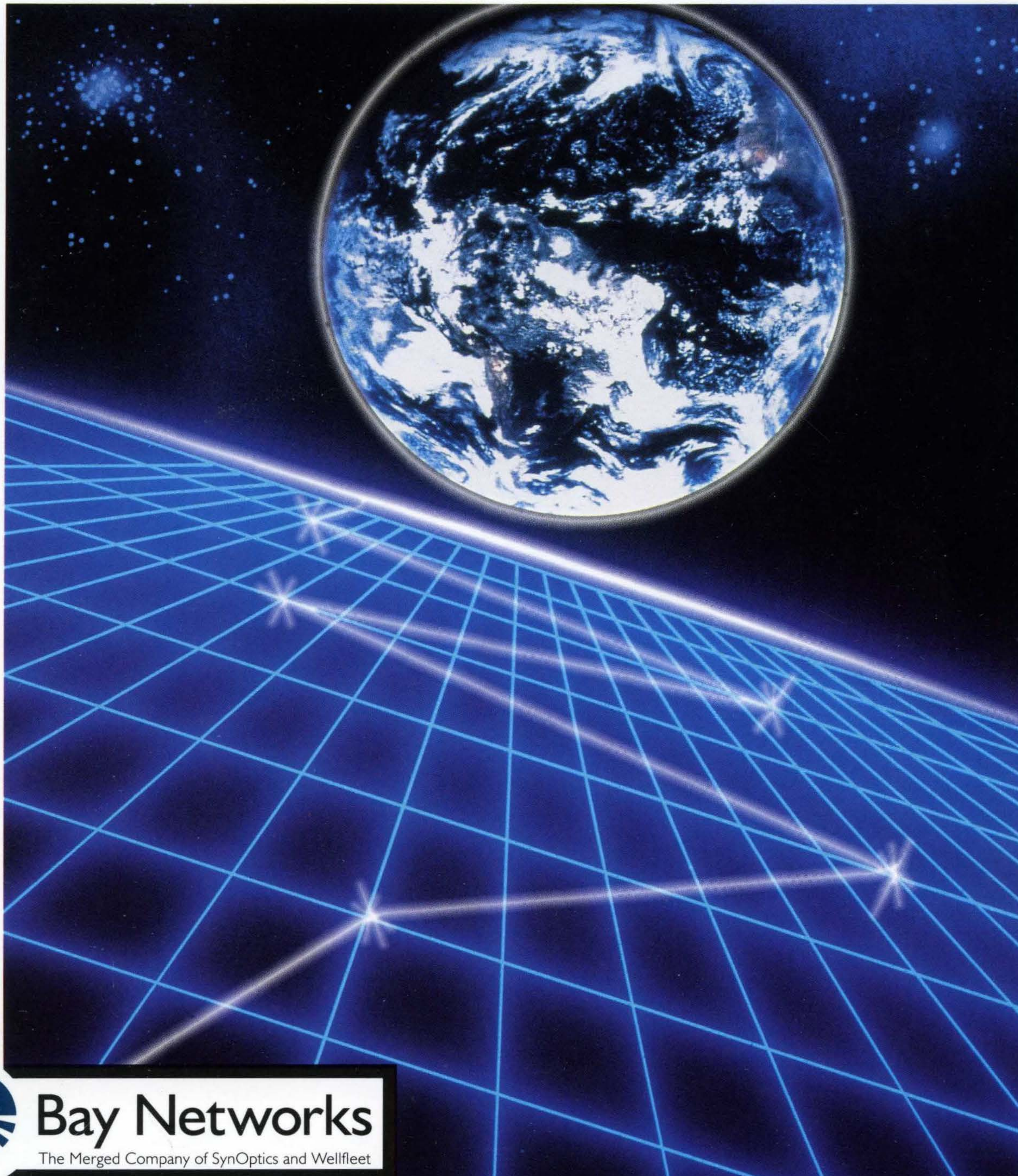

Bay Networks

The Merged Company of SynOptics and Wellfleet

Customizing XNS Services

Part No. 110049 A

Customizing XNS Services

Router Software Version 8.10
Site Manager Software Version 2.10

Part No. 110049 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 that use Xerox® Network Systems (XNS™) protocols, you need to read this guide. This guide presents information on how to customize Wellfleet router software for XNS services.

Refer to this guide for

- An overview of the XNS protocol, as implemented in Wellfleet System and Site Manager Software (refer to Chapter 1, "XNS Overview")
- Implementation notes that may affect how you configure XNS routing services (refer to Chapter 2, "XNS Configuration Notes")
- Instructions on editing XNS global and interface parameters and configuring XNS services (refer to Chapter 3, "Editing XNS Parameters")

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

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

Before You Begin

Before you use this guide, you must use the Site Manager software to complete the following procedures:

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

Refer to *Configuring Wellfleet Routers* for detailed 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
Valbonne, France	(33) 92-966-968
Sydney, Australia	(61) 2-903-5800
Tokyo, Japan	(81) 3-328-0052

Conventions

arrow character (➔)	Separates menu and option names in instructions. Example: Protocols➔AppleTalk identifies the AppleTalk option in the Protocols menu.
italic text	Indicates variable values in command syntax descriptions, new terms, file and directory names, and book titles.
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

ANSI	American National Standards Institute
DLCI	Data Link Connection Identifier
IDP	Internet Datagram Protocol
MAC	media access control
OSI	Open Systems Interconnection
PEP	Packet Exchange Protocol
RIP	Routing Information Protocol
SMDS	Switched Multimegabit Data Services
SNAP	Subnetwork Access Protocol
SNMP	Simple Network Management Protocol
SPP	Sequenced Packet Protocol
WAN	wide area network
XNS	Xerox™ Network Systems

Chapter 1
XNS Overview

This chapter provides information on the Bay Networks implementation of the Xerox Network Systems (XNS) router software. The Bay Networks implementation of XNS is based on the *Xerox System Integration Standard* specification (Xerox Corporation, December 1981), commonly referred to as *The Gray Book*.

This chapter includes discussion on the following topics:

- XNS Protocol Stack
- Protocol Layer/Level Support
- XNS Routing Information Protocol (RIP)
- Error Protocol
- Echo Protocol
- Sequenced Packet Protocol
- Packet Exchange Protocol
- External Servers
- Static Routes
- Adjacent Hosts
- Configurable Split Horizon

The following sections describe the XNS protocol stack and the internetworking services pertaining to the Wellfleet router running XNS software.

XNS Protocol Stack

XNS was developed at the Xerox Palo Alto Research Center (PARC). Its layered architecture is a predecessor of the OSI architectural model. Both architectures are functionally similar. Figure 1-1 compares the OSI and XNS protocol stacks.

<table>
<tr><th>OSI</th><th>XNS</th></tr>
<tr><td>Layer 7 - Application</td><td>Level 4 - Application</td></tr>
<tr><td>Layer 6 - Presentation</td><td rowspan="2">Level 3 - Control,
Process Interaction</td></tr>
<tr><td>Layer 5 - Session</td></tr>
<tr><td>Layer 4 - Transport</td><td>Level 2 - Transport</td></tr>
<tr><td>Layer 3 - Network</td><td>Level 1 - IDP</td></tr>
<tr><td>Layer 2 - Data Link</td><td rowspan="2">Level 0 - Transmission
Media Protocols</td></tr>
<tr><td>Layer 1 - Physical</td></tr>
</table>

Figure 1-1. Comparison of OSI and XNS Protocol Stacks

A description of each XNS level follows:

- Level 0 protocols handle the physical transmission of data between two points. Level 0 protocols are independent of XNS specifications. Instead, they depend on the transmission medium available between the two points engaged in communication. Examples of Level 0 protocols are Ethernet and Token Ring. Level 0 corresponds generally to Layers 1 and 2, the physical and data link layers, of the OSI model.
- The Level 1 protocol, Internet Datagram Protocol (IDP), determines where each internet packet goes, addresses the source and destination of each internet packet, and selects the

transmission medium. Level 1 corresponds generally to Layer 3, the network layer, of the OSI model.

- Level 2 protocols provide for the exchange of routing information between routers, handle the sequencing of packets within a packet stream, report transmission errors, retransmit packets in response to errors, suppress duplicate packets, and adjust the rate of packet transmission (flow control). Examples of Level 2 protocols are Routing Information Protocol, Error Protocol, Echo Protocol, Sequenced Packet Protocol, and the Packet Exchange Protocol. Level 2 corresponds to Layer 4, the transport layer, of the OSI model.
- Level 3 protocols are control protocols; they determine process interactions that involve remote resources, such as printer and file requests, and data structuring conventions. Level 3 corresponds generally to Layers 5 and 6, the session and presentation layers, of the OSI model.
- Level 4 protocols are application protocols that are implemented for specific platforms. Level 4 corresponds to Layer 7, the application layer, of the OSI model.

The following sections describe the involvement of the Wellfleet XNS routing software in Levels 0, 1, and 2. Levels 3 and 4 do not involve routing, and are beyond the scope of this document.

Protocol Layer/Level Support

This section describes in detail the protocol support provided at each level of the XNS protocol model.

Level 0

The XNS Level 0 protocols handle the physical transmission of data between two points.

The Wellfleet router running XNS software supports the following Level 0 protocols or frame formats/encapsulations:

- Ethernet: Ethernet II
- Token Ring: SNAP
- FDDI: SNAP
- Frame Relay: Frame Relay SNAP
- SMDS: SMDS SNAP

Level 1

Bay Networks implements IDP, the only XNS Level 1 protocol. IDP determines where each internet packet goes, addresses the source and destination of each internet packet, and selects the transmission medium. IDP is a connectionless datagram protocol. In other words, it does not need a channel established for delivery. Also, IDP is unreliable. Higher-level protocols assume the responsibility for reliability.

The Level 2 services provide IDP with the information necessary to route internet packets.

Level 2

Level 2 protocols correspond to the transport layers of the OSI model. The Wellfleet router running XNS software implements the following XNS Level 2 protocols:

- Routing Information Protocol
- Error Protocol
- Echo Protocol
- Sequenced Packet Protocol
- Packet Exchange Protocol

Note also that the Wellfleet router running XNS software bridges non-XNS packets.

XNSRIP Overview

XNS Routing Information Protocol (RIP) lets workstations and routers exchange information dynamically to establish the route with the fewest hops and shortest delay to each network.

Each router running XNS software maintains a RIP table, that contains the following information about every network in the XNS network topology:

- The network address of each network
- The number of hops (cost) to that network
- The address of the next hop node to which packets destined for that network will be forwarded

Routers maintain RIP tables by exchanging request and response packets. Routers update their RIP tables with information from incoming response packets.

The header of each packet indicates the packet operation: request or response.

RIP request packets contain the number of the destination network in the header. A RIP request packet may be one of the following types:

- A general request that a router broadcasts to determine the fastest route to all networks on an internetwork.

  The value *FFFFFFFF* in the network number field within the RIP data indicates that the packet is a general request.
- A specific request that a workstation or router broadcasts to determine the fastest route to a particular network.

  One or more network numbers in the network number field within the RIP data indicates that the packet is a specific request.

Routers at the destination network issue RIP response packets. RIP response packets contain the network number and the number of hops and ticks required to get to the network.

A RIP response may be one of the following types:

- A response to a request
- An informational broadcast from a router issued every 30 seconds
- An informational broadcast when a change occurs in the routing table; examples are changes in cost information, changes to routes, aging of routes, and additions of routes to networks new to the table
- An informational broadcast when an interface performs an orderly shutdown procedure or initializes

To limit traffic, RIP broadcasts are limited to a router's immediate segments and are not forwarded by receiving routers.

Warning The router running XNS software learns WAN addresses from RIP broadcasts received over WANs, and the router stores XNS address/WAN address pairs for future use as next hop destinations. So, if RIP is not configured for a WAN interface, you must configure adjacent hosts for all transmission paths to nodes adjacent to Frame Relay or SMDS circuits when you configure an XNS interface. You must then configure static routes from the adjacent hosts to the next hop routers.

The router running XNS software allows you to enable RIP Listen and RIP Supply functions for each XNS and/or XNS interface. When you enable the Listen function, the router adds routes received in RIP updates from neighboring routers to its own internal routing table. When you enable the Supply function, the router running XNS software transmits RIP updates to routers on neighboring networks.

Error Protocol

The Error Protocol is an optional Level 2 protocol. It is intended to provide diagnostic and performance information.

The destination host that detects an error returns an Error Protocol packet to the socket of the host that generated the incorrect packet. The Error Protocol packet contains a copy of the first 42 bytes of the incorrect packet so that it can be validated by the source. The Packet Type field of the Error Protocol packet identifies the error number. Table 1-1 lists the XNS standard Error Protocol numbers. Wellfleet routers running XNS software report errors they detect while using this standard.

The host that detected the error discards the incorrect packet after copying its first 42 bytes to the Data field of the Error Protocol packet.

Because the protocol is optional, the host that receives the Error Protocol packet may or may not use the information before dropping the packet. The Wellfleet router running XNS software does not use the information in the Error Protocol packets it receives.

Table 1-1. XNS Error Protocol Numbers

Error Number (Octal)	Description of Error
0	An unspecified error is detected at the destination.
1	A serious inconsistency, such as an incorrect checksum, is detected at the destination.
2	The destination socket specified in the incorrect packet does not exist in the destination host.
3	The destination dropped the packet because of resource limitations.
1000	An unspecified error occurred before reaching the destination.

Table 1-1. XNS Error Protocol Numbers *(continued)*

Error Number (Octal)	Description of Error
1001	A serious inconsistency, such as an incorrect checksum, occurred before reaching the destination.
1002	The destination host cannot be reached from here.
1003	The packet's hop count reached its upper-bound threshold without reaching its destination.
1004	The packet is too large for an intermediate network. The Error Parameter field of the Error Protocol packet contains the maximum packet length allowed.

Echo Protocol

The Echo Protocol is a Level 2 protocol. It provides a relatively simple means to verify the existence and correct operation of a host's IDP implementation and a path to a host.

The Echo Protocol packet contains an Operation field, which indicates whether the packet is a request (1) or a response (2). The Wellfleet router running XNS software generates responses only to echo requests it receives on the well-known error socket, Socket 2. It does not generate echo request packets.

When the destination host receives an echo request packet, it generates a response packet and copies the data from the Data field of the request packet to the Data field of the response packet. The destination host then forwards the response packet to the source socket of the host that sent the echo request. This lets the requesting host verify the data.

Sequenced Packet Protocol

The Sequenced Packet Protocol (SPP) is a Level 2 protocol. It supports the reliable transmission of sequenced internet packets between clients on the network. SPP uses IDP to create a virtual circuit between the source and destination endpoints.

SPP has an open connection when it knows the address (host and socket number) and the connection identification for both connection endpoints. At the commencement of packet flow over a new connection, SPP assigns sequence number 0 (zero) to the first packet transmitted.

SPP supports extended sessions between connection endpoints, as opposed to PEP, which requires no connection and supports only request-response transactions.

SPP specifications provide information on packet format, standard packet sequences, and recommendations on how best to use the protocol.

Packet Exchange Protocol

The Packet Exchange Protocol (PEP) is a Level 2 protocol that XNS uses to send a request and receive a response reliably. PEP handles request-response transactions without the need to establish a connection between clients.

Packet Exchange Protocol can send packets to or from any valid socket address.

External Servers

The Wellfleet XNS routing software features external server support. External server support provides client access to a service on another network if the service is not available on the client's network.

You enable external server support from the XNS Interface Parameters window (refer to "Editing XNS Interface Parameters," in Chapter 3).

When you enable external server support on a particular XNS interface, you specify the service request type to be routed and the destination of the service. The router then forwards incoming requests for that service type to the remote destination.

Note: You should enable external server support only when a service is not available on the local network. The default setting for this feature is Disabled.

Static Routes

Static routes are manually configured routes that specify the next hop in the transmission path a datagram must follow based on the datagram's destination address. A static route specifies a transmission path to another network.

The Wellfleet router running XNS software allows you to configure static routes on each logical XNS interface. For example, in Figure 1-2 the route from the interface on Wellfleet Router Host ID 1 to Network 5 is a static route. Unlike routes learned through RIP, static routes remain in the RIP tables until you delete them.

Static route support for XNS allows you to do the following:

- Direct all XNS traffic destined to a given network to an adjacent host.
- Reduce routing traffic by disabling RIP Supply on all or a subset of attached interfaces and by manually configuring static routes.
- Eliminate all dynamic routing capabilities and all RIP supply and listen activities over an XNS interface.

Warning To establish a Data Link layer connection in a Frame Relay or SMDS network (with the router sending frames over a static route), you must configure an adjacent host and enter a locally significant DLCI (refer to "Configuring Adjacent Host Parameters," in Chapter 3).

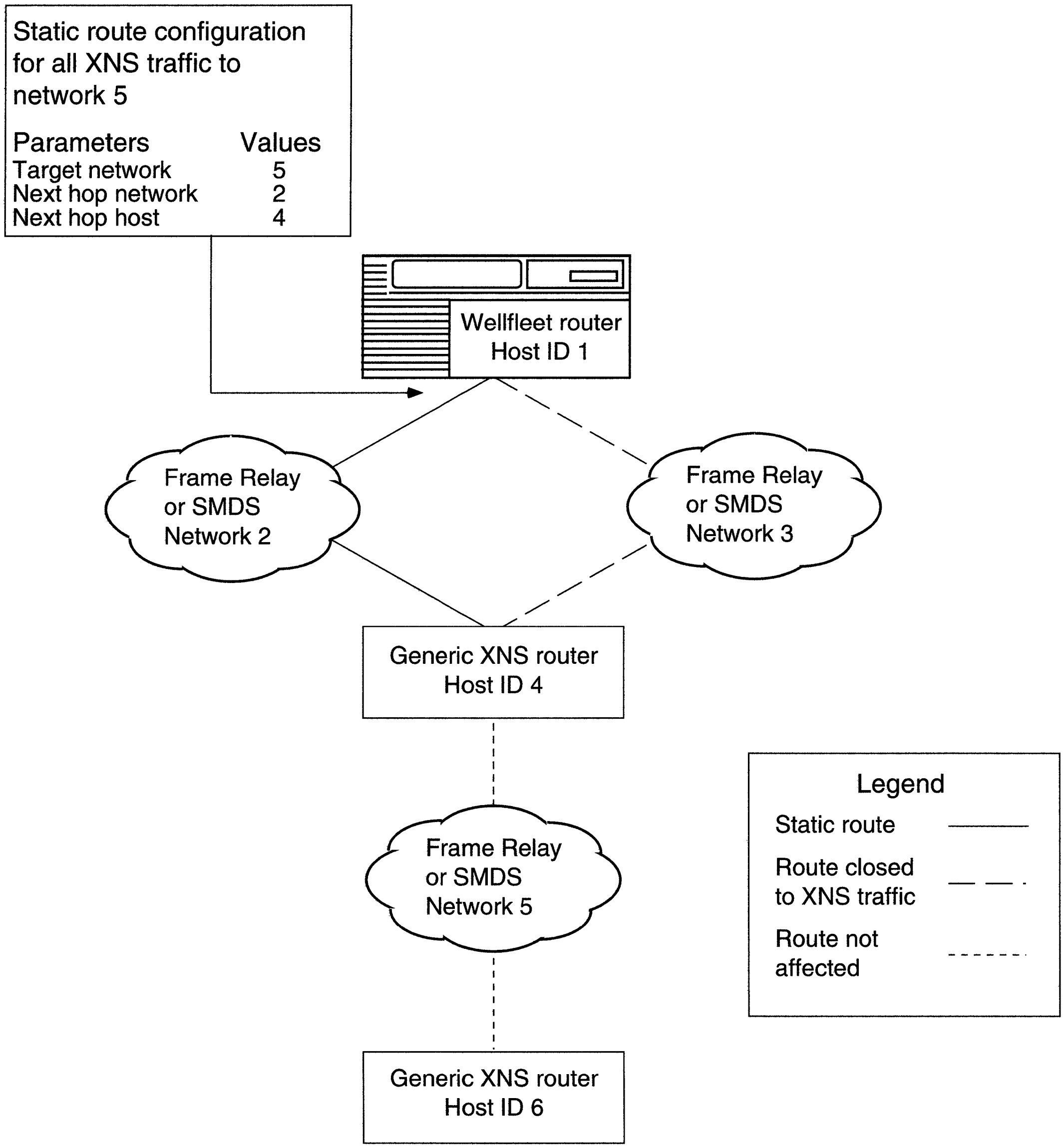

Figure 1-2. Static Route in a Sample Network

Adjacent Hosts

An adjacent host is a network device that is local to a directly connected network. This device may or may not be a router. For example, Host 4 in Figure 1-3 is an adjacent host to Wellfleet Router Host ID 1. Host 6 is not an adjacent host because it is not connected logically to a directly adjacent network.

The Wellfleet router running XNS software allows you to specify static transmission paths to adjacent hosts. A static transmission path to an adjacent host establishes the data link connection necessary for packet transmission along a static route in a Frame Relay or SMDS network when RIP is not enabled. For example, in Figure 1-3 the XNS interface on Wellfleet Router Host ID 1 has Host 4 configured as a statically adjacent host. This provides a data link connection that allows the static routing to occur between Host ID 1 and Network 5.

With adjacent host support, you can do the following:

- Configure the router to map XNS addresses of network devices that are local to adjacent WANs to their associated WAN addresses.
- Configure many static routes that use a single adjacent host as their next hop node, thereby reducing manual configuration tasks.

Note: You must use the locally significant DLCI (Data Link Control Identifier) parameter to identify a virtual circuit when you configure a static adjacent host in a Frame Relay or SMDS network. You must enter the DLCI in hexadecimal format (refer to “Configuring Adjacent Host Parameters,” in Chapter 3).

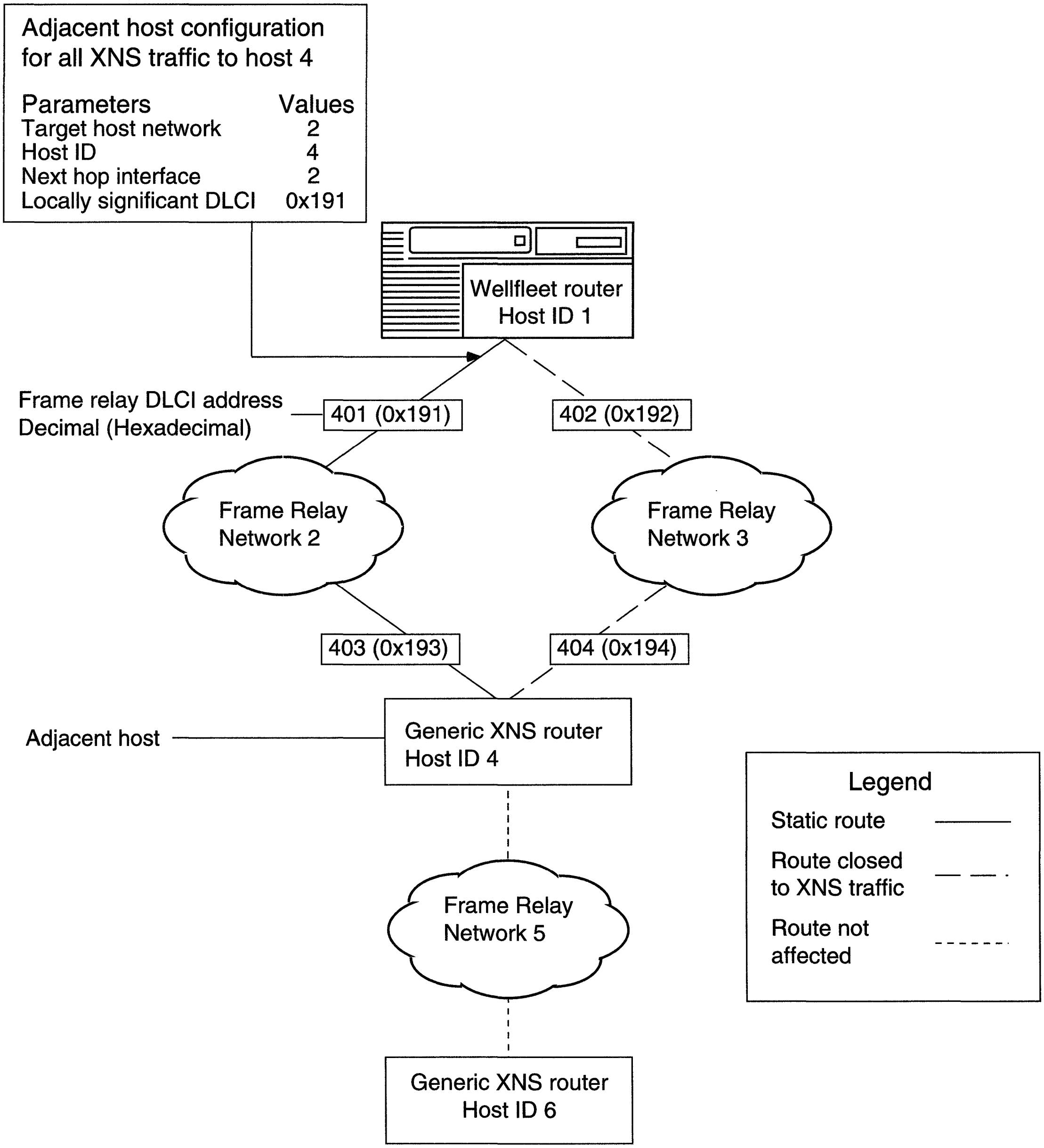

Figure 1-3. Static Adjacent Host in a Sample Network

Configurable Split Horizon

The purposes of the Split Horizon algorithm are to prevent circular routes and to reduce network traffic. The Bay Networks implementation of Split Horizon excludes RIPs and SAPs learned from a neighbor when forwarding RIP and SAP updates to that neighbor. Split Horizon is enabled by default for each interface.

Caution: We advise you not to disable Split Horizon unless it is absolutely necessary.

If you have a star or non-fully meshed Frame Relay topology, you may need to disable Split Horizon on certain interfaces for the routers to learn about the other networks.

A fully meshed network is a WAN in which all nodes have a logically direct connection to each other. In a fully-meshed environment, all routers will learn about all networks and have complete routing tables. Figure 1-4 shows a sample fully meshed network with Split Horizon enabled.

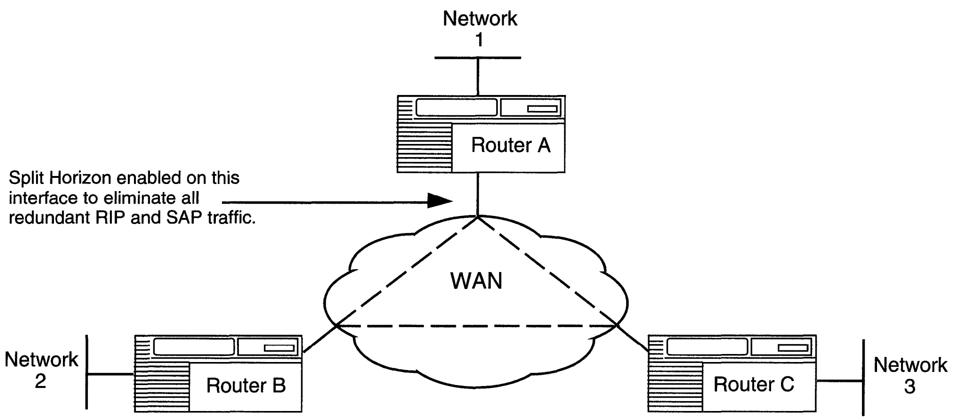

Figure 1-4. Split Horizon Enabled in a Fully Meshed Network

A non-fully meshed network is a WAN in which one or more nodes do not have logically direct connections to all other nodes. Figure 1-5 shows a sample non-fully meshed network with Split Horizon disabled.

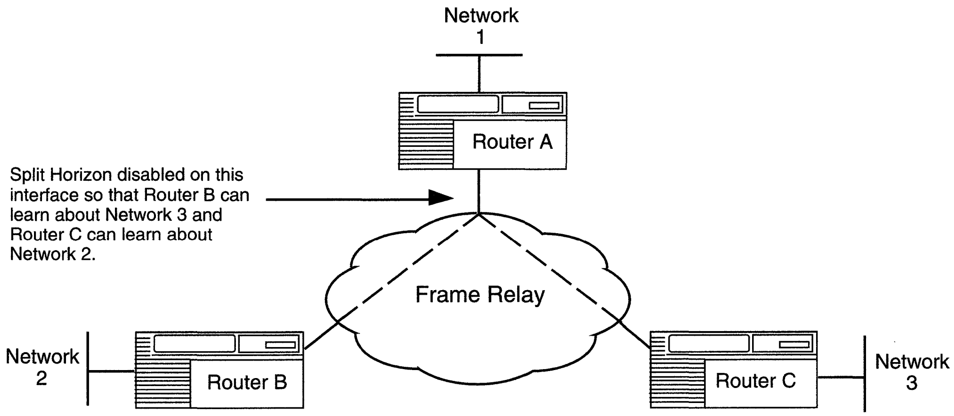

Figure 1-5. Split Horizon Disabled in a Non-Fully Meshed Network

If you enable Split Horizon on Router A, as shown in Figure 1-4, Router B will never learn about Router C's networks and vice versa. If users on Network 2 need to communicate with users on Network 3, you must disable Split Horizon on Router A, as shown in Figure 1-5. You do not, however, need to disable Split Horizon on Routers B and C.

For More Information about XNS

The following documents provide technical detail on XNS protocol implementation:

Xerox System Integration Standard (Xerox Corporation, December 1981).

Xerox Network Systems Architecture General Information Manual (Xerox Corporation, 1985).

Chapter 2
XNS Configuration Notes

Refer to this chapter when you are configuring the following XNS services:

- XNS without RIP
- XNS on a Token Ring interface

Configuring XNS without RIP

The router running XNS software learns WAN addresses from RIP broadcasts received over WANs. The router stores the XNS address/ WAN address pairs in its RIP table for future determination of next hop destinations.

Every router running XNS software on the internetwork learns about all of the other routers running XNS software through the propagation of RIP tables. These tables can become very large in large internetworks. You may want to configure XNS without RIP to control the size of these tables and to reduce bandwidth. However, you must do the following when you configure an XNS WAN interface without RIP:

1. Configure an adjacent host, and edit the DLCI parameter in the XNS Adjacent Host Parameters window for each host on an adjacent Frame Relay or SMDS network (refer to “Configuring Adjacent Host Parameters,” in Chapter 3).
2. Configure a static route to the next hop router for each adjacent host (refer to “Configuring Static Route Parameters,” in Chapter 3).

Configuring a MAC Address on a Token Ring Interface

Any physical interface (such as LANCE, ILACC, and FSI) that can run in indiscriminate mode allows multiple protocols to register a media access control (MAC) address for which the protocol software can listen. Therefore, XNS can register its host number as the MAC address for each interface. However, if XNS is running over a Token Ring interface, you must enter the host ID in the MAC Address Override parameter and set the MAC Address Select parameter to Cnfg for every Token Ring interface on which XNS is running, as follows:

1. Select the Circuits→Edit Circuits option from the Configuration Manager window.
2. Select the Token Ring circuit in the Circuit List window and click the Edit button.
3. Select the Lines option in the Circuit Definition window.
4. Select the interface from the Edit Lines window and click the Edit button.
5. Enter the router's XNS host ID in the MAC Address Override parameter box.
6. Set the MAC Address Select parameter to Cnfg in the Token Ring Parameters window.
7. Repeat Steps 2 through 6 for every Token Ring circuit on which XNS is running.

Chapter 3
Editing XNS Parameters

Refer to this chapter when you are using the Wellfleet Site Manager to

- Access XNS parameters
- Edit XNS global parameters
- Edit XNS interface parameters
- Edit XNS RIP interface parameters
- Add, edit, and delete adjacent hosts
- Add, edit, and delete static routes
- Delete XNS services completely from the router

Once you successfully enable an XNS interface on the router, you can use Site Manager to edit XNS parameters and customize XNS services, as described in this chapter.

This description assumes that you have already added one or more XNS default interfaces to a router configuration file that you now want to edit. (Refer to *Configuring Wellfleet Routers* if you need to add XNS interfaces to the configuration file.)

Accessing XNS Parameters

You can access all XNS operational parameters from the Configuration Manager window (Figure 3-1). Refer to *Configuring Wellfleet Routers* if you need instructions on how to access this window.

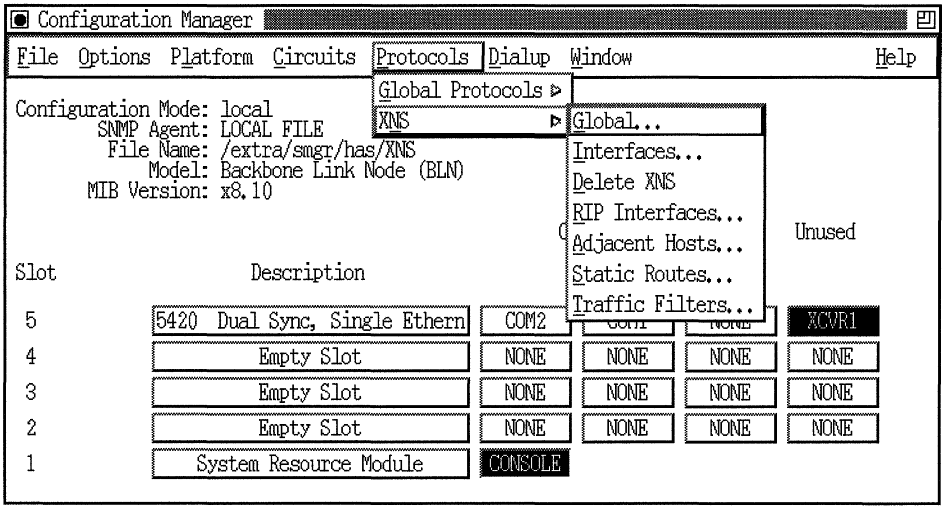

Figure 3-1. Configuration Manager Window

Editing XNS Global Parameters

To edit XNS Global parameters, begin at the Configuration Manager window (Figure 3-1) and proceed as follows:

1. Select the Protocols→XNS→Global option.

   The Edit XNS Global Parameters window appears (Figure 3-2).

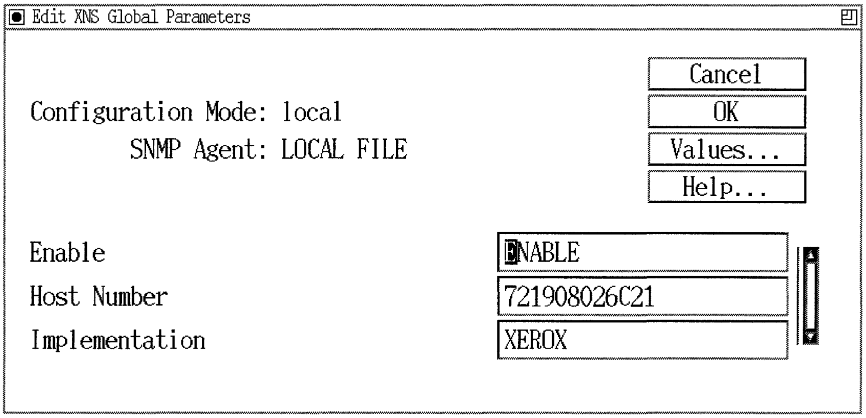

Figure 3-2. Edit XNS Global Parameters Window

2. Edit those parameters you want to change.
3. Click the OK button to save your changes and exit the window.

A description follows of the parameters in the XNS Global Parameters window.

Parameter:	**Enable**
Default:	Enable
Options:	Enable | Disable
Function:	Globally enables or disables the system software mechanisms that allow users to add XNS interfaces to the node configuration. The other significant actions the system software performs when you choose a setting are as follows: *Disable* forces every XNS interface existing on the node into the "down" (inoperative) state. *Enable* reinitializes every XNS interface existing on the node, with each interface maintaining the most recent setting of its own Interface Enable | Disable parameter. The actual up/down operating state of each interface at the time of global reinitialization further depends on the current up/down state of the associated circuit.
Instructions:	Select Disable to force every XNS interface existing on the node into the "down" (inoperative) state. Select Enable to globally reinitialize all XNS interfaces configured on the node, with each interface maintaining the most recent setting of its own Interface Enable|Disable parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.1.2

Parameter:	**Host Number (hex)**
Default:	The Configuration Manager automatically generates a unique 6-byte host number from the Wellfleet router's serial number if you do not enter a value. (The automatically generated number does not appear.)
Options:	Any host number
Function:	Sets a host ID and source MAC address for all slots. By means of this parameter, XNS interfaces configured on any slot in the node share the same host ID and source MAC address.
Instructions:	Do not enter a number in this box if you want the Configuration Manager to generate a host number automatically or if the interface is on a Token Ring circuit and you are setting the Token Ring Mac Address Select parameter to Boxwide. Enter the MAC address in hexadecimal notation only if the interface is on a Token Ring circuit and you are setting the Token Ring MAC Address Select parameter to Cnfg.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.1.4

Note: Refer to "Configuring a MAC Address on a Token Ring Interface," in Chapter 2, for more information about this parameter.

Parameter:	**Implementation**
Default:	XEROX
Options:	None
Function:	Specifies the implementation of the XNS protocol on the router.
Instructions:	Use the default setting.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.1.6

Editing XNS Interface Parameters

Any XNS interface you add to a Token Ring circuit acquires from the system a default set of XNS parameter values. You can use the Configuration Manager to enable or disable a specific XNS interface. To access the XNS Interface Parameters window, begin at the Configuration Manager window (refer to Figure 3-1) and proceed as follows:

1. Select the Protocols→XNS→Interfaces option to display the XNS Interfaces window (Figure 3-3).

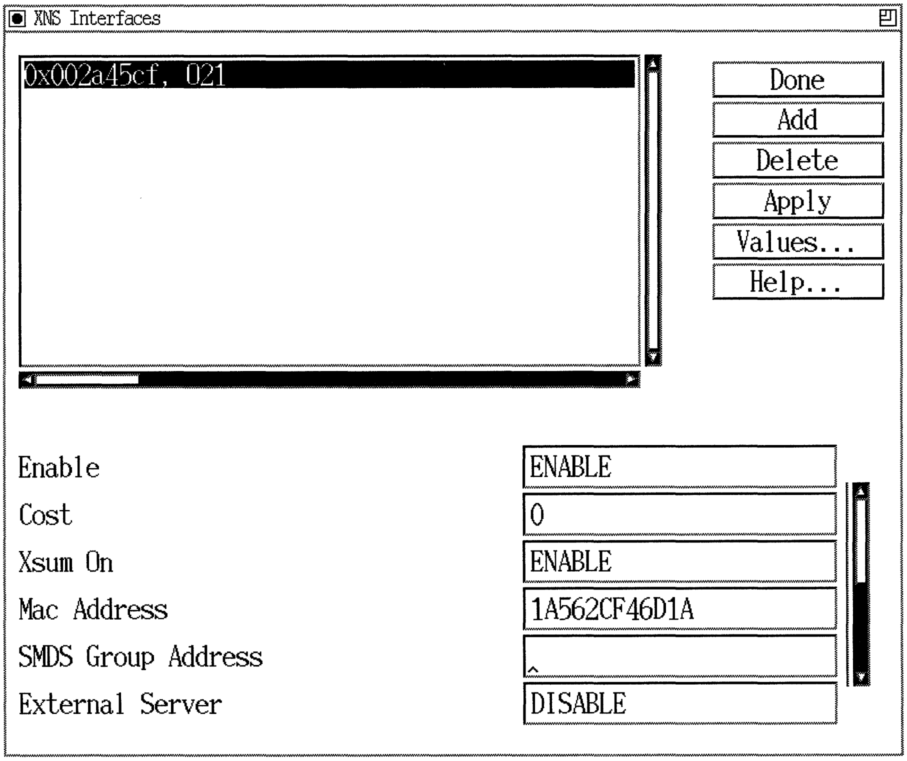

Figure 3-3. XNS Interfaces Window

The reference for each interface in the list appears in the form:

network address, circuit name

where:

- The network address of the interface is in hexadecimal format.
- The name of the physical circuit supporting that interface is in alphanumeric format.

2. Select the interface you want to modify. The parameter values associated with that interface appear (lower right) in the parameter windows.
3. Modify the values of those parameters you want to change.
4. Click the Apply button to save your changes.
5. Click on the Done button to exit the XNS Interfaces window.

A description of the parameters in the XNS Interfaces window follows.

Parameter:	**Enable**
Default:	The Configuration Manager automatically sets this interface-specific parameter to Enable when you add XNS support to this interface.
Options:	Enable | Disable
Function:	Enables or disables XNS routing on this interface.
Instructions:	Select Enable if you previously set this parameter to Disable and now want the interface to support XNS routing. Select Disable only if you want to disable XNS routing over this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.2

Parameter:	**Cost**
Default:	0 (for each hop)
Range:	1 to 15
Function:	Sets the cost (number of hops) for this interface. This parameter allows you to configure the shortest path. The cost is added to routes learned on this interface through RIP and is specified in subsequent RIP packets sent to other interfaces. XNS disposes of the packet when its hop count surpasses 15.
Instructions:	Enter the interface cost value. Standard RIP implementation assigns a cost of 1. Increasing this value causes the RIP Network Diameter to reach the upper bound of 15 more quickly.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.7

Parameter:	**Xsum on**
Default:	Enable
Options:	Enable | Disable
Function:	Performs checksumming and compares the checksum to the number in the Checksum field of each XNS packet. However, XNS does not perform a checksum on a packet it receives if the value of 0xffff is in the Checksum field. If XNS performs a checksum on a packet, and its value does not match the value in the Checksum field, XNS drops this packet.
Instructions:	Select Enable if you want XNS to perform checksumming. Select Disable to bypass checksumming.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.8

Parameter:	**MAC Address**
Default:	None (the base host number that you entered when you added XNS to the circuit overrides the MAC Address parameter)
Options:	Any valid MAC address
Function:	Specifies the MAC address of this interface.
Instructions:	Leave this setting blank.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.10

Parameter:	**SMDS Group Address**
Default:	None
Options:	A complete SMDS E.164 address specified by the SMDS subscription agreement that you have with your SMDS provider.
Function:	Provides a MAC-layer multicast address for this SMDS interface. This network-level interface parameter overrides the Group Address setting you entered when adding SMDS at the circuit level.
Instructions:	Leave blank if this interface is not on an SMDS circuit. Enter the complete SMDS E.164 group address, for example, E16175552876FFFF. If only one telephone number is assigned to the circuit, enter the same telephone number that you entered when you added SMDS to this circuit.You can display this number in the SMDS Interface Parameters window. Refer to the book *Customizing SMDS Services* for more information.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.11

Parameter:	**External Server**
Default:	Disable
Options:	Enable | Disable
Function:	Specifies whether external server capabilities are active. If you select Enable, the interface forwards packets of a particular type to a specific destination.
Instructions:	Select Enable to turn on external server capabilities. Select Disable to turn off external server capabilities. Use the Ext Serv PacketType parameter to specify the packet type. Use the Ext Serv Network, Ext Serv Host ID, and Ext Serv Socket Num parameters to specify the destination.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.13

Parameter:	**Ext Serv Network**
Default:	Enable
Options:	Any valid network address
Function:	Specifies the network of the remote server to supply external server capabilities. Use this setting only if you set the External Server parameter to Enable.
Instructions:	Enter the network address of the remote server to which you want to supply external server capabilities. Leave blank if you are not using external server capabilities.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.14

Parameter: **Ext Serv Host ID**

Default: 0

Options: Any valid host ID

Function: Specifies the host ID of the remote server to supply external server capabilities. Use this setting only if the External Server parameter is set to Enable.

Instructions: Enter the host ID of the remote server to which you want to supply external server capabilities.

Leave blank if you are not using external server capabilities.

MIB Object ID: 1.3.6.1.4.1.18.3.5.10.3.1.15

Parameter: **Ext Serv PacketType**

Default: None

Options: Any valid packet type

Function: Specifies the packet type of the service requests to forward to the remote server. Use this setting only if the External Server parameter is set to Enable.

Instructions: Enter the packet type of the service requests to forward to the remote server.

Leave blank if you are not using external server capabilities.

MIB Object ID: 1.3.6.1.4.1.18.3.5.10.3.1.16

Parameter:	**Ext Serv Socket Num**
Default:	None
Options:	Any valid destination socket number
Function:	Specifies the destination socket number of the remote server to which to forward service requests. Use this setting only if the External Server parameter is set to Enable.
Instructions:	Leave blank if you are not using external server capabilities or if you are using external server capabilities and you want to forward all packets of the specified type that this interface receives to the specified remote server. Enter the destination socket number of the remote server to which to forward service requests.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.17

Parameter:	**WAN Broadcast**
Default:	ffffff (not displayed)
Options:	Default value or a user-specified Frame Relay broadcast address
Function:	Specifies a Frame Relay broadcast address for this XNS interface.
Instructions:	Leave blank to accept the default value. With the default value, the router sends all broadcast traffic through all logical connections associated with the XNS interface you are configuring. Enter a Frame Relay broadcast address to send all broadcast traffic through the XNS interface you are configuring.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.28

Parameter:	**WAN Multicast**
Default:	ffffff (not displayed)
Options:	Default value or a user-specified Frame Relay multicast address
Function:	Specifies a Frame Relay multicast address for this XNS interface.
Instructions:	Leave blank to accept the default value. With the default value, the router sends all multicast traffic through all logical connections associated with the XNS interface you are configuring. Enter a Frame Relay multicast address to send all multicast traffic through the XNS interface you are configuring.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.29

Parameter:	**Split Horizon Algorithm**
Default:	Enable
Options:	Enable | Disable
Function:	When the interface forwards RIP and SAP updates, it can exclude RIP and SAP broadcast updates learned on that interface.
Instructions:	Select Enable if you previously set this parameter to Disable and now do not want the router to transmit RIP and SAP updates received from the interface over that interface. Select Disable only if you want the router to transmit RIP and SAP updates it received from the interface over that interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.3.1.30

Editing RIP Interface Parameters

If you enable RIP on an XNS interface, you can edit the RIP parameters of that interface by accessing the XNS RIP Interfaces window. (The following instructions describe a RIP-enabled XNS interface as an XNS RIP interface.) For instructions on how to add an XNS RIP interface to a circuit, refer to *Configuring Wellfleet Routers*. To edit the configurable RIP parameters of an XNS interface, begin at the Configuration Manager window (refer to Figure 3-1) and proceed as follows:

1. Select the Protocols→XNS→RIP Interfaces option.

   The XNS RIP Interfaces window appears (Figure 3-4). The window shows at the upper left a list of all XNS RIP interfaces configured on the selected circuit.

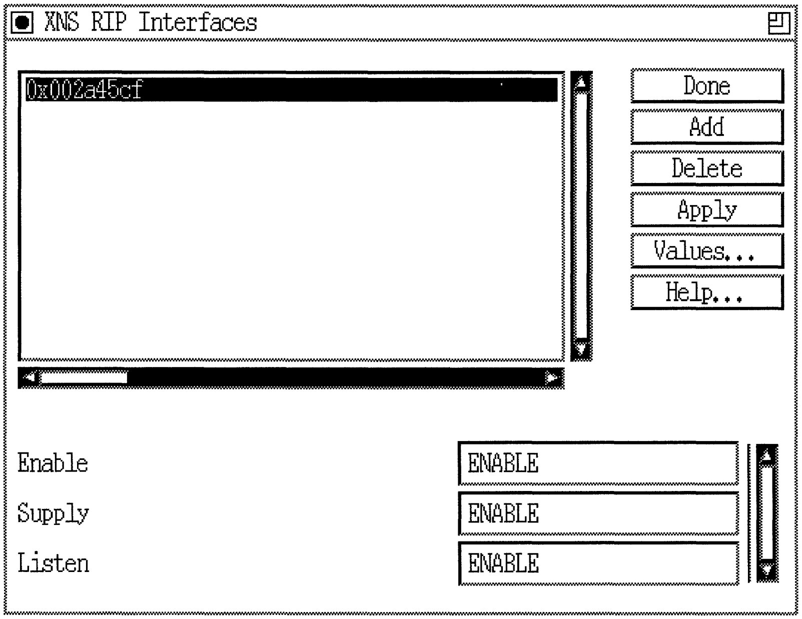

Figure 3-4. XNS RIP Interface Parameters Window

2. Select the interface you want to edit by clicking on the appropriate entry in the list of RIP interfaces.
3. Click on any parameter value you want to change, then enter a new value.
4. Click on the Apply button to save your changes.
5. Click on the Done button to exit the XNS RIP Interfaces window.

A description of the parameters in the XNS RIP Interfaces window follows.

Parameter:	**Enable**
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether you enabled the Routing Information Protocol on this XNS interface.
Instructions:	Select Enable to enable RIP on this interface. Select Disable to disable RIP on this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.4.1.2

Parameter:	**Supply**
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether the interface transmits all RIP updates to routers in neighboring networks.
Instructions:	Select Enable to configure the interface to transmit all RIP updates. Select Disable to prohibit the interface from transmitting all RIP updates.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.4.1.5

Parameter:	**Listen**
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether this interface listens to RIP updates from neighboring networks.
Instructions:	Select Enable to configure this XNS interface to listen to RIP updates, and to convey received routing information to its internal routing table. Select Disable to configure this XNS interface to ignore RIP updates from neighboring routers. Disabling RIP also prevents this interface from conveying any received routing information to its internal routing table.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.4.1.6

Note: If you set this parameter to Enable, a route filter can still prohibit the interface from updating its internal routing tables.

Configuring Adjacent Host Parameters

The sections that follow describe how to add, edit, and delete adjacent host routes in a Wellfleet router configuration. You perform these actions via the XNS Adjacent Hosts window.

To access the Adjacent Hosts window, begin at the Configuration Manager window (refer to Figure 3-1) and select the Protocols→XNS→Adjacent Hosts option. The XNS Adjacent Hosts window appears (Figure 3-5), showing a list of all Adjacent Hosts currently associated with a specific Host ID. (The Host ID is a global parameter for XNS interfaces defined on any slot.)

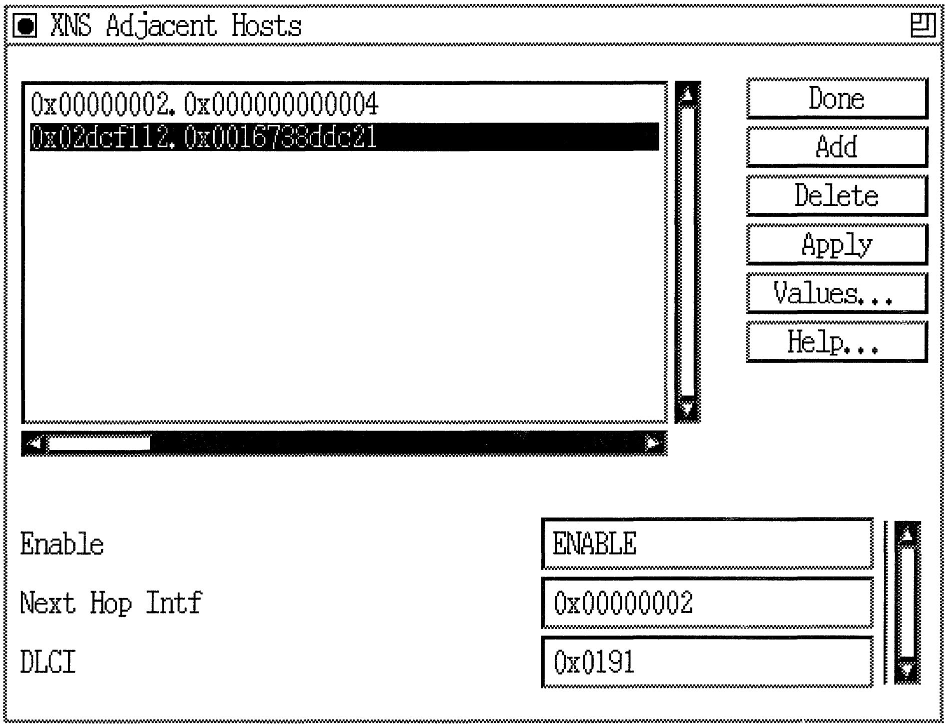

Figure 3-5. XNS Adjacent Hosts Window

Adding an Adjacent Host

To add an adjacent host, begin at the XNS Adjacent Hosts window (Figure 3-5) and proceed as follows:

1. Click on the Add button.

   The Adjacent Host Configuration window appears (Figure 3-6).

   The reference for each adjacent host in the list appears in the form:

   target host network address, host ID address

   Both addresses are in hexadecimal format.

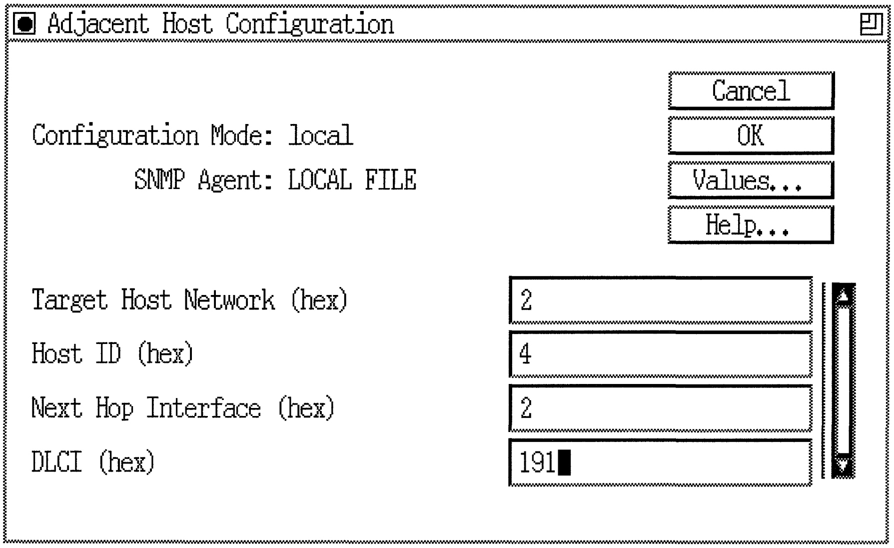

Figure 3-6. Adjacent Host Configuration Window

2. Enter hexadecimal values for the Target Host Network and Host ID parameters. Once you enter appropriate values, these parameters are available for viewing as statistics only.

3. Enter hexadecimal values for the Next Hop Interface and the DLCI, if appropriate. Refer to the descriptions at the end of this section for information about these parameters.

4. Click on the OK button to save your entries to the configuration file.

   The XNS Adjacent Hosts window (refer to Figure 3-5) reappears immediately after you press the OK button.

A description of the parameters in the Adjacent Host Configuration window follows.

Parameter:	**Target Host Network**
Default:	None
Options:	Valid network address of the adjacent host
Function:	Specifies the network address of the adjacent host.
Instructions:	Enter a network address of up to 8 hexadecimal characters.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.5.1.3

Parameter:	**Host ID (hex)**
Default:	None
Options:	Valid host ID of the adjacent host
Function:	Specifies the Host ID of the device you want to configure as an adjacent host.
Instructions:	Enter a Host ID of up to 12 hexadecimal characters.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.5.1.4

Parameter:	**Next Hop Interface (hex)**
Default:	None
Options:	Configured network address of the next hop
Function:	Specifies the network address of the next-hop interface.
Instructions:	Enter a network address of up to 8 hexadecimal characters.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.5.1.5

Parameter:	**DLCI (hex)**
Default:	None
Options:	Data Link Control Identifier
Function:	Identifies the virtual circuit in a Frame Relay or SMDS network.
Instructions:	Enter a locally significant DLCI of up to 16 hexadecimal characters if the interface is on a Frame Relay or SMDS network. Leave blank if the interface is not on a Frame Relay or SMDS network.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.5.1.6

Caution: The router cannot pass traffic through an interface to an adjacent host on a Frame Relay or SMDS network if the adjacent host is configured without the correct DLCI.

Editing an Adjacent Host

You can edit the configurable parameters of an Adjacent Host entry in the node configuration. The Configuration Manager does not allow you to change the Target Host Network and Host ID parameters you set in any Adjacent Host Configuration window. To establish new values for these parameters belonging to a particular adjacent host, you must delete that host and configure a new host. You can, however, reconfigure all other parameters associated with an adjacent host.

To edit the configurable parameters associated with an existing adjacent host, begin at the Configuration Manager window (refer to Figure 3-1) and select the Protocols→XNS→Adjacent Hosts option. The XNS Adjacent Hosts (list) window appears (refer to Figure 3-5). From this window, proceed as follows:

1. Select the adjacent host you want to edit. Click on the appropriate entry in the list of Adjacent Hosts.

2. Click on any parameter value you want to change, then enter a new value.
3. Click on the Apply button to save your changes.
4. Click on the Done button to exit the XNS Adjacent Hosts window.

A description of parameters in the XNS Adjacent Hosts window follows.

Parameter:	**Enable**
Default:	The Configuration Manager automatically sets this parameter to Enable when you click on the Add button in the XNS Adjacent Hosts window.
Options:	Enable | Disable
Function:	Specifies whether the selected adjacent host record is enabled or disabled in the XNS routing tables. The router does not consider any adjacent host record you disable.
Instructions:	Select Disable to make the adjacent host record inactive in the XNS routing table; the router will not consider this adjacent host. Select Enable to make the adjacent host record active again in the XNS routing table.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.5.1.2

Parameter:	**Next Hop Interface**
Default:	None
Options:	Configured network address of the next hop
Function:	Specifies the network address of the next-hop interface.
Instructions:	Enter a network address of up to 8 hexadecimal characters.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.5.1.5

Parameter:	**DLCI**
Default:	None
Options:	Data Link Control Identifier
Function:	Identifies the virtual circuit in a Frame Relay or SMDS network.
Instructions:	Enter a locally significant DLCI of up to 16 hexadecimal characters if the interface is on a Frame Relay or SMDS network. Leave blank if the interface is not on a Frame Relay or SMDS network.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.5.1.6

Caution: The router cannot pass traffic through an interface to an adjacent host on a Frame Relay or SMDS network if the adjacent host is configured without the correct DLCI.

Deleting an Adjacent Host

To delete an adjacent host:

1. Select from the XNS Adjacent Hosts window the adjacent host you want to delete from the node configuration (refer to Figure 3-5).
2. Click on the Delete button in the XNS Adjacent Hosts window.

The system software deletes the Adjacent Host entry you selected, and the entry disappears from the list of adjacent hosts in the Adjacent Hosts window.

Configuring Static Route Parameters

XNS static routes are user-specified transmission paths that XNS internet packets follow. You configure static routes when you want to restrict the paths that packets can follow. Static routes, like routes learned through RIP, appear in the XNS routing table. Unlike routes learned through RIP, however, static routes do not time out. Static routes remain in the XNS routing table until you reconfigure them manually.

The sections that follow present information on how to add, edit, and delete XNS static routes in a Wellfleet router configuration. You perform these functions from the XNS Static Routes window. Begin at the Configuration Manager window (Figure 3-1) and select the Protocols➔XNS➔Static Routes option. The XNS Static Routes window appears (Figure 3-7).

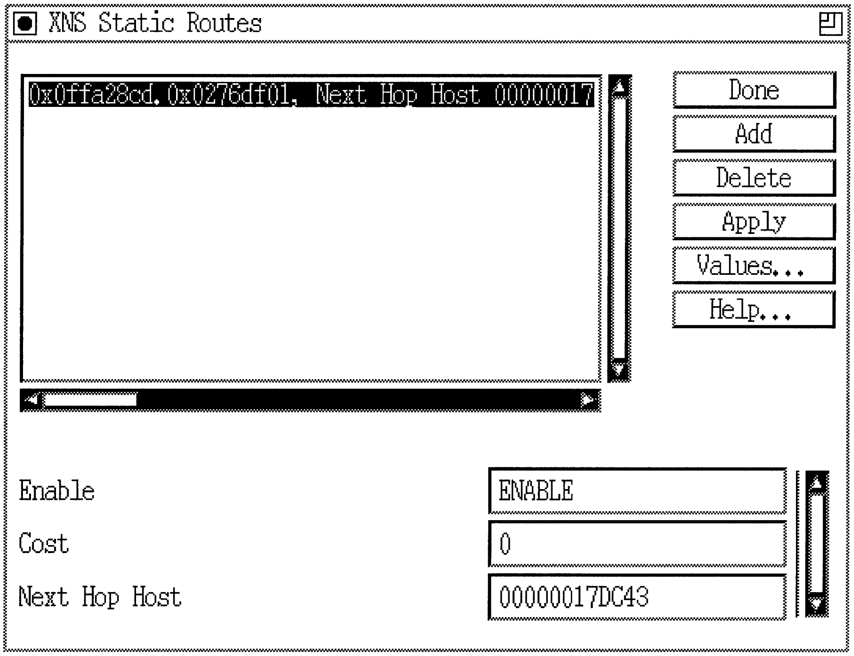

Figure 3-7. XNS Static Routes Window

Caution: To establish a Data Link layer connection in a Frame Relay or SMDS network, which allows the router to send packets over a static route, you must configure an adjacent host and edit the DLCI parameter in the XNS Adjacent Hosts Parameter window.

Adding a Static Route

To add a static route, begin at the XNS Static Routes (list) window (Figure 3-7) and proceed as follows:

1. Click on the Add button.

   The XNS Add Static Route window appears (Figure 3-8).

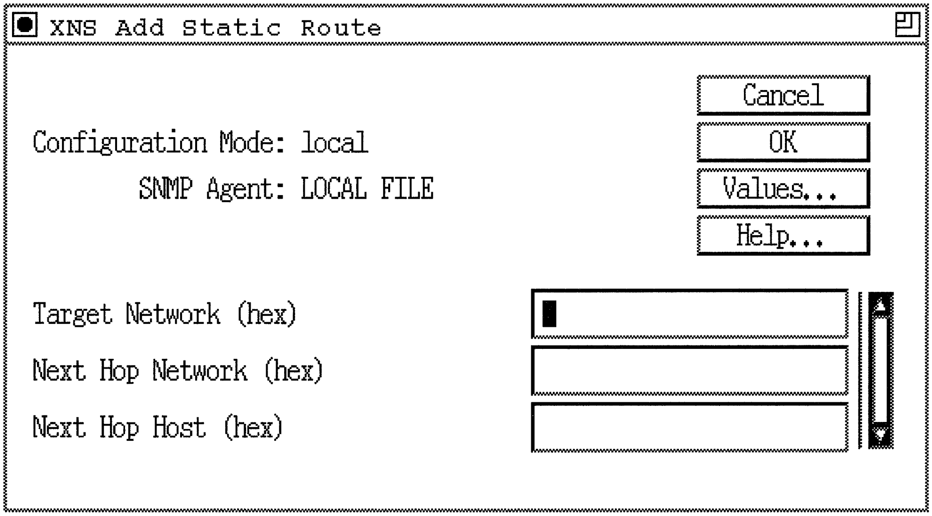

Figure 3-8. XNS Add Static Route Window

2. Enter values for the Target Network and Next Hop Network parameters. Once you enter appropriate values, those parameters are available for viewing as statistics only.
3. Click on the OK button to save your entries.

The XNS Add Static Route (list) window (Figure 3-8) reappears immediately after you click on the OK button.

A description of the parameters in the XNS Add Static Route window follows.

Parameter:	**Target Network**
Default:	None
Options:	Any valid network address in hexadecimal notation
Function:	Specifies the address of the network to which you want to configure the static route.
Instructions:	Enter a network address of up to 8 hexadecimal characters.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.6.1.3

Parameter:	**Next Hop Network**
Default:	None
Options:	Any valid network address in hexadecimal notation
Function:	Specifies the network address of the next hop.
Instructions:	Enter a network address of up to 8 hexadecimal characters.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.6.1.5

Editing a Static Route

You can edit the configurable parameters of a static route that you specified earlier in the node configuration. The Configuration Manager does not allow you to reconfigure the Target Network and Next Hop Network parameters for a static route. If you want to change these parameters, you must delete the static route and add a new route with the proper information. However, you can reconfigure all other parameters associated with a static route.

To edit the configurable parameters associated with an existing static route, begin at the Configuration Manager window (Figure 3-1) and select the Protocols→XNS→Static Routes option. The XNS Static Routes (list) window appears (refer to Figure 3-7). From this window, proceed as follows:

1. Select the static route you want to edit. Click on the appropriate entry in the list of static routes.
2. Click on any parameter value you want to change, then enter a new value.
3. Click on the Apply button to save your changes.
4. Click on the Done button to exit the XNS Static Routes window.

A description of parameters in the XNS Static Routes window follows.

Parameter:	**Enable**
Default:	The Configuration Manager automatically sets this parameter to Enable when you click on the Add Static Route button in the Add XNS Static Route window.
Options:	Enable | Disable
Function:	Specifies the state (active or inactive) of the static route record in the XNS routing tables.
Instructions:	Select Disable to make the static route record inactive in the XNS routing table; the router will not consider this static route. Select Enable to make the static route record active in the XNS routing table.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.6.1.2

Parameter:	**Cost**
Default:	0 router hops
Options:	0 to 15 router hops
Function:	Specifies the number of router hops added to an XNS data packet. The router uses Cost when determining the best route for a datagram to follow. The Cost is also propagated through RIP. The default setting of 0 for static routes gives them priority over RIP-learned routes.
Instructions:	Enter the number of router hops.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.6.1.4

Parameter:	**Next Hop Host**
Default:	None
Options:	Any valid host address in hexadecimal notation
Function:	Specifies the address of the next host in the static routing path.
Instructions:	Enter a host address of up to 12 hexadecimal characters.
MIB Object ID:	1.3.6.1.4.1.18.3.5.10.6.1.6

Deleting a Static Route

To delete an XNS static route:

1. Select from the XNS Static Routes window the static route you want to delete from the node configuration.
2. Click on the Delete button in the Static Routes (list) window (refer to Figure 3-7).

The system software deletes the Static Routes entry you selected, and the entry disappears from the list of static routes in the XNS Static Routes window.

Editing XNS Traffic Filters

Traffic filters allow you to control network traffic on configured network interfaces. You can configure traffic filters to drop inbound protocol-specific network packets and datagrams when they arrive at a configured network interface on the router. You can also configure these filters to accept outbound traffic and forward it to specific destination nodes on the network. XNS traffic filters, for example, allow to you to drop, accept, or forward XNS packets on those interfaces that you configure for XNS.

For information about traffic filters for XNS, and other protocols that support this capability, refer to *Configuring Filter Options for Wellfleet Routers*.

Deleting XNS from the Node

You can delete XNS from the node entirely, in two steps.

To delete XNS (if it is enabled on the node), begin at the Configuration Manager window (refer to Figure 3-1) and complete the following steps:

1. Select the Protocols➔XNS➔Delete XNS option.

   A confirmation window appears.

2. Select OK.

   The Configuration Manager window appears.

XNS is no longer configured on the Wellfleet router.

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