



“C” Configuration Manager and NetEx[®] Alternate Path Retry (APR)

Release 4.0

Software Reference Manual

Revision Record

Revision	Description
01 (01/2001)	Reformat using nesi_man.dot (12/15/00) template.
02 (04/2002)	Updates to incorporate Protocol 4 information.

Portions of text which have been changed or added at this revision are indicated by a bar (“ | ”) in the margin. Minor editorial revisions are not indicated.

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Preface

This manual has two sections; the first, ““C” Configuration Manager” on page 1, describes the Network Executive Software “C” Configuration Manager (H925), release 1.0. The second, “Alternate Path Retry (APR)” on page 40, provides information about the NetEx Alternate Path Retry facility. Alternate Path Retry is a feature of Release 3.4 host-based NETWORK EXECutive (NetEx[®]) and Offload NetEx software and is based on route mapping and sorting performed by the Configuration Manager. The Configuration Manager section is intended only for users of the “C” version. However, the Alternate Path Retry section applies to all NetEx versions with this feature, including those with “C”, PASCAL, or FORTRAN versions of the Configuration Manager.

“C” Configuration Manager

This section describes the “C” Configuration Manager and is most useful to those who are responsible for managing the NCT.

“Introduction” on page 2 introduces and briefly describes the Configuration Manager facility.

“Operation” on page 3 explains the Configuration Managers, the network configuration statements, configuration commands, and PAM (Physical Address Map) file structure.

“NCT Configuration File Errors” on page 34 provides a listing and explanation of errors specific to the Network Configuration Table (NCT) File.

Readers are expected to be familiar with general concepts related to HYPERchannel[®] hardware. Readers are not expected to be familiar with NetEx before using this section. However, an understanding of programming and using the host operating system is required.

Alternate Path Retry (APR)

This section helps the NetEx user understand and use the Alternate Path Retry (APR) Facility. It supplements the NetEx software reference manuals, but does not replace them. This guide explains the interrelationship of NetEx commands when using Alternate Path Retry.

“Introduction” on page 41 introduces the Alternate Path Retry (APR) facility and provides definitions for terms used when discussing APR.

“Operation” on page 46 explains the path verification task, how internal paths work, and which commands automatically generate internal paths and path groups.

“Multi-Hop Network Definition” on page 61 provides examples of a typical multi-hop network.

Reference Material

The following manuals contain related information.

Number	Title and Description
MAN-CNET-CONFIG-MGR	<i>"C" Configuration Manager and NetEx Alternate Path Retry (APR) User Guide</i>
460280	<i>NCT Loader Software Reference Manual</i>
460580	<i>NetEx Application Programmer's Interface Software Reference Manual</i>
NS547	<i>NetEx General Information Manual</i>
460347	<i>Common CP NetEx User Guide</i>
MAN-REF-H210IP	<i>H210 NetEx for IBM MVS/SP, MVS/XA And MVS/ESA Software Reference Manual</i>
460194	<i>H260 NetEx for DEC VAX/VMS Software Reference Manual</i>
460237	<i>H280 NetEx for IBM VM/SP Software Reference Manual</i>
460222	<i>H290 NetEx for HIS GCOS 3 and GCOS8 Software Reference Manual</i>
460328	<i>H300 NetEx for Unisys 1100 Computer Systems Software Reference Manual</i>
460542	<i>H217 DX NetEx User Interface for IBM SP/XA/ESA Software Reference Manual</i>
460552	<i>H287 DX NetEx User Interface for IBM VM/CMS Installation and Application Reference Manual</i>
460594	<i>H307 DX NetEx User Interface for Unisys OS1100 Software Reference Manual</i>

Other vendor's manuals are listed below:

From StorageTek:

Number	Title and Description
460028	<i>HYPERchannel A71x Adapters Hardware Reference Manual</i>
460035	<i>HYPERchannel-50 A223 Adapter Hardware Reference Manual</i>
460451	<i>DX NB220 Host Interface for IBM or FIPS channels Installation and Maintenance Manual</i>
460527	<i>HYPERchannel® Message Formats and Protocol Encapsulation</i>

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These references are made for informational purposes only.

The diagnostic tools and programs described in this manual are **not** part of the products described.

Notice to the Customer

The installation information supplied in this document is intended for use by experienced System Programmers.

Document Conventions

The following notational conventions are used in this document.

Format	Description
displayed information	Information displayed on a CRT (or printed) is shown in <i>this font</i> .
user entry	<i>This font</i> is used to indicate the information to be entered by the user.
UPPERCASE	The exact form of a keyword that is not case-sensitive or is issued in uppercase.
MIXedcase	The exact form of a keyword that is not case-sensitive or is issued in uppercase, with the minimum spelling shown in uppercase.
bold	The exact form of a keyword that is case-sensitive and all or part of it must be issued in lowercase.
lowercase	A user-supplied name or string.
value	Underlined parameters or options are defaults.
<label>	The label of a key appearing on a keyboard. If "label" is in uppercase, it matches the label on the key (for example: <ENTER>). If "label" is in lowercase, it describes the label on the key (for example: <up-arrow>).
<key1><key2>	Two keys to be pressed simultaneously.
No delimiter	Required keyword/parameter.

Glossary

asynchronous: A class of data transmission service whereby all requests for service contend for a pool of dynamically allocated ring bandwidth and response time.

ASCII: Acronym for American National Standard Code for Information Interchange.

buffer: A contiguous block of memory allocated for temporary storage of information in performing I/O operations. Data is saved in a predetermined format. Data may be written into or read from the buffers.

code conversion: An optional feature in the adapter or host DX interface that dynamically converts the host data from one character set to another. An adapter configured with the code conversion has a special 1K RAM that is used for code conversion. This RAM can be loaded with any type of code (for example, ASCII, EBCDIC, et cetera).

Configuration Manager: A utility that parses a text NCT file into a PAM file.

Coprocessor NETwork EXecutive (CP NetEx): Resides on some types of Processor Interface (PI) boards and uses the processing and storage capacity of the board. This allows minicomputer users to use NetEx with minimal impact on host storage and processing.

Data Exchange Unit (DX unit or DXU): A chassis containing a nucleus processor, multiple customer-selectable interfaces, and/or coprocessors.

DX NetEx: A version of NetEx product specifically designed to operate from a DX unit, driven by software running on a host. DX NetEx resides on the P/NDNTx board.

Fiber Distributed Data Interface (FDDI): An American National Standards Institute (ANSI)-specified standard (X T9.5) for fiber optic links with data rates up to 100 Mbps. The standard specifies: multimode fiber; 50/125, 62.5/125, or 85/125 core-cladding specification; an LED or laser light source; and 2 kilometers for unrepeated data transmission at 40 Mbps.

header: A collection of control information transmitted at the beginning of a message, segment, datagram, packet, or block of data.

host: A data processing system that is connected to the network and with which devices on the network communicate. In the context of Internet Protocol (IP), a host is any addressable node on the network; an IP router has more than one host address.

Internet Protocol (IP): A protocol suite operating within the Internet as defined by the *Requests For Comment* (RFC). This may also refer to the network layer (level 3) of this protocol stack (the layer concerned with routing datagrams from network to network).

ISO: Acronym for International Standards Organization.

link: (1) A joining of any kind of DX networks. (2) The communications facility used to interconnect two trunks on a network.

Network Configuration Table (NCT): An internal data structure that is used by the NetEx configuration manager program to store all the information describing the network.

Network Configuration Table Loader (NCTL): An interactive NetEx application program used for configuring local or remote DX NetEx boards, updating their NetEx configuration parameters and/or Network Control Table. The NCT Loader takes a pamfile created by the Configuration Manager and transfers it to the NetEx Coprocessor through a NetEx connection.

NETwork EXecutive (NetEx): A family of software designed to enable two or more application programs on heterogeneous host systems to communicate. NetEx is tailored to each supported operating system, but can communicate with any other supported NetEx, regardless of operating system.

NetEx can reside on the host, on a processor interface board (obsolete), or in a DX unit. The latter two cases use host-resident drivers as interfaces.

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Open Systems Interconnection (OSI): A seven-layer protocol stack defining a model for communications among components (computers, devices, people, and et cetera) of a distributed network. OSI was defined by the ISO.

processor interface (PI): A PI interfaces a minicomputer with an adapter. The PI is a board(s) that contains a microprocessor and memory. The processor interface is generally installed in the host. Some types of PIs contain NetEx.

path: A route that can reach a specific host or group of devices.

TCP/IP: An acronym for Transmission Control Protocol/Internet Protocol. These communication protocols provide the mechanism for inter-network communications, especially on the Internet. The protocols are hardware-independent. They are described and updated through *Requests For Comment* (RFC). IP corresponds to the OSI network layer 3, TCP to layers 4 and 5.

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“C” Configuration Manager

Introduction

The Configuration Manager (CM) is a stand-alone program that is used to coordinate the management of configuration information for a NetEx network. There are two major components in CM: the NCT preprocessor and the PAM file generator. The NCT preprocessor reads as input a network configuration description file (text file). The network configuration describes the topology of the network. The preprocessor transforms this text file into an internal data structure called the Network Configuration Table (NCT). The second component creates a binary file based on user commands and the NCT. This binary file is used by the NetEx routing mechanism.

User Interface

The user interface involves building the NCT data file used by the Configuration Manager. The data file consists of configuration statements describing the network. Once this text file is created, the user executes the Configuration Manager program. The program is interactive and various commands may be given to generate what the user desires. The output, a binary file, is ready for NetEx use upon completion of the program. The configuration statements, CM commands, and program output are described in detail in the following sections.

Operation

Network Configuration Statements

Network configuration statements are used during the installation process to describe the user's IP and/or HYPERchannel network configuration to NetEx. The network configuration statements are placed in a network configuration file, which is used to generate the Network Configuration Table (NCT).

Network Configuration Statement Syntax

The following syntax rules apply to the Network Configuration statements.

- The entire 80 characters of each statement are scanned.
- All references to identifiers must be identical to the identifier. The same combination of upper and lowercase must be used (for example, T0=Beta references the label 'Beta' not 'BETA', 'beta', or any other combination).
- If a label is present, it must begin in the first character position of the statement, with no leading blanks. At least one space must separate the label from the statement type and the statement type from the parameters. If a label is missing, at least one blank must precede the statement type.
- All labels must be unique. They must be distinct from each other and from any names used by the Configuration Manager. This includes all statement names, key words, and adapter types.
All host group names must also be distinct from labels or Configuration Manager names.
- A comma (,) or blank is used to delimit the parameters of each statement.
- Continuation statements are denoted by at least one blank preceding the statement.
- If an asterisk is detected in the first character position of the statement, the entire statement is treated as a comment.

Network Configuration File

The configuration file contains the configuration manager statements that describe the user's network. Ten different statement types are used to describe this, as follows.

- VERSION - specifies the version of the network configuration. This value is recorded in the configuration record when the PAM file is built.
- LOCALNET - describes all equipment that is interconnected via one or more coaxial trunks. Statements describing the equipment on that network follow the LOCALNET statement.
- TRUNK –
 - For IP networks, TRUNK specifies a name used to identify connectivity to an IP network.
 - For HYPERchannel networks, TRUNK specifies a coaxial cable that is used to connect adapters on a 50 Mbps HYPERchannel network.

- FIBER - specifies a fiber-optic cable that is used to connect adapters. It can either be HYPERchannel-100 or FDDI.
- HOST - describes a host processor that has a connection to the network via one or more processor adapters.
- ADAPTER - specifies the address and characteristics of the processor adapter that is attached to the HOST.
- LINK - describes a connection to another local network via an AC710, AC715, BC715, NB701, or NB703 Link Adapter, an S720 Satellite Link Subsystem, or a B900 Network-to-Network Link.
- PORT - describes a communication line interface from the LINK to a similar PORT on a different LOCALNET.
- END - specifies the end of the network configuration.

In the following specifications, the format used is as described in the preface of this manual. Note that the statement types and parameters can be in upper or lower case, but labels and identifiers are case specific, as mentioned above.

Sorting the PAM List for Alternate Path Retry

The “C” Configuration Manager sorts the PAM list as follows.

1. Segment size (segsize - smallest to largest)
2. PAM length (physical length in bytes, smallest to largest)
3. Transmission rate (highest to lowest)
4. Delay (lowest to highest)

Alternate Path Retry (APR) provides the capability for connections to automatically reroute on different network paths when a failure on a path is detected. See the second section of this manual, “Alternate Path Retry (APR)” on page 40, for a detailed discussion of the APR facility. The “C” Configuration Manager makes APR available at any time, even during data transfer, since the next path will never have a smaller segment size. See “Commands” on page 23 (`makepam hostname ofilename [connapr | fullapr]`) for a discussion of the `makepam` command.

VERSION Statement

The VERSION statement defines a version number associated with this network description. It is purely for local version control and identification. The version should be incremented each time a significant change is made to the NCT. This allows confirmation that the PAM file being used corresponds to the NCT being examined, because the version number is recorded in the Configuration Record.

The VERSION statement has the following format.

Name	Statement	Parameters
[label]	VERSION	number

The following control words are used in the VERSION statement.

label

This optional name is ignored; it is allowed for commentary.

VERSION

This required string is the verb for this statement.

number

This required parameter specifies the version number of the NCT. The number is recorded in the configuration record and can be used to match the PAM file being used with the text NCT it came from.

LOCALNET Statement

The LOCALNET statement defines the name of the local network. The term 'local network' signifies Hosts, Adapters and Trunks sectioned into logical groups and separated by one of the high-speed communications links. The presence of a link does not necessarily mean that there are two local networks. A single LOCALNET may have S720 links connecting within itself. The first statement in the configuration file must be a LOCALNET statement. All TRUNK, HOST, ADAPTER, LINK, and PORT statements for that local network must follow the LOCALNET statement. The presence of a second LOCALNET statement, regardless of the label, will begin the description of a second local network. At least one LOCALNET statement must be present in any network configuration.

The LOCALNET statement has the following format.

Name	Statement	Parameters
[label]	LOCALNET	TYPE = HC FDDI

The following control words are used in the LOCALNET statement.

label

This optional control word specifies the name of this local network. This label should be used to make the NCT more readable. The label may be any name desired by the user which is one to eight alpha-numeric characters long. It must be unique from all other labels in the network configuration. A typical label would be the site ID of the network which is referenced by remote sites.

LOCALNET

This required string is the verb for this statement.

TYPE

This required parameter specifies the type of local network to be described. It must be specified as either HC or FDDI. HC stands for HYPERchannel network, while FDDI refers to a network using FDDI fiber. HC and FDDI are equivalent in their meaning, as NetEx uses both media in the same way. The FDDI type is included so that the network description can be more accurate. It will normally be used with the FIBER cable statement, but may also be used with TRUNK.

Note: NetEx/IP networks must be defined as TYPE=HC.

TRUNK Statement

For IP networks, the TRUNK statement identifies connectivity to an IP media. One trunk statement must be present for each unique IP network (or subnet) that is used by NetEx/IP. Adapters and/or servers connected to the IP Trunk are identified in subsequent HOST and ADAPTER statements. All rules regarding naming and placement of TRUNK statements are the same as those identified below for HYPERchannel trunks.

For HYPERchannel networks, the TRUNK statement identifies a 'run' of coaxial cable used in a local 50 Mbps HYPERchannel network. One trunk statement must be present for each run. Hardware connected to the trunk is identified in subsequent HOST and LINK statements. All TRUNK statements in a HYPERchannel local network must immediately follow the LOCALNET statement and precede all HOST and LINK statements that define the usage of the trunks. The range of a trunk is a single local network. A TRUNK defined in one LOCALNET may not be referenced in another.

A HYPERchannel trunk begins with a hardware terminator on a network adapter, proceeds through a series of adapters, and ends with another terminator on the last adapter. Each of these trunks is given a label so that NetEx software can determine the trunk paths used to communicate with any other adapter on the network. Note that the label is required.

The TRUNK statement has the following format.

Name	Statement	Parameters
label	TRUNK	

The following control words are used in the TRUNK statement.

label

This required control word specifies the name of this trunk. The label may be any name desired by the user which is from one to eight alphanumeric characters long. It must be unique from all other labels in the network configuration. Typical labels are ALPHA, BETA, etc.

TRUNK

This required string is the verb for this statement.

FIBER Statement

Note: FIBER statements are not used in NetEx/IP networks

The FIBER statement identifies a 'run' of fiber optic cable. This cable may either be a HYPERchannel-100 or a single or paired dual counter-rotating FDDI ring. Hardware connected to the fiber is identified in subsequent HOST and LINK statements. All FIBER statements in a HYPERchannel local network must immediately follow the LOCALNET statement and precede all HOST and LINK statements that define the usage of the trunks. The range of a fiber is a single local network. A FIBER defined in one LOCALNET may not be referenced in another.

Note that TRUNK and FIBER statements may be mixed freely.

If the FIBER represents a HYPERchannel-100 cable, it is exactly like a HYPERchannel coaxial cable. It is identified by a label and referred to by the T0, T1, T2, and T3 parameters on ADAPTER or LINK statements. This allows the configuration manager (and NetEx) to determine which trunks (and trunk mask) to use.

If the FIBER represents an FDDI ring, then while it is referenced on T0, T1, T2, and T3 parameters, it does not matter which is used, as other hardware processing replaces the trunk mask. Typically, a LOCALNET will have only one FDDI ring although multiple rings within a LOCALNET are possible.

Note that the label is required on the FIBER statement.

The FIBER statement has the following format.

Name	Statement	Parameters
label	FIBER	

The following control words are used in the FIBER statement.

label

This required control word specifies the name of this fiber. The label may be any name desired by the user which is from one to eight alphanumeric characters long. It must be unique from all other labels in the network configuration. Typical labels are ALPHA, BETA, etc.

FIBER

This required string is the verb for this statement.

HOST Statement

The HOST statement provides NetEx with information about a particular host in the network. One HOST statement is required for each host in the network.

The HOST statement must follow the LOCALNET and TRUNK statements for that local network. All ADAPTER statements describing the configuration of the host must immediately follow the HOST statement. Note that the label is required. The parameters TYPE, MODEL, and OS are for readability only and may be omitted. The parameters GROUP and PROTOCOL are used as needed and may be repeated within a single HOST statement.

The HOST statement has the following format.

Name	Statement	Parameters
label	HOST	[TYPE = manufacture_product_line] [MODEL = model_number] [OS = operating_system_name] [GROUP = group_name] [VALDREF = xxxx] [OPTIONS = ALTFIRST] NOAPR PROTOCOL = n [, PROTOCOL = n]

The following control words are used in the HOST statement.

label

This required control word specifies the logical name of the host. This label is to be the same name specified in the HNAME field of user connections. The label may be any name (one to eight characters long) chosen by the user. It must be unique from all other labels in the network configuration.

HOST

This required string is the verb for this statement.

TYPE

This optional parameter specifies the physical characteristics of the HOST by defining the trade name of the manufacturer's CPU product line. This parameter should be used to make the NCT more readable. The manufacturer_product_line may be an alphanumeric string from one to eight characters long.

MODEL

This optional parameter specifies the model number within the manufacturer's product line. This parameter should be used to make the NCT more readable. The model_number may be an alphanumeric string from one to eight characters long.

OS

This optional parameter specifies the operating system running on the machine. This parameter should be used to make the NCT more readable. The operating_system_name may be an alphanumeric string from one to eight characters long.

GROUP

This optional parameter specifies the logical name of a group of hosts that this HOST belongs to. If this HOST fits into more than one group, this parameter may be specified as many times as needed. The group_name may be an alphanumeric string from one to eight characters long. The GROUP parameter is used for Alternate Path Retry to a cluster of hosts (see the Introduction of "Alternate Path Retry (APR)").

The `group_name` must be distinct from all labels used in the configuration. It must also be distinct from all configuration manager reserved words, including all adapter identifiers.

VALDREF

This optional parameter specifies alternate drefs for valid communication with this host. This is primarily for documentation purposes.

OPTIONS

This optional parameter specifies several special options. The `ALTFIRST` option indicates that when this is the local host, the local NetEx should, if it supports it, rotate which alternate path it tries first on successive `SCONNECT` requests. This is currently only supported by a few NetExes. The `NOAPR` options indicates that this host either can not or wishes not to engage in APR. It instructs remote NetExes not to attempt APR to it.

PROTOCOL

This optional parameter specifies the protocol level of NetEx that will be used with this configuration. `n` may be specified as any decimal integer from 1 to 16. The number selected corresponds to the protocol level. When more than one level is acceptable, this parameter may be repeated, each time specifying a different level number. If a host is defined to belong to a `GROUP`, all the hosts in that group must have the same protocols selected.

Currently, this parameter must be specified as either `PROTOCOL=2` or `PROTOCOL=4`. If it is not specified, `PROTOCOL=2` is used as the default.

PROTOCOL=2 indicates that this NetEx/IP host supports the NetEx/IP Type-2 protocol. This protocol results in more static usage of network bandwidth, and is usually preferred in local environments (LAN), or in short-distance configurations (e.g. < 500 miles).

PROTOCOL=4 indicates that this NetEx/IP host supports the NetEx/IP Type-4 protocol. This protocol provides the ability for NetEx/IP to dynamically maximize the network performance, based on factors such as available bandwidth, distance, and workload on the network. To use Type-4 protocol on any given NetEx/IP connection, `PROTOCOL=4` must be specified on the remote `HOST` definitions in the Configuration File, and optionally on the local `HOST` definition. If the local host NetEx/IP supports Type-4 protocol, it will be used on any connections to remote hosts for which `PROTOCOL=4` is specified, regardless of how this parameter is specified, and also on any incoming Type-4 connections. Otherwise, Type-2 protocol is used.

ADAPTER Statement

The ADAPTER statement describes each adapter to NetEx. The ADAPTER statements for each adapter attached to a host must immediately follow the HOST statement.

The ADAPTER statement has the following format.

Name	Statement	Parameters
[label]	ADAPTER	<pre> MODEL = nxxx NETADDR = xx [SMGDREF = xx] [SMGNREF = xxxx] [CHANADDR = [c]cud] [NUMADDRS = n] [OPTIONS = 8KMEM] CODECONV CRC USEEMSG] [DEVNAME = device_name] For Axxx or Nxxx adapters only: T0 = label T1 = label T2 = label T3 = label For A4xx, B4xx, and N40x adapters only: PORT = 0 . . 16 [ADAPT = label] [INTERFACE = P xx] </pre>

The following control words are used in the ADAPTER statement.

label

This optional control word specifies a symbolic name for the processor adapter. The label may be any name desired by the user, which is from one to eight alphanumeric characters long. It must be unique from all other labels in the network configuration. Its presence is optional unless this ADAPTER statement is defining a multiport A4xx, N40x, or B4xx adapter.

ADAPTER

This required string is the verb for this statement.

MODEL

This required parameter defines the type of adapter attached to the HOST. Only processor adapters may be specified. Use the following as a guide when defining ADAPTER models:

Adapter type	Model	Example NetEx
Channel-attached adapters:		
NESiGate or DXE	N220	H210IP, H300IP
DXE	N220	H210, H300
Channel or LAN Offload adapters:		
NESiGate or DXE	N130	H217IP, H307IP, H267IP, H367IP
DXE	N130	H217, H307, H367R
Host-NIC adapters:		
IP	N130	H140IP, H320IP, H620IP H690IP, H800IP
HC	N130	H260FD, H320FD, H620FD, H690FD

NETADDR

This required parameter defines the hexadecimal network address of the adapter on the local network. The operand xx consists of two hexadecimal digits that specify the eight-bit adapter address. It must be unique from all other NETADDRs in this specific LOCALNET. This operand is required in all ADAPTER definitions.

SMGDREF

This optional parameter specifies the subaddress for this host's session manager. This value corresponds to a specific task within the host. It consists of two hexadecimal integer digits. The default value is '00'. This operand need not be specified unless the user wishes to change the default; in that case, the SMGDREF must be defined on all ADAPTER statements referencing the host.

The SMGDREF assigned must be the complete dref for that adapter. For A22x or N220 adapters, this means adding in the offset of the two low-order hex digits from the CHANADDR (ex. CHANADDR=240, if dref=01 then SMGDREF=41). For A4xx, B4xx, and N400 adapters, the SMGDREF must represent the PORT number in the two low-order bits (ex. PORT=1, if dref=04 then SMGDREF=05). In these cases, the SMGDREF must be defined, unless it computes to be 00.

For Nxxx adapters with DX NetEx, SMGDREF must be the lowest address assigned to NDNT1 NetEx GNA addresses.

Another case in which the user would need to specify a specific SMGDREF value would be if there are multiple copies of NetEx running on the host to which this ADAPTER statement refers. The easiest way to assign values to the SMGDREFs is to start at '00' and count up to the number of applications. For example, if there are three applications using NetEx on a PDP11, the following would be acceptable.

```

PDP1    HOST
A1      ADAPTER  MODEL = A400, NETADDR = 01, SMGDREF = 01,
          T3 = Alpha, PORT = 1, INTRFACE = PI11

PDPapp1 HOST
        ADAPTER  MODEL = A400, NETADDR = 01, SMGDREF = 09,
          T3 = Alpha, PORT = 1,

```

```

                                INTRFACE = PI11
PDPapp2 HOST
    ADAPTER  MODEL = A400, NETADDR = 01, SMGDREF = 05,
            T3 = Alpha, PORT = 1,
            INTRFACE = PI11

```

The above statements describe a host with a single physical adapter at address 0116. There are three tasks running on the host at subaddress 01, 09, and 0516. Keep in mind that the three ADAPTER statements are describing only one physical adapter.

In the case where there is more than one physical adapter connected to a multi-task host, all adapters need to be described. In this case, there would be multiple ADAPTER statements for each physical adapter, and SMGDREF would be defined on each statement. The group of ADAPTER statements describing one physical adapter may have the same SMGDREFs as the other ADAPTER statements describing the other physical adapters.

SMGNREF

This optional parameter specifies the transport reference subaddress for this host's session manager. This value corresponds to a specific process within a task specified by SMGDREF. It consists of four hexadecimal digits. The default value is 'FFFF'. This operand need not be specified unless the user wishes to change the default, in which case the operand must be defined on all ADAPTER statements referencing this host.

There are no conditions at the present time which would require the user to change the default. Therefore, SMGNREF should not be used except for documentation in the configuration file, and in that case it should be defined as 'FFFF'.

When describing a group of hosts, all the SMGNREFs for each host in the group must be the same.

CHANADDR

This required parameter (required for A22x, B22x, or N220 adapters only, optional for all others) specifies the lowest channel device address of a group of devices to be used by the NetEx software on an IBM or Unisys system. This channel unit address must be expressed as three or four hexadecimal digits (example: CHANADDR = 3C0, CHANADDR = 5100). Normally, NetEx is given a contiguous range of channel device addresses responded to by the A22x or N220 Processor Adapter. CHANADDR specifies the first. If A22x or N220 unit addresses are used by other software such as the RDS CPU-device facility, the unit addresses used by other software products should not be specified in the NetEx network configuration. If a multi-task adapter is defined, each CHANADDR must be unique.

When describing an Nxxx adapter with DX NetEx, the channel unit specified must be the same as the SMGDREF and the channel number is irrelevant.

NUMADDRS

This required parameter (required for A22x, B22x, or N220 adapters only, optional for all others) specifies the maximum number of channel unit addresses that will be used by the IBM NetEx software. The number of addresses must be expressed as a decimal number (example: NUMADDRS = 32). The minimum required is 2. The maximum allowed is 64.

OPTIONS

Note: this parameter is not applicable to NESiGate adapters.

This optional parameter specifies several hardware options. This information will be stored as a bit mask; any options selected will set the corresponding bit in the mask. CODECONV and 8KMEM are represented as the rightmost two bits in the mask. The CRC option represents the presence of the ESP CRC board. The USEEMSG option indicates the presence of an N series unit with support for

Extended messages. If this is a host adapter, USEEMSG should only be specified if the NetEx supports the use of extended messages (currently, only DX NetEx supports this.)

DEVNAME

This optional parameter specifies a logical device name for this adapter. The device_name may be from one to eight alphanumeric characters.

T0, T1, T2, and T3

These required parameters (Axxx or Nxxx adapters only) define the IP media or HYPERchannel trunks that are attached to the network adapter. At least ONE operand must be defined for each adapter. The associated labels specify the label of a preceding TRUNK statement. The referenced TRUNK must be defined in this LOCALNET. For HYPERchannel trunks, the physical placement of the trunks in the back of the adapter is quite important; T0 is the trunk interface on the left as one faces the back of the adapter, and T3 is the rightmost trunk interface. If any of the four operands are missing, the adapter is assumed not to have a trunk interface in that position.

PORT

This required parameter (A4xx, B4xx, and N40x adapters only) specifies the port number to which the associated HOST is attached. This value is specified as a decimal integer. The Configuration Manager accepts ports 0 through 16. This is to support the B444, which has ports numbered 1 to 16. A/B/N400 have only ports 0 through 3. This is not checked by CM.

ADAPT

This parameter (A4xx, B4xx, N40x adapters only) is required only if several host processors are connected to a single A4xx, B4xx, or N40x type network adapter, or if a single processor has more than one interface to a single A4xx, B4xx, or N40x adapter. Otherwise, it is not required. This value is specified as one to eight alphanumeric characters.

Of all the ADAPTER statements for a multi-port adapter, only one may have its label specified. That one will be referred to as the 'main' adapter. The main adapter should not have its ADAPT parameter specified. All subsequent ADAPTER statements referencing the main one must specify their ADAPT parameters to be the label of the main adapter. MODEL, NETADDR, and Tx parameters on subsequent ADAPTER statements must agree with those parameters for the main ADAPTER definition. The ADAPTER statements may be in any order, but the main adapter must have a label specified.

The ADAPT parameter is not used in defining a multi-task adapter. However, it may be used when defining a multi-task, multi-port adapter. The following examples describe the same configuration in two different ways to explain the ADAPT parameter when defining a multi-task, multi-port adapter.

```
H1      HOST
main   ADAPTER  MODEL=A400, NETADDR=01, T0=Alpha,
        PORT=1, SMGDREF=01

H2      HOST
        ADAPTER  MODEL=A400, NETADDR=01, T0=Alpha,
        PORT=1, SMGDREF=05

H3      HOST
        ADAPTER  MODEL=A400, NETADDR=01, T0=Alpha,
        PORT=2, SMGDREF=02, ADAPT=main
```

Another way:

```
H1      HOST
        ADAPTER  MODEL=A400, NETADDR=01, T0=Alpha,
        PORT=1, SMGDREF=01, ADAPT=main

H2      HOST
```

```
ADAPTER MODEL=A400, NETADDR=01, T0=Alpha,  
PORT=1, SMGDREF=05, ADAPT=main  
H3 HOST  
main ADAPTER MODEL=A400, NETADDR=01, T0=Alpha,  
PORT=2, SMGDREF=02,
```

INTRFACE

This optional parameter (A4xx, B4xx, and N40x adapters only) specifies the type of interface used to connect the host to the adapter. This operand is not currently used by NetEx and therefore is for readability only. The option may be any name desired by the user which is from one to eight alphanumeric characters long. Current INTRFACE options include PI10, PI11, PI12, PI13, PI14, PI15, PI16, PI20, PI30, PI32, PI40, PI27 (for PI270), PI37 (for PI370), and UN49.

LINK Statement

Note: LINK statements are not used in NetEx/IP networks.

The LINK statement is used to specify a network adapter on the current LOCALNET that is a gateway to some other local network.

The LINK statement has the following format.

Name	Statement	Parameters
[label]	LINK	MODEL = nxxx NETADDR = xx OPTIONS = USEEMSG For A7xx or N7xx links only: T0 = label T1 = label T2 = label T3 = label For A715, B715, and N7xx links only: [MODE710=nn]

The following control words are used in the LINK statement.

label

This optional control word specifies a symbolic name for this link. The label may be any name desired by the user which is from one to eight alphanumeric characters long. It must be unique from all other labels in the network configuration.

LINK

This required string is the verb for this statement.

MODEL

This required parameter specifies the type of link adapter.

NETADDR

This required parameter specifies the eight-bit hexadecimal address or addresses of the link adapter on the local network. The operand must be expressed as two hexadecimal digits. It must be unique from all other NETADDRs in this specific LOCALNET. In the case of the AC710 adapter, it should contain the same setting as is found on the back of the AC710 adapter. The AC710 is unique in that the switch settings do not reflect the actual address of the adapter. Rather, from one to eight ranges of 32 addresses are selected based on the bit pattern specified by the hexadecimal value in the switches.

The S720 Satellite Link Subsystem (SLS) consists of two basic units: the A721 Transmit Adapter and the A722 Receive Adapter. Only the S720 needs to be described in the configuration when defining an SLS. The S720's NETADDR specifies the A721 network address. The corresponding A722 always has an address that is one (1) greater than the A721. No other adapter on this local network may specify the same NETADDR as the A721 or A722. Remember the A721 and A722 adapters are implicitly defined when the S720 is defined.

The AC715 and BC715 links have as their NETADDR the address of the SLS in 720-mode. This represents a single address, not two addresses as does the basic S720 link described above.

N7xx links have as their NETADDR the base address used for SLS 720 mode operation (as with the 715 units).

OPTIONS

This optional parameter specifies several hardware options. The USEEMSG option (the only currently supported option on the LINK statement) indicates the presence of an N series unit with support for Extended message transfers.

T0, T1, T2, and T3

These required parameters (ACxxx, S72x, and NB7xx Link Adapters™ only) define the trunks that are attached to the link adapter. At least one operand must be defined for each link. The associated labels specify the label of a preceding TRUNK statement. The physical placement of the trunks in the back of the adapter is quite important; T0 is the trunk interface on the left as one faces the back of the adapter, and T3 is the rightmost trunk interface. If any of the four operands are missing, the adapter is assumed not to have a trunk interface in that position.

MODE710

This optional parameter (AC715, BC715, and NB7xx Link Adapters only) specifies the eight-bit hexadecimal address that the link will accept when it is in 710 mode. This parameter is repeated for each address desired. If no address is to be accepted in the 710 mode, this parameter may be omitted. Ensure that each address used is also profiled into the corresponding link adapter's Translate Table. The operand must be expressed as two hexadecimal digits.

PORT Statement

One PORT statement must be supplied following each LINK statement. PORT statements have two major functions: to identify the link adapter on the other side of the communications link and to describe certain characteristics of the link.

Each communications link has two PORT statements that each describe one end of the link. Each of the two PORT statements follow the LINK statement that describes the link adapter configuration on each end, and the two LOCALNET statements that describe the two local networks connected by the communications line. Note that the port_lab is required.

The PORT statement has the following format.

Name	Statement	Parameters
port_lab	PORT	DEST = port_lab For A7xx, N7xx, S72x, B715, and B9xx links: RATE = nnK DELAY = nnnnM [SEGSIZE = nnnnn]

The following control words are used in the PORT statement.

port_lab

This required control word specifies a symbolic name for this port. The port_lab may be any name desired by the user which is from one to eight alphanumeric characters long. It must be unique from all other labels in the network configuration. This port_lab is used in conjunction with the DEST=port_lab parameter on other PORT statements.

PORT

This required string is the verb for this statement.

DEST

This required parameter specifies the label of the PORT statement describing the other end of the communications link in another local network.

RATE

This required parameter (AC7xx, NB7xx, S72x, BC715, and B9xx links only) describes the communications speed of the line in 1000 bits per second. This value is used by the NetEx software to plan for buffer usage and buffer size requirements. RATE is expressed as a decimal number followed by 'K' representing 1000 bits per second.

DELAY

This required parameter (AC7xx, NB7xx, S72x, BC715, and B9xx links only) specifies the propagation delay of the communications line in milliseconds. The delay is expressed as the length of time needed for a signal to go from one end of the communications line to the other end. For terrestrial links of under 30 miles, DELAY = 0 (the default) is acceptable. For longer terrestrial links, or satellite links this value must be specified for optimum performance on the link. DELAY is expressed as a decimal number followed by 'M' representing one millisecond. As a general rule, one millisecond of delay is equal to 100 miles.

SEGSIZE

This optional parameter specifies the maximum data transmission size in bytes for this link. SEGSIZE is expressed as a decimal number. 4096 is the maximum for 10 Mb links, 65535 for 50 Mb links.

END Statement

The END statement indicates the end of the Network Configuration statements. This must be the last network configuration statement.

The END statement has the following format.

Name	Statement	Parameters
	END	

The following control word is used in the END statement.

END

This required string is the verb for this statement.

Network Configuration Example

Figure 1 shows a possible network configuration. The associated statements needed to define the network are shown in Figure 2.

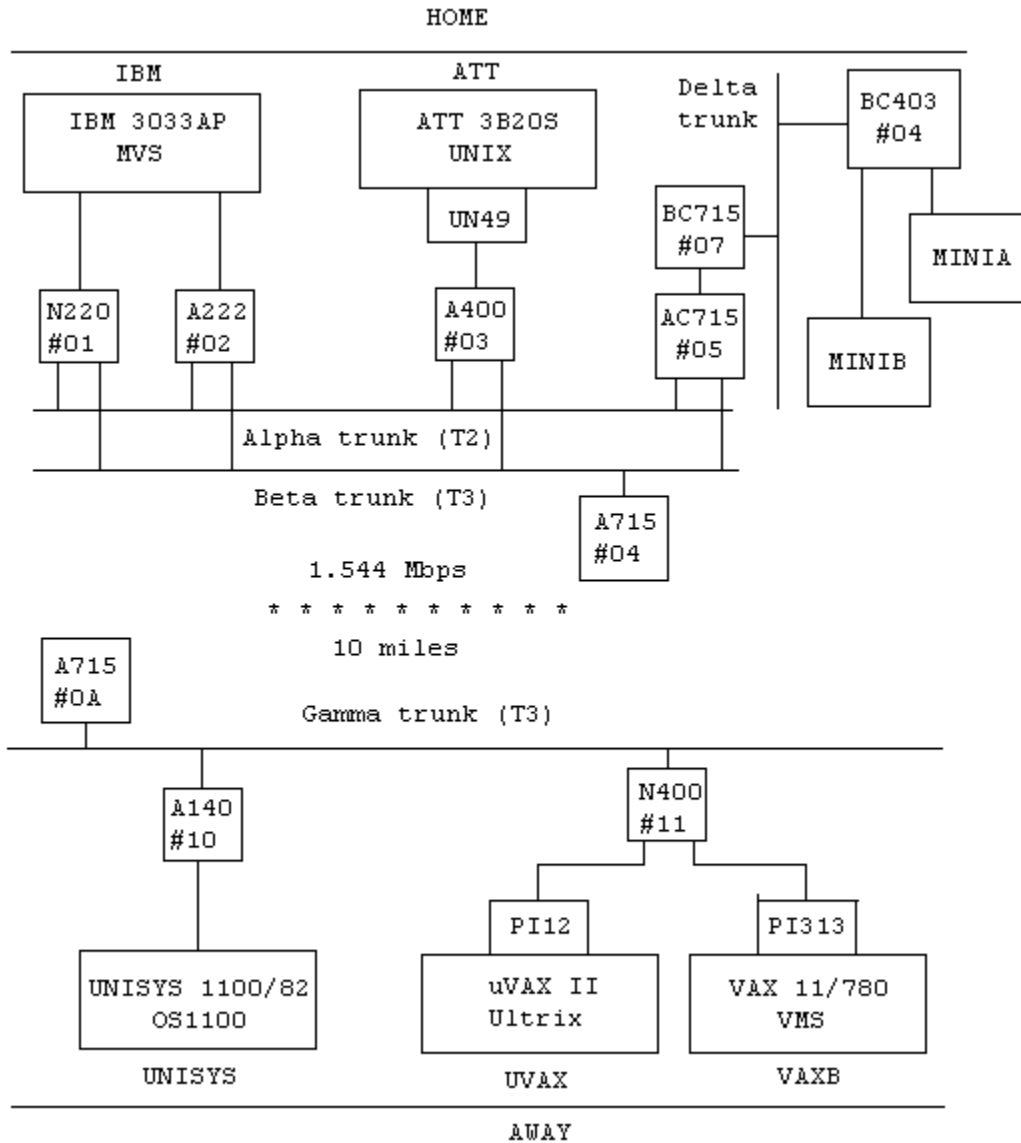


Figure 1. Sample Network Configuration

```

* DESCRIBE 'HOME' NETWORK
HOME      LOCALNET TYPE=HC
ALPHA     TRUNK
BETA      TRUNK
*
* DEFINE CONFIGURATION FOR IBM PROCESSOR
IBM       HOST          TYPE=IBM,MODEL=3033AP,OS=MVS,PROTOCOL=2
          ADAPTER       MODEL=N220,NETADDR=01,T2=ALPHA,T3=BETA,
          CHANADDR=270,NUMADDRS=4,SMGDREF=73
          ADAPTER       MODEL=A222,NETADDR=02,T2=ALPHA,T3=BETA,
          CHANADDR=320,NUMADDRS=4,SMGDREF=23
*
* DEFINE CONFIGURATION FOR VAX PROCESSOR
ATT       HOST          TYPE=ATT,MODEL=3B20S,OS=UNIX,PROTOCOL=2
ATTA400   ADAPTER       MODEL=A400,NETADDR=03,T2=ALPHA,T3=BETA,
          PORT=0,INTRFACE=UN49,SMGDREF=04
*
* LINK ADAPTER CONNECTING TO 'AWAY' LOCAL NETWORK
          LINK          MODEL=A715,NETADDR=04,T3=BETA,
          MODE710=10,MODE710=11
HOMEPEP   PORT          DEST=AWAYP,RATE=1544K,DELAY=0M
*
* LINK ADAPTER (SLS) CONNECTING TO 'BUSNET' LOCAL NETWORK
          LINK          MODEL=A715,NETADDR=05,T2=ALPHA,T3=BETA
CHANLINK   PORT          DEST=BUSLINK,RATE=1544K,DELAY=01M
*
* DESCRIBE 'BUSNET' NETWORK
BUSNET    LOCALNET TYPE=HC
* DEFINE THE BUS ON 'BUSNET' NETWORK
DELTA     HB
*
* DEFINE CONFIGURATION FOR VAX PROCESSOR ON 'BUSNET' NETWORK
MINIA     HOST          TYPE=MICROVAX,OS=VMS,MODEL=2,PROTOCOL=2
ADAPT04   ADAPTER       MODEL=B403,NETADDR=04,BUS=DELTA,
          PORT=0,SMGDREF=0C
MINIB     HOST          TYPE=MICROVAX,OS=VMS,MODEL=2,PROTOCOL=2
          ADAPTER       MODEL=B403,NETADDR=04,BUS=DELTA,
          PORT=1,SMGDREF=0D,ADAPT=ADAPT04
*
* LINK ADAPTER (SLS) BACK TO 'HOME' NETWORK
          LINK          MODEL=B715,NETADDR=07,BUS=DELTA
BUSLINK   PORT          DEST=CHANLINK,RATE=1544K,DELAY=01M
*
* DESCRIBE 'AWAY' NETWORK
AWAY      LOCALNET TYPE=HC
GAMMA     TRUNK
*
* DESCRIBE HOSTS ON 'AWAY' NETWORK
UNISYS    HOST          TYPE=UNISYS,MODEL=1100,OS=OS1100,PROTOCOL=2
          ADAPTER       MODEL=A140,NETADDR=10,T3=GAMMA,SMGDREF=00
*
UVAX      HOST          TYPE=VAX,MODEL=11/780,OS=Ultrix,PROTOCOL=2
UVAXADAP  ADAPTER       MODEL=N400,NETADDR=11,T3=GAMMA,PORT=0,
          INTRFACE=PI12,SMGDREF=08
*

```

```
VAXB      HOST      TYPE=VAX,MODEL=780,OS=VMS,PROTOCOL=2
          ADAPTER   MODEL=N400,NETADDR=11,T3=GAMMA,PORT=1,
          INTRFACE=PI313,SMGDREF=01,ADAPT=UVAXADAP
*
* LINK ADAPTER BACK TO 'HOME' NETWORK
          LINK      MODEL=A715,NETADDR=0A,T3=GAMMA,
          MODE710=02,MODE710=03,MODE710=05
AWAYP     PORT      DEST=HOME,RATE=1544K,DELAY=0M
* END DEFINITION
          END
```

Figure 2. Sample Network Description

Commands

The NCT preprocessor is the major component of the configuration preprocessor. This program accepts NCT data files and builds files of PAM lists. It is designed to work from an input data file. This can be either the user's terminal or a disk file.

The preprocessor program is started by the user as a task. It prompts the user for commands, then responds accordingly. The commands are listed and explained as follows.

nct *ifilename*

This command tells the preprocessor to read new NCT data. The data is read from the file whose name is given. This file must have 64-character fixed length records. Any existing tables are thrown away, and the new file is read. The internal representation for the network is built from the NCT data in the file, and then the validity of the structure is verified. This command is required before any `makepam` commands.

select *hostname*

select *

This command is used to select which hosts should be used as destinations in generating the PAM List file. The `makepam` command clears the list of selected hosts. If no hosts are selected, or a `select *` statement is given, then all hosts are used.

deselect *hostname*

This command is used to de-select host and group names that should not be used as destinations. The most common use of this command would be after the `select *` command, to take a few hosts out of the list that was selected. The `makepam` command will take out of the select list those hosts in the `deselect` list. It will clear the list of deselected hosts after building the file.

makepam *hostname ofilename [connapr | fullapr]*

This command tells the preprocessor to generate a PAM List file from the current network data structure read in by the last NCT command. Hence, an NCT command must have been given before this command is legal. The preprocessor first builds the host configuration entry for the specified host. Then it builds the PAM Lists for the paths from the specified host to all selected hosts on the network and writes all this information to a file. If no `select` statements have been given, then all hosts on the network are selected. The file is written under the given filename. This command implicitly clears the list of selected hosts when it has finished writing the file.

The `connapr` or `fullapr` parameter is optional. If omitted, `connapr` is assumed. These parameters allow the person building the PAM file to optimize paths for different circumstances. Because different paths may have different segment sizes, Alternate Path Retry may need to take account of this difference. If `connapr` is specified, then no effort is made to structure the paths so that APR may be effectively done on an established connection. It is assumed in this case that APR will normally only be done when a connect is attempted. This allows the use of the largest possible segment size on each path.

If `fullapr` is specified, then segment sizes will be adjusted so that APR can be done in all cases on an established connection. Therefore, all possible paths between two hosts use the smallest segment size of any path between them. This is because APR may never switch from a path at a certain segment size to one that requires a smaller segment size if there is an established connection. To avoid this, if `fullapr` is specified, reduce the segment size on all paths to the lowest needed.

exit

This command tells the preprocessor to stop.

quit

This command tells the preprocessor to stop.

show

This command will display the components of the NCT. The names of the LOCALNETs and the adapter and link models in each LOCALNET are displayed. Also displayed are the names of all the trunks, hosts, and groups.

list

This command will display the names of the hosts and groups that have been selected. Those hosts/groups that have been deselected will still appear in the list because they are not deleted from the select list until the makepam command is given.

help

This command will display the help file.

Sample Configuration Manager Interface

This is an example of the user interface to Configuration Manager (CM). User input follows the symbol '>'. It specifies a configuration text file named 'sample.conf' and selects the host name 'NTXDEV' as a destination. The next command specifies 'UNIX' as the local host name and 'ntx_pam' as the place to store the output. If there had been any error in processing, the user would have seen a message displayed and the prompt 'Config>' would be repeated.

```
> pwd
/usr/ntx
> cm

Config> nct sample.conf
Host selections cleared.
The NCT is valid.

Config> select NTXDEV

Config> makepam UNIX ntx_pam
Path exists from UNIX to NTXDEV.

Config> exit
Goodbye.

>
```

Note: In order to use the CM utility, the user must have CM in the current directory.

PAM File Structure

The data file, which is used, for communication between the NCT Preprocessor and the NetEx sub-routines has a very specific format. The file is treated by the processing routines as a random file of octets. Low level I/O routines map these requests into block I/O requests and ensure that necessary alignment constraints are met. (See "PAM File Analysis" for a detailed discussion of the PAM file structure.)

The file can be considered to have two parts. The first part of the file is the directory. This consists of a number of 16-octet entries. The first directory entry is the directory header. It has the local host name that this file is being built for in the first eight octets. The next two octets contain the version number of the file (currently version 1) and a reserved octet for future use. The next two octets contain the number of directory

entries, which are present. The next four octets contain the length of the directory in octets. This will be sixteen times one more than the number of directory entries. Each directory entry consists of an eight-octet host name (the name of a host), a one-octet entry type (1 = PAM list, 2 = host configuration), a one-octet reserved field, and two octets for the length of the PAM list or host configuration entry. The remaining four octets contain the file address (the address in the file of the PAM list or host configuration).

The PAM lists will begin at the first legitimate address (as returned by the write routine) after the directory. Each PAM list will begin on a legitimate address boundary, but otherwise they will appear to be continuous within the file. The host configuration entry also behaves in this manner.

The file address referred to above is a composite quantity. It is made up of two 16 bit integers. The first number is the number of the block containing the addressed byte (treating the first block as block 0). The second number is the offset within the block where the selected data resides. The offset is actually in integers because those are the units in which the I/O routines perform their operations. Thus the beginning of the file is at 0,0. The beginning of the second block would be 1,0.

It should be realized that while the file addresses are based on block numbers and offsets, the directory, PAM Lists and host configuration entry are packed with no regard for block boundaries. The I/O routines take care of all the necessary blocking and unblocking. The address returned as the next legal address by the write routine even takes care of the addressability constraints (everything falls on integer boundaries).

The host configuration entry describes the local host and various components of its adapter(s). The information stored in this entry is taken from the NCT. The header is six bytes long. The length of the entire entry is first followed by the number of adapters on this host. Three bytes are reserved for future use.

The following fields make up the body of the entry. There is one entry per adapter up to the number specified in the header. Each entry is 26 bytes long.

Logical Device Name	Logical name of adapter (eight bytes).
Adapter Type Code	Model number of this adapter (four bytes) - for example, 'A400'.
Network Address	Logical and physical TO address to reach this adapter (two bytes).
Host Address Range	Address range specifying the maximum number of addresses that will be used (two bytes).
Host Dependent Address	Channel unit address for this adapter (four bytes).
Hardware Options Mask	Bit mask of adapter options (two bytes); current options: 8KMEM, CODECONV. If a bit is set, the corresponding options have been chosen.
Reserved	Reserved for future use (four bytes).

The Host Configuration entry looks like Figure 3 (four octets per line):

Configuration Length	# of Adapts	RESERVED
R E S E R V E D		

First Half of Logical Device Name			
Second Half of Logical Device Name			
Adapter	Type	Code	
Network Address		Host Address Range	
Host	Dependent	Address	
Hardware Options Mask		R E S E R V E D	
R E S E R V E D			

Figure 3. Host Configuration

The file as a whole now looks like Figure 4 (four octets per line):

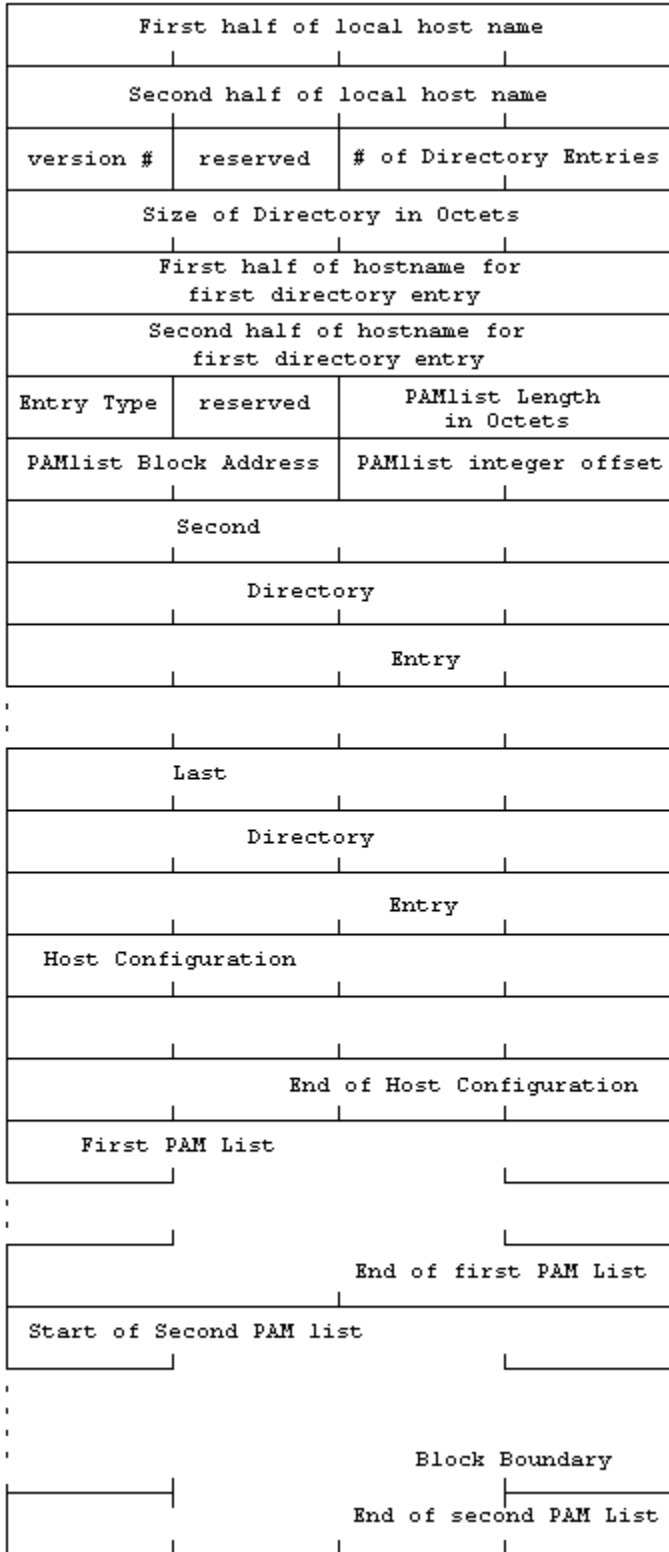


Figure 4. PAM File

PRTPAM and DUMPPAM

The contents of the PAM file may be summarized and viewed through the PRTPAM and DUMPPAM programs. These programs allow the person responsible for setting up the Configuration Manager and managing the NCT to verify the PAM file contents from outside of NetEx. PRTPAM provides a summary of PAM file information (see Figure 5), while DUMPPAM describes the components of the PAM file more specifically (see Figure 6).

```
prtpam uninct.pam > listing
Dump of PAM file uninct.pam:

Local host TEST      CM version  1 NCT version  11 Hosts  2
  A222 Adapter 15 Port c0
Remote host NTXLCL   (length 24 (d)) Routes      0 Session manager nref ffff
Remote host UTCMAP   (length 120 (d)) Routes      3 Session manager nref ffff
  UTCMAP   Segsize  65536 bits      Rate  1544 kbps      Delay  18 msec
           HYPERchannel  Adapter 15 Port c0 Trunk 33 Flags 80
           Satellite link Adapter 04      Trunk 33 Flags 00
           Satellite link Adapter 64      Trunk 33 Flags 00
           HYPERchannel  Adapter 6a Port c1 Trunk 11 Flags 40

  UTCMAP   Segsize  65536 bits      Rate  1544 kbps      Delay  30 msec
           HYPERchannel  Adapter 15 Port c0 Trunk 33 Flags 80
           Satellite link Adapter ac      Trunk 33 Flags 00
           Satellite link Adapter 63      Trunk 33 Flags 00
           HYPERchannel  Adapter 6a Port c1 Trunk 33 Flags 40

  UTCMAP   Segsize  65536 bits      Rate  1500 kbps      Delay  24 msec
           HYPERchannel  Adapter 15 Port c0 Trunk 33 Flags 80
           Satellite link Adapter 05      Trunk 33 Flags 00
           Satellite link Adapter 07      Trunk 11 Flags 00
           HYPERchannel  Adapter 6a Port c1 Trunk 11 Flags 40

End of PAM file dump
```

Figure 5. Output From PRTPAM Program

```
dumppam uninct.pam > listing
Dump of PAM file uninct.pam:

  Local host name = TEST
  Version = 1 (d)
  Reserved = ff (h)
  Number of directory entries = 3 (d)
  Length = 64 (d)

Directory entry 1 (host configuration entry):

  Configuration entry length = 32 (d)
  Number of adapters = 1 (d)
  NCT version = 11 (d)
  Reserved1 = 0 (h)

  Adapter 1:
  Logical device name =
  Adapter type = A222
```

```
Network address = 15c0 (h)
Host address = e (h)
Host dependent address = 5c0 (h)
Hardware options = 0 (h)
Reserved2 = 0 (h)
Reserved3 = 0 (h)
```

Directory entry 2:

```
Host name = NTXLCL
Entry type = 1 (d)
Reserved = ff (h)
PAMlist length = 24 (d)
PAMlist block address = 0 (d)
PAMlist offset = 96 (d)
```

Host NTXLCL (length 24 (d)) Pam list entries:

```
SPL header:
SPL length = 24 (d)
Session manager nref = ffff (h)
Host protocol mask = 2 (h)
TPL count = 1 (d)
Flags = 0 (h)
```

```
TPL header:
TPL length = 14 (d)
Host name = NTXLCL
Pam count = 0 (d)
Flags = 0 (h)
```

Directory entry 3:

```
Host name = UTCMAP
Entry type = 1 (d)
Reserved = ff (h)
PAMlist length = 120 (d)
PAMlist block address = 0 (d)
PAMlist offset = 120 (d)
```

Host UTCMAP (length 120 (d)) Pam list entries:

```
SPL header:
SPL length = 120 (d)
Session manager nref = ffff (h)
Host protocol mask = 2 (h)
TPL count = 1 (d)
Flags = 0 (h)
```

```
TPL header:
TPL length = 110 (d)
Host name = UTCMAP
Pam count = 3 (d)
Flags = 0 (h)
```

Pam 1:

```
Header:
Max blocksize = 65536 (d), 10000 (h)
```

```

        Max rate = 1544 (d)
        Delay = 18 (d)
Segment 1:
    Length = 6 (d)
    Type = HYPERchannel (1)
    Flags = 80 (h)
    Trunk mask = 33 (h)
    Physical TO address = 15 (h)
    Logical TO address = c0 (h)

Segment 2:
    Length = 6 (d)
    Type = Satellite link (4)
    Flags = 0 (h)
    Trunk mask = 33 (h)
    Physical TO address = 4 (h)
    Reserved = 0 (h)
Segment 3:
    Length = 6 (d)
    Type = Satellite link (4)
    Flags = 0 (h)
    Trunk mask = 33 (h)
    Physical TO address = 64 (h)
    Reserved = 0 (h)

Segment 4:
    Length = 6 (d)
    Type = HYPERchannel (1)
    Flags = 40 (h)
    Trunk mask = 11 (h)
    Physical TO address = 6a (h)
    Logical TO address = c1 (h)
Pam 2:
    Header:
        Max blocksize = 65536 (d), 10000 (h)
        Max rate = 1544 (d)
        Delay = 30 (d)
    Segment 1:
        Length = 6 (d)
        Type = HYPERchannel (1)
        Flags = 80 (h)
        Trunk mask = 33 (h)
        Physical TO address = 15 (h)
        Logical TO address = c0 (h)

    Segment 2:
        Length = 6 (d)
        Type = Satellite link (4)
        Flags = 0 (h)
        Trunk mask = 33 (h)
        Physical TO address = ac (h)
        Reserved = 0 (h)
    Segment 3:
        Length = 6 (d)
        Type = Satellite link (4)
        Flags = 0 (h)
        Trunk mask = 33 (h)

```

```

        Physical TO address = 63 (h)
        Reserved = 0 (h)
    Segment 4:
        Length = 6 (d)
        Type = HYPERchannel (1)
        Flags = 40 (h)
        Trunk mask = 33 (h)
        Physical TO address = 6a (h)
        Logical TO address = c1 (h)
Pam 3:
    Header:
        Max blocksize = 65536 (d), 10000 (h)
        Max rate = 1500 (d)
        Delay = 24 (d)
    Segment 1:
        Length = 6 (d)
        Type = HYPERchannel (1)
        Flags = 80 (h)
        Trunk mask = 33 (h)
        Physical TO address = 15 (h)
        Logical TO address = c0 (h)

    Segment 2:
        Length = 6 (d)
        Type = Satellite link (4)
        Flags = 0 (h)
        Trunk mask = 33 (h)
        Physical TO address = 5 (h)
        Reserved = 0 (h)
    Segment 3:
        Length = 6 (d)
        Type = Satellite link (4)
        Flags = 0 (h)
        Trunk mask = 11 (h)
        Physical TO address = 7 (h)
        Reserved = 0 (h)
    Segment 4:
        Length = 6 (d)
        Type = HYPERchannel (1)
        Flags = 40 (h)
        Trunk mask = 11 (h)
        Physical TO address = 6a (h)
        Logical TO address = c1 (h)
End of pamfile dump

```

Figure 6. Output From DUMPPAM Program

PAM List Structure

Headers

The first header found on a full PAM List is the Session PAM List (SPL) header (see “Session PAM List Header” for a detailed explanation). The SPL header has six fields. The first two-octet field is the total length of the entire PAM list in octets. The next field, also two octets long, is the session manager NREF to be used with this host or group of hosts. The next two octets make up the Host Protocol Mask. This field describes the protocol of this group of hosts (which, again, may be one host). The next field, one octet long, is the Transport PAM List (TPL) count. This is the number of PAM lists to be used with the transport layer that are contained in this SPL. Each TPL can be used to attempt to establish a connection, but once a connection is established, Alternate Path Retry is only allowed on a single TPL. The three remaining octets are flags and reserved fields. Following this ten-octet header is the sequence of Transport PAM Lists.

A TPL contains a 14-octet header (see “Transport PAM List Header” for a complete discussion). The first two octets in the header form the length in octets of the Transport PAM List. Next is an eight-octet field containing the host name of the destination host for which this TPL is built. The next octet is the number of PAMs, each one representing an alternate path to a host, contained in this TPL. As in the SPL header, the three remaining octets are flags and reserved fields. Following this header, there is a sequence of PAMs.

A PAM describes a route from one host to a single remote host. It consists of an eight-octet header, followed by a sequence of PAM entries. The first octet of the header forms the length in octets of the PAM. The first octet of each individual PAM entry gives the length (in octets) of the PAM entry. (See Figure 7.)

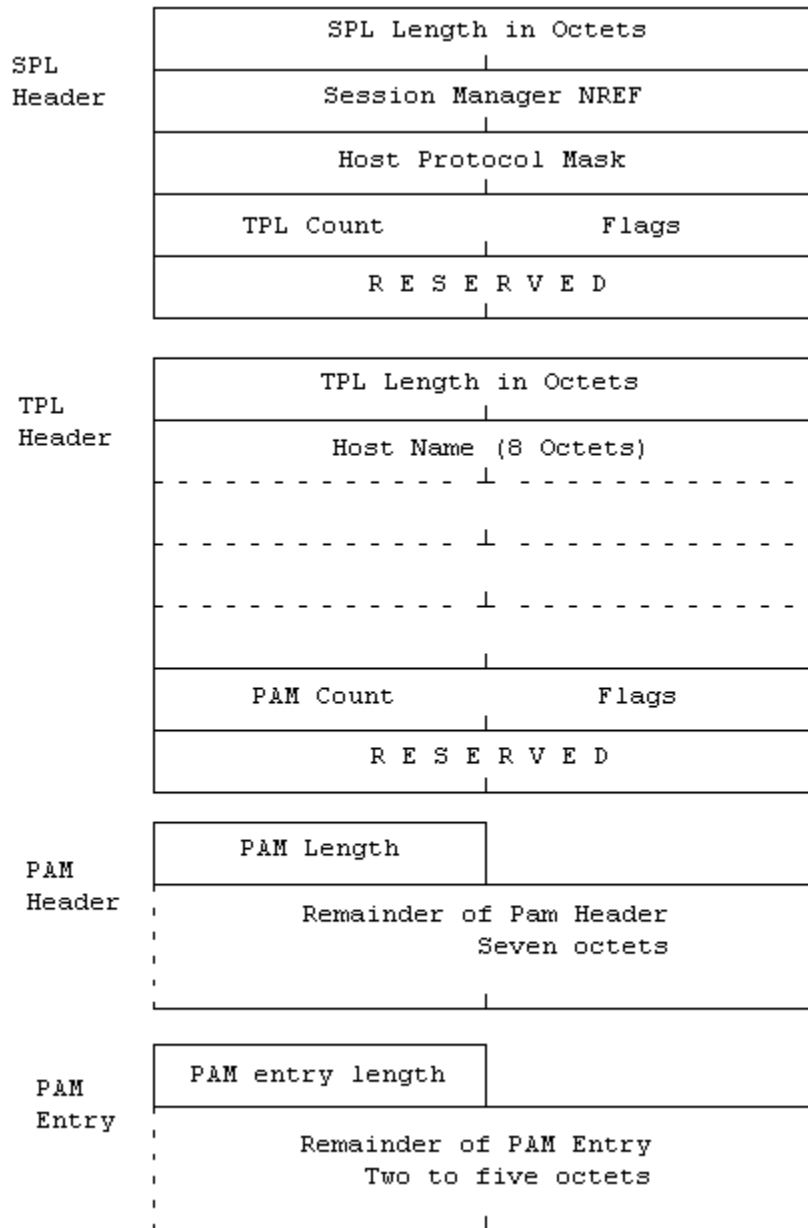


Figure 7. PAM List Structure

NCT Configuration File Errors

This section lists error messages that are specific to the NCT file. If an error is not listed here, it is probably considered a Configuration Manager error; these errors should be self-explanatory. Error messages are generally listed alphabetically within this category. However, some messages begin with a user-defined symbol or label and cannot be listed alphabetically. The general form of each of those errors is listed at the end of this section, in no particular order.

A destination must be supplied.

Explanation: A DEST= field specifies the label of the PORT statement describing the other end of the communications link in another local network. This DEST= field was not specified on the PORT statement.

A label is required on HOST statements.

Explanation: The hostname is specified by its label. All HOST statements must include a label.

A label is required on PORT statements.

Explanation: PORT statements must be labeled in order to be referenced by their partner link/port.

A NETADDR must be defined.

Explanation: All LINK statements require a NETADDR parameter. The NETADDR defines the adapter address of that link adapter.

A PORT statement must follow a LINK statement.

Explanation: A LINK statement was found without an immediately following PORT statement.

A trunk must be specified.

Explanation: Axxx and Nxxx Link Adapters must have at least one trunk defined.

A222/B222/N220 ADAPTERS need a CHANADDR.

Explanation: The required keyword CHANADDR was omitted from an ADAPTER statement.

A222/B222/N220 ADAPTERS need a NUMADDRS.

Explanation: The required keyword NUMADDRS was omitted from an ADAPTER statement.

A400 as a link is no longer allowed.

Explanation: The use of A400s as link adapters is no longer supported.

A/NXXX ADAPTERS need at least one trunk.

Explanation: At least one trunk must be specified on all HYPERchannel adapters. While it is possible for a multiported A400 to link two or more hosts without any trunks, it is certainly not the norm that the adapter would have no trunks. This error may be suppressed by entering dummy trunk names and specifying them on the ADAPTER statement if this simple case truly exists without trunks.

ADAPT='label' is not an adapter.

Explanation: An ADAPT= field referenced a defined 'label', but that 'label' was not the name of an adapter. The 'label' was the name on some other type of statement.

Bad adapter model on LINK statement.

Explanation: The model specified on a LINK statement was not a link unit.

Bad MODE710: 'string'.

Explanation: Non-hex value 'string' specified for MODE710.

Bad NETADDR string.

Explanation: A value greater than hex FF was specified for NETADDR on a LINK or ADAPTER statement.

Bad PORT number 'string'.

Explanation: Illegal value specified for the PORT number and A/N400 ADAPTER statement. Ports generally must be between 0 and 3 for A400s and 0 to 1 for link adapters.

Bad protocol 'string' (must be 1 or 2).

Explanation: Protocol for a HOST statement must be specified as either 1 or 2. See the description of the Configuration File statements for additional information.

build_glob: Unknown class.

Explanation: Some statement appeared to have a valid form but was interpretable. If the NCT appears correct, contact an SE for assistance.

BUS 'string' is not defined. - or -

BUS 'string' is not declared.

Explanation: The value for the BUS= parameter on a BXXX LINK or ADAPTER was not a previously declared BUS.

BXXX adapters need bus connection.

Explanation: All BXXX adapters must have a bus specified.

BXXX link must specify a BUS.

Explanation: All BXXX Link Adapters must have a bus specified.

CHANADDR out of range: 'string'.

Explanation: Value given for CHANADDR ('string') on an ADAPTER statement outside of allowable range.

DELAY not allowed on B800 links.

Explanation: DELAY statements are permitted only on A7XX, N7xx, S720, BC715, and B9XX links.

DELAYS do not match: 'string's.

Explanation: The DELAY parameter on the named PORT and its partner do not match.

Destination 'string' for port 'string' is weird? - or -

Destination 'string' has no object pointer.

Explanation: The port 'string' is improperly declared in an unexpected fashion.

Destination 'string' is already fully defined.

Explanation: Port specified in a LINK statement was already connected to another host.

Distinct trunks required on each interface.

Explanation: The same trunk name was specified for more than one of the adapter's trunks. Each trunk interface on an adapter must be connected to a different trunk. However, it is not necessary that every trunk interface be used or connected to a trunk.

Duplicate VERSION statement near line 'number' ignored.

Explanation: A second VERSION statement was found in the NCT near the listed line. The second VERSION statement is ignored, and processing continues.

Error(s) on ADAPTER statement 'label', near line 'number'.

Explanation: One or more errors, listed elsewhere, were detected in an ADAPTER statement. The statement label will appear if given. The line number is usually the last line of the ADAPTER statement.

Error(s) on HOST statement: ‘hostname’, near line ‘number’.

Explanation: Errors were detected in the HOST statement labeled ‘hostname’. The line number is usually the last line of the HOST statement.

Error(s) on LINK statement ‘label’, near line ‘number’.

Explanation: One or more errors were detected while parsing a LINK statement. The statement label is printed if one was given. The line number is usually the last line of the LINK statement.

Error(s) on PORT statement ‘label’, near line ‘number’.

Explanation: One or more errors were encountered while parsing a PORT statement. The statement label is printed if one was given. The line number is usually the last line of the PORT statement.

Garbage at end of VERSION, LOCALNET, TRUNK, or HB statement.

Explanation: Extraneous characters were found and ignored at the end of a statement.

Hash: Pointer corruption suspected.

Explanation: This message indicates an internal error within the CM. Retry the operation before reporting to Network Executive Software.

HB statement needs label.

Explanation: All HB statements require a label.

Host names are limited to eight characters: ‘string’.

Explanation: A host name (or label on a HOST statement) was encountered which exceeded eight characters in length. The maximum host name length is eight characters.

Missing parameter value for ‘string’.

Explanation: The parameter ‘string’ does not have a value associated with it.

Must specify a HOST before an ADAPTER.

Explanation: A HOST statement must be specified before an ADAPTER statement. All adapters (other than links) belong to some host and must appear immediately following the host definition or statement.

Must specify a LINK before a PORT.

Explanation: A PORT statement was not preceded by a LINK statement.

Must specify a LOCALNET before an ADAPTER.

Explanation: A LOCALNET statement must precede any ADAPTER statements.

Must specify a LOCALNET before a HB.

Explanation: A LOCALNET statement must precede any HB statements.

Must specify a LOCALNET before a HOST.

Explanation: A LOCALNET statement must be defined before a HOST statement.

Must specify a LOCALNET before a LINK.

Explanation: A LOCALNET statement must precede any LINK statements.

Must specify a LOCALNET before a TRUNK.

Explanation: A LOCALNET statement must precede any TRUNK statements.

Must specify MODEL on ADAPTER statement.

Explanation: The required keyword MODEL was omitted on an ADAPTER statement.

Must specify NETADDR on ADAPTER statement.

Explanation: The required keyword NETADDR was omitted from an ADAPTER statement.

Non-matching adapters at same NETADDR.

Explanation: Two adapters with the same NETADDR but with other differing characteristics have been detected. This is probably an error in the definition of different ports on the same adapter in the Configuration File. An A400 adapter with the same NETADDR may appear as long as different ports are indicated in each occurrence.

Non-matching model types on link adapters: 'string'.

Explanation: The model of the named link port and its partner do not match.

Non-matching trunks (or bus) on adapters at same ADDR.

Explanation: The same adapter has been specified more than once in the text NCT file, probably with different ports, but the specified trunks or bus are not the same.

NREF out of range: 'string'.

Explanation: A value greater than hex FFFF was specified for the SMGRNREF on an ADAPTER statement.

NUMADDRS out of range: 'string'.

Explanation: The NUMADDR specified on an ADAPTER statement is outside the allowed range.

Numeric CHANADDR required: 'string'.

Explanation: The CHANADDR specified on a HOST statement was not a number.

Numeric Dref required: 'string'.

Explanation: The DREF on an ADAPTER statement was not a hex valued 'string'.

Numeric Netaddr required: 'string'.

Explanation: The NETADDR on a LINK or ADAPTER statement was not a hex valued 'string'.

Numeric Nref required: 'string'.

Explanation: The SMGRNREF on an ADAPTER statement was not a hex valued 'string'.

Numeric NUMADDRS required: 'string'.

Explanation: The NUMADDRS specified on an ADAPTER statement was not numeric.

Numeric PORT required: 'string'.

Explanation: The PORT on an A/N400 was not a numeric 'string'

Numeric SEGSIZE required: 'string'.

Explanation: The value specified for SEGSIZE on a PORT statement was not numeric.

Numeric VALDREF required: 'string'.

Explanation: The value specified for VALDREF was not numeric.

Out of memory.

Explanation: The CM attempted to allocate additional memory for required internal table space and was unable to do so. Retry the operation before reporting the problem to Network Executive Software.

Partners 'string' for 'string' does not match.

Explanation: Adapters at opposite ends of a link do not specify each other as partners. The DEST= field of one end of a link must correspond to the label field of the PORT statement on the other end.

PORT must be specified for A/B/N400s.

Explanation: The required keyword PORT was omitted from an A/B/N400 ADAPTER statement. There is no default or assumed port. The site must specify a value from 0 to 3, inclusive.

Premature EOF.

Explanation: In parsing an NCT text file, an end of file was detected prior to reading an END statement. An END statement should appear once in each NCT text file.

PROTOCOL must be numeric (1 or 2): 'string'.

Explanation: The PROTOCOL value on a HOST statement was not a number.

RATE not allowed on B800 links.

Explanation: RATE and DELAY statements are permitted only on A7XX, S720, B715, and B9xx links.

RATEs do not match: 'string'.

Explanation: The RATE parameter on the named PORT and its partner do not match.

SEGSIZE out of range 'string'.

Explanation: The value specified for SEGSIZE on a PORT statement is outside of the allowable range.

SMGDREF out of range: 'string'.

Explanation: The hex value of 'string' is not between 0 and 255 on an ADAPTER statement.

Syntax error near line 'number':

Label 'string' with no statement - or -

At statement labeled 'string', 'string' unknown. - or -

'string' unknown statement.

Explanation: An invalid statement type was encountered. Any label present, the line number where the problem was encountered, and the unrecognized word, are all presented to help the user find the problem.

The NCT is not valid.

Explanation: One or more fatal errors occurred while parsing the NCT text file. As a result, the NCT is considered invalid. The errors detected should already have been displayed.

The NCT is valid.

Explanation: Though several miscellaneous error messages may have been printed, the CM was able to parse a valid NCT for a PAM file may be generated. If any fatal errors are detected, the message "The NCT is not valid." would have been displayed instead, in response to the NCT command.

TRUNK is not defined. - or -

TRUNK is not declared.

Explanation: The value for the TRUNK= parameter on an A/NXXX LINK or ADAPTER was not a previously declared TRUNK or FIBER.

TRUNK statement needs label.

Explanation: A TRUNK statement was found which did not have a label. All TRUNK statements must be labeled, so they may be referenced by ADAPTER statements.

TYPE not specified on LOCALNET statement.

Explanation: The type of a local network, HC or HB, was not specified on the LOCALNET.

Unknown keyword: 'string'. - or -

Unknown keyword 'string'. Ignored.

Explanation: The keyword 'string' is not a valid keyword, or not a valid keyword on the specified statement. It is ignored.

Unknown model 'string'.

Explanation: An invalid model type 'string' was specified.

Unknown parameter name ‘string’.

Explanation: An invalid parameter ‘string’ was detected.

Unknown TYPE ‘string’. Default to HC.

Explanation: An invalid LOCALNET type of ‘string’ has been specified. Only HC is valid.

Unrecognized CHANADDR: ‘string’. - or -

Unrecognized DEVNAME: ‘string’. - or -

Unrecognized MODE710: ‘string’. - or -

Unrecognized OPTIONS: ‘string’.

Explanation: Invalid or non-hex value specified or value outside of allowable range.

VALDREF out of range: ‘string’.

Explanation: The value specified for VALDREF is outside the allowable range.

Value required on version statement, ignored. Near line ‘number’.

Explanation: A VERSION statement with no version number was found and was ignored.

Version must be between 0 and 255, ‘string’ ignored (near line ‘number’).

Explanation: The number specified on a VERSION statement was out of range and ignored.

The general form of the NCT file errors which begin with a user-defined symbol or label follow here. They are listed in order by the first word after the user information.

‘hostname’ has no adapters.

Explanation: The specified host ‘hostname’ has no adapters connected to it. There is no path for communication with the named host.

‘label’ has no object pointer.

Explanation: The label ‘label’ does not label anything. There is no valid, corresponding NCT statement for the specified label.

‘label’ has no partner.

Explanation: The specified port 'label' has no partner or LINK/PORT pair. There is no path from this LOCALNET to another LOCALNET through this LINK/PORT.

‘label’ is not defined.

Explanation: The specified label was referenced, but never defined.

‘label’ Redeclared, ‘statement’ statement ignored. - or -

‘label’ Redeclared on ‘statement’ statement.

Explanation: The specified label ‘label’ has been previously declared. LOCALNETs with duplicate definitions are ignored, all others are fatal. All labels must be unique across the NCT.

Alternate Path Retry (APR)

Introduction

Network Executive Software's Alternate Path Retry (APR) is a feature found in DX NetEx, CP NetEx, and Release 3.4 host-based NetEx software. APR is derived from the NetEx Model and provides two approaches to retrying a transfer connection. The first approach is handled by the Session level of NetEx, and the second is handled by the Transport layer. The two approaches function as follows.

- When a session connection is being established, the local NETEX attempts to contact the Session Manager on the remote host. If the remote NETEX is down, or if the desired application is not offered on that particular host, APR allows retries to alternate host(s).

The list of alternate hosts is established by Session management. The HOST statement in Network Configuration can establish a host "group" or a list of hosts identified by a single name (see "HOST Statement"). Each time a connection is established, the hosts in the group are tried in sequence. Attempts to S-Connect to each host in the group continue until an active NetEx and the desired application S-Offered is found, or the list is exhausted.

- At the Transport Level, APR allows NETEX to detect a failure on a network path to a remote host, switch activity to an alternate path (providing one is available), and maintain the connection between the hosts. The rest of this manual primarily addresses this level of APR.

APR is supported in all versions of NESiGate, DX NetEx, CP NetEx, and in the following minimum release levels of NetEx and NetEx/IP:

IBM OS/390	H210 Rel 2.3, H210IP Rel 5.0
DEC PDP11 RSX	H250 Rel 3.1
DEC VMS	H260 Rel 3.3
IBM VM/ESA	H280 Rel 2.3
Bull GCOS 3/8	H290 Rel 3.3
Unisys OS2200	H300 Rel 3.4, H300IP Rel 5.0
DEC ULTRIX	H410 Rel 3.4
Fujitsu OSIV	H430 Rel 2.2
Prime PRIMOS	H460 Rel 3.4
Gould SEL UTX	H650 Rel 3.4
Cray UNICOS	H660 Rel 3.4
Unisys A-Series MCP/LH830	Rel 3.4
WinNT	H140IP Rel 6.0
HP/UX	H320FD Rel 3.5, H320IP Rel 5.0
AIX	H620FD Rel 3.5, H620IP Rel 5.0
Solaris	H690FD Rel 3.5, H690IP Rel 5.0
Linux/Intel	H800IP Rel 6.0

Definitions

The following terms are used when discussing APR:

1. The **path** is the combination of network components that provides a connection between two hosts. The path may or may not include Link Adapters AC710/AC715/AC730. Link adapters need not be explicitly defined in the path description. Some (but not necessarily all) of these components are:
 1. Host adapters
 2. link adapters
 3. Satellite adapters
 4. Communications lines
 5. Modems

Note that though the path implicitly includes communication lines and modems, these components are never explicitly referenced in an NCT.

2. **710 mode** is the link mode that implies transparent operation of AC/NB7xx Link Adapters. For example, if a network contains an AC710 whose unit (trunk) address is 10, any HYPERchannel messages whose “to” addresses range from 80 - 9F will be intercepted by the AC710 and transmitted to the other side of the communications link. They are then transmitted again on the remote HYPERchannel trunk with the original “to” address. Refer to the HYPERchannel A71x Adapters Hardware Reference Manual for more information.

This mode allows messages to be transparently moved across a pair of link adapters by merely profiling the correct address range into the AC710 adapter(s). The address range that the AC710 is to “intercept” is dialed into the unit number switches located on the back of the AC710.

The trunk address range that the AC715/AC730/NB7xx Link Adapters support is profiled into the link adapter from an attached terminal. The interception range of these link adapters is much more flexible than in the AC710 Link Adapters. Discrete “to” addresses may be intercepted as well as ranges of “to” addresses.

Note that the remote link adapter must be correctly profiled to return reply messages to the local link adapter.

In Figure 8, to send a message/data from Host A to Host B, Host A NetEx would generate a Message Proper as follows.

```
0 1 2 3 4 5 6 7 8 - Message Proper Byte Number
00 00 81 80 71 40 00 00 00
00 00 00 00 81 80 71 40 F2
```

The “to” address, bytes 2 and 3, address the Host B adapter (8116). Since A710, unit number 10 captures all to addresses from 80-9f, it will intercept this message, pass it across the communications link and retransmit the message on the remote trunk with the original to address (81) intact. If the remote host (B) inverts the “to” and “from” addresses, the new “to” address will be 71, and since A710 0816 captures addresses in the range of 60-7F, it will send the return message across the link and retransmit it on Host A’s trunk.

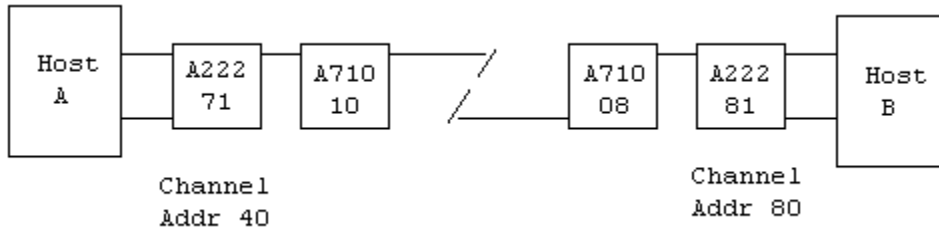


Figure 8. A710 Link Configuration

For further detail on link adapter addressing and operation, consult the appropriate reference manual.

3. **720 mode (or satellite mode)** differs from the transparent processing of messages done by 710 mode in that the A720 adapter (or the base “to” address of AC715/AC730 adapters) is directly addressed, and the actual “to” address is encapsulated with the HYPERchannel message proper. In satellite mode addressing, (embedded address), message proper bytes 1616 - 1B16 are swapped with bytes 0016 – 0516, the message is transmitted to the other side of the link and then re-transmitted on the remote HYPERchannel trunk.

Satellite mode (embedded addressing) will only support one satellite hop. If more than one hop is needed, the other Link Adapters must be in A710 (interception) mode. In Figure 9, to send a message/data from Host A to Host B, Host A NetEx would generate a Message Proper as follows.

```

0  1  2  3  4  5  6  7  8 - Message Proper Byte Number
00 00 10 00 71 40 00 00 00
00 00 00 00 81 80 71 40 F3

16 17 18 19 1A 1B 1C      - Message Proper Byte Number
00 00 81 80 11 00 00 00 00

```

The “to” address, bytes 2 and 3, is for the base address of the A715 (satellite mode address). The A715 will replace bytes 0 - 5 of the original message proper with bytes 16 - 1B, send the message across the link, then transmit it on the remote trunk. The “to” address will now be 8116, or Host B’s A222.

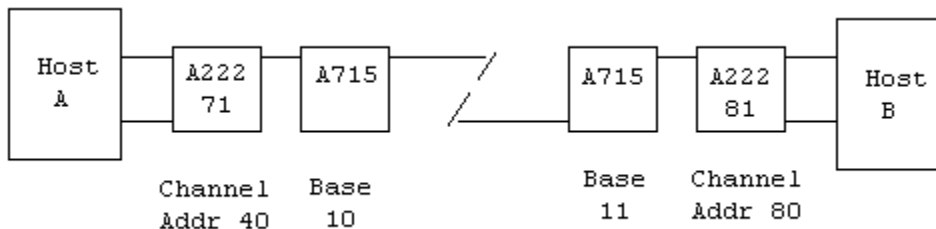


Figure 9. A720 Link Configuration

4. **Both 710 and 720 modes** are supported by AC715/AC730/NB7xx Link Adapters. When profiling one of these link adapters, the first trunk “to” address entered (no matter where it lies within the range of addresses the adapter is to support) becomes the base address of the link adapter. This base trunk “to” address supports satellite mode operation only.

For example, if an AC730’s profile is entered as the string of hex numbers, 1016 3116 3516 0516 0116 F016; the first address entered (in this case 1016) becomes the base address of the AC730, even though lower addresses are entered later in the string.

If a HYPERchannel message is addressed to the AC715/AC730 base trunk address, and the function code, in byte 8, is not a maintenance function (loopback, return statistics, etc.) the message is assumed to be a satellite mode message. This message is then processed as outlined above under A720 Link Adapters.

5. Multiple paths are generated from the NCT (Network Configuration Table) for a given source/destination pair if one of the following is true.
 - a. There is more than one adapter on the source host that can reach the destination host.
 - b. There is more than one adapter on the destination host that can be reached by the source host.
 - c. There is more than one link path between some pair of host/destination adapters.

In summary, multiple paths are generated in the PAM if there are multiple routes from the source to the destination.

Note: While multiple trunks may also be discrete routes between components, they are not specifically described as such. The reason for this is that the HYPERchannel adapter hardware handles the retry for trunks.

The trunk specifications within the NCT are used to build the “trunk mask” for HYPERchannel messages. For example, if an adapter has trunks 3 and 2 specified (T2=xx,T3=yy), NetEx will build the trunk mask in the message proper to be 3316. In binary, this corresponds to trunks-to-try of 2 and 3. The HYPERchannel hardware will first attempt transmission on trunk 3, then physically rotor to trunk 2 if the attempt on 3 was not successful. This is totally transparent to NetEx.

6. The primary path is the path that occurs first in the list of paths passed to NetEx.
7. The secondary path is the next path in the list of paths. Paths are tried (when APR is invoked) in the order they appear in the list of paths. NetEx will attempt connection on all the paths in the list before reporting a “Connect Failure”, 3500 error, back to the application.

Before the list of paths is passed to NetEx, it is sorted by a subroutine of the Configuration Manager, appropriately named the “Sort PAM” Routine.

Note: Currently, various versions of the Configuration Manager sort the PAM file differently. The actual sorting algorithms are described under “PAM Sorting”.

The source adapters are scanned in the order given, while the destination adapters are scanned in the reverse order. This is done so that if there are connections in both directions, the load will somewhat balance.

8. The following timers affect APR as indicated.

CONTO Connect time out. If this interval expires on a “Connect,” the next path will be attempted.

DEADTO Dead time out. This is the allowed interval for switching to a new path for an established connection.

IDLETO Idle time out. This is the interval at which “keepalive” messages are sent between the source and destination ends of the connection. Note that if data (or a confirm) is sent by the local (source side) within the IDLETO, the idle timer is reset. When the IDLETO is reset by transmission of a message/data, no “keepalive” message is sent. IDLETO should be much less than either DEADTO or CONTO.

TMSGTTO Transmit message termination time out. The length of time the offerer will wait while not receiving any messages, data, or idle; before terminating the connection.

The timer interval (TMSGTTO - Transport Message Termination Time Out) is calculated as follows:

$$\text{TMSGTTO} = \text{DEADTO} + (\text{npaths} * \text{CONTO}) .$$

The timer intervals (TMSGITO/TMSGTTO - Transport Message Idle/Termination Time Out) are passed in the initial connection protocol exchanged between the source and destination. The offerer (source) then uses the requestor (destination) timer interval.

9. **Physical Address Map - PAM.** This is a binary representation of a route from one host to another through the network. This map is built by the Configuration Manager using the NCT.
10. **Transport PAM List - TPL.** The Transport PAM List is a list of PAMs that describe all routes from the connecting host to a particular destination host.
11. **Session PAM List - SPL.** The Session PAM List is a list of TPLs that describe all routes from the connecting host to a destination host or group of destination hosts.

Operation

Overview

Note: In the following discussion, the T (T-xxx where xxx is a function such as Connect, etc.) refers to Transport Layer, N to Network Layer, and S to Session Layer. The error responses are also coded according to which layer issues them. Error codes of 1xxx are Driver layer, 4xxx are Network, 2xxx are Transport and 3xxx are Session.

The NetEx Transport layer provides the capability to transparently redirect traffic over a totally independent network connection without causing a loss of service to the transport user.

When a T-Connect request is issued, the addressing information contains a list of the primary and all selected alternate routes to the destination. Transport then issues an N-Connect (establish path) for the primary path. The connection or normal data transfer proceeds. However, if Transport detects that all communications have ceased on the existing network connection (detected by timers expiring without data or messages being received), it N-Disconnects the failing connection and attempts to N-Connect using the next alternate route provided in the list of PAMs passed to it at T-Connect time.

If the N-Connection succeeds, the transport connection continues as normal. If it does not, the timers are re-zeroed, and the next PAM is tried until the list of PAMs is exhausted. If the list of PAMs is exhausted without a successful connection, a Disconnect indication is returned to the Transport user indicating the connection has been lost/did not succeed.

Detail

PAM Sorting

PASCAL/FORTRAN Configuration Managers

The PASCAL Configuration Manager (H210, H250, H260, H280, H290, H300, H430, and H830) and the FORTRAN Configuration Managers sort the list of PAMs before passing the list to the Transport layer using the following algorithm.

1. Segment Size (Segsize - largest to smallest)
2. PAM length (physical length in bytes, smallest to largest)
3. Transmission Rate (highest to lowest)

This has the effect of making the highest performance (largest segment size), shortest (shortest physical PAM), and fastest (highest transmission rate), path the primary.

The disadvantage of this method is that if a path fails after the connection is established, during data transfer; and the next path in the list has a smaller segment size, APR will not be invoked. This is because the same connection cannot move to a smaller segment size path. The Session would be failed, and when reconnection was attempted, it would succeed on the next path.

If the segment size were equal on the next path, then APR would be invoked during data transfer.

“C” Configuration Managers

The “C” Configuration Manager (H410, H460, H650, H660) sorts the PAM list as follows. (See the first section in this manual, ““C” Configuration Manager”, for a complete description of this Configuration Manager version and its functions.)

1. Segment Size (Segsize - smallest to largest)
2. PAM length (physical length in bytes, smallest to largest)
3. Transmission Rate (highest to lowest)
4. Delay (lowest to highest)

This has the effect of always being able to invoke APR, even during data transfer, since the next path will never have a smaller segment size.

The disadvantage of this method is that the primary path will be the path with the smallest segment size, typically the lowest performance path. However the AC715/AC730/NB7xx Link Adapters allow greater segment size than earlier link adapters.

Transport

APR is the responsibility of the Transport entity that initiated the connection by accepting a T-Connect request from a user. A list of PAMs, describing paths between the source and destination NetExes, is passed to Transport along with the T-Connect request. The PAMs were sorted by the Configuration Manager, before being passed to the Transport layer.

It is the responsibility of the source (local/connecting) Transport entity to try all possible network connections to the destination (remote) Transport process. It is the responsibility of the destination remote/offering Transport process to simply wait until sufficient time has elapsed for all paths to be tried, or until input arrives from the connecting (source) Transport. This is accomplished by setting READTIME sufficiently high so that all routes between the local and remote sides may be tried.

Offering Side

If a Transport process began with a T-Offer, it will continue to transmit Idle (keepalive) messages every TMSGITO (Transport Message Idle Time Out) seconds, if it is not sending data messages. The offering side will take no other action until TMSGTTO (Transport Message Transmit Time Out) seconds expire with no response of any kind from the connecting side. At that time, the connection has been lost, and the Transport layer informs its user by returning the NRB with a 2400 (Dead Time Out) NRB Error Status.

If a network message containing a Connect indication does arrive within the TMSGTTO, Transport considers the connection, or reconnection to have succeeded. It then sends a Transport message (either an Idle or data) using the N-Confirm service. Transport will continue to send N-Confirm responses until a message with a normal data indication arrives. At that point Transport will N-Write all subsequent messages.

Connecting Side

The connecting Transport service will continue to send Idle messages every TMSGITO (Transport Message Idle Time Out) seconds and will take no further action until DEADTO (Dead Time Out) seconds have elapsed with no response whatsoever from the destination Transport service. Transport will then N-Disconnect the original network path and attempt to N-Connect on the next PAM entry. The N-Connect will contain a Transport idle message and possibly data.

Once the new path is selected, the Transport process will continue to try this path by sending N-Connect requests every IDLETO seconds until CONTO (Connect Time Out) seconds have expired. During the whole CONTO time period, Transport will leave an N-Read outstanding. If data containing an N-Confirm arrives before CONTO seconds, the new path is considered to be good, and Transport will consider this path the primary path until subsequent DEADTO seconds have elapsed without a network message arriving from the offering side.

If no data are received on the new path within CONTO seconds, the next path in the list of PAMs is selected. The process is repeated (with N-Disconnect and N-Connect being issued) until either CONTO seconds expire or an N-Confirm is received. Transport will continue to try new paths until all paths in the PAM list originally provided with the T-Connect have been tried with no response from any. In this case an NRB status of 2500 (Connect Time Out) would be returned to the Transport service user.

DISPLAY HOST Command

The NetEx user can determine which paths have been generated by either dumping the PAMFILE, or by using NetEx operator commands.

The NetEx Operator command, DISPLAY HOST, is used to display the various hosts that have been described to NetEx in the NCT. Enter the command as shown below.

```
DISPLAY HOST
```

Figure 10 is the actual output of the DISPLAY HOST command in the sample NCT in Figure 13 on page 52.

Host IBM	Current Routes	
Dest Host	Prot Type	# of Routes
-----	-----	-----
IBM	2	1
NTXLCL	2	4
NTXLCL00	2	1
NTXLCL01	2	1
NTXLCL02	2	1
NTXLCL03	2	1
PDP	2	4
SPERRY	2	4
VAXA	2	2
VAXB	2	4
IBM	1,2	1

Where - Prot Type = Protocol Type
 1 - Old NetEx Protocol
 2 - Current NetEx Protocol

Figure 10. NetEx Display Host Output

Select a host from the list that is defined to NetEx, such as host SPERRY, and enter the DISPLAY HOST command as shown below.

```
DISPLAY HOST SPERRY
```

This command will produce the output shown in Figure 11.

```

Host IBM      Routes to SPERRY
Local Dref=3223  LsDref=0400  RsDref=0A00  Remote Dref=1000
      MaxSeg= 65536  MaxRate= 1544  Delay= 0  Type=2      Trk=33
-----
Local Dref=3223  LsDref=0500  RsDref=0700  Remote Dref=1000
      MaxSeg= 65536  MaxRate= 1544  Delay= 300  Type=2      Trk=33
-----
Local Dref=1673  LsDref=0400  RsDref=0A00  Remote Dref=1000
      MaxSeg= 65536  MaxRate= 1544  Delay= 0  Type=2      Trk=33
-----
Local Dref=1673  LsDref=0500  RsDref=0700  Remote Dref=1000
      MaxSeg= 65536  MaxRate= 1544  Delay= 300  Type=2      Trk=33
-----

Where - Local Dref - Local Adapter D Ref
      LsDref - Local Link Adapter D Ref
      RsDref - Remote Link Adapter D Ref
      Remote Dref - Remote Adapter D Ref
      MaxSeg - Maximum Segment Size on this path
      MaxRate - Maximum Rate on this path (in Kbits/Second)
      Delay - Delay (in miles/milliseconds) on this path
      Type - Protocol Type
      Trk - Trunk Mask to use in Message Proper

```

Figure 11. NetEx Display Host Sperry Output

Note: For a complete description of the NetEx operator commands, including syntax and output examples, consult the appropriate NetEx reference manual. For example, if you are using H210 NetEx, refer to the “Operator Interface” section in the H210 NetEx for IBM MVS/SP, MVS/XA, and MVS/ESA Software Reference Manual for more information. See “Reference Material” for a list of related manuals.

The capability of determining which PAM (path) is currently in use is not generally available in all NetExes. Check the individual NetEx reference manual to determine if the feature is available.

Connect Failure

NetEx will try all paths. If Connection Failure (NRBSTAT 3500) is reported back to the user, then all paths between the source and destination have been attempted, unsuccessfully.

If APR is invoked, and a connection is successfully made on an alternate path; then that alternate path is used for the duration of the connection. If the alternate path would fail, the retry process would continue with the next PAM entry until the list wrapped back to the current failing entry.

Once a Session has completed and a new Session is being established, the PAM list would be passed to the Transport layer as before and the list of PAMs attempted beginning with the first entry.

Sample Network Definition

Sample Network Topology

Figure 12 is a sample network used to illustrate alternate path configurations.

Note: The job used to create the sample PAM, operator commands, and NetEx output were run on an IBM MVS/ESA system, using H210 NetEx, Release 2.3.

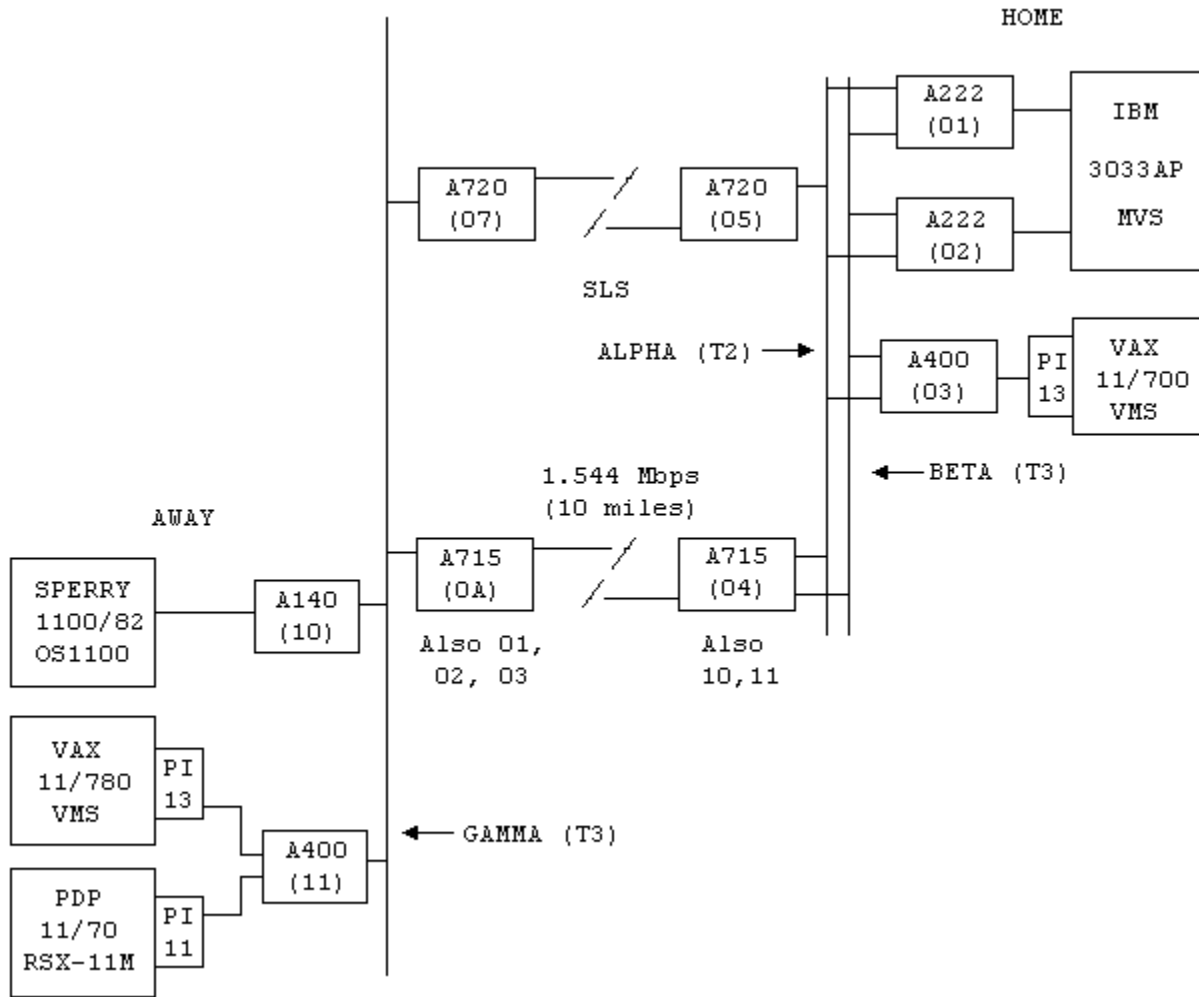


Figure 12. Sample Network Configuration

Configuration Manager Commands

The following NCT commands, as shown in Figure 13, would be used to describe this network and build the PAM file. See the appropriate reference manual for more information on NCT commands.


```

* DESCRIBE 'HOME' NETWORK
HOME      LOCALNET TYPE=HC
ALPHA     TRUNK
BETA      TRUNK
*
IBM       HOST      TYPE=IBM,MODEL=3033AP,OS=MVS,PROTOCOL=2
          ADAPTER   MODEL=A222,NETADDR=01,T2=ALPHA,T3=BETA,
          CHANADDR=270,NUMADDRS=4,SMGDREF=73
          ADAPTER   MODEL=A222,NETADDR=02,T2=ALPHA,T3=BETA,
          CHANADDR=320,NUMADDRS=4,SMGDREF=23
*
* DEFINE CONFIGURATION FOR VAX PROCESSOR
VAXA     HOST      TYPE=VAX,MODEL=780,OS=VMS,PROTOCOL=2
VAXA400  ADAPTER   MODEL=A400,NETADDR=03,T2=ALPHA,T3=BETA,
          PORT=0,INTRFACE=PI13,SMGDREF=04
*
* LINK ADAPTER CONNECTING TO 'AWAY' LOCAL NETWORK
          LINK      MODEL=A715,NETADDR=04,T2=ALPHA,T3=BETA,
          MODE710=10,MODE710=11
HOMEP    PORT      DEST=AWAYA,RATE=1544K,DELAY=0M
*
* LINK ADAPTER (SLS) CONNECTING TO 'AWAY' LOCAL NETWORK
          LINK      MODEL=A715,NETADDR=05,T2=ALPHA,T3=BETA
CHANLINK  PORT      DEST=AWAYB,RATE=1544K,DELAY=300M
*
* DESCRIBE 'AWAY' NETWORK
*
AWAY     LOCALNET TYPE=HC
GAMMA    TRUNK
*
* DESCRIBE HOSTS ON 'AWAY' NETWORK
SPERRY   HOST      TYPE=SPERRY,MODEL=1100,OS=OS1100,PROTOCOL=2
          ADAPTER   MODEL=A140,NETADDR=10,T3=GAMMA,SMGDREF=00
*
PDP      HOST      TYPE=PDP11,MODEL=70,OS=RSX11M,PROTOCOL=2
PDPADAP  ADAPTER   MODEL=A400,NETADDR=11,T3=GAMMA,PORT=0,
          INTRFACE=PI11,SMGDREF=08
*
VAXB     HOST      TYPE=VAX,MODEL=780,OS=VMS,PROTOCOL=2
          ADAPTER   MODEL=A400,NETADDR=11,T3=GAMMA,PORT=1,
          INTRFACE=PI13,SMGDREF=01,ADAPT=PDPADAP
*
* LINK ADAPTER BACK TO 'HOME' NETWORK
          LINK      MODEL=A715,NETADDR=0A,T3=GAMMA,
          MODE710=01,MODE710=02,MODE710=03,MODE710=05
AWAYA    PORT      DEST=HOMEP,RATE=1544K,DELAY=0M
*
* LINK ADAPTER (SLS) BACK TO 'HOME' NETWORK
          LINK      MODEL=A715,NETADDR=07,T3=GAMMA,
AWAYB    PORT      DEST=CHANLINK,RATE=1544K,DELAY=300M
* END DEFINITION
          END

```

Figure 13. Sample Network Description

Configuration Manager Job Output

Figure 14 is actual job output from running the Configuration Manager against the sample NCT file in Figure 13 on page 52.

```
DATA GENERATOR OUTPUT FOR CONTROL CARDS AND MESSAGES
      DSD OUTPUT=(DDOUT)
      FD  NAME=F1,LENGTH=1024,FORMAT=AL,ACTION=SL
      CREATE QUANTITY=100,NAME=(F1)
      END
IEB700I  DATA GENERATION HAS BEEN SUCCESSFULLY COMPLETED
          COMPLETION CODE IS ZERO

Configuration Manager 2.1 8906
Enter command: NCT, SELECT, DESELECT, MAKEPAM, or EXIT
CONF001I Parsing initiated
CONF057I Parsing completed ValidNCT=TRUE, Errors=0, Warnings=0
Valid NCT read and data structure built
Enter command: NCT, SELECT, DESELECT, MAKEPAM, or EXIT
Enter command: NCT, SELECT, DESELECT, MAKEPAM, or EXIT
CONF099I path exists from HOST: IBM to HOST: NTXLCL
CONF099I path exists from HOST: IBM to HOST: NTXLCL
CONF099I path exists from HOST: IBM to HOST: NTXLCL
CONF099I path exists from HOST: IBM to HOST: NTXLCL
CONF099I path exists from HOST: IBM to HOST: NTXLCL03
CONF099I path exists from HOST: IBM to HOST: NTXLCL02
CONF099I path exists from HOST: IBM to HOST: NTXLCL01
CONF099I path exists from HOST: IBM to HOST: NTXLCL00
CONF099I path exists from HOST: IBM to HOST: VAXB
CONF099I path exists from HOST: IBM to HOST: VAXB
CONF099I path exists from HOST: IBM to HOST: VAXB
CONF099I path exists from HOST: IBM to HOST: VAXB
CONF099I path exists from HOST: IBM to HOST: VAXB
CONF099I path exists from HOST: IBM to HOST: VAXB
CONF099I path exists from HOST: IBM to HOST: PDP
CONF099I path exists from HOST: IBM to HOST: PDP
CONF099I path exists from HOST: IBM to HOST: PDP
CONF099I path exists from HOST: IBM to HOST: PDP
CONF099I path exists from HOST: IBM to HOST: PDP
CONF099I path exists from HOST: IBM to HOST: PDP
CONF099I path exists from HOST: IBM to HOST: SPERRY
CONF099I path exists from HOST: IBM to HOST: SPERRY
CONF099I path exists from HOST: IBM to HOST: SPERRY
CONF099I path exists from HOST: IBM to HOST: SPERRY
CONF099I path exists from HOST: IBM to HOST: SPERRY
CONF099I path exists from HOST: IBM to HOST: SPERRY
CONF099I path exists from HOST: IBM to HOST: VAXA
CONF099I path exists from HOST: IBM to HOST: VAXA
CONF099I path exists from HOST: IBM to HOST: IBM
PAM List generation complete
Enter command: NCT, SELECT, DESELECT, MAKEPAM, or EXIT
Configuration Management Complete
```

Figure 14. Sample Configuration Manager Output

Note that in Figure 12 on page 50, there are physically four paths from the IBM 3033 to the Sperry 1100. However, the Configuration Manager output, as shown in Figure 14, indicates that there are six paths. This is due to the Configuration Manager generating both a 710 mode PAM as well as a satellite mode PAM for the A715 Link Adapter pair. This is done so that multiple hops may be supported.

PAM File

Figure 15 is a dump of the first block of the actual PAM generated by running the IBM MVS Configuration Manager with the input as shown in Figure 13 on page 52. The PAMFile dataset was allocated with a block length of 1024 bytes.

C9C2D440	40404040	0100000B	000000C0	C9C2D440	40404040
0200003A	00000030	D5E3E7D3	C3D3F0F3	0100002C	0000003F
D5E3E7D3	C3D3F0F2	0100002C	0000004A	D5E3E7D3	C3D3F0F1
0100002C	00000055	D5E3E7D3	C3D3F0F0	0100002C	00000060
E5C1E7C2	40404040	010000C0	0000006B	D7C4D740	40404040
010000C0	0000009B	E2D7C5D9	D9E84040	010000C0	000000CB
E5C1E7C1	40404040	01000040	000000FB	C9C2D440	40404040
01000026	0001000B	D5E3E7D3	C3D34040	01000068	00010015
003A0200	00004040	40404040	4040C1F2	F2F20173	00040000
02703000	00000000	40404040	40404040	C1F2F2F2	02230004
00000320	30000000	00000000	002CFFFF	00020100	00000022
D5E3E7D3	C3D3F0F3	01000000	14080000	00000000	06018033
01730601	40330223	002CFFFF	00020100	00000022	D5E3E7D3
C3D3F0F2	01000000	14080000	00000000	06018033	01730601
40330173	002CFFFF	00020100	00000022	D5E3E7D3	C3D3F0F1
01000000	14080000	00000000	06018033	02230601	40330223
002CFFFF	00020100	00000022	D5E3E7D3	C3D3F0F0	01000000
14080000	00000000	06018033	02230601	40330173	00C0FFFF
00020100	000000B6	E5C1E7C2	40404040	06000000	14080000
06080000	06018033	02230601	40331101	14080000	06080000
06018033	01730601	40331101	20080000	06080000	06018033
02230604	00330400	06040011	0A000601	40111101	20080000
0608012C	06018033	02230604	00330500	06040011	07000601
40111101	20080000	06080000	06018033	01730604	00330400
06040011	0A000601	40111101	20080000	0608012C	06018033
01730604	00330500	06040011	07000601	40111101	00C0FFFF
00020100	000000B6	D7C4D740	40404040	06000000	14080000
06080000	06018033	02230601	40331108	14080000	06080000
06018033	01730601	40331108	20080000	06080000	06018033
02230604	00330400	06040011	0A000601	40111108	20080000
0608012C	06018033	02230604	00330500	06040011	07000601
40111108	20080000	06080000	06018033	01730604	00330400
06040011	0A000601	40111108	20080000	0608012C	06018033
01730604	00330500	06040011	07000601	40111108	00C0FFFF
00020100	000000B6	E2D7C5D9	D9E84040	06000000	14080000
06080000	06018033	02230601	40331000	14080000	06080000
06018033	01730601	40331000	20080000	06080000	06018033
02230604	00330400	06040011	0A000601	40111000	20080000
0608012C	06018033	02230604	00330500	06040011	07000601
40111000	20080000	06080000	06018033	01730604	00330400
06040011	0A000601	40111000	20080000	0608012C	06018033
01730604	00330500	06040011	07000601	40111000	0040FFFF
00020100	00000036	E5C1E7C1	40404040*		

Figure 15. PAM File

PAM File Analysis

PAM File

The entries broken down in the following paragraphs have been extracted from the sample PAM block in Figure 15 on page 54. Where the examples show a specific portion of the overall PAM, only the bytes pertaining to that section are broken out.

The file begins with the directory, which is a sequence of n 16 byte entries. The first of these entries is the Directory Header.

Directory Header

The first entry in a PAM file (see Figure 15 on page 54) is (by definition) 16 bytes long, and contains the Directory Header. The Directory Header in the sample PAM follows. Significant information is decoded below the entry. Figure 16 is an example of the Directory Header.

```
C9C2D440 40404040 0100000B 000000C0
```

Figure 16. Directory Header Example

Byte #	Meaning
0-7	Host name this PAM was generated on (IBM)
8	Version
9	Undefined - filler
10-11	Count of entries in directory, not counting
12-15	Length of directory, including header, in bytes

Local Host Configuration Directory Entry

Following the Directory Header is the Local Host Configuration Directory Entry. The Local Host Configuration Directory Entry for the example shown in Figure 17 is decoded below.

```
C9C2D440 40404040 0200003A 00000030
```

Figure 17. Local Host Configuration Directory Entry Example

Bytes#	Meaning
0-7	Host name for this record (IBM)
8	Type of record (2 - Configuration Entry)
9	Undefined - filler
10-11	Length of configuration record (in bytes, 3A16= 58)
12-13	Offset to configuration record (12-13 - block number)
14-15	Offset in block (in bytes)

Host Directory Entry

Following the Configuration Entry, are n Host Directory Entries. There is one Host Directory Entry for each host in the NCT. The example in Figure 18 shows the Host Directory Entry for the Sperry host.

E2D7C5D9	D9E84040	010000C0	000000CB
----------	----------	----------	----------

Figure 18. Host Directory Entry Example

Bytes#	Meaning
0-7	Host name for this record (SPERRY)
8	Type of record (1 - Session PAM List - SPL)
9	Undefined - filler
10-11	Length of SPL (in bytes, C016 = 192)
12-15	Offset to SPL (12-13 - block number, 14-15 - offset into block, in bytes)

Local Host Configuration Record

Following the Directory is the Configuration Record. The displacement of the Configuration Record into the file may be calculated from the Directory Header. The address of the Directory Header + Length of header, (C016= 192 bytes) equals the address of the Configuration Record. From the example PAM, the Configuration Record is shown in Figure 19.

003A0200	00004040	40404040	4040C1F2	F2F20173	00040000
02703000	00000000	40404040	40404040	C1F2F2F2	02230004
00000320	30000000	0000			

Figure 19. Local Host Configuration Record Example

Bytes#	Meaning
0-1	Length of Configuration Record (3A16, or 58 bytes).
2	Number of adapters on this host (2)
6-13	Name of first adapter (unnamed)
14-17	Type of adapter (A222)
18	Net Address (Unit Number) 0116
19	DRef, 7316
20-21	Number of Addresses (4)
22-25	Base Subchannel Address (27016)
26-31	Undefined - filler

Repeat bytes 6-31 for as many iterations as byte 2 specifies,

Session PAM List

Following the Configuration Record is the first Session PAM List (SPL) as shown in Figure 20. The displacement of the SPL for each host is determined from the Host Directory Entry for that host name. For example, the Host Directory Entry for host 'Sperry' specifies that the displacement of the SPL is CB16 words

into the PAM (this Host Directory Entry is shown above). CB16 is 203 (decimal), and at 203 words into the PAM File we find the following:

00C0FFFF	00020100	000000B6	E2D7C5D9	D9E84040	06000000
14080000	06080000	06018033	02230601	40331000	14080000
06080000	06018033	01730601	40331000	20080000	06080000
06018033	02230604	00330400	06040011	0A000601	40111000
20080000	0608012C	06018033	02230604	00330500	06040011
07000601	40111000	20080000	06080000	06018033	01730604
00330400	06040011	0A000601	40111000	20080000	0608012C
06018033	01730604	00330500	06040011	07000601	40111000

Figure 20. Session PAM List Example

Session PAM List Header

The first portion of this block is the Session PAM List (SPL) Header. The Sperry SPL Header information is shown in Figure 21.

00C0FFFF	00020100	0000
----------	----------	------

Figure 21. Session PAM List Header

Byte #	Meaning
0-1	Length of SPL (C016 or 192 bytes)
2-3	NRef FFFF16
4-5	Protocol Version Mask (2)
6	Number of Transport PAM Lists (There is only 1 TPL unless Host Groups are specified)
7-9	Undefined - filler

Transport PAM List Header

Immediately following the SPL Header is the Transport PAM List (TPL) Header. The TPL Header is decoded as shown in Figure 22.

00B6	E2D7C5D9	D9E84040	06000000
------	----------	----------	----------

Figure 22. Transport PAM List Header Example

Byte #	Meaning
0-1	Transport PAM List (TPL) Length (X'B6 or 182 bytes)
2-9	Host Name for this record (SPERRY)
10	Number of paths to host Sperry (6)
11	Flagbits - Currently Unused
12-13	Undefined - filler

PAM List Header

Immediately following the TPL header information is the PAM Header. The first PAM Header is shown in Figure 23.

```
14080000 06080000
```

Figure 23. PAM List Header Example

Byte #	Meaning
0	Length of PAM (1416 - 20 bytes)
1-3	Max Segment Size, in bits
0	No limit
80000	64K bytes
4-5	Transmission Rate (in Kbits/second) 060816= 1.544
6-7	Transmission Delay in Milliseconds

Following this PAM Header information are the actual PAM entries. The first PAM entry is shown in Figure 24.

```
06018033 0223
```

Figure 24. First PAM Entry Example

Byte #	Meaning
0	Length of PAM (0616 - 6 bytes)
1	Type entry
0116	Host
0316	A710 Link Adapter (May not appear)
0416	S720 SLS Adapter
2	Flags
8016	First PAM entry
4016	Last PAM entry
3	Trunk Mask (3316 - Trunks 2 and 3)
4	Net Address (Unit Number) 0216
5	DRef, 2316

The second PAM entry (which also happens to be the last) follows this first. The second PAM entry is shown in Figure 25.

```
06014033 1000
```

Figure 25. Second PAM Entry Example

Byte #	Meaning
0	Length of PAM (0616 - 6 bytes)

- 1 Type entry
 - 0116 Host
 - 0316 A710 Link Adapter (May not appear)
 - 0416 A715 SLS Adapter
- 2 Flags
 - 8016 First PAM entry
 - 4016 Last PAM entry
- 3 Trunk Mask (3316 - Trunks 2 and 3)
- 4 Net Address (Unit Number) 1016
- 5 DRef, 0016

Path Calculation

The Transport PAM List indicates that the first path to be attempted when going from host IBM to host Sperry will be from host adapter with Net Addr = 0216, DRef 2316 (the A222 IBM host adapter) to adapter with Net Addr = 1016. This is the host adapter on the Sperry system.

APR Calculation

By examining the next entry in the TPL, we can see the first alternate path that will be attempted if the connection on the first path is not successful. An example of this TPL is shown in Figure 26.

14080000	06080000	06018033	01730601	40331000
----------	----------	----------	----------	----------

Figure 26. First APR Calculation Example

This PAM will attempt a connection via IBM host adapter with a network address of 0116, to the host adapter, network address 1016. In other words from the other IBM host adapter to the Sperry host adapter.

If this connection should not succeed, the next entry would be attempted. This entry is shown in Figure 27.

20080000	06080000	06018033	02230604
00330400	06040011	0A000601	40111000

Figure 27. Second APR Calculation Example

This PAM list is 32 bytes in length and specifies the following path.

1. IBM host adapter - Net Addr 02, DRef 23, Trunk Mask 3316
2. SLS Link Adapter - Net Addr 04, Trunk Mask 3316
3. SLS Link Adapter - Net Addr 0A, Trunk Mask 1116
4. Sperry host adapter - Net Addr 10, Trunk Mask 1116

Looking back at Figure 12, this is indeed a valid path from the IBM host to the Sperry. Note that on the Away net, only trunk 3 is installed, hence the trunk mask of 1116.

Notes and Cautions

The sample configuration used is an example only. The Configuration Manager is IBM MVS NetEx Release 2.3. The job output is actual output from an IBM MVS system, and has not been changed in any manner.

Certain values change from system to system, and Configuration Manager to Configuration Manager, although the path calculations are standard. The following values can vary:

1. Blocksize of the PAM File
2. Offset values; 32 bit words, bytes, or some other value.

This manual is intended for the Systems Engineering level audience as informational material only.

Multi-Hop Network Definition

Multi-Hop Network Topology

Figure 28 illustrates a typical multi-hop network. This serves to illustrate two paths from one site to another, with the alternate path being through a third point.

This is an example and does not represent any particular customer configuration.

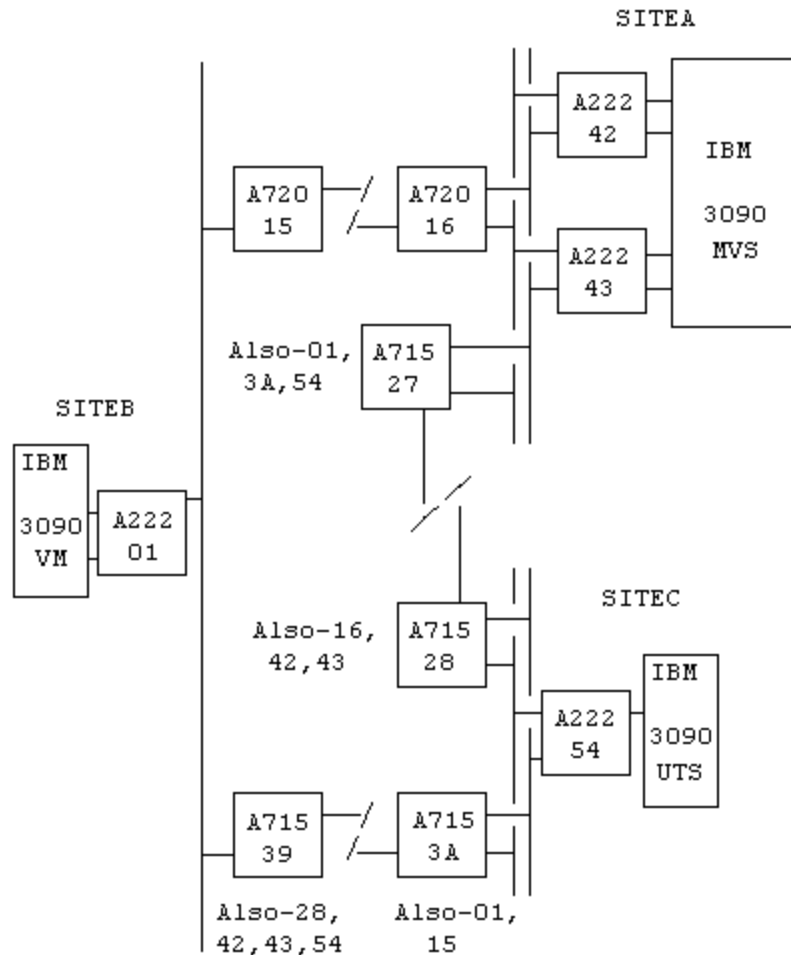


Figure 28. Multi-Hop Network Configuration

Multi-Hop Network NCT

An NCT used to describe the multi-hop network in Figure 28 could resemble the following example. The example (in Figure 29) is shown in the actual 64 byte record length used by H210, so is spread across several pages. See the appropriate reference manual for more information on NCT commands.

```
*
* DESCRIBE 'SITEB' NETWORK
*
SITEB      LOCALNET  TYPE=HC
RED        TRUNK
*
VM1        HOST      MODEL=3090,
           OS=VM,
           PROTOCOL=1,
           PROTOCOL=2,
           TYPE=IBM
           ADAPTER   CHANADDR=320,
           MODEL=A222,
           NETADDR=01,
           NUMADDRES=4,
           SMGDREF=23,
           SMGNREF=FFFF,
           T0=RED
*
           LINK      MODEL=S720,
           NETADDR=15,
           T0=RED
*
L720P1     PORT      DELAY=0M,
           DEST=L720P2,
           RATE=1544K
*
           LINK      MODEL=A715,
           MODE710=28,
           MODE710=42,
           MODE710=43,
           MODE710=54,
           NETADDR=39,
           T0=RED
*
L715P1     PORT      DELAY=0M,
           DEST=L715P2,
           RATE=1544K
*
* DESCRIBE 'SITEA' NETWORK
*
LOCAL2     LOCALNET  TYPE=HC
GREEN      TRUNK
*
MVS1       HOST      MODEL=3090,
           OS=MVS,
           PROTOCOL=1,
           PROTOCOL=2,
           TYPE=IBM
```

```

ADAPTER  CHANADDR=320,
MODEL=A222,
NETADDR=42,
NUMADDRS=4,
SMGDREF=23,
SMGNREF=FFFF,
T0=GREEN
ADAPTER  CHANADDR=440,
MODEL=A222,
NETADDR=43,
NUMADDRS=4,
SMGDREF=43,
SMGNREF=FFFF,
T0=GREEN
*
LINK     MODEL=S720,
NETADDR=16,
T0=GREEN
L720P2  PORT  DELAY=0M,
DEST=L720P1,
RATE=1544K
*
LINK     MODEL=A715,
MODE710=01,
MODE710=3A,
MODE710=54,
NETADDR=27,
T0=GREEN
*
A715P1  PORT  DELAY=0M
DEST=A715P2,
RATE=1544K,
*
* DESCRIBE 'SITEC' NETWORK
*
LOCAL3   LOCALNET  TYPE=HC
BLUE     TRUNK
*
UTS1     HOST      MODEL=3090,
OS=UTS,
PROTOCOL=2,
TYPE=IBM
*
ADAPTER  CHANADDR=320,
MODEL=A222,
NETADDR=54,
NUMADDRS=4,
SMGDREF=23,
SMGNREF=FFFF,
T0=BLUE
*
LINK     MODEL=A715,
MODE710=16,
MODE710=42,
MODE710=43,
NETADDR=28,
T0=BLUE

```

```
*
A715P2  PORT      DELAY=0M,
                DEST=A715P1,
                RATE=1544K
*
                LINK      MODEL=A715,
                MODE710=01,
                MODE710=15,
                NETADDR=3A,
                T0=BLUE
*
L715P2  PORT      DELAY=0M,
                DEST=L715P1,
                RATE=1544K
*
* END DEFINITION
*
                END
```

Figure 29. Multi-Hop Network NCT

Multi-Hop NCT Explanation

The following sections illustrate the Configuration Manager job output, as well as the actual PAM produced from the above NCT. As before, the PAM is also examined to determine the actual paths it has generated through the network.

Configuration Manager Job Output

The Configuration Manager output for the above NCT is shown in Figure 30.

```
Configuration Manager 2.1 8906
Enter command: NCT, SELECT, DESELECT, MAKEPAM, or EXIT
CONF001I Parsing initiated
CONF057I Parsing completed ValidNCT=TRUE, Errors=0, Warnings=0
Valid NCT read and data structure built
Enter command: NCT, SELECT, DESELECT, MAKEPAM, or EXIT
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL07
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL06
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL05
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL04
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL03
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL02
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL01
CONF099I path exists from HOST: MVS1 to HOST: NTXLCL00
CONF099I path exists from HOST: MVS1 to HOST: UTS1
CONF099I path exists from HOST: MVS1 to HOST: UTS1
CONF099I path exists from HOST: MVS1 to HOST: UTS1
CONF099I path exists from HOST: MVS1 to HOST: UTS1
CONF099I path exists from HOST: MVS1 to HOST: UTS1
CONF099I path exists from HOST: MVS1 to HOST: UTS1
CONF099I path exists from HOST: MVS1 to HOST: MVS1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
CONF099I path exists from HOST: MVS1 to HOST: VM1
PAM List generation complete
Enter command: NCT, SELECT, DESELECT, MAKEPAM, or EXIT
Configuration Management Complete
```

Figure 30. Sample Configuration Manager Output

Paths Through the Network

The addresses for profiling the AC715 adapters were chosen as follows.

Note: Recall that the first address profiled into each of the AC715s (that is, the address within the box in Figure 28) is the base or satellite mode address for the Link Adapter. See the discussion under “Introduction” on page 41 regarding satellite addressing processing by Link Adapters.

1. The base addresses of the AC715's, as well as the address of the S720, were chosen arbitrarily; however, they cannot conflict with any host adapter addresses.
2. AC715 - base address 27 (SITEA) - is also profiled to intercept (in A710 mode) addresses 01, 3A and 54. This provides paths to:
 - 01 - Host adapter 01 (SITEB) through SITEC, Link Adapter base 3A.
 - 3A - A double hop path through AC715 base 3A to SITEB.
 - 54 - SITEC host adapter 54.
3. AC715 - base address 28 (top Link Adapter, SITEC) - is also profiled to intercept (in A710 mode) addresses 16, 42 and 43. This provides paths to:
 - 16 - The double hop path from SITEC to SITEB, with the second leg being through the S720 pair.
 - 42 - The path to host adapter 42 (SITEA) A710 mode.
 - 43 - The path to host adapter 43 (SITEA) A710 mode.
4. AC715 - base address 3A (bottom Link Adapter, SITEC) - is also profiled to intercept (in A710 mode) addresses 01 and 15. This provides paths to:
 - 01 - The path to host adapter 01 (SITEB) from SITEC or SITEA via the double hop.
 - 15 - The double hop path from SITEC to SITEA through satellite pair, 15 and 16, via SITEB.
5. AC715 - base address 39 (bottom Link Adapter, SITEB) - is also profiled to intercept (in A710 mode) addresses 28, 42, 43 and 54. This provides paths to:
 - 28 - A path to host adapter 42 or 43 (SITEA) via link mode AC715's 28 and 27.
 - 42 - A 710 mode path from SITEB to SITEA via SITEC (AC715 base address 28).
 - 43 - A 710 mode path from SITEB to SITEA via SITEC (AC715 base address 28).
 - 54 - A 710 mode path from SITEB or SITEA to host adapter 54 (SITEC).

Multi-Hop PAM File

Figure 31 is a dump of the first block of the actual PAM generated by running the IBM MVS Configuration Manager with the input as shown in Figure 29 on page 64. The PAMFile dataset was again allocated with a block length of 1024 bytes.

```

H210 V2R3M1 PAM-file
D4E5E2F1 40404040 0100000D 000000E0 D4E5E2F1 40404040 0200003A 00000038
D5E3E7D3 C3D3F0F7 01000038 00000047 D5E3E7D3 C3D3F0F6 01000038 00000055
D5E3E7D3 C3D3F0F5 01000038 00000063 D5E3E7D3 C3D3F0F4 01000038 00000071
D5E3E7D3 C3D3F0F3 0100002C 0000007F D5E3E7D3 C3D3F0F2 0100002C 0000008A
D5E3E7D3 C3D3F0F1 0100002C 00000095 D5E3E7D3 C3D3F0F0 0100002C 000000A0
E4E3E2F1 40404040 010000C0 000000AB D4E5E2F1 40404040 01000026 000000DB
E5D4F140 40404040 01000140 000000E5 D5E3E7D3 C3D34040 010000E8 00010035
003A0200 00004040 40404040 4040C1F2 F2F24223 00040000 03208000 00000000
40404040 40404040 C1F2F2F2 43430004 00000440 80000000 00000000 0038FFFF
00030100 0000002E D5E3E7D3 C3D3F0F7 01000000 20080000 06080000 06018088
42230604 00881500 06040088 16000601 40884343 0038FFFF 00030100 0000002E
D5E3E7D3 C3D3F0F6 01000000 20080000 06080000 06018088 42230604 00881500
06040088 16000601 40884223 0038FFFF 00030100 0000002E D5E3E7D3 C3D3F0F5
01000000 20080000 06080000 06018088 43430604 00881500 06040088 16000601
40884343 0038FFFF 00030100 0000002E D5E3E7D3 C3D3F0F4 01000000 20080000
06080000 06018088 43430604 00881500 06040088 16000601 40884223 002CFFFF
00030100 00000022 D5E3E7D3 C3D3F0F3 01000000 14080000 00000000 06018088
42230601 40884343 002CFFFF 00030100 00000022 D5E3E7D3 C3D3F0F2 01000000
14080000 00000000 06018088 42230601 40884223 002CFFFF 00030100 00000022
D5E3E7D3 C3D3F0F1 01000000 14080000 00000000 06018088 43430601 40884343
002CFFFF 00030100 00000022 D5E3E7D3 C3D3F0F0 01000000 14080000 00000000
06018088 43430601 40884223 00C0FFFF 00020100 000000B6 E4E3E2F1 40404040
06000000 14080000 06080000 06018088 43430601 40885423 14080000 06080000
06018088 42230601 40885423 20080000 06080000 06018088 43430604 00881600
06040088 15000601 40885423 20080000 06080000 06018088 43430604 00882700
06040088 28000601 40885423 20080000 06080000 06018088 42230604 00881600
06040088 15000601 40885423 20080000 06080000 06018088 42230604 00882700
06040088 28000601 40885423 0026FFFF 00030100 0000001C D4E5E2F1 40404040
01000000 0E080000 00000000 0600C000 43430000 0140FFFF 00030100 00000136
E5D4F140 40404040 0A000000 14080000 06080000 06018088 43430601 40880123
14080000 06080000 06018088 42230601 40880123 20080000 06080000 06018088
43430604 00881600 06040088 15000601 40880123 20080000 06080000 06018088
43430604 00883A00 06040088 39000601 40880123 20080000 06080000 06018088
43430604 00882700 06040088 28000601 40880123 20080000 06080000 06018088
43430604 00883A00 06040088 28000601 40880123 20080000 06080000 06018088
42230604 00881600 06040088 15000601 40880123 20080000 06080000 06018088
42230604 00883A00 06040088 39000601 40880123 20080000 06080000 06018088
42230604 00882700 06040088 28000601 40880123 20080000 06080000 06018088
42230604 00883A00 06040088 28000601 40880123 00E8FFFF 00030100 000000DE
D5E3E7D3 C3D34040 08000000 14080000 00000000 06018088 43430601 40884223
14080000 00000000 06018088 43430601 40884343 14080000 00000000 06018088
42230601 40884223 14080000 00000000 06018088 42230601 40884343 20080000
06080000 06018088 43430604 00881500 06040088 16000601 40884223 20080000
06080000 06018088 43430604 00881500 06040088 16000601 40884343 20080000
06080000 06018088 42230604 00881500 06040088 16000601 40884223 20080000
06080000 06018088 42230604 00881500 06040088 16000601 40884343 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
.
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

```

Figure 31. Multi-Hop PAM File

Multi-Hop PAM File Analysis

The multi-hop PAM is examined following the same procedure as outlined earlier in this document.

Multi-Hop PAM Directory Header

The Directory Header for the multi-hop PAM is shown in Figure 32.

```
D4E5E2F1 40404040 0100000D 000000E0
```

Figure 32. Multi-Hop PAM Directory Header Example

Byte #	Meaning
0-7	Host name for this record - MVS1
8	Version - 01
9	Undefined - filler
10-11	Count of entries in directory - 0D16 - 13
12-15	Length of directory in bytes - E016 - 224

Multi-Hop Network Local Host Directory

The Local Host Configuration Directory Entry in this PAM is shown in Figure 33.

```
D4E5E2F1 40404040 0200003A 00000038
```

Figure 33. Multi-Hop Network Local Host Directory Example

Bytes#	Meaning
0-7	Host name for this record for this record - MVS1
8	Type of record - 2, (Configuration Entry)
9	Undefined - filler
10-11	Length of configuration record - 3A16 - 58
12-15	Offset to configuration record - Block 0, 3816 - 56

Multi-Hop Host Directory Entry

To examine multiple paths, we will examine the Host Directory Entry for the host “VM1”, from our local host “MVS1”. The Host Directory Entry is shown in Figure 34.

```
E5D4F140 40404040 01000140 000000E5
```

Figure 34. Multi-Hop Host Directory Entry Example

Bytes#	Meaning
0-7	Host name for this record - VM1
8	Type of record (1 - Session PAM List - SPL)
9	Undefined - filler

10-11 Length of SPL – 14016 - 320

12-15 Offset to SPL (12-13 - block number) (14-15 - offset into block, in words)

Multi-Hop Local Host Configuration Record

The Local Host Configuration Record for host “MVS1” is found by looking into the PAM E016 bytes (from the Directory Header), from the beginning. If you were looking at this PAM from a system, you would add the length of the Directory Header to the address of the Directory Header to get the displacement of the Local Host Configuration Record.

This Local Host Configuration Record is shown in Figure 35.

003A0200	00004040	40404040	4040C1F2	F2F24223	00040000	03208000	00000000
40404040	40404040	C1F2F2F2	43430004	00000440	80000000		

Figure 35. Multi-Hop Local Host Configuration Record Example

Bytes#	Meaning
0-1	Length of configuration record (3A16, or 58 bytes).
2	Number of adapters on this host (2)
6-13	Name of first adapter (unnamed)
14-17	Type of adapter (A222)
18	Net Address (Unit Number) 4216
19	DRef, 2316
20-21	Number of Addresses (4)
22-25	Base Subchannel Address (32016)
26-31	Undefined - filler
Bytes 6-31 are repeated since byte 2 specifies 2 host adapters	
32-39	Name of next adapter (unnamed)
40-43	Type of adapter (A222)
44	Net Address (Unit Number) 4316
45	DRef, 4316
46-47	Number of Addresses (4)
48-51	Base Subchannel Address (44016)
52-57	Undefined - filler

Multi-Hop Session PAM List

To find the Session PAM List for the host VM1, locate the Host Directory Entry for host VM1 and get the displacement from the directory entry.

In Figure 36, the Host Directory Entry for host VM1 shows the offset into the PAM to be E516 (229) words into the PAM. The following is found at this displacement.

```

0140FFFF 00030100 00000136
E5D4F140 40404040 0A000000 14080000 06080000 06018088 43430601 40880123
14080000 06080000 06018088 42230601 40880123 20080000 06080000 06018088
43430604 00881600 06040088 15000601 40880123 20080000 06080000 06018088
43430604 00883A00 06040088 39000601 40880123 20080000 06080000 06018088
43430604 00882700 06040088 28000601 40880123 20080000 06080000 06018088
43430604 00883A00 06040088 28000601 40880123 20080000 06080000 06018088
42230604 00881600 06040088 15000601 40880123 20080000 06080000 06018088
42230604 00883A00 06040088 39000601 40880123 20080000 06080000 06018088
42230604 00882700 06040088 28000601 40880123 20080000 06080000 06018088
42230604 00883A00 06040088 28000601 40880123

```

Figure 36. Multi-Hop Session PAM List Example

VM1 Session PAM List Header

The SPL Header for host VM1 is shown in Figure 37.

```

0140FFFF 00030100 0000

```

Figure 37. VM1 Session PAM List Header Example

Byte #	Meaning
0-1	Length of SPL (14016 or 320 bytes)
2-3	NRef FFFF16
4-5	Protocol Version Mask (3 = protocols 1 and 2)
6	Number of Transport PAM Lists (There is only 1 TPL unless Host Groups are specified)
7-9	Undefined - filler

VM1 Transport PAM List Header

The Transport PAM List (TPL) Header for VM1 is shown in Figure 38.

```

0136 E5D4F140 40404040 0A000000

```

Figure 38. VM1 Transport PAM List Header Example

Byte #	Meaning
0-1	Transport PAM List (TPL) Length – 13616 - 310 bytes
2-9	Host name for this record - VM1
10	Number of paths to host VM1 0A16 - 10
11	Flagbits - Currently Unused
12-13	Undefined - filler

VM1 PAM List Header

The PAM Header for the first path generated to host VM1 is shown in Figure 39.

```
14080000 06080000
```

Figure 39. VM1 PAM List Header Example

Byte #	Meaning
0	Length of PAM (1416 - 20 bytes)
1-3	Max Segment Size, in bits
0	No limit
0000	64K bytes
4-5	Transmission Rate (in Kbits/second) 060816 = 1.544 Mbits/second
6-7	Transmission Delay in Milliseconds

Following this PAM Header information are the actual PAM entries. Note that the PAM entries are decoded as described in “PAM List Header” on page 58. A list of PAM entries is searched from the first PAM entry, Flag byte=8016, to the last, Flag byte=4016.

First Path, MVS1 to VM1

The first path, as shown in Figure 40, is 20 bytes long (including header) and consists of these two entries. The header is not shown in this first example for clarity. The header is included in the path descriptions following this initial one.

```
06018088 4343 0601 40880123
```

Figure 40. First Path, MVS1 to VM1 Example

This path is decoded as host adapter with net address (Unit Number) 4316, DRef 4316, trunk mask 8816; to net address (unit number) 0116, DRef 2316, trunk mask 8816.

Examining Figure 28, we see that this is a valid path from host MVS1 to VM1. Note further, however, that this path actually goes by way of a double hop (two sets of A715 Link Adapters). If a HYPERchannel message with a “to” address of 0116 is sent from host MVS1, it will be intercepted by A715, base address 2716 (also profiled to accept 0116), sent across the link and retransmitted on the trunk at “SITEC” with the original “to” address of 0116. At SITEC, the link adapter with base address 3A16 will intercept this message (because it is also profiled to accept 0116), send the message across the link and retransmit it on the trunk at SITEB with the “to” address of 0116. This will get the message to adapter 01, thence to host VM1.

Second Path, MVS1 to VM1

The second path, including header, is shown in Figure 41.

```
14080000 06080000 06018088 42230601 40880123
```

Figure 41. Second Path, MVS1 to VM1 Example

This path differs from the first only in the local adapter to use. This path is through host adapter network address (Unit Number) 4216, DRef 2316. Again however, this path would also use the double-hop A715 link pairs.

Third Path, MVS1 to VM1

The third path in the list, including header, is shown in Figure 42.

```
20080000 06080000 06018088 43430604 00881600 06040088 15000601 40880123
```

Figure 42. Third Path, MVS1 to VM1 Example

The component PAMs in the list are shown in Figure 43.

```
0601 8088 4343
0604 0088 1600
0604 0088 1500
0601 4088 0123
```

Figure 43. List of Component PAMs

This path is from host adapter 4316 through A720 pair 1616 and 1516, to host adapter 0116. Again, this is a valid path. This path goes through an A720 pair using “imbedded addressing”.

Fourth Path, MVS1 to VM1

Examining the fourth path, as shown in Figure 44, you can see that this path uses the same host adapters, but uses imbedded addressing for A720pair 3A16 and 3916. Note that to use this path, the HYPERchannel “to” address would have to be 3A16 with the “real to” address of 0116 imbedded in the message proper. The “to” address of 3A16 would be captured by A715, base 2716 and transmitted to the trunk at SITEC, where it would be seen by the A715 with base address 3A16.

```
20080000 06080000 06018088 43430604 00883A00 06040088 39000601 40880123
```

Figure 44. Fourth Path, MVS1 to VM1 Example

Successive Paths, MVS1 to VM1

Successive paths between the two hosts are shown in Figure 45.

```
20080000 06080000 06018088 43430604 00882700 06040088 28000601 40880123
20080000 06080000 06018088 43430604 00883A00 06040088 28000601 40880123
20080000 06080000 06018088 42230604 00881600 06040088 15000601 40880123
20080000 06080000 06018088 42230604 00883A00 06040088 39000601 40880123
20080000 06080000 06018088 42230604 00882700 06040088 28000601 40880123
20080000 06080000 06018088 42230604 00883A00 06040088 28000601 40880123
```

Figure 45. Successive Paths, MVS1 to VM1 Example

These paths, 5 through 10, use the components as follows:

- 5 Through A715 (embedded addressing mode, or base address) pair 2716 and 2816. This message would directly address unit 2716 with the “to” address of 0116 embedded.
- 6 This is a special case path. This type of path is generated when the network contains double-hops. This path uses A715 pair 3A16 and 3916 in 720 mode with 0116 imbedded, but when the message is turned around at the remote host, the return path uses A715 pair 2816 and 2716 in 720 mode with “to” address 4316 embedded. This is done to somewhat load balance in large complex networks.
- 7 Same as path 3, but using host 4216 rather than 4316.

- 8** Same as path 4, but using host 4216 rather than 4316.
- 9** Same as path 5, but using host 4216 rather than 4316.
- 10** Same as path 6, but using host 4216 rather than 4316.

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