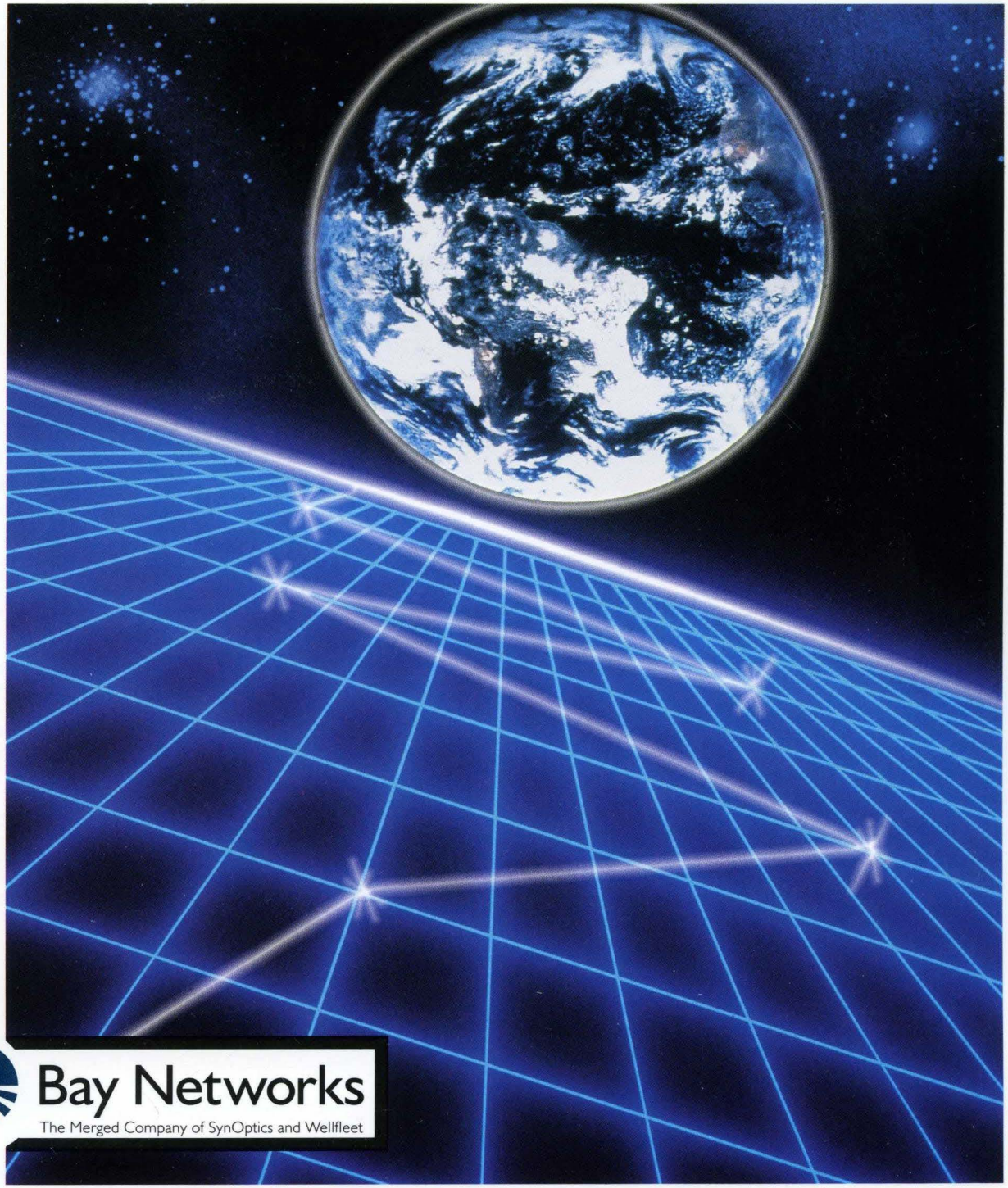

Bay Networks

The Merged Company of SynOptics and Wellfleet

Customizing DECnet Services

Part No. 110044 A

Customizing DECnet Services

Router Software Version 8.10
Site Manager Software Version 2.10

Part No. 110044 Rev. A
February 1995

Bay Networks

The Merged Company of SynOptics and Wellfleet

Bay Networks, Inc., 8 Federal Street, Billerica, MA 01821

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About This Guide

If you are responsible for configuring and managing Wellfleet® routers, you need to read this guide.

This guide describes how to customize Wellfleet router software for DECnet™ Phase IV services.

Refer to this guide for

- An overview of the Wellfleet routing protocol for DECnet services and a description of how DECnet services work (see the "DECnet Overview" chapter)
- Implementation notes that may affect how you configure DECnet routing services (see the "DECnet Implementation Notes" chapter)
- Instructions on editing DECnet global and interface parameters and details on configuring static routes, static adjacencies, and DECnet IV to V Transition (see the "Editing DECnet Parameters" chapter)

For information and instructions about the following topics, see *Configuring Wellfleet Routers*.

- Initially configuring and saving a DECnet interface
- Retrieving a configuration file
- Rebooting the router with a configuration file

Before You Begin

Before using this guide, you must complete the following procedures:

- Create and save a configuration file that contains at least one DECnet interface.
- Retrieve the configuration file in local, remote, or dynamic mode.

Refer to *Configuring Wellfleet Routers* for instructions.

How to Get Help

For additional information or advice, contact the Bay Networks Help Desk in your area:

United States	1-800-2LAN-WAN
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Sydney, Australia	(61) 2-903-5800
Tokyo, Japan	(81) 3-328-0052

Conventions

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: if command syntax is **ping** <*ip_address*>, you enter **ping 192.32.10.12**
arrow character (➔)	Separates menu and option names in instructions. Example: Protocols➔AppleTalk identifies the AppleTalk option in the Protocols menu.
brackets ([ ])	Indicate optional elements. You can choose none, one, or all of the options.
user entry text	Denotes text that you need to enter. Example: Start up the Windows environment by entering the following after the prompt: **win**
command text	Denotes command names in text. Example: Use the **xmodem** command.

italic text	Indicates variable values in command syntax descriptions, new terms, file and directory names, and book titles.
`screen text`	Indicates data that appears on the screen. Example: `Set Trap Monitor Filters`
ellipsis points	Horizontal (. . .) and vertical (⋮) ellipsis points indicate omitted information.
quotation marks (" ")	Indicate the title of a chapter or section within a book.
vertical line (|)	Indicates that you enter only one of the parts of the command. The vertical line separates choices. Do not type the vertical line when entering the command. Example: If the command syntax is **show at routes | nets**, you enter either **show at routes** or **show at nets**, but not both.

Acronyms

AFI	Authority Format Identifier
CLNP	Connectionless Network Protocol
DSP	Domain Specific Part
ES-IS	End System to Intermediate System
IDI	Initial Domain Identifier
IDP	Initial Domain Part
IS-IS	Intermediate System to Intermediate System
MAC	Media Access Control
MIB	Management Information Base
NSAP	Network Service Access Point
OSI	Open Systems Interconnection
SMDS	Switched Multimegabit Data Services
WAN	Wide Area Network

Chapter 1
DECnet Overview

This chapter provides an overview of the DECnet technology and describes how the Wellfleet router software works with DECnet services. It also describes the

- Organization of end systems and routers in a DECnet network
- Transmission of messages from the Wellfleet router through the DECnet network
- Routing decision process for a DECnet network
- DECnet IV to V Transition feature

DECnet Network Organization

A DECnet network contains two types of nodes: end nodes and routers. End nodes send and receive messages. The Wellfleet router transmits messages to end nodes and other routers on the network.

DECnet Phase IV Organization

DECnet Phase IV is a networking protocol that supports large networks (approximately 64,000 nodes). Each network is divided into distinct areas (up to 63); each area contains up to 1023 nodes. Each area is assigned an Area ID, unique to the network. Each node within an area is assigned a Node ID, unique to the area.

Together, the Area ID and Node ID identify a 16-bit DECnet Phase IV address (Figure 1-1). The first six bits identify the area in which the node resides; the last 10 bits identify the node itself. Each DECnet Phase IV address must be unique within the network.

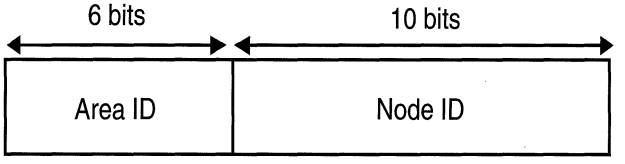


Figure 1-1. DECnet Phase IV Address

A Wellfleet router running the routing software for a DECnet Phase IV network can service multiple areas; that is, you assign addresses to each of the router's individual interfaces, rather than to the entire router.

Not all of the router's interfaces have to use the same address. For example, if a router resides in multiple areas (has circuits connecting to more than one area), it is assigned an Area ID and Node ID for each area to which it connects. A router can also have several interfaces (each one assigned a unique Node ID) in the same area.

Figure shows that circuits E21 and E22 were assigned different DECnet addresses, even though they connect to the same router. Note that each circuit's address is still unique within its area and within the DECnet network.

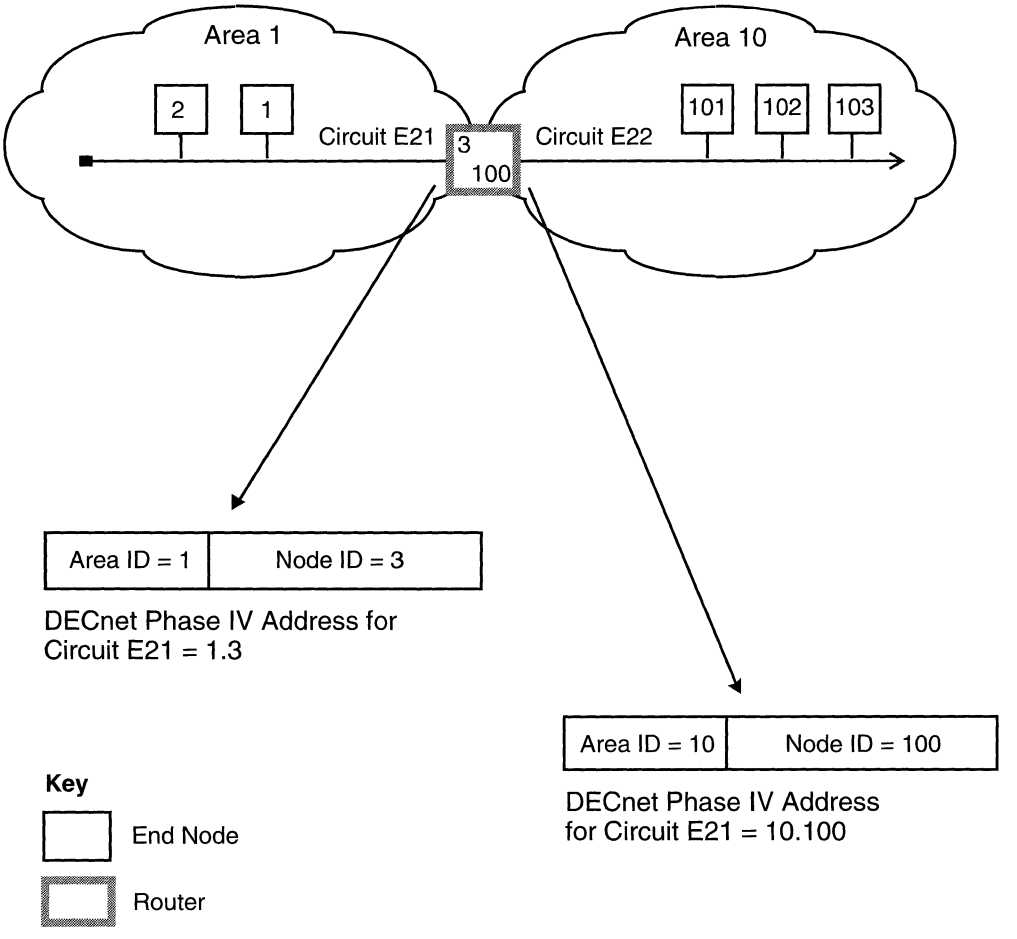


Figure 1-2. Wellfleet Router with Multiple DECnet Addresses

DECnet Phase V Organization

DECnet Phase V is an implementation of the Open Systems Interconnection (OSI) Connectionless-mode Network Layer protocols. These protocols include Connectionless Network Protocol (CLNP), End System to Intermediate System (ES-IS) Protocol, and Intermediate System to Intermediate System (IS-IS) Protocol.

Each system in a DECnet Phase V network is assigned a Network Service Access Point (NSAP) address. Each DECnet Phase V NSAP address must be globally unique and can be from 10 bytes to 20 bytes in length. However, a local DECnet network does not need a unique address.

For more information about Phase V network organization and addressing, see Chapter 1 of *Customizing OSI Services*.

How the Wellfleet Routing Software for DECnet Services Works

The Wellfleet routing software for DECnet services uses a datagram service to route packets through the DECnet network. Routing within an area is called Level 1 (or intra-area) routing; routing between areas is called Level 2 (or inter-area) routing.

The Wellfleet routing software for DECnet services performs both types of routing services. That is, as a Level 1 router, it maintains paths to systems within its local area. As a Level 2 router, it maintains paths to all other areas within the DECnet network.

When a Wellfleet router receives a packet, it examines the destination address contained in the packet header. If the destination address is local, the router forwards the packet toward the destination system using the least cost path. If the destination address is to another area, the router forwards the packet toward the destination area; again, using the least cost path.

The router decides on the least cost path based on network topology and assigned circuit costs. If the least cost path is disabled, or a node fails, the router will find a different path, if one exists.

How Routing Decisions Are Made

The Wellfleet routing software for DECnet services uses these four processes to make routing decisions:

- Update
- Listening
- Decision
- Forwarding

Update Process

The Wellfleet router software for DECnet services continually monitors the circuits directly attached to it. It periodically receives routing control messages from its adjacent neighbors. These routing updates inform the router of the current network topology. For example, if a circuit on a router fails, or another circuit is added, the network topology changes. The router then generates and transmits routing updates to all adjacent routers informing them of the changes. Timers control how often routing updates are sent out.

Routing updates describe which nodes in the local area are reachable (called node or Level 1 topology updates), and which other areas in the network are reachable (called area or Level 2 topology updates). Routers use this information to update their routing tables.

Listening Process

The router periodically receives *Hello* messages from its adjacent neighbors. Hello messages inform the router of the identity of adjacent nodes, and identify the circuits that the router can use to reach the adjacent nodes. The router stores this information in an adjacency table, thus creating a database of *next hops* that it uses to forward data packets. A hop is the logical distance between two nodes.

Decision Process

The router calculates the least cost paths from itself to all other systems that it can reach, using information it retrieves from its routing tables.

Every circuit on a DECnet network is assigned a default cost by the network manager. During the decision process, the Wellfleet router running DECnet calculates the total path cost of forwarding a datagram along each possible path toward its destination. The total path cost is the sum of the costs of the outbound circuits that make up the path (Figure 1-3). The least cost path is the one preferred by the router.

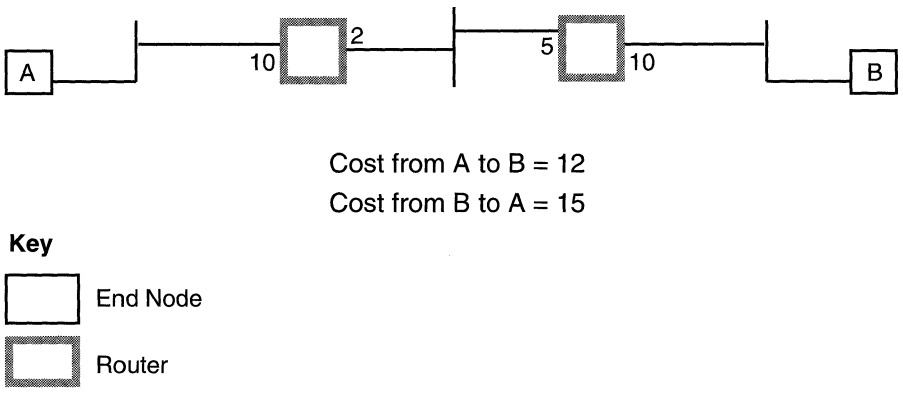
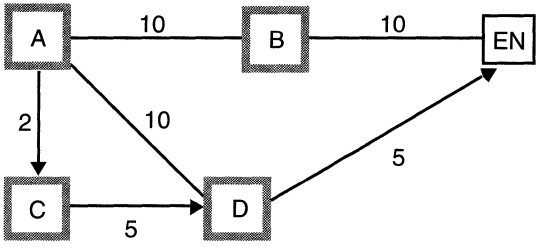


Figure 1-3. Calculating Least Cost Path

When deciding between multiple paths to a destination, the router chooses the path that is assigned a lower path cost over one assigned a higher cost, even if the lower cost path is longer (refer to Figure 1-4). If there is a tie between two paths, the router chooses the path whose next hop has the highest address. The amount of traffic on a circuit does not affect the path selected by the router.

Once the router determines the least cost path to a destination, it stores the identity of the corresponding adjacent router into its forwarding database. The adjacent router is the next hop on the path toward the destination. The decision process is executed separately for each routing level; the router keeps separate forwarding databases for intra-area and inter-area routing.

The complete distance (or number of hops) that a packet travels from the source to its destination is the path length. The maximum number of hops the routing algorithm will forward a packet to is called the maximum hops. If the distance between the source and destination exceeds the maximum hops, the packet is returned or discarded.



Key

End Node

Router

Router A wants to route a packet to the end node. Three different paths are available.

Router A forwards the packet along path choice 3 because it has the lowest Total Path Cost (12).

Path Choice	Path Length	Path Cost
A to B, B to EN	2 hops	20
A to D, D to EN	2 hops	15
A to C, C to D, D to EN	3 hops	12

Figure 1-4. Lowest Cost Path to a Destination

Forwarding Process

When a router receives a packet, it checks the destination address. This destination address determines whether the router routes the packet locally (intra-area), or to another destination (inter-area). If the destination is not known, the router returns the packet. The router discards the packet if the destination is unreachable (for example, if the maximum hops value is exceeded). Otherwise, it forwards the packet to the adjacent node specified in its forwarding database.

The Designated Router

You assign a *designated* router to each Ethernet circuit in a DECnet network. If an end node on an Ethernet segment receives a packet that it cannot forward because the destination node's address is not in the end node's destination address cache, or the destination node does not reside on the circuit, the end node forwards the packet to the designated router. The designated router then forwards the packets toward the destination.

You specify a designated router by assigning a router the highest priority value among all routers on the Ethernet circuit. If you do not choose a designated router, or you have assigned two or more routers the same priority, the router assigned the highest node ID becomes the designated router by default. See the next chapter for details on assigning the designated router.

DECnet IV to V Transition

The DECnet IV to V Transition feature provides the following capabilities:

- A router running DECnet Phase V can map DECnet Phase IV network layer addresses to compatible Phase V NSAP addresses, and convert Phase IV data packets to Phase V Connectionless Network Protocol (CLNP) packets before forwarding them to a Phase V end node
- A router running DECnet Phase IV can map DECnet Phase V NSAP addresses to compatible Phase IV addresses, and convert Phase V (CLNP) packets to Phase IV data packets before forwarding them to a Phase IV end node
- A router running Phase V can learn and advertise Phase IV end nodes, which are adjacent to it
- A router running Phase IV can learn and advertise Phase V end nodes, which are adjacent to it
- Routers running DECnet Phase IV or DECnet Phase V can forward packets without translation when routing their native protocols

Translating DECnet Network Layer Addresses

With the DECnet IV to V Transition feature enabled, a router can always translate a DECnet Phase IV network layer address to a Phase V (NSAP) address. However, since a Phase V address is larger than a Phase IV address, a router can translate a Phase V address only if it is Phase IV compatible.

A Phase V address is Phase IV compatible if

- The leading bytes of the Phase V address match the configured local Phase IV Prefix. The local Phase IV Prefix defines the addresses eligible for translation within a local Phase IV routing domain.
- The high order value of the Phase V System ID is AA000400, which is the DECnet architectural constant.

- The Area component of the Phase IV address in the Phase V System ID is the same as the Area field of the Phase V Area Address.

Figure 1-5 shows how a router maps a DECnet Phase V address so that it is Phase IV compatible.

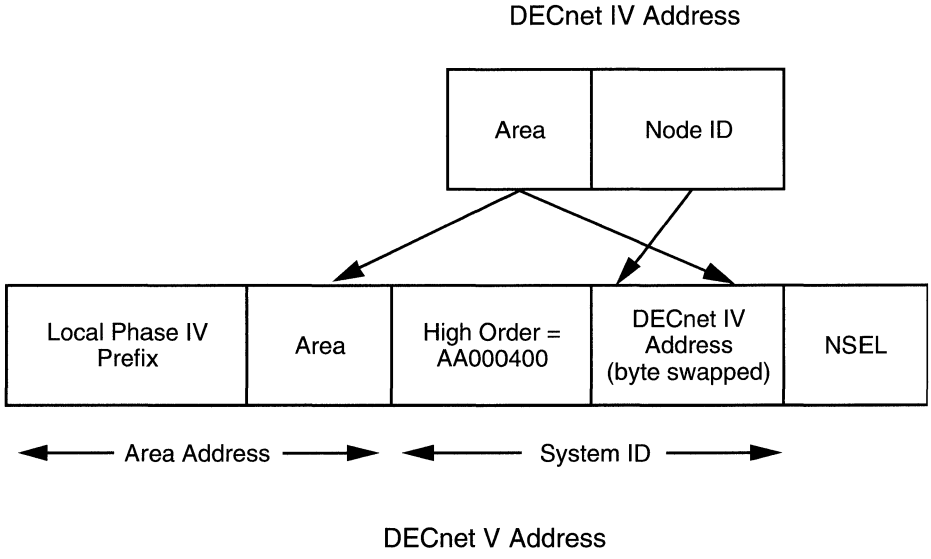


Figure 1-5. DECnet Phase IV to Phase V Address Mapping

The Phase IV Prefix and Area fields of the Phase IV-compatible address make up the *Area Address*. The Area Address identifies the area in a DECnet network where a node resides. The high order and DECnet IV Address fields of the Phase IV-compatible address make up the *System ID*. The System ID identifies a node within an area.

Translating Data Packets

With the DECnet IV to V Transition feature enabled, a router can always translate a Phase IV data packet to a Phase V (CLNP) packet. However, there are restrictions when a router translates a Phase V packet to a Phase IV packet:

- The packet cannot be fragmented.
- The packet must fit the Phase IV maximum transmission unit (MTU) size.

A router running DECnet Phase IV always attempts to forward a Phase IV data packet by looking up the destination address in the DECnet Phase IV forwarding tables. If you enable the DECnet IV to V Transition feature and the router does not find the destination address, the router maps the Phase IV address to a Phase V address and looks up its destination in the Phase V forwarding table. If the router finds the destination address, the router running Phase V translates the source address and Phase IV data packet header to a Phase V (CLNP) packet header. If the router does not find the destination address in the Phase V forwarding table, the router running Phase V returns the packet to the router running Phase IV for error processing.

Likewise, a router running DECnet Phase V always attempts to forward a Phase V (CLNP) packet by looking up the destination address in the DECnet Phase V forwarding tables. If you enable the DECnet IV to V Transition feature and the router does not find the destination address, the router determines whether the address is Phase IV compatible.

If the address is Phase IV compatible, the router maps the Phase V address to a Phase IV address and looks up its destination in the Phase IV forwarding table. If the router finds the destination address, the DECnet router running Phase IV translates the source address and Phase V (CLNP) packet header to a Phase IV data packet header. If the router does not find the destination address in the Phase IV forwarding table, the router running Phase IV returns the packet to the router running DECnet Phase V for error processing.

For example, a Phase IV host sends a data packet to a Phase V end node. Routers in the network were configured with Phase IV only and both Phase IV and Phase V. The Phase IV host routes the packet to the router running both Phase IV and Phase V. Because the router has Phase IV configured, it routes the Phase IV data packet to the next router on the network, which also has Phase IV configured. This router routes the Phase IV data packet to the next router on the network, which has both Phase IV and Phase V configured.

Since the destination address of the packet is a Phase V end node, the router maps the address to the Phase V forwarding tables, and translates the source address and packet header. The router then forwards the packet to the Phase V end node (Figure 1-6).

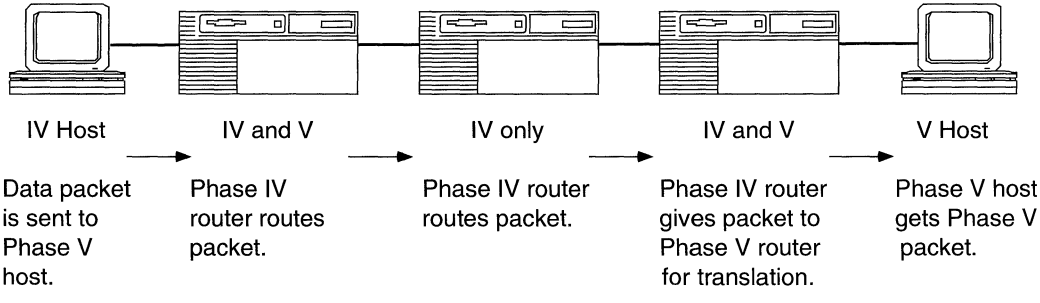


Figure 1-6. Translation of a DECnet Phase IV Data Packet to a Phase V CLNP Packet

Advertising Routes

With the DECnet IV to V Transition feature enabled, the only routing information exchanged between DECnet Phase IV and Phase V is end node addresses.

The Phase IV router advertises Phase V end nodes in Level 1 topology update packets. The DECnet Phase V router can only reside in one area. Therefore, the Phase V router only advertises Phase IV end nodes in Level 1 link state packets for the areas in common between Phase IV and Phase V.

DECnet IV to V Basic Transition Strategy

Wellfleet uses a dual stack approach for supporting the DECnet IV to V Transition feature. This approach provides the following advantages:

- Phase IV and Phase V routing are done in parallel. A router routes packets whose source and destination nodes operate the same phase of DECnet, using their native routing protocol.
- A router translates a packet when necessary and only once.
- You can transition routers incrementally rather than all at once.

The following strategy describes how you can use the DECnet IV to V Transition feature to support a graceful migration from a Phase IV network to a Phase V network.

- All routers run Phase IV with contiguous areas and contiguous Level 2 backbone.
- All routers continue to run Phase IV. On an individual basis, routers run Phase V with the DECnet IV to V Transition feature enabled. All routers running Phase V are contiguous within areas and the Level 2 backbone.
- All routers in the routing domain run Phase IV and Phase V with the DECnet IV to V Transition feature enabled.

- Phase IV is turned off on an individual basis; continuity is not necessary at this point. If Phase IV routing fails for a particular DECnet data packet, then the router forwards the packet, using Phase V.
- All routers run Phase V. Only routers with adjacent Phase IV-only end nodes run Phase IV and Phase V with the DECnet IV to V Transition feature enabled.
- A Phase V host runs in Phase IV-compatible mode when it is on the same local area network (LAN) segment as a Phase IV host.

Refer to Chapter 2 for details on adding the DECnet IV to V Transition feature and editing the parameters.

Static Routes

The Wellfleet routing software for DECnet services allows you to configure *static routes* for the Wellfleet router. Static routes are manually configured routes that specify the transmission path a datagram must follow based on the datagram's destination address. They specify a transmission path to another network or node.

You use static routes and disable the sending of Level 1 or Level 2 topology update packets if you want to reduce traffic over wide area networks (WAN) or slow links. Static routes restrict the paths that datagrams follow to paths you specifically configure.

For example, if two Level 2 routers reside in different areas and you want to configure a static route from A to C, you must specify the source address, next hop, and destination address. Since this is a route from area 1 to area 2, the static route is type Level 2 (Figure 1-7).

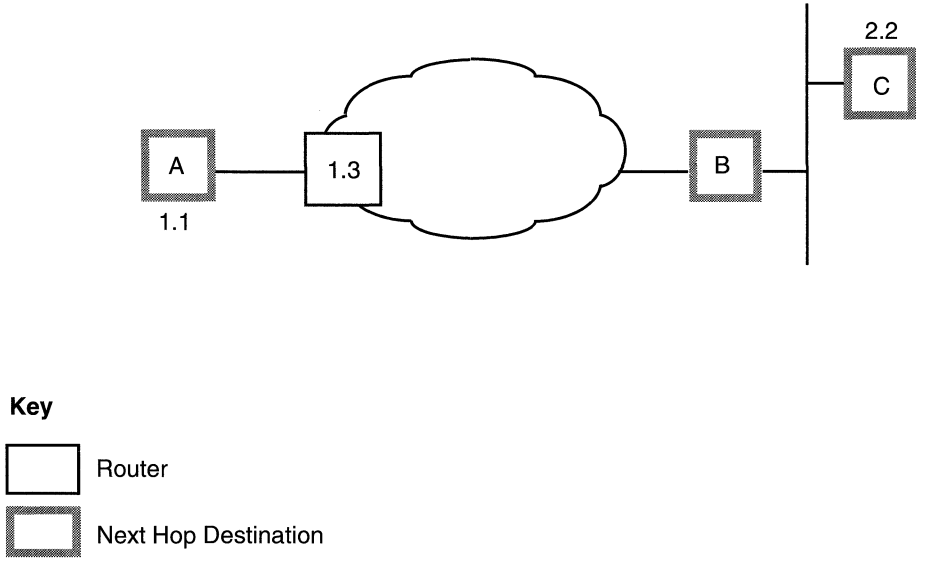


Figure 1-7. Static Routes Defined for Routers Residing in Different Areas

See "Configuring Static Routes" in Chapter 2 for details on adding, editing, and deleting static routes.

Static Adjacency Support

The Wellfleet routing software for DECnet services creates and maintains its adjacency database by periodically broadcasting Hello messages to its neighbors. In DECnet terminology, an *adjacency* is a directly connected circuit-neighbor pair toward which packets are forwarded by the router (a neighbor is analogous to an adjacent host). The neighbor can be a Level 1 router, a Level 2 router, or an end node.

The Wellfleet routing software for DECnet services allows you to configure *static adjacencies* for the Wellfleet router. Static adjacencies specify the DECnet address of the neighbor, the data link layer address of the neighbor, and the circuit used to reach the neighbor. Unless a static adjacency is explicitly deleted from the system, it remains in the router's adjacency database – even if the router never receives Hello messages from the adjacent host. Thus, by configuring static adjacencies and disabling Hello message generation, you reduce the Hello message traffic traversing between the router and its neighbors.

Note: Static adjacencies are recommended over wide area network lines to help reduce overhead traffic. Static adjacencies are not recommended over local area network connections because if a remote node is removed from the network, the local router does not recognize the topology change.

For example, DECnet Routers A and B reside in the same area (see Figure 1-8).

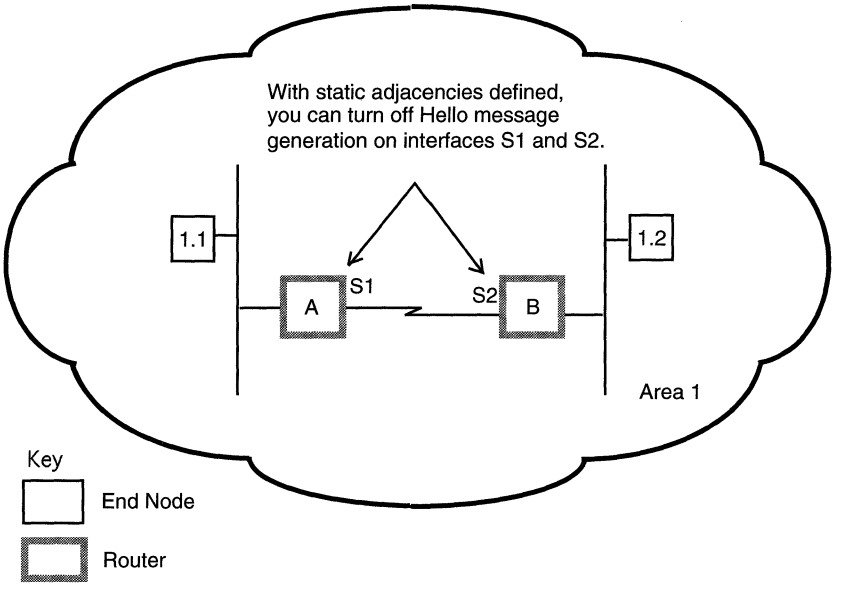


Figure 1-8. Static Adjacencies Defined for Routers Residing in the Same Area

The only network information the routers need to exchange is Level 1 topology information. To reduce traffic overhead, the network administrator did the following:

- Configured a static adjacency for interface S1 that specifies its neighbor – interface S2 on Router B
- Configured a static adjacency for interface S2 that specifies its neighbor – interface S1 on Router A
- Set the Routing Hello parameter to Disable for both interfaces

As a result, the routers know about each other's existence, even though no Hello messages are exchanged.

If two Level 2 routers reside in different areas, you can reduce both Hello message traffic and Level 1 topology traffic traversing between the two systems by disabling the Routing Hello parameter and

disabling the Level 1 Topology Update parameter for the connecting interfaces (Figure 1-9). If you disable the Level 1 Topology Update parameter, you prevent the Wellfleet router running DECnet from sending Level 1 topology update packets to other routers.

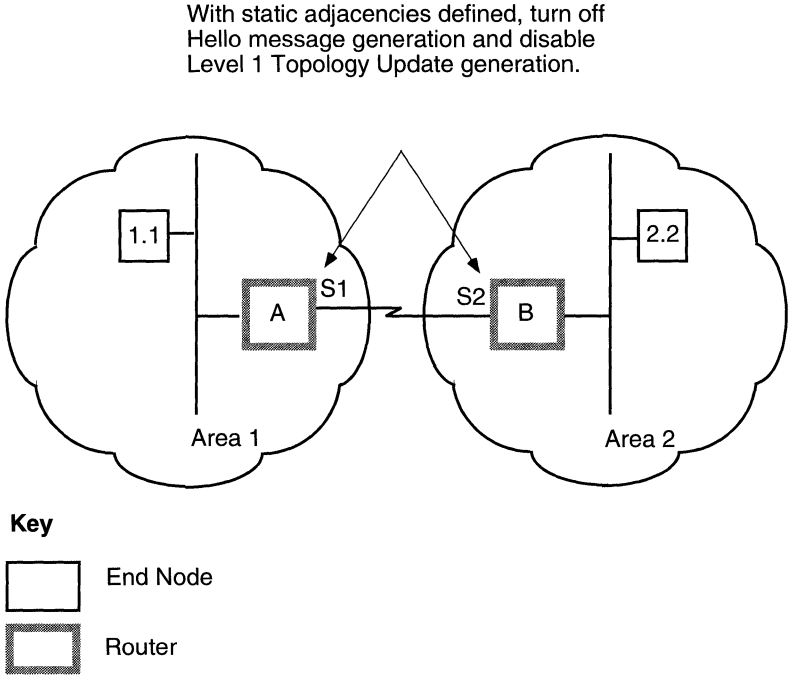


Figure 1-9. Static Adjacencies Defined for Routers Residing in Different Areas

Likewise, you can disable the Level 2 Topology Update parameter if you want to prevent the Wellfleet router running DECnet from sending Level 2 topology update packets to other routers. In this case, you use static routes to establish reachability information between connected routers.

See "Configuring Static Adjacencies" for details on configuring static adjacencies. See "Editing DECnet Interface Parameters" for instructions on setting the Router Hello, and Level 1 and Level 2 Topology Update parameters.

For More Information

The *DECnet Digital Network Architecture Phase IV Routing Layer Function Specification, Version 2.0* document (Digital Equipment Corporation, December 1983) provides technical detail on DECnet protocol implementation.

Chapter 2
Editing DECnet Parameters

Once you enable a DECnet interface, you can use Site Manager to edit DECnet parameters and customize DECnet services.

This chapter describes how to use Site Manager to

- Edit DECnet parameters.
- Add, edit, or delete a static route, static adjacency, or DECnet IV to V Transition.
- Delete DECnet and DECnet IV to V Transition globally from the Wellfleet router.

Note: The instructions in this chapter assume that you have already configured at least one DECnet interface on the router. If you have not yet configured the DECnet interface, or want to add additional DECnet interfaces, see *Configuring Wellfleet Routers* for instructions. You must configure both DECnet Phase IV and OSI on each network interface participating in a DECnet IV to V Transition if you have a mixed Phase IV and Phase V node network.

For instructions on configuring DECnet filters, see *Configuring Wellfleet Routers*.

Accessing DECnet Parameters

You access all DECnet parameters from the Configuration Manager window shown in Figure 2-1. Refer to the *Using Wellfleet Site Manager Software* guide for instructions on accessing this window.

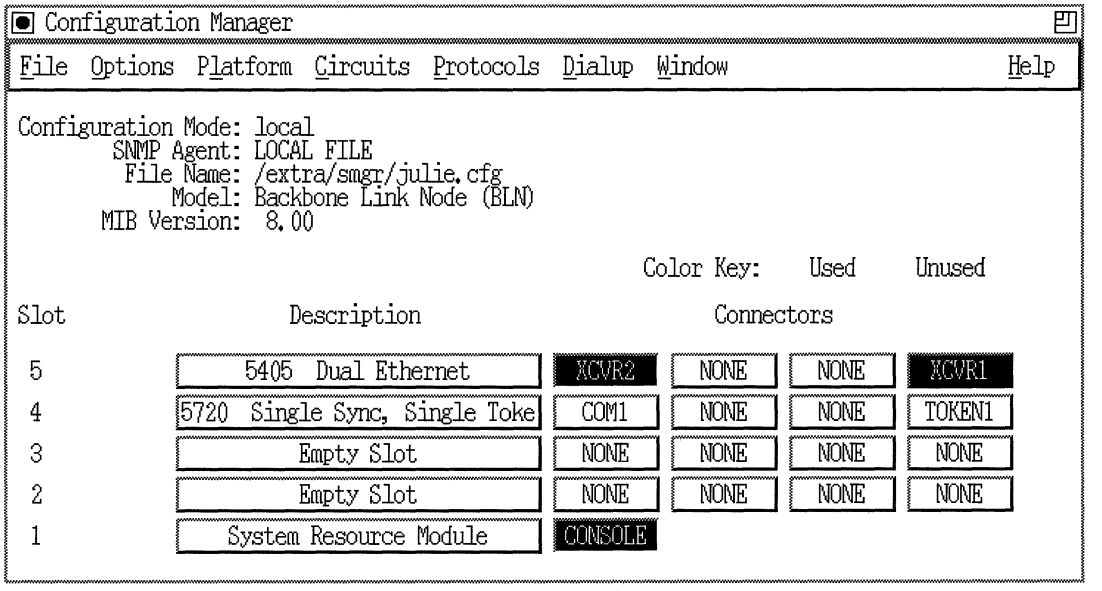


Figure 2-1. Configuration Manager Window

To customize the router software for DECnet services, you can edit any of these DECnet parameters:

- Global
- Interface
- Static route
- Static adjacency
- DECnet IV to V Transition

For each DECnet parameter, this chapter describes the default setting, all valid setting options, the parameter function, instructions for setting the parameter, and the MIB object ID. See the section that applies to the type of parameter you want to edit.

Editing DECnet Global Parameters

To edit the DECnet global parameters:

1. Select the Protocols→Decnet IV→Global option from the Configuration Manager window (Figure 2-2). The Edit DecNet Global Parameters window appears (refer to Figure 2-3).

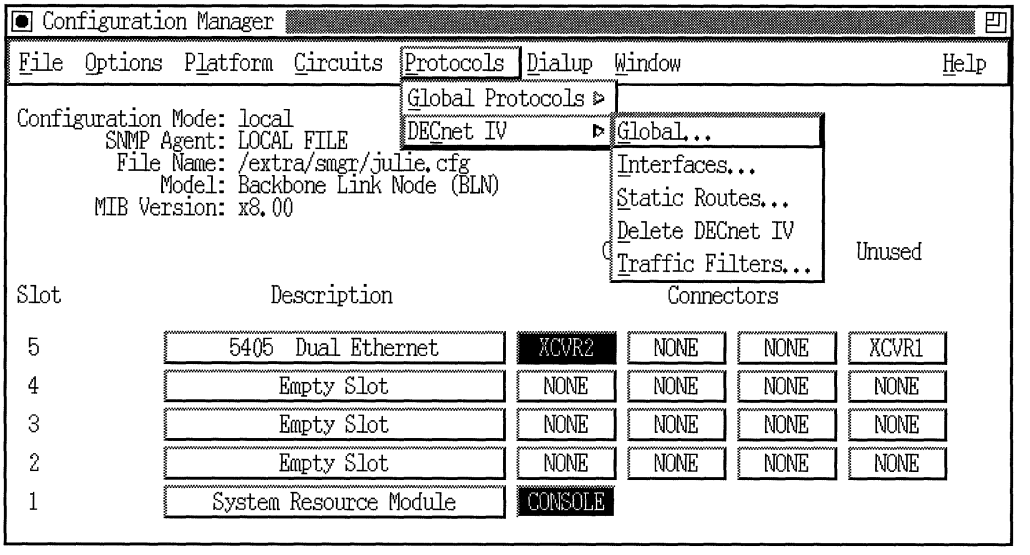


Figure 2-2. Selecting Protocols→Decnet IV→Global

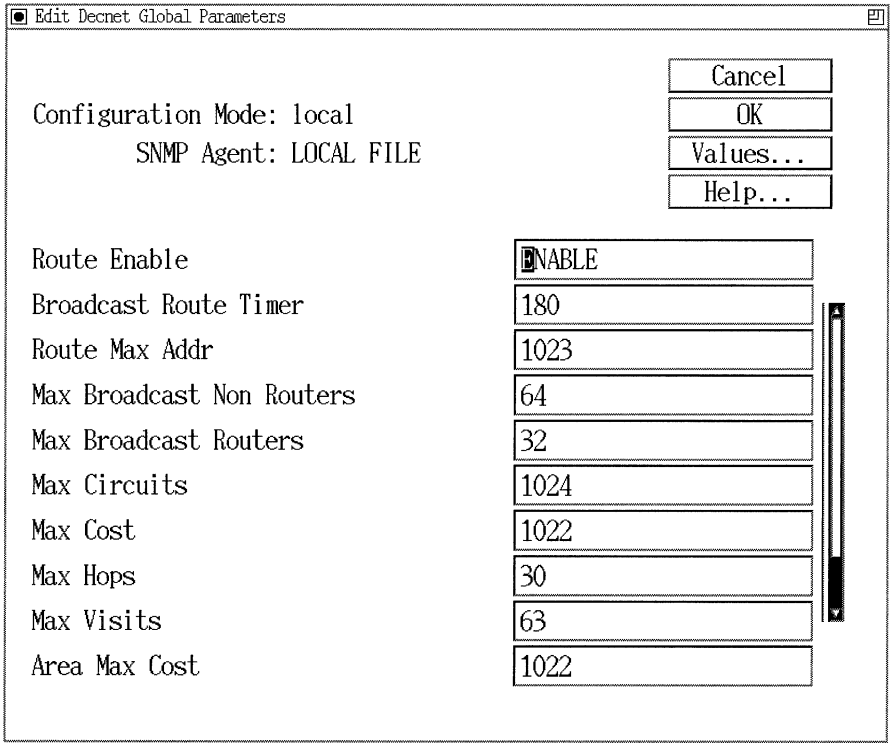


Figure 2-3. Edit DECnet Global Parameters Window

2. Edit the parameters, using the descriptions in the next section as a guide.
3. Click on the OK button to save your changes and exit the window. Site Manager returns you to the Configuration Manager window.

DECnet Global Parameter Descriptions

Use the following descriptions as a guide when you configure the parameters in the Edit DECnet Global Parameters window (refer to Figure 2-3):

Parameter:	**Route Enable**
Default:	Enable
Options:	Enable | Disable
Function:	Enables or disables DECnet routing on the entire Wellfleet router.
Instructions:	Set to Disable only if you want to globally disable DECnet routing on all interfaces on which it is configured. Otherwise, we recommend that you use the default setting.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.2

Parameter:	**Broadcast Route Timer**
Default:	180
Options:	1 to 65535 seconds
Function:	Determines the maximum amount of time in seconds between routing updates issued by the router. If no routing update occurs before this timer expires, then a routing update is automatically generated.
Instructions:	Enter a number between 1 and 65535. If you want the Wellfleet router to generate routing updates more frequently, then set this to a lower number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.4

Parameter:	**Route Max Addr**
Default:	1023
Options:	1 to 1023
Function:	Specifies the highest Node ID contained within all areas.
Instructions:	We recommend accepting the default value. If you change the default, make certain to use the same value for each router in the network.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.6

Parameter:	**Max Broadcast NonRouters**
Default:	64
Options:	1 to 1023 adjacencies
Function:	Specifies the maximum number of end node adjacencies residing on all circuits for a single slot. The higher the number of adjacent end nodes, the greater the impact on the router's performance and memory utilization.
Instructions:	Consult your network topology drawing. If there are more than 64 end node adjacencies on any of the router's slots, then increase this number to reflect your network topology.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.7

Parameter:	**Max Broadcast Routers**
Default:	32
Options:	1 to 1023 adjacencies
Function:	Specifies the maximum number of router adjacencies on all circuits for a single slot.
Instructions:	Consult your network topology drawing. If there are more than 32 router adjacencies on any of the router's slots, then increase this number to reflect your network topology. Decrease this number if there are fewer than 32 router adjacencies on a single slot.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.8

Parameter:	**Max Circuits**
Default:	1024
Options:	1 to 1024
Function:	Specifies the highest circuit number that this router can recognize. Also specifies the maximum number of circuits that this router can recognize.
Instructions:	We recommend accepting the default value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.9

Parameter: **Max Cost**

Default: 1022

Options: 1 to 1022

Function: Specifies the maximum path cost from this router to any destination node in the local area. The path cost is the sum of the individual circuit costs between this router and the destination node.

The router will declare a destination node unreachable if the least cost path to the destination node exceeds this number.

Instructions: Determine the maximum path cost between this router and any node in the area, and enter it.

MIB Object ID: 1.3.6.1.4.1.18.3.5.2.1.10

Parameter: **Max Hops**

Default: 30

Options: 1 to 30 hops

Function: Specifies the maximum path length in hops between this router and any other destination node in the local area. A hop is the logical distance between two nodes.

Instructions: Calculate the maximum path length in hops from this router to any other destination node in the area. Double the number you get, and enter it.

MIB Object ID: 1.3.6.1.4.1.18.3.5.2.1.11

Parameter:	**Max Visits**
Default:	63
Options:	1 to 63 hops
Function:	Used to detect routing loops. That is, it enables the packet lifetime control, which limits the number of times a packet can pass through a router. If the router receives a packet that (1) is not destined for the router, and (2) whose Max Visits value is exceeded, the router will discard the packet because it has traversed too many nodes.
Instructions:	Determine the maximum path length (in hops) of between the two nodes furthest separated on the network. Enter a number that is at least as large as this value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.12

Parameter:	**Area Max Cost**
Default:	1022
Options:	1 to 1022
Function:	Specifies the maximum path cost from this router to any other area in the network. The router will declare a destination area unreachable if the least cost path to the destination area exceeds this number.
Instructions:	Determine the total path cost of the worst-case longest path between this router and any other area in the network and enter it in the Area Max Cost field.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.13

Parameter:	**Area Max Hops**
Default:	30
Options:	1 to 30 hops
Function:	Specifies the maximum path length in hops from this router to any other destination area in the network. The router will declare a destination area unreachable if the path length to the destination area exceeds this number.
Instructions:	Determine the maximum path length in hops from this router to any other destination area in the network. Double the number you get, and enter it in the Area Max Hops field.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.14

Parameter:	**Max Area**
Default:	63
Options:	1 to 63
Function:	Specifies the highest area number in your DECnet network. Also specifies the number of areas in your DECnet network.
Instructions:	Refer to your network topology map, then enter the highest area number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.1.15

Note: You may want to set this value lower than the default to conserve slot memory.

Editing DECnet Interface Parameters

To edit a DECnet interface:

1. Select the Protocols→DECnet IV→Interfaces option from the Configuration Manager window (refer to Figure 2-1). The DECnet IV Interface List window appears (Figure 2-4). It displays all interfaces on which DECnet is enabled.

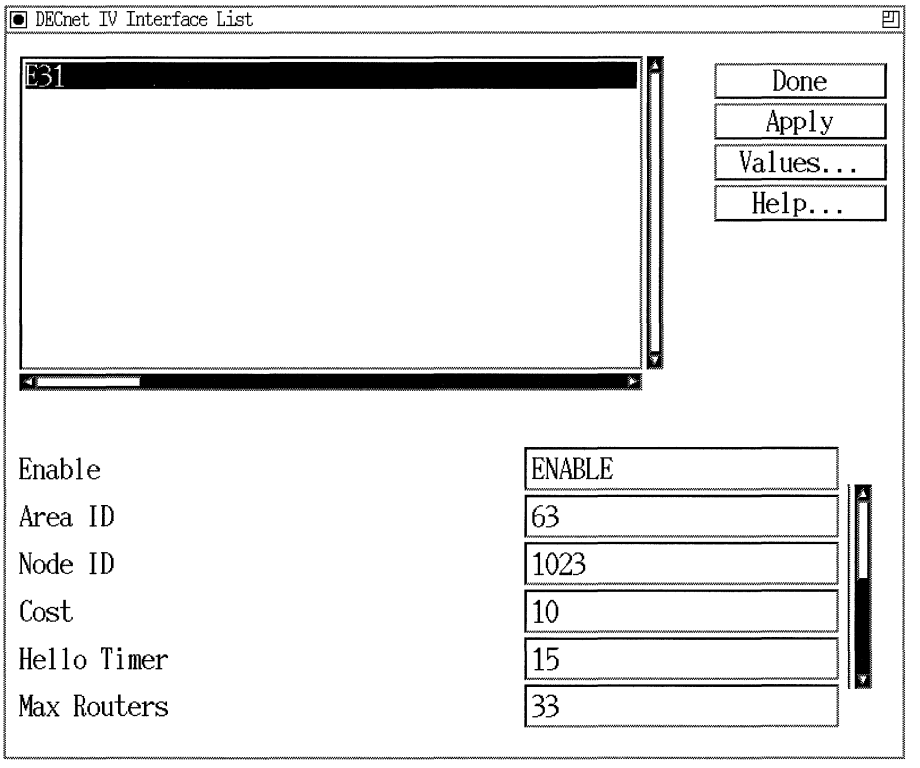


Figure 2-4. DECnet IV Interface List Window

2. Click on the interface you want to edit to select it.
3. Edit the parameters, using the descriptions in the next section as a guide.

4. Implement your changes by clicking on the Apply button.
5. Click on the Done button to exit the window. Site Manager returns you to the Configuration Manager window.

Note: When you reconfigure an interface in dynamic configuration mode, DECnet restarts on that interface.

DECnet Interface Parameter Descriptions

Use the following descriptions as a guide when you configure the parameters in the DECnet Phase IV Interface List window (refer to Figure 2-4):

Parameter:	**Enable**
Default:	Enable
Options:	Enable | Disable
Function:	Enables or disables DECnet over this circuit.
Instructions:	To disable DECnet over this circuit, set to Disable. Otherwise, we recommend that you use the default setting.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.2

Parameter:	**Area ID**
Default:	None
Options:	1 to 63
Function:	Specifies a DECnet Area ID for this circuit. The Area ID is the first six bits of a DECnet node address. You specify the Area ID on a circuit-by-circuit basis, since a single Wellfleet router may have individual circuits residing in different areas.
Instructions:	Enter the Area ID assigned to this circuit.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.4

Parameter:	**Node ID**
Default:	None
Options:	1 to 1024
Function:	Specifies a unique DECnet Node ID for this circuit. The Node ID is the last 10 bits of a DECnet node address. Note that individual circuits on a Wellfleet router may have different Node IDs.
Instructions:	Enter the Node ID assigned to this circuit.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.5

Parameter:	**Cost**
Default:	10
Options:	1 to 63
Function:	Specifies the relative cost of routing over this circuit. The sum of the individual outbound circuit costs from a source node to a destination node is the *total path cost*. When the router receives a data packet, it decides which circuit to forward the packet over based on *least cost path* toward the destination.
Instructions:	If you want the circuit to be used on a regular basis, then assign it a low cost; similarly, assign the circuit a high cost if you do not want it used on a regular basis.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.9

Parameter:	**Hello Timer**
Default:	15
Options:	1 to 8191 seconds
Function:	Specifies in seconds how often the router broadcasts DECnet hello messages to all nodes on this Ethernet circuit.
Instructions:	Increase the Hello Timer if you want to reduce the amount of traffic traversing a slow line.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.10

Note: Inconsistent Hello Timer settings can cause confusion between DECnet routers and end nodes when rerouting occurs. We recommend that you synchronize the Hello Timer settings throughout your DECnet network.

Parameter:	**Max Routers**
Default:	33
Options:	1 to 33
Function:	Specifies the maximum number of routers attached to this Ethernet circuit, including the router itself.
Instructions:	We recommend accepting the default value. If you change the default, refer to your network topology drawing to determine the number, then enter it in the Max Routers field.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.12

Parameter:	**Router Priority**
Default:	64
Options:	0 to 127
Function:	Dictates which router becomes the designated router on an Ethernet circuit. The designated router performs additional services for other nodes attached to the Ethernet circuit (all know the address of the designated router). When an end node attempts to send a packet to a destination node that either (1) is not in its destination address cache, or (2) does not reside on the circuit, it sends the packet to the designated router, which forwards the packet towards the destination.
Instructions:	If you want this node to be the designated router on this circuit, then assign it the highest priority value among all routers on the circuit. (If you do not choose a designated router, or you have assigned two or more routers the same priority, the router with the highest node ID becomes the designated router by default.)
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.13

Parameter:	**End Nodes MAC**
Default:	None
Options:	0 to 127
Function:	Assigns the All Endnodes multicast MAC address value to this circuit for use over Frame Relay and SMDS WAN connections. The multicast MAC address value you specify here determines the destination address for DECnet end node broadcast traffic across the Frame Relay or SMDS cloud. This parameter is only valid if this circuit is a Frame Relay or SMDS circuit.
Instructions:	Enter the multicasting address (Frame Relay circuits) or group address (SMDS circuits) that you obtain from your service provider. If you do not specify a value for this parameter, then broadcast traffic will be sent to *all* VCs configured on the interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.31

Parameter:	**End Routers MAC**
Default:	None
Options:	0 to 127
Function:	Assigns the AllRouters multicast MAC address value to this circuit for use over Frame Relay and SMDS WAN connections. This allows you to specify a destination address for DECnet Level 1 broadcast traffic across the Frame Relay or SMDS cloud. This parameter is only valid if this circuit is a Frame Relay or SMDS circuit.
Instructions:	Enter the multicasting address (Frame Relay circuits) or group address (SMDS circuits) that you obtain from your service provider. If you do not specify a value for this parameter, then broadcast traffic will be sent to *all* virtual circuits configured on the interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.32

Parameter:	**Area Routers MAC**
Default:	none
Function:	Assigns the AllAreaRouters multicast MAC address value to this circuit for use over Frame Relay and SMDS WAN connections. This allows you to specify a destination address for DECnet Level 2 broadcast traffic across the Frame Relay or SMDS cloud. This parameter is only valid if this circuit is a Frame Relay or SMDS circuit.
Instructions:	Enter the multicasting address (Frame Relay circuits) or group address (SMDS circuits) that you obtain from your service provider. If you do not specify a value for this parameter, then broadcast traffic will be sent to *all* virtual circuits configured on the interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.33

Parameter:	**Node Hello**
Default:	Enable
Options:	Enable | Disable
Function:	When disabled, keeps the DECnet router from sending Hello packets to end nodes. Use this parameter with a static adjacency to limit the amount of traffic sent over a WAN connection.
Instructions:	To limit the amount of traffic traversing the WAN connection between static adjacencies, set this value to Disable. Otherwise, we recommend that you use the default setting.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.34

Parameter:	**Router Hello**
Default:	Enable
Options:	Enable | Disable
Function:	When disabled, keeps the DECnet router from sending Hello packets to other routers. Use this parameter with a static adjacency to limit the amount of traffic sent over a WAN connection.
Instructions:	To limit the amount of traffic traversing the WAN connection between static adjacencies, set this value to Disable. Otherwise, we recommend that you use the default setting.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.35

Parameter:	**Level 1 Topology Update**
Default:	Enable
Options:	Enable | Disable
Function:	When disabled, keeps the DECnet router from sending Level 1 topology update packets to other routers. Use this parameter with a static adjacency to limit the amount of traffic sent over a WAN connection.
Instructions:	To limit the amount of traffic traversing the WAN connection between static adjacencies, set this value to Disable. Otherwise, we recommend that you use the default setting.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.36

Parameter:	**Level 2 Topology Update**
Default:	Enable
Options:	Enable | Disable
Function:	When disabled, keeps the DECnet router from sending Level 2 topology update packets to other routers. Use this parameter with static adjacencies to limit the amount of traffic sent over a WAN connection.
Instructions:	To limit the amount of traffic traversing the WAN connection between static adjacencies, set this value to Disable. Otherwise, we recommend that you use the default setting.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.2.1.40

Configuring Static Routes

You configure static routes when you want to control which path the router uses to route DECnet traffic to another network or node.

To configure a static route, select the Protocols→DECnet IV→Static Routes option from the Configuration Manager window (refer to Figure 2-1). The DECnet Static Routes List window appears (Figure 2-5). It lists all static routes that are defined. If you did not add any static routes, none will be listed.

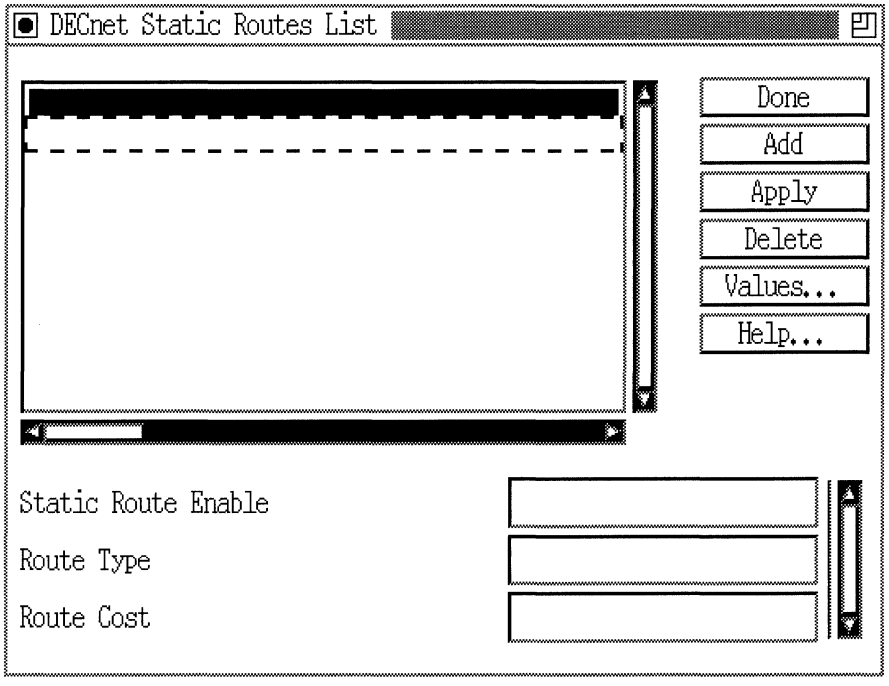


Figure 2-5. DECnet Static Routes List Window

Continue to the following sections to add, edit, or delete static routes.

Adding a Static Route

To add a static route:

1. Click on the Add button in the DECnet Static Routes List window (refer to Figure 2-5). The DECnet Static Routes Configuration window appears (Figure 2-6).

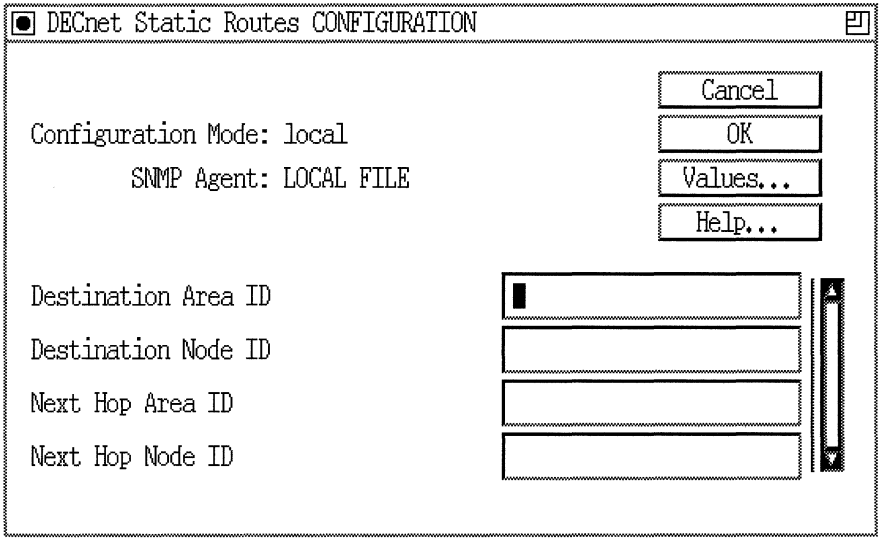


Figure 2-6. DECnet Static Routes Configuration Window

2. Define the static route parameters, using the descriptions in the next section as a guide.
3. Click on the OK button. The DECnet Static Routes List window displays the new static route you defined.
4. Repeat Steps 1–3 to add additional static routes.

If you want to edit an existing static route, skip to "Editing a Static Route." For details on deleting a static route, skip to "Deleting a Static Route."

DECnet Static Route Parameter Descriptions

Use the following descriptions as a guide when you configure the parameters in the DECnet Static Routes List and DECnet Static Routes Configuration windows (Figures 2-5 and 2-6):

Parameter:	**Static Route Enable**
Default:	This parameter defaults to Enable when you configure the static route.
Options:	Enable | Disable
Function:	Specifies the state (active or inactive) of the static route record in the DECnet routing tables.
Instructions:	Select Disable to make the static route record inactive in the DECnet routing table; the DECnet router will not consider this static route. Select Enable to make the static route record active again in the DECnet routing table.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.8.1.2

Parameter:	**Route Type**
Default:	None
Options:	Level 1 | Level 2
Function:	Specifies the type of traffic that is routed over this interface.
Instructions:	Select the traffic type for this static route. Level 1 routing is for routing data within an area. Level 2 routing is for routing data between areas.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.8.1.3

Parameter:	**Route Cost**
Default:	None
Options:	1 to 63
Function:	Specifies the total cost of a route to a destination address. Keep in mind that routes with lower costs are preferred routes. This means that you can force traffic over particular routes if you want.
Instructions:	Enter the route cost assigned to the static route.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.8.1.6

Parameter:	**Destination Area ID**
Default:	None
Options:	1 to 63
Function:	Specifies the Area ID portion of the static route's destination DECnet address.
Instructions:	Enter the Area ID of the area in which the destination of this route resides.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.8.1.4

Parameter:	**Destination Node ID**
Default:	None
Options:	1 to 1023
Function:	Specifies the Node ID portion of the static route's destination DECnet address.
Instructions:	Enter the Node ID of the destination end system of this static route.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.8.1.5

Parameter:	**Next Hop Area ID**
Default:	None
Options:	Any valid DECnet Area ID
Function:	Specifies the DECnet area ID of the intermediate system that is the next hop on the path to the destination end system.
Instructions:	Enter the Area ID assigned to the next hop intermediate system in hexadecimal format.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.8.1.7

Parameter:	**Next Hop Node ID**
Default:	None
Options:	Any valid DECnet Node ID
Function:	Specifies the DECnet node ID of the intermediate system that is the next hop on the path to the destination end system.
Instructions:	Enter the Node ID assigned to the next hop intermediate system in hexadecimal format.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.8.1.8

Editing a Static Route

To edit a static route:

1. Select the static route you want to edit from the list in the DECnet IV Static Routes List window (refer to Figure 2-5).
2. Edit the static route parameters.
3. Click on the Apply button to implement your changes.
4. Repeat Steps 1–3 to edit additional static routes.
5. Click on the Done button to exit the screen.

If you want to delete a static route, continue to the next section.

Deleting a Static Route

To delete an existing static route from the DECnet Static Routes List window:

1. Select the static route you want to delete from the list.
2. Click on the Delete button. The DECnet Static Routes List window no longer displays the static route.
3. Repeat Steps 1 and 2 to delete additional static routes.
4. Click on the Done button to exit the window.

Configuring Static Adjacencies

The DECnet router allows you to specify static transmission paths to adjacent hosts. The static adjacency may or may not be another router. Continue to the following sections to add, edit, and delete static adjacencies.

Adding a Static Adjacency

To add a static adjacency:

1. Select the Circuits→Edit Circuits option from the Configuration Manager window (refer to Figure 2-1). The system displays the Circuit List window, which lists the circuits configured on the router (Figure 2-7).

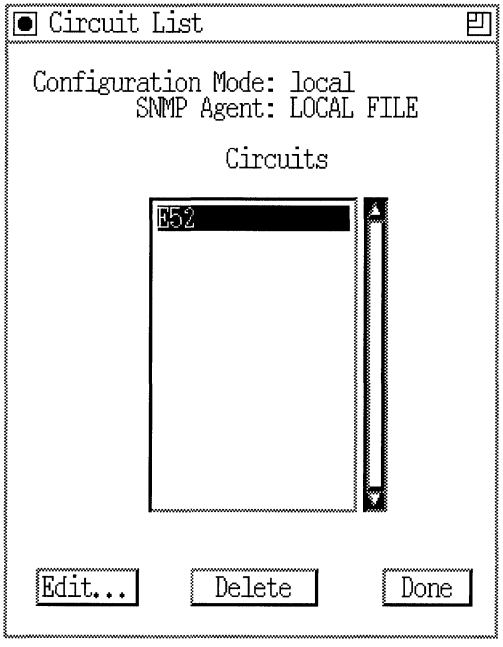


Figure 2-7. Circuit List Window

2. Choose a DECnet circuit from the list and click on the Edit button. The system displays the Circuit Definition window for that circuit.
3. Select Protocols→Edit DECnet IV→Static Adjacencies from the Circuit Definition window (Figure 2-8). The system displays the DECnet Static Adjacent Hosts List window (refer to Figure 2-9).

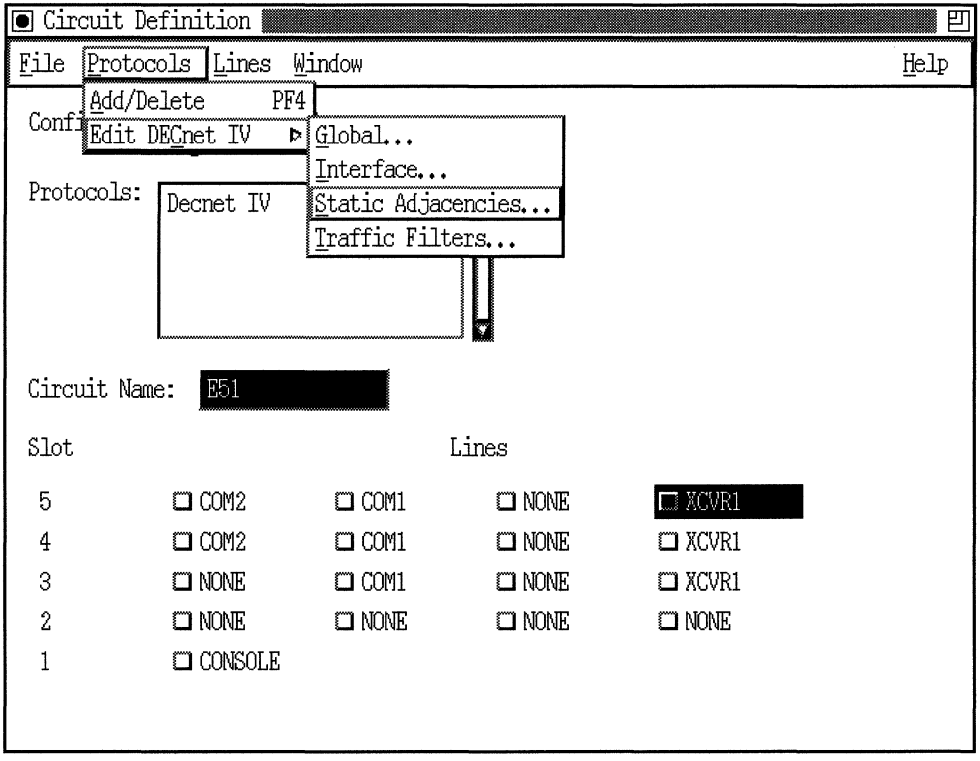


Figure 2-8. Selecting Protocols→Edit DECnet IV→Static Adjacencies

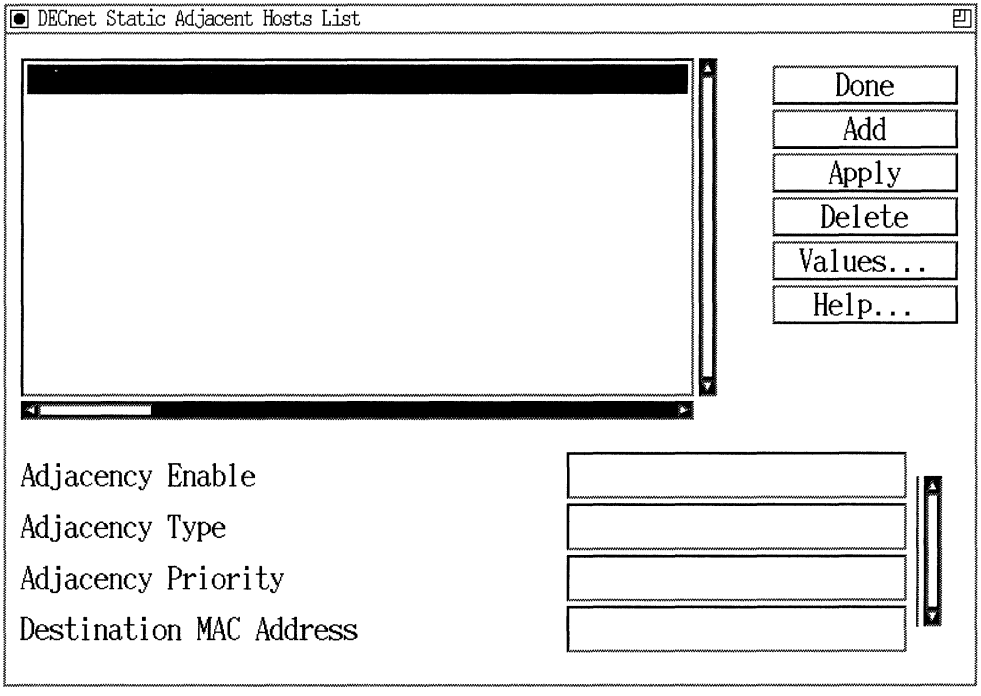


Figure 2-9. DECnet Static Adjacent Hosts List Window

4. Click on the Add button from the DECnet Static Adjacent Hosts List window (Figure 2-9). The system displays the DECnet Static Adjacency Configuration window (Figure 2-10).

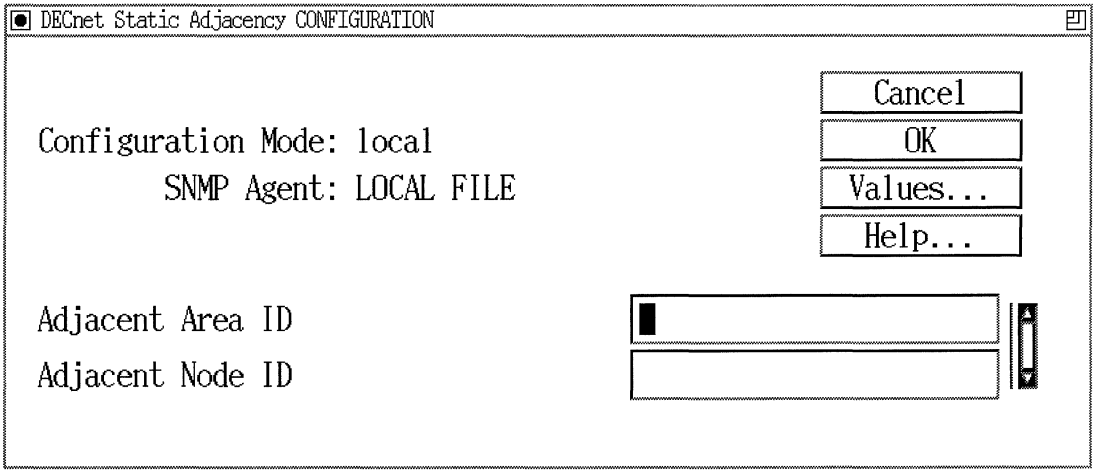


Figure 2-10. DECnet Static Adjacency Configuration Window

5. Enter an adjacent area and an adjacent node ID, using the descriptions in the next section as a guide.
6. Click on the OK button to exit the window and save your changes. The system redisplays the DECnet Static Adjacency Host List window. The static adjacency you configured is added to the list.
7. Repeat Steps 1–6 to add additional static adjacencies.

If you want to edit a static adjacency, skip to "Editing a Static Adjacency." For details on deleting a static adjacency, skip to "Deleting a Static Adjacency."

DECnet Static Adjacency Parameter Descriptions

Use the following descriptions as a guide when you configure the parameters in the DECnet Static Adjacent Hosts List and DECnet Phase IV Static Adjacency Configuration window (refer to Figures 2-9 and 2-10):

Parameter:	**Adjacency Enable**
Default:	The Configuration Manager automatically sets this parameter to Enable when you click on the Add button shown the Adjacent Host window.
Options:	Enable | Disable
Function:	Specifies the state of the static adjacency in the DECnet router's routing tables.
Instructions:	Select Disable to make the static adjacency record inactive in the DECnet routing table; the router will not consider this a static adjacency. Select Enable to make this static adjacency record active again.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.7.2

Parameter:	**Adjacent Type**
Default:	Area
Options:	Area | Routing IV | Non-Routing IV
Function:	Specifies whether the static adjacency is another router or is an end node.
Instructions:	Select Area if the static adjacency is a level 2 router, select Routing IV if the static adjacency is a level 1 router, or select Non-Routing IV if the static adjacency is an end node.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.7.7

Parameter:	**Adjacent Priority**
Default:	None
Options:	0 to 127
Function:	If the static adjacency is another router, this parameter specifies the router's priority for becoming the designated router on the network. The designated router performs additional services for other nodes attached to the Ethernet circuit (all know the address of the designated router).
Instructions:	If you want this node to be the designated router on this circuit, then assign it the highest priority value among all routers on the circuit. (If you do not choose a designated router, the router with highest ID becomes the designated router by default.)
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.7.8

Parameter:	**Destination MAC Address**
Default:	None
Options:	Any valid MAC address
Function:	Specifies the 48-bit Ethernet address of the static adjacency.
Instructions:	Enter the MAC address as a 12-digit hexadecimal number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.7.9

Parameter:	**Adjacent Area ID**
Default:	None
Options:	1 to 63
Function:	Specifies the Area ID portion of the static adjacency's DECnet address.
Instructions:	Enter the Area ID assigned to the static adjacency.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.7.1.3

Parameter:	**Adjacent Node ID**
Default:	None
Options:	1 to 1024
Function:	Specifies the Node ID portion of the static adjacency's DECnet address.
Instructions:	Enter the Node ID assigned to the static adjacency.
MIB Object ID:	1.3.6.1.4.1.18.3.5.2.7.1.4

Editing a Static Adjacency

To edit the parameters for an existing static adjacency:

1. Choose a DECnet circuit from this list on the Circuit List window and click on the Edit button. The system displays the Circuit Definition window for the circuit.
2. Select Protocols→Edit DECnet IV→Static Adjacencies from the Circuit Definition window (refer to Figure 2-8). The system displays the DECnet Static Adjacent Hosts List window.
3. Click on the static adjacent host whose parameters you want to modify.
4. Edit the parameters you want to change.
5. Click on the Apply button to implement your changes.
6. Repeat Steps 1–5 to edit additional static adjacencies.
7. Exit the screen by clicking on the Done button.

If you want to delete a static adjacency, continue to the next section.

Deleting a Static Adjacency

To delete an existing static adjacency:

1. Select the Circuits→Edit Circuits option from the Configuration Manager window (refer to Figure 2-1). The system displays the Circuit List window, which lists the circuits configured on the router.
2. Select a DECnet circuit from this list and click on the Edit button. The system displays the Circuit Definition window for the circuit.
3. Select Protocols→Edit DECnet IV→Static Adjacencies from the Circuit Definition window (refer to Figure 2-8). The system displays the DECnet Static Adjacent Hosts List window (refer to Figure 2-9).
4. Click on the static adjacent host you want to delete.
5. Delete the static adjacency by clicking on the Delete button. The system deletes the static adjacency.

6. Repeat Steps 1–5 to delete additional static adjacencies.
7. Click on the Done button to exit the screen.

Configuring DECnet IV to V Transition

You create, edit, and delete DECnet IV to V Transition from the Configuration Manager window. Continue to the next section if you want to create DECnet IV to V Transition.

Note: You must configure both DECnet Phase IV and OSI on each network interface participating in a DECnet IV to V Transition if you have a mixed Phase IV and Phase V node network. See *Configuring Wellfleet Routers* for details on configuring OSI.

Creating the DECnet IV to V Transition

From the Configuration Manager window, select Protocols→ OSI→Create DECnet IV to V Transition (Figure 2-11). This enables the DECnet IV to V Transition feature. If you select Protocols→OSI, you will see that the edit and delete options are now available.

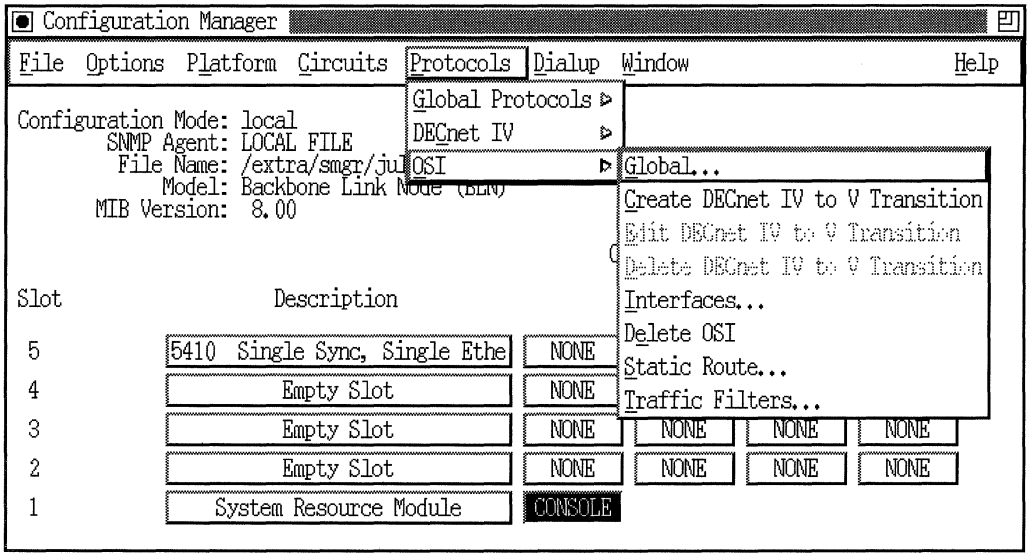


Figure 2-11. Selecting Protocols→OSI→Create DECnet IV to V Transition

If you want to edit the DECnet IV to V Transition parameters, continue to the next section. For details on deleting DECnet IV to V Transition feature, skip to "Deleting DECnet IV to V Transition."

Editing the DECnet IV to V Transition Parameters

To edit the DECnet IV to V Transition parameters:

1. Select Protocols→OSI→Edit DECnet IV to V Transition from the Configuration Manager window (refer to Figure 2-11). The Edit DECnet IV to V Transition Parameters window appears (Figure 2-12).

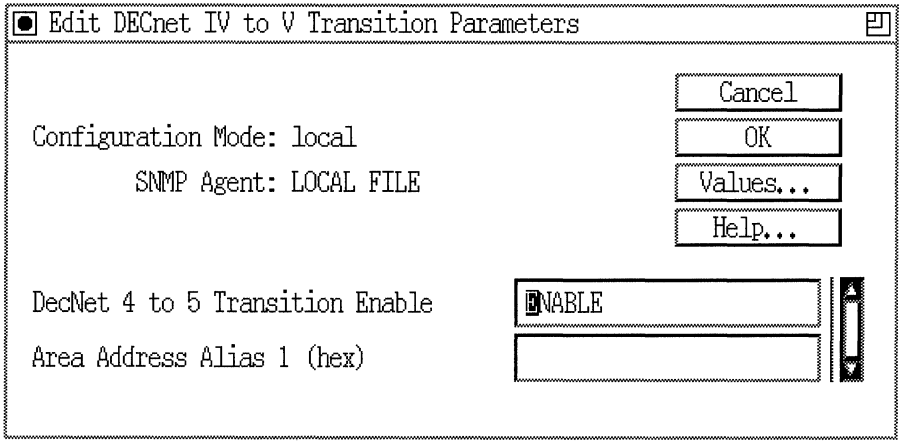


Figure 2-12. Edit DECnet IV to V Transition Parameters Window

2. Edit the parameters, using the descriptions in "DECnet IV to V Transition Parameter Descriptions" as a guide.
3. Click on the OK button to implement your changes and exit the screen.

If you want to delete DECnet IV to V Transition from the router, skip to "Deleting DECnet IV to V Transition."

DECnet IV to V Transition Parameter Descriptions

Use the following descriptions as a guide when you configure the parameters in the Edit DECnet IV to V Transition Parameters window (refer to Figure 2-12):

Parameter:	**DECnet 4 to 5 Transition Enable**
Default:	None
Options:	Enable | Disable
Function:	Enables or Disables DECnet IV to V Transition.
Instructions:	To enable the transition, set this value to Enable. Otherwise, set this value to Disable to turn it off.
MIB Object ID:	1.3.6.1.4.1.18.3.5.6.12.2

Parameter:	**Area Address Alias 1 (hex)**
Default:	None
Options:	Any valid area address.
Function:	Assigns the first area address alias to the router. An area address alias is a different area address that is assigned to the same router. For the DECnet IV to V Transition feature, the area address alias defines the Phase IV prefix and Phase IV area fields of the Phase IV-compatible address.
Instructions:	Enter the area address alias in hexadecimal format. For the DECnet IV to V Transition feature, enter the Phase IV prefix (from 1 to 9 bytes) followed by 2 bytes of the Phase IV area address. Otherwise, leave this field blank.
MIB Object ID:	1.3.6.1.4.1.18.3.5.6.1.17

Note: See Chapter 2 of *Customizing OSI Services* for more information about the area address alias.

Deleting DECnet IV to V Transition

To delete the DECnet IV to V Transition feature:

1. Select Protocols→OSI→Delete DECnet IV to V Transition from the Configuration Manager window (refer to Figure 2-11). A window pops up and prompts:

   ```
   Do you REALLY want to delete OSI DECnet IV to V
   Transition?
   ```

2. Click on the OK button. The system returns you to the Configuration Manager window. The DECnet IV to V Transition feature is no longer configured on the router.

Deleting DECnet from the Router

To delete the DECnet routing protocol from all router circuits on which it is currently enabled:

1. Select the Protocols→DECnet IV→Delete DECnet IV option from the Configuration Manager window (refer to Figure 2-1). A window pops up and prompts:

   ```
   Do you REALLY want to delete DECnet IV?
   ```

2. Click on the OK button. The Configuration Manager window appears. DECnet is no longer configured on the router.

If you examine the Configuration Manager window, you see that the connectors for circuits on which DECnet was the only protocol enabled are no longer highlighted. You must reconfigure the circuits for these connectors. See the *Configuring Wellfleet Routers* guide for details on configuring circuits.

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