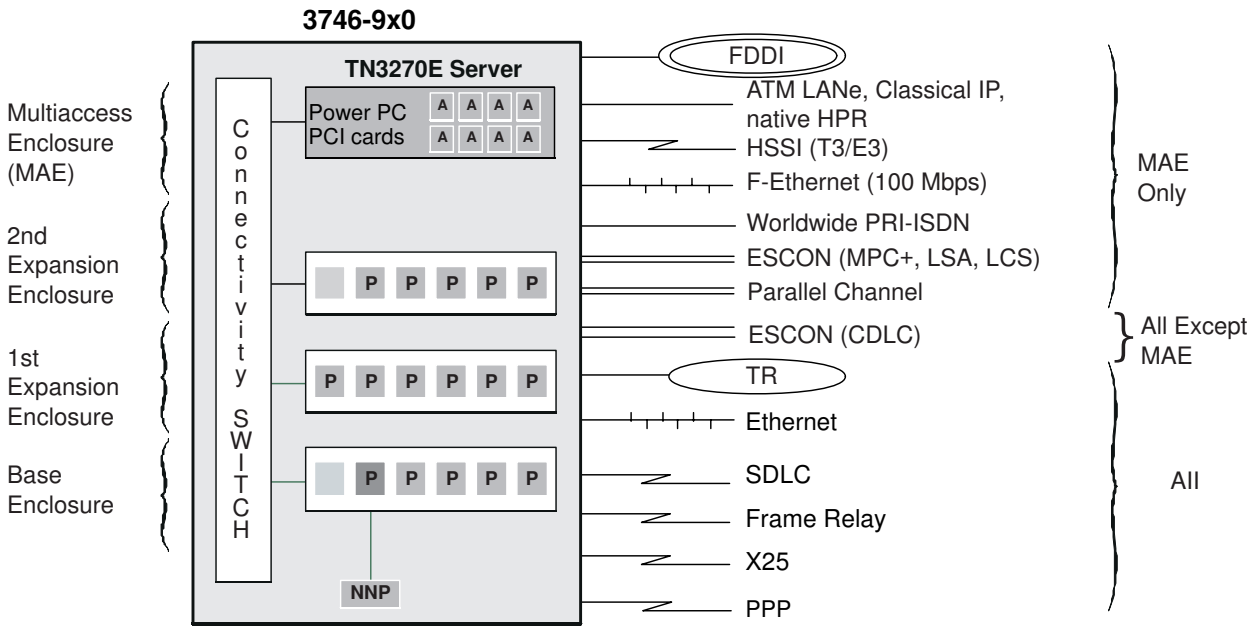

Figure 4. Protocol Support for 3746-9x0.

The Multiaccess Enclosure supports some protocols that are not supported by adapters in the other enclosures, and vice-versa. This is illustrated in Figure 4.

The network interfaces located within the MAE are not under NCP control. They are configured through the service processor using the Multiaccess Enclosure configurator for the MAE FC 3000 or the CCM for the MAE FC 3001.

IPX is supported on the Multiaccess Enclosure interfaces for:

- PPP links
- FR links
- X.25 links
- ISDN
- Token Ring
- Ethernet [5].

[5] IPX is supported using LAN emulation.

Chapter 2. Multiaccess Enclosure Adapters Overview

Slots and Adapter Plugging

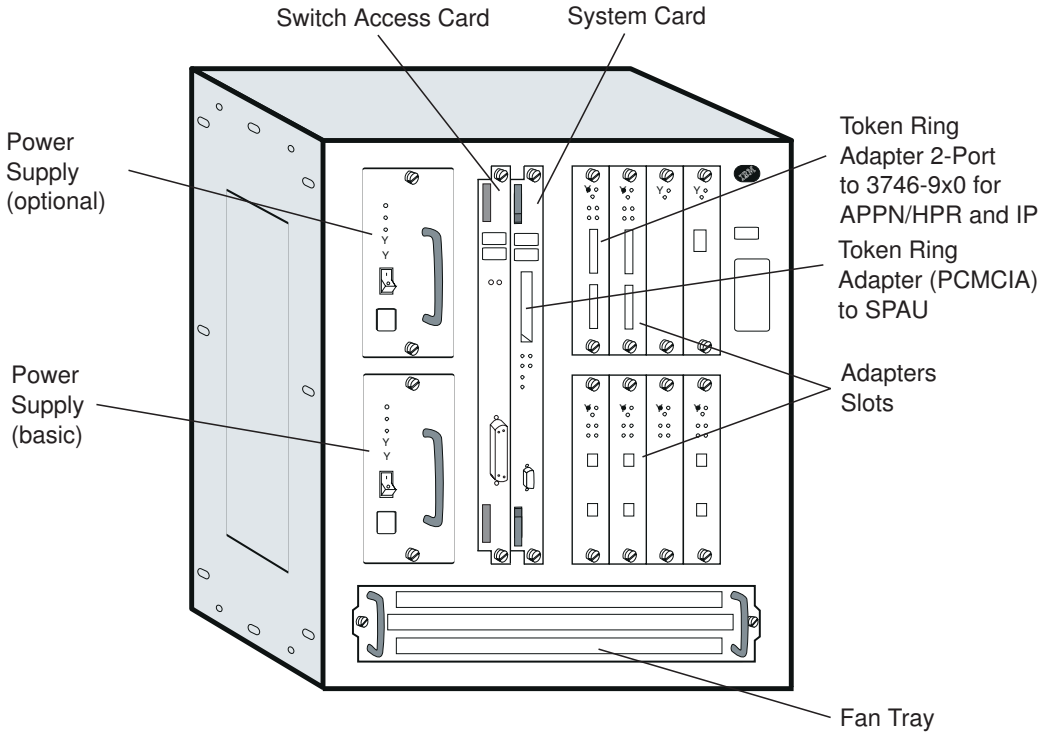

Figure 5. Components of Multiaccess Enclosure

Figure 5 shows the Multiaccess Enclosure. There are two large slots:

1. Slot A is used by the Switch Access card for connection to the 3746 switch
2. Slot B is filled by the system card.

There are eight adapter slots used for adapters based on PCI technology. These MAE adapters cannot be plugged in the other enclosures.

Note: APPN/HPR and SNA traffic that flows between the MAE and the 3746 connectivity switch uses a 2-port token-ring card (FC 3280).

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Adapters can be installed in any of the slots numbered 1 through 8 with the following restrictions:

- The Multiaccess Enclosure supports a maximum of two ATM adapters (FC 3284 or FC 3293)
- The Multiaccess Enclosure supports a maximum of four ISDN adapters (FC 3283 or FC 3292)
- If the 2-port token-ring (FC 3280) or 2-port Ethernet (FC 3281) adapter is plugged into slot 3 and active, then slot 4 cannot be used.
- If the 2-port token-ring (FC 3280) or 2-port Ethernet (FC 3281) is plugged into slot 4 and active, then slot 3 cannot be used.
- If the 2-port token-ring (FC 3280) or 2-port Ethernet (FC 3281) adapter is plugged into slot 7 and active, then slot 8 cannot be used.
- If the 2-port token-ring (FC 3280) or 2-port Ethernet (FC 3281) adapter is plugged into slot 8 and active, then slot 7 cannot be used.

Plugging Sequences

Table 4 illustrates how the slots are numbered: two rows of four slots, numbered 1 through 8.

Table 4. Slot Numbering

Slot 1	Slot 2	Slot 3	Slot 4
Slot 5	Slot 6	Slot 7	Slot 8

Table 5 and Table 6 show the default sequence of installation for the various adapters.

LIC280s (FC 3280 2-port token ring) and LIC281s (FC 3281 2-port Ethernet) are installed left to right. A maximum of six may be installed in any single MAE.

Table 5. LIC280 and LIC281 Installation Sequence

First	Third	Fifth	
Second	Fourth	Sixth	

Other adapters are installed right-to-left in the first-available slot beginning with slot 8 on the far right.

Table 6. Installation Sequence for all other Adapters

Eighth	Sixth	Fourth	Third
Seventh	Fifth	Second	First

MAE Adapters

The following adapters are available for the Multiaccess Enclosure.

Cable information for these adapters can be found in the “Physical Planning Details” chapter in the *3745/3746 Planning Series: Physical Planning*, GA27-4238.

Table 7. Multiaccess Enclosure Adapters

Adapter	**Feature Codes**
4-port ISDN-PRI/Channelized Daughter Card (T1/J1 interface)	3251
4-port ISDN-PRI/Channelized Daughter Card (E1 interface)	3252
2-port Token-Ring	3280
2-port Ethernet	3281
8-port V.24/EIA-232	3282
1-port ISDN-PRI (T1/J1 interface)	3283
1-port ATM 155-Mbps MMF	3284 (See note)
1-port FDDI MMF	3286
1-port ESCON	3287
1-port 10/100 Ethernet	3288
1-port HSSI (interface)	3289
6-port V.35/V.36	3290
8-port X.21	3291
1-port ISDN-PRI (E1 interface)	3292
1-port ATM 155-Mbps SMF	3293 (See note)
1-port ATM 155-Mbps MMF	3294
1-port ATM 155-Mbps SMF	3295
1-port ISDN-PRI/Channelized (T1/J1 interface)	3297
1-port ISDN-PRI (E1 interface)	3298
1-port Parallel Channel	3299
Note: These adapters are no longer manufactured.	

Note: Adapters can be inserted and removed while the Multiaccess Enclosure is operational. Failed adapters can be replaced without rebooting or taking down the enclosure. The replaced adapter assumes the configuration of the failed adapter. New adapters can be added without powering the enclosure down and activated at a convenient time by rebooting the Multiaccess Enclosure.

The adapters are described in the *3745 Communication Controller Models A and 170, 3746 Nways Multiprotocol Controller Models 900 and 950: Overview*, GA33-0180.

Power Supply

The Multiaccess Enclosure can have one or two power supplies. A single power supply can provide power for a fully configured unit. The first power supply will remain fully operational while a second power supply (FC 3500) is either being installed or removed. The second power supply must have its power switch in the off position while it is being installed or removed.

The ac inputs are connected to the Controller Expansion internal ac outlet distribution boxes.

Note: Power plugging rules apply (see the "Physical Planning Details" chapter in the *3745/3746 Planning Series: Physical Planning*.). The power supplies use a voltage sensing system that converts line current of 200-240 volts ac, 50/60 Hz single-phase from the ac outlet distribution box to dc input as required by the system card, the adapters, and the fan tray.

MAE Optional Microcode Features

Refer to the *3745 Communication Controller Models A and 170, 3746 Nways Multiprotocol Controller Models 900 and 950: Overview*, GA33-0180 for information about:

- Multiaccess Enclosure Extended Functions 1 (FC 5804)
- Multiaccess Enclosure Extended Functions 2 (FC 5805[6])
- Multiaccess Enclosure Extended Functions 3 (FC 5807[6])
- 3746 and Multiaccess Enclosure Extended Functions 4 (FC 5810).

  The Extended Functions 4 include the functions previously available in the Multiaccess Enclosure Extended Functions 1, 2, and 3.
- TN3270E Server (FC 5806).

TN3270E (FC 5806) Server Configuration

The TN3270E server is configured using CCM. Where configuring the IP interface for TN3270E, you cannot use an interface on the 3746. You can use any MAE IP address or the 3746 IP router ID (internal IP address) configured in CCM.

In the VTAM switched major node, you must code:

```
IDBLK=077
```

which uniquely identifies the TN3270E server.

6 No longer available.

Chapter 3. ESCON Channel Adapter

Planning for the 3746 Multiaccess Enclosure ESCON Adapter

This chapter describes how to plan for the installation of the Multiaccess Enclosure ESCON Adapter.

Configuration help...

The following documents are helpful for the MAE ESCON configuration:

- *2216 Nways Multiaccess Connector ESCON Channel Adapter Planning and Setup Guide*, GA27-4193
- *IBM 2216/Network Utility Channel-Attach Examples*, G224-4599.

They are located at

`http://www.networking.ibm.com/support/docs.nsf/2216docs?OpenView`

ESCON Channel Adapter Functions

The Multiaccess Enclosure ESCON Channel Adapter (FC 3287) provides access to SNA and TCP/IP host applications over a duplex-to-duplex multimode fiber-optic cable. At most four ESCON adapters can be installed in the Multiaccess Enclosure. The adapter features:

- High-performance IP and SNA host-application access, featuring Multi-Path Channel+ (MPC+) support for high-throughput APPN high-performance routing (HPR) to VTAM 4.4 SNA applications
- APPN intermediate session routing (ISR) to VTAM 3.4 (or higher) SNA applications
- APPN and IP routing over any other Multiaccess Enclosure interface
- Dependent LU Requester (DLUR) in APPN to provide connectivity between dependent downstream SNA devices and VTAM SNA applications
- Boundary access node (BAN) support in APPN to provide connectivity between downstream BAN frame relay access devices and VTAM SNA applications
- IP route selection based on static, RIP, OSPF and BGP-4 routes and filtering of IP frames coming from or destined for the channel
- Data link switching (DLSw) support for VTAM 3.4 (or higher) SNA applications DLSw allows for local (single Multiaccess Enclosure) conversion from SDLC and LANs to the channel and remote (via DLSw partners) connectivity to SNA devices on SDLC, LANs, and ATM forum-compliant LAN emulation (LANe)
- ESCON channel-to-channel connectivity for token-ring, Ethernet, and ATM LAN emulation
- Support for up to 32 ESCON logical addresses (subchannels) per adapter for access to up to 32 hosts for LSA or 16 hosts for LCS or 16 hosts for MPC+ (assuming these types are not mixed on the adapter) when used with an IBM 9032 or 9033 ESCON Director or access to up to 15 logical host images in EMIF-capable processors operating in a logically partitioned (LP) mode.

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The Multiaccess Enclosure LAN/WAN Gateway

A Multiaccess Enclosure with an ESCON Channel Adapter that provides access for LAN-to-host applications is called a *Multiaccess Enclosure LAN/WAN gateway*.

The Multiaccess Enclosure LAN gateway gives LAN devices concurrent access to VTAM and TCP/IP programs running on host computers.

Figure 6 represents a possible environment consisting of 3746 multiaccess enclosures, hosts, and LAN devices (it is only a sample configuration).

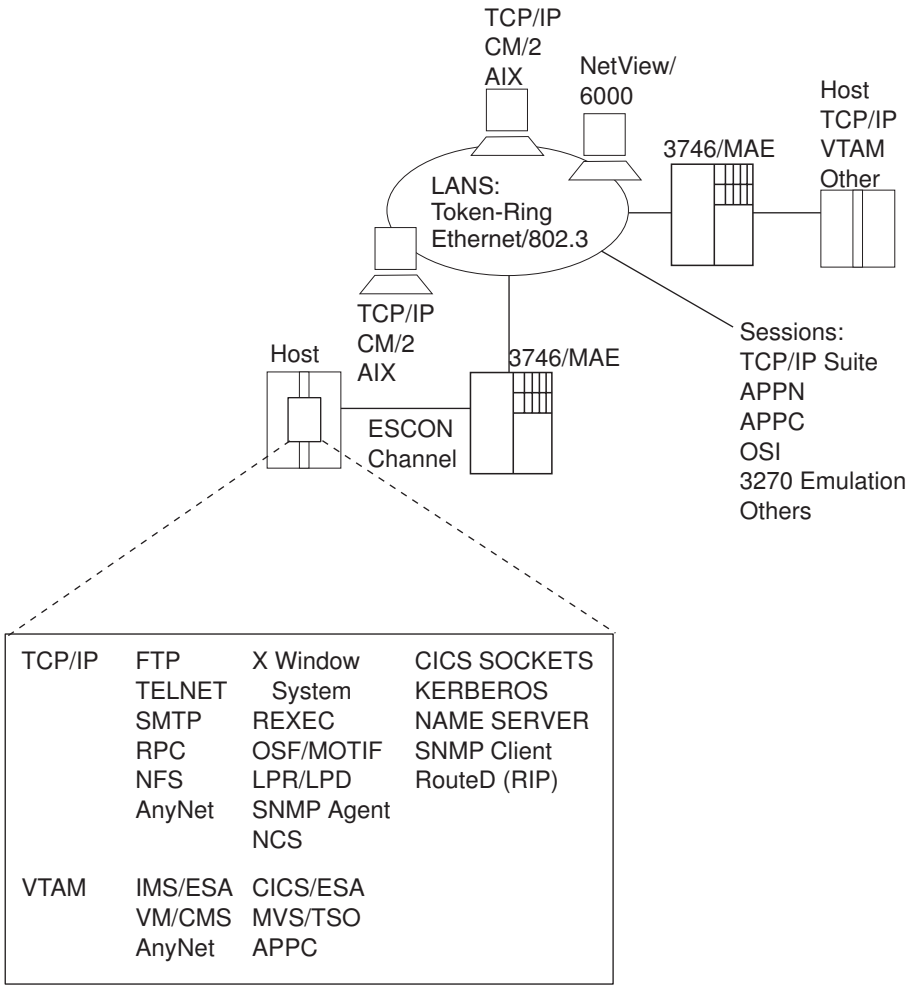


Figure 6. Representative Network Containing the 3746 Multiaccess Enclosure

The Multiaccess Enclosure LAN/WAN gateway with ESCON channel adapter supports the following communications:

- Between a LAN/WAN device and a host, through a Multiaccess Enclosure (LAN/WAN-to-host)
- From a device on one LAN/WAN to a device on a different LAN/WAN, with host routing support

See Table 8 on page 17 for more information on LAN/WAN devices.

In both cases, LAN/WAN-to-channel connections in the Multiaccess Enclosure are dedicated (defined as part of the host and Multiaccess Enclosure configuration).

Each host program (using either one subchannel or a pair of subchannels, depending on the host program type) communicates through a LAN/WAN adapter in the Multiaccess Enclosure.

LAN/WAN-to-channel connections (LAN/WAN gateway definitions) are defined during configuration for the Multiaccess Enclosure by associating the subchannels used by the host programs to the LAN/WAN adapters.

The dedicated definition allows faster processing of frames, because the Multiaccess Enclosure need not determine the route a frame must take. For each LAN/WAN-to-host definition, data typically follows the same path through the Multiaccess Enclosure when going both to the host or to the LAN/WAN.

The host and LAN/WAN device can each be one of the following:

- A TCP/IP client, server, or IP router.

  Note: This support is provided by Logical Channel Station (LCS) virtual network handlers in the Multiaccess Enclosure.

- A PU 5 (VTAM), PU 2.0, PU 2.1, APPN end node (EN), or network node (NN)

  Note: This support is provided by Link Services Architecture (LSA) virtual net handlers in the Multiaccess Enclosure.

The LAN/WAN device can also be a PU 4 with the IBM Network Control Program (NCP) on the IBM 3745 or 3746.

Multi-Path Channel+ Support

The Multiaccess Enclosure provides the latest level of MPC support, *High Performance Data Transfer (HPDT)*, also referred to as *MPC+*. HPDT MPC connections provide more efficient transfer of data than non-HPDT MPC connections.

The Multiaccess Enclosure Multi-Path Channel+ support, which is called Multi-Path Channel+ (MPC+), provides more efficient transfer of data by using high-performance data transfer (HPDT) services (in VTAM) to provide data packing without data movement and chain scheduling of programs. While MPC+ in the 3746/MAE does not fully make use of HPDT services (that is, it does data movement), it does support receiving data that fully uses the HPDT services in VTAM.

The level of MPC support used for an MPC connection is automatically determined by negotiation between the partner nodes.

When HPDT MPC Is Used: If both partner nodes support MPC+, MPC+ is automatically used.

- The Multiaccess Enclosure only supports MPC+
- You can control the level used in VTAM by coding the MPCLEVEL operand on the TRLE definition statement that defines the MPC connection. VTAM supports MPC+ if it is defined as an HPR APPN node that provides RTP-level HPR support.

  Note: Pre-V4 R4 VTAMs do not support HPDT MPC.

When Non-HPDT MPC Is Used: If either partner node does not support MPC+, non-HPDT MPC is automatically used.

The Multiaccess Enclosure does not support non-HPDT MPC.

Multi-Path Channel+ (MPC+) connections allow you to code a single transmission group (TG) that uses multiple write-direction and read-direction subchannels. Because each subchannel operates in only one direction, the half-duplex turnaround time that occurs with other channel-to-channel connections is reduced. The Multiaccess Enclosure MPC+ does not allow the subchannels of an MPC+ group to be on more than one physical channel.

If at least one read and one write path is allocated successfully, the MPC+ channel connection is activated. Additional paths (defined but not online) in an MPC+ group can late r be dynamically added to the active group using the MVS VARY ONLINE command. For example, if there is a need for an increase in capacity to allow for extra traffic over a channel, additional paths can be added to the active group without disruption. Similarly, paths can be deleted from the active group when no longer needed using the MVS command VARY device OFFLINE.

Currently the Multiaccess Enclosure MPC+ supports only APPN HPR.

Note: For the Multiaccess Enclosure ESCON Channel Adapter, the terms *MPC+ Group* and *MPC+ Virtual Interface* mean the same thing.

Multiaccess Enclosure ESCON Functional Support

Depending on the environment, a Multiaccess Enclosure with an ESCON Channel Adapter gives host applications access to different types of LANs/WANs. The particular networks supported depend on the communications protocols being used, which host applications they are used with, and which operating systems are supported.

Multiaccess Enclosure ESCON software provides support for TCP/IP and SNA Gateway host programs, and support for VTAM applications to token-ring, IEEE 802.3, Ethernet/V2, and LAN/WAN-attached devices.

Table 8 on page 17 illustrates the Multiaccess Enclosure connections provided for each host program. The supported environments are grouped by protocol. The table shows the host programs, operating systems, and adapters that provide each protocol support. For example, the TCP/IP protocol is supported by the TCP/IP host program (for VM or MVS). For each of these host environments, the adapters that can be used are indicated with a Y in the table.

Table 8. Functional Support for Multiaccess Enclosure ESCON Adapter

	TCP/IP [1] (LCS) Gateway (See note 1)	VTAM (See note 2)			
		SNA (LSA) Gateway	APPN ISR	MPC+ (See note 3)	DLSw
Token-Ring	Y	Y	Y	Y	Y
Ethernet V2	Y	N	Y	Y	Y
Ethernet 802.3	Y	Y	Y	Y	Y
Serial PPP	Y	N	Y	Y	Y
Serial FR:					
bridged	N	N	Y	Y	Y
routed	Y	N	Y	Y	N
SDLC	N	N	Y	N	Y
X.25	Y	N	Y	N	Y
ATM LANE	Y	Y	Y	Y	Y
ATM Classical IP	Y	N	N	N	N

Notes:

1. TCP/IP 2.2 or higher.
2. ESCON support requires an ESA operating system (V3R4 or higher).
3. MPC+ requires VTAM V4R4 and APPN HPR. VTAM V4R4 requires the following PTFs:

   UW36478 UW36159 UW36490 UW36495 UW36245 UW36265 UW36540
   UW36537 UW36564 UW36612 UW36614 UW36861 UW37958 UW38105

Channel and Network Connections

The following ESCON channel connections are supported:

- ES/3090J Processor (selected models)
- 9021 ES/9000® Processor
- 9121 ES/9000 Processor
- 9221 ES/9000 Processor
- 9032 and 9033 ESCON Directors
- 9036 ESCON Remote Channel Extender.

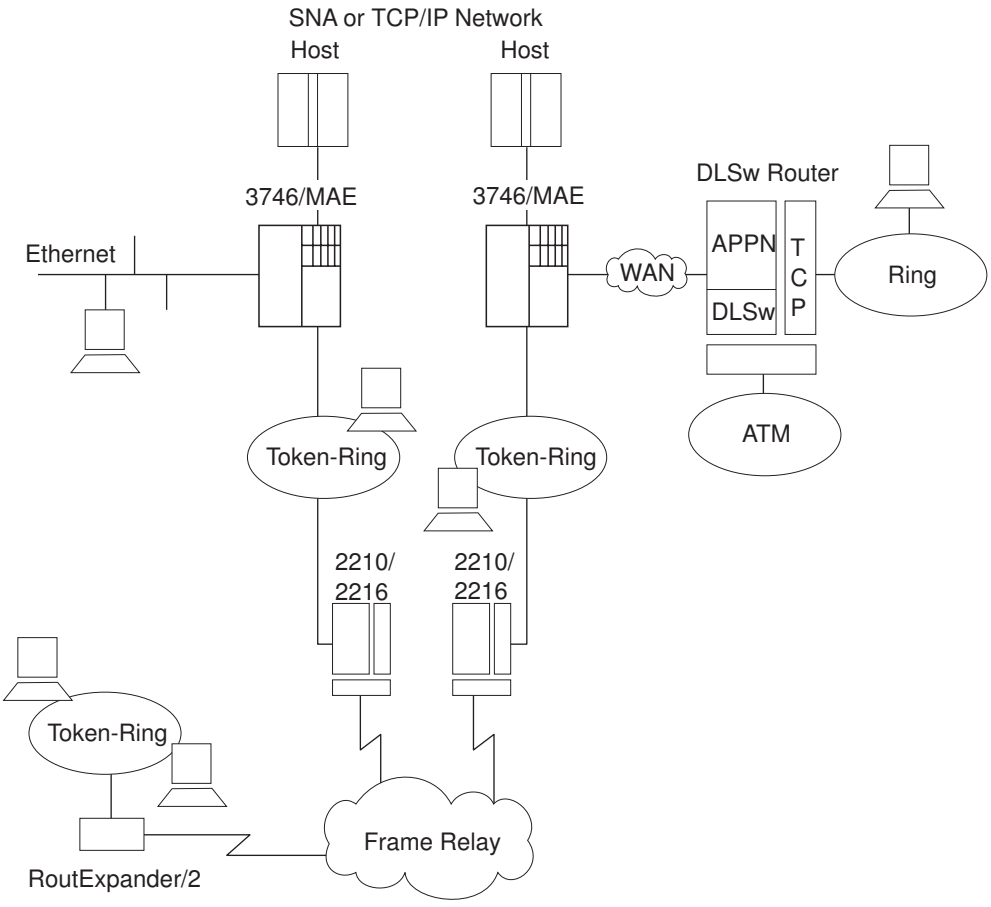
Introduction to Host Planning for the Multiaccess Enclosure

Table 9 summarizes the protocols, channels, networks, and management functions supported by the Multiaccess Enclosure with an ESCON channel adapter.

Table 9. Multiaccess Enclosure ESCON Functional Summary

Communications Protocols	Channels and Networks	Management
• TCP/IP • Subarea SNA • APPN ISR • APPN HPR • DLSw	• ESCON Channel • Token-Ring Network • Ethernet V2 Network • IEEE 802.3 Network • ATM LANE • Frame Relay	• SNMP Client

The Multiaccess Enclosure offers a solution for customers with traditional hierarchical (host-centric) networks as well as those customers who are migrating to flat (network-centric) networks. Figure 7 illustrates the latter, showing a local LAN and remote LAN gaining access to an existing hierarchical network (depicted by the cloud) through a Multiaccess Enclosure with an ESCON channel adapter.



- All workstations can talk to all hosts.
- All workstations can talk to each other.

Figure 7. IBM 3746 with Multiaccess Enclosure ESCON Channel Adapter in a Network

Channel Support

This section describes the characteristics of host channel support. Host connection selections impact design decisions for the 3746-9x0 and Multiaccess Enclosure.

Remember that at most four ESCON adapters (PCI adapter based) can be installed in a Multiaccess Enclosure.

ESCON Channel Characteristics and Configuration Examples

The Multiaccess Enclosure with an ESCON adapter provides the following support:

- A maximum of 32 logical paths (ESCON subchannels) per Multiaccess Enclosure ESCON channel adapter to the connected hosts. These logical paths can be defined to the same ESCON channel or divided among multiple ESCON channels.
- EMIF support for sharing ESCON channels for connection to multiple host images in LP-capable hosts. This support can be used with the IBM ESCON Directors connecting to multiple hosts, or for direct connection to a single host processor.
- A maximum of two IBM 9032 or 9033 ESCON Directors (ESCDs) in the path between the Multiaccess Enclosure ESCON channel adapter and the host.
- Distances of up to 43 km (26.7 mi) using the ESCON Extended Distance Feature (XDF) available on host processors, ESCDs, and ESCON Remote Channel Extenders.

The following examples illustrate various Multiaccess Enclosure/ESCON configurations:

- Single and direct attachment between a S/370™ or S/390® processor and Multiaccess Enclosures

  See Figure 8 on page 20.
- Multiple systems attachment with ESCDs

  See Figure 9 on page 21.
- EMIF attachment between a S/370 or S/390 processor and Multiaccess Enclosures

  See Figure 10 on page 22.

Direct Attachment Between a S/390 Host and a Multiaccess Enclosure: In Figure 8, connection A shows a Multiaccess Enclosure directly attached to a S/390 host channel. The separation of the host and the Multiaccess Enclosure can be up to 3 km (1.86 mi).

Single Attachment Between a S/390 Processor and Multiaccess Enclosures: Connections A, B, C, and D show Multiaccess Enclosures attached to a single host.

The maximum distance between the S/390 host and the Multiaccess Enclosure can vary from 3 km (1.86 mi) to 43 km (26.7 mi). For connection A, a maximum distance of 3 km (1.86 mi) can be achieved without ESCDs between the host and Multiaccess Enclosure. For connection B, a maximum distance of 9 km can be achieved with two ESCDs connected with multimode fiber. As shown in connections C and D, distances of up to 43 km can be achieved by using 9032 or

9033 ESCDs with the XDF or a combination of ESCDs and 9036 remote channel extenders. The host must also have the XDF.

When two ESCON directors are serially attached, the connection through one of the directors must be dedicated.

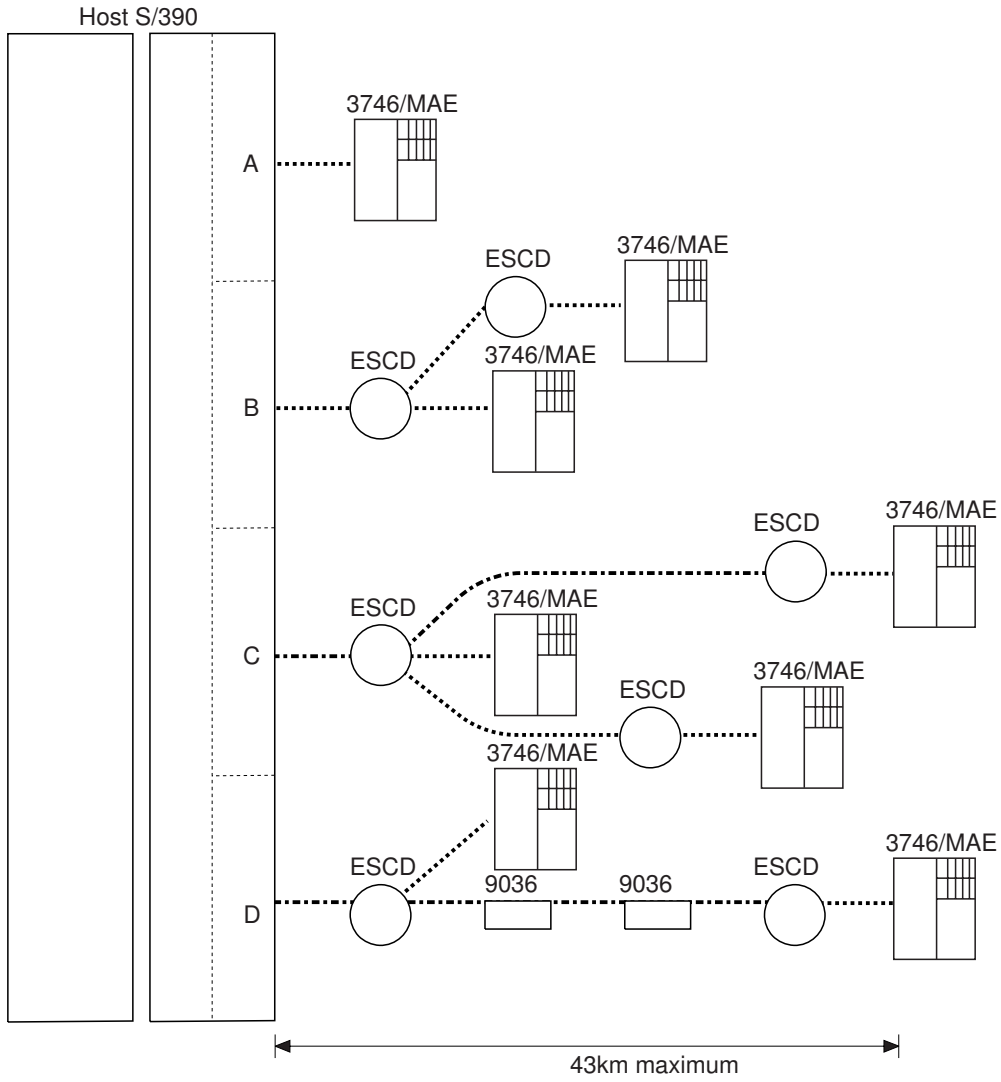


Figure 8. Single System ESCON Connection Example

Multiple Systems Attachment with ESCDs: Figure 9 shows the connection of multiple S/390 hosts to single and multiple Multiaccess Enclosures, with possible backup paths. A fault-tolerant solution can be designed using backup channels, multiple ESCDs, and/or multiple Multiaccess Enclosures.

For additional information, see “3746 Multiaccess Enclosure: Availability and Backup” on page 51.

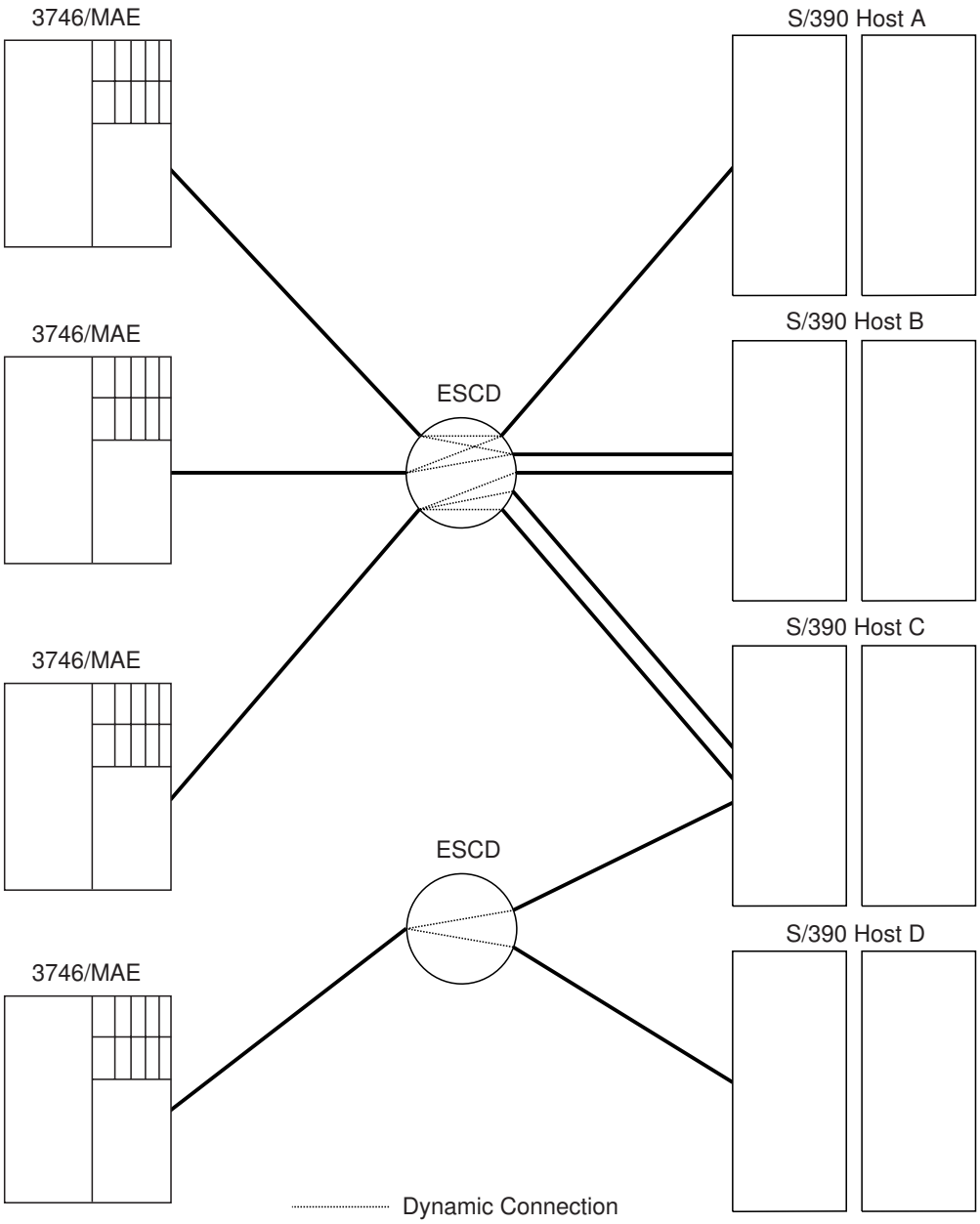


Figure 9. Multiple System ESCON Connections Example

EMIF Attachment Between an ES/9000 Processor and a Multiaccess Enclosure: The ESCON Multiple Image Facility (EMIF) allows the sharing of ESCON channels across Processor Resource/Systems Manager™ (PR/SM) logical partitions (LPs). Prior to EMIF, dedicated channels to each logical partition were required.

EMIF is supported on all ES/9000 Model 511/711-based processors, and on the Model 520-based processors.

The Multiaccess Enclosure ESCON Channel Adapter supports EMIF connectivity. This connection can be either direct host attachment or through an ESCD, and the logical hosts can be on the same or different physical hosts.

Figure 10 on page 22 shows Multiaccess Enclosure connectivity to an LP host. Logical hosts A and B are connected directly to the Multiaccess Enclosure. Logical hosts B, C and D are connected to multiple Multiaccess Enclosures with a single ESCON connection from the ESCON Director. Each of these Multiaccess Enclosures may be connected to both logical hosts B, C and D.

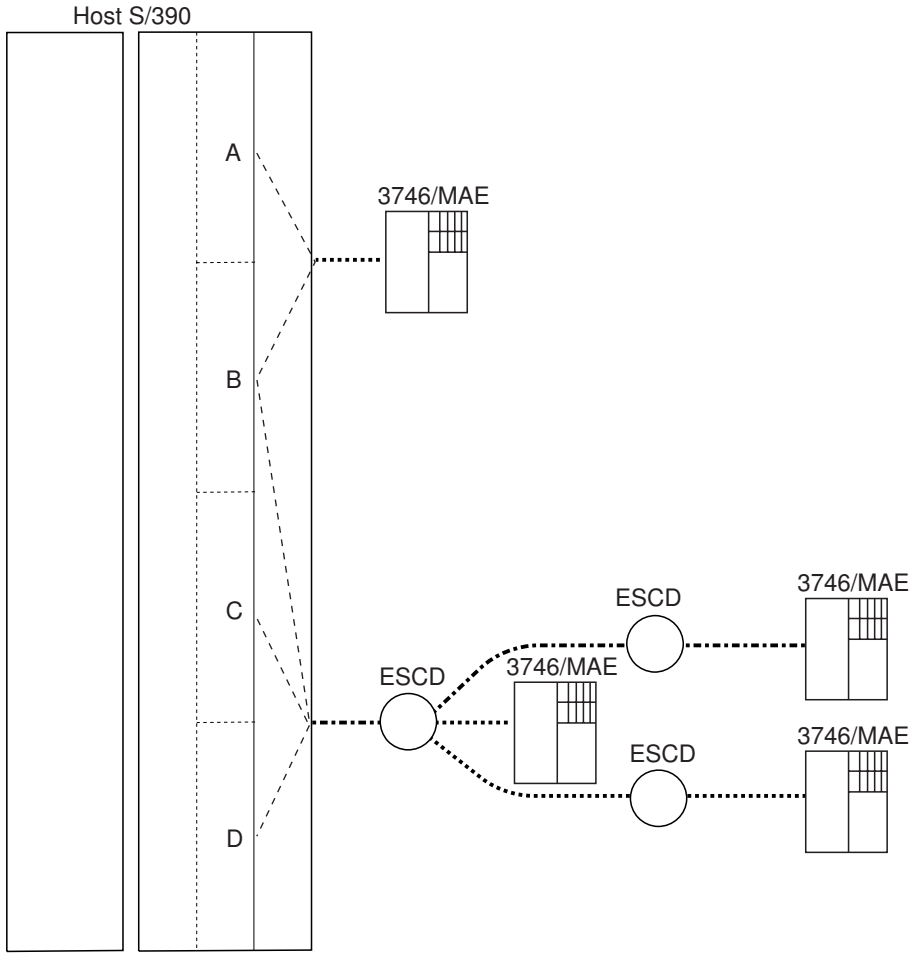


Figure 10. Multiaccess Enclosure EMIF Attachment Example

Number of Hosts, Host Programs, and Users

Your channel and LAN/WAN choices affect the number of hosts and host programs each Multiaccess Enclosure can support. Also, your host program choice affects the number of users that can be supported by each Multiaccess Enclosure.

Number of Hosts

The number of hosts (or the number of logical partitions in a single host) you can configure to use with one Multiaccess Enclosure is influenced by several factors.

For ESCON hosts that are attaching to a Multiaccess Enclosure, the Multiaccess Enclosure must have at least:

- One LSA subchannel for each host (or logical partition) running VTAM programs that are not using MPC+
- One LCS interface (two subchannels) for each host (or logical partition) connecting to TCP/IP
- Two subchannels for each host (or logical partition) that will be communicating with the Multiaccess Enclosure using MPC+

Refer to “Limits for Multiaccess Enclosure ESCON Network Interfaces and Subchannels” on page 24 for more information about the limits mentioned here.

Number of Host Programs

The number of host programs that can run using a Multiaccess Enclosure is less restrictive than the number of hosts that can use a Multiaccess Enclosure. This allows you to run more than one VTAM or TCP/IP host program on the same host (or in the same logical partition) using the same Multiaccess Enclosure.

For host programs that need to access a Multiaccess Enclosure, the Multiaccess Enclosure must have at least:

- One subchannel (or subchannel pair) for each host program instance
- One LCS interface for each TCP/IP program

Be aware that multiple VTAMs can share an LSA interface If more than one VTAM needs to use the same LSA interface, each VTAM needs to open a different SAP.

Refer to “Limits for Multiaccess Enclosure ESCON Network Interfaces and Subchannels” on page 24 for more information about the limits mentioned here.

Number of Users

Table 10 describes the maximum number of users attached through a Multiaccess Enclosure that can have concurrent sessions with host programs.

Table 10. Number of Concurrent Sessions

Host Program	Maximum Number of Users	See Note
VTAM	1500	1
TCP/IP for MVS TCP/IP for VM	5000 sessions (Number of sockets) 2000 sessions (Number of sockets)	2 2

1. Each LSA is limited to 255 LLC link stations per SAP. This is 255 sessions per LAN adapter. For SNA, this is the number of PUs supported. For MPC+, the number of users is based on APPN and not on the interface type.
2. For example, you can have up to 5000 Telnet sessions (number of sockets) with TCP/IP for MVS using one Multiaccess Enclosure.

Limits for Multiaccess Enclosure ESCON Network Interfaces and Subchannels

Subchannels will be associated with network interfaces when you configure the Multiaccess Enclosure with an ESCON Channel Adapter as described in Chapter 7, “Multiaccess Enclosure Configuration” on page 57.

A few simple rules govern the network interfaces:

1. Up to 16 interfaces can be configured.
2. Up to 32 subchannels can be used per ESCON Channel adapter.
3. One LCS interface is required for each host (or logical partition) connecting to TCP/IP.
4. One or more subchannels are used for each VTAM host LAN/WAN gateway (LSA).
5. Two or more subchannels are required for each MPC+ interface.
6. EMIF provides attachment to multiple host images in LP-capable processors using a single host ESCON port. Attachment to multiple hosts including LP hosts is provided using an IBM 9032 or 9033 ESCON director.
7. VTAM (LSA) interfaces must be defined as either SNA gateway (TR, EN, ATM LANE) or loopback (APPN or DLSw). Gateway LSA interfaces are associated with a specific LAN or LANE interface. LSA loopback interfaces can be used for both APPN ISR and DLSw. An LSA interface cannot be both loopback and SNA gateway.
8. Each LCS interface must have a unique subnet address.
9. Each MPC+ interface (also known as an MPC+ group) must have at least two subchannels, one for reading and one for writing. If VTAM has the subchannel configured as “read” then the MPC+ group in the Multiaccess Enclosure must have the subchannel configured as “write.”
10. MPC+ groups cannot share subchannels with other MPC+ groups.

Sample Illustration of the Rules for LCS and LSA Subchannels

Figure 11 illustrates valid uses of subchannels by LAN adapters, according to these rules, for LCS and LSA.

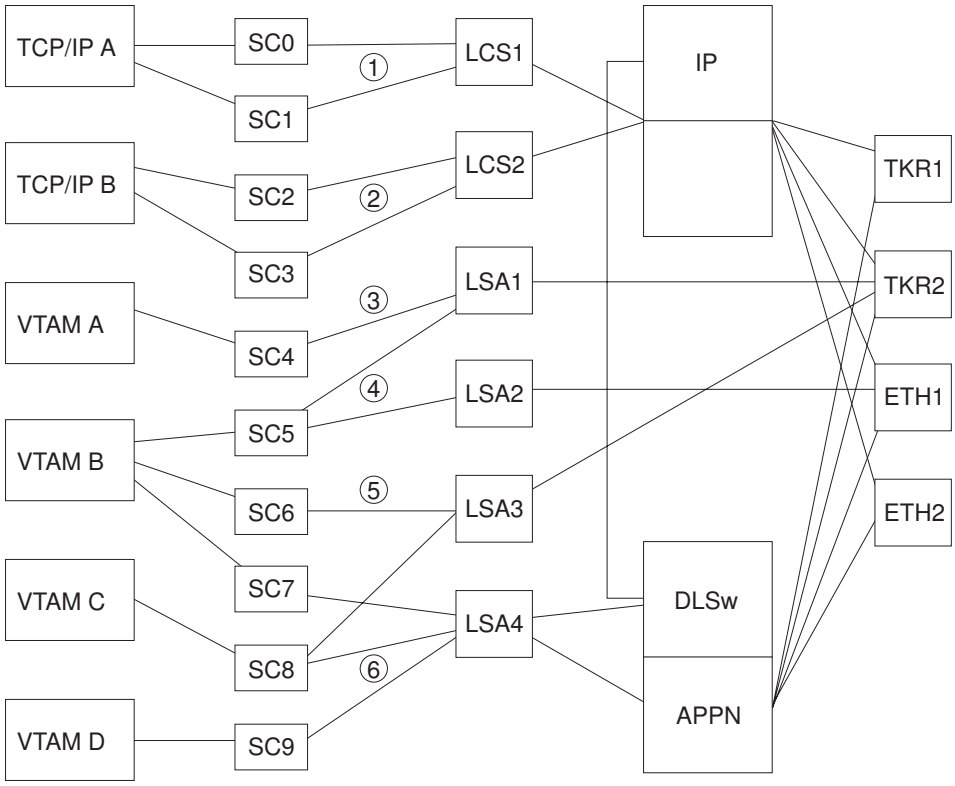


Figure 11. Rules for LAN/WAN Gateway Definitions for LCS and LSA Subchannels

1 LCS interface 1 uses subchannels 0 and 1 and provides access to all LAN interfaces for TCP/IP host A.

2 LCS interface 2 uses subchannels 2 and 3 and provides access to all LAN interfaces for TCP/IP host B.

3 LSA interface 1 uses subchannels 4 and 5 and provides access to TKR2 for VTAM hosts A and B, respectively.

4 LSA interface 2 uses subchannel 5 and provides access to ETH1 for VTAM host B.

5 LSA interface 3 uses subchannels 6 and 8 and provides access to TKR2 for VTAM hosts B and C.

6 LSA interface 4 uses subchannels 7, 8 and 9 and provides APPN ISR and DLSw access to all LAN interfaces for VTAM hosts B, C and D, respectively.

Sample Illustration of the Rules for MPC+ Subchannels

Figure 12 illustrates valid uses of subchannels for MPC+.

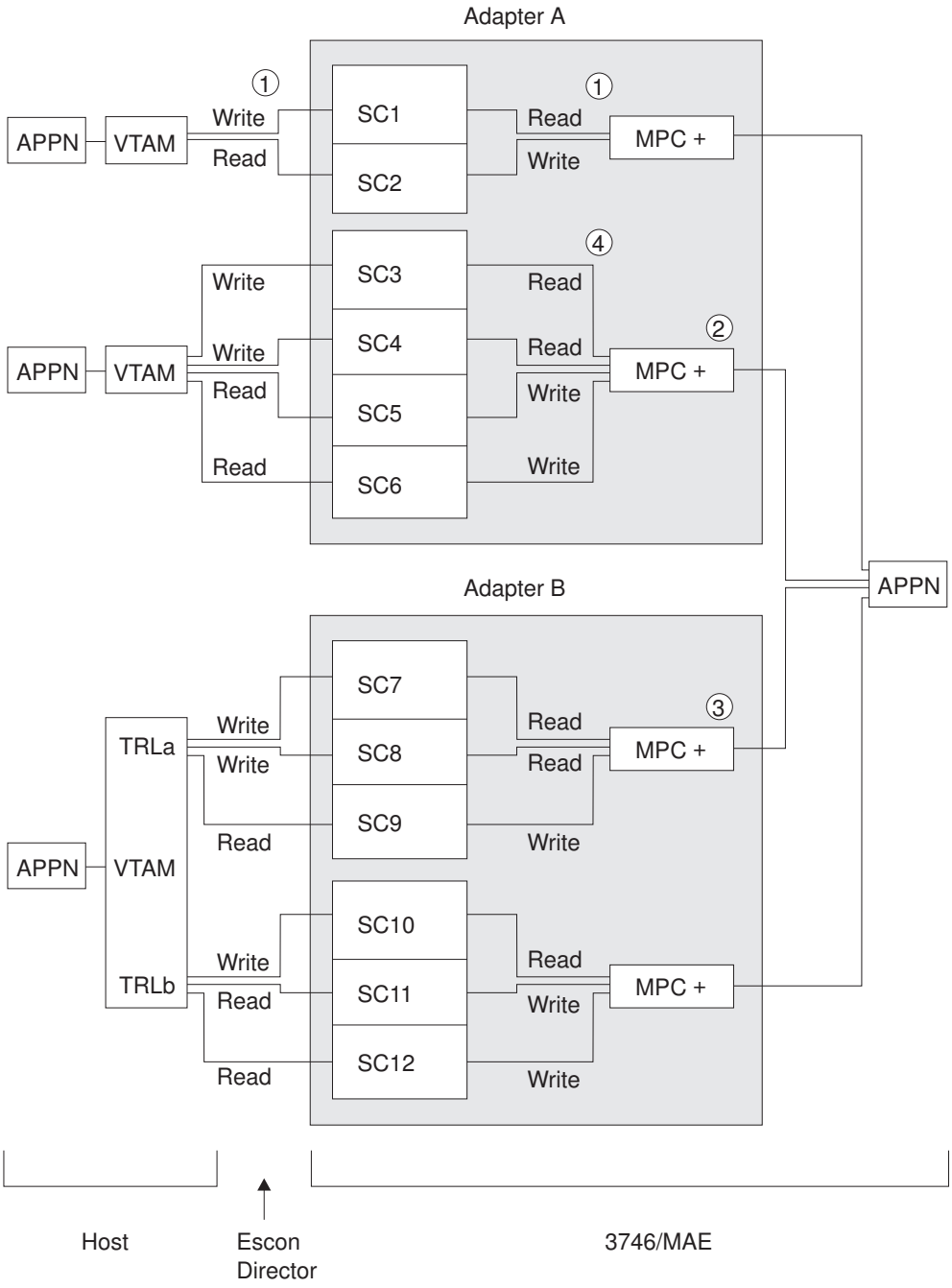


Figure 12. Rules for Definitions for MPC+

1 A subchannel that is configured as a "write" subchannel in VTAM is a "read" subchannel in the Multiaccess Enclosure ESCON configuration.

2 There can be multiple MPC+ Groups on the same ESCON channel adapter.

3 Parallel MPC+ groups are supported but each must be placed in a separate TRL entry in the VTAM definition.

4 Although you must have at least two subchannels (one read and one write) you can have more if there is at least one read subchannel and one write subchannel.

Multiaccess Enclosure Planning Considerations

This section discusses planning considerations for installing and configuring a Multiaccess Enclosure. It includes:

- What activities you need to plan for before installing and configuring the 3746/MAE in your network
- What to consider about how the 3746/MAE fits into your network
- What you will need to have available before you begin installation and configuration
- What to consider for supporting the 3746/MAE in the network.

Activities to Plan for Before Installation and Configuration

You will need to plan for the following activities prior to installing and configuring the 3746/MAE in a network:

- Defining the 3746/MAE for channel attachment
- Defining the 3746/MAE for LAN attachment
- Supporting the 3746/MAE in the network.

Defining the 3746/MAE for Channel Attachment

Your system programmer will need to determine configuration and system generation (SYSGEN) parameter values for the following program types at the host:

- Control programs and operating systems (including IOCP, HCD for MVS, MVS, and VM)
- Host programs (including VTAM and TCP/IP)
- Applications
- Network management (including SNA management services and NetView).

The system generations and configurations should be done before the 3746/MAE hardware is installed and released for customer use. “Host Definition Planning” on page 108, contains detailed information about host parameter definition for the 3746/MAE.

Defining the 3746/MAE for LAN Attachment

Defining the 3746/MAE for LAN attachment requires several tasks:

- LAN adapter address administration
- Changes to LAN device configurations to optimize performance
- Matching 3746/MAE configuration parameters to those of your LAN or host devices.

Considerations for Including a Multiaccess Enclosure in a Network

Host and LAN planners and administrators will need to be involved in integrating the 3746/MAE into your network. System and application programmers will also participate in defining configuration parameters and installing code.

Configuration Considerations

Before configuring the 3746/MAE in your network, consider:

Addresses Group, functional, multicast, and node (universally or locally administered individual) addresses need to be assigned by the network administrator for each 3746/MAE LAN adapter. These addresses may need to be specified in the configurations for LAN devices that will access a 3746/MAE.

SAPs For VTAM communication, the network administrator needs to decide the SAPs to be used for each 3746/MAE LAN adapter.

Each VTAM host program that uses a 3746/MAE LAN adapter is assigned a different SAP value. The SAP for each adapter can be used once on the adapter; VTAM can use the same SAP on different LAN adapters.

Note: If APPN and LSA are configured to use the same LAN adapter, they must use different SAPs.

The network administrator and system programmer must determine how to change the SAP value used by each LAN adapter, if necessary.

MPC+ timers

Reply TO timer This is the amount of time that the MPC+ Group will wait to hear from across the channel during XID2 and DISC exchanges before it decides that the other end of the channel is not answering and this side should continue with the bring up or bring down of the MPC+ group.

Sequencing Interval timer Used to determine whether connection-oriented data is flowing smoothly across the connection on an MPC+ Group. The MPC+ control flows and the APPN activation/deactivation flows flow connection-oriented. Since these commands must have guaranteed delivery at the link level they flow connection-oriented and the sequencing interval timer is used to determine whether enough time has passed that checking of the delivery of connection-oriented traffic should be done.

Note: This value can be overwritten for each APPN PORT on an MPC+ Group. This is done during the APPN PORT configuration.

LLC timers If a 3746/MAE supports remote SNA connections (using a remote bridge, for example), consider what values are needed for LLC timers T1, Ti, and T2 on the LAN adapters.

LAN number This number distinguishes between multiple network interfaces of the same type within one 3746/MAE. Link number for TCP/IP and ADAPNO for VTAM specify the LAN number to the host program.

These definitions must be the same if both programs use the same network interface.

Subchannels The subchannels (logical paths for ESCON) must be defined for all 3746/MAE LAN/WAN gateway definitions to associate 3746/MAE channel adapters with 3746/MAE LAN adapters.

PMF password
The Parameter Management Frames (PMF) password protects the station from an unauthorized setting of MIB attributes by a remote station using Simple Mail Transfer Protocol (SMTP) PMF frames.

LAN data transfer rate
The 3746/MAE Token-Ring Adapter can be configured to transfer data at 4 Mbps or 16 Mbps. Select the data transfer rate to match your LAN.

Receive mode Determines which frames will be received by the Ethernet adapter.

Transceiver type
Identifies the type of transceiver that the Ethernet adapter uses.

Optimizing Performance

There are many parameters that affect the overall performance of a host-to-LAN network. The parameters that affect 3746/MAE throughput are discussed in this section.

In planning the volume and flow of traffic over the network, consider the following configuration parameters. It is recommended that the default 3746/MAE host parameters be used initially. You can then tune the network to optimize overall performance.

TCP/IP Window Size
A larger TCP/IP window size allows more frames to be sent before requiring acknowledgment. This helps move frames through devices faster and requires less frequent processing of acknowledgments.

VTAM I/O Buffer Size
Frames are segmented into more than one buffer when the frame size exceeds the VTAM I/O buffer size, causing additional processing overhead. Make the VTAM buffers large enough to contain the largest average frame size.

Also consider the following concepts:

Sharing Subchannels
When defining a LAN/WAN gateway, dedicate a subchannel or subchannel pair for each network interface to ensure maximum performance.

Trace Using the 3746/MAE trace function may affect performance noticeably.

Frame Size Most protocols segment data into packets based on restrictions of the network to which they are attached. Bridges, for example, may restrict the size of forwarded frames to the smaller of the two maximum sizes that can be handled by the LANs they connect. Frames that traverse different LAN types can be limited in size by the maximum frame size of the most restrictive LAN. Frames that are larger than the specified

maximum size can get segmented into two or more packets for network transmission; the packets must be reassembled by the receiver into their original size. Some programs and devices discard frames that are too large or too small.

Protocols and applications take these frame size limits into consideration when they determine their maximum frame size; some can negotiate to the largest common frame size that both sender and receiver can handle. (The 3646/MAE does not negotiate frame size.) To reduce the effects of segmenting data into smaller frame sizes, you need to be aware of how devices on the network affect protocol packet size.

Table 11 shows the size of the largest frame that can be transferred by each type of 3746/MAE LAN adapter.

Table 11. LAN Adapter Maximum Frame Sizes and Channel Adapter Maximum Block Sizes

Adapter Type	Largest Frame Size	Maximum Block Size
Token-Ring (4 Mbps)	4.5 KB	
Token-Ring (16 Mbps)	17.5 KB	
Ethernet V2/IEEE 802.3	1.5 KB	
ESCON		32 KB

Chapter 4. ATM Support

The Multiaccess Enclosure supports 155-Mbps ATM multimode and singlemode fiber interfaces using the LIC294 and LIC295. For more information about these LICs, refer to the *3745 Communication Controller Models A and 170, 3746 Nways Multiprotocol Controller Models 900 and 950: Overview*, GA33-0180. Using these interfaces, you can connect software that supports *Legacy LAN* (Ethernet or token-ring) networks, and IP applications across an ATM network.

The two types of ATM connection methods supported are:

- LAN Emulation (LANE)
- Routing over ATM (Classical IP, or IPX over ATM).

The Multiaccess Enclosure implements the *LANE over ATM Version 1.0 Specification* (which is widely accepted as the industry standard for multivendor multiprotocol interoperability), and RFC1577 (Classical IP with ARP). The Multiaccess Enclosure uses ATMARP and InATMARP to get the ATM address of an IP node from an ARP server, but is not an ARP server itself. In addition, the Multiaccess Enclosure supports *Multiprotocol Encapsulation over AAL5* (RFC1483). This describes two encapsulation methods for carrying routed and bridged protocol data units (PDUs) over an ATM network. This includes:

LLC Encapsulation
: Enables multiplexing of multiple protocols over a single ATM virtual circuit.

VC-Based Multiplexing
: Each protocol is carried over a separate ATM virtual circuit.

This section gives a description of the ATM functions. If you need more detailed information about the ATM features of the Multiaccess Enclosure, please refer to *IBM 2210/2216 Nways Multiprotocol Router APPN/ATM Function Description and Configuration Scenarios,* SG24-4956.

ATM Addressing

ATM uses 20 byte addresses as shown below.

The first 13 octets of an ATM address are the network prefix. There are three kinds of this network prefix format type: ISO DCC, ISO ICD, ITU-T(CCITT) E.164. Each frame type is discriminated by the *AFI* (Authority and Format Identifier) field, which is above the network prefix. These AFI numbers are fixed:

ISO DDC ='0x39'
ISO ICD ='0x47'
ITU-T E.164 ='0x45'

Each switch in your ATM network must have a unique network prefix. ATM switches use the Network Prefix to route VCC setup requests to the destination ATM switch. End systems, such as this router, retrieve their network prefix from their ATM switch when they activate.

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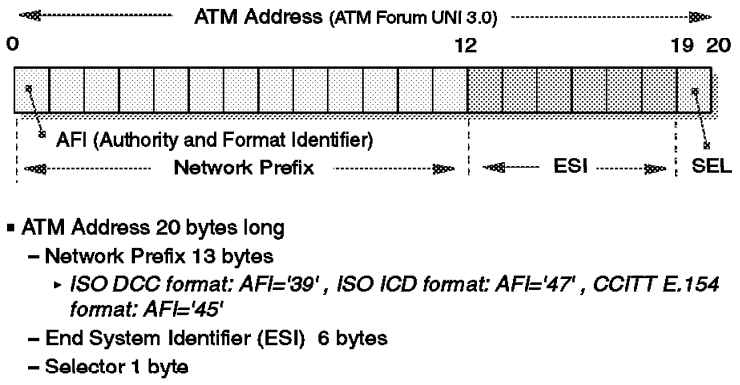


Figure 13. ATM Address Format Overview

The next 6 octets (octets 14-19) of an ATM address are the End System Identifier (ESI). Each end system that is attached to the same switch must use a unique identification number.

When an end system activates, it attempts to register its ESI with its ATM switch by using the Interim Local Management Interface (ILMI). ILMI defines a set of SNMP-based procedures used to manage the interface between an end system and an ATM switch. End systems use ILMI to:

- Obtain the network prefix from the switch.
- Register their ESIs with the switch.
- Dynamically determine the UNI version of the ATM switch.
- Get a list of LECS addresses from the switch.

The octet 20 of an ATM address is the selector. End stations obtain their network prefix from the switch and from their own addresses by appending an ESI and selector. These addresses must then be registered with the switch, which rejects the registration if the ATM address is not unique.

Emulated and Virtual LANs

An ideal environment would only have ATM as the network transport layer and all applications would connect directly to this layer. Current network users have invested heavily in their physical networking infrastructure and applications that are built to use this infrastructure. The investment in existing networks means that a migration path must be offered to enable a gradual migration to ATM networks. In order to enable such *legacy* applications to use an ATM network without changes, it was necessary to define a method whereby the applications can run unchanged, and the networking hardware can gradually be migrated to ATM. The ATM Forum LAN Emulation over ATM Specification V1.0 allows such a migration.

LAN emulation supports all layer 3 protocols transparently, while RFC 1577, or Classical IP and ARP over ATM, is designed only to support IP as the layer 3 protocol.

LAN Emulation Version 1.0

LAN emulation enables the implementation of emulated LANs over an ATM network. An emulated LAN provides communication of user data frames across all of its users, similar to a physical LAN. One or more emulated LANs could run on the same ATM network. However, each of the emulated LANs is independent of the other and users cannot communicate directly across emulated boundaries. This is exactly the same as physical LANs. Inter-LANE communication will only be possible through routers or bridges.

Figure 14 shows a physical view of an emulated LAN. All LAN Emulation components are connected to the same switch. The software that is running above the LAN emulation software layers sees a logical view of the network shown in Figure 15. All LANE components connected to the switch, and using the same LANE server, appear to be in the same LAN.

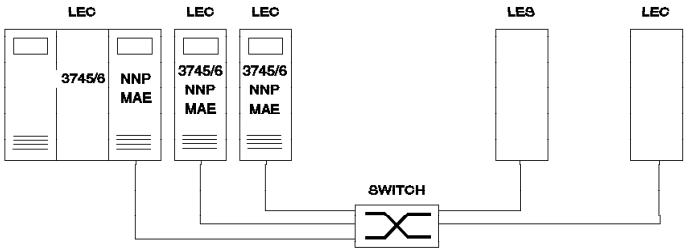


Figure 14. LAN Emulation Physical View

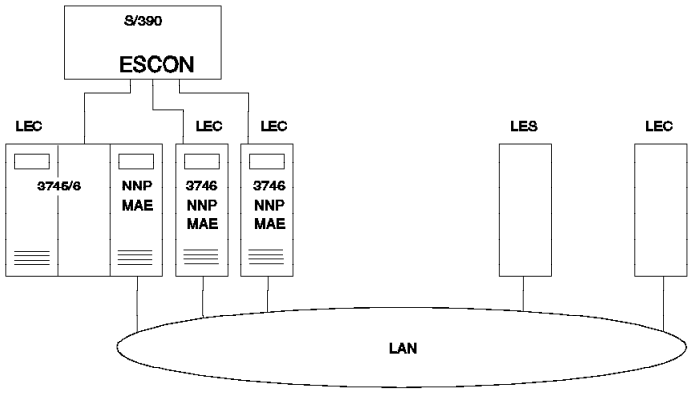


Figure 15. LAN Emulation Logical View

Each emulated LAN has only one type; either Ethernet/IEEE 802.3 or Token-Ring/IEEE 802.5. An emulated LAN is composed of several LAN emulation clients (LEC) and a single LAN emulation service entity (LE Service). The LE Service consists of an LE configuration server (LECS), an LE server (LES) and a broadcast and unknown server (BUS). The LE client resides in an ATM end station.

It represents a set of users, identified by their MAC address. The LE Service may be part of an end station or a switch. It can be centralized or distributed over a number of stations.

Communication between LE clients, and between LE clients and the LE Service, is performed over ATM virtual channel connections (VCCs). Each LE client must communicate with the LE Service over control and data VCCs. Emulated LANs operate in any of the possible environments:

- Switched virtual circuit (SVC)
- Permanent virtual circuit (PVC)
- Mixed SVC and PVC.

In a PVC-only LAN, there are no call setup and shutdown procedures. Instead of that, layer management is used to set up and clear the connections. In this PVC environment, the layer management is responsible for both setting up and clearing connections and has the responsibility that the emulated LAN works correctly.

LAN Emulation Protocol Stack

LAN emulation over ATM operates within the data link layer of the OSI reference model. In Figure 16 on page 35, the position of the LAN emulation layer is shown.

The following list explains the flows depicted by the arrows in the figure:

1. LE to Higher Layer Services

   These services apply only to the LAN emulation client. The higher layer could be logical link control, or equivalent, or a bridging relay function. The services provide the capability to exchange user data frames over the LAN emulation service. Service definitions are compatible with ISO 10039 service architecture and ISO 10038 MAC bridging standard.

2. LAN Emulation to AAL Services

   These services apply to the LAN emulation clients and the LAN emulation service. These services provide the capabilities to transfer frames between peer LAN emulation layers. This specification assumes a null Service Specific Convergence Sublayer (SSCS), that is, the SSCS provides for the mapping of the equivalent primitives of the AAL and the Common Part Convergence Sublayer (CPCS). The common part of AAL5 makes use of the services provided by the underlaying ATM layer.

   A LAN emulation entity includes the following AAL service interfaces, each identified by a distinct SAP-ID. Each LAN emulation client includes the following SAPs:

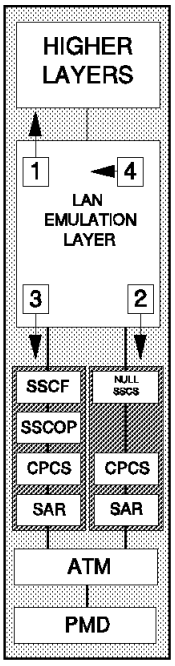
   a. One or two control SAPs that handle initialization, registration and address resolution

   b. Two or more data forwarding SAPs

   c. Zero or one control SAP that handle configuration

3. Connection Management Services

   These services apply to the LAN emulation clients and the LAN emulation service.



Legend:

- Higher Layers (802.2, NetBIOS, IPX,...)
- Control Plane (SAAL)
  - SSCF Service Specific Coordination Function
  - SSCOP Service Specific Connection Oriented Protocol
  - CPCS Common Part Convergence Sublayer
  - SAR Segmentation and reassembly Sublayer
- User Plane (AAL5)
  - SSCS Service Specific Convergence Sublayer
  - CPCS Common Part Convergence Sublayer
  - SAR Segmentation and reassembly Sublayer
- ATM ATM Layer
- PMD Physical Medium Dependent Layer

Figure 16. LANE Emulation Layers

The conceptual model assumed by the LAN emulation layer is shown in Figure 16 on page 35. The connection management services may use either PVCs or SVCs and provides the following primitives:

- Setup

  This service provides initial call establishment. It receives an ATM address and establishes a virtual connection identified by a SAP-ID.

- Release

  This service is used to request the network to clear an end-to-end connection identified by a SAP-ID.

- Add Party

  This service provides the capability to add a party to an existing connection.

  This service is used to drop or clear a party from an existing point-to-multipoint connection.

4. LAN Emulation to Layer Management Services

   These services enable initialization and control of the LAN emulation entities. These services differ between LAN emulation clients and the LAN emulation service.

LAN Emulation Components

An emulated LAN consists of several components. Clients, for example, ATM workstations and ATM bridges, each have at least one LE client entity. The LE Service consists of several components, including the LE server, the broadcast and unknown server, and the LAN emulation configuration server.

LAN Emulation Client (LEC)

The LAN emulation client is the entity in the end systems that performs data forwarding, address resolution, and other control functions. This provides MAC level emulated Ethernet/IEEE 802.3 or IEEE 802.5 service interface to higher-level software and implements the LUNI interface when communicating with other entities within the emulated LAN.

LE Server (LES)

The LE server implements the control coordination for the emulated LAN. The LE server provides a facility for registering and resolving MAC addresses and/or descriptors to ATM addresses. Clients may register the LAN destinations they represent with the LE server. A client will also query the LE server when the client wishes to resolve a MAC address and/or route descriptor to an ATM address. The LE server will either respond directly to the client or forward the query to other clients so they may respond. This is implemented by the Multiaccess Enclosure ATM adapter.

Broadcast and Unknown Server (BUS)

The broadcast and unknown server (BUS) handles data sent by an LE client to the broadcast MAC address ('FFFFFFFFFFFF'). All multicast and initial unicast frames that are sent by a LAN emulation client before the data direct VC target ATM address has been resolved (before a data direct VCC has been established) are handled by the broadcast and unknown server.

The multicast function provided in the BUS may be implemented by an underlying ATM multicast service. The BUS multicast function must be consistent with the ITU-T Recommendation X.6 Multicast Service Definition.

A LAN emulation client sends data frames to the BUS, which serializes the frames and retransmits them to a group of attached LAN emulation clients. Serialization is required to prevent AAL-5 frames from different sources from being interleaved.

In an SVC environment, the BUS needs to participate in the LE address resolution protocol (LE_ARP) to enable a LAN emulation client to locate the BUS.

The BUS must always exist in the emulated LAN and all LAN emulation clients must join its distribution group.

LE Configuration Server (LECS)

An ATM network can consist of several emulated LANs. The LE configuration server assigns LE clients to an emulated LAN based on its configuration database, its own policies and the information it receives from the respective LE clients. It assigns any client that requests configuration information to a particular emulated LAN service by giving the client the LES's ATM address. This method supports the ability to assign a client to an emulated LAN based on either the physical location (ATM address) or the identity of a LAN destination that it is representing.

It is optional for the LAN emulation client to obtain information from the LECS using the configuration protocol. The LECS allows the LAN emulation client to be automatically configured.

LAN Emulation Connections

VCCs are used for the connections of LAN emulation clients and other entities of LAN emulation such as the LECS, LES and BUS. For each different connection a separate VCC exists. In Figure 16 on page 35, the connections are shown with the stronger lines designating control connections.

Control Connections

Several control VCCs exist. They link the LEC to the LECS, or link the LEC to the LES, and carry LE_ARP traffic and control frames. A control VCC never carries data frames. Building control VCCs is a part of the LAN emulation client initialization process.

Three different control VCCs exist:

Configuration Direct VCC

The configuration direct VCC is a bidirectional VCC that may be set up by the LAN emulation client, or other entity, as part of the LECS connect phase. It is used for obtaining configuration information, including the address of the LES. The entity may maintain this VCC while participating in the emulated LAN. It may continue to keep it open for further queries to the LECS while participating in the emulated LAN. The configuration direct VCC may be used to inquire about an LE client other than the one to which the configuration direct VCC is attached. This connection is signaled using B-LLI to indicate it carries LE control packet formats.

Control Direct VCC

The LAN emulation client sets up a bidirectional point-to-point VCC to the LES for sending control traffic. This is set up by the LAN emulation client as part of the initialization phase. The LES has the option to use the return path for sending control data to the LAN emulation client. The LAN emulation client must thus accept control data from this VCC.

The LEC and LES must maintain this VCC as long as they are members of the emulated LAN.

Control Distribute VCC

The LES may optionally set up a unidirectional point-to-point or point-to-multipoint VCC to the LAN emulation client for distributing control traffic. This VCC may be set up by the LES as part of the initialization phase. If this VCC is set up, the LAN emulation client must accept the control distribute VCC.

The LEC and LES must maintain this VCC as long as they are members of the emulated LAN.

Data Connections

Data connections are used to connect LECs to LECs, and LECs to the broadcast and unknown server. The VCCs carry IEEE 802.3 or IEEE 802.5 data frames as well as flush messages. A flush message is the only time that a data connection will have control traffic. A flush message is generated by the flush protocol in order to ensure that the frames will remain in sequence when two data paths exist. This possibility exists when

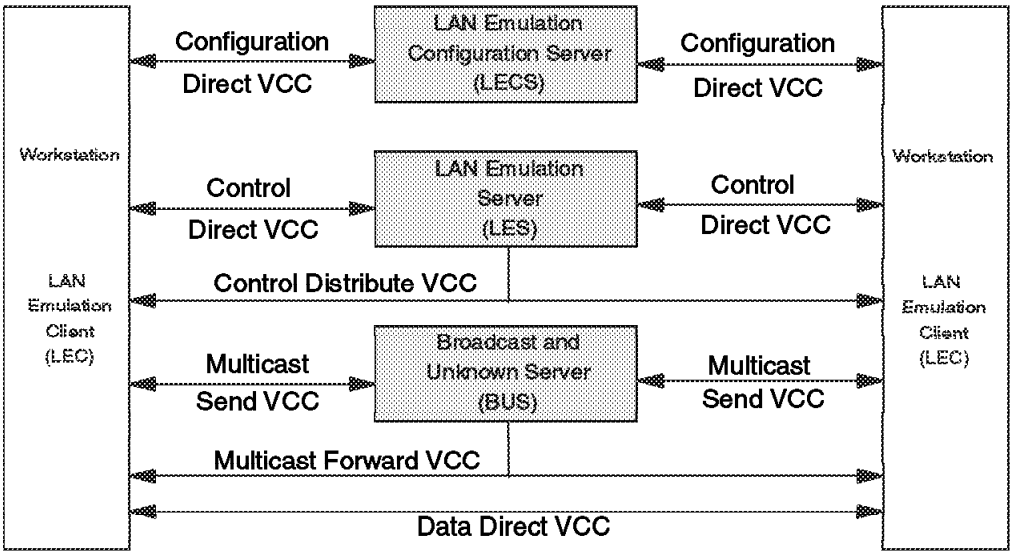


Figure 17. LANE Components

data is sent both via the broadcast and unknown server and via a direct VCC.

The following VCCs are defined:

Data Direct VCC

A data direct VCC is a bidirectional point-to-point VCC between LECs that wants to exchange unicast data traffic.

When a LAN emulation client has a packet to send and the ATM address for the destination MAC address is unknown, the LEC generates an LE_ARP request to resolve the ATM address for the destination. Once the LEC receives a reply to the LE_ARP, it sets up a point-to-point VCC, if not already established, over which to send all subsequent data to that destination.

The LEC that issues an LE_ARP request and receives an LE_ARP response is responsible for initiating the signalling to establish a bidirectional data direct VCC with the LEC sought in the LE_ARP request.

Multicast Send VCC

This VCC is used for sending multicast data to the BUS and for sending initial unicast data. The BUS may use the return path on this VCC to send data back to the LEC. This requires that the LEC accept traffic on this VCC.

A LAN emulation client sets up a bidirectional point-to-point multicast send VCC to the BUS. This VCC has the same setup as the data direct VCC. The LEC first sends an LE_ARP request and, when it receives the LE_ARP response, initiates signalling to establish the multicast send VCC to the BUS.

The LAN emulation client must maintain this VCC as long as it is a part of the emulated LAN.

Multicast Forward VCC

The multicast forward VCC is initiated by the broadcast and unknown server. This is done after the LAN emulation client has set up the multicast send VCC. The multicast forward VCC is used for distributing data from the broadcast and unknown server. It can be either a point-to-multipoint VCC or a unidirectional point-to-point VCC. The LEC emulation client must accept the multicast forward VCC regardless of type. A multicast forward VCC from the broadcast and unknown server must be established before a LAN emulation client can participate in the emulated LAN.

The LAN emulation client must attempt to maintain this VCC as long as it is a member of the emulated LAN.

The broadcast and unknown server may forward frames to a LAN emulation client on either the multicast send VCC or the multicast forward VCC. A LAN emulation client will not receive duplicate frames forwarded from the broadcast and unknown server on both the VCCs, but must be able to accept frames on either VCC.

LAN Emulation User-to-Network Interface

LE clients and the LE Service must interact in a well-defined manner. This is accomplished using PDUs and well-defined protocols. Four steps can be distinguished:

Initialization

- Obtaining the ATM addresses of the LE Services that are available in an ATM network
- Joining or leaving a particular LAN specified by the ATM address of the LE Service
- Declaring whether this LE client wants to receive address resolution request for all the frames with unregistered destinations.

Registration

Informing the LE Service of the following:

- The list of individual MAC addresses that the LEC client represents
- The list of source route descriptors (for example, segment/bridge pairs) that the LE client represents for source route bridging.

Address resolution

Obtaining the ATM address representing the LE client with a particular MAC address (unicast, broadcast or segment/bridge pair).

Data transfer:

Moving the data from the source to the destination by:

- Encapsulation of the LE-SDU (service data unit) in an AAL-5 frame and transmission by the LE client
- Forwarding of the AAL-5 frame by the LE Service (if applicable)
- Reception and header removal of the AAL-5 frame by the LE client.

LAN Emulation Functions

LAN emulation service is divided into seven functions. Some of the functions can be divided into several subfunctions. This chapter describes the functions and subfunctions as defined by the ATM Forum.

Initialization

Several steps are taken before the Initialization function is completed:

Initial State

In the initial state, there are parameters (for example, addresses, emulated LAN, maximum frame size, etc.) that are known to the LE server and the LE clients about themselves before they participate in the configuration and join phase functions.

LAN Emulation Configuration Server Connect Phase

In the LECS connect phase, the LE client establishes a configuration direct VCC to the LE configuration server.

Join Phase

In the join phase of ATM LAN emulation initialization, the LAN emulation client establishes its control connections to the LAN emulation server. The join phase can have two outcomes: success or failure.

Once the join phase has successfully completed, the LAN emulation client has been assigned a unique LAN emulation client identifier (LECID). It now knows the emulated LAN's maximum frame size and its LAN type. It also has established the control VCCs with the LAN emulation server.

Initial Registration

After joining, a LAN emulation client may register any number of MAC addresses and/or route descriptors. This is in addition to the single MAC address that can be registered as part of the join phase. Initial registration allows a LAN emulation client to verify the uniqueness of its local addresses before completing initialization and becoming operational.

Connecting to the Broadcast and Unknown Server

In order to establish a connection to the broadcast and unknown server, the LAN emulation client LE_ARPs for the broadcast MAC address and proceeds to set up the connection. The broadcast and unknown server then establishes the multicast forward VCC to the LAN emulation client.

Initialization Phases, Recovery and Termination

Registration

The address registration function is the mechanism by which clients provide address information to the LAN emulation server. An intelligent LAN emulation server may respond to address resolution requests if LAN emulation clients register their LAN destinations, defined as MAC addresses or, for source routing IEEE 802.5 LANs only, route descriptors, with the LAN emulation server. The LAN destinations may also be unregistered as the state of the client changes. A client must either register all LAN destinations for which it is responsible or join as a proxy.

Address Resolution

Address resolution is the procedure by which a client associates a LAN destination with the ATM address of another client or the broadcast and unknown server. Address resolution allows clients to set up data direct VCCs to carry frames.

When a LAN emulation client is presented with a frame for transmission whose LAN destination is unknown to that client, it must issue a LAN emulation address resolution protocol (LE_ARP) request frame to the LAN emulation server over its control point-to-point VCC.

The LAN emulation server may either:

1. Forward this LE_ARP to the appropriate clients using the control distribute VCC or one or more control direct VCCs. Different LAN emulation server implementations may use different distribution algorithms. If a client responds to a forwarded LE_ARP request with a LE_ARP reply, that reply is also sent and forwarded over the control VCCs to the original requester.
2. Or instead of forwarding the LE_ARP, the LAN emulation server may issue an LE_ARP reply on behalf of a client that has registered the requested LAN destination with the LAN emulation server.

A LAN emulation client must respond to an LE_ARP that it receives, asking for a LAN destination it has registered with the LAN emulation server or for which it is a proxy.

Each LAN emulation client maintains a cache of LE_ARP replies and uses a two-period time out mechanism to age entries in this cache. The aging time period is used for all entries learned from LE_ARP responses whose remote address flag was zero. That is, responses for registered LAN destinations are always timed out with the aging time. For aging entries learned from LE_ARP replies with the remote address FLAGS bit set to 1 and for entries learned from observing source addresses on data VCCs, which timeout to use is determined by the state of the LAN emulation client's topology change flag. When this flag is set, such entries are aged using the aging time parameter. The state of this flag may be altered either by local management or by reception of the LE_TOPOLOGY_REQUEST messages.

Connection Management

In switched virtual connection environments, the LAN emulation entities set up connections between each other using UNI signalling. The connections use best-effort quality of service as the minimum level.

Call establishment

When a call is being set up, the destination must not send its CONNECT message until it is ready to receive frames on the new VCC. The originator should expect that it can transmit frames after it has received the CONNECT message from the destination.

The CONNECT_ACK message is received by the destination and can be generated by its local switch. This message can reach the destination before the CONNECT message reaches the originator. The originator can only start to initialize its VCC after it receives the CONNECT message from the destination. Therefore, there is no guarantee for the destination that its initial data will be received by the originator until it receives some end-to-end indication from the originator.

The originator must send a READY_IND message as soon as it is ready to receive frames on the newly established VCC. At that point, the originator considers call establishment to be complete. The originator may also send data as soon as it is ready to receive frames on the newly established VCC. Data may be sent before or after sending the READY_IND.

It is possible that the READY_IND message can get lost. To recover it, the destination is responsible for timing the arrival of the READY_IND message. If the timer expires, the destination sends data or a READY_QUERY message on the VCC. Either party should always respond to receipt of a READY_QUERY message on an active VCC by transmitting a READY_IND message.

Tear down and timeout of VCCs

If a control direct VCC or control distribute VCC is ever released, a LAN emulation client must always return to the LAN emulation configuration server connect phase of initialization. If the broadcast and unknown server VCC is lost while the LAN emulation client is participating in a emulated LAN, the LAN emulation client may return to the broadcast and unknown server connect phase or go to the termination phase and restart.

Data Transfer

There are two different connections used for data transfer:

- Data direct VCCs between individual LAN emulation clients
- Multicast send and multicast forward VCCs that connect clients. to the broadcast and unknown server

Unicast Frames

When a LAN emulation client has established, via the address resolution mechanism, that a certain LAN destination corresponds to a certain ATM address, and when that client knows it has a data direct VCC to that ATM address, then a frame addressed to that LAN destination must be forwarded via that data direct VCC.

If a LAN emulation client does not know which data direct VCC to use for a given unicast LAN destination, or if that data direct VCC has not yet been established, it may elect to transmit the frame over the multicast send VCC to the broadcast and unknown server. The broadcast and unknown server, in turn, forwards the frame to at least the client for which it is destined. If the LAN destination is unregistered, then the frame must be forwarded to at least all proxy clients and may be forwarded to all clients.

On an emulated LAN, the case can arise where a frame can only reach its destination through an IEEE 802.1D transparent bridge, and that bridge does not know the whereabouts of that destination. The only way such a frame can be assured of reaching its destination is for the frame to be transmitted to all of the IEEE 802.1D transparent bridges via the broadcast and unknown server so that they, in turn, can flood that frame to all of their other bridge ports, or at least the ones enabled by the spanning tree protocol. A LAN emulation client that chooses not to forward frames to the broadcast and unknown server, therefore, may not be able to reach destinations via transparent bridges, or perhaps other proxy agents.

Multicast Frames

LAN emulation clients may wish to send frames to a multicast MAC address, and/or they may wish to receive frames addressed to a given

multicast MAC address. In order to send frames to a multicast MAC address, a LAN emulation client must send the frames to the broadcast and unknown server. The address resolution mechanism is used during the initialization process to provide the ATM address of the broadcast and unknown server for multicast and broadcast traffic, and connection management will provide a point-to-point multicast send VCC over which to send such frames.

All that is required in order for the LAN emulation client to receive frames addressed to a given multicast MAC address is for the LAN emulation client to connect to the broadcast and unknown server, after which the broadcast and unknown server will try to set up a return path for all broadcast and multicast traffic. When a client connects to the broadcast and unknown server, the broadcast and unknown server will try to establish a multicast forward VCC to that client. It is expected that multicast forward VCCs will be unidirectional point-to-multipoint VCCs, but they may be implemented as point-to-point VCCs. This decision is left to the LAN emulation service, not to the client.

A LAN emulation client will receive all flooded unicast frames and all broadcast and multicast frames over either its multicast send VCC or its multicast forward VCC. Which VCC the broadcast and unknown server uses to forward frames to the LAN emulation client is at the discretion of the broadcast and unknown server. A LAN emulation client will not, however, receive duplicate frames.

The LAN emulation header of any data frame sent from a client to the broadcast and unknown server must either contain the value 0 or the unique LECID value assigned to that client. The broadcast and unknown server is required to preserve the LAN emulation header of a relayed frame. Thus, a client can identify and filter frames that it sent by comparing the LECID field to its own LECID value. A transparent bridge LAN emulation client cannot reliably use the source MAC address to identify its own broadcast and unknown server traffic.

Token-ring functional addresses are treated just as any other multicast MAC address.

Frame Ordering

There may be two paths for unicast frames between a sending LAN emulation client and a receiving client: one via the broadcast and unknown server and one via a data direct VCC between them. For a given LAN destination, a sending client is expected to use only one path at a time, but the choice of paths may change over time. Switching between those paths introduces the possibility that frames may be delivered to the receiving client out of order. Out-of-order delivery between two LAN endpoints is uncharacteristic of LANs and undesirable in an ATM emulated LAN. The flush protocol is provided to ensure the correct order of delivery of unicast data frames.

Source Route Considerations

Source route bridging is the predominant bridging technology used within IEEE 802.5 token-ring networks. The use of source routing does not preclude transparent bridging in these networks. A token-ring end station will typically use a combination of source-routed and nonsource-routed frames. This allows a LAN emulation client to operate with both source routing and transparent bridging.

In addition to the Destination Address (DA) field and Source Address (SA) field, a source-routed frame contains a Routing Information (RI) field. The RI field contains a control field and a list of route descriptors (RD) that indicate the frame's path through the network. Therefore, the information in the RO field determines which SR bridges will forward the frame. The LAN emulation client determines if the frame is to be forwarded by an SR bridge or if the LAN destination is a station on the emulated LAN.

The LAN emulation client determines if the frame is to be forwarded by an SR bridge, or if the LAN destination is a station on the local emulated LAN by examining the RI field. If the LAN destination is accessible through an SR bridge, the LAN destination is the Next Route Descriptor (Next_RD); otherwise, the LAN destination is the frame's destination address.

Frames with specifically routed source routing information (an SRF frame) and unicast destination MAC address are sent down data direct VCCs following the usual LE_ARP and VCC setup process. Other source-routing frames are sent through the broadcast and unknown server.

Classical IP over ATM (RFC 1577)

IP was the first protocol that was used over ATM in a multivendor environment. Classical IP, or IETF RFC 1577, was the first standard available. Enhancements are made or proposed on all kinds of levels. This chapter gives an overview of work that is done or is under development and has IP as a base.

Since January 1993, the Internet Engineering Task Force (IETF) has had a formal recommendation on how to transport IP traffic over ATM. RFC 1577 describes the flows and mechanisms of Classical IP and ARP over ATM. RFC 1577 is the initial deployment of ATM within *classical* IP networks as a direct replacement for local area networks and for IP links that interconnect routers, either within or between administrative domains. The *classical* model refers to the treatment of the ATM host adapters as a networking interface to the IP protocol stack operating in a LAN-based paradigm.

Characteristics of the classical model are:

- The same maximum transmission unit (MTU) size is used for all VCs in a LIS.
- Default LLC/SNAP encapsulation of IP packets.
- End-to-end IP routing architecture stays the same.
- IP addresses are resolved to ATM addresses by use of an ATMARP service within the LIS; ATMARPs stay within the LIS. From a client's perspective, the ATMARP architecture stays faithful to the basic ARP model.
- One IP subnet is used for many hosts and routers. Each VC directly connects two IP members within the same LIS.

IP Subnetwork Configuration

In the LIS scenario, each separate administrative entity configures its hosts and routers within a closed logical IP subnetwork. Each LIS operates and communicates independently of other LISs on the same ATM network. Hosts connected to ATM communicate directly to hosts within the same LIS. Communication to hosts outside of the local LIS is provided via an IP router. This router is an ATM endpoint attached to the ATM network that is configured as a member of one or more LISs. This configuration may result in a number of disjoint LISs operating over the same ATM network. Hosts of differing OP subnets must communicate via an intermediate IP router even though it may be possible to open a direct VC between the two OP members over the ATM network.

The requirements for IP members (hosts, routers) operating in an ATM LIS configuration are:

- All members have the same IP network/subnet number and address mask
- All members within a LIS are directly connected to the ATM network
- All members outside of the LIS are accessed via a router
- All members of a LIS must have a mechanism for resolving IP addresses to ATM addresses via ATMARP (based on RFC 826) and vice versa via InATMARP (based on RFC 1293) when using SVCs
- All members of a LIS must have a mechanism for resolving VCs to IP addresses via InATMARP (based on RFC 1293) when using PVCs

- All members within a LIS must be able to communicate via ATM with all other members in the same LIS; that is, the virtual connection topology underlying the intercommunication among the members is fully meshed.

The following list identifies a set of ATM-specific parameters that must be implemented in each IP station connected to the ATM network:

- The ATM hardware address (atm$ha) is the ATM address of the individual IP station.
- The ATMARP request address (atm$arp-req) is the ATM address of an individual ATMARP server located within the LIS. In an SVC environment, ATMARP requests are sent to this address for the resolution of target protocol addresses to target ATM addresses. That server must have authoritative responsibility for resolving ATMARP requests of all IP members within the LIS.

  Note: If the LIS is operating with PVCs only, then this parameter may be set to null, and the IP station is not required to send ATMARP requests to the ATMARP server.

Permanent Virtual Connections

An IP station *must* have a mechanism (for example, manual configuration) for determining what PVCs it has and, in particular, which PVCs are being used with LLC/SNAP encapsulation.

All IP members supporting PVCs are required to use the Inverse ATM Address Resolution Protocol (InATMARP) (refer to RFC 1293) on those VCs using LLC/SNAP encapsulation. In a strict PVC environment, the receiver will infer the relevant VC from the VC on which the InATMARP request (InARP_REQUEST) or response (InARP_REPLY) was received. When the ATM source and/or target address is unknown, the corresponding ATM address length in the InATMARP packet *must* be set to zero (0) indicating a null length, otherwise the appropriate address field should be filled in and the corresponding length set appropriately.

Switched Virtual Connections

SVCs require support for ATMARP in the nonbroadcast, nonmulticast environment that ATM networks currently provide. To meet this need, a single ATMARP server must be located within the LIS. This server must have authoritative responsibility for resolving the ATMARP requests of all IP members within the LIS.

The server itself does not actively establish connections. It depends on the clients in the LIS to initiate the ATMARP registration procedure. An individual client connects to the ATMARP server using a point-to-point VC. The server, upon the completion of an ATM call/connection of a new VC specifying LLC/SNAP encapsulation, will transmit an InATMARP request to determine the IP address of the client. The InATMARP reply from the client contains the information necessary for the ATMARP server to build its ATMARP table cache. This information is used to generate replies to the ATMARP requests it receives.

The ATMARP server mechanism requires that each client be administratively configured with the ATM address of the ATMARP server (atm$arp-req) as defined earlier in this chapter. There is to be one and only one ATMARP server operational per logical IP subnet. It is recommended that the ATMARP server also be an IP station. This station must be administratively configured to operate and recognize itself as the ATMARP server for a LIS. The ATMARP server must be configured

with an IP address for each logical IP subnet it is serving to support InATMARP requests.

Enhancing RFC 1577

In RFC 1577, it was not possible to have more than one ATMARP server within a LIS. In the future there will be an environment with either a single or multiple synchronized servers. To make an ATMARP server capable of supporting server-to-server neighbor synchronization protocol and operations, several extensions must be made to the single ATMARP server model. These changes are still under consideration and are not discussed further here.

The MTU size is now negotiable. The same maximum transmission unit (MTU) is the default for all VCs in a LIS. However, on a VC-by-VC point-to-point basis, the MTU size may be negotiated during connection startup using Path MTU Discovery to better suit the needs of the cooperating pair of IP members or the attributes of the communications path. The Path MTU Discovery mechanism is Internet Standard RFC 1191 and is an important mechanism for reducing IP fragmentation in the Internet. This mechanism is particularly important because the new subnet ATM uses a default MTU size significantly different from older subnet technologies, such as Ethernet and FDDI.

In order to ensure good performance through the Internet, and also to permit IP to take full advantage of the potentially larger IP datagram sizes supported by ATM, all router implementations that comply or conform with this specification must also implement the IP Path MTU Discovery mechanism as defined in RFC 1191 and clarified by RFC 1435. Host implementations should implement the IP Path MTU Discovery mechanisms as defined in RFC 1191.

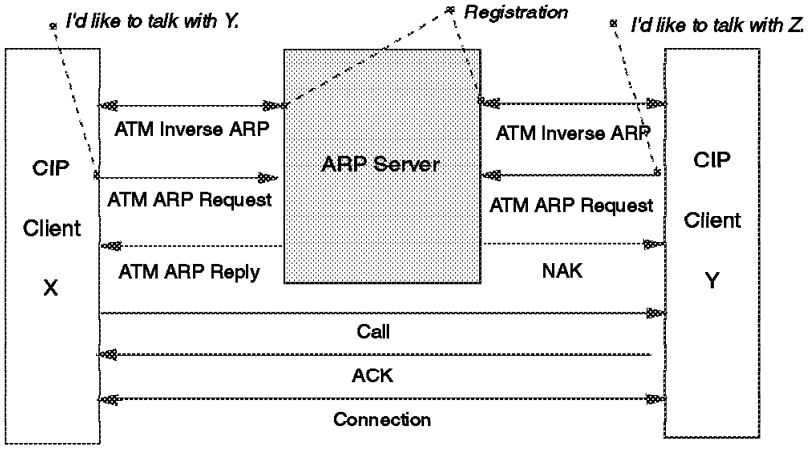


Figure 18. Classical IP Connection Overview

Differences between Classical IP and IPX over ATM

Configuring IPX over ATM (using RFC 1483) is similar to configuring Classical IP (RFC 1577). In the Multiaccess Enclosuresave configuration process, once you enter IPX as the protocol, some subsequent questions are different from those for the IP protocol. Since IPX over ATM does not use ARP servers, questions relating to ARP servers are not asked.

Also, IPX over ATM requires fewer parameters to be configured than CIP. The IPX network number and the IPX host number (IPX ATM-ARP-client) are the only required parameters for IPX over ATM. If you need to open a connection to a remote IPX router, you must additionally configure the desired channels (VCCs).

Chapter 5. ISDN Support

The 3746 Multiaccess Enclosure offers a variety of ways to connect to ISDN networks. Native connections are made via LIC 283 or LIC 292 for respectively T1/J1 or E1 speeds. Each of these LICs supports an ISDN primary rate interface. Alternatively, X.21 adapters together with appropriate terminal adapter hardware can also provide for ISDN access.

Figure 19 illustrates Multiaccess Enclosure access to ISDN networks.

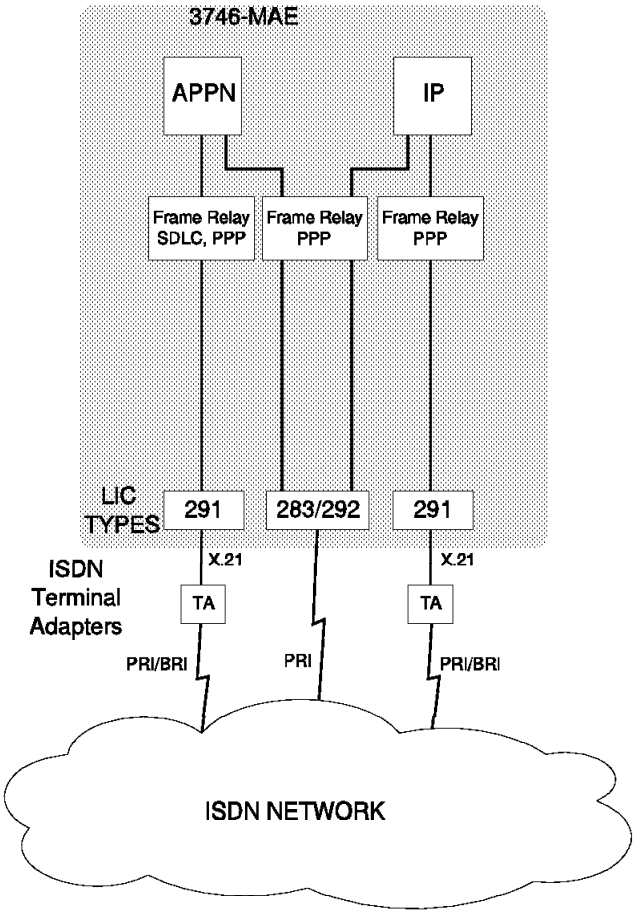


Figure 19. ISDN Access from the 3746 Multiaccess Enclosure

Native ISDN Access

Native ISDN access is supported over the LIC283, LIC292, LIC297, and LIC298. These support one primary rate worldwide ISDN interface each. For more information about these LICs, refer to the *3745 Communication Controller Models A and 170, 3746 Nways Multiprotocol Controller Models 900 and 950: Overview*, GA33-0180. The Multiaccess Enclosure adapters support both SNA and IP traffic using frame relay and PPP framing.

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ISDN Terminal Adapter Access

As with the 3746 native adapters, ISDN terminal adapters (TA) can be used to adapt X.21 links to ISDN networks. In this case, the X.21 call setup procedure is used to call out, or answer via the ISDN network.

For more detailed information, see “ISDN Adapters” in the *3745/3746 Planning Series: Token Ring and Ethernet*.

Chapter 6. Configuration Scenarios

3746 Multiaccess Enclosure: Availability and Backup

In an environment where high availability is required, redundant 3746 Multiaccess Enclosures can be used for backup. Various backup scenarios will be examined on the following pages. They are not meant to be exhaustive but should provide for discussion of typical recovery configurations. They may require redundant 3746 Multiaccess Enclosure and ESCON adapters.

LCS and LSA Examples

To recover from host failures, a secondary host and a path to that host are required. In Figure 20, if Host A fails, users have access to Host B through 3746-MAE2. When Host A recovers, user access to Host A can be restored. This is just one example of recovering from a host failure. For host failures, other factors should also be considered, such as availability of applications and data on the secondary host.

To recover from 3746/MAE failures, a second 3746/MAE must be in the path to your hosts. In Figure 20, when 3746-MAE1 fails, users of Host A could be rerouted through 3746-MAE2, because there are two paths to Host A. When the 3746-MAE1 recovers, users of Host A could be rerouted back through 3746-MAE1. There is only one path to Host B; and if the 3736-MAE2 fails, users will not be able to access Host B. This could be resolved by connecting and configuring Host B to the 3746-MAE1. Then when 3746-MAE2 recovers, user access to Host B could be restored. Again, other variations of this example could be employed to recover from 3746 Multiaccess Enclosure failure.

The backup configuration in Figure 20 on page 52 is designed as follows:

- Host A has access to LAN Segment A through 3746-MAE1. It has access to LAN Segment B through either the 3746-MAE2 or 3746-MAE1.
- Host B has access to LAN Segment A and to LAN Segment B through 3746-MAE2.
- Both of the 3746/MAEs have the same node address. The node addresses can be different for TCP/IP, but not for SNA.
- The IP address for both the 3746/MAEs is the same.
- LAN Segment A and LAN Segment B are connected by a bridge or router.

  For TCP/IP, a router cannot be used. Using a router would, by design, require the IP addresses for 3746-MAE1 and 3746-MAE2 to be different. The IP addresses for the 3746/MAEs must be the same so that the LAN devices can rediscover the route to the secondary 3746/MAE.

Figure 20 on page 52 and Figure 21 on page 53 show sample token-ring LAN segments, but the same principles apply to all the LAN types supported by the 3746/MAE.

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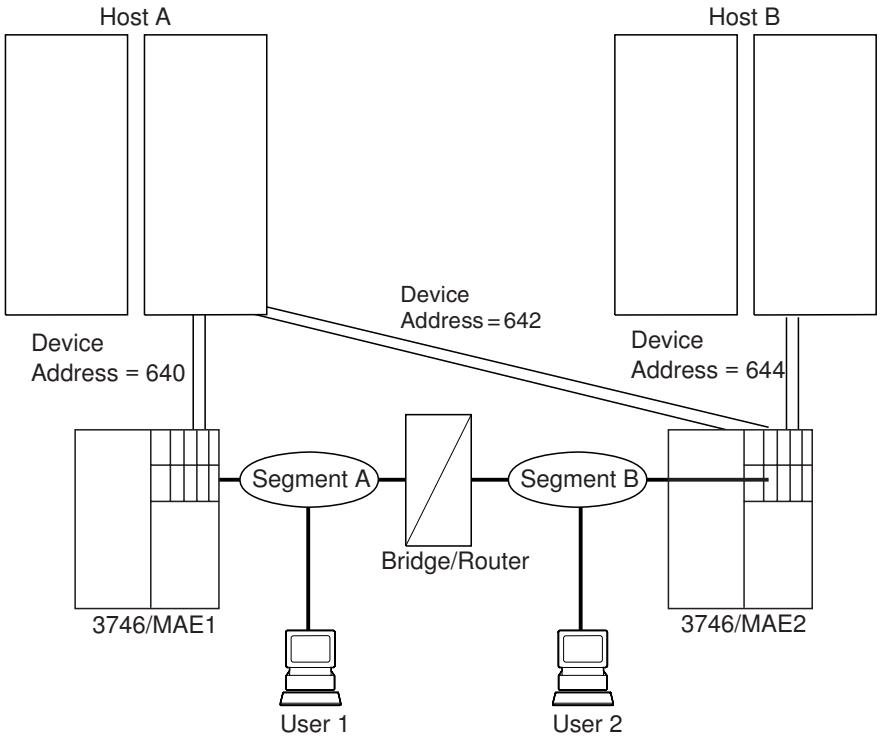

Figure 20. 3746/MAE and Host Backup Using Two LAN Segments

Figure 21 provides the same host and 3746/MAE backup as Figure 20 on page 52, except:

- 3746-MAE1 and 3746-MAE2 are connected to the same LAN segment.
- The primary 3746/MAE must finish IPL before the secondary 3746/MAE is restarted. Then the secondary LAN adapter will not become active on the LAN, because the node addresses are the same.

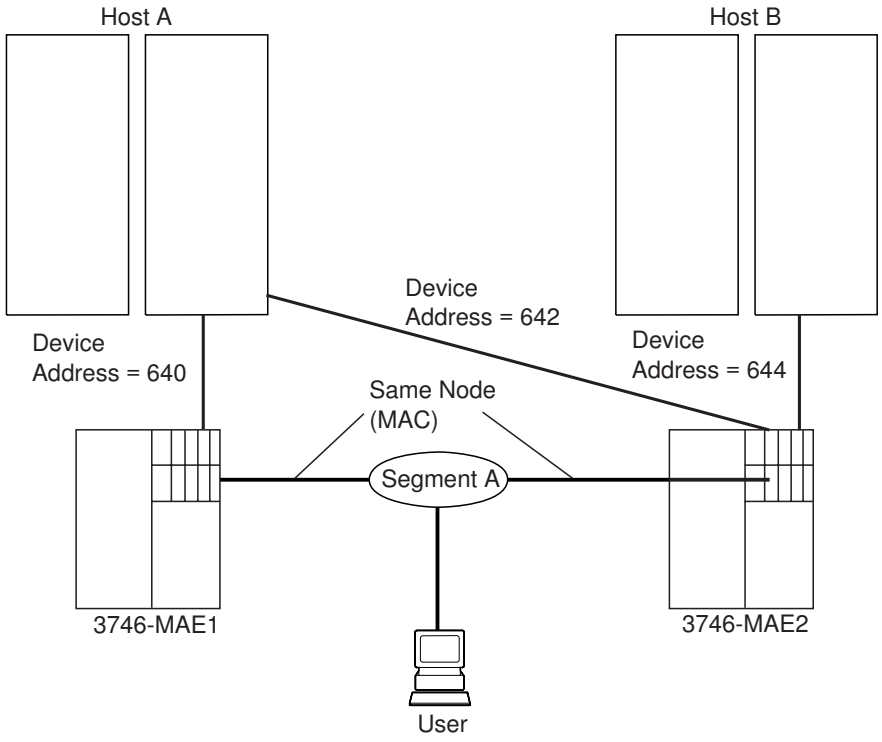

Figure 21. 3746/MAE and Host Backup Using One LAN Segment

Increasing Availability in VTAM Environments

To demonstrate backup in the VTAM environment using the system in Figure 20 on page 52, assume that both 3746/MAEs and hosts are operational and that 3746-MAE1 and Host A are being used as the primary system. Only the XCA major node for 3746-MAE1 is active. Refer to "VTAM Control Blocks Used to Configure LSA at the Host" on page 116 for more information.

When 3746-MAE1 fails:

1. From Host A, deactivate the XCA major node for 3746-MAE1.
2. From Host A, activate the XCA major node for 3746-MAE2.
3. Host A users experience a temporary session loss, but connect through 3746-MAE2 using the same node address.

When Host A fails:

1. 3746-MAE1 detects the inactive host.
2. From Host B, activate the XCA major node for 3746-MAE2.
3. Host A users experience a temporary session loss, but connect to Host B through the 3746-MAE2 using the same node address.

In both cases, after the failure is corrected, sessions can be moved from 3746-MAE2 to 3746-MAE1 in a similar manner.

To demonstrate backup in the VTAM environment using the system in Figure 21 on page 53, assume that both hosts and both 3746/Multiaccess Enclosures are operational, and that Host A and 3746-MAE1 are being used as the primary system.

When 3746-MAE1 fails:

1. From 3746-MAE1, issue a 2216 command to remove 3746-MAE1 connection from the LAN (stop the LAN-A adapter). This can be done from the service processor.
2. From 3746-MAE2, issue a 2216 command to attach the 3746-MAE2 adapter to the LAN (start the LAN-B adapter) This would be from its service processor.
3. From Host A, activate the XCA major node for 3746-MAE2.
4. Host A users experience a temporary session loss, but reconnect through 3746-MAE2 using the same node address.

When Host A fails:

1. From the 3746-MAE1, issue a 2216 command to remove 3746-MAE2 from the LAN (stop the LAN-A adapter). This would be from its SP.
2. From 3746-MAE2, issue a 2216 command to attach 3746-MAE2 to the LAN (start the LAN-B adapter). This would be from its SP.
3. From Host B, activate the XCA major node for the 3746-MAE2.
4. Host A users experience a temporary session loss, but connect to Host B through 3746-MAE2 using the same node address.

In both cases, after the failure is corrected, sessions can be moved from 3746-MAE2 to 3746-MAE1 in a similar manner.

Increasing Availability in a TCP/IP Environment

To demonstrate backup in a TCP/IP environment using the system in Figure 20 on page 52, assume that both 3746/MAEs and hosts are operational and that 3746-MAE1 and Host A are being used as the primary system.

The TCP/IP Profile data set in the host includes the following statements:

Note: The default name for the TCP/IP profile data set is TCPIP.PROFILE.TCPIP for MVS and PROFILE TCPIP for VM.

- DEVICE statements for both 3746/MAEs attached to Host A (subchannels 640 and 642)
- LINK statements for the LAN adapters in both 3746/MAEs
- A HOME statement only for the LAN-A adapter
- A GATEWAY statement for your routing table that includes the LAN-A adapter
- A START statement for the device using the LAN-A adapter.

When 3746-MAE1 fails, the OBEYFILE command can be executed from Host A to give users access to Host A through 3746-MAE2. You will need to issue a PING command to one device ***after*** the obey file has been used. You will need an obey file that contains:

- A STOP statement for the LAN-A adapter

  The STOP statement deactivates ***all lan*** adapters associated with that device. Therefore, if another LAN adapter was defined in 3746-MAE1 for device 640, a STOP for device 640 would stop both the LAN-A adapter and the other adapter. Depending on the type of 3746/Multiaccess Enclosure failure, you may have to stop the LAN-A adapter using a 2216 command and execute the OBEYFILE command again.

- A HOME statement for the LAN-B adapter with the same IP address that is used for the LAN-A adapter
- A GATEWAY statement for your routing table that includes the LAN-B adapter
- A START statement for the device using the LAN-B adapter

A similar obey file can be used to restore user access to Host A when it recovers.

These steps can also be followed using the system in Figure 21 on page 53.

TCP/IP host backup is not illustrated in Figure 20 on page 52 or Figure 21 on page 53. Because each TCP/IP host requires its own LAN adapter, you will not be able to recover from TCP/IP host failures as you can with VTAM hosts. You can, however, add a LAN adapter to either 3746/MAE (or both if you want a backup for both hosts) and define a connection between the host and LAN adapters.

- These new adapters will not have the same node (or MAC) address as the adapters for your primary hosts (shown in Figure 20 on page 52 and Figure 21 on page 53).
- The adapters for the backup host will need to use the same IP addresses that you used for the primary hosts. You can switch the IP/LAN adapter association when one host fails in a similar manner as you do for 3746/MAE failures described above.

For more information about TCP/IP configuration, refer to “Host Definition Planning” on page 108.

MPC+ Examples

Figure 22 shows an example of backup for Multi-Path Channel+ (MPC+).

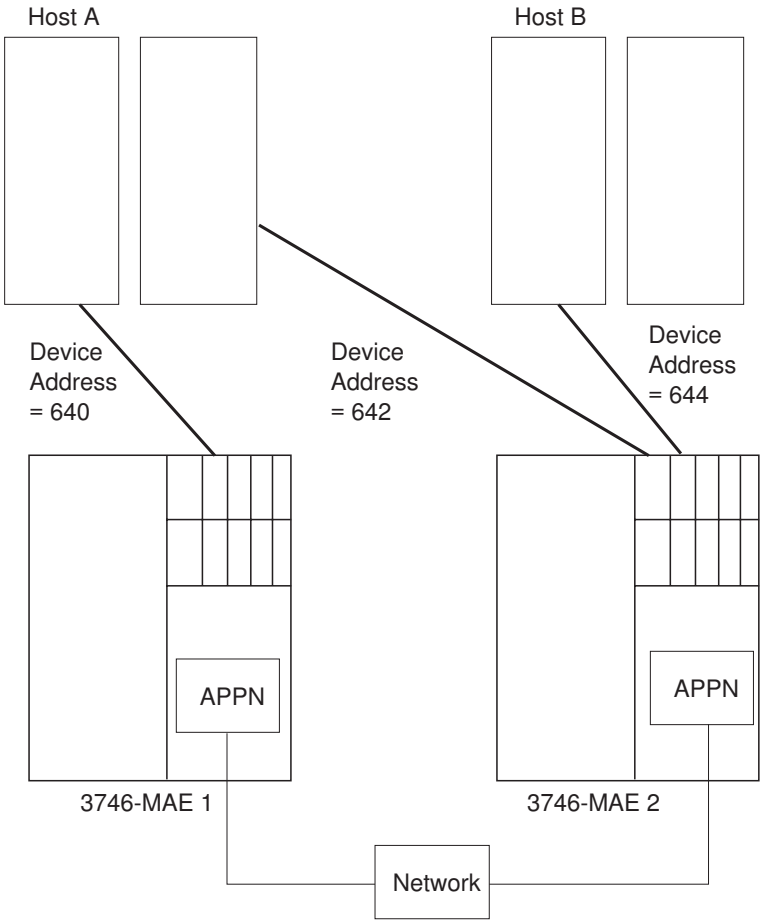

Figure 22. 3746/MAE and Host Backup - Multi-Path Channel+

If one of the 3746/MAEs goes down, any HPR traffic should route around that down box. It is a property of APPN HPR to route around the down box. For example, if 3746-MAE1 goes down, the APPN HPR will path switch around the down box and the session that may have been going between Host A and the network will now all go though 3746-MAE2.

To do the above you just need to make sure that 3746-MAE2 has an APPN PORT/LINK set up to both Host A and Host B.

Chapter 7. Multiaccess Enclosure Configuration

The Multiaccess Enclosure FC 3001 uses the MAE Configurator integrated into the Controller Configuration and Management to configure its slots, adapters, interfaces, and protocols to be used in your network.

For the MAE FC 3000, this is accomplished by using the 2216-400 Configuration Program from the service processor.

The Multiaccess Enclosure functions are accessed from the 3746-9x0 menu. See Figure 23. If the MAE FC 3001 is installed, selecting **Multiaccess Enclosure (MAE) Management** menu allows access to a series functions for the MAE, refer to "Multiaccess Enclosure FC 3001 Consoles" on page 60. If the MAE FC 3001 is installed, selecting **Manage Multiaccess Enclosure** from this menu will open the Multiaccess Enclosure management window. Refer to Figure 25 on page 59.

The Multiaccess Enclosure can be configured from either the service processor or a workstation that runs the CCM program. In the latter case, the configuration import facility must be used.

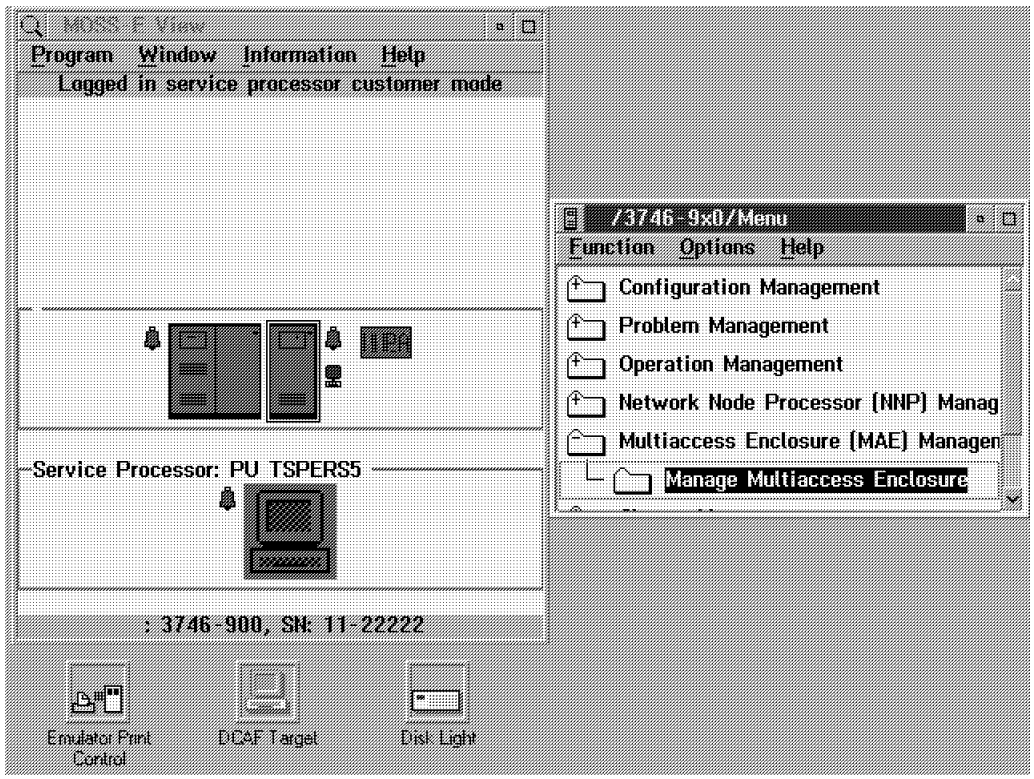

Figure 23. Multiaccess Enclosure Management Menu within Service Processor

Consideration must be given to configuring the token-ring adapter ports in slot 1 of the Multiaccess Enclosure, and matching definitions for the associated TIC3s in the 3746-9x0 using CCM, to allow the Multiaccess Enclosure traffic to flow to the existing 3746-9x0 hardware, (see "Examples of MAE Connection Configuration" on page 73).

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Overview of the Multiaccess Enclosure Environment

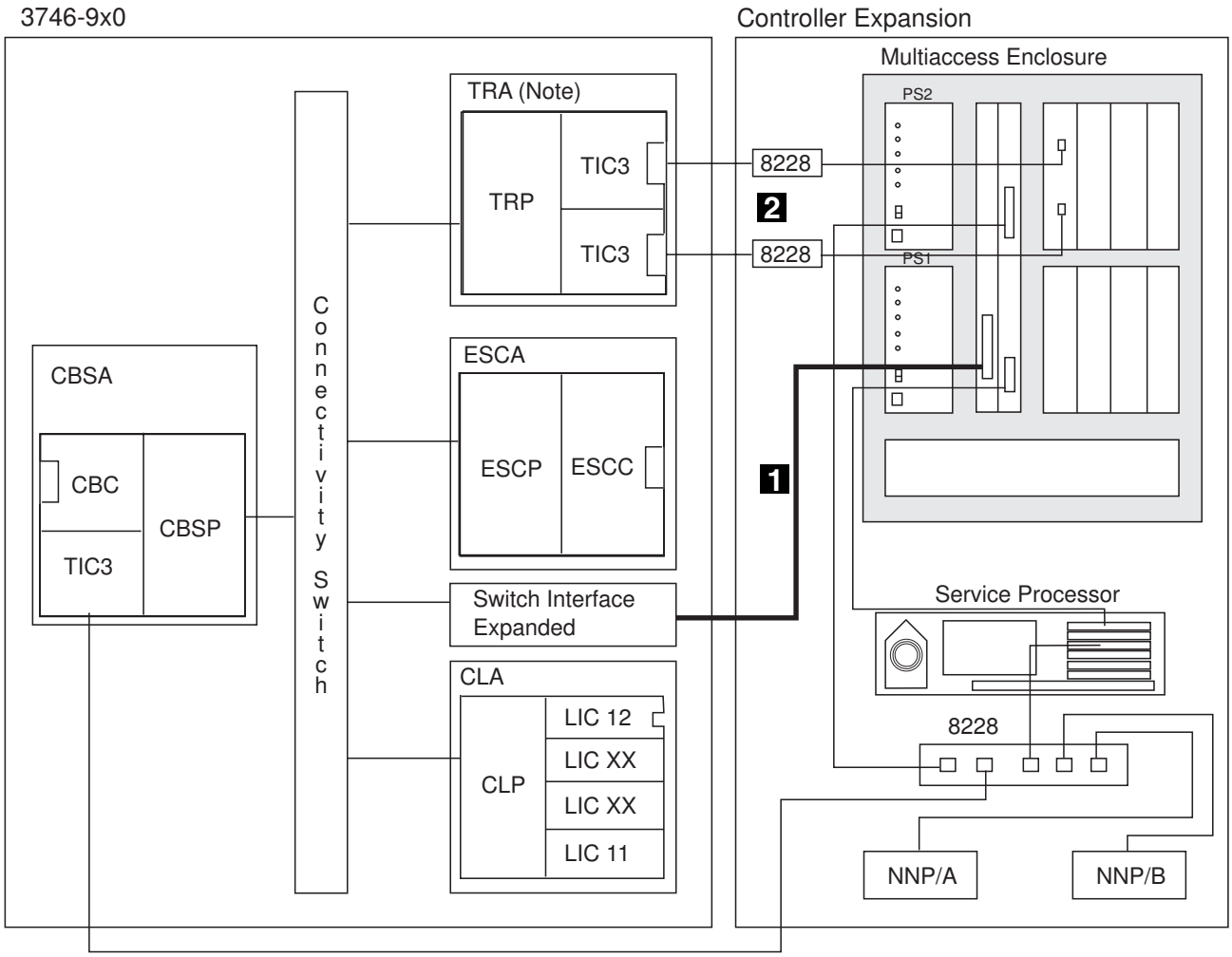

Figure 24. Multiaccess Enclosure Environment

The MAE-3746 Direct Attachment connection (**1** in Figure 24) is used for IP Traffic.

If internal attachment via LAN to the 3746 Models 900 or 950 switch is required for traffic routing between MAE ports and other 3746 ports (such as APPN/HPR and NCP traffic), a 2-port Token-Ring adapter (FC 3280), one or two dedicated Token-Ring couplers type 3 (FC 5601), and one or two Multiaccess Enclosure Token-Ring Kits (FC 5713), depending on performance requirement, are required. See **2** in Figure 24 for the token-ring cable connections between the Multiaccess Enclosure and the 3746.

For the IBM service representative who installs your Multiaccess Enclosure, fill out the worksheet on page 123 with the number (zero, one, or two) of token-ring links you need for traffic flow between the Multiaccess Enclosure and 3746.

Note: When token-ring kits are used, they can be plugged on two different TRPs.

Communicating with the Multiaccess Enclosure

There are two methods of communicating with the Multiaccess Enclosure from the service processor:

1. ASCII connection, maintenance operation only, through an RS-232 null modem cable.
2. TELNET session, network operations and dynamic online configuration update, thru the Service ring.

For Telnet to work, the Multiaccess Enclosure be installed. Also, the PCMCIA token-ring port on the service LAN must have an IP address set (refer to “IP Addressing” on page 60 or “IP Addressing” on page 62).

MAE FC 3001

Refer to the IBM 2216 Nways Multiaccess Controller documentation for the procedures to setup the MAE FC 3001 for communication with the service processor.

MAE FC 3000

Figure 25 shows the Multiaccess Enclosure Management Menu before any setup has been performed on a new Multiaccess Enclosure. The field MAE IP address is blank and should have the IP address of the Multiaccess Enclosure service LAN port entered directly into this field. This will tell the service processor who to talk to when addressing the Multiaccess Enclosure.

Note: The same address must also be set in the Multiaccess Enclosure firmware.

All of the above should be operational when IBM complete the hardware install.

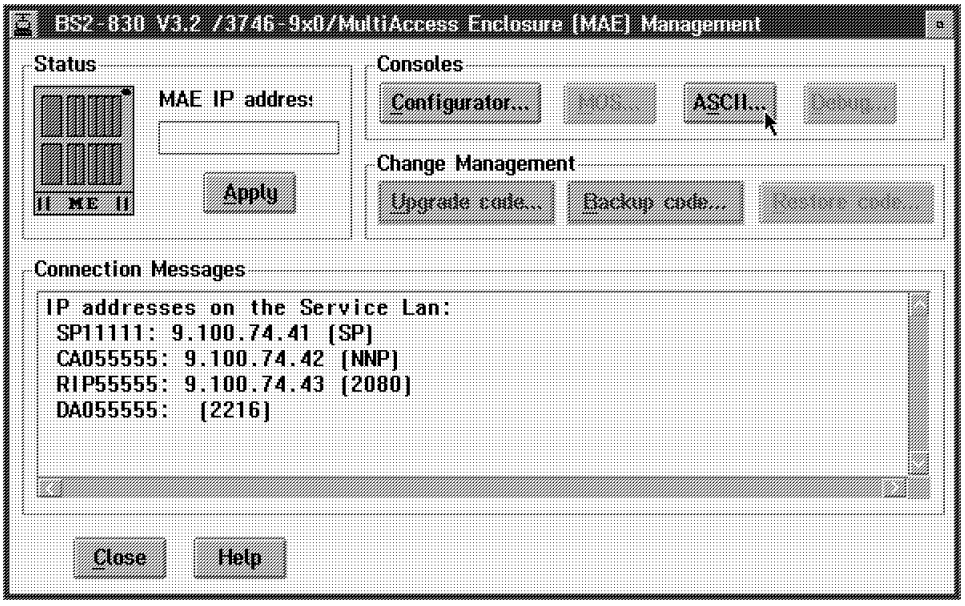

Figure 25. Multiaccess Enclosure Management Menu Window

Multiaccess Enclosure FC 3001 Consoles

There are two type of console access to the Multiaccess Enclosure operational code. **ASCII** and **MOS** consoles allow you to access the user interface to monitor and change the function of the Multiaccess Enclosure.

ASCII Console

The ASCII console is a direct connection from the service processor SERIAL port to the Multiaccess Enclosure IEA 232 interface on the system card. Use the **ASCII Console** function the 3746-9x0 **Multiaccess Enclosure (MAE) Management** menu to access this console.

After the initial setup connection, performed by the IBM service representative, you do not need to use this console for Multiaccess Enclosure operation, as long as IP forwarding is enabled.

When IP forwarding is enabled, an IP stack is built on the Multiaccess Enclosure and the service LAN token-ring port IP address has been set, and you may connect via MOS (TELNET), refer to “MOS Console.”

MOS Console

Use the **MOS Console** function the 3746-9x0 **Multiaccess Enclosure (MAE) Management** menu to access this console. It establishes a TELNET session to the Multiaccess Enclosure via the service LAN.

The MOS console provides the same function as the ASCII console but is faster because it uses the 16-Mbps service LAN instead of a serial connection.

Note: You may also TELNET remotely to the Multiaccess Enclosure by connecting to any IP address defined on the Multiaccess Enclosure.

Login and Passwords: When connecting to the Multiaccess Enclosure via a remote Telnet session, you are prompted for a login name and password. You can display the login name when logged in to the Multiaccess Enclosure from a remote console by using the status command. Use the set password command to supply a password for the Multiaccess Enclosure. You may also configure a password for users of the MOS console.

Note: If you do not enter a login name and a valid password within one minute of the initial prompt, or if you enter an incorrect password three times in succession, the Multiaccess Enclosure drops the Telnet connection.

Multiple users with login permissions may also be added using the add user command.

IP Addressing

In the **MOSS-E View** window, the Multiaccess Enclosure Status should be green. This only indicates that the Multiaccess Enclosure PCMCIA service ring port has been contacted, that is, it has an IP address set. If the icon is not green, you need to set the MAE IP address.

Note: A green icon does not indicate that successful communication will occur via the service ring. The Multiaccess Enclosure still requires an IP stack. During installation of your Multiaccess Enclosure, the IBM Service Representative sets an

IP address for the PCMCIA token-ring port. For more information, refer to "Controller and Service Processor Integration" in the *3745/3746 Planning Series: Overview, Installation, and Integration*.

Multiaccess Enclosure FC 3000 Consoles

There are two type of console access to the Multiaccess Enclosure operational code. **ASCII** and **MOS** consoles allow you to access the user interface to monitor and change the function of the Multiaccess Enclosure.

ASCII Console

The ASCII console is a direct connection from the service processor SERIAL port to the Multiaccess Enclosure IEA 232 interface on the system card. The **ASCII...** button on the Multiaccess Enclosure Management Menu (see Figure 25 on page 59) opens a window for communication. After the initial setup connection, performed by the IBM service representative, you will not be required to use this console interface for Multiaccess Enclosure operation, as long as IP forwarding is enabled. If IP forwarding is enabled, an IP stack is built on the Multiaccess Enclosure and the service LAN token-ring port IP address has been set, then you may connect via MOS (TELNET), refer to "MOS Console."

Note: The ASCII console should not be used by the customer.

MOS Console

The MOS console is accessed from the Multiaccess Enclosure Management Menu consoles area by pressing **MOS...** button and establishes a TELNET session to the Multiaccess Enclosure via the service LAN.

Note: In Figure 25 on page 59 the **MOS...** button is disabled. This is because the Multiaccess Enclosure requires an initial setup.

The MOS console provides the same function as the ASCII console, except that TELNET will not work until initial setup is performed. The MOS console is faster because it uses the 16-Mbps service ring.

Note: You may also remotely TELNET to the Multiaccess Enclosure by connecting to any IP address defined on the Multiaccess Enclosure.

Login and Passwords: When connecting to the Multiaccess Enclosure via a remote Telnet session, you are prompted for a login name and password. You can display the login name when logged in to the Multiaccess Enclosure from a remote console by using the status command. Use the set password command to supply a password for the Multiaccess Enclosure. You may also configure a password for users of the MOS console.

Note: If you do not enter a login name and a valid password within one minute of the initial prompt, or if you enter an incorrect password three times in succession, the Multiaccess Enclosure drops the Telnet connection.

Multiple users with login permissions may also be added using the add user command.

IP Addressing

In the **Multiaccess Enclosure Management** window, the Multiaccess Enclosure Status should be green. This only indicates that the Multiaccess Enclosure PCMCIA service ring port has been contacted, that is, it has an IP address set. If the icon is not green, you need to set the MAE IP address, refer to the status area on Figure 25 on page 59.

Note: A green icon does not indicate that successful communication will occur via the service ring. The Multiaccess Enclosure still requires an IP stack. During installation of your Multiaccess Enclosure, the IBM Service Representative sets an IP address for the PCMCIA token-ring port. For more information, refer to "Controller and Service Processor Integration" in the *3745/3746 Planning Series: Overview, Installation, and Integration*.

Starting the MAE Configurator

Depending on the MAE feature code and the microcode level installed on your service processor, the procedure is different.

MAE FC 3001

Use the MAE Configurator in the Controller Configuration and Management.

MAE FC 3000 Up to D46130 Microcode Level...

The MAE configurator resides on the Service Processor Optical Disk (labeled 'MAE_XXXX' where XXXX is the version level). It is therefore a requirement to have this disk inserted in the optical drive. The configuration database and configurations that you create will also be saved onto this optical disk.

To start the MAE configurator:

1. Locate and open the Multiaccess Enclosure menu (Figure 23 on page 57).
2. Double-click on the Multiaccess Enclosure menu. line to open the window (Figure 25 on page 59).
3. Click **Configurator**.

   Note: You may be requested to insert the MAE NORMAL diskette or media. This means you need to insert the Multiaccess Enclosure normal optical disk (label 'MAE_XXXX') into the OD drive before the program will start.

   The main window for the MAE configurator will be displayed.

MAE FC 3000 From F12380 Microcode Level...

The MAE configurator is delivered on a CD-ROM that also contains the MOSS-E microcode and the product documentation. It is therefore a requirement to have the CD-ROM inserted in the CD-ROM drive. The configuration database and configurations that you create, however, must be saved on a diskette. For more information, refer to "Controller and Service Processor Integration" in the *3745/3746 Planning Series: Overview, Installation, and Integration*.

To start the MAE configurator:

1. Locate and open the Multiaccess Enclosure menu (Figure 23 on page 57).

2. Double-click on the Multiaccess Enclosure menu line to open the window (Figure 25 on page 59).
3. Click **Configurator...**.

   Note: You may be requested to insert the MAE NORMAL diskette or media. This means that before the program starts, you must insert into the CD-ROM drive the CD-ROM on which the MAE code is delivered.

   The main window for the MAE configurator is then displayed.

Using the MAE Configurator

This section describes how to use the MAE Configurator by including some of the navigation features of the program.

Understanding the Navigation and Configuration Windows

After you start the MAE configurator and clear the copyright notice, you will see two windows similar to those in Figure 26 on page 64 and Figure 27 on page 66.

The thinner, left-hand window is the Navigation Window and the broader, right-hand window is the Configuration Window.

Note: The Navigation Window overlaps the Configuration Window, and, if you click on the Configuration Window, the Navigation Window is now hidden. To switch back to the Navigation Window, press **Ctrl+Esc** keys to see a list of open windows and select the Navigation Window.

You configure the Multiaccess Enclosure by selecting items in the Navigation Window and then providing the details for each selected item in the Configuration Window. When you have completed entering the configuration details, select a new item to configure by selecting the item in the Navigation Window.

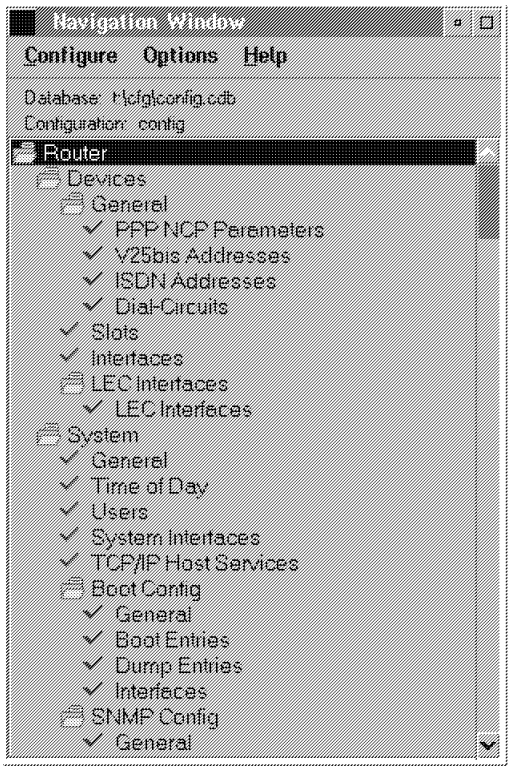

Figure 26. Multiaccess Enclosure Configurator Navigation Window (List)

The Navigation Window

The Navigation Window contains:

- A title bar
- A menu bar
- A configuration description area
- A scrollable list of features and protocols that you can configure.

This book refers to the scrollable list as a navigation list. As you select items in the navigation list, the program displays a configuration panel in the Configuration Window. If you select a folder item, the MAE configurator displays help for configuring the feature that is represented by the folder in the Configuration Window. A folder is an item in the Navigation Window that has a folder icon next to the item. You can copy the help text from the Configuration Window to a Help window by pressing **F1** at this time.

If there is an error or if you have not supplied required information in the current configuration, a yellow question mark (?) appears next to that item in the navigation list.

If there are no errors, a green check mark (√) appears next to that item in the navigation list.

The title bar of the Configuration Window displays an identification for an item that is selected in the navigation list.

The Navigation Window's menu bar contains the following options:

Configure
Options
Help.

The area below the menu bar is the configuration description area. It displays the following information:

.
- Database path and name that contains the configuration.
- Filename of the current configuration (the default is config)

Another feature of the Navigation Window is a pop-up menu that you invoke by pressing the right mouse button on any selected folder in the navigation list.

The pop-up menu allows you to:

- Fully expand the navigation list.
- Expand a portion of the navigation list out of a folder.
- Contract a portion of the navigation list into a folder.
- Display a history pop-up menu of configuration items you have selected. From the history pop-up you can access any of the previously selected configuration items. Press and hold mouse button 2 until you select the item from the submenu displayed by the history menu item. You can invoke the history pop-up from any item in the navigation list as you would the pop-up menu.
- Validate a selection item in error. The Navigation Window displays erroneous items with a yellow question mark (?) next to the item. The validate function displays messages for any configuration errors or required fields that do not have correct values based on the list item selected. Using the validate function on a folder in the navigation list will display validation messages for all of the navigation list items within that folder.

  After you correct an error and leave the panel that contained the error, the program replaces the question mark (?) with a check mark (√).

Changing the MAE Configurator Options

Use the Option menu to change:

- Font
- Colors
- Message Prompting
- ATM Address Format.

The Configuration Window

As you select items in the Navigation Window, the program presents panels in the Configuration Window. The format of the configuration panels depends on the item that you select.

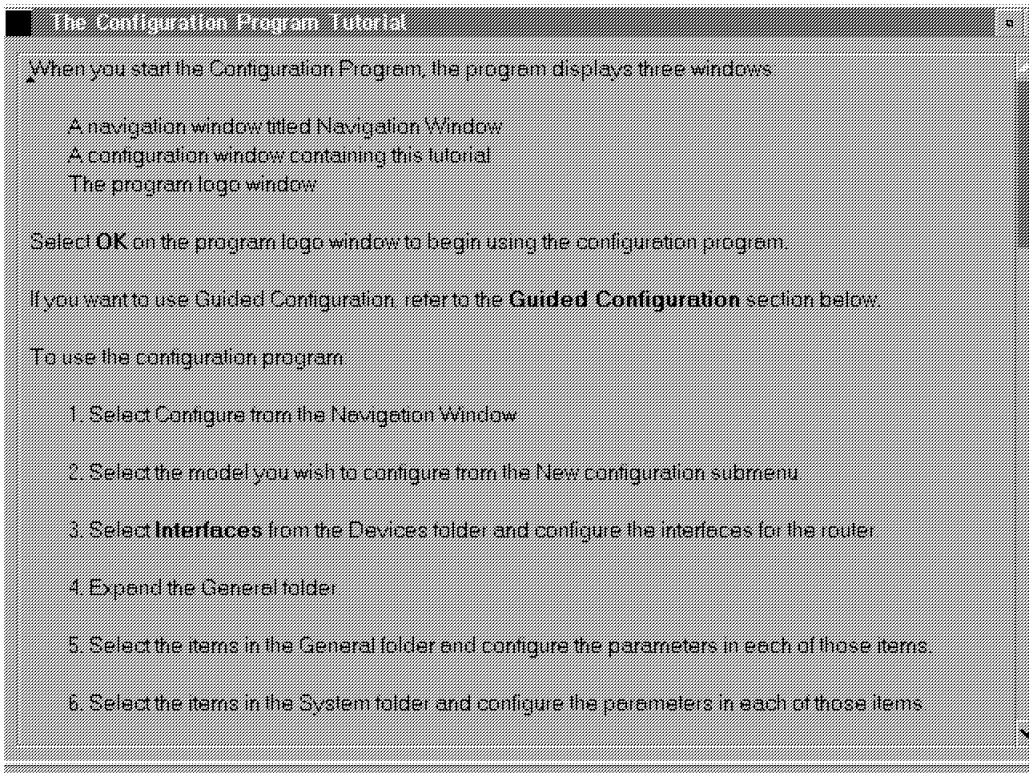

Figure 27. Multiaccess Enclosure Configuration Window

Navigating through the MAE Configurator

The MAE configurator is designed as a point-and-click interface. You select items from the Navigation list using a pointer and then fill in items in the various panels in the Configuration Window. Various keys also have specific meanings to the MAE configurator (seeTable 12 on page 68).

Using the Mouse

The mouse is the main tool you use to move through the various lists and panels in the MAE configurator.

The MAE configurator uses the following buttons:

- Left (button 1) - to select an item in a panel
- Right (button 2) - to perform the following actions:
  - In the Navigation Window
    - Display a pop-up menu for a selected item in the scrollable list.
    - Move through and select items in a menu.
    - Validate a selection item in error. The Navigation Window displays erroneous items with a yellow question mark next to the item. The validate function displays a message for each required field that does not have a valid values and for any configuration errors.
  - In the Configuration Window
    - Drag-and-drop items in lists. The program indicates that drag-and-drop is active by changing the cursor into a hand icon. Use this function to reorder filters, dump entries, and other configuration lists.

Using the Keyboard in the MAE Configurator

Various keys have specific functions in the configuration program. Table 12 explains these.

Table 12 (Page 1 of 2). The MAE Configurator Keyboard Functions

Keys	Function	How to Use
F1 (Help)	Request help (see note).	**To obtain help for configuring a feature or protocol:** The MAE configurator displays a configuration process for a feature or protocol in the Configuration Window. See "The Navigation Window" on page 64. **To obtain help on a panel:** 1. Select an item in the Navigation Window. 2. Press **F1**. **To obtain help on a parameter, a button, or a drop-down list:** 1. Select the parameter field or button by tabbing to the field, button, or list. 2. Press **F1**. **Note:** When you tab to the field or button, a yellow box will highlight the item and you can then request help. Clicking on a button causes the configuration program to perform the configuration task indicated by that button or drop-down list. In the help text, additional information is hypertext linked to the information on a particular panel. By default, this link is highlighted in blue. If you press F1 on different panels or parameters without closing a previously opened help window, the new help text overlays the currently displayed text. • To view the previous topics, select the **UP** button. • To view the next topic, select the **DOWN** button. • To close the help window, select the **CLOSE** button.
Note: After you press F1, the MAE configurator displays a frame that you use to position the window. Position the frame wherever you wish on your desktop and press the left mouse button to display the help text.		
Up/Down Arrow Keys	Move vertically.	Use these keys to move through lists on any panel, including the Navigation Window or items in any of the drop-down menus. To select an item, press **Enter**.
Left/Right Arrow Keys	Move horizontally.	Use these keys to move through the menu items on the Navigation Window, after you have selected one of the menu items. Also use them to move through a parameter field without affecting the existing values.
Tab and Back-tab	Next or previous entry field.	These keys work only in the Configuration Window. The keys move you to the various entry items in the Configuration Windows. If there are items in a scrollable list, such as in the Device Interfaces panel you will move to items that are below the scrolling window.

Table 12 (Page 2 of 2). The MAE Configurator Keyboard Functions

Keys	Function	How to Use
Character Keys	Speed-scroll	Use character keys in the Navigation Window to speed your scrolling through the list. As you type in characters, the selection marker will move to an item in the list. This feature can help you change specific protocols in the configuration without using the scroll bar to locate the protocol. The following limitations exist: • Speed-scroll works only in the Navigation Window. • The selection marker will stop at the first item in the list that matches your keystrokes. You will be unable to speed-scroll to a second item with the same name unless you compact the list at a point above the currently selected item. • Once you speed-scroll to an item, you must select that item before you can use the speed-scroll feature again.
Alt + C	Configure pull-down menu	Drops down the Configure menu to allow you to select items from that menu.
Alt + P	Options pull-down menu	Drops down the Options menu to allow you to select items from that menu.
Alt + H	Help pull-down menu	Drops down the Help menu to allow you to select items from that menu.
Esc	Escape	Clears pull-down menus.

Using the Configure Menu

The Configure pull-down menu enables you to access the configuration program's features. Table 13 describes the menu choices and their use. The underscored character and the text in parentheses indicates the keyboard shortcut for the choice.

Table 13 (Page 1 of 2). Configure Menu Choices

Choice	Use
New configuration	Reset the working configuration to the default configuration for a specific model. The program resets the Navigation Window with a list appropriate for the selected model.
Open configuration (Alt+O)	Update an existing configuration or use an existing configuration as basis for a new configuration.
Save configuration (Alt+S)	Save the current configuration into a configuration database. If the current configuration is named config and a config.cdb with a configuration named config does not exist, the program invokes the Save configuration as dialog box to allow you to specify a different name.
S**a**ve configuration as	Save the current configuration with a different configuration name.
Delete configuration	Remove configurations from a configuration database.
Create Multiaccess Enclosure configuration	Create a binary configuration file that you load into your Multiaccess Enclosure.

Table 13 (Page 2 of 2). Configure Menu Choices

Choice	Use
Read Multiaccess Enclosure configuration	Read a binary configuration file created by the Create Multiaccess Enclosure configuration option or obtained from the Multiaccess Enclosure using TFTP.
Co**m**munications	Use this choice to: • Send or retrieve a configuration to or from a single Multiaccess Enclosure, restart a single Multiaccess Enclosure, or query a single Multiaccess Enclosure's information. • Send or retrieve configurations to or from multiple Multiaccess Enclosures or restart multiple Multiaccess Enclosures. **Note:** Before using the communication features, you must establish communications between the MAE configurator and the Multiaccess Enclosure.
ASCII **f**ile	Use this option to create an ASCII version of a configuration. You can use this file as documentation of a Multiaccess Enclosure's configuration.
E**x**it (Alt+X)	Leave the MAE configurator.

MAE FC 3001 Firmware

The Multiaccess Enclosure has its own firmware and operational microcode. These can both be accessed from either the ASCII or MOS consoles, and reside on the Multiaccess Enclosure System Card. The firmware is kept in Flash Memory and the Operational microcode is on a hard disk drive (HDD). Refer to Figure 28.

The HDD has two image *banks* of microcode and configurations that can be used to IML or boot the enclosure. These *banks* are known as Bank A and Bank B.

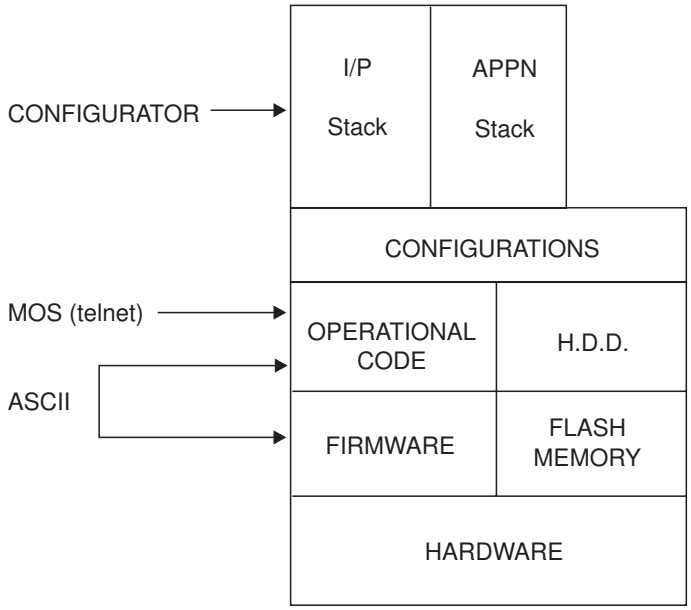

Figure 28. Logical View of Multiaccess Enclosure Operational Structure

MAE FC 3000 Firmware

The Multiaccess Enclosure has its own firmware and operational microcode. These can both be accessed from either the ASCII or MOS consoles, and reside on the Multiaccess Enclosure System Card. The firmware is kept in Flash Memory and the Operational microcode is on a hard disk drive (HDD). Refer to Figure 28.

The HDD has two image *banks* of microcode and configurations that can be used to IML or boot the enclosure. These *banks* are known as Bank A and Bank B. The Multiaccess Enclosure is designed to boot from one of the integrated image banks, allowing for microcode upgrades to be loaded concurrently and activated at a later time by switching to the other bank. Figure 29 on page 72 shows these banks displayed through the ASCII, *QVT* console.

The structure of the image banks is as follows:

- IMAGE - Status of image
- CONFIG 1 - Status of Config
- CONFIG 2 - Status of Config
- CONFIG 3 - Status of Config
- CONFIG 4 - Status of Config.

The possible file status descriptors are:

ACTIVE The file is currently loaded and is running on the Multiaccess Enclosure.

AVAIL The file is a valid file that can be made ACTIVE.

CORRUPT The file was damaged or not loaded into the Multiaccess Enclosure completely. The file must be replaced.

LOCAL The file will be used only on the next reload or reset. After the file is used, it will be placed in AVAIL state.

PENDING The file will be loaded on the next reload, reset, or power-up of the Multiaccess Enclosure.

When a file is saved to the Multiaccess Enclosure HDD from the configurator, it will become *PENDING* unless the restart router option is selected, as shown in Figure 48 on page 86.

```
MAE MOS Console
Select the source bank:  (A, B): [A]
Select the source configuration:  (1, 2, 3, 4): [1] 1
Enter the description of the file: () MAE MPG slot1 ip
Attempting to set description for bank A and configuration 1.

Operation completed successfully.
Boot config>list
+------ BankA ----------+--------- Description ----------+------ Date -------+
| IMAGE - ACTIVE        |                                 | 11 Apr 1997 12:52 |
| CONFIG 1 - PENDING    | MAE MPG slot1 ip                | 09 May 1997 13:25 |
| CONFIG 2 - AVAIL      |                                 | 07 May 1997 08:18 |
| CONFIG 3 - AVAIL      |                                 | 07 May 1997 11:12 |
| CONFIG 4 - ACTIVE  *  |                                 | 09 May 1997 07:06 |
+------ BankB ----------+--------- Description ----------+------ Date -------+
| IMAGE - AVAIL         |                                 | 11 Apr 1997 12:52 |
| CONFIG 1 - NONE       |                                 |                   |
| CONFIG 2 - NONE       |                                 |                   |
| CONFIG 3 - NONE       |                                 |                   |
| CONFIG 4 - NONE       |                                 |                   |
+-----------------------+---------------------------------+-------------------+
  * - Last Used Config      L - Config File is Locked


Boot config>
```

Figure 29. MOS Console

The four configurations are saved consecutively. As shown in Figure 29 CONFIG 4 is ACTIVE. A new configuration has been created and saved to the next AVAIL position, CONFIG 1.

The restart router option, (see Figure 48 on page 86) was not selected so CONFIG 1 has become pending and will become ACTIVE on the next Multiaccess Enclosure reboot or power on.

Examples of MAE Connection Configuration

The following procedure uses the CCM and its MAE Configurator to give examples of how to configure the MAE.

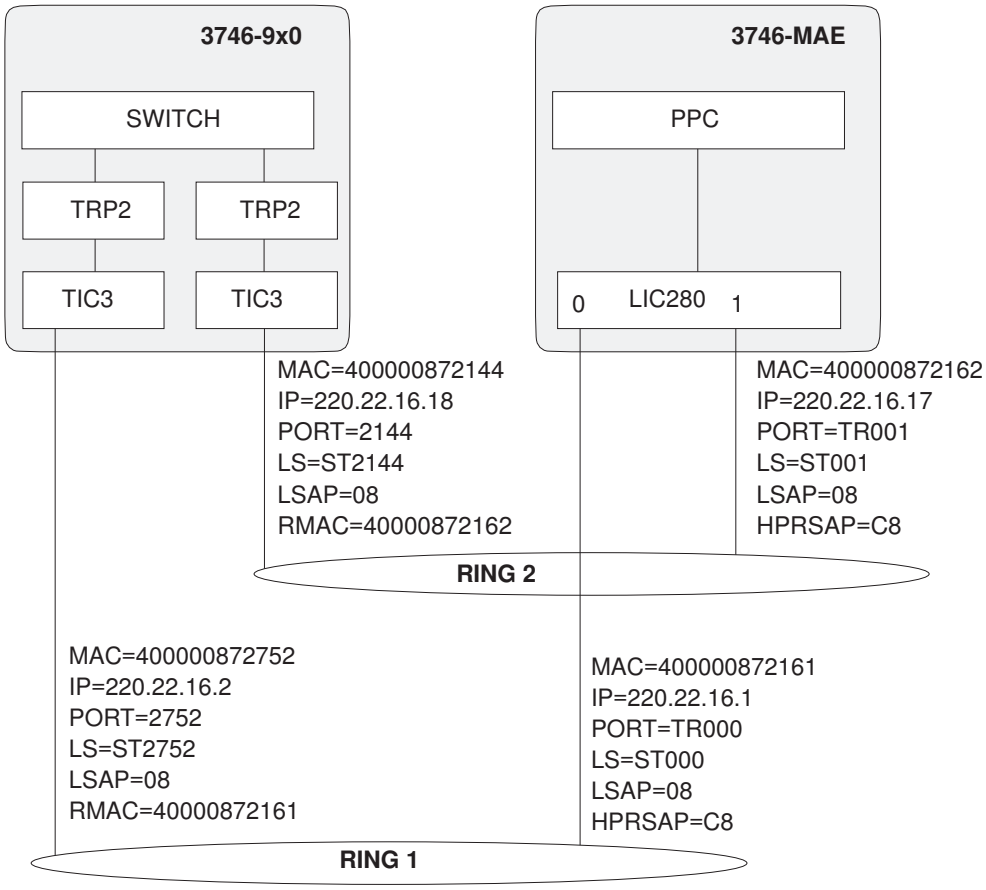

Figure 30. 3746 to Multiaccess Enclosure Data Connections

Notes:

1. In the APPN definitions shown, HPR has not been activated. If you wish to route HPR traffic over these connections, then you must update these definitions accordingly.
2. If you will not be using IP in your network, it is still required to define at least one of the SLOT 1 ports on the Multiaccess Enclosure for IP, to enable the service ring port to operate.

The procedure starting on page 74 takes you through the configuration of the resources shown in Figure 30.

Step 1. Slot Configuration

Refer to Figure 31.

- Select **Slots** on the Navigation list. Refer to Figure 26 on page 64.
- In the Slot Browser window click the down arrow for Slot 1.
- Select **2 Port TR**.

  Note: At this time you may set each *Slot* for the appropriate adapters for your configuration.

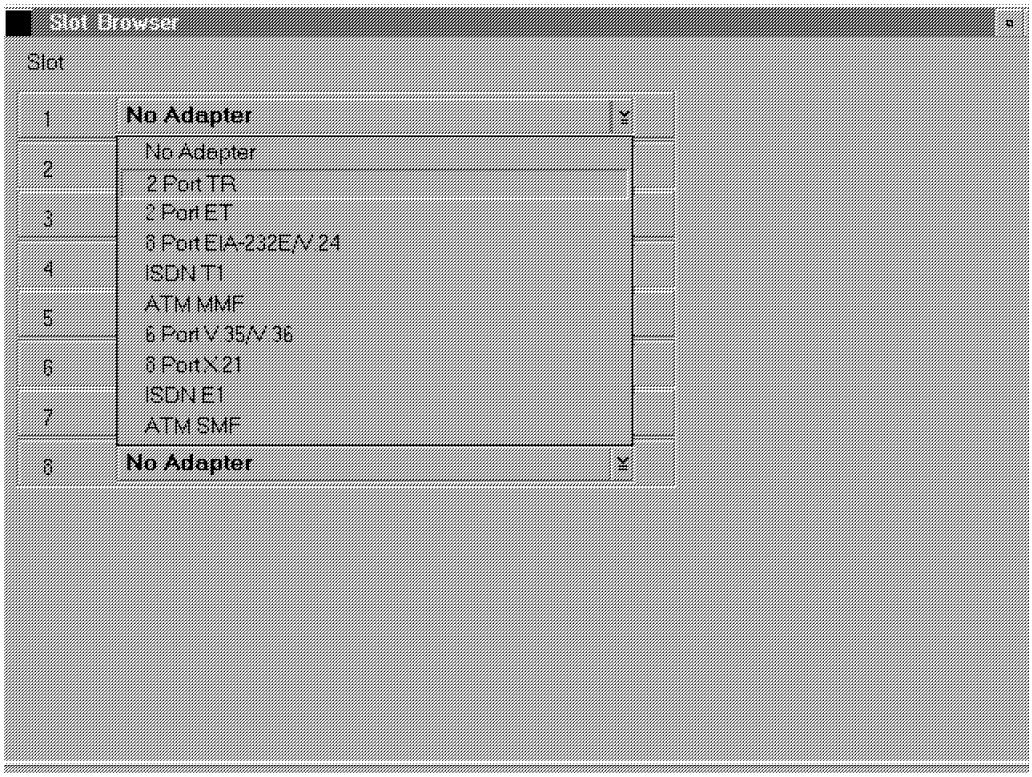

Figure 31. Defining the Slot 1 Token-Ring Ports in the Slot Browser window

Step 2. Token Ring Configuration

Refer to Figure 32 on page 75.

- Select **Interfaces** from the Navigation list. Refer to Figure 26 on page 64.
- Select **Configure** from the device interfaces window for Interface 0 (Slot 1 / Port 1).
- Set the token-ring MAC address, keeping to your network standard. In this example it is set to 400000872161. Set the Cable type to STP and verify that Speed is set for 16 Mbps.

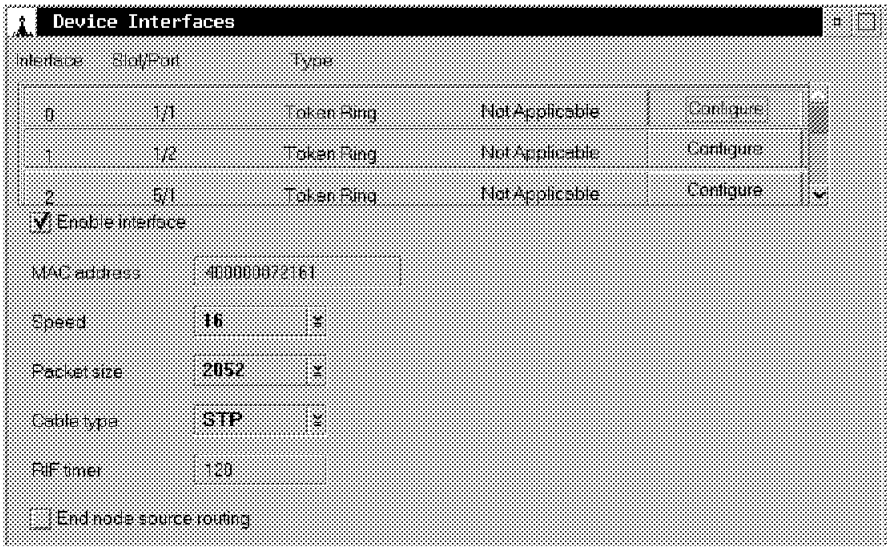

Figure 32. Setting MAC Address, Speed and Cable Type for Port 0

- Select **Configure** from the Device Interfaces window (see Figure 33) for Interface 1 (Slot 1 / Port 2).
- Set the MAC to **400000872162**.

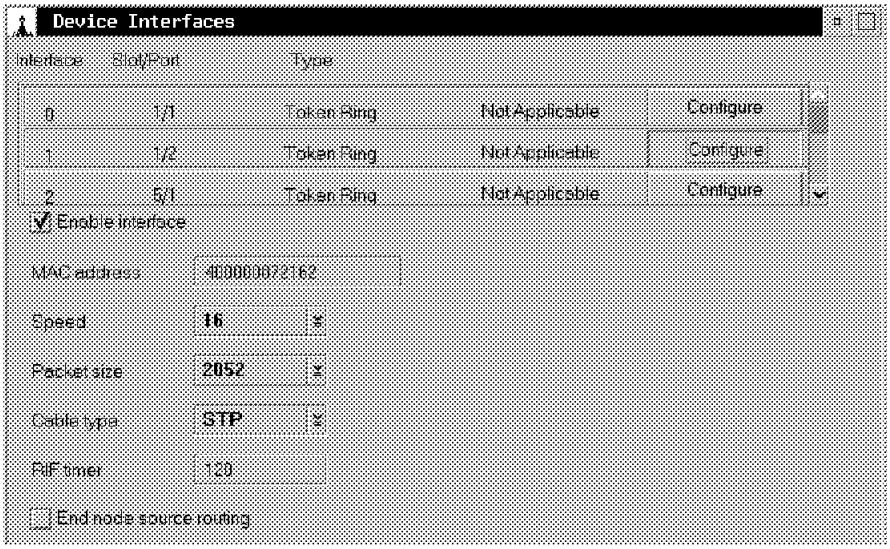

Figure 33. Setting MAC Address, Speed and Cable Type for Interface 1

Step 3. IP Configuration

- Locate (by scrolling down) and click on **Interfaces** under the Protocols/IP folders in the Navigation Window, shown below in Figure 34.

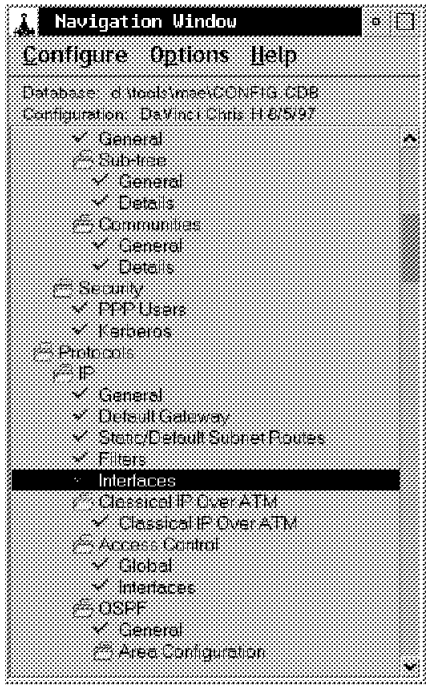

Figure 34. Selecting IP Interfaces in the Navigation Window

- In the IP Interface window, select **IP Addresses** as shown below:

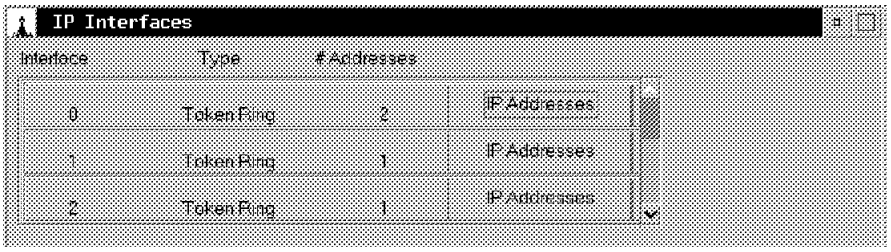

Figure 35. IP Interfaces Window

- The IP address: 220.22.16.1 and subnet mask: 255.255.255.240 for this example, has been set on interface 0, as shown in Figure 36.

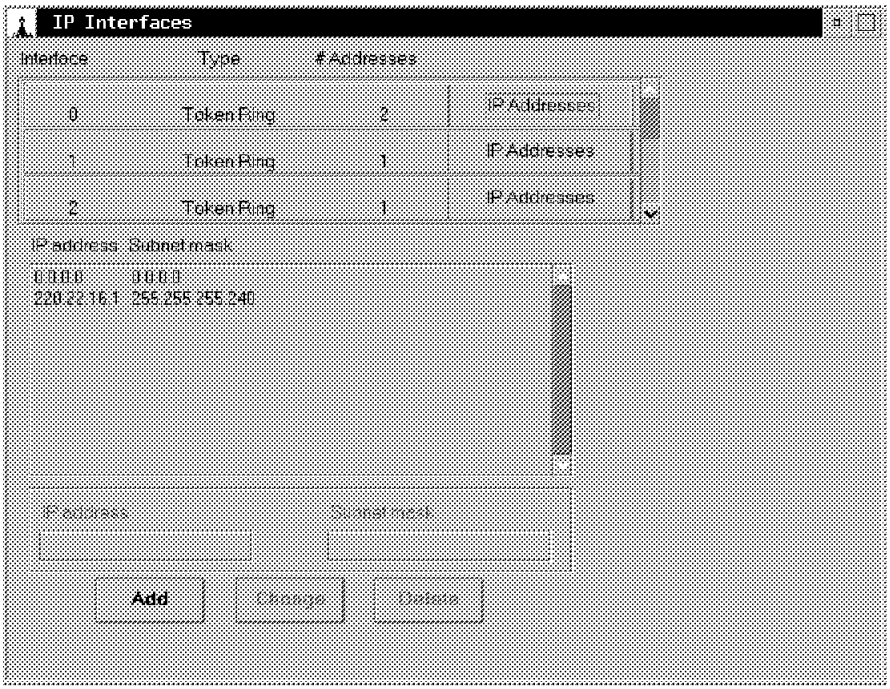

Figure 36. Configure IP Address for Interface 0

- Figure 37 shows the IP address: 220.22.16.17 and subnet mask: 255.255.255.240, on interface 1, for this example, being entered.

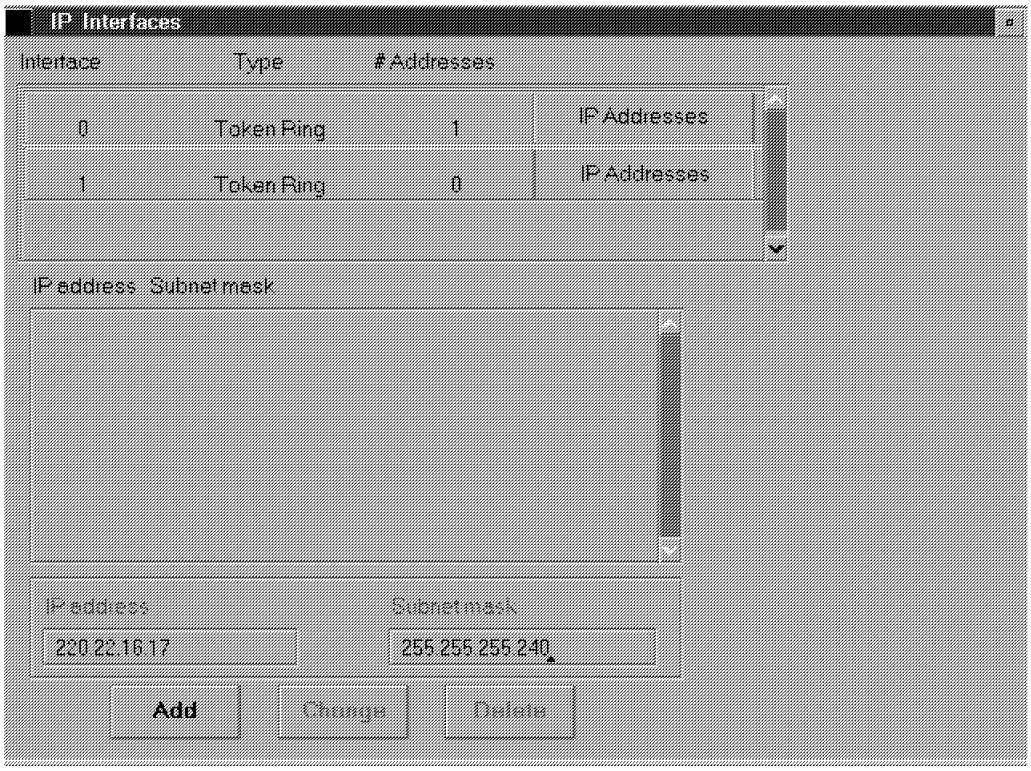

Figure 37. Configure IP Address for Interface 1

Note: Both interfaces *must* be defined to be on a different subnet, to ensure that both paths will be utilized. It also makes validation of each path, and performance monitoring possible.

Step 4. APPN Configuration

- In the navigation Window, scroll down until the APPN folder is displayed and select **Interfaces** under this folder as shown below in Figure 38.

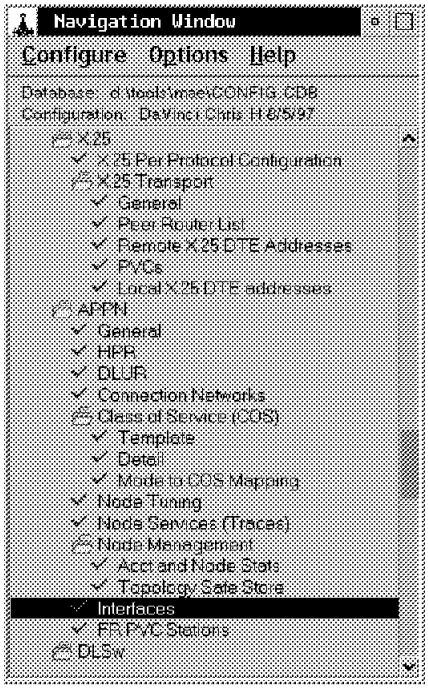

Figure 38. Selecting APPN Interfaces

Now in the Configuration Window a list of interfaces that were the previously defined is displayed and can be configured for APPN.

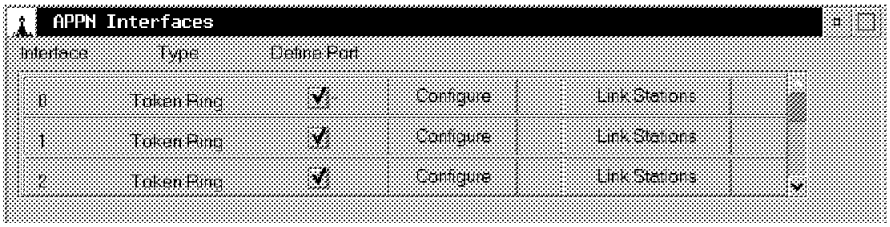

Figure 39. APPN Interfaces

- Select **Configure** for Interface 0 The port name TR000 has been entered for this interface, shown in Figure 40.

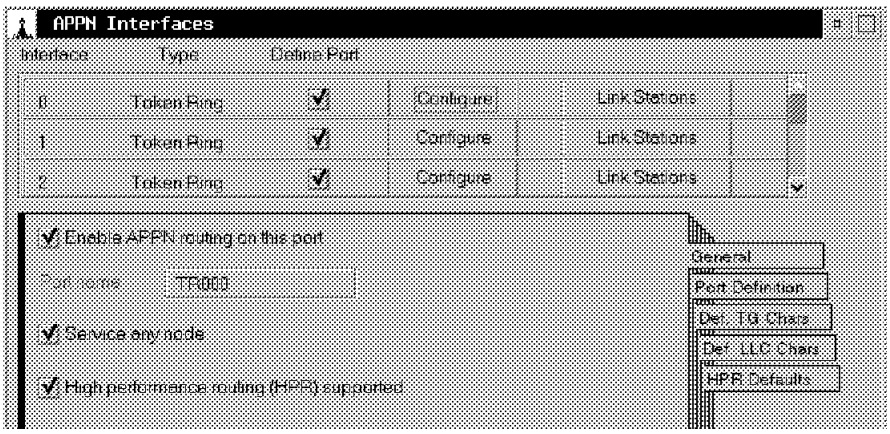

Figure 40. Configure APPN for Interface 0

- Select the **Port Definition** tab on the notebook, where the local APPN SAP 8 and local HPR SAP C8 can be specified, as in Figure 41 below.
- Select the **Def. LLC Chars** tab on the notebook, and set the Remote SAP 8.

  Note: In the Multiaccess Enclosure the Local SAP has a default value of 04, while the CCM uses a default value of 08 (NCP uses 04). While you may use any valid local SAP value, care should be taken to define the correct remote SAP for a link.

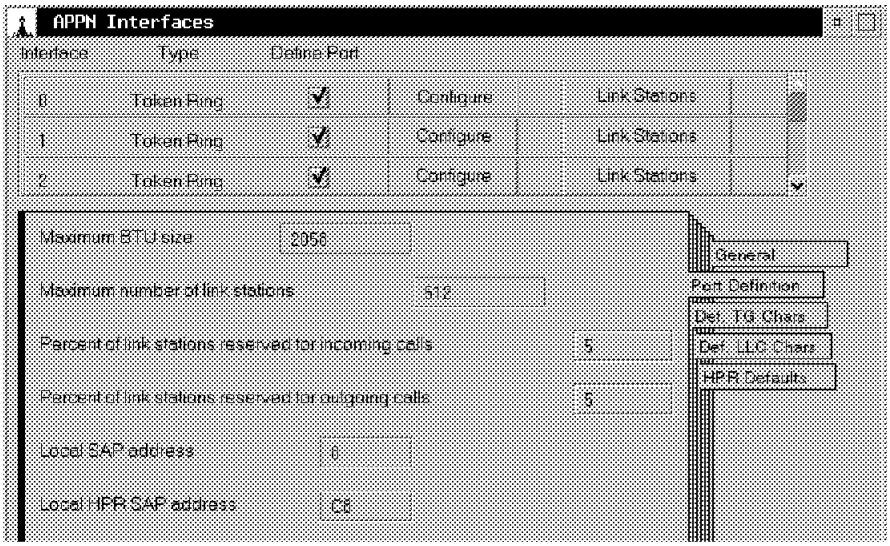

Figure 41. APPN Port Definitions for Interface 0

- Select the **Link Stations** button, for Interface 0 here the link station name **ST000** has been specified, shown in Figure 42 below.

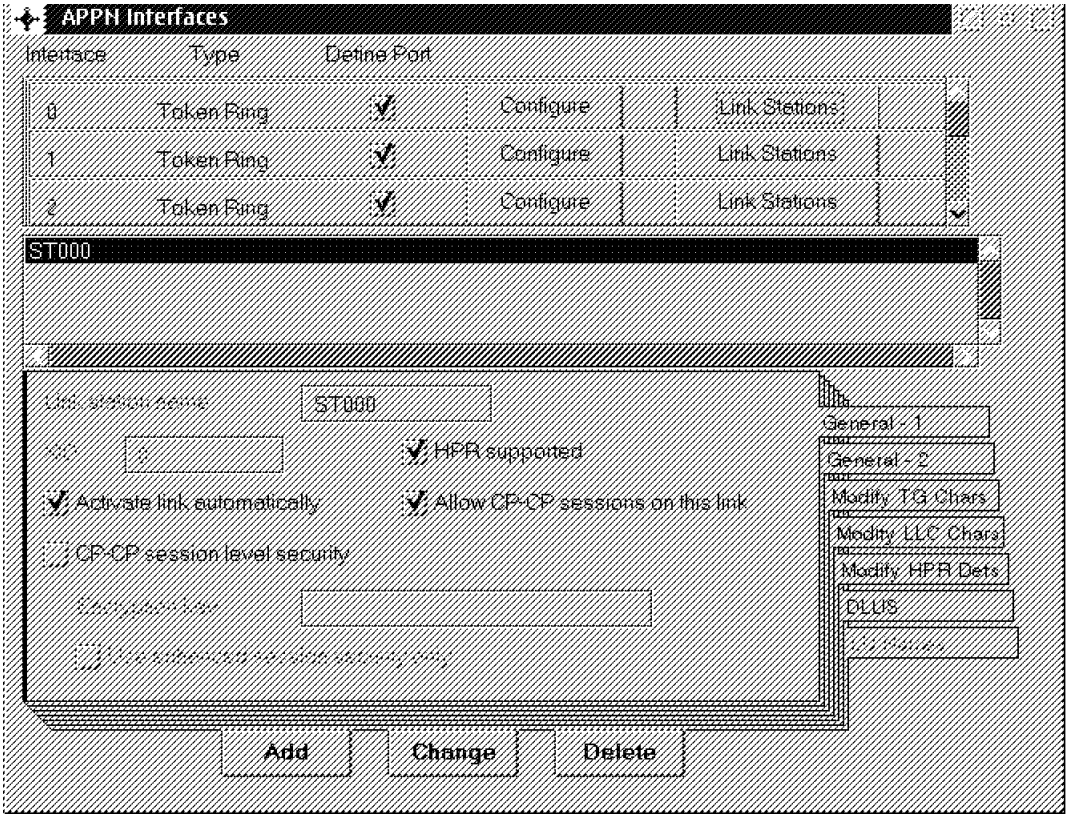

Figure 42. APPN Link Station Name for Interface 0

Note: The APPN Interfaces window, shown above in Figure 42, is divided into three areas.

- Interface selection area
- Defined stations list area
- Station definition notebook area

Selecting a station in the Defined stations area will display that stations definitions in the notebook area. If no station is selected (highlighted), the notebook values will be default.

- Select the **General - 2** tab brings up the notebook page where the destination MAC of this link *must* be specified: 400000872144 in this case.

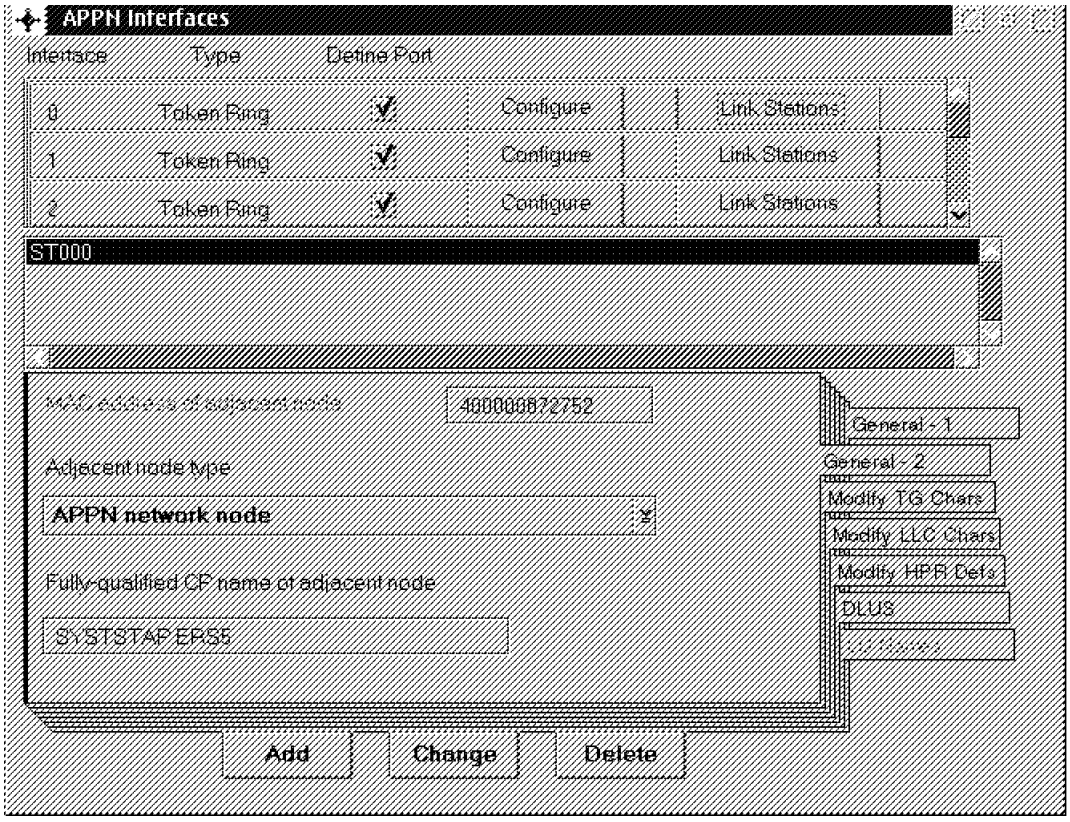

Figure 43. APPN Destination MAC for Interface 0

- Select **Configure** for interface 1.
- The Port name TR001 has been entered for this interface in Figure 44.

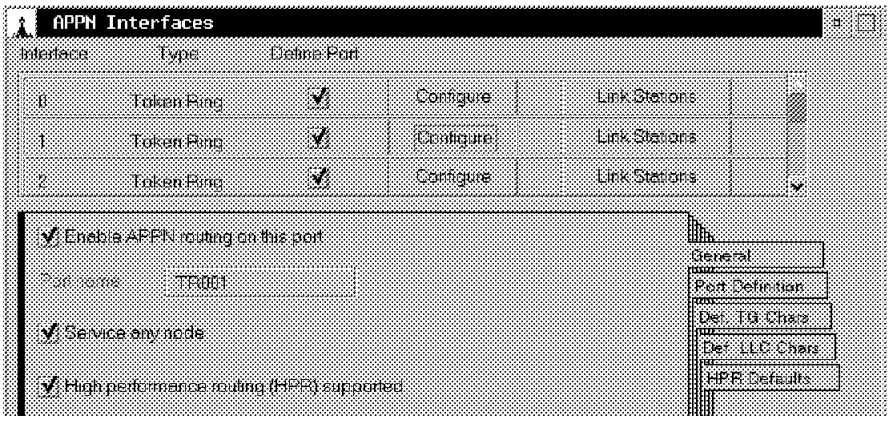

Figure 44. Configure APPN Name on Interface 1

- Select the Port Definition tab on the notebook, where the local APPN SAP 8 and local HPR SAP C8 can be specified.

- Select the **Def. LLC Chars** tab on the notebook, and set the Remote SAP 8.
- In Figure 45, select the **Link Stations** button. Here the link station name ST001 has been specified.

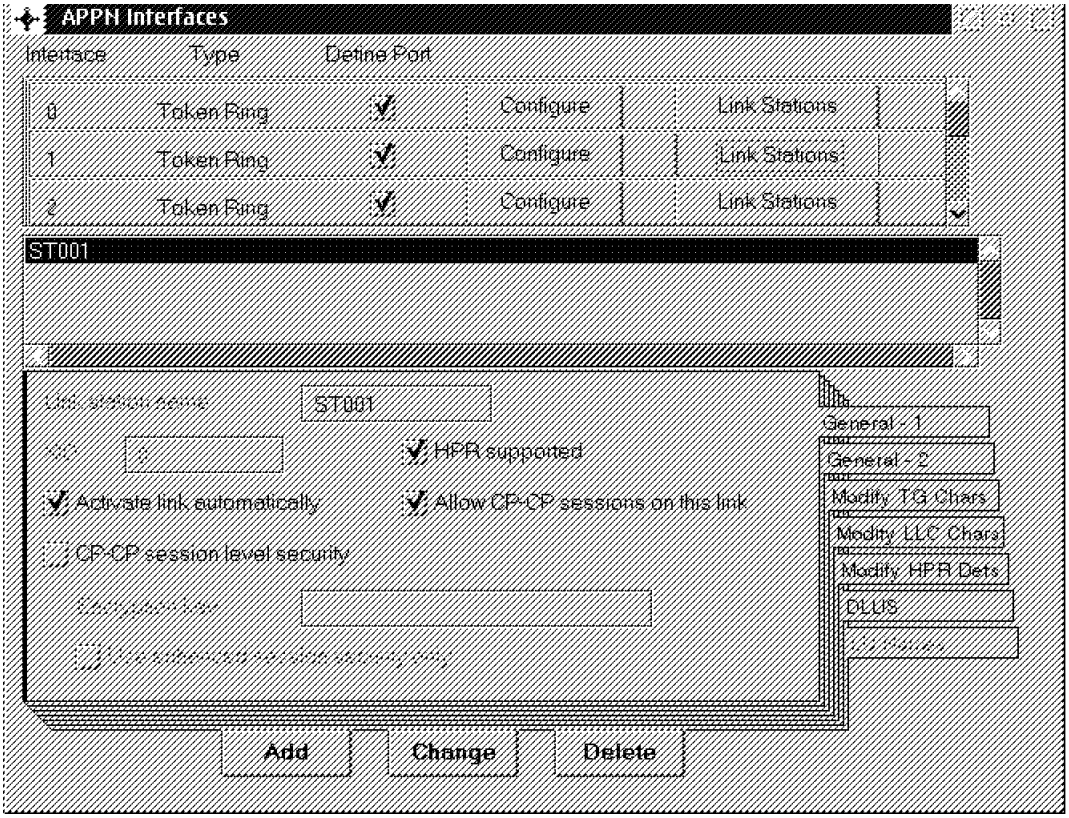

Figure 45. APPN Link Station Name for Interface 1

- Select the **General - 2** tab brings up the notebook page where the destination MAC of this link *must* be specified: 400000872752 in this case.

Step 5. SNMP Access

- In the Navigation Window, scroll up until the SNMP folder is displayed. Select **General** under the Communities subfolder.
- Ensure that there is an entry for the public Name with Access type set to Read-write trap.

This allows the configurator program to write the configuration file to the Multiaccess Enclosure hard disk.

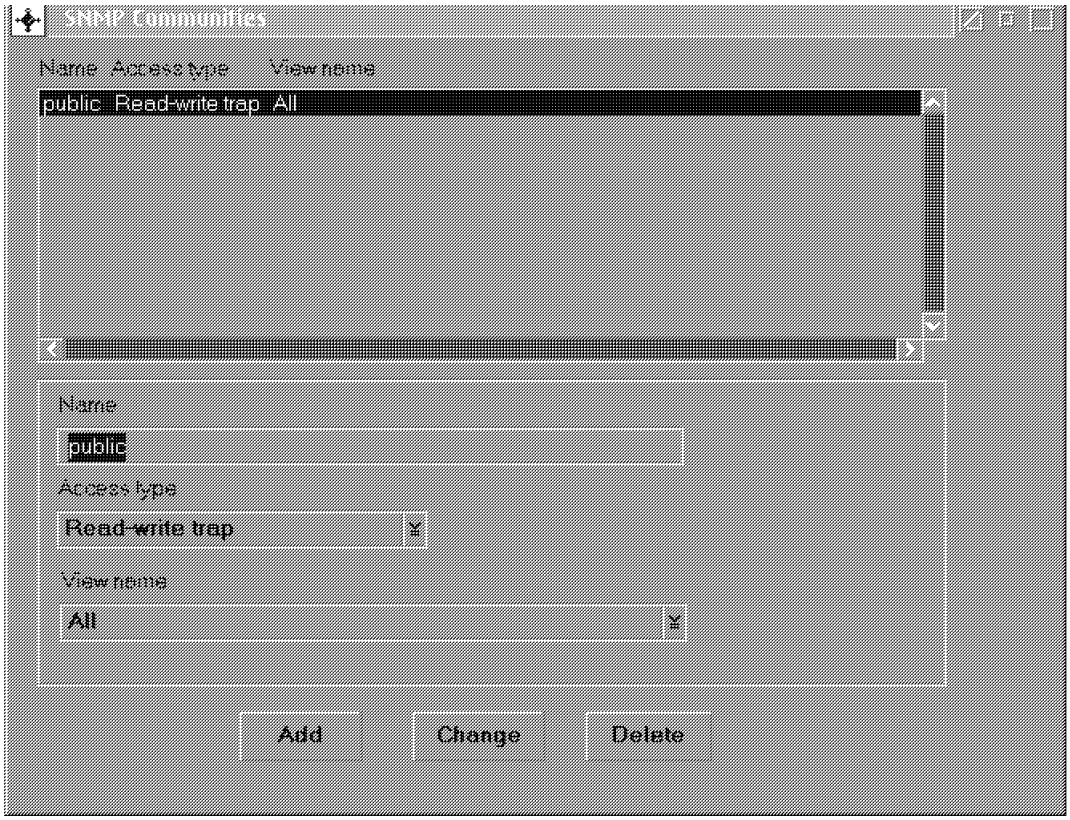

Figure 46. SNMP Communities Set for Read-write Trap

Step 6. Saving your new configuration

- In the Navigation Window, click on **Configure** and select **Save As** from the pull-down menu.

  The window shown in Figure 47 will open.

- Type a description for your configuration in the Configuration name field. You can save to a different database if appropriate also, for example Production environment and Test environment databases.
- Click **OK**.

This has now saved the new configuration to the optical disk and is not yet written to the Multiaccess Enclosure.

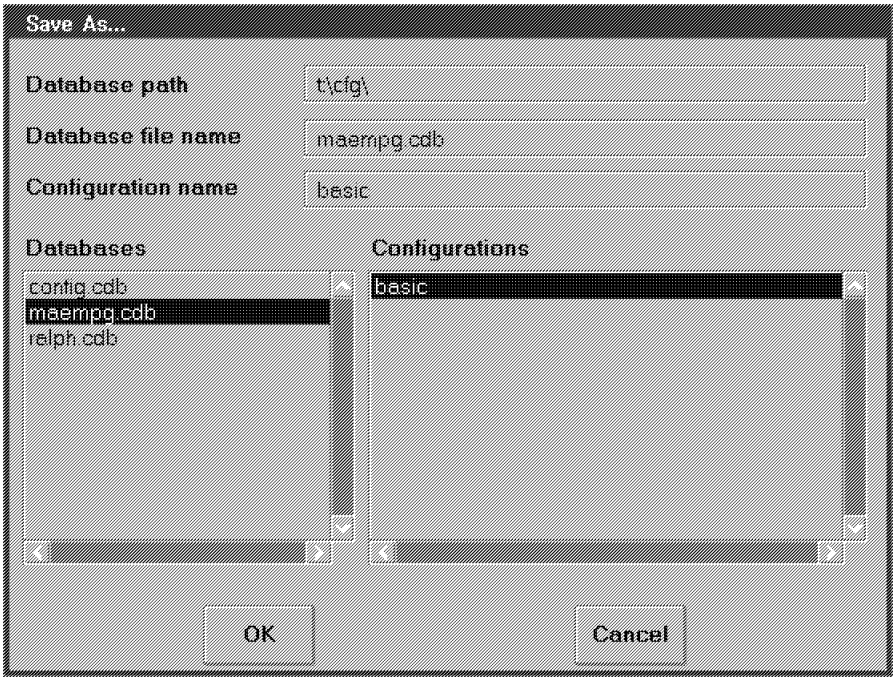

Figure 47. Saving Your Configuration

Step 7. Sending the configuration to the Multiaccess Enclosure

- In the Navigation Window, click on **Configure** and select **Communications** from the pull-down menu.
- Select **Single router...**

  The window shown in Figure 48 will appear.
- Enter the Multiaccess Enclosure IP address in the IP Address or name field, and ensure that Community is set to public.
- Check (√) the **Send configuration to router** box.
- Check (√) the **Restart router** box, if you want to make this configuration ACTIVE.

Figure 48. Sending a Built Configuration to the Multiaccess Enclosure

Step 8. Configuring the 3746 base frame TIC3s using CCM

While reading the following configuration steps, refer to Figure 30 on page 73.

TIC3 Port 2752 Configuration

- Select the **2752 TIC3** from the CCM Main window shown in Figure 49 below.

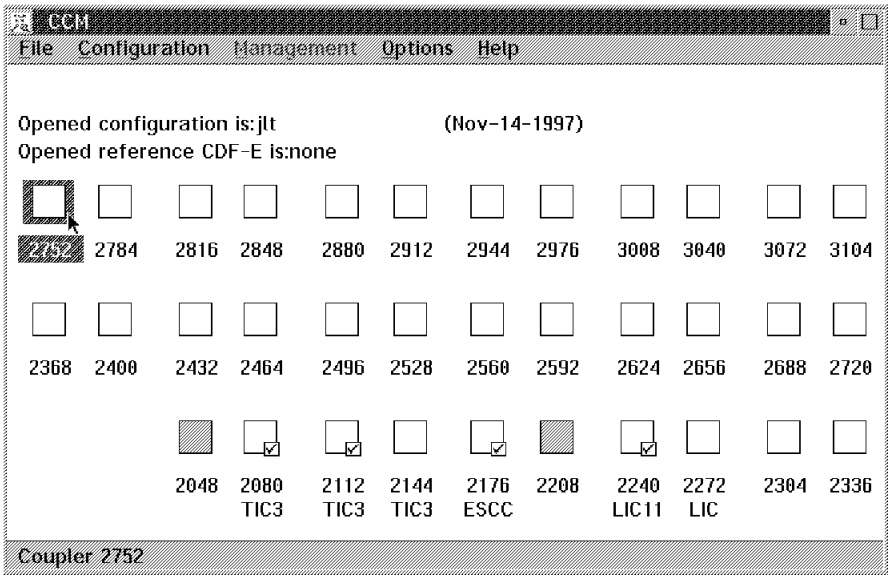

Figure 49. Selecting Port 2752 from the CCM Main Window

- Check (√) **APPN** and **IP** network boxes, and specify the APPN and IP port names
- Select **Speed 16 Mbps**, and enter the local MAC address 400000872752, as shown in Figure 50.

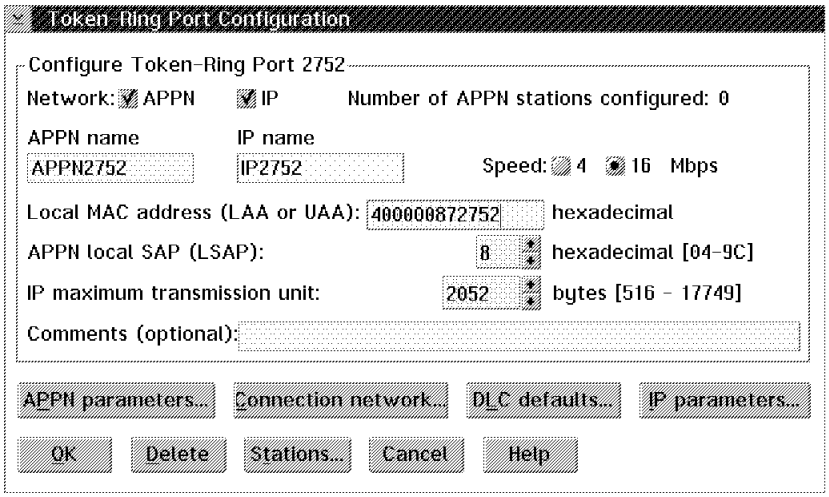

Figure 50. Token-Ring Port Configuration for Multiaccess Enclosure Port 0 Connection

- Click **APPN parameters...**.

- Select **Yes** for any incoming call and Automatic reactivation (see Figure 51). Selecting **Accept any incoming call** will allow the 3746 to define a dynamic link station for an incoming call from the Multiaccess Enclosure if any of the definitions do not match exactly at both sides. As no other stations should be connected to these token-rings, setting this parameter as shown will not cause problems.

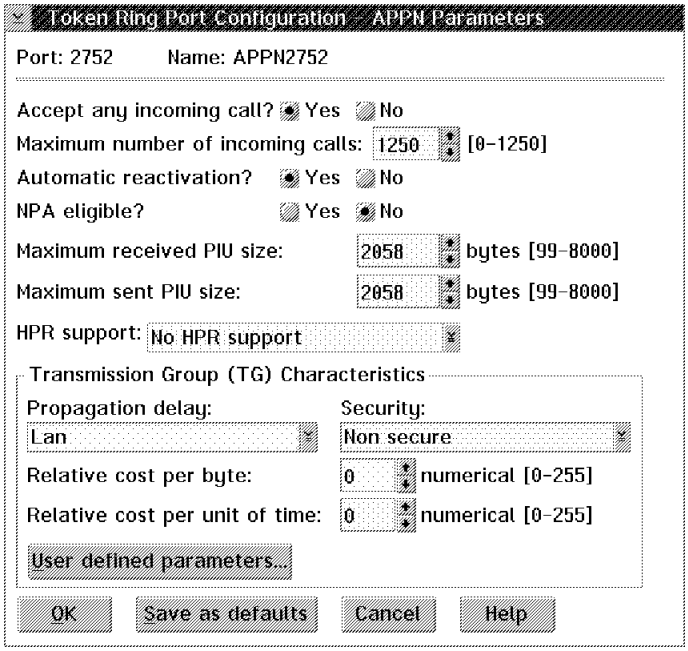

Figure 51. APPN Parameters

- Click **OK** to return one level, then click **IP parameters...**.
- Enter the address 220.22.16.2, and the Subnet mask 255.255.255.240 for this token ring connection to Port 0 on the Multiaccess Enclosure, as shown in Figure 52.

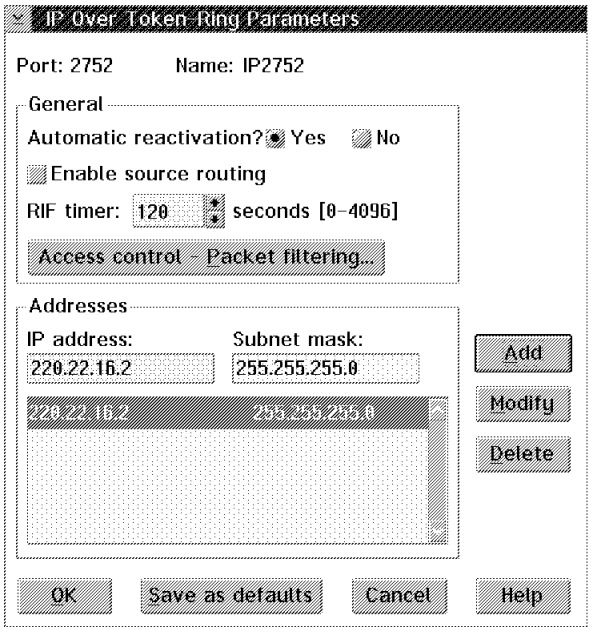

Figure 52. IP over Token-Ring Parameters

- Click **OK** to return one level, then click **Stations**.

- Figure 53 shows where to enter the Remote Station Name ST2752, Remote MAC address 40000872161 and Remote SAP 08.

  Note: The default APPN HPR SAP value of C8 is used for the HPR SAP. This value cannot be specified from the CCM screens. If an adjacent station wants to use a different SAP for HPR, this can be negotiated during XID exchange. In the Multiaccess Enclosure the remote SAP value of C8 was defined for HPR. See Figure 41 on page 80.

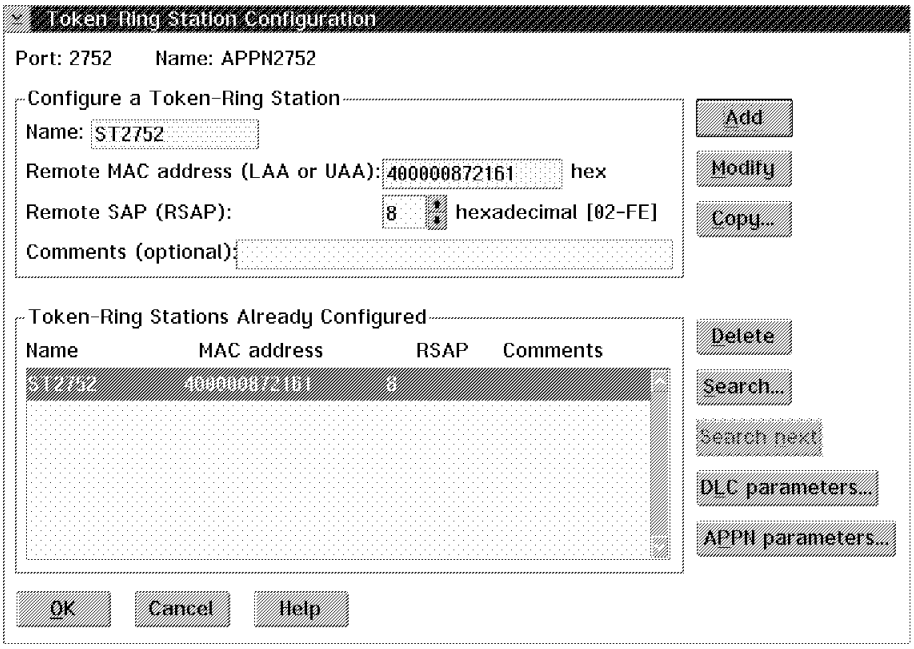

Figure 53. Token-Ring Station Configuration

- Click **APPN parameters...**, here select **Yes** to set CP-CP session support.

  HPR, MLTG, and DLUR parameters can also be specified here. See Figure 54.

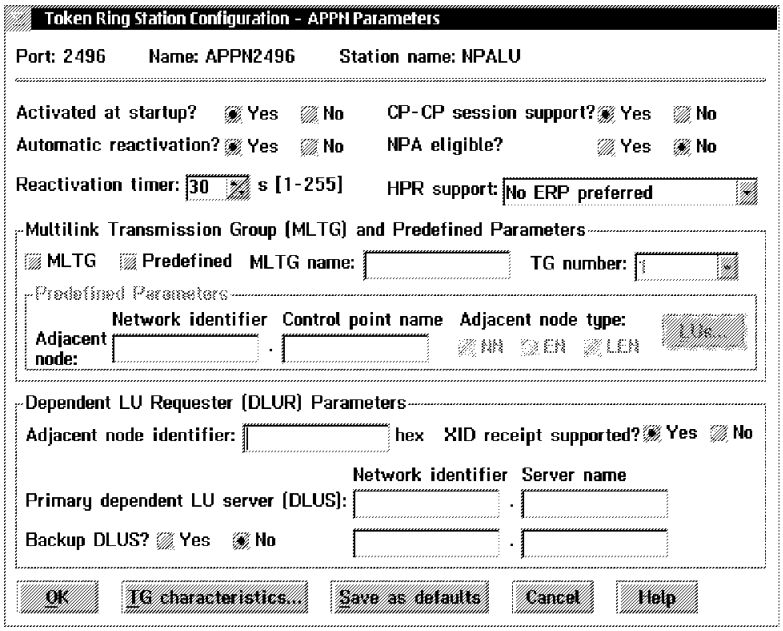

Figure 54. APPN Station Parameters

Step 9. TIC3 Port 2144 Configuration

- Select **2144 TIC3** from the CCM Main window shown below.

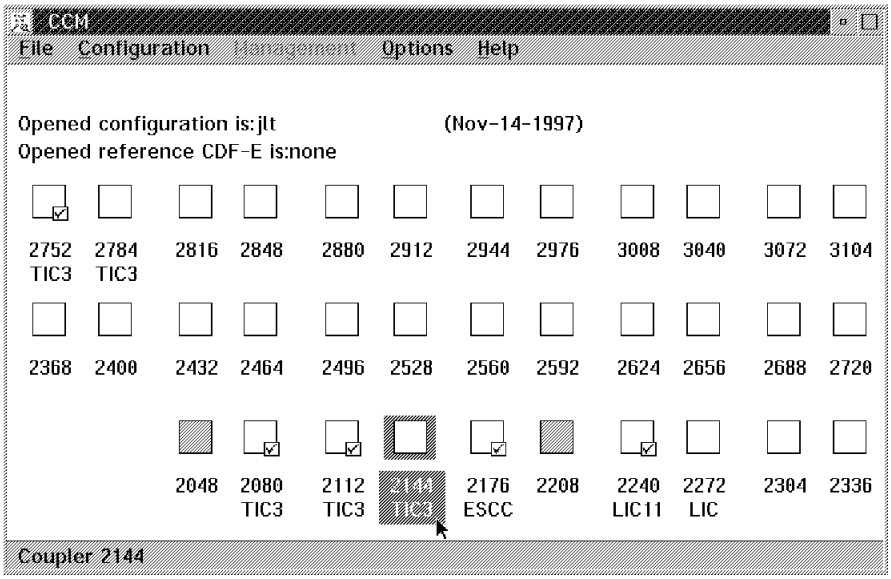

Figure 55. Selecting Port 2144 on the CCM Main Window

- Check (√) **APPN** and **IP** Network boxes, and specify the APPN and IP port names,
- Select **Speed 16 Mbps**, and enter the local MAC address 400000872144. as shown in Figure 56 and the local MAC address.

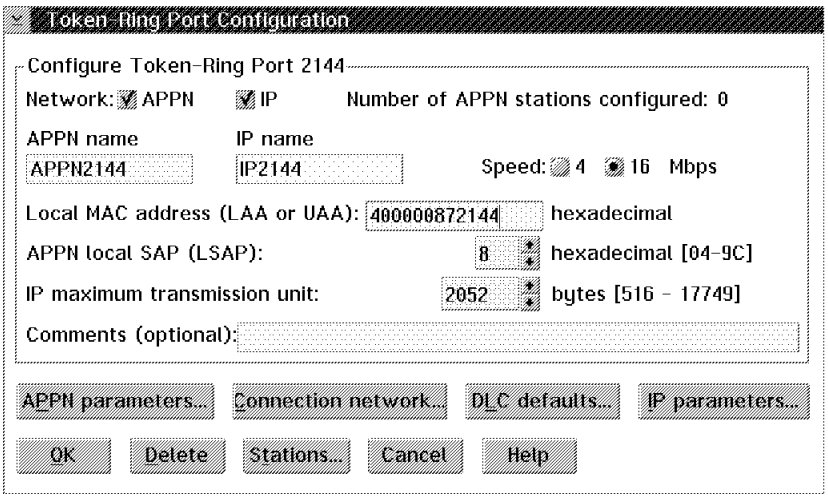

Figure 56. Token-Ring Port Configuration for Multiaccess Enclosure port 1 Connection

- Click **APPN parameters...**, and select **Yes** for any incoming call, and Automatic reactivation.

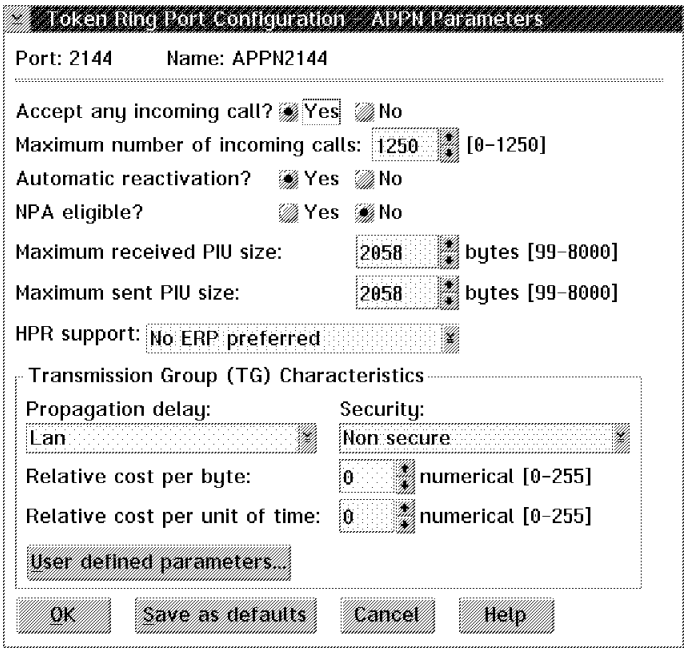

Figure 57. APPN Parameters

- Click **OK** to return one level, then click **IP parameters...**.
- Enter the IP address 220.22.16.18, and the Subnet mask 255.255.255.240 for this token-ring connection to Port 0 on the Multiaccess Enclosure, as shown in Figure 58.

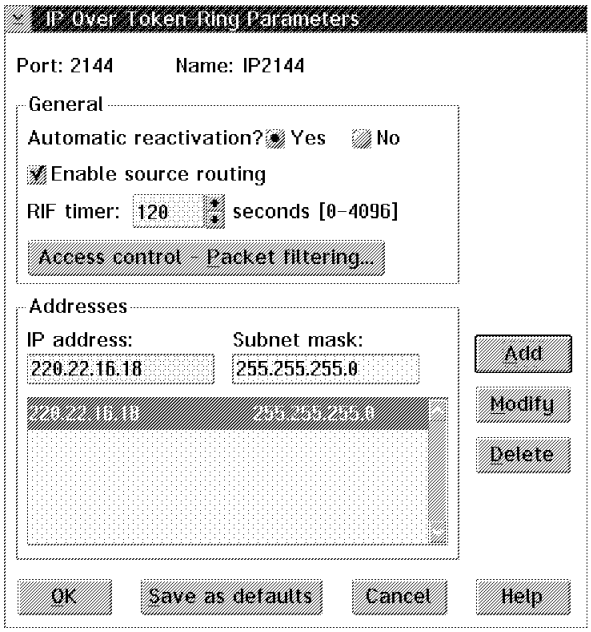

Figure 58. IP over Token-Ring Parameters

- Click **OK** to return one level, then click **Stations**.

- Figure 59 shows where to enter the Remote Station Name ST2144, Remote MAC address 400008721622 and Remote SAP 08.

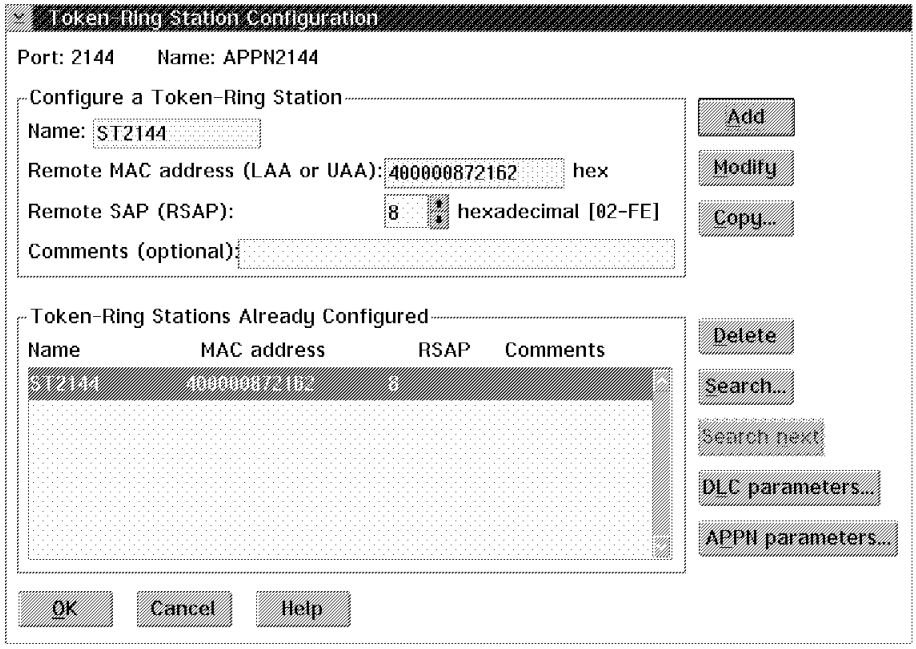

Figure 59. Token-Ring Station Configuration

- Click **APPN parameters...all**, and select **Yes** for CP-CP session support.

  HPR, MLTG, and DLUR parameters can also be specified here.

Recommendations

- Even though the configuration on the Multiaccess Enclosure may be changed via the ASCII or MOS user interfaces, it is recommended that you use the MAE configurator to construct and load your network configurations for the Multiaccess Enclosure. Using the configurator means that your configurations are saved on the MAE optical disk or service processor hard disk. Therefore, in the case of an Multiaccess Enclosure failure, you still have a copy of your configurations

  Note: For the MAE FC 3000, performing a **Backup code** function from the Multiaccess Enclosure Management Menu (refer to Figure 25 on page 59), does *not* save the configurations that are on the Multiaccess Enclosure hard disk. This function only saves the microcode.

  The **Backup code** function does not exist in the MAE FC 3001.

- Each 3746-9x0 to Multiaccess Enclosure ring should be defined on separate subnets to allow each paths operation to be validated easily, and to monitor their performance.
- ESCON processor utilization should be monitored as the traffic to/from the host can easily increase above 80%, so further ESCON paths may be required to handle the load.

Chapter 8. Configuring the MAE ESCON Channel Adapter

This chapter describes how to configure the ESCON Channel Adapter and attached networks.

A general description of the Multiaccess Enclosure configuration process can be found in Chapter 7, “Multiaccess Enclosure Configuration” on page 57.

Configuration help...

Helpful documents for MAE ESCON configuration are:

- *2216 Nways Multiaccess Connector ESCON Channel Adapter Planning and Setup Guide*, GA27-4193
- *IBM 2216/Network Utility Channel-Attach Examples*, G224-4599.

They are located at

`http://www.networking.ibm.com/support/docs.nsf/2216docs?OpenView`

MAE ESCON Channel Adapter Overview

It is a PCI ESCON adapter (FC 3287) base technology. You can have a maximum of four ESCON adapters installed in the MAE.

The ESCON channel adapter provides the 3746 Multiaccess Enclosure with access to SNA and TCP/IP host applications from LANs, WANs, and ATM over a duplex-to-duplex multimode fiber optic cable.

Figure 60 on page 98 shows a Multiaccess Enclosure connected to a VTAM host through an ESCON channel adapter. Each ESCON channel adapter provides up to 32 subchannels and up to 16 associated virtual network handlers that can support LAN channel station (LCS), Link Services Architecture (LSA), and Multi-Path Channel (MPC+) protocols. Each Multiaccess Enclosure can contain up to four ESCON channel adapters and each ESCON channel adapter can provide connections to up to 16 hosts when used with an ESCON Director or access to up to 15 logical host images in EMIF-capable processors operating in logically partitioned mode.

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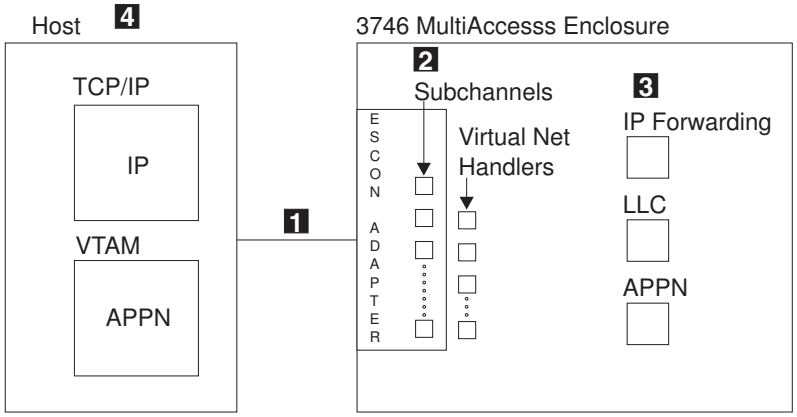

Figure 60. Multiaccess Enclosure Connected to a Host through an ESCON Channel Adapter - Logical View

1 At the physical level, the ESCON channel adapter provides a flexible fiber optic connection to communication channels at the host processor.

2 At the logical level, the ESCON Channel Adapter provides up to 32 subchannels and up to 16 associated virtual network handlers.

Each virtual network handler supports one of the following protocols:

LCS LAN Channel Station
LSA Link Services Architecture
MPC+ Multi-Path Channel+

For each LCS virtual network handler, you must define two subchannels, one for read and one for write; you can define up to 16 LCS virtual network handlers for each ESCON channel adapter.

For each LSA virtual network handler, you must define at least one subchannel up to a maximum of 32 subchannels. You can define up to 16 LSA virtual network handlers for each ESCON channel adapter.

For MPC+, you can define up to 32 subchannels. You must have at least one read subchannel and at least one write subchannel. You can define up to 16 MPC+ virtual network handlers for each ESCON Channel Adapter.

Each Multiaccess Enclosure can contain up to four ESCON channel adapters and each ESCON Channel Adapter can provide connections to up to 16 hosts when used with an ESCON director or access up to 15 logical host images in EMIF-capable processors operating in logically partitioned mode.

Notes:

1. You can configure LCS and LSA on the same ESCON channel adapter.
2. For migration purposes, MPC+ may be configured on the same ESCON channel adapter as LCS/LSA. This is not recommended as a long term solution. MPC+ combined with another type of virtual interface (LCS/LSA) on the same adapter could impact the performance benefits provided by the MPC+ interface.

3 The Multiaccess Enclosure ESCON channel adapter provides services for IP forwarding, Logical Link Control (LLC), and Advanced Peer-to-Peer Networking (APPN).

4 The virtual net handlers provide connections for transmitting and receiving packets of information for host applications as, shown in Figure 61 on page 99 and Figure 62 on page 99.

Once the ESCON channel adapter is installed and configured for LCS, LSA, and MPC+, (with VTAM V4R4 as minimum level), it can provide the functions listed in "ESCON Channel Adapter Functions" on page 13.

- Hierarchical SNA, including DLSw traffic, and APPN ISR traffic runs over LSA connections. (DLSw and APPN require LLC loopback.)
- TCP/IP traffic runs over LCS.
- APPN HPR traffic runs over MPC+.

Figure 61 shows the basic flow for an ESCON channel adapter with LCS and LSA configured.

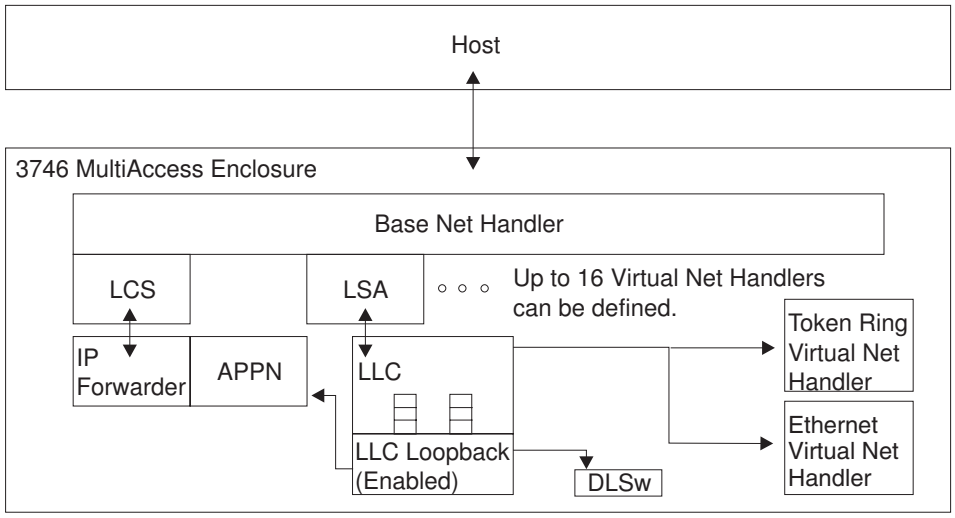

Figure 61. Multiaccess Enclosure ESCON Virtual Net Handlers for LCS and LSA - Logical View

Figure 62 shows the basic flow for an ESCON Channel Adapter for which MPC+ is configured.

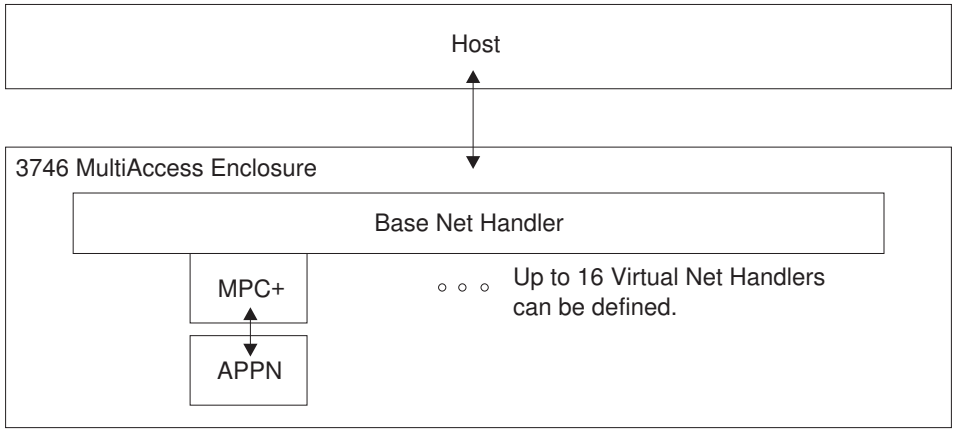

Figure 62. Multiaccess Enclosure ESCON Virtual Net Handlers for MPC+ - Logical View.

LAN Channel Station (LCS) Support

Figure 63 shows how TCP/IP data flows from the host, through LCS and other Multiaccess Enclosure software components, and out to the LANs/WANs.

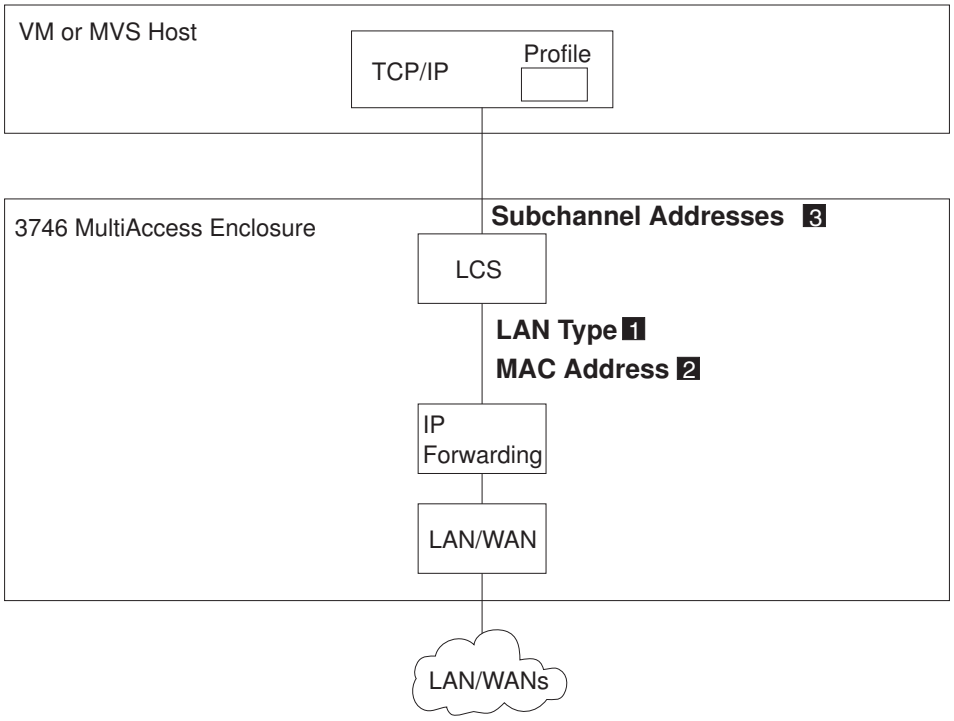

Figure 63. Configuring LAN Channel Station (LCS) Virtual Net Handlers. This figure shows LCS flow and highlights key parameters at the host and in the Multiaccess Enclosure

Configuring the 3746 Multiaccess Enclosure for LCS

Three parameters are required to configure the Multiaccess Enclosure for LCS as shown in Figure 63:

1 LAN type Type of LAN connection, either Ethernet or token-ring. This is the frame type that the host expects to send and receive.

2 MAC address A unique MAC address to identify this virtual interface.

Note: If the LAN type is Ethernet, then the MAC address must be in canonical format.

3 Configure the subchannel pair used by this connection.

You must configure an IP address and mask. Refer to “Internet Protocol (IP) Overview” in the *3745/3746 Planning Series: Protocols Description*.

There is one optional parameter:

maxdata Maximum size of data handled by this virtual network

For information on the corresponding host definitions, see “Configuring the Host for TCP/IP” on page 113.

Link Services Architecture (LSA) Support

Link Services Architecture (LSA) permits the VTAM host to communicate with the ESCON channel Adapter in the Multiaccess Enclosure.

Figure 64 shows the four types of LSA connections:

- "Configuring an LSA Direct Connection at the Multiaccess Enclosure" on page 102
- "Configuring an LSA APPN Connection at the Multiaccess Enclosure" on page 103
- "Configuring an LSA DLSw Connection at the 3746 Multiaccess Enclosure" on page 105
- "Configuring an LSA DLSw Local Conversion at the 3746 Multiaccess Enclosure" on page 106

For information on the corresponding host definitions, see "VTAM Control Blocks Used to Configure LSA at the Host" on page 116.

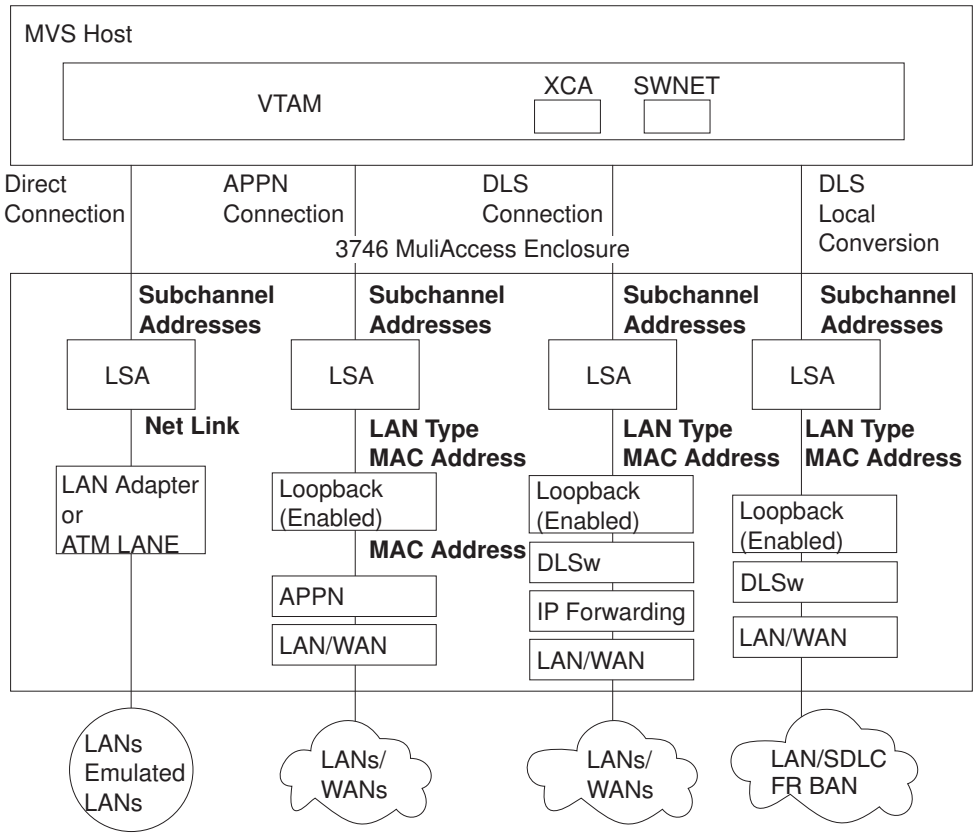

Figure 64. Configuring Link Services Architecture (LSA) Virtual Net Handlers

Configuring an LSA Direct Connection at the Multiaccess Enclosure

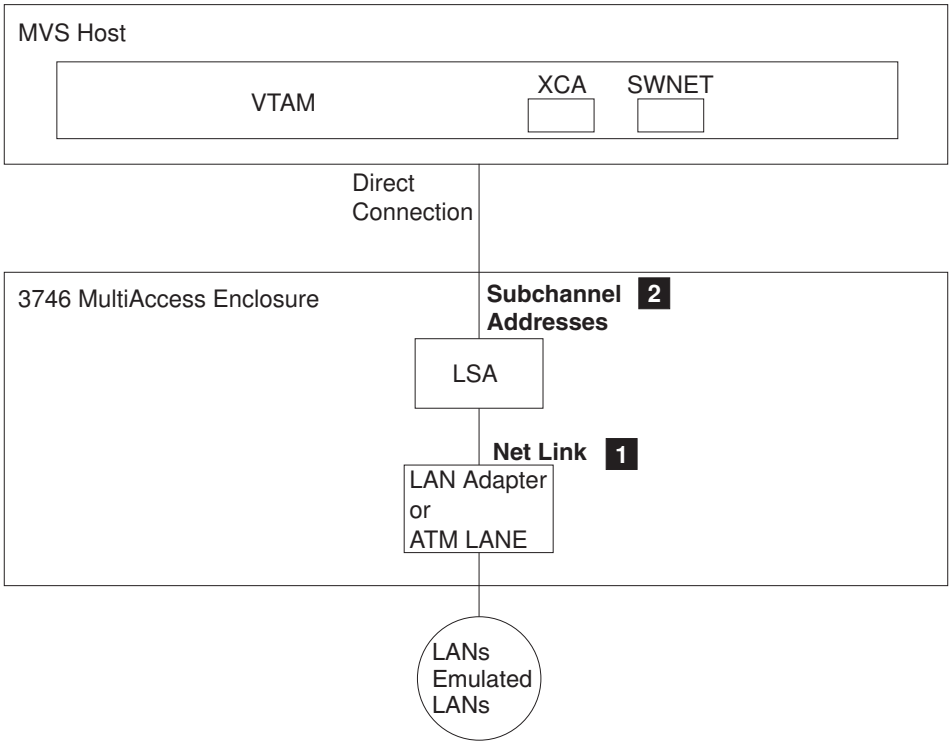

Figure 65. Configuring Virtual Net Handlers for LSA Direct Connection

Two parameters are required to configure the Multiaccess Enclosure for a direct LSA connection as shown in Figure 65:

1 Net Link The network interface number of the LAN adapter to which the LSA network is linked. This is the interface used by the Multiaccess Enclosure to transmit data to the host.

2 Configure the subchannel or subchannels used by this connection.

There is one optional parameter:

maxdata Maximum size of data handled by this virtual network

Note: The LSA net will read its MAC address from the Multiaccess Enclosure interface configured with the Net Link command.

For information on the corresponding host definitions, see “Configuring an LSA Direct Connection at the VTAM Host” on page 117.

Configuring an LSA APPN Connection at the Multiaccess Enclosure

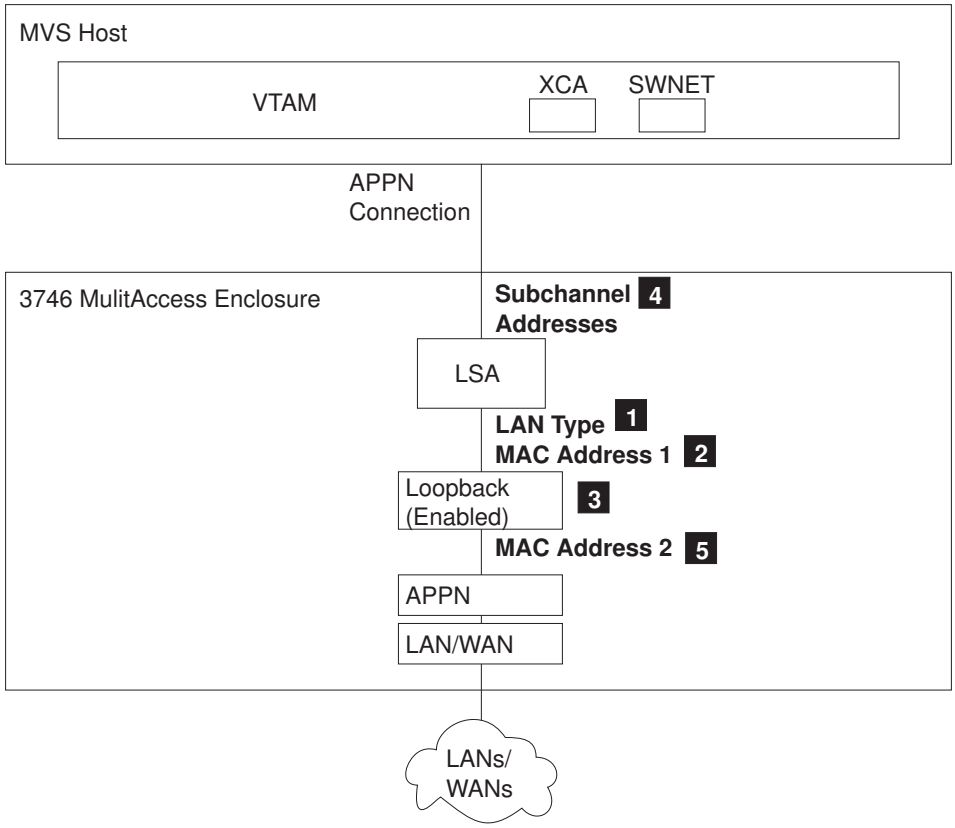

Figure 66. Configuring Virtual Net Handlers for LSA APPN Connection

Four parameters are required to configure the 3746 Multiaccess Enclosure for an LSA APPN connection as shown in Figure 66:

1 LAN type LAN type, either Ethernet or token-ring.

Note: You must configure the LAN type for both the LSA net and the Loopback net.

2 MAC Address 1 A unique MAC address to identify the host (VTAM) end of the loopback connection.

Note: If the LAN type is Ethernet, then the MAC address must be in canonical format.

3 Enable LSA loopback using the enable parameter.

4 Configure the subchannel or subchannels used by this connection.

There is one optional parameter:

maxdata Maximum size of data handled by this virtual network

Also, configure APPN to use the APPN loopback net. The APPN port must be configured on the APPN loopback net. To then configure an APPN link station over this APPN port, the destination MAC address of the link station definition should be that of the LSA net.

Specify a LAN type (token-ring or Ethernet) using the LANtype command.

5 MAC Address 2 A unique MAC address to identify the Multiaccess Enclosure (APPN) end of the loopback connection.

Note: If the LAN type is Ethernet, then the MAC address must be in canonical format.

For information on the corresponding host definitions, see “Configuring an LSA APPN Connection at the VTAM Host” on page 117.

Configuring an LSA DLSw Connection at the 3746 Multiaccess Enclosure

.

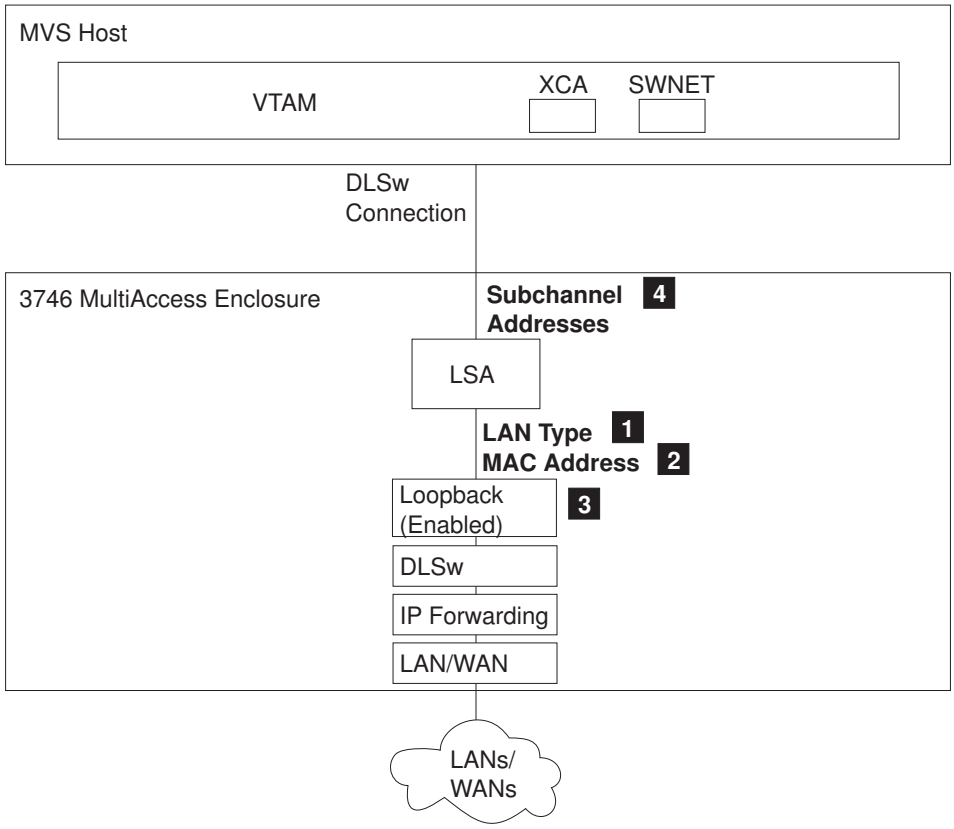

Figure 67. Configuring Virtual Net Handlers for LSA DLSw Connection

Four parameters are required to configure the Multiaccess Enclosure for an LSA DLSw connection as shown in Figure 67:

1 LAN type Type of LAN connection, either Ethernet or token-ring. This is the frame type that the host expects to send and receive.

2 MAC Address A unique MAC address to identify the host (VTAM) end of the loopback connection.

Note: If the LAN type is Ethernet, then the MAC address must be in canonical format.

3 Enable LSA loopback using the enable parameter.

4 Configure the subchannel or subchannels used by this connection.

There is one optional parameter:

maxdata Maximum size of data handled by this virtual network

For information on the corresponding host definitions, see “Configuring an LSA DLSw Connection at the VTAM Host” on page 118.

Configuring an LSA DLSw Local Conversion at the 3746 Multiaccess Enclosure

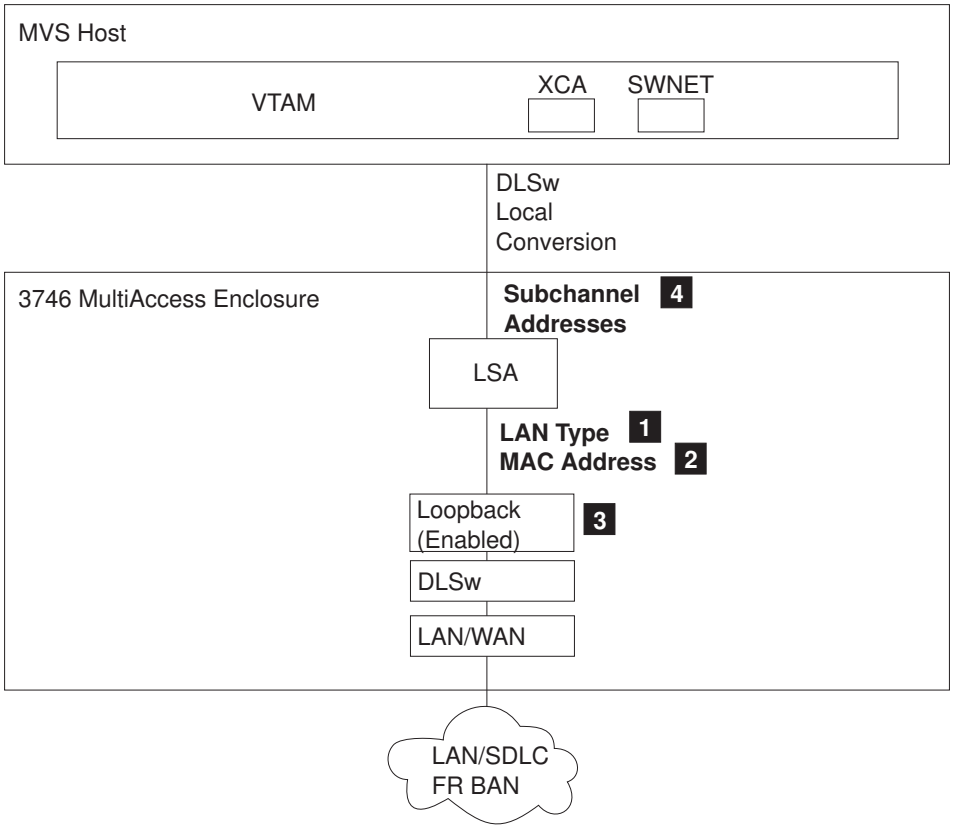

Figure 68. Configuring Virtual Net Handlers for LSA DLSw Local Conversion

Three parameters are required to configure the Multiaccess Enclosure for LSA DLSw Local Conversion as shown in Figure 68:

1 LAN type Type of LAN connection, either Ethernet or token-ring. This is the frame type that the host expects to send and receive.

2 MAC Address A unique MAC address to identify the host (VTAM) end of the loopback connection.

Note: If the LAN type is Ethernet, then the MAC address must be in canonical format.

3 Enable LSA loopback using the enable parameter.

4 Configure the subchannel or subchannels used by this connection.

There is one optional parameter:

maxdata Maximum size of data handled by this virtual network

Multi-Path Channel+ Support

Figure 69 shows Multi-Path+ (MPC+) flow and highlights key parameters at the host and in the 3746 Multiaccess Enclosure.

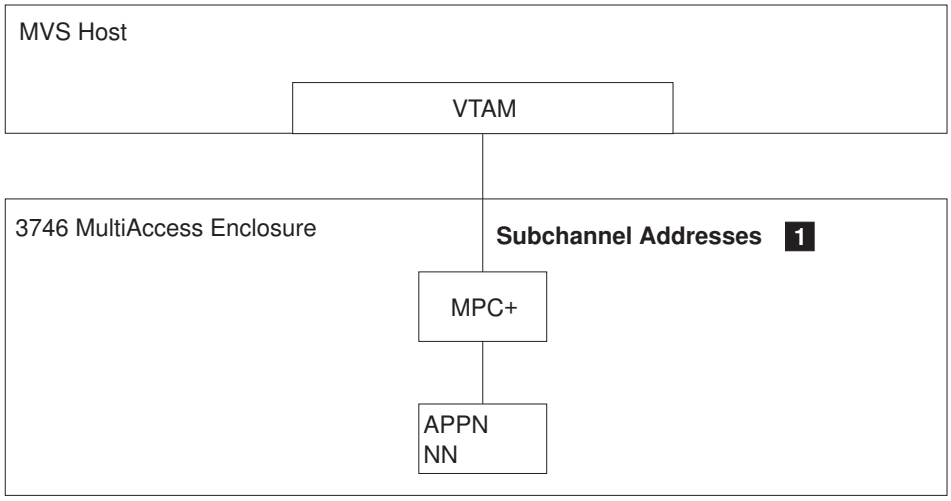

Figure 69. Configuring Virtual Net Handlers for Multi-Path Channel+ (MPC+)

Configuring the Multiaccess Enclosure for MPC+

Figure 69 shows the parameters required to configure MPC+.

1 Configure subchannels for read and write connections to the host.

There are three optional parameters:

reply timeout
: Timer for XID2/disconnect timeout in milliseconds.

  This is the amount of time that the MPC+ Group waits to hear from across the channel during XID2 and DISC exchanges before deciding that the other end of the channel is not answering and that this side should continue as you bring up or bring down the MPC+ Group.

sequencing interval timer
: Sequencing interval timer in milliseconds.

  This timer is used to determine whether connection-oriented data is flowing smoothly across the connection on an MPC+ Group. The MPC+ control flows and the APPN activation/deactivation flows flow connection-oriented. Since these commands must have guaranteed delivery at the link level they flow connection-oriented and the sequencing interval timer is used to determine whether enough time has passed that checking of the delivery of connection-oriented traffic should be done.

  Note: This value can be overwritten for each APPN PORT on an MPC+ Group. This is done during the APPN PORT configuration.

maxdata
: Maximum size of data handled by this virtual network handler.

With the following exceptions, APPN is configured over the MPC+ interface as it is over other interface types:

- On the APPN add port command, specify link type MPC+.
- On the APPN add port command, you may specify the MPC+ sequencing interval timer.

For information on the corresponding host definitions, see “Configuring the VTAM Host for MPC+” on page 121.

Host Definition Planning

This section provides information to help you plan for host definition. It includes information for system definition from the host perspective and information for definition from the 3746/MAE perspective.

Before you can attach the 3746/MAE to an ESCON channel, the host system must be configured correctly. The following series of steps is required to define the 3746/MAE connection to the host. These definition steps should be done by your system programmer.

1. Define the 3746/MAE to the host channel subsystem using either the host Input/Output Configuration Program (IOCP) or Hardware Configuration Definition (HCD) program.
2. Define the 3746/MAE to the host operating system.
3. Define the 3746/MAE and configuration to the host program (TCP/IP or VTAM).

After the host definitions are complete, you must configure the MAE ESCON interfaces using the command line interface, as described in Chapter 7, “Multiaccess Enclosure Configuration” on page 57, or using the configuration program described in *Configuration Program User’s Guide*, GC30-3830. Many of the parameters that you provide when you configure the MAE must match corresponding parameters in the host definition.

Finally, the stations will need to be configured to communicate through the 3746/MAE to the host applications.

The following sections describe host definition and provide sample host configuration statements.

IOCP Definition for the MAE

The following sections describe examples of IOCP definitions for the MAE with ESCON channel attachment. The output of the IOCP device definitions (I/O Configuration Data Set or IOCDS) can be generated using MVS, VM, VSE, or in a stand-alone environment. Refer to the *ES/9000 and ES/3090 Input/Output Configuration Program User’s Guide Volume A04*, GC38-0097, for details.

Example IOCP Definition for the ESCON Channel

Figure 70 on page 109 shows an example of an ESCON configuration. The S/390® host is divided into two logical partitions (LPs): LPA and LPB. A connection on path 30 is configured between LPA and MAE1 through ESCD switch 00. LPA is attached to ESCD port C0 and MAE1 is attached to port C1. The connection between port C0 and C1 is dynamic.

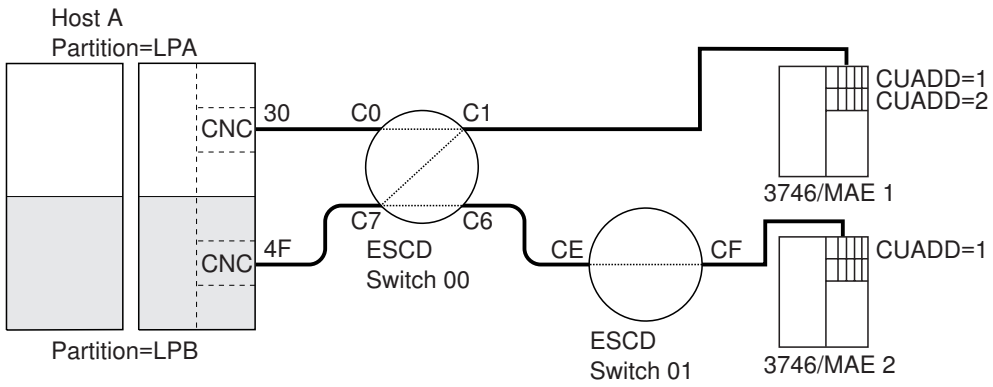

Figure 70. ESCON Channel Configuration Example

LPB on path 4F has a connection with MAE1 through ESCD switch 00, and a connection with MAE2 through ESCD switches 00 and 01. The connection between ports C7 and C6 is dynamic; the connection between ESCD ports CE and CF is dedicated.

The following example definitions match Figure 70:

Channel path definitions:

```
CHPID     PATH=((30)),TYPE=CNC,PART=(LPA),SWITCH=00
CHPID     PATH=((4F)),TYPE=CNC,PART=(LPB),SWITCH=00
```

Control unit and device definition for the 3746/mae, with logical addressing = 1 for 3746-MAE1:

```
CNTLUNIT  CUNUMBR=500,PATH=30,UNIT=3172,LINK=C1,        X
          UNITADD=(00,32),CUADD=1
IODEVICE  ADDRESS=(500,32),CUNUMBR=500,UNIT=SCTC,       X
          UNITADD=((00,32))
```

Control unit and device definition for the Multiaccess Enclosure with logical addressing = 2 for MAE1:

```
CNTLUNIT  CUNUMBR=600,PATH=4F,UNIT=3172,LINK=C1,        X
          UNITADD=(00,32),CUADD=2
IODEVICE  ADDRESS=(600,32),CUNUMBR=600,UNIT=SCTC,       X
          UNITADD=((00,32))
```

Control unit and device definition for the Multiaccess Enclosure, with logical addressing = 1 for MAE2:

```
CNTLUNIT  CUNUMBR=620,PATH=4F,UNIT=3172,LINK=C6,        X
          UNITADD=(20,32),CUADD=1
IODEVICE  ADDRESS=(620,32),CUNUMBR=620,UNIT=SCTC,       X
          UNITADD=((20,32))
```

The IOCP macroinstructions in the example:

- Assign a CHPID to logical partitions LPA and LPB.
- Define channel path 30 to MAE1. for partition LPA and channel path 4F for partition LPB.
- Identify channel type as an ESCON channel (CNC).
- Assign the two CHPIDs to ESCD switch number 00.
- Associate control unit numbers 500 and 600 to logical addresses 1 and 2 on MAE1 and control unit number 620 to logical address 1 on MAE2.

- Assign link address C1 to control units 500 and 600 and link address C6 to control unit 620.
- Define unit addresses (subchannels) 00 through 1F to control units 500 and 600 and unit addresses 20 through 3F to control unit 620.
- Identify each control unit as an SCTC device.

Considerations:

1. The address range for each MAE must be contiguous pairs of addresses for TCP/IP programs and a single address for VTAM. TCP/IP programs require even-odd pairs and VTAM accepts an even or odd address.

   The allowable device address range is 00 through FF. The MAE address range is limited to 32 addresses, and only requires that the addresses defined at the host computer map to the address or addresses configured in the MAE. The address range can extend beyond the addresses actually used, but cannot overlap addresses of other control units cabled to the same CHPID or channel.
2. The ESCON channel mode of operation can be type CNC for basic ESCON channel mode or CVC if there is an ESCON converter attached.
3. The IODEVICE UNIT parameter should be set to SCTC.
4. The LINK number specifies the link address (ESCD port number) to which the MAE is connected. When two ESCDs are connected in series, the link address must be the port number of the ESCD that has the dynamic connection and to which the MAE is attached.
5. The logical address (CUADD) must be unique for a given path between a host channel and a MAE.

Example IOCP Definition for the EMIF Host

Figure 71 shows an example of an ESCON configuration using the ESCON Multiple Image Facility (EMIF). The S/390 host is divided into two logical partitions (LPs): LPA and LPB. Both LPA and LPB are connected on path 30 to 3746-MAE1 through switch 00.

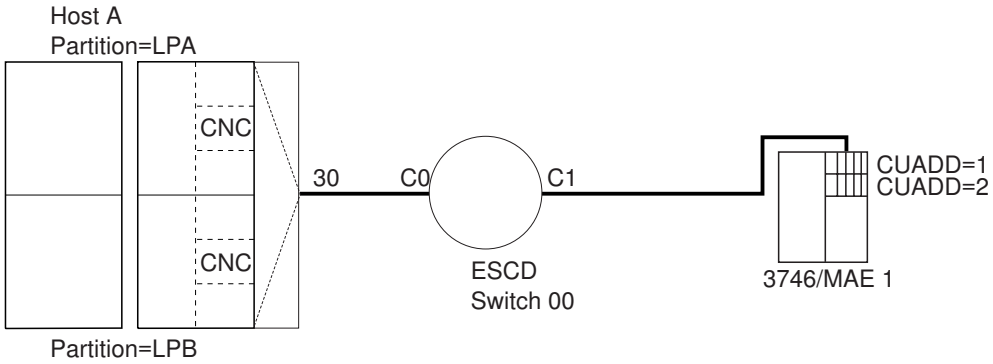

Figure 71. EMIF Host Configuration Example

The following example definitions match Figure 71:

Channel path definitions:

```
CHPID      PATH=((30)),TYPE=CNC,PART=(LPA,LPB),SWITCH=00
```

Control unit and device definition for the MAE, with logical addressing = 1 for MAE1:

```
CNTLUNIT   CUNUMBR=500,PATH=30,UNIT=3172,LINK=C1,         X
           UNITADD=(00,32),CUADD=1
IODEVICE   ADDRESS=(500,32),CUNUMBR=500,UNIT=SCTC,        X
           UNITADD=((00,32))
```

Control unit and device definition for the MAE, with logical addressing = 2 for MAE1:

```
CNTLUNIT   CUNUMBR=620,PATH=30,UNIT=3172,LINK=C1,         X
           UNITADD=(20,32),CUADD=2
IODEVICE   ADDRESS=(620,32),CUNUMBR=620,UNIT=SCTC,        X
           UNITADD=((20,32))
```

The IOCP macroinstructions in the example:

- Assign a CHPID to logical partitions LPA and LPB
- Define channel path 30 to the MAE to be shared by partition LPA and partition LPB.
- Identify channel type as an ESCON channel (CNC)
- Assign the CHPID to ESCD switch number 00
- Associate control unit numbers 500 to logical address 1 and 620 to logical address 2 on MAE1
- Assign link address C1 to control units 500 and 620
- Define unit addresses (subchannels) 00 through 1F to control unit 500 and 20 through 3F to control unit 620
- Identify each control unit as an SCTC device

Considerations:

1. The address range for each 3746/MAE must be contiguous pairs of addresses for TCP/IP programs and a single address for VTAM. TCP/IP programs require even-odd pairs and VTAM accepts an even or odd address.

   The allowable device address range is 00 through FF. The MAE address range is limited to 32 addresses, and only requires that the addresses defined at the host computer map to the address or addresses configured in the MAE. The address range can extend beyond the addresses actually used for the MAE, but cannot overlap addresses of other control units cabled to the same CHPID or channel.

2. The ESCON channel mode of operation can be type CNC for basic ESCON channel mode or CVC if there is an ESCON Converter attached.
3. The IODEVICE UNIT parameter should be set to SCTC.
4. The LINK number specifies the link address (ESCD port number) to which the MAE is connected. When two ESCDs are connected in series, the link address must be the port number of the ESCD that has the dynamic connection and to which the MAE is attached.
5. The logical address (CUADD) must be unique for a given path between a host channel and a MAE.
6. Each partition must have a unique logical address defined on the MAE.

Defining the MAE to the Operating System

The following definitions apply to a MAE with an ESCON channel adapter.

MAE Definition for VM/SP

The MAE must be defined to a VM/Extended Architecture, (VM/XA), or VM/ESA® operating system. This definition is accomplished by updating the real I/O configuration file (DMKRIO) with entries for the MAE in the RDEVICE and the RCTLUNIT macros. In the following example, 640 is the base unit address and the size of the address range is 32.

```
RDEVICE ADDRESS=(640,32),DEVTYPE=3088
RCTLUNIT ADDRESS=640,CUTYPE=3088,FEATURE=32-DEVICE
```

MAE Definition for VM/XA and VM/ESA

The MAE must be defined to a VM/Extended Architecture (VM/XA or VM/ESA operating system. This definition is accomplished by updating the real I/O configuration file (HCPRIO) with an entry for the MAE in the RDEVICE macro. In the following examples, 640 and 2A0 are base control unit addresses. The address range size, as defined in the UCW or IOCP, is 8 in both examples.

The following example is a VM/XA HCPRIO definition:

```
RDEVICE ADDRESS=(640,8),DEVTYPE=CTCA
```

The following example is a VM/ESA HCPRIO definition:

```
RDEVICE ADDRESS=(2A0,8),DEVTYPE=CTCA
```

MAE Definition for MVS/XA and MVS/ESA

The MAE must be defined to an IBM Multiple Virtual Storage/Extended Architecture (MVS/XA™) or MVS/ESA™ operating system. This definition is accomplished by updating the MVS Control Program with an entry for the MAE in the IODEVICE macro.

For ESCON channels, an example IODEVICE macro is:

```
IODEVICE UNIT=SCTC,ADDRESS(540,8)
```

The base control unit address is 540 and the address range size, as defined in the UCW or IOCP, is 8.

MAE Definition for MVS/ESA with HCD

The hardware configuration definition (HCD) component of MVS/ESA SP Version 4.2 and 4.3 with APAR #OY67361 offers an improved method of defining system hardware configuration for MAE. Several complex steps required for entering hardware configuration data can be accomplished using an interactive dialog with HCD.

The required configuration data for the MAE is:

1. When using HCD, with APAR #OY67361, the MAE is defined as (UNIT = 3172).
2. Without HCD, the MAE is defined for ESCON channels as a serial CTC device (UNIT = SCTC).

Notes:

1. If you are using HCD for MVS Version 4 to define your ESCON host connection, you may need APAR # OY67361 to obtain the UIM support for the device definition (UNIT=3172).
2. When migrating your IOCP definition and operating system definitions to the HCD environment, it is important that all MAE device statements be changed to device type (UNIT=3172).

MAE Definition for VSE/ESA

The MAE must be defined to a VSE/ESA™ operating system. This definition is accomplished by supplying an ADD statement for each channel unit address at initial program load (IPL) time. Code the device type on the ADD statement as CTCA,EML as shown in the following example:

```
ADD 640,CTCA,EML
```

The base control unit address is 640 in the example. For the number of channel unit addresses added, increment the IOTAB storage macro by this count.

Defining the MAE to Host Programs

The section has configuration definitions with samples of host definitions required to connect to the MAE ESCON channel adapter.

Configuring the Host for TCP/IP

TCP is configured on a host by modifying the TCP/IP profile. The default name for the TCP/IP profile data set is TCPIP.PROFILE.TCPIP for MVS and PROFILE TCPIP for VM. Each channel connection requires:

- One LINK and one DEVICE statement in the TCP/IP profile
- An entry in the HOME statement
- Entries in the GATEWAY statement for the link to be used (if ROUTED is not being used)
- A START command for the device

DEVICE and LINK statements: The format of the DEVICE and LINK statements are:

```
DEVICE devicename LCS subchannel
LINK   iplinkname LANtype LANnumber devicename
```

where:

devicename is a local name to distinguish devices. You need a START statement for this device name at the end of the TCP/IP profile as shown in “TCP/IP Commands - Example” on page 114.

LCS subchannel is the even subchannel of the two LCS subchannels that this connection to the MAE will use.

iplinkname is a local name to distinguish LINKs. This name can help you identify which link is being configured.

LANtype is the type of link.

LANnumber is obtained from the MAE by using the LIST NETS command of the appropriate NETWORK submenu.

HOME Command: Specify IP addresses for each channel connection using the following format:

```
HOME hostipadd iplinkname
```

where:

hostipadd is the host's IP address for this connection to the TCP/IP network.
iplinkname is the parameter defined by the LINK statement as described in "DEVICE and LINK statements" on page 113.

GATEWAY Command: Specify routing information if you are not using the ROUTED server.

```
GATEWAY network  first hop  driver  packet size  subn mask  subn value
```

where:

network is the IP address for the network. The default value is *defaultnet*, which specifies a default routing entry for any network not explicitly routed.
first hop is the Internet address that you can reach directly and that forwards messages to the destination. A value of = implies that messages are routed directly to the destination.
driver is the *iplinkname* defined by the LINK statement as described in "DEVICE and LINK statements" on page 113.
packet size is the maximum transmission unit in bytes for the network or host.
subn mask is a bit mask that defines the bits of the host field that make up the subnet field.
subn value is the value of the subnet field.

START Command: Start all the interfaces:

```
START devicename
```

where:

devicename is the parameter defined by the DEVICE statement as described in "DEVICE and LINK statements" on page 113.

TCP/IP Commands - Example:

```
DEVICE LCS1 LCS   108
LINK   TR1  IBMTR 0 LCS1
HOME
    16.51.136.199 TR1
GATEWAY
    DEFAULTNET 16.51.136.201 TR1 4000 0
START LCS1
```

Sample MAE Definition to TCP/IP for MVS or VM

The following is an example of TCP/IP definitions provided to the host computer in the TCP/IP profile data set. The default name for the TCP/IP profile data set is TCPIP.PROFILE.TCPIP for MVS and PROFILE TCPIP for VM.

First, MAE devices and links are defined to TCP/IP.

There is a DEVICE statement for each subchannel pair that is used to access MAEs. The first address specified must be an *even* address. In this example, two devices (subchannel pairs) are defined: one at address 640 and one at address

642. These devices could be in the same or different MAEs. A device type of LCS (LAN Channel Station) is used to define these devices to TCP/IP.

There is a LINK statement for each LAN adapter that is accessible from these devices. In this example, one Ethernet/802.3 Adapter is assigned to the device using subchannels 640 and 641, and two token-ring adapters are assigned to the device using 642 and 643. These two token-ring adapters are in the same MAE because they are associated with the same device. The LINK number for each adapter (0 and 1 in this example) is assigned by the MAE when you add an adapter to a profile. When sharing a LAN adapter with VTAM, the ADAPNO value in the VTAM definition and the LINK number in the TCP/IP definition will be the same number, which is assigned by the MAE.

Note: Two subchannel addresses are required for sending and receiving (for example, 640 and 641), but only the first address is defined.

```
DEVICE LCS1 LCS 640
LINK ETH1 ETHEROr802.3  0 LCS1
DEVICE LCS2 LCS 642
LINK TR1  IBMTR     0 LCS2
LINK TR2  IBMTR     1 LCS2
```

Note: In this example, `0` and `1` are the LAN numbers for these connections.

This section of the example TCP/IP profile defines the local host internet addresses:

```
HOME

193.5.2.1      ETH1
130.50.75.1    TR1
130.50.76.1    TR2
```

This section of the example TCP/IP profile represents the LAN/WAN gateway definition:

```
GATEWAY

Network  First hop Driver  Packet Size Subnet mask Subnet value
193.5.2     =      ETH1    1500           0
130.50      =      TR1     2000        0.0.255.0   0.0.75.0
130.50      =      TR2     2000        0.0.255.0   0.0.76.0
```

This section of the example TCP/IP profile activates the LCS devices:

```
START LCS1
START LCS2
```

The following examples illustrate various ways that LAN adapters can be specified and linked to subchannel pairs in the TCP/IP profile.

Two LCS devices for the two subchannel pairs 40,41 and 42,43 and four LAN adapters are defined in the MAE as follows:

```
DEVICE LCS1 LCS 640
LINK ETH1 ETHERNET 0 LCS1
LINK ETH2 ETHERNET 1 LCS1
DEVICE LCS3 LCS 642
LINK TRN1 IBMTR    0 LCS2
LINK TRN2 IBMTR    1 LCS2
```

Four LCS devices for the four subchannel pairs 40,41; 42,43; 44,45; and 46,47 and four LAN adapters are defined in the MAE as follows:

```
DEVICE LCS1 LCS 640
LINK ETH1 ETHERNET 0 LCS1
DEVICE LCS2 LCS 642
LINK ETH2 ETHERNET 1 LCS2
DEVICE LCS3 LCS 644
LINK TRN1 IBMTR    0 LCS3
DEVICE LCS4 LCS 646
LINK TRN2 IBMTR    1 LCS4
```

One LCS device for the subchannel pair 40,41 and four LAN adapters are defined in the MAE as follows:

```
DEVICE LCS1 LCS 640
LINK ETH1 ETHERNET 0 LCS1
LINK ETH2 ETHERNET 1 LCS1
LINK ETH3 ETHERNET 2 LCS1
LINK ETH4 ETHERNET 3 LCS1
```

For more information about TCP/IP definitions, refer to the TCP/IP publications listed in “Related Documentation” on page 146.

VTAM Control Blocks Used to Configure LSA at the Host

Configuring the VM or MVS host requires entries in two VTAM control blocks:

- External communication adapter (XCA) major node definition file
- Switched major node configuration file

For more information on configuring VTAM, refer to *VTAM Resource Definition Reference*.

XCA Major Node Definition File - Sample: Defining an XCA major node requires coding VTAM definition statements to define the following characteristics:

- Node type (VBUILD definition statement)
- Port used by the LAN (PORT definition statement)
- Switched lines attached through the MAE ESCON Channel Adapter (GROUP, LINE, and PU definition statements)

You must code a VBUILD definition statement and a PORT definition statement for the major node, and code GROUP, LINE, and PU definition statements for minor nodes.

You must also assign service access points (SAPs) to be used for each virtual channel to a LAN or emulated LAN.

Switched Major Node Definition File - Sample: The switched major node definition file defines the workstations that VTAM will be able to access through the MAE ESCON Channel Adapter, and identifies:

- Node type (VBUILD definition statement)
- Network Resources (PU and LU definition statements)

To define the MAE LAN/WAN gateway to VTAM, the appropriate LAN adapter in the IBM MAE must be associated with a subchannel address. This association is defined to VTAM in a major node definition that is supported by VTAM Version 3 Release 4 and VTAM Version 4 Release 1.

Configuring an LSA Direct Connection at the VTAM Host

Configuring the VM or MVS host requires entries in two VTAM control blocks, the XCA Major Node Definition File and the Switched Major Node Definition File. See "VTAM Control Blocks Used to Configure LSA at the Host" on page 116 for a description of the purpose of these control blocks and references to VTAM publications.

XCA Major Node Definition File - Sample

```
ROUTE6B1 VBUILD TYPE=XCA
PORT6B1  PORT   CUADDR=0CB,ADAPNO=0,TIMER=60,SAPADDR=08,
                MEDIUM=RING
GRP6B1   GROUP  DIAL=YES
************************
LN06B001 LINE  ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU06B001 PU    ISTATUS=ACTIVE
```

Notes:

1. ADAPNO is the LAN number for the MAE interface.
2. CUADDR is the channel address. This corresponds to the device address (two hexadecimal characters defining the lower byte of the channel address) for the MAE interface.
3. MEDIUM=RING for token ring and MEDIUM=CSMACD for Ethernet. This corresponds to the value specified for LANtype for the MAE interface.

Switched Major Node Definition File - Sample

```
PS06SW  VBUILD TYPE=SWNET
PS06PU  PU ADDR=01,IDBLK=05D,IDNUM=54445,MAXOUT=7,PACING=0,VPACING=0,  C
               SSCPFM=USSSCS,MAXDATA=4105,MODETAB=LMT3270,MAXPATH=1,   C
               ANS=CONT,ISTATUS=ACTIVE,DLOGMOD=B22NNE
PS06LU2 LU LOCADDR=02
PS06LU3 LU LOCADDR=03
PS06LU4 LU LOCADDR=04
PS06LU5 LU LOCADDR=05
```

Configuring an LSA APPN Connection at the VTAM Host

With the following exceptions, APPN is configured over the MPC+ interface as it is over other interface types:

- On the APPN "add port" command, specify link type MPC.
- On the APPN "add port" command, you may specify the MPC+ sequencing interval timer.

Configuring the VM or MVS host requires entries in two VTAM control blocks, the XCA Major Node Definition File and the Switched Major Node Definition File. See "VTAM Control Blocks Used to Configure LSA at the Host" on page 116 for a description of the purpose of these control blocks and references to VTAM publications.

XCA Major Node Definition File - Sample

```
P15AP63X VBUILD TYPE=XCA
PORT63X  PORT   CUADDR=0CD,ADAPNO=0,TIMER=60,SAPADDR=04,              C
                MEDIUM=CSMACD
GRP63X   GROUP  DIAL=YES
************************
LN630403 LINE  ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU630403 PU    ISTATUS=ACTIVE
```

Notes:

1. ADAPNO is the LAN number for the MAE interface.
2. CUADDR is the channel address. This corresponds to the device address (two hexadecimal characters defining the lower byte of the channel address) for the MAE interface.
3. MEDIUM=RING for token ring and MEDIUM=CSMACD for Ethernet. This corresponds to the value specified for LANtype for the MAE interface.

Switched Major Node Definition File - Sample

```
LS601    VBUILD TYPE=SWNET
CS601   PU ADDR=02,CPNAME=C210,MAXOUT=7,PACING=0,VPACING=0,           C
              CPCP=YES,MAXDATA=4105,MODETAB=LMT3270,MAXPATH=10,       C
              CONNTYPE=APPN,DYNLU=YES
```

Configuring an LSA DLSw Connection at the VTAM Host

Configuring the VM or MVS host requires entries in two VTAM control blocks, the XCA Major Node Definition File and the Switched Major Node Definition File. See "VTAM Control Blocks Used to Configure LSA at the Host" on page 116 for a description of the purpose of these control blocks and references to VTAM publications.

XCA Major Node Definition File - Sample

```
P15AP60X VBUILD TYPE=XCA
PORT60X  PORT   CUADDR=0CC,ADAPNO=1,TIMER=60,SAPADDR=04,              C
              MEDIUM=CSMACD
GRP60X   GROUP  DIAL=YES
************************
LN600403 LINE  ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU600403 PU    ISTATUS=ACTIVE
LN600404 LINE  ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU600404 PU    ISTATUS=ACTIVE
```

Notes:

1. ADAPNO is the LAN number for the MAE interface.
2. CUADDR is the channel address. This corresponds to the device address (two hexadecimal characters defining the lower byte of the channel address) for the MAEinterface.
3. MEDIUM=RING for token ring and MEDIUM=CSMACD for Ethernet. This corresponds to the value specified for LANtype for the MAE interface.

Switched Major Node Definition File - Sample

```
PSK5SW  VBUILD TYPE=SWNET
PSK5PU  PU ADDR=03,IDBLK=05D,IDNUM=07251,MAXOUT=7,PACING=0,VPACING=0,  C
              DLOGMOD=B22NNE,                                         C
              SSCPFM=USSSCS,MAXDATA=2000,MODETAB=LMT3270
PSK5LU2 LU LOCADDR=02
PSK5LU3 LU LOCADDR=03
PSK5LU4 LU LOCADDR=04
PSK5LU5 LU LOCADDR=05
PSK5LU6 LU LOCADDR=06
```

Configuring an LSA DLSw Local Conversion at the VTAM Host

Configuring the VM or MVS host requires entries in two VTAM control blocks, the XCA Major Node Definition File and the Switched Major Node Definition File. See "VTAM Control Blocks Used to Configure LSA at the Host" on page 116 for a description of the purpose of these control blocks and references to VTAM publications.

XCA Major Node Definition File - Sample

```
P15AP60X VBUILD TYPE=XCA
PORT60X  PORT   CUADDR=0CC,ADAPNO=1,TIMER=60,SAPADDR=04,              C
               MEDIUM=CSMACD
GRP60X   GROUP  DIAL=YES
************************
LN600403 LINE  ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU600403 PU    ISTATUS=ACTIVE
LN600404 LINE  ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU600404 PU    ISTATUS=ACTIVE
```

Notes:

1. ADAPNO is the LAN number for the MAE interface.
2. CUADDR is the channel address. This corresponds to the Device Address (two hexadecimal characters defining the lower byte of the channel address) for the MAE interface.
3. MEDIUM=RING for Token Ring and MEDIUM=CSMACD for Ethernet. This corresponds to the value specified for LANtype for the MAE interface.

Switched Major Node Definition File - Sample

```
PS06SW  VBUILD TYPE=SWNET,MAXDLUR=20
PS06PU  PU ADDR=01,IDBLK=05D,IDNUM=54445,MAXOUT=7,PACING=0,VPACING=0,  C
               SSCPFM=USSSCS,MAXDATA=4105,MODETAB=LMT3270,MAXPATH=1,   C
               ANS=CONT,ISTATUS=ACTIVE,DLOGMOD=B22NNE
PS06LU2 LU LOCADDR=02
PS06LU3 LU LOCADDR=03
PS06LU4 LU LOCADDR=04
PS06LU5 LU LOCADDR=05

PSK5SW  VBUILD TYPE=SWNET
PSK5PU  PU ADDR=03,IDBLK=05D,IDNUM=07251,MAXOUT=7,PACING=0,VPACING=0,  C
               DLOGMOD=B22NNE,                                         C
               SSCPFM=USSSCS,MAXDATA=2000,MODETAB=LMT3270
PSK5LU2 LU LOCADDR=02
PSK5LU3 LU LOCADDR=03
PSK5LU4 LU LOCADDR=04
PSK5LU5 LU LOCADDR=05
PSK5LU6 LU LOCADDR=06
```

The following examples show XCA and SWNET macros that define the LAN major node for a token-ring adapter and an Ethernet adapter, respectively. In the examples:

- GROUP1T, GROUP1E, and GROUP1F represent resources connected to the LAN that require a VBUILD TYPE=SWNET.
- GROUP2T, GROUP2E, and GROUP2F represent a connection for the PU 5 node.

The mode table and default mode entries are examples only. Be sure to use the mode tables and mode entries defined in your installation.

```
TRLAN1   VBUILD TYPE=XCA
PORT1    PORT   MEDIUM=RING,ADAPNO=0,CUADDR=644,TIMER=60,SAPADDR=4
GROUP1T  GROUP  DIAL=YES    * Switched Attachment
LINE1TA  LINE   ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU1TA    PU     ISTATUS=ACTIVE
LINE1TB  LINE   ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU1TB    PU     ISTATUS=ACTIVE
GROUP2T  GROUP  DIAL=NO     * Leased Definition
LINE2T   LINE   USER=SNA    * Multi-domain Connection
PU2T     PU     MACADDR=400000000001,TGN=1,SUBAREA=2,SAPADDR=4,PUTYPE=5
```

```
ENLAN2   VBUILD TYPE=XCA
PORT2    PORT   MEDIUM=CSMACD,ADAPNO=0,CUADDR=645,TIMER=60,SAPADDR=4
GROUP1E  GROUP  DIAL=YES    * Switched Attachment
LINE1EA  LINE   ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU1EA    PU     ISTATUS=ACTIVE
LINE1EB  LINE   ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE
PU1EB    PU     ISTATUS=ACTIVE
GROUP2E  GROUP  DIAL=NO     * Leased Definition
LINE2E   LINE   USER=SNA    * Multi-domain Connection
PU2E     PU     MACADDR=400000000002,TGN=2,SUBAREA=2,SAPADDR=4,PUTYPE=5
```

The following examples are the switched major node definitions:

```
LS100SW VBUILD TYPE=SWNET,MAXGRP=400,MAXNO=400
CS100001 PU  ADDR=01,PUTYPE=2,MAXPATH=4,ANS=CONT,DLOGMOD=B22NNE,
         ISTATUS=ACTIVE,MAXDATA=521,IRETRY=YES,MAXOUT=7,
         PASSLIM=5,IDBLK=111,IDNUM=00001,MODETAB=LMT3270
         PATH  DIALNO=0104400000000004,GRPNM=GROUP1T
S00102   LU   LOCADDR=2
CS100002 PU  ADDR=02,PUTYPE=2,MAXPATH=4,ANS=CONT,DLOGMOD=B22NNE,
         ISTATUS=ACTIVE,MAXDATA=521,IRETRY=YES,MAXOUT=7,
         PASSLIM=5,CPNAME=MYNS2,MODETAB=LMT3270
         PATH  DIALNO=0104400000000005,GRPNM=GROUP1T
S00200  LU   LOCADDR=0,DLOGMOD=LU62MODE
S00202  LU   LOCADDR=2
```

```
CS100003 PU  ADDR=03,PUTYPE=2,MAXPATH=4,ANS=CONT,DLOGMOD=B22NNE,
         ISTATUS=ACTIVE,MAXDATA=521,IRETRY=YES,MAXOUT=7,
         PASSLIM=5,IDBLK=111,IDNUM=00003,MODETAB=LMT3270
         PATH  DIALNO=0104400000000006,GRPNM=GROUP1E
S00302   LU   LOCADDR=2
CS100004 PU  ADDR=04,PUTYPE=2,MAXPATH=4,ANS=CONT,DLOGMOD=B22NNE,
         ISTATUS=ACTIVE,MAXDATA=521,IRETRY=YES,MAXOUT=7,
         PASSLIM=5,IDBLK=111,IDNUM=00004,MODETAB=LMT3270
         PATH  DIALNO=0104400000000007,GRPNM=GROUP1E
S00402  LU   LOCADDR=2
```

```
CS100005 PU  ADDR=05,PUTYPE=2,MAXPATH=4,ANS=CONT,DLOGMOD=B22NNE,
         ISTATUS=ACTIVE,MAXDATA=521,IRETRY=YES,MAXOUT=7,
         PASSLIM=5,IDBLK=111,IDNUM=00005,MODETAB=LMT3270
         PATH  DIALNO=0104400000000008,GRPNM=GROUP1F
S00502   LU   LOCADDR=2
CS100006 PU  ADDR=06,PUTYPE=2,MAXPATH=4,ANS=CONT,DLOGMOD=B22NNE,
         ISTATUS=ACTIVE,MAXDATA=521,IRETRY=YES,MAXOUT=7,
         PASSLIM=5,IDBLK=111,IDNUM=00006,MODETAB=LMT3270
         PATH  DIALNO=0104400000000005,GRPNM=GROUP1F
S00602  LU   LOCADDR=2
```

For more information about VTAM definitions, refer to the VTAM publications listed in “Related Documentation” on page 146.

Configuring the VTAM Host for MPC+

Configuring the VTAM host requires entries in two VTAM control blocks, the Local SNA Major Node and the Transport Resource (TRL) Major Node, and a change to the VTAM startup parameters. For more information on configuring VTAM, refer to *VTAM Resource Definition Reference*.

Local SNA Major Node: Use the following definition statements to configure a local SNA major node in VTAM:

```
UTYLSNA VBUILD TYPE=LOCAL
UTYHCC1 PU     TRLE=UHCC1,XID=YES,CONNTYPE=APPN,CPCP=YES,HPR=YES
```

Transport Resource List (TRL) Major Node:

```
BC4UTRL VBUILD TYPE=TRL
UHCC1   TRLE LNCTL=MPC,                                          C
             MAXBFRU=8,                                          C
             READ=(xxx1,xxx2,...),                               C
             WRITE=(yyy1,yyy2,...),                              C
             REPLYTO=3.0
```

where:

xxx1,xxx2,... are the read subchannel numbers.
yyy1,yyy2,... are the write subchannel numbers.

The read and write subchannel numbers must match those configured on the MAE.

Note: A read subchannel to VTAM is a write subchannel to the MAE and a write subchannel to VTAM is a read subchannel to the MAE.

VTAM Start-up Parameters: In the VTAM initialization file ATCSTRxx, where xx is defined by the user, define a network node:

```
NODETYPE=NN
```

Since high-performance routing (HPR) is being used, you also should add to this file:

```
HPR=YES
```

Note: Only APPN HPR is supported across the MPC+ interface. APPN ISR is not supported.

Appendix A. MAE Installation Worksheets

The worksheet in this chapter is for the parameter that is needed during the Multiaccess Enclosure installation. Complete this sheet and give it to the IBM service representative who installs your Multiaccess Enclosure.

LAN link from the MAE to the 3746

This parameter is explained in page 58.

Table 14. LAN link to 3746

LAN link to 3746 required	□ Yes • □ One link • □ Two links □ No

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Appendix B. Helpful Books To Read

Here is a list of publications that you may find useful to read when supporting various MAE situations:

Protocol Configuration and Monitoring Reference Vol. 1, SC30-3884 – Assistance for BRIDGING, NETBIOS, TCPIP, IPX Protocols Configuration

Provides useful information about the following topics:

- Bridging (Basics, method features,configuring, monitoring...)
- NETBIOS
- TCPIP protocol
- OSPF routing protocol[7]
- BGP4 routing protocol[7]
- DLSW
- ARP
- IPX

Protocol Configuration and Monitoring Reference Vol. 2, SC30-3885 – Assistance for APPN, APPLE TALK, VINES, DECnet Protocols Configuration

Provides useful information about the following topics:

- APPN , DLUR , TN3270E server, DDDLU parameters
- Monitoring and configuring APPN, TN3270E
- APPLE TALK
- VINES
- DNA
- OSI/DECnet[8]
- NHRP[8]
- IP V6 PIM[8], RIP6[8].

Software User's Guide, SC30-3886

Provides a complete description of the parameters configured for each kind of interfaces available both on the 2216 and the MAE; which includes Token-Ring, X.25, Frame-Relay...

- Introduction
- Token ring
- Fast Token Ring
- FDDI
- Ethernet
- Fast Ethernet
- ATM (LAN emulation, configuring, monitoring..)
- Channel (ESCON, Parallel Channel Adapter)
- X25
- Frame Relay
- PPP
- Multi Link PPP (MP)
- V25bis
- ISDN
- Dial Circuit

---

7 Definitions and commands provided in the subject book apply to the IBM 2216 Nways Multiaccess Connector only.

8 Function not available on the MAE.

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Using and Configuring Features, SC30-3993

Provides a good description of the 2216 features. Among these, the following apply to the MAE:

- Network dispatcher
- Authentication (AAA)
- IP security
- L2TP (tunneling)
- NAT (Network Address Translation)

2216/Network Utility Channel-Attach Examples, G224-4599

Provides examples of the ESCON attachment definition for APPN DLUR/TN3270E, SNA/TN3270E, which can be useful when setting up a new configuration with the ESCON direct attachment to the MAE.

List of Abbreviations

AB	area border
ACF	advanced communications function
ACF/VTAM	advanced communications function for the virtual telecommunications access method
ANR	automatic network routing
APPN	advanced peer-to-peer networking
ARB	adaptive rate-based flow/congestion control
ARC	active remote connector
ARP	address resolution protocol
AS	autonomous system
ASB	autonomous system border
ASE	autonomous system external
ASCII	american national standard code for information interchange
AUTO	automatic
BAN	boundary access node
BECN	backward explicit congestion notification
BER	box event record
BGP	border gateway protocol
BOOTP	bootstrap protocol
bps	bits per second
BRS	bandwidth reservation system
BSC	binary synchronous communication
C&SM	communications and system management
CBSP	control bus and service processor
CCITT	Comité Consultative International Télégraphique et Téléphonique The international telegraph and telephone consultative committee
CCU	central control unit
CD	carrier detector
CDF-E	configuration data file - extended
CE	customer engineer
CF3745	3745 and 3746 configurator and performance model
CHPID	channel path id
CIDR	classless inter-domain routing
CIR	committed information rate
CLIST	command list
CLA	communication line adapter
CLP	communication line processor
CM	communications manager
CNN	composite network node
CNM	communication network management
COS	cost of service
CP	control point
CR	communications rate
CSU	customer service unit
DCAF	distributed console access facility
DCE	data circuit-terminating equipment
DDS	digital data service
DE	discard eligibility
DLC	data link control
DLCI	data link connection identifier
DLSw	data link switching
DLUR	dependent LU requester
DLUS	dependent LU server
DMUX	double multiplex circuit
DSU	data service unit
DTE	data terminal equipment
DX	duplex
EBCDIC	extended binary-coded decimal interchange code
EBN	extended border node
EC	engineering change
EMIF	ESCON multiple image facility
EN	end node
EP	emulation program
EPO	emergency power OFF
ESCA	ESCON channel adapter
ESCC	ESCON channel coupler
ESCD	ESCON Director
ESCON	Enterprise Systems Connection
ESCP	ESCON processor
FC	feature code
FDX	full duplex
FECN	forward explicit congestion notification

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FRAD frame-relay access device

FRFH frame-relay frame handler

FRSE frame-relay switching equipment

FRTE frame-relay terminating equipment

HCD hardware configuration definition

HDX half duplex

HI high

HLA host link address

HONE hands-on network environment

HPR high performance routing

HSS high-speed scanner

ICMP internet control message protocol

IML initial microcode load

INN intermediate network node or IBM information network

IOCP Input/Output Configuration Program

IP internet, or internetwork, protocol

IPL initial program load

IPR installation planning representative

ITU-T international telecommunications union - telecommunications (ex-CCITT)

KB kilobyte (processor storage)
1KB = 2^{10} bytes (1 024 bytes)

kbps kilobits per second (speed or communication volume per second)
1 kbps = 1 000 (one thousand) bits per second

LAA locally administered address

LAN local area network

LCB line connection box

LCBB line connection box base

LCBE line connection box expansion

LCP link control protocol

LDM limited distance modem

LED light emitting diode

LIB n line interface board type n

LIC n line interface coupler type n

LSA link state advertisement

LIU n line interface coupler unit type n

LIV link integrity verification

LMI local management interface

LP logical partition

LPDA® link problem determination aid

LQ line quality

LU logical unit

LSS low-speed scanner

MAC medium access control

MAU medium attachment unit

MB megabyte (processor storage)
1MB = 2^{20} bytes (1 048 576 bytes)

Mbps megabits per second (speed or communication volume per second)
1 Mbps = 1 000 000 (one million) bits per second

MCL microcode change level

MES miscellaneous equipment specification

MIB management information base

MIH missing interrupt handler

MLC machine level control

MLTG multi-link transmission group

MOSS-E maintenance and operator subsystem - extended

MTP multipoint

MUX multiplex circuit

MVS multiple virtual storage

NAU network addressable unit

NMBA nonbroadcast multiaccess

NCP Network Control Program

NDRS non-disruptive route switching

NGMF netView graphic monitor facility

NN network node

NNP network node processor

NPM netView performance monitor

NRZI non-return-to-zero inverted

NVT network virtual terminal

ODLC outboard data link control

OSPF open shortest path first

PBN peripheral border node

PCI Peripheral component interconnect

PEP partitioned emulation program

PING packet internet groper

PN peripheral node

PPP point-to-point protocol

PPPNCP point-to-point network control protocol

PTP point-to-point

PTT	post, telegraph, and telephone
PU	physical unit
PVC	permanent virtual circuit
QUAL	quality
RCV	receive clock
RETAIN®	remote technical assistance information network
RFS	ready for sending
RIP	routing information protocol
RNR	receive not ready
ROS	read-only storage
RR	receive ready
RSF	remote support facility
RTP	rapid transport protocol
RTS	request to send
SDLC	synchronous data link control
SMUX	single multiplex circuit
SNBU	switched network backup
SNI	SNA network interconnection
SNMP	simple network management protocol
SPAU	service processor access unit
SRC	service reference code
S/S	start-stop
SVC	switched virtual circuit
TC	test control
TCM	trellis code modulation
TCP	transmission control protocol
TG	transmission group
THRES	threshold
TICn	Token-ring interface coupler type n
TIM	time services
TOS	type of service
TPF	transaction processing facility
TRA	Token-ring adapter
TRP	Token-ring processor
TSS	transmission subsystem
UDP	user datagram protocol
UTP	unshielded twisted pair
VTAM	virtual telecommunications access method
XID	exchange station identification
XMIT	transmit

Glossary

This glossary defines new terms used in this manual.

adaptive rate-based flow and congestion control (ARB). A function of High Performance Routing (HPR) that regulates the flow of data over an RTP connection by adaptively changing the sender's rate based on feedback on the receiver's rate. It allows high link utilization and prevents congestion before it occurs, rather than recovering after congestion has occurred.

advanced communication function (ACF). A group of IBM licensed programs. principally VTAM programs. TCAM, NCP, and SSP, that use the concepts of Systems Network Architecture (SNA), including distribution of function and resource sharing.

advanced communications function for the virtual telecommunications access method (ACF/VTAM). An IBM licensed program that controls communication and the flow of data in an SNA network. It provides single-domain, multiple-domain, and interconnected network capability.

advanced peer-to-peer networking (APPN). Data communications support that routes data in a network between two or more advanced program-to-program communications (APPC) systems that do not need to be adjacent.

automatic network routing. A function of High Performance Routing (HPR) that is provides a low-level routing mechanism that requires no intermediate storage.

channel adapter (CA). A communication controller hardware unit used to attach the controller to a host processor.

communication controller. A device that directs the transmission of data over the data links of a network; its operation may be controlled by a program executed in a processor to which the controller is connected or it may be controlled by a program executed within the device. For example, the IBM 3745 and 3746 Network Nodes.

communications manager. A function of the OS/2 Extended Edition program that lets a workstation connect to a host computer and use the host resources as well as the resources of the other personal computers to which the workstation is attached, either directly or through a host system. The communications manager provides application programming interfaces (APIs) so that users and develop their own applications.

configuration data file - extended (CDF-E). A 3746 Network Node MOSS-E file that contains a description of all the hardware features (presence, type, address, and characteristics).

communications management configuration host node. The type 5 host processor in a communications management configuration that does all network-control functions in the network except for the control of devices channel-attached to a data host nodes. Synonymous with communications management host. See also data host node.

control panel. A panel that contains switches and indicators for the customer's operator and service personnel.

control program. A computer program designed to schedule and to supervise the execution of programs of the controller.

control subsystem. The part of the controller that stores and executes the control program, and monitors the data transfers over the channel and transmission interfaces.

customer engineer. See IBM service representative

data circuit-terminating equipment (DCE). The equipment installed at the user's premises that provides all the functions required to establish, maintain, and terminate a connection, and the signal conversion between the data terminal equipment (DTE) and the line. For example, a modem is a DCE.

Note: The DCE may be a stand-alone equipment or integrated in the 3745.

data terminal equipment (DTE). That part of a data station that serves as a data source, data link, or both, and provides for the data communication control function according to protocols. For example, the 3174 and PS/2s are DTEs.

data host node. In a communication management configuration, a type 5 host node that is dedicated to processing applications and does not control network resources, except for its channel adapter-attached or communication adapter-attached devices. Synonymous with data host. See also communications management configuration host node.

direct attachment. The attachment of a DTE to another DTE without a DCE.

ESCON channel. A channel having an Enterprise System Connection* channel-to-control-unit I/O interface that uses optical cables as a transmission medium.

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ESCON channel adapter (ESCA). A communication controller hardware unit used to attach the controller to a host via ESCON fiber optics. An ESCA consists of an ESCON channel processor (ESCP) and an ESCON channel coupler (ESCC).

ESCON channel coupler (ESCC). A communication controller hardware unit which is the interface between the ESCON channel processor and the ESCON fiber optic cable.

ESCON channel processor (ESCP). A communication controller hardware unit which provides the channel data link control for the ESCON channel adapter.

distributed console access facility. (1) This program product provides a remote console function that allows a user at one programmable workstation (PS/2) to remotely control the keyboard input and monitor the display of output of another programmable workstation. The DCAF program does not affect the application programs that are running on the workstation that is being controlled. (2) An icon that represents the Distributed Console Access Facility.

enterprise systems chhnection (ESCON). A set of IBM products and services that provides a dynamically connected environment within an enterprise.

Host. See host processor

host processor. (1) A processor that controls all or part of a user application network. (2) In a network, the processing unit where the access method for the network resides. (3) In an SNA network, the processing unit that contains a system services control point (SSCP). (4) A processing unit that executes the access method for attached communication controllers.

High performance routing (HPR). An extension of APPN that provides faster traffic throughput, lower delays, and lower storage overheads.

IBM service representative. An individual in IBM who does maintenance services for IBM products or systems. Also called the IBM *Customer Engineer*.

initial microcode load (IML). The process of loading the microcode into an adapter, the MOSS, or the service processor.

internet. (1) A wide area network connecting disparate networks using the internetwork protocol (IP) (2) A public domain wide area network connecting thousands of disparate networks in industry, education, government and research. The Internet uses TCP/IP as the standard for transmitting information.

internet address. The numbering system used in IP internetwork communications to specify a particular network, or a particular host on that network with which to communicate.

internet control message protocol (ICMP). A protocol used by a gateway to communicate with a source host, for example, to report an error in a datagram. It is an integral part of the Internetwork Protocol (IP).

internetwork protocol. A protocol that routes data from its source to its destination in an internet environment. It is also called the *Internet Protocol*.

internetwork. Any wide area network connecting more than one network.

initial program load (IPL). The initialization procedure that causes the 3745 control program (NCP) to begin operation.

LAN-attached console. A PS/2 attached to the token-ring LAN that has the service processor attached. It is used to operate remotely the MOSS and MOSS-E functions.

IP router. A device that enables an Internetwork Protocol (IP) host to act as a gateway for routing data between separate networks.

line interface coupler (LIC). A circuit that attaches up to four transmission cables to the controller (from DTEs, DCEs or telecommunication lines).

locally administered address. In a local area network, an adapter address that the user can assign to override the universally administered address.

maintenance and operator subsystem - extended (MOSS-E). The licensed internal code loaded on the service processor hard disk to provide maintenance and operator facilities to the user and IBM service representative.

microcode. A program that is loaded in a processor (for example, the MOSS processor) to replace a hardware function. The microcode is not accessible to the customer.

modem (modulator-demodulator). See DCE.

multiple virtual storage (MVS). Multiple Virtual Storage, consisting of MVS/System Product Version 1 and the MVS/370 Data Facility Product operating on a System/370™ processor.

NetView. An IBM licensed program used to monitor a network, manage it, and diagnose its problems.

nonswitched line. A connection between systems or devices that does not have to be made by dialing. The

connection can be point-to-point or multipoint. The line can be leased or private. Contrast with *switched line.*.

ping. A simple IP application that sends one or more messages to a specified destination host requesting a reply. Usually used to verify that the target host exists, or that its IP address is a valid address.

remote console. A PS/2 attached to the 3746 Network Node either by a switched line (with modems) or by one of the communication lines of the user network.

remote technical assistance information network (RETAIN).

service processor. The processor attached to a 3745, 3746-900, and 3746-950 via a token-ring LAN.

remote support facility (RSF). RSF provides IBM maintenance assistance when requested via the public switched network. It is connected to the IBM RETAIN database system.

service representative. See IBM service representative

services. A set of functions designed to simplify the maintenance of a device or system.

switched line. A transmission line with which the connections are established by dialing, only when data transmission is needed. The connection is point-to-point and uses a different transmission line each time it is established. Contrast with *nonswitched line*.

synchronous data link control (SDLC). A discipline for managing synchronous, code-transparent, serial-by-bit information transfer over a link connection. Transmission exchanges may be duplex or half-duplex over switched or nonswitched links. The configuration of the link connection may be point-to-point, multipoint, or loop. SDLC conforms to subsets of the Advanced Data Communication Control Procedures of the American National Standards Institute and High-Level Data Link Control (HDLC) of the International Standards Organization.

synchronous transmission. Data transmission in which the sending and receiving instruments are operating continuously at substantially the same frequency and are maintained, through correction, in a desired phase relationship.

Token-ring adapter (TRA) type 3. 3746-900 and 3746-950 line adapter for IBM Token-Ring Network, composed of one token-ring processor card (TRP2), and two Token-Ring interface couplers type 3 (TIC 3s).

Token-ring interface coupler type 2 (TIC2). A circuit that attaches an IBM Token-Ring network to the 3745.

Token-Ring Interface Coupler type 3 (TIC3). A circuit that attaches an IBM Token-Ring network to the 3746-900 or 3746-950.

user access area. A specific area in the controller where the customer can install, remove, change, or swap couplers and cables without IBM assistance.

universally administered address. In a local area network, the address permanently encoded in an adapter at the time of manufacture. All universally administered addresses are unique.

user application network. A configuration of data processing products, such as processors, controllers, and terminals, for data processing and information exchange. This configuration may use circuit-switched, packet-switched, and leased-circuit services provided by carriers or PTT. Also called a *user network*.

V.24, V.35, and X.21. ITU-T (ex-CCITT) recommendations on transmission interfaces.

Bibliography

Customer Documentation for the 3745 (All Models), and 3746 (Model 900)

Table 15 (Page 1 of 6). Customer Documentation for the 3745 Models X10 and X1A, and 3746 Model 900

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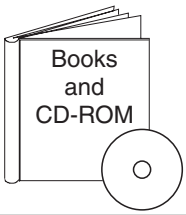
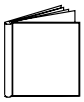


Finding Information

3745 Models A and 3746 Books

All of the books in the 3745 Models A and 3746 library are available on the CD-ROM that contains the Licensed Internal Code (LIC) for the machine.

Evaluating and Configuring



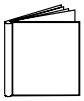
GA33-0092

IBM 3745 Communication Controller
Models 210, 310, 410, and 610

Introduction

Gives an introduction of the IBM Models 210 to 610 capabilities.

For Models A, refer to the *Overview*, GA33-0180.

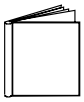


GA33-0180

IBM 3745 Communication Controller Models A and 170[2]
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Overview

Gives an overview of connectivity capabilities within SNA, APPN, and IP networking.



GA27-4234

IBM 3745 Communication Controller Models A[2]
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Overview, Installation, and Integration

Provides information for:

- Overall 3746 planning
- Installation and upgrade scenarios
- Controller and service processor network integration
- Related MOSS-E and CCM worksheets for these tasks.

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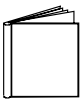
Table 15 (Page 2 of 6). Customer Documentation for the 3745 Models X10 and X1A, and 3746 Model 900



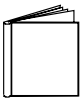
GA27-4235

IBM 3745 Communication Controller Models A[2]
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Serial Line Adapters

Provides information for:

- Serial line adapter descriptions
- Serial line adapter line weights and connectivity
- Types of SDLC support
- Configuring X.25 lines
- Performance tuning for frame-relay, PPP, X.25, and NCP lines.
- ISDN adapter description and configuration.



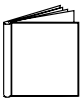
GA27-4236

IBM 3745 Communication Controller Models A[2]
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Token Ring and Ethernet

Provides information for:

- Token-ring adapter description and configuration
- Ethernet adapter desription and configuration.



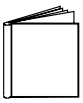
GA27-4237

IBM 3745 Communication Controller Models A[2]
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
ESCON Channels

Provides information for:

- ESCON adapter descriptions
- ESCON configuration and tuning information
- ESCON configuration examples.



GA27-4238

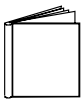
IBM 3745 Communication Controller Models A[2]
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Physical Planning

Provides information for:

- 3746 and MAE physical planning details
- 3746 and MAE cable information
- Explanation of installation sheets
- 3746 plugging sheets.

Table 15 (Page 3 of 6). Customer Documentation for the 3745 Models X10 and X1A, and 3746 Model 900



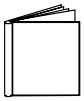
GA27-4239

IBM 3745 Communication Controller Models A²
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Management Planning

Provides information for:

- Overview for 3746
- 3746 APPN/HPR, IP router, and X.25
- NetView Performance Monitor (NPM), remote consoles, and RSF
- MAE APPN/HPR management.



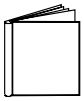
GA27-4240

IBM 3745 Communication Controller Models A²
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Multiaccess Enclosure Planning

Provides information for:

- MAE adapters details
- MAE ESCON planning and configuration
- ATM and ISDN support.



GA27-4241

IBM 3745 Communication Controller Models A²
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Protocols Description

Provides information for:

- Overview and details about APPN/HPR and IP.

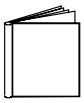
On-line information

IBM 3745 Communication Controller Models A²
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Controller Configuration and Management Worksheets

Provides planning worksheets for ESCON, Multiaccess Enclosure, serial line, and token-ring definitions.

Preparing Your Site



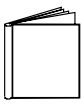
GC22-7064

IBM System/360™, System/370™, 4300 Processor

Input/Output Equipment Installation Manual-Physical Planning
(Including Technical News Letter GN22-5490)

Provides information for physical installation for the 3745 Models 130 to 610.

For 3745 Models A and 3746 Model 900, refer to the *Planning Guide*, GA33-0457.



GA33-0127

IBM 3745 Communication Controller
Models 210, 310, 410, and 610

Preparing for Connection

Helps for preparing the 3745 Models 210 to 610 cable installation.

For 3745 Models A refer to the *Connection and Integration Guide*, SA33-0129.

Table 15 (Page 4 of 6). Customer Documentation for the 3745 Models X10 and X1A, and 3746 Model 900

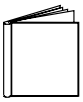
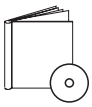
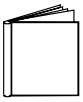
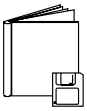
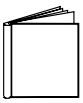
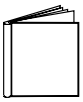
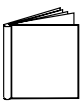
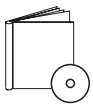
Preparing for Operation		
	GA33-0400	***IBM 3745 Communication Controller All Models***[3] ***IBM 3746 Nways Multiprotocol Controller*** ***Models 900 and 950*** ***Safety Information***[1] Provides general safety guidelines.
	SA33-0129	***IBM 3745 Communication Controller All Models***[3] ***IBM 3746 Nways Multiprotocol Controller Model 900*** ***Connection and Integration Guide***[1] Contains information for connecting hardware and integrating network of the 3745 and 3746-900 after installation.
	SA33-0416	***Line Interface Coupler Type 5 and Type 6*** ***Portable Keypad Display*** ***Migration and Integration Guide*** Contains information for moving and testing LIC types 5 and 6.
	SA33-0158	***IBM 3745 Communication Controller All Models***[3] ***IBM 3746 Nways Multiprotocol Controller Model 900*** ***Console Setup Guide***[1] Provides information for: • Installing local, alternate, or remote consoles for 3745 Models 130 to 610 • Configuring user workstations to remotely control the service processor for 3745 Models A and 3746 Model 900 using: – DCAF program – Telnet Client program – Java Console support.
Customizing Your Control Program		
	SA33-0178	***Guide to Timed IPL and Rename Load Module*** Provides VTAM procedures for: • Scheduling an automatic reload of the 3745 • Getting 3745 load module changes transparent to the operations staff.
Operating and Testing		
	SA33-0098	***IBM 3745 Communication Controller*** ***All Models***[4] ***Basic Operations Guide***[1] Provides instructions for daily routine operations on the 3745 Models 130 to 610.
	SA33-0177	***IBM 3745 Communication Controller Models A***[2] ***IBM 3746 Nways Multiprotocol Controller Model 900*** ***Basic Operations Guide***[1] Provides instructions for daily routine operations on the 3745 Models 17A to 61A, and 3746 Model 900 operating as an SNA node (using NCP), APPN/HPR Network Node, and IP Router.

Table 15 (Page 5 of 6). Customer Documentation for the 3745 Models X10 and X1A, and 3746 Model 900



SA33-0097

IBM 3745 Communication Controller
All Models[3]

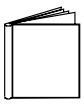
Advanced Operations Guide[1]

Provides instructions for advanced operations and testing, using the 3745 MOSS console.

On-line Information

Controller Configuration and Management Application

Provides a graphical user interface for configuring and managing a 3746 APPN/HPR Network Node and IP Router, and its resources.
It is also available as a stand-alone application, using an OS/2 workstation.
Defines and explains all the 3746 Network Node and IP Router configuration parameters through its online help.

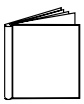


SH11-3081

IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Controller Configuration and Management: User's Guide[5]

Explains how to use CCM and gives examples of the configuration process.



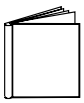
GA33-0479

IBM 3745 Communication Controller Models A
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

NetView Console
APPN Command Reference Guide

Explains how to use the RUN COMMAND from the NetView S/390 Program and gives examples.

Managing Problems



SA33-0096

IBM 3745 Communication Controller
All Models[3]

Problem Determination Guide[1]

A guide to perform problem determination on the 3745 Models 130 to 61A.

On-line Information

Problem Analysis Guide

An online guide to analyze alarms, events, and control panel codes on:

- IBM 3745 Communication Controller Models A[2]
- IBM 3746 Nways Multiprotocol Controller Models 900 and 950.

SA33-0175

IBM 3745 Communication Controller Models A[2]
IBM 3746 Expansion Unit Model 900
IBM 3746 Nways Multiprotocol Controller Model 950

Alert Reference Guide

Provides information about events or errors reported by alerts for:

- IBM 3745 Communication Controller Models A[2]
- IBM 3746 Nways Multiprotocol Controller Models 900 and 950.

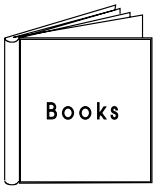
Table 15 (Page 6 of 6). Customer Documentation for the 3745 Models X10 and X1A, and 3746 Model 900

[1] Documentation shipped with the 3745.
[2] 3745 Models 17A to 61A.
[3] 3745 Models 130 to 61A.
[4] Except 3745 Models A.
[5] Documentation shipped with the 3746-900.

Additional Customer Documentation for the 3745 Models 130, 150, 160, 170, and 17A

Table 16. Additional Customer Documentation for the 3745 Models 130 to 17A

This customer documentation has the following format:

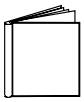


Finding Information

3745 Models A and 3746 Books

All of the books in the 3745 Models A and 3746 library are available on the CD-ROM that contains the Licensed Internal Code (LIC) for the machine.

Evaluating and Configuring



GA33-0138

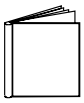
IBM 3745 Communication Controller
Models 130, 150, 160, and 170

Introduction

Gives an introduction about the IBM Models 130 to 170 capabilities, including Model 160.

For Model 17A refer to the *Overview*, GA33-0180.

Preparing Your Site



GA33-0140

IBM 3745 Communication Controller
Models 130, 150, 160, and 170

Preparing for Connection

Helps for preparing the 3745 Models 130 to 170 cable installation.

For 3745 Model 17A refer to the *Connection and Integration Guide*, SA33-0129.

[1] Documentation shipped with the 3745.

Customer Documentation for the 3746 Model 950

Table 17 (Page 1 of 4). Customer Documentation for the 3746 Model 950

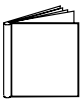
This customer documentation has the following formats:

Finding Information

3745 Models A and 3746 Books

All of the books in the 3745 Models A and 3746 library are available on the CD-ROM that contains the Licensed Internal Code (LIC) for the machine.

Preparing for Operation



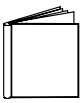
GA33-0400

IBM 3745 Communication Controller All Models[1]
IBM 3746 Expansion Unit Model 900
IBM 3746 Nways Multiprotocol Controller Model 950

Safety Information[2]

Provides general safety guidelines.

Evaluating and Configuring

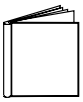


GA33-0180

IBM 3745 Communication Controller Models A and 170[3]
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Overview

Gives an overview of connectivity capabilities within SNA, APPN, and IP networking.



GA27-4234

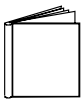
IBM 3745 Communication Controller Models A[2]
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Overview, Installation, and Integration

Provides information for:

- Overall 3746 planning
- Installation and upgrade scenarios
- Controller and service processor network integration
- Related MOSS-E and CCM worksheets for these tasks.

Table 17 (Page 2 of 4). Customer Documentation for the 3746 Model 950



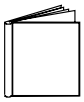
GA27-4235

IBM 3745 Communication Controller Models A2
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Serial Line Adapters

Provides information for:

- Serial line adapter descriptions
- Serial line adapter line weights and connectivity
- Types of SDLC support
- Configuring X.25 lines
- Performance tuning for frame-relay, PPP, X.25, and NCP lines.
- ISDN adapter description and configuration.



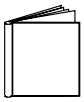
GA27-4236

IBM 3745 Communication Controller Models A2
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Token Ring and Ethernet

Provides information for:

- Token-ring adapter description and configuration
- Ethernet adapter description and configuration.



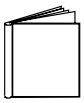
GA27-4237

IBM 3745 Communication Controller Models A2
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
ESCON Channels

Provides information for:

- ESCON adapter descriptions
- ESCON configuration and tuning information
- ESCON configuration examples.



GA27-4238

IBM 3745 Communication Controller Models A2
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Planning Series:
Physical Planning

Provides information for:

- 3746 and MAE physical planning details
- 3746 and MAE cable information
- Explanation of installation sheets
- 3746 plugging sheets.

Table 17 (Page 3 of 4). Customer Documentation for the 3746 Model 950

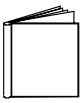
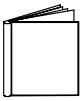
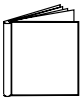
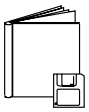
	GA27-4239	***IBM 3745 Communication Controller Models A[2]*** ***IBM 3746 Nways Multiprotocol Controller*** ***Models 900 and 950*** ***Planning Series:*** ***Management Planning*** Provides information for: • Overview for 3746 • 3746 APPN/HPR, IP router, and X.25 • NetView Performance Monitor (NPM), remote consoles, and RSF • MAE APPN/HPR management.
	GA27-4240	***IBM 3745 Communication Controller Models A[2]*** ***IBM 3746 Nways Multiprotocol Controller*** ***Models 900 and 950*** ***Planning Series:*** ***Multiaccess Enclosure Planning*** Provides information for: • MAE adapters details • MAE ESCON planning and configuration • ATM and ISDN support.
	GA27-4241	***IBM 3745 Communication Controller Models A[2]*** ***IBM 3746 Nways Multiprotocol Controller*** ***Models 900 and 950*** ***Planning Series:*** ***Protocols Description*** Provides information for: • Overview and details about APPN/HPR and IP.
	On-line information	***IBM 3745 Communication Controller Models A[2]*** ***IBM 3746 Nways Multiprotocol Controller*** ***Models 900 and 950*** ***Planning Series:*** ***Controller Configuration and Management Worksheets*** Provides planning worksheets for ESCON, Multiaccess Enclosure, serial line, and token-ring definitions.

Table 17 (Page 4 of 4). Customer Documentation for the 3746 Model 950

Operating and Testing



SA33-0356

IBM 3746 Nways Multiprotocol Controller
Model 950

User's Guide[2]

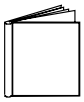
Explains how to:

- Carry out daily routine operations on Nways controller
- Install, test, and customize the Nways controller after installation
- Configure user's workstations to remotely control the service processor using:
  - DCAF program
  - Telnet client program
  - Java Console support.

On-line information

Controller Configuration and Management Application

Provides a graphical user interface for configuring and managing a 3746 APPN/HPR network node and IP Router, and its resources.
It is also available as a stand-alone application, using an OS/2 workstation.
Defines and explains all the 3746 Network Node and IP Router configuration parameters through its on-line help.

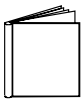


SH11-3081

IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

Controller Configuration and Management: User's Guide[2]

Explains how to use CCM and gives examples of the configuration process.



GA33-0479

IBM 3745 Communication Controller Models A
IBM 3746 Nways Multiprotocol Controller
Models 900 and 950

NetView Console
APPN Command Reference Guide

Explains how to use the RUN COMMAND from the NetView S/390 Program and gives examples.

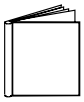
Managing Problems

On-line information

Problem Analysis Guide

An on-line guide to analyze alarms, events, and control panel codes on:

- IBM 3745 Communication Controller Models A[3]
- IBM 3746 Nways Multiprotocol Controller Models 900 and 950.



SA33-0175

IBM 3745 Communication Controller Models A[3]
IBM 3746 Expansion Unit Model 900
IBM 3746 Nways Multiprotocol Controller Model 950

Alert Reference Guide

Provides information about events or errors reported by alerts for:

- IBM 3745 Communication Controller Models A[3]
- IBM 3746 Nways Multiprotocol Controller Models 900 and 950.

[1] Models 130 to 61A.
[2] Documentation shipped with the 3746-950
[3] 3745 Models 17A to 61A.

Required Documentation

The following documents are indispensable for planning for your 3745/3746 controllers:

- *3745 Communication Controller Models A and 170, 3746 Nways Multiprotocol Controller Models 900 and 950: Overview*, GA33-0180
- *3745 Communication Controller All Models, 3746 Nways Multiprotocol Controller Model 900: Console Setup Guide*, SA33-0158.

Be sure to use the latest editions of the above documents.

Related Documentation

The following documents are also helpful for **planning** for your 3745/3746 controllers:

- *Planning for Integrated Networks*, SC31-8062
- *Planning and Reference for NetView, NCP, and VTAM*, SC31-7122.
- *Virtual Telecommunications Access Method V3 R4: Resource Definition Reference*, SC31-6438

The following Enterprise Systems Connection (**ESCON**) documents may be helpful:

- *Introducing the Enterprise Systems Connection*, GA23-0383
- *Enterprise Systems Connection Migration*, GA23-0383
- *Planning for Enterprise Systems Connection Links*, GA23-0367
- *Introducing Enterprise Systems Connection Directors*, GA23-0363.

The following *IBM International Technical Support Centers* “redbooks” are generally very helpful:

- *Frame Relay Guide*, GG24-4463
- *3746-900 and NCP Version 7 Release 2*, GG24-4464.

The following Network Control Program (**NCP**) documents may be helpful:

- For NCP V6 R2:
  - *Network Control Program V6 R2: Migration Guide*, SC31-6216
  - *Network Control Program V6 R2, ACF/SSP V3 R8, EP R11: Resource Definition Guide*, SC31-6209-01
  - *Network Control Program V6 R2, ACF/SSP V3 R8, EP R11: Resource Definition Reference*, SC31-6210-01
  - *Network Control Program V6 R2: Planning and Implementation Guide*, GG24-4012
  - *Network Control Program V6 R2, ACF/SSP V3 R8, EP R11: Library Directory*, SC31-6215.
- For NCP V6 R3:
  - *Network Control Program V6 R3: Migration Guide*, SC31-6217
  - *Network Control Program V6 R3, ACF/SSP V3 R9, EP R11: Resource Definition Guide*, SC31-6209-02
  - *Network Control Program V6 R3, ACF/SSP V3 R9, EP R11: Resource Definition Reference*, SC31-6210-02 Guide,
  - *Network Control Program V6 R3, ACF/SSP V3 R9, EP R11: Library Directory*, SC31-6218.
- For NCP V7 R1:
  - *Network Control Program V7 R1: Migration Guide*, SC31-6219
  - *Network Control Program V7 R1, ACF/SSP V4 R1, EP R12: Resource Definition Guide*, SC31-6223-00
  - *Network Control Program V7 R1, ACF/SSP V4 R1, EP R12: Resource Definition Reference*, SC31-6224-00
  - *Network Control Program V7 R1, ACF/SSP V4 R1, EP R12: Library Directory*, SC31-6220.

- For NCP V7 R2:
  - *Network Control Program V7 R2, ACF/SSP V4 R2, EP R12: Generation and Loading Guide*, SC31-6221.
  - *Network Control Program V7 R2: Migration Guide*, SC31-6258-00
  - *Network Control Program V7 R2, ACF/SSP V4 R2, EP R12: Resource Definition Guide*, SC31-6223-01
  - *Network Control Program V7 R2, ACF/SSP V4 R2, EP R12: Resource Definition Reference*, SC31-6224-01
  - *Network Control Program V7 R2, ACF/SSP V4 R2, EP R12: Library Directory*, SC31-6259.
- For NCP V7 R3:
  - *Network Control Program V7 R3: Migration Guide*, SC31-6258-01
  - *Network Control Program V7 R3, ACF/SSP V4 R3, EP R12: Resource Definition Guide*, SC31-6223-02
  - *Network Control Program V7 R3, ACF/SSP V4 R3, EP R12: Resource Definition Reference*, SC31-6224-02
  - *Network Control Program V7 R3, ACF/SSP V4 R3, EP R12: Library Directory*, SC31-6262.
- For NCP V7 R4:
  - *Network Control Program V7 R4: Migration Guide*, SC30-3786
  - *Network Control Program V7 R4, ACF/SSP V4 R4, EP R12: Resource Definition Guide*, SC31-6223-03
  - *Network Control Program V7 R4, ACF/SSP V4 R4, EP R12: Resource Definition Reference*, SC31-6224-03
  - *Network Control Program V7 R4, ACF/SSP V4 R4, EP R12: Library Directory*, SC30-3785.
- For NCP V7 R5:
  - *Network Control Program V7 R5: Migration Guide*, SC30-3833
  - *Network Control Program V7 R5, ACF/SSP V4 R4, EP R12: Resource Definition Guide*, SC31-6223-04
  - *Network Control Program V7 R5, ACF/SSP V4 R4, EP R12: Resource Definition Reference*, SC31-6224-04
  - *Network Control Program V7 R5, ACF/SSP V4 R4, EP R12: Library Directory*, SC30-3832.
- For NCP V7 R6:
  - *Network Control Program V7 R6: Migration Guide*, SC30-3833-01
  - *Network Control Program V7 R6, ACF/SSP V4 R4, EP R14: Resource Definition Guide*, SC31-6223-06
  - *Network Control Program V7 R6, ACF/SSP V4 R4, EP R14: Resource Definition Reference*, SC31-6224-06
  - *Network Control Program V7 R6, ACF/SSP V4 R4, EP R14: Library Directory*, SC30-3785.
- For NCP V7 R7:
  - *Network Control Program V7 R7: Migration Guide*, SC30-3889
  - *Network Control Program V7 R7, ACF/SSP V4 R4, EP R14: Resource Definition Guide*, SC31-6223-07
  - *Network Control Program V7 R7, ACF/SSP V4 R4, EP R14: Resource Definition Reference*, SC31-6224-07
  - *Network Control Program V7 R7, ACF/SSP V4 R4, EP R14: Library Directory*, SC30-3971.
- For NCP V7 R8:
  - *Network Control Program V7 R8: Migration Guide*, SC30-4024
  - *Network Control Program V7 R8, ACF/SSP V4 R8, EP R14: Resource Definition Guide*, SC31-6223-09

- *Network Control Program V7 R8, ACF/SSP V4 R8, EP R14: Resource Definition Reference*, SC31-6224-09
- *Network Control Program V7 R8, ACF/SSP V4 R8, EP R14: Library Directory*, SC30-4025.

The following **OS/2** document may be of some help:

IBM Extended Services® for OS/2 Programming Services and Advanced Problem Determination for Communications, SO4G-1007.

For the Distributed Console Access Facility (**DCAF**) Version 1.3 the following documents are needed:

- *DCAF: Installation and Configuration Guide*, SH19-4068
- *DCAF: User's Guide*, SH19-4069
- *DCAF: Target User's Guide*, SH19-6839.

To learn more about the **APPN** architecture, including high-performance routing (HPR), adaptive rate based flow and congestion control (ARB), dependent LU requesters/servers (DLURs/DLUSs), and other subjects, refer to:

- *Inside APPN - The Essential Guide to the Next-Generation SNA*, SG24-3669.
- *APPN Architecture and Protocol Implementations Tutorial* SG24-3669.

The following Virtual Telecommunications Access Method (**VTAM**), may be helpful:

- *Virtual Telecommunications Access Method V4R3: Resource Definition Reference*, SC31-6438.

For help with **TCP/IP**, refer to:

- *TCP/IP for MVS: Performance Tuning Guide*, SC31-7188.

To learn about token-ring configurations and the **IEEE 802.2** standard, refer to:

- *Token-Ring Network Architecture Reference*, SC30-3374.

These latest NetView documents may be helpful:

- *TME 10 NetView for OS/390 Version 1: Planning Guide*, GC31-8226
- *TME 10 NetView for OS/390 Version 1: Tuning Guide*, SC31-8240.

The following NetView Performance Monitor (**NPM**) documents are available:

- *NetView Performance Monitor: Concepts and Planning V2R2*, GH19-6961-01
- *NetView Performance Monitor: Concepts and Planning V2R3*, GH19-6961-02
- *NetView Performance Monitor: Concepts and Planning V2R4*, GH19-6961-03
- *NetView Performance Monitor: Concepts and Planning V3R1*, GH19-4221-00.

Index

Numerics

A

B

C

D

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E

F

H

U

V

X

Y

Tell Us What You Think!

3745 Communication Controller Models A
3746 Nways Multiprotocol Controller
Models 900 and 950
Planning Series:

Multiaccess Enclosure Planning

Publication No. GA27-4240-01

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	☐	☐

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Complete	☐	☐
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Easy to understand	☐	☐
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