

## Chapter 10

# Configuring Tunnel Connections

This chapter describes how to create tunnel connections and contains the following sections:

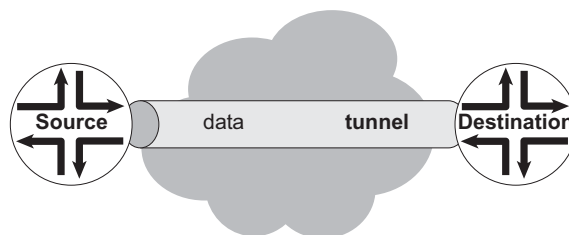
- Overview on page 129
- References on page 132
- Creating IP Tunnel Connections on page 132
- Creating SMDS Tunnel Connections on page 137
- Analyzing Tunnel Operation on page 140

## Overview

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Tunnels provide a way of transporting datagrams between routers separated by networks that do not support all the protocols that those routers support. (See Figure 2.)

**Figure 2: Basic Components of a Tunnel**



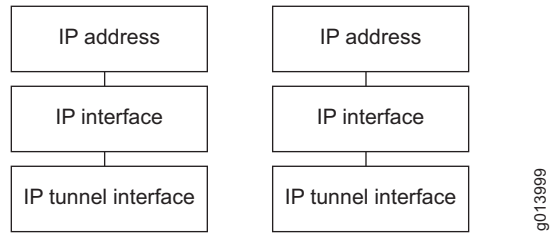
The NMC-RX application supports IP tunnel connections and SMDS tunnel connections. This chapter discusses both types of connections.

## IP Tunnels

The E-series router supports static IP tunnels. An IP tunnel is a virtual point-to-point connection between two routers.

To establish an IP tunnel, you specify an IP tunnel type and name, and then specify an interface on each router to act as endpoints for the tunnel. (See Figure 3.)

**Figure 3: Interface Column Components for an IP Tunnel**



The E-series router supports the following IP tunnel types:

- Generic routing encapsulation (GRE)
- Distance Vector Multicast Routing Protocol (DVMRP)



**NOTE:** Currently, the E-series router tunnels only IP packets.

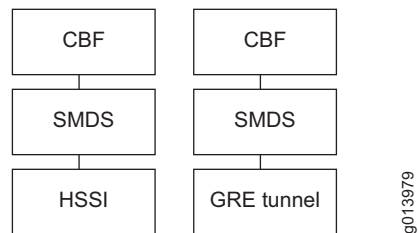
### SMDS Tunnels

The E-series router supports SMDS tunnels. The following components support the SMDS application:

- High-speed serial interface (HSSI) line module—Provides the physical interface to connect to the SMDS switch
- GRE tunnels—Transport SMDS traffic among E-series routers
- SMDS trunk interface—Runs over the HSSI line module and GRE tunnels
- Connection-based forwarding (CBF) interface—Forwards SMDS traffic among SMDS trunk interfaces

Figure 4 shows how these components make up the interface columns for the SMDS application.

**Figure 4: Interface Columns for the SMDS Application**



Two sets of interfaces are required for SMDS:

- The first set provides the connection between the E-series router and the SMDS switch. It has a physical HSSI line module on which you configure an SMDS trunk interface and a CBF interface.
- The second set provides the connection between E-series routers. It has a GRE tunnel, an SMDS trunk interface, and a CBF interface.

## HSSI

The HSSI line module supports the SMDS trunk interface. This connection supports speeds of 34.368 or 44.736 Mbps.

## GRE Tunnels

All SMDS traffic received on a HSSI must be mapped one-to-one with a specific GRE tunnel.

## Line Modules

To create tunnels, you must install a Tunnel Service module in the E-series device. This module receives data from the ingress port and transmits data to other line modules from egress ports. You must assign IP tunnel interfaces to act as destination endpoints for the tunnel.

All line modules forward traffic to tunnels. The following line modules and their corresponding I/O modules accept traffic for tunnels:

- CE1
- cOCx/STMx
- CT1
- CT3
- E3 ATM and FRAME
- FE-2
- GE/FE
- OCx/STMx ATM and POS
- T3 ATM and FRAME

## References

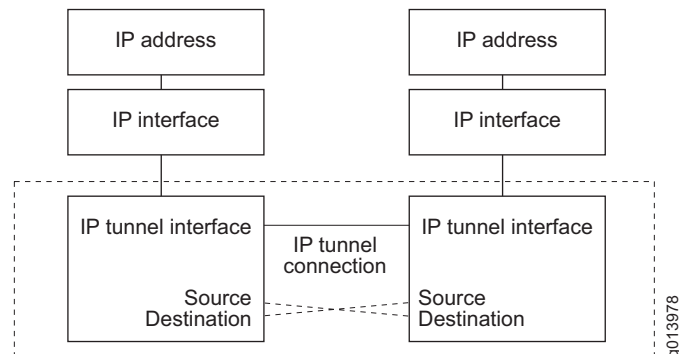
See the following chapters for related information:

- *NMC-RX User Guide, Vol. 1, Chapter 21, Configuring CBF Interfaces*
- *NMC-RX User Guide, Vol. 1, Chapter 29, Configuring SMDS Interfaces*
- *Chapter 9, Configuring IP Tunnel Interfaces*

## Creating IP Tunnel Connections

An IP tunnel connection is a network-level object that links two mirrored IP tunnel interfaces (referred to in this chapter as endpoint A and endpoint B). (See Figure 5.)

**Figure 5: Components of an IP Tunnel Connection**

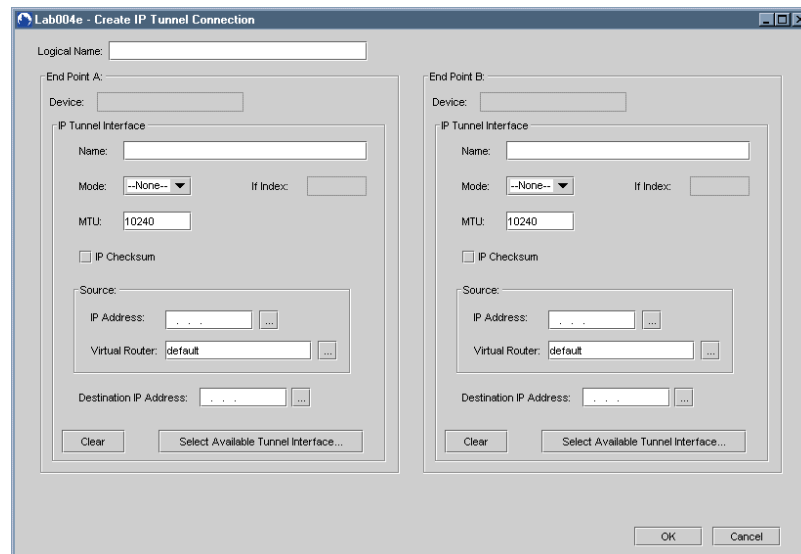


The two tunnel interfaces must identify a locally configured IP address as the source IP address and another IP address as the destination IP address. The source IP address of one IP tunnel interface is the destination IP address of the other IP tunnel interface, and vice versa.

To create an IP tunnel connection:

1. From the Configuration menu, select Create, and click IP Tunnel Connection.

The Create IP Tunnel Connection dialog box appears.



2. Type a logical name for the IP tunnel connection in the text box. (See Table 46.)
3. Create the tunnel endpoints in either of the following ways:
  - Create a *new* IP tunnel interface for each endpoint by setting the parameters in each endpoint's group box. See *Creating IP Tunnel Endpoints on page 134*.
  - Select an *existing* tunnel interface by clicking the Select Available Tunnel Interface button in the IP Tunnel Interface group box. See *Selecting Available IP Tunnel Interfaces on page 135*.
4. When you finish configuring each endpoint, click OK in the Create IP Tunnel Connection dialog box.

The NMC-RX application creates an IP tunnel connection.



**NOTE:** The Clear button in the IP Tunnel Interface group box allows you to reset the parameters to their default values.




## Creating IP Tunnel Endpoints

This section describes creating the endpoints in an IP tunnel connection. You can also create the IP tunnel interfaces individually and then associate them as endpoints in a tunnel connection. See *Chapter 9, Configuring IP Tunnel Interfaces*.

To create the tunnel endpoints:

1. Set the parameters (Table 46).

**Table 46: IP Tunnel Connection Parameters**

Parameter	Description
Logical Name	Name for the IP tunnel connection; maximum of 80 characters
Device	Device identifier. This field is automatically populated.
Name	Name for the IP tunnel interface; 1–80 characters, no spaces
Mode	IP tunnel mode for an IP tunnel: GRE or DVMRP. You must choose one or the other.
MTU	Maximum transmission unit setting for the IP tunnel interface; range 1024–10240; default 10240. To ensure effective function, the MTU value should be the same for both endpoints.
IP Checksum	Checking this box enables end-to-end check summing and causes the system to drop packets with bad checksums received on this interface. Range: enable/disable. Default: disable.  This feature is disabled for DVMRP mode.
Source: IP Address	Source IP address for the IP tunnel interface. Enter a valid address, or click  to search for and select an IP address (see <i>Related Dialog Boxes</i> on page 136).
Source: Virtual Router	The transport router associated with the source IP tunnel interface. You cannot edit this parameter once you create the tunnel interface. Once you choose a virtual router, you cannot change it. Enter a virtual router name, or click  to search for and select a virtual router (see <i>Related Dialog Boxes</i> on page 136).
Destination IP Address	Destination IP address for the tunnel interface. Enter a valid address, or click  to search for and select an IP address (see <i>Related Dialog Boxes</i> on page 136).

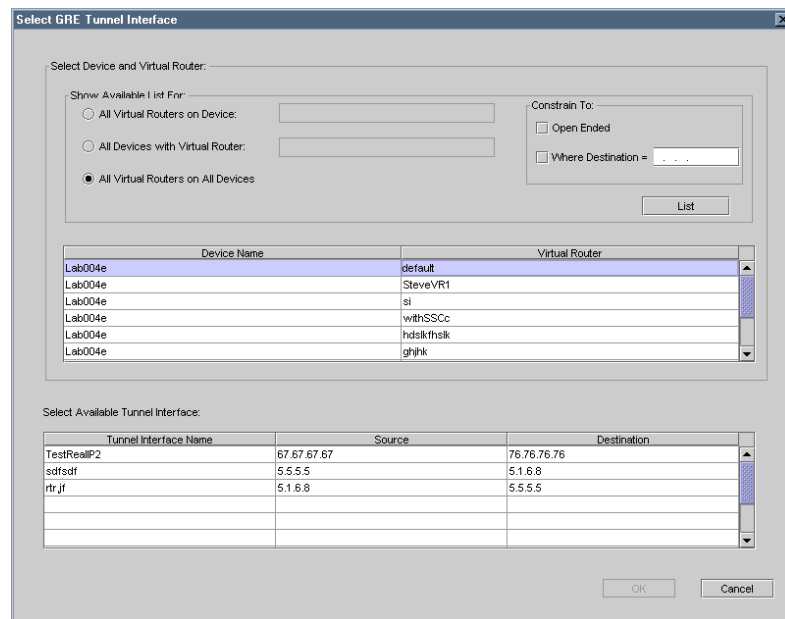


**NOTE:** To select existing IP tunnel interfaces, click the Select Available Tunnel Interface button in the IP (or SMDS) Tunnel Interface group box.

2. Follow the instructions in *Chapter 9, Configuring IP Tunnel Interfaces*, for creating each endpoint.

## Selecting Available IP Tunnel Interfaces

The Select GRE (or DVMRP) Tunnel Interface dialog box appears when you click the Select Available Tunnel Interface button in the IP (or GRE) Tunnel Interface group box.



1. In the Show Available List For group box, select an option.

The Show Available List filters help you to pare down the list of IP tunnel interfaces to those specifying a specific virtual router on a specific device. The filters provide the following options:

- All Virtual Routers on Device—If you choose this option, you need to enter the name of the device in the text box.
- All Devices with Virtual Router—If you choose this option, you need to enter the name of the virtual router in the text box.
- All Virtual Routers on all Devices—You need only to select this option.



**NOTE:** You can use a wildcard format for the names of devices and virtual routers; for example, Lab\* or \*RX.

2. In the Constrain To group box, select an option:
  - Open Ended—Only those tunnel interfaces that are not already part of a tunnel connection are displayed.
  - Where Destination = —Only those IP tunnel interfaces whose destination address equals the IP address that you enter are displayed.

3. Click List.

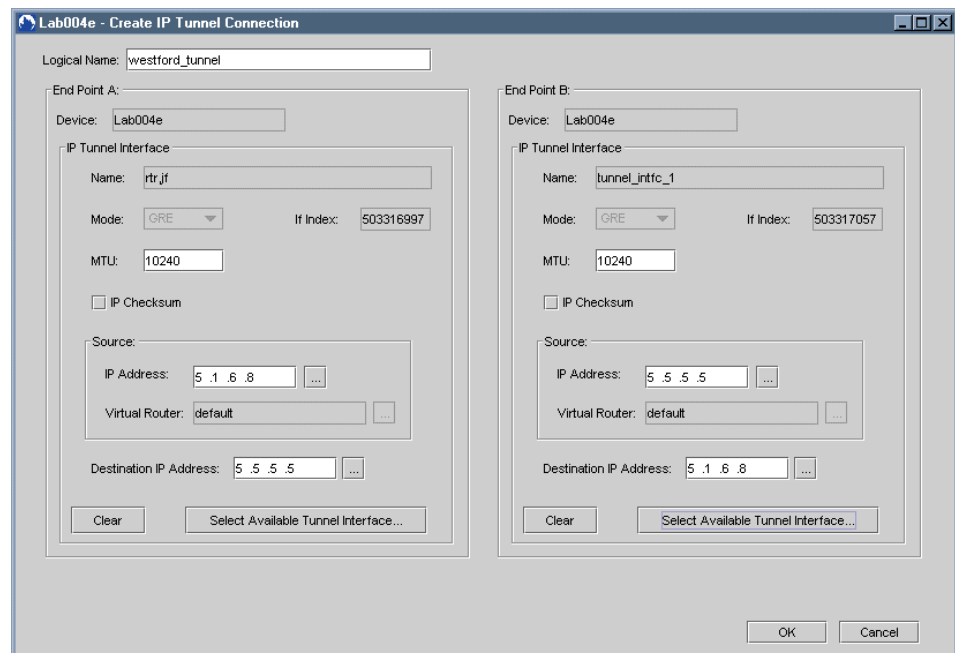
The filtered list of device names and virtual routers appears.

4. Select the virtual router you want.

The list of tunnel interfaces for the virtual router you selected appears with each interface's source and destination IP address

5. Select the tunnel interface you want, and click OK.

The settings for the endpoint's tunnel interface appear in the Create IP (or SMDS) Tunnel Connection dialog box, as shown in the following example.



## Related Dialog Boxes

The Select IP Address and Associate Virtual Router dialog boxes for the two IP tunnel connection endpoints are the same as those for individual IP tunnel interfaces, with one difference.

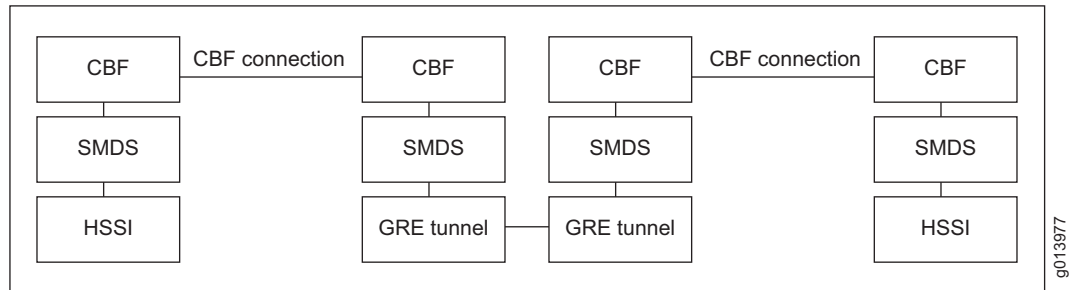
The Select IP Address dialog box for IP tunnel interfaces has only one filter option, whereas in the context of IP tunnel connections the same dialog box allows you to use three filter options. See Related Dialog Boxes on page 125.

## Creating SMDS Tunnel Connections

An SMDS tunnel connection is a network-level object that links two mirrored GRE tunnel interfaces.

Figure 6 shows the SMDS tunnel connection components.

**Figure 6: SMDS Tunnel Connection Components**



The two tunnel interfaces must identify a locally configured IP address as the source IP address and another IP address as the destination IP address. The source IP address of one GRE tunnel interface is the destination IP address of the other GRE tunnel interface, and vice versa.

To create an SMDS tunnel connection:

1. From the Configuration menu, select Create, and click SMDS Tunnel Connection.

The Create SMDS Tunnel Connection dialog box appears.

2. Type a logical name for the SMDS tunnel connection in the text box. (See Table 47 on page 139.)
3. Create the tunnel endpoints in either of the following ways:
  - Create a *new* GRE tunnel interface for each endpoint by setting the parameters in each endpoint's group box. See *Creating SMDS Tunnel Endpoints* on page 139.
  - Select an *existing* tunnel interface by clicking the Select Available Tunnel Interface button in the IP Tunnel Interface group box. See *Selecting Available IP Tunnel Interfaces* on page 135.
4. When you finish configuring each endpoint, click OK in the Create SMDS Tunnel Connection dialog box.

The NMC-RX application creates a GRE tunnel connection.



**NOTE:** The Clear button in the GRE Tunnel Interface group box allows you to reset the parameters to their default values.

## Creating SMDS Tunnel Endpoints

This section describes creating the endpoints in an SMDS tunnel connection.

To create the tunnel endpoints:

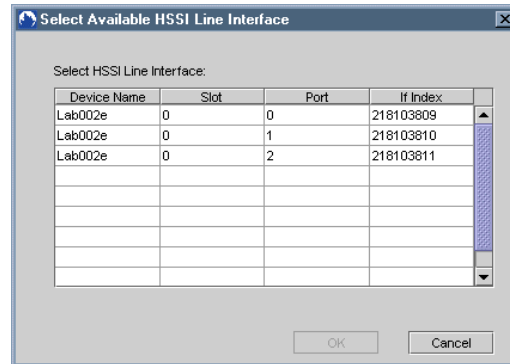
1. Set the parameters (Table 47).

**Table 47: SMDS Tunnel Connection Parameters**

Parameter	Description
Logical Name	Name for the SMDS tunnel connection; maximum of 80 characters.
Device	Device identifier. This field is automatically set.
<b>HSSI Line Interface</b>	
Slot	Slot of the physical interface to connect to the SMDS switch; default: blank.
Port	Port of the physical interface to connect to the SMDS switch.
If Index	This field is blank when you create an object and is automatically populated with the If Index identifier when you configure the object; cannot edit.
<b>GRE Tunnel Interface</b>	
Name	Name for the GRE tunnel interface; 1–80 characters.
Mode	IP tunnel mode for an SMDS tunnel connection; must be GRE; therefore, this field is preselected and disabled; default: GRE.
If Index	This field is blank when you create an object and is automatically populated with the If Index identifier when you configure the object; cannot edit.
MTU	Maximum transmission unit setting for the GRE tunnel interface; range 1024–10240; default 10240. To ensure effective function, the MTU value should be the same for both endpoints. <b>NOTE:</b> The SMDS interface supports a maximum value of 9188.
IP Checksum	Checking this box enables end-to-end check summing and causes the system to drop packets with bad checksums received on this interface. Range: enable/disable. Default: disable.
Source: IP Address	Source IP address for the GRE tunnel interface.
Source: Virtual Router	Transport router associated with the source IP tunnel interface. Once you have created the tunnel interface, you cannot change this parameter.
Destination IP Address	Destination IP address for the GRE tunnel interface.

2. Select the HSSI line interface.

To do this, in the HSSI Line Interface group box, click Select Interface. The Select Available HSSI Line Interface dialog box appears. When you select a line interface, the HSSI parameters are populated: Slot, Port, and If Index.



**NOTE:** A HSSI that is not listed may already be associated with an existing tunnel interface. You may select all the interfaces (HSSI through IP tunnel) for the entire endpoint by clicking the Select Available Tunnel Interface button in the GRE Tunnel Interface group box.

### Selecting Available GRE Tunnel Interfaces

The Select GRE Tunnel Interface dialog box appears when you click the Select Available Tunnel Interface button in the GRE Tunnel Interface group box. See *Selecting Available IP Tunnel Interfaces* on page 135. The information and procedures are the same for both IP tunnel interfaces and GRE tunnel interfaces.

### Create SMDS Tunnel Connection-Related Dialog Boxes

These dialog boxes are used to configure the source IP address and virtual router and the destination IP address for the endpoint. They work the same for both IP tunnel interfaces and GRE tunnel interfaces. See the *Related Dialog Boxes* on page 125.

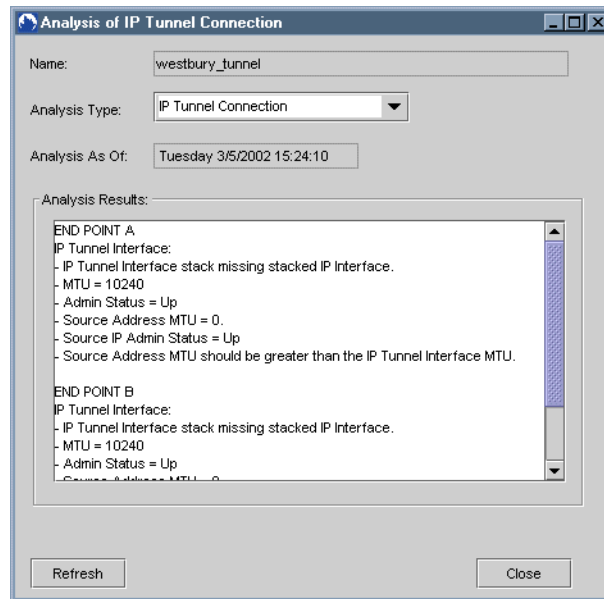
### Analyzing Tunnel Operation

To view an analysis of IP or SMDS tunnel connection operation:

1. From the Configuration menu, select Analysis.

An Analysis dialog box appears. The following dialog box is an example of the information you will receive about the IP tunnel connection. You will receive similar information about an SMDS tunnel connection.

This dialog box displays information about an IP tunnel connection that has no conflict.

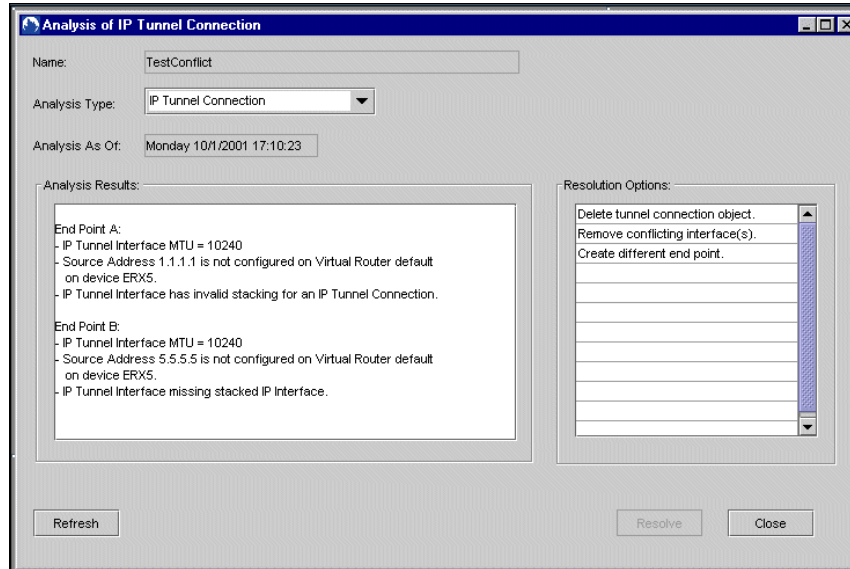


2. Click Refresh to update the information displayed.

The information provided in the Analysis dialog box will aid you in resolving any operational problems related to the IP tunnel connection.

## Resolving Tunnel Connection Conflicts

Because interfaces can be changed through the CLI and the NMC-RX application, the IP tunnel connection could get into a conflicting state. For example, interfaces can be removed, and then an IP interface can be stacked on the IP tunnel interface. If the tunnel connection becomes a conflicting type, the following version of the Analysis dialog box is displayed to let you resolve the conflict.



The Resolution Options frame identifies possible solutions to the conflict.