



Inter Node Links

This chapter contains information and procedures for data links in the network. A data link can link two NEs, or it can link an NE to an external device such as a router.

This chapter contains the following sections:

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- IP Data Link Procedures, page 8-3
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 - Provisioning a Fractional T1 (Frame Relay and PPP Links), page 8-4
 - Deleting a Fractional T1, page 8-5
 - Creating a Link to the Local Node, page 8-6
 - Creating a Default Route to the Local Node, page 8-9
 - Verifying the Link, page 8-11
- Inter Node Data Link Procedure, page 8-12
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 - Creating a Visual Link to the Remote Node, page 8-14
 - Creating a Link to the Remote Node, page 8-16
 - Creating a Visual Link to the Local Node, page 8-20
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 - Creating a Default Route to the Local Node, page 8-24
 - Verifying the Inter Node Data Link, page 8-25

Link Types

EMS offers the following types of inter node links:

- Nodata Link
- Inter Node Data Link
- IP over Frame Relay Link
- IP over PPP (Point-to-Point Protocol)

Nodata Link

A nodata link identifies an established (nailed-up) connection between the local and remote node. A nodata link does not allow provisioning of a remote node, but it can be used to carry traffic and cross connects between the two nodes.

IP over Frame Relay Link

This link is used to carry IP traffic from the Cisco IAD1101 through a Frame Relay cloud. The link must end on a router with a Frame Relay interface.



Note

You must provision the interface (line) for Frame Relay before creating an IP over Frame Relay data link. See Chapter 12, “Frame Relay,” for details about line provisioning.

IP over PPP

This link uses point-to-point protocol (PPP) to carry IP traffic from the Cisco IAD1101 through the Cisco WAN, ending on a router.

Inter Node Data Link

An inter node data link (INDL) allows the provisioning of a remote node over an established connection to the local node. There are two types of INDLs:

- DS0 INDL—EMS uses DS0 channel number 24 for management of the remote node.
- DS1-FDL INDL—EMS uses the DS1 overhead FDL for management of the remote node.

The remaining, nonmanagement bandwidth is available for cross connects between nodes.

IP Data Link Procedures

**Note**

If you are creating an inter node data link (INDL) or a nondata link between two NEs, Cisco Systems recommends that you use the visual link procedure. See “Inter Node Data Link Procedure” on page 8-12.

The menu-based link procedure can be used to provision all types of inter node links. This is the only procedure that allows the creation of IP links (IP over Frame Relay and IP over PPP). The following example creates an IP link between a router and a Cisco IAD1101. (See Figure 8-1.) In this example, the router is the local node, and the Cisco IAD1101 is the remote node.

Figure 8-1 Inter Node Link between Cisco IAD1101 and Router



Before an inter node link can be provisioned, you must have an operational physical link between the two nodes. Both ends of the link must be in service and correctly provisioned before you can create an inter node link.

Complete the following procedures to provision an inter node link:

- Provisioning the Local Node, page 8-3
- Provisioning the Remote Node, page 8-3
- Verifying the Link, page 8-11

Provisioning the Local Node

The local node must be provisioned with a link to the remote node.

- If the local node is a router, add a static route pointing to the remote node. For a Cisco Systems router, use the **ip route** command to create a static route.
- If the local node is an NE, follow the procedure given in the “Creating a Link to the Remote Node” on page 8-16.

Provisioning the Remote Node

You must complete the following procedures to provision the remote node with an inter node link:

- Provisioning a Fractional T1 (Frame Relay and PPP Links), page 8-4
- Creating a Link to the Local Node, page 8-6
- Creating a Default Route to the Local Node, page 8-9

Provisioning a Fractional T1 (Frame Relay and PPP Links)

If you are creating an inter node link over Frame Relay or PPP, you must identify the group of DS0 channels to be used for the inter node link. EMS manages user-defined groups of DS0 channels with fractional T1 line provisioning.

- Step 1** From Cisco 6700 NodeView (see Figure 8-2), right-click the LED in the icon of a T1 line, and click **Start Fractional T1 Provisioning** from the popup menu. EMS launches the fractional T1 provisioning window. (See Figure 8-3.)

Figure 8-2 Cisco 6700 NodeView

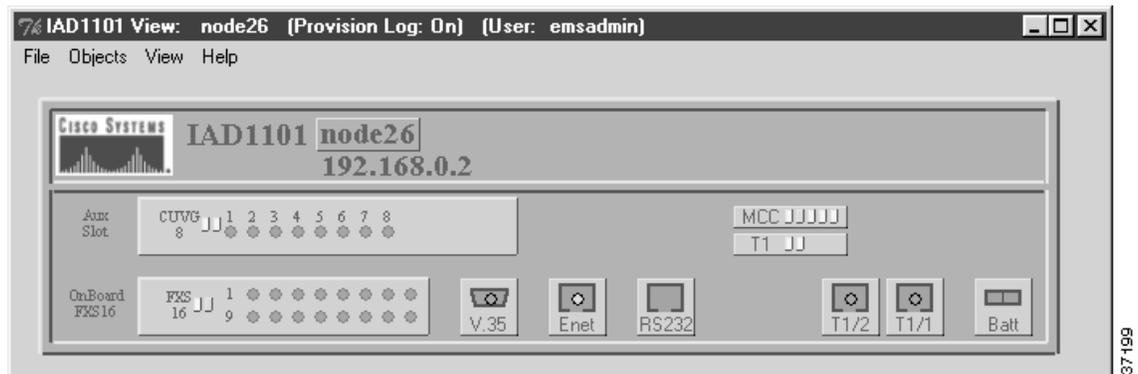
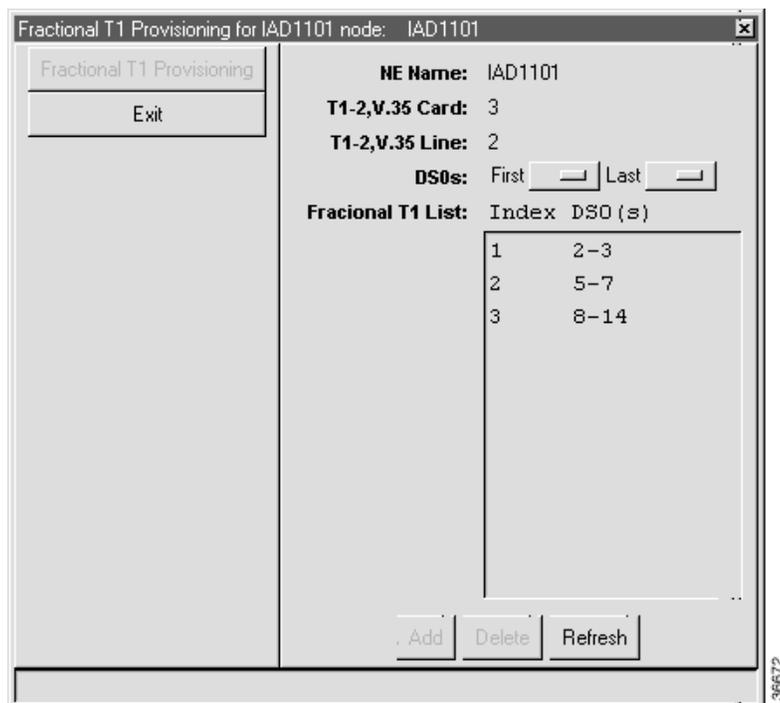


Figure 8-3 Fractional T1 Provisioning Window



- Step 2** In the **DS0s** field, select the **First** and **Last** DS0 to define the range of DS0 channels for the fractional T1.
- Step 3** Click **Add** to provision the fractional T1. EMS adds the fractional T1 to the list and assigns the T1 an index.
- Step 4** To provision additional fractional T1s, go to Step 2 and repeat this procedure.
-



Note If fractional T1s have previously been provisioned, their ranges are listed in the Fractional T1 List, as shown in Figure 8-3. If you are creating a new fractional T1, you cannot use DS0 channels that are already part of another fractional T1.

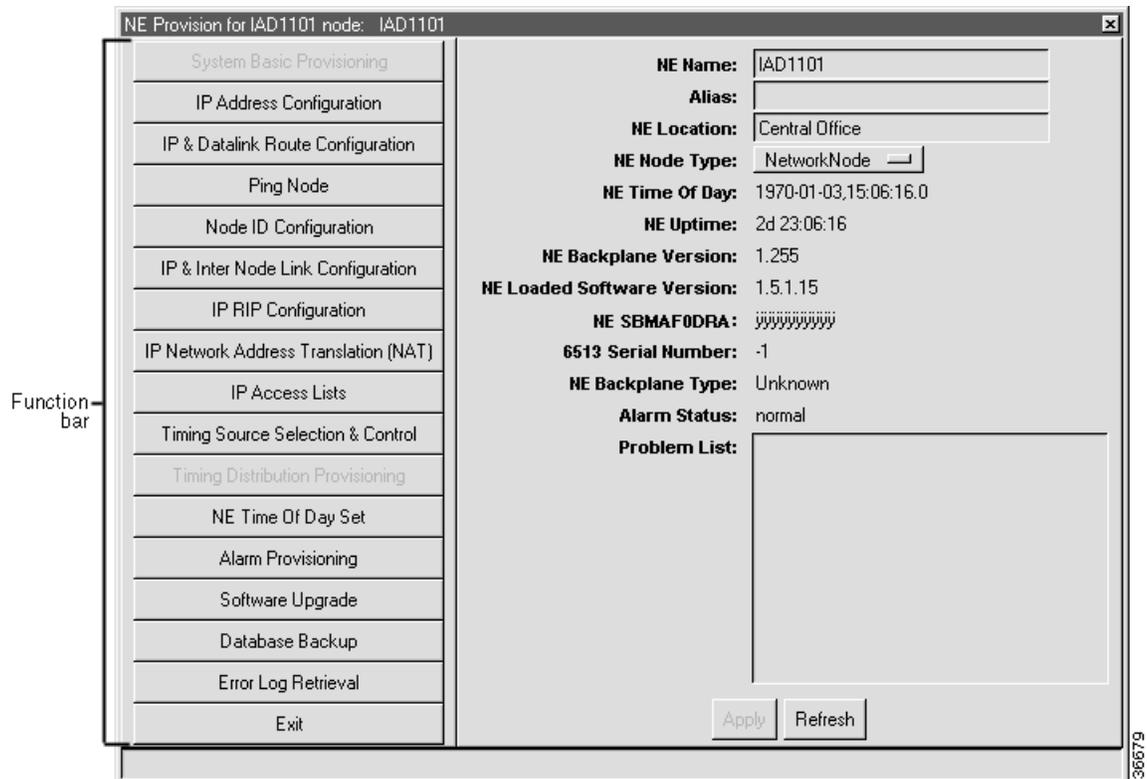
Deleting a Fractional T1

-
- Step 1** From the fractional T1 provisioning window, highlight a fractional T1 in the list.
- Step 2** Click **Delete**. EMS removes the fractional T1 from the list.
-

Creating a Link to the Local Node

- Step 1** From Cisco 6700 NetView, double-click the icon of the remote node to open Cisco 6700 NodeView. (See Figure 8-2.)
- Step 2** Double-click the node nameplate to open the NE provisioning window of the remote node. (See Figure 8-4.)

Figure 8-4 IAD1101 NE Provisioning Window



- Step 3** From the NE provisioning window of the remote node, click **Node ID Configuration** in the function bar. EMS displays a list of all known nodes in the network. (See Figure 8-5.)

Figure 8-5 Node ID Configuration

NE Provision for IAD1101 node: IAD1101

System Basic Provisioning

IP Address Configuration

IP & Datalink Route Configuration

Ping Node

Node ID Configuration

IP & Inter Node Link Configuration

IP RIP Configuration

IP Network Address Translation (NAT)

IP Access Lists

Timing Source Selection & Control

Timing Distribution Provisioning

NE Time Of Day Set

Alarm Provisioning

Software Upgrade

Database Backup

Error Log Retrieval

Exit

NE Node ID: 1

Node ID: 1

Node IP Address: [] [] [] []

Node ID List:

Index	NodeID	IP Address
1	1	192.168.0.2
2	2	192.168.0.3

Add Delete Set NE Node ID Refresh

- Step 4** Look for the IP address of the local node in the Node ID list. If the local node is not listed, complete the following steps to add the node (also see the note following this procedure):
- Enter an unused node ID in the **Node ID** field to identify the local node. You cannot select an ID number that is currently being used on the local node.
 - Enter the **IP Address** of the local node.
 - Click **Add** to add the node to the list.
 - If you have not yet set the local node as the NE node ID, highlight the local node IP address and click the **Set NE Node ID** button at the bottom of the screen.

- Step 5** Click **IP & Inter Node Link Configuration** in the function bar. (See Figure 8-6.) EMS launches the inter node link provision window.

Figure 8-6 Provision Data Link

- Step 6** Select the **Local Interface** type, card number, and line number.
- Step 7** Select the **Link Type**:
- **DS0-INDL**—Creates an INDL using DS0 channel 24 for remote management
 - **FDL-INDL**—Creates an INDL using the T1 overhead for remote management
 - **None**—Creates a nondata link for inter node cross connects
 - **FrameRelay**—Creates an IP over Frame Relay link
 - **PPP**—Creates an IP over PPP link
- Step 8** For a PPP link, select the **Fractional T1** to carry the link.
- Step 9** In the **Remote Node ID** field, enter the node ID of the remote node.
- Step 10** For a Frame Relay link, click the DLCI in the **DLCI List** that will carry the INDL.
- Step 11** Click **Add** to provision the link.
- Step 12** To view information and statistics for the link, click the entry in the **Link List**.

Creating a Default Route to the Local Node

You must create a default route from the remote node to the local node.



Note

If you are creating a nondata link, you do not need to create a default route. See “Verifying the Link” on page 8-11 to ensure that the nondata link is operational.

- Step 1** From the NE provision window of the remote node (see Figure 8-4), select **IP & Datalink Route Configuration** from the function bar. EMS launches the data link route configuration window. (See Figure 8-7.)

Figure 8-7 IP & Datalink Route Configuration Window

NE Provision for IAD1101 node: IAD1101

System Basic Provisioning

IP Address Configuration

IP & Datalink Route Configuration

Ping Node

Node ID Configuration

IP & Inter Node Link Configuration

IP RIP Configuration

IP Network Address Translation (NAT)

IP Access Lists

Timing Source Selection & Control

Timing Distribution Provisioning

NE Time Of Day Set

Alarm Provisioning

Software Upgrade

Database Backup

Error Log Retrieval

Exit

Interface: Type Card Line

Destination IP Address: 0 0 0 0

Gateway IP Address:

Netmask:

Route Type: Host

Route List:

ID	Interface
1	Ethernet

Add Delete Refresh

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- Step 2** Set the following parameters in the data link route configuration window:
- **Card Type**—Card used in the remote node.
 - **Card**—Slot number of the card used in the remote node.
 - **Line**—Line number of the line used in the remote node.
 - **Destination IP Address**—The destination address for the route. To configure a default route, leave this field at the default (**0.0.0.0**).
 - **Gateway IP Address**—The IP address of the local node. This is the next destination along the route path.
 - **Netmask**—The netmask for the destination IP address. To configure a default route, leave this field blank.
 - **Route Type**—Set to **Default**.
- Step 3** Click **Add** to provision the default route to the routing table.
-

In addition to the default route, you can configure additional routes as needed. See Chapter 11, “IP Services,” for more information about assigning routes.

Verifying the Link

- Step 1** From the NE provisioning window (see Figure 8-4), select **Ping Node** from the function bar. EMS displays the ping node window. (See Figure 8-8.)

Figure 8-8 Ping Node Window

- Step 2** Set the following parameters:
- **Packet Size**—Use the default packet size, 50 bytes.
 - **IP Address**—Enter the IP address of the connected node.
- Step 3** Click **Ping** to ping the node. EMS displays results of the attempted ping in the **Results** list.
- Step 4** A result of **Success** indicates that the IP data link is correctly provisioned.

Inter Node Data Link Procedure

The visual link procedure is recommended for connecting two NEs with the following link types:

- Nodata link
- DS0 INDL
- FDL INDL

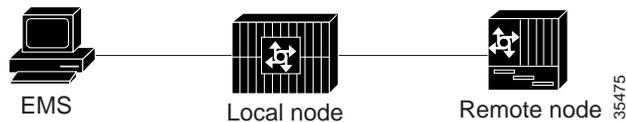


Note

IP data links (IP over Frame Relay or IP over PPP) cannot be provisioned using this procedure. (See the sections “IP over Frame Relay Link” and “IP over PPP” on page 8-2.)

Figure 8-9 displays a common inter node link between two NEs. In this example, a Cisco 6732 is the local node, and a Cisco 6705 is the remote node (another Cisco 6732 could also be used as the remote node). The two nodes must be on a different subnet. An INDL allows provisioning of the remote node from the local node network.

Figure 8-9 Inter Node Link between NEs



Each node must be provisioned with a separate “half link” before the inter node link can be used. The following procedures require local access to both nodes with the EMS workstation.

To create an inter node link, complete the following procedures:

- Setting the Default Gateway on the EMS Workstation, page 8-13
- Creating a Visual Link to the Remote Node, page 8-14
- Creating a Link to the Remote Node, page 8-16
- Creating a Visual Link to the Local Node, page 8-20
- Creating a Link to the Local Node, page 8-22
- Creating a Default Route to the Local Node, page 8-24
- Verifying the Inter Node Data Link, page 8-25



Note

During these procedures, confirm your most recent action by refreshing the window display.

Setting the Default Gateway on the EMS Workstation

If you are creating an INDL, you must configure the EMS workstation to use the local node as the default gateway.

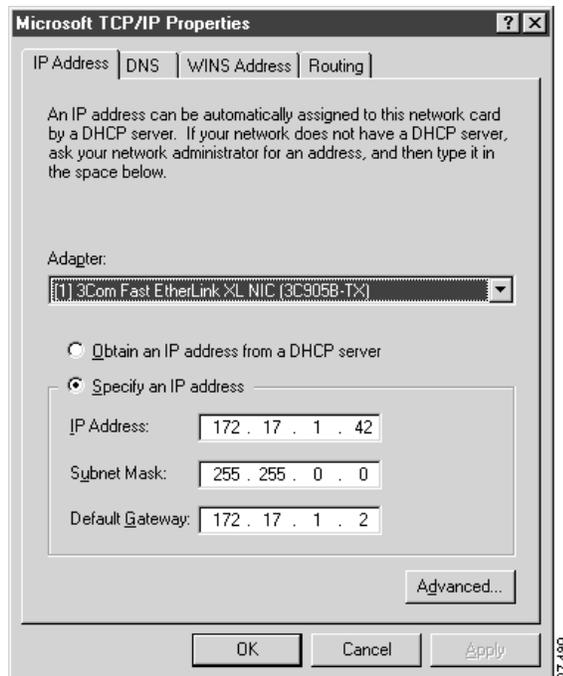


Note

You do not need to configure your EMS workstation for a nondata link. This procedure is only required for remote management and provisioning.

Use the TCP/IP configuration utility on your EMS workstation to set the **Default Gateway** to the same IP address as the local node. Figure 8-10 shows the TCP/IP configuration window for Windows NT. For the complete TCP/IP configuration procedure, see “Configuring TCP/IP on the EMS Workstation” on page 3-2, or contact your network administrator.

Figure 8-10 Windows NT—TCP/IP Properties



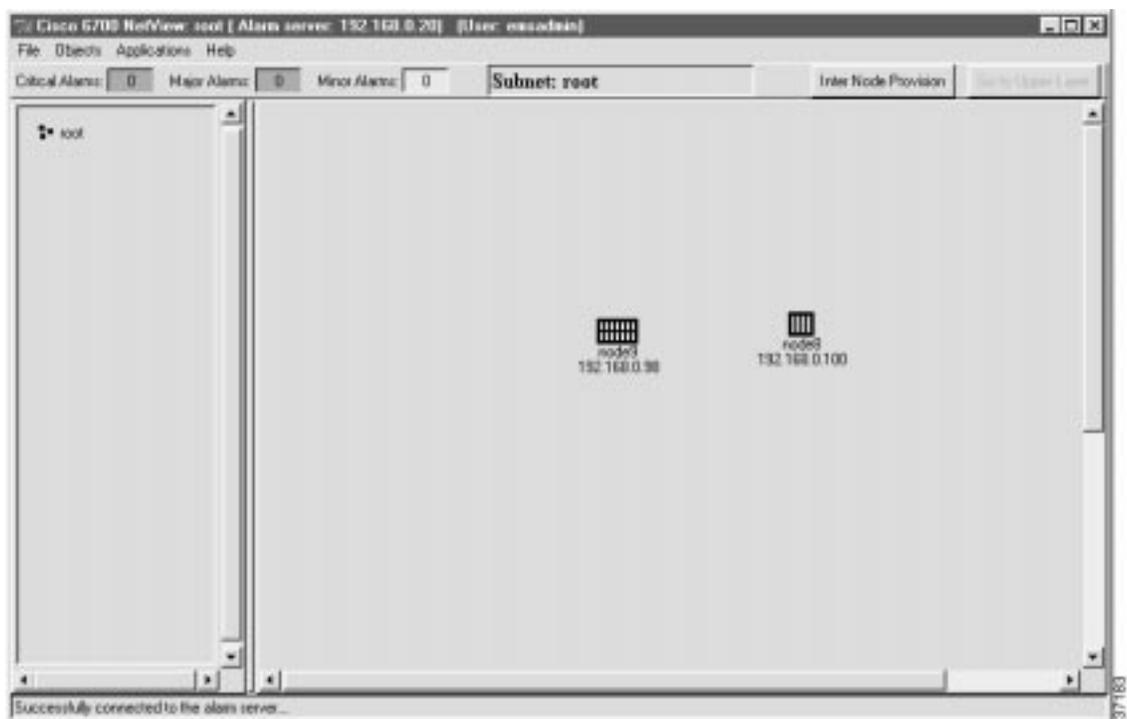
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Creating a Visual Link to the Remote Node

This procedure describes how provision the local node by creating a half link from the local node (in this example, a Cisco 6732 called “node9”) to the remote node (in this example, a Cisco 6705 called “node8”).

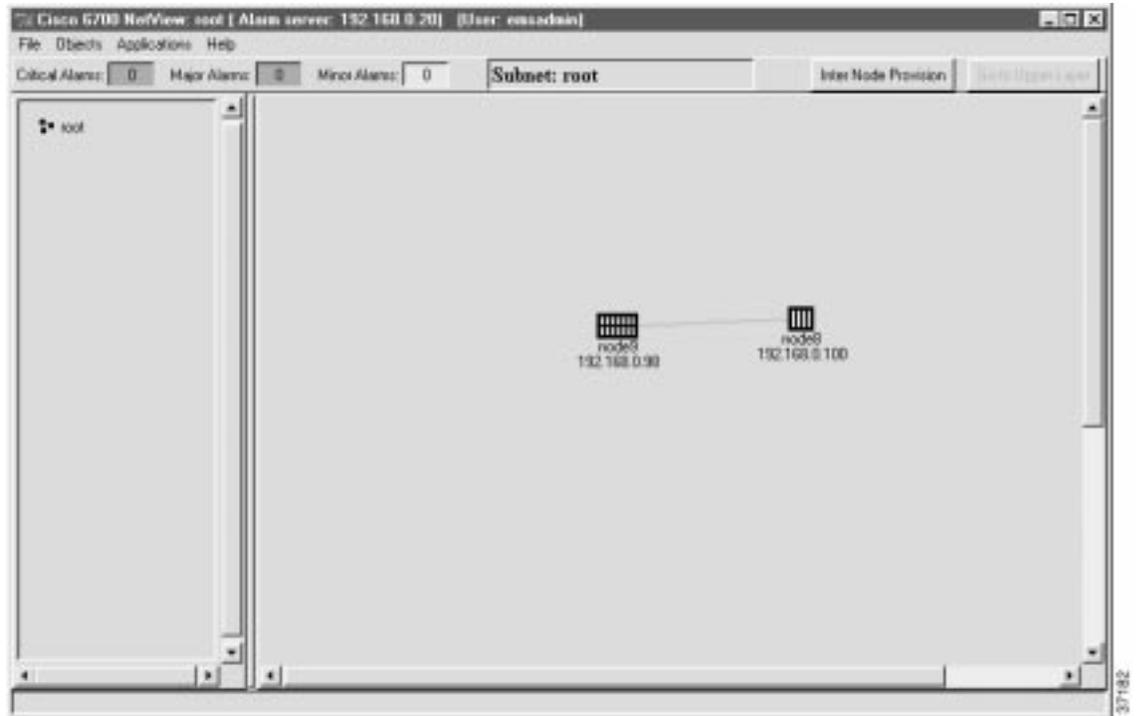
- Step 1** From Cisco 6700 NetView, connect the EMS workstation to the local node.
- Step 2** Launch EMS on the workstation.
- Step 3** In Cisco 6700 NetView, make sure that both the local and remote nodes have been created. (See Figure 8-11.)

Figure 8-11 Cisco 6700 NetView



- Step 4** Click and drag a line from the local node to the remote node. This creates a visual link between the two nodes. (See Figure 8-12.)

Figure 8-12 Visual Link Between Nodes

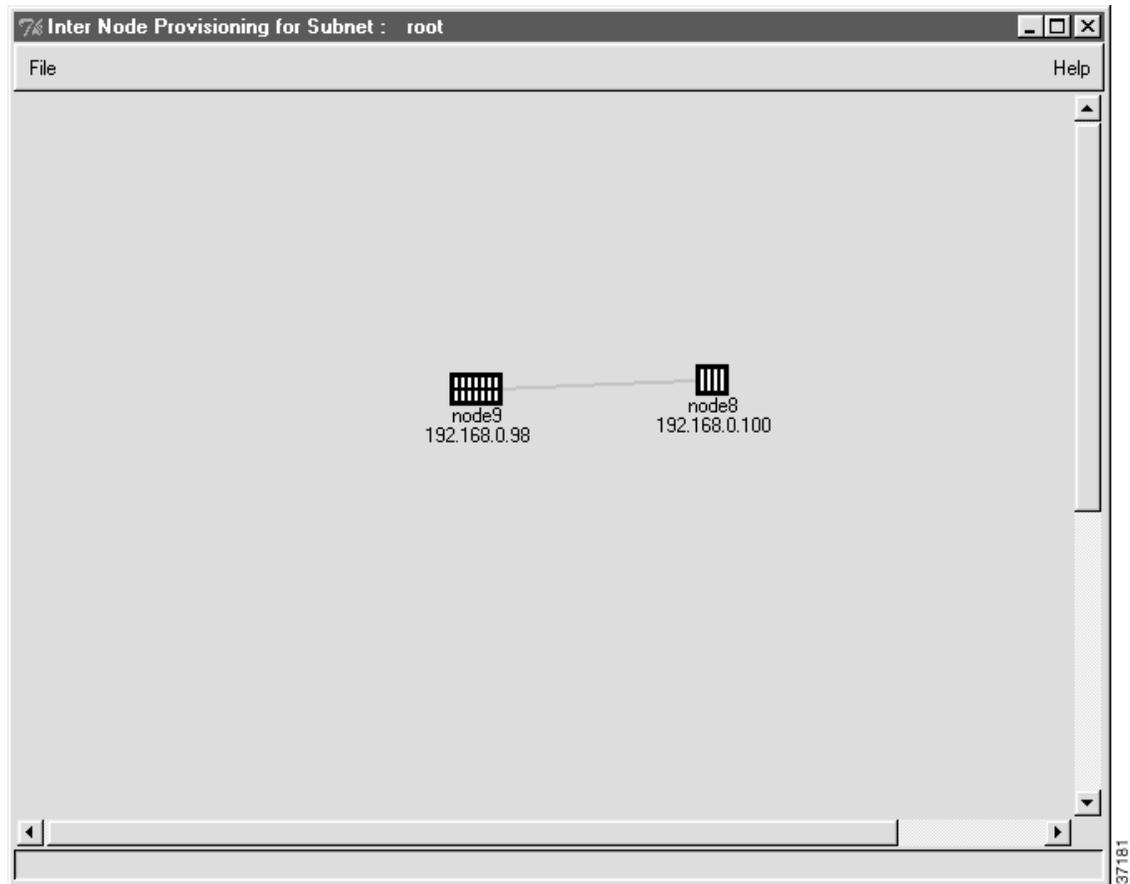


- Step 5** From the menu bar, select **File > Save** to save the visual link.

Creating a Link to the Remote Node

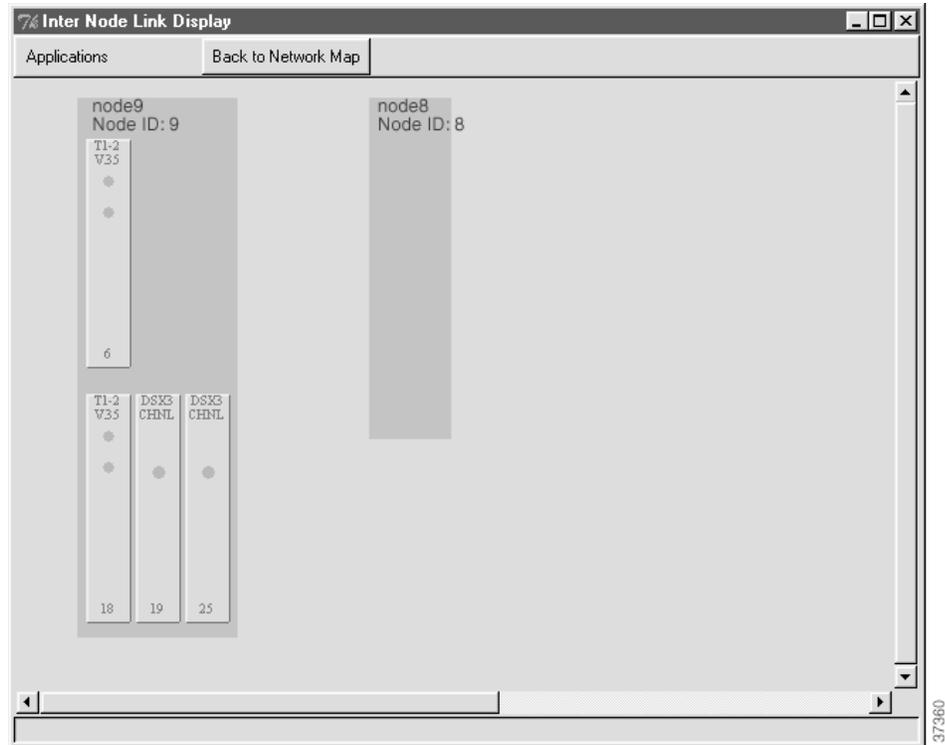
- Step 1** From Cisco 6700 NetView (see Figure 8-11 on page 8-14), click the **InterNode Provision** button (located in the upper right portion of the window). EMS launches the inter node provisioning window. (See Figure 8-13.)

Figure 8-13 Inter Node Provisioning Window



- Step 2** Double-click the line between the two nodes (the line turns orange when the cursor is on it). EMS launches the inter node link display. (See Figure 8-14.)

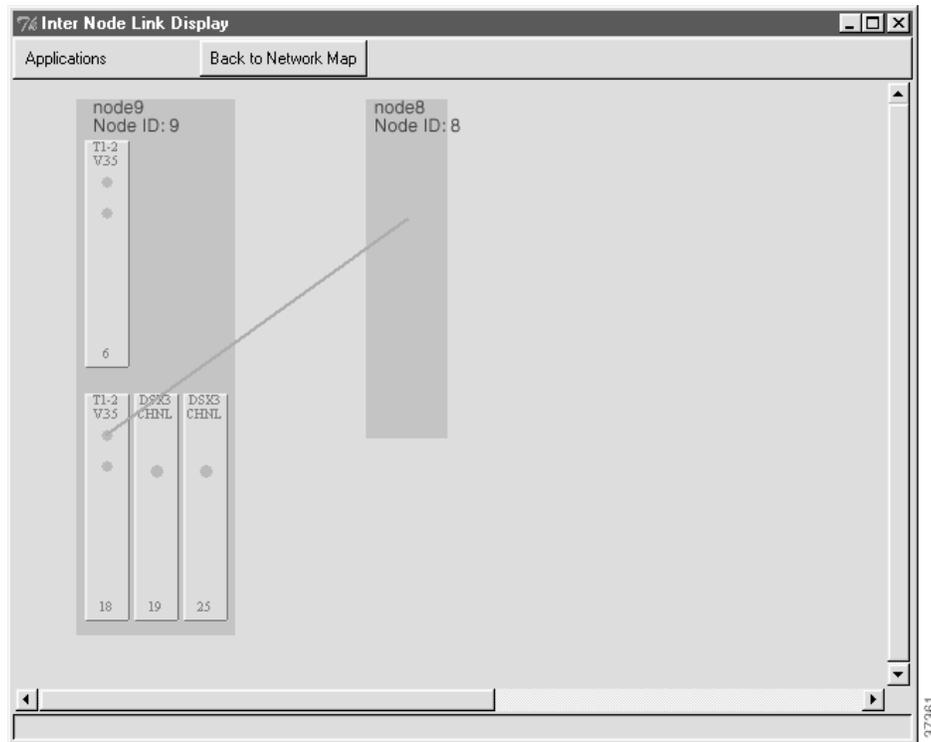
Figure 8-14 Inter Node Link Display (Local Node)



- Step 3** Select a line on the local node to provision with the half link.

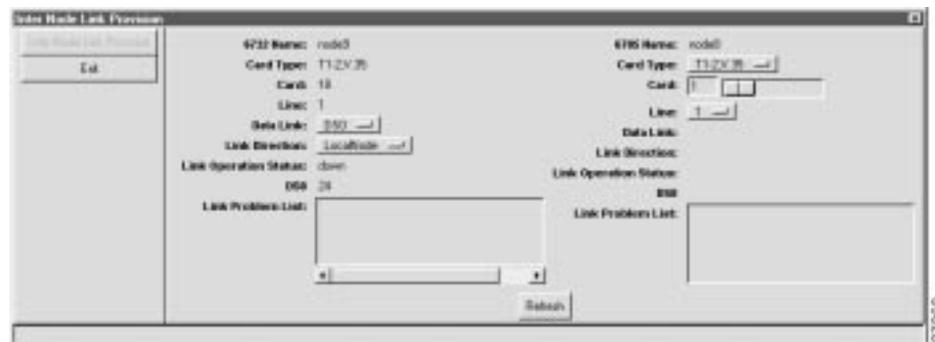
Step 4 Click and drag a visual link from the selected line on the local node to the remote node. (See Figure 8-15.)

Figure 8-15 Drag a Visual Link to the Remote Node



Step 5 After creating the visual link, EMS launches the inter node link provision window. (See Figure 8-16.)

Figure 8-16 Inter Node Link Provision Window (Local Node)



Step 6 In the inter node link provision window, set the following parameters:

- **Data Link**—Set to **DS0** (uses a DS0 channel for the data link) or **FDL** (uses DS1 overhead bandwidth for the data link). Cisco Systems recommends the DS0 format; some line cards cannot support the FDL format.



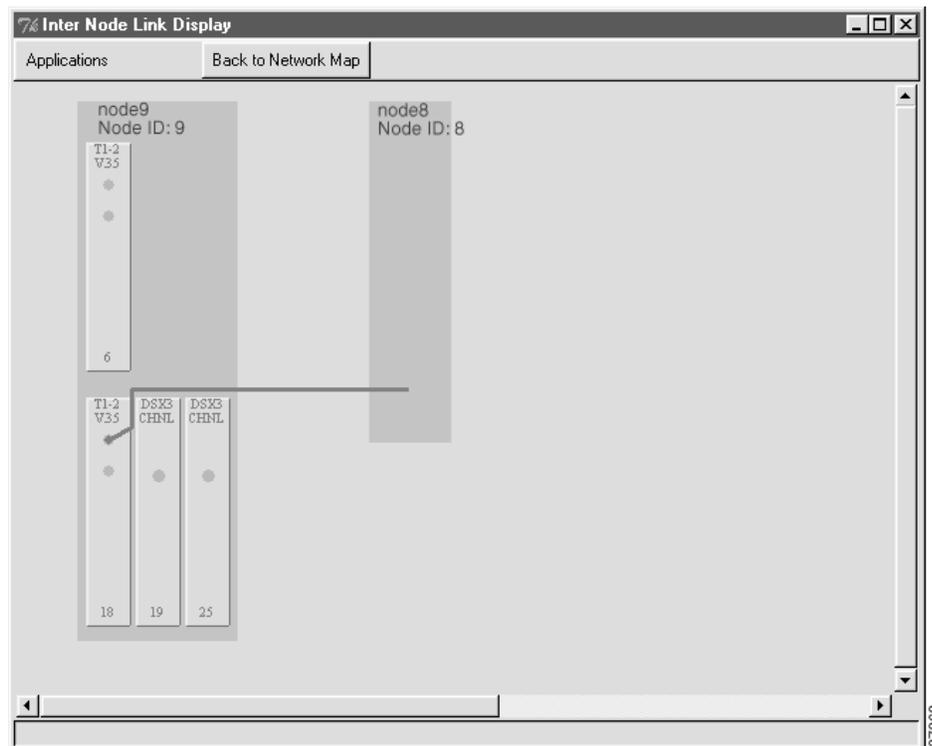
Note To create a nondata link (used only for cross connects), set the **Data Link** field to **None**.

- **Link Direction**—Set to **LocalNode**.
- **Card Type**—Set to type of card used in the remote node.
- **Card**—Set to the slot number of the card used in the remote node.
- **Line**—Set to the line number used in the remote node.

Step 7 Click **Create** (at the bottom of the window). EMS changes the **Create** button to **Refresh**.

Step 8 Click **Exit** to close the inter node link provision window. EMS returns to the inter node link display. The newly-created half link is shown as a blue line connecting the local node and remote node. (See Figure 8-17.)

Figure 8-17 Inter Node Link Display with Local Half Link



Step 9 Click **Back to Network Map** (at the top of the window) to return to the internode provisioning window.

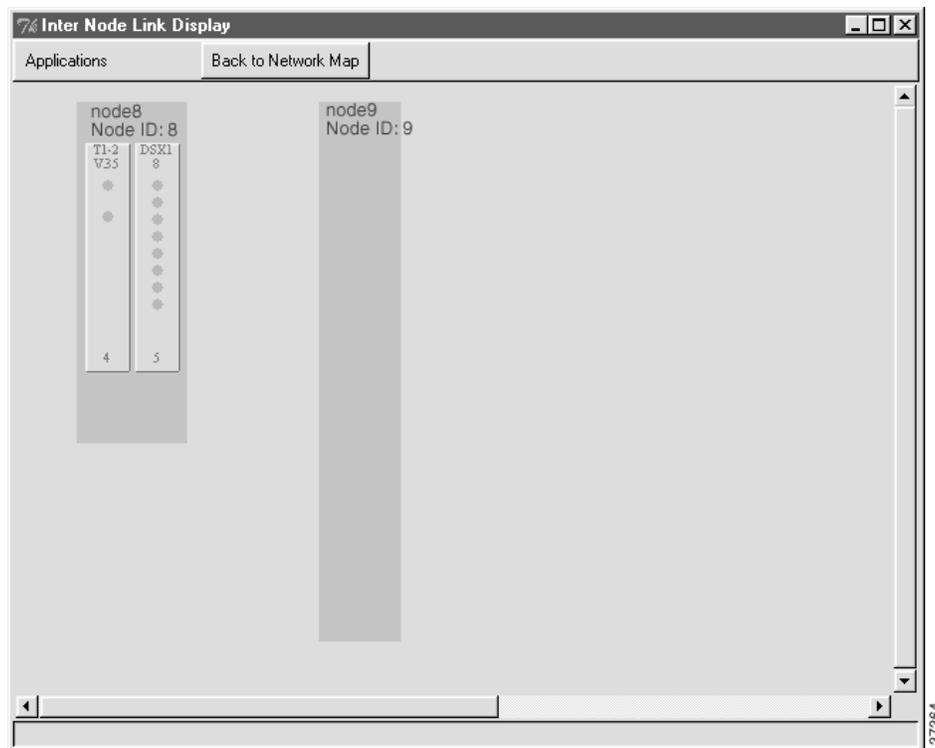
Step 10 Select **File>Exit**.

Creating a Visual Link to the Local Node

After creating a link on the local node (in this example, a Cisco 6732 called “node9”), you must provision the remote node by creating a similar link on the remote node (in this example, a Cisco 6705 called “node8”).

-
- Step 1** Connect the EMS workstation to the remote node.
 - Step 2** From Cisco 6700 Netview, click the **Internode Provision** button (located in the upper right portion of the window). EMS launches the inter node provisioning window. (See Figure 8-13.)
 - Step 3** Double-click the line between the two nodes. EMS launches the inter node link display. (See Figure 8-18.)

Figure 8-18 Inter Node Link Display (Remote Node)

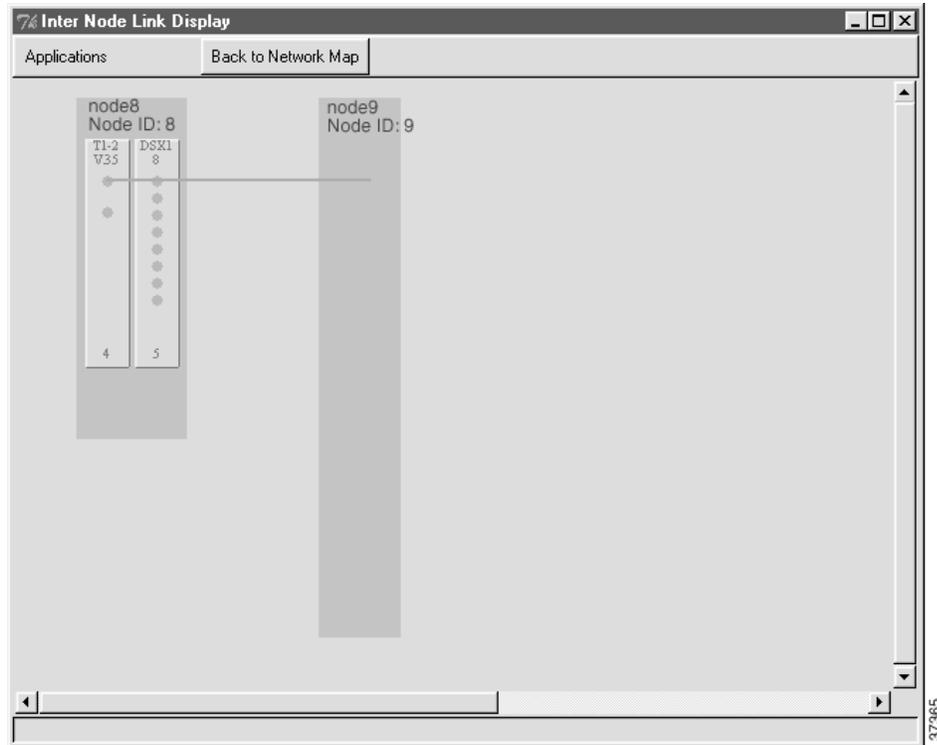


The remote node (Cisco 6705) is at the left side of the display. The local node (Cisco 6732), shown as a gray box, is at the right side of the display.

- Step 4** Select the line from the remote node display to be provisioned with the half link. Use the same line as in the “Creating a Visual Link to the Remote Node” on page 8-14.

- Step 5** Click and drag a visual link from the selected line on the remote node to the local node. (See Figure 8-19.)

Figure 8-19 Draw Line to Local Node

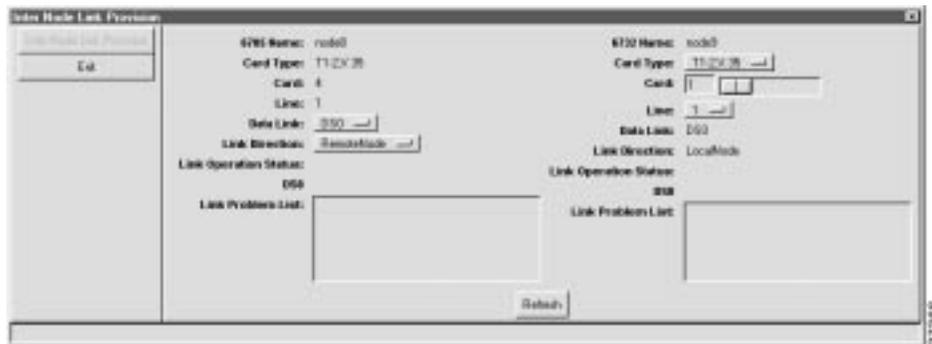


After creating the visual link, EMS launches the inter node link provision window. You can now create a link to the local node (see the next procedure).

Creating a Link to the Local Node

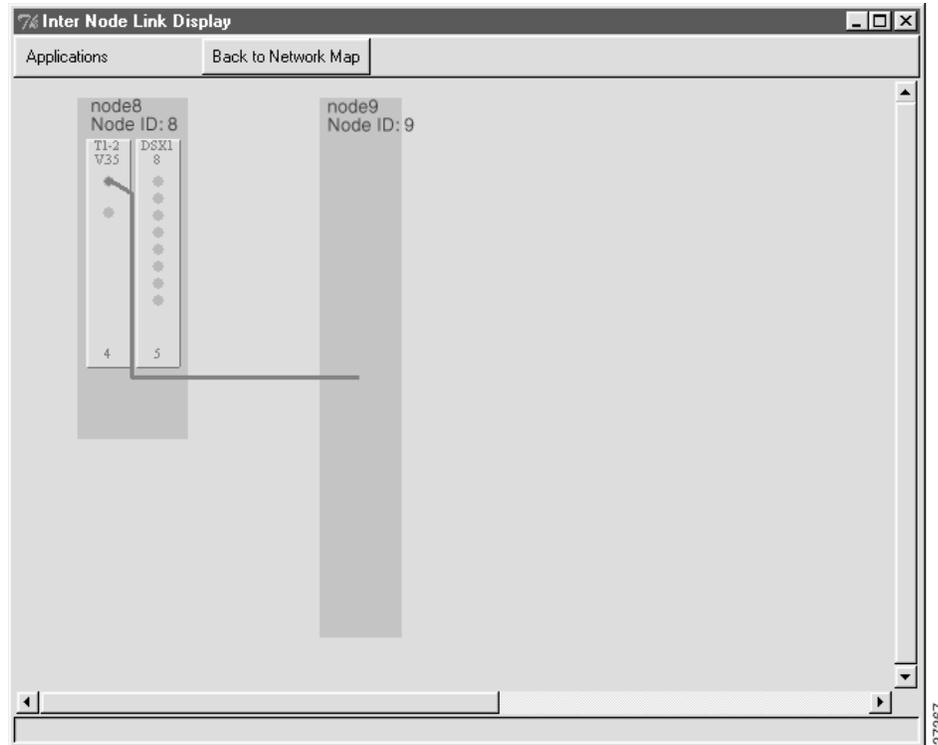
- Step 1** In the inter node link provision window (see Figure 8-20 below), set the following parameters:
- **Data Link**—Select **DS0-INDL**, **FDL-INDL**, or **None** (nondata link). The link type must be consistent with the selection in the “Creating a Visual Link to the Remote Node” procedure on page 8-14. For example, if the local node is provisioned to use a DS0 INDL, the remote node must use a DS0 INDL as well.
 - **Link Direction**—Set to **RemoteNode**.
 - **Card Type**—Set to type of card used in the local node (in this example, the Cisco 6732).
 - **Card**—Set to slot number of the card used in the local node.
 - **Line**—Set to facility number of the line used in the local node.
- Step 2** Click **Create** (at the bottom of the window). EMS changes the **Create** button to **Refresh**. (See Figure 8-20.)

Figure 8-20 Remote Half Link Created



- Step 3** Click **Exit** to close the inter node link provision window. EMS returns to the inter node link display. (See Figure 8-21.)

Figure 8-21 Inter Node Link Display with Remote Half Link



The newly-created half link is shown as a blue line connecting the remote node and local node.

- Step 4** Click **Back to Network Map** (at the top of the window) to return to the internode provisioning window.
- Step 5** Select **File>Exit**.

If you are creating an INDL, proceed to the next section to configure the default data-link route.

Creating a Default Route to the Local Node

To allow remote management and provisioning, you must create a default route from the remote node to the local node.



Note

If you are creating a nondata link, you do not need to create a default route. See “Verifying the Link” on page 8-11 to ensure that the nondata link is operational.

- Step 1** Open the remote node (Cisco 6705) by double-clicking the remote node icon in Cisco 6700 NetView. EMS launches the NodeView of the remote node.
- Step 2** Double-click the node nameplate. EMS launches the NE provision window.
- Step 3** From the function bar on the left, click on the **IP & Datalink Route Configuration** button. This brings up the data-link route configuration window. (See Figure 8-22.)

Figure 8-22 IP & Data Link Route Configuration Window

NE Provision for IAD1101 node: IAD1101

System Basic Provisioning	Interface: Type <input type="text"/> Card <input type="text"/> Line <input type="text"/>				
IP Address Configuration	Destination IP Address: 0 0 0 0				
IP & Datalink Route Configuration	Gateway IP Address: <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Ping Node	Netmask: <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Node ID Configuration	Route Type: Host <input type="text"/>				
IP & Inter Node Link Configuration	Route List:				
IP RIP Configuration	<table border="1"> <thead> <tr> <th>ID</th> <th>Interface</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Ethernet</td> </tr> </tbody> </table>	ID	Interface	1	Ethernet
ID	Interface				
1	Ethernet				
IP Network Address Translation (NAT)					
IP Access Lists					
Timing Source Selection & Control					
Timing Distribution Provisioning					
NE Time Of Day Set					
Alarm Provisioning					
Software Upgrade					
Database Backup					
Error Log Retrieval					
Exit					

Add Delete Refresh

- Step 4** Set the following parameters in the data-link route configuration window:
 - **Card Type**—Card used in the remote node (Cisco 6705).
 - **Card**—Slot number of the card used in the remote node.
 - **Line**—Facility number of the line used on the card in the remote node.
 - **Destination Address**—Leave blank.
 - **Gateway Address**—IP address of the local node (Cisco 6732).
 - **Netmask**—Leave blank.
 - **Route Type**—Set to **Default**.

- Step 5** Click **Add** when you are finished.
- Step 6** Click the **Exit** button (on the function bar) to return to the NodeView.
- Step 7** Select **File > Exit** to return to Cisco 6700 NetView.



Note As an alternative to entering the gateway address in Step 4, open the command prompt window and enter (for example): C:>route add 172.17.30.26 192.168.124. 250 (route add<remote IP> <local IP>)

Verifying the Inter Node Data Link

To verify that an INDL has been successfully created, connect a EMS workstation to the local node (Cisco 6732). Open EMS NetView and double-click the remote node (Cisco 6705). The remote node should open, displaying the NodeView. This means EMS can use the INDL to access the remote node.

