CHAPTER 9

Router Configuration Tutorial

Overview

This tutorial provides information describing how to view and modify router attributes through the Router Configuration windows. Viewing router attributes can be accomplished using the initial baseline scenario created when a baseline is opened and loaded. Therefore, creating a new scenario is not required when viewing router attributes. Modifying router attributes, however, *requires* the creation of a new scenario.

The following tasks are performed and described:

- a baseline is loaded for simulation
- a baseline topology is constructed
- router configuration settings are examined
- a predicted Routing Table is inspected
- a new scenario is created
- router interface delay metrics are modified
- a static route is created
- router interface failure is induced
- a router passive interface is specified
- a routing algorithm network parameter is modified
- an interface in a router distribution list is specified

Tutorial

Having proceeded through the steps of creating and opening a baseline, as described in the first tutorial, the Connectivity Tools window, shown in Figure 9-1, is displayed.

Note The Connectivity Tools window's **Requirements** and **Analysis** buttons are not implemented in the Connectivity Baseliner. These buttons' features are implemented in the Connectivity Solver.

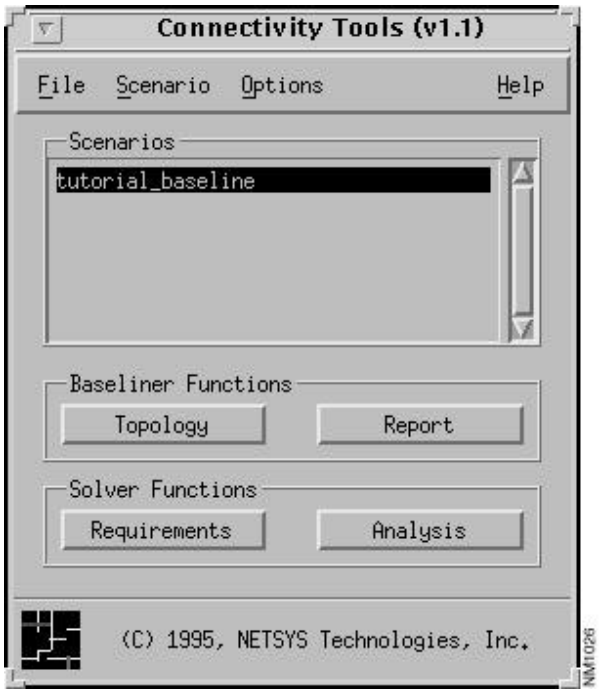

Figure 9-1 Connectivity Tools Window (Solver): Baseline Scenario Created

Step 1 Click on the **Topology** button in the Connectivity Tools window.

A campus view of the *tutorial_baseline* scenario's topology is displayed in the Topology window.

Step 2 Select the **View>Flat** menu option in the Topology window.

The topology is displayed in a flat IP view, as shown in Figure 9-2.

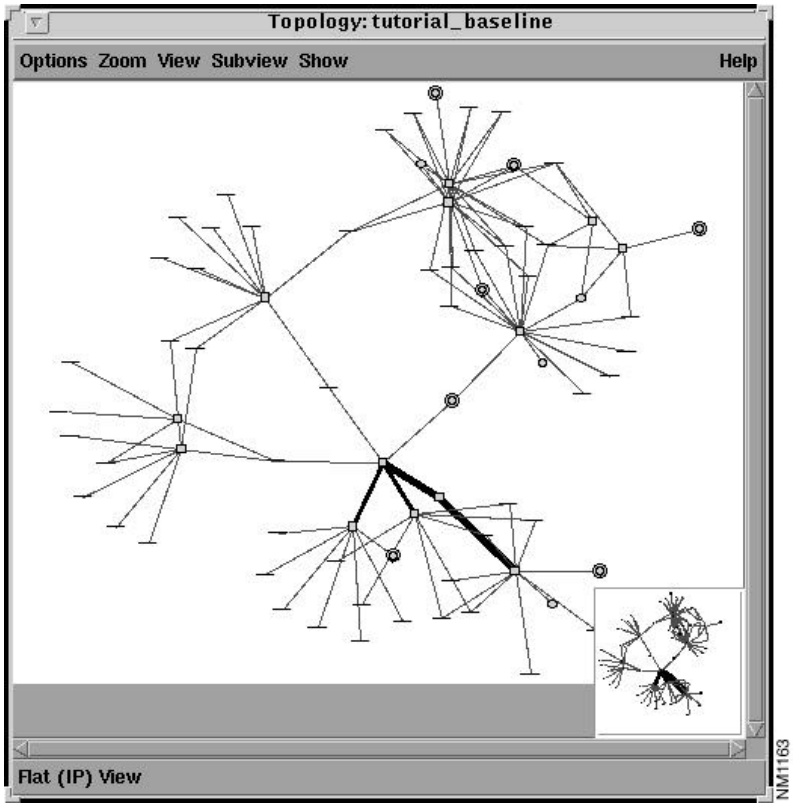

Figure 9-2 tutorial_baseline Topology Window: Flat IP View

Step 3 With the *tutorial_baseline* scenario selected in the Connectivity Tools window's **Scenarios** list, click on the **Requirements** button.

To load connectivity requirements for analysis, the Requirements feature is used. Connectivity requirements are created, viewed, loaded, unloaded, deleted, and undeleted using this option. The Requirement Sets window is displayed, as shown in Figure 9-3.

Figure 9-3 Requirement Sets Window

Step 4 Select the **`srb_ring_1857`** requirements file set from the **Requirement Files** list.

A list of network connectivity requirement file sets, if any exist, containing the connectivity requirements for the *tutorial_baseline* scenario, is displayed in the **Requirement Files** list.

Requirement File entries preceded by an asterisk indicate connectivity requirements implicitly derived from the router configuration files. These connectivity requirement file sets can not be edited or deleted.

The implicitly derived **Routing Loops** requirement set is provided to find routing loops caused by IP redistribution. When you select the **Routing Loops** requirement set and then load it for analysis by clicking on the **Load** button followed by the **OK** button, a list of all the redistribution IP routing loops detected during analysis is displayed in the Requirements Analysis window. The results are a set of paths showing the identified routing loops. Each path displays a source address set to a port address of a router involved in the loop and a destination, which is a subnet or end point address, identifying the Routing Table destination involved in the routing loop. The path also shows a set of routers involved in a loop.

Step 5 Click on the **View** button.

The Requirements window is displayed, partially shown in Figure 9-4. The *srb_ring_1857* connectivity requirements are displayed in this window.

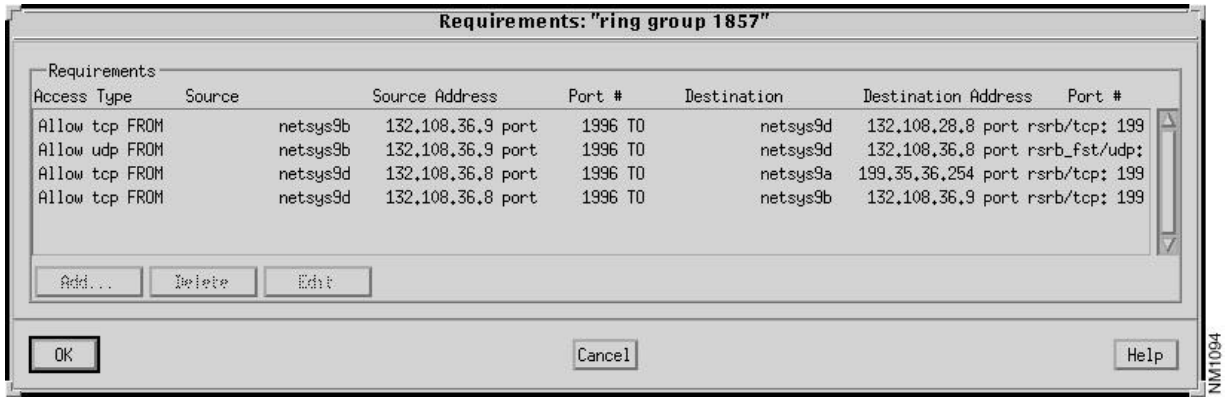

Figure 9-4 Requirements Window: srb_ring_1857

Step 6 Click on the **OK** button.

The Requirements window is dismissed and the Requirement Sets window is displayed again.

Step 7 Click on the **Load** button followed by the **OK** button.

The implicitly derived *srb_ring_1857* connectivity requirements are loaded for analysis. The Requirements Analysis window is displayed, partially shown in Figure 9-5, showing the status of the imposed connectivity requirements on the *tutorial_baseline*.

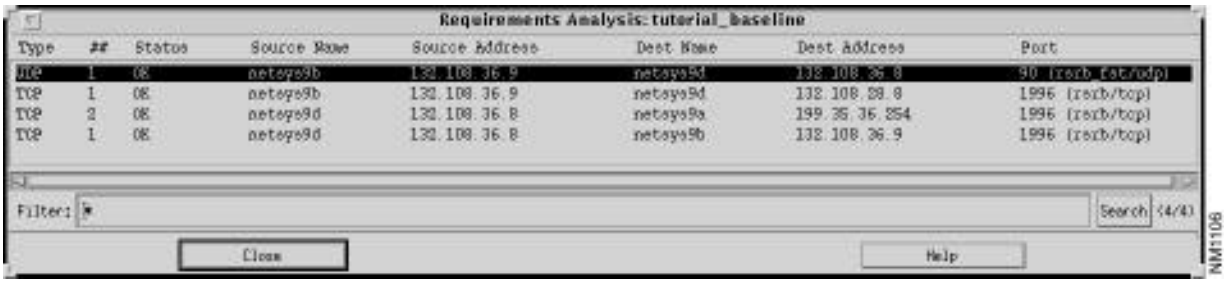

Figure 9-5 Requirements Analysis Window: srb_ring_1857 Analysis Results

Step 8 Select the entry with **`netsys9d`** in the **Source Name** column and **`netsys9a`** in the **Dest Name** column in the Requirements Analysis window.

The corresponding path is highlighted in the Topology window, as shown in Figure 9-6.

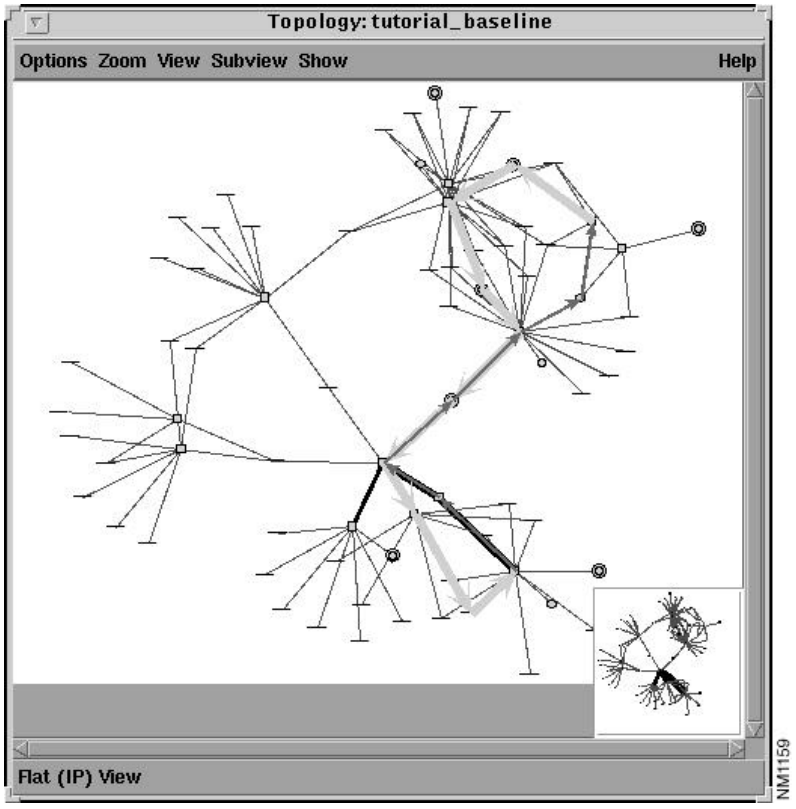

Figure 9-6 Topology Window: srb_ring_1857 Path Highlighted

The thicker highlighted line represents the route from the source router (**netsys9d**) to the destination router (**netsys9a**). The thinner highlighted line represents the return path from the destination router (**netsys9a**) to the source router (**netsys9d**).

Step 9 Double-click on the same entry in the Requirements Analysis window.

The Round Trip Path window is displayed, as shown in Figure 9-7. This window displays information about the two end systems, the number and status of routes available, and a list of the components along the route between the two end systems.

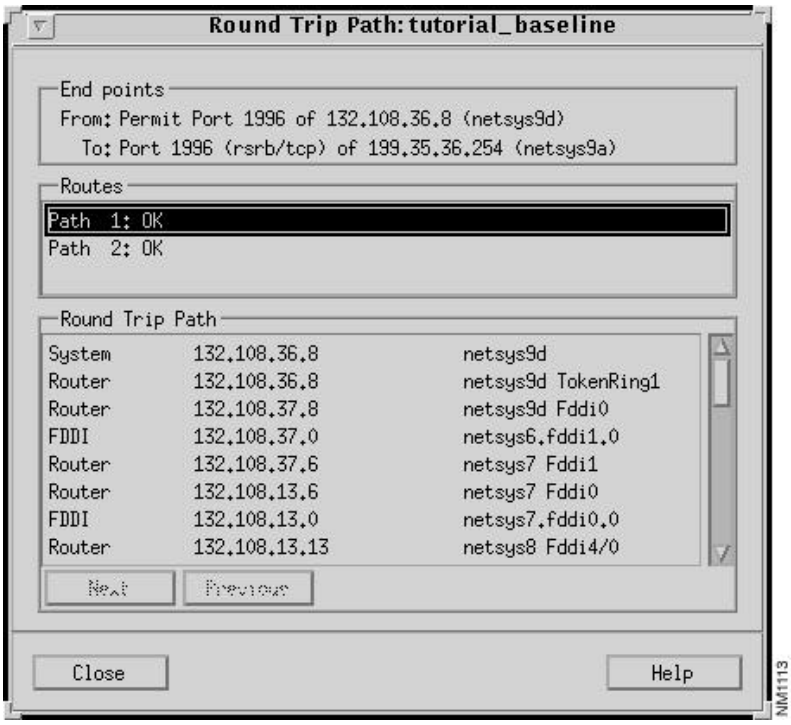

Figure 9-7 Round Trip Path Window: srb_ring_1857 Path

Step 10 Double-click on a **`netsys1`** router entry in the **Round Trip Path** list.

The **netsys1** Router Configuration window, shown in Figure 9-8, is displayed. An external view of the **netsys1** router attributes are displayed in this window. Buttons are supplied to change the context to various internal views of the router. Router attribute modifications can only be made within the context of an internal view of a router in a newly created scenario.

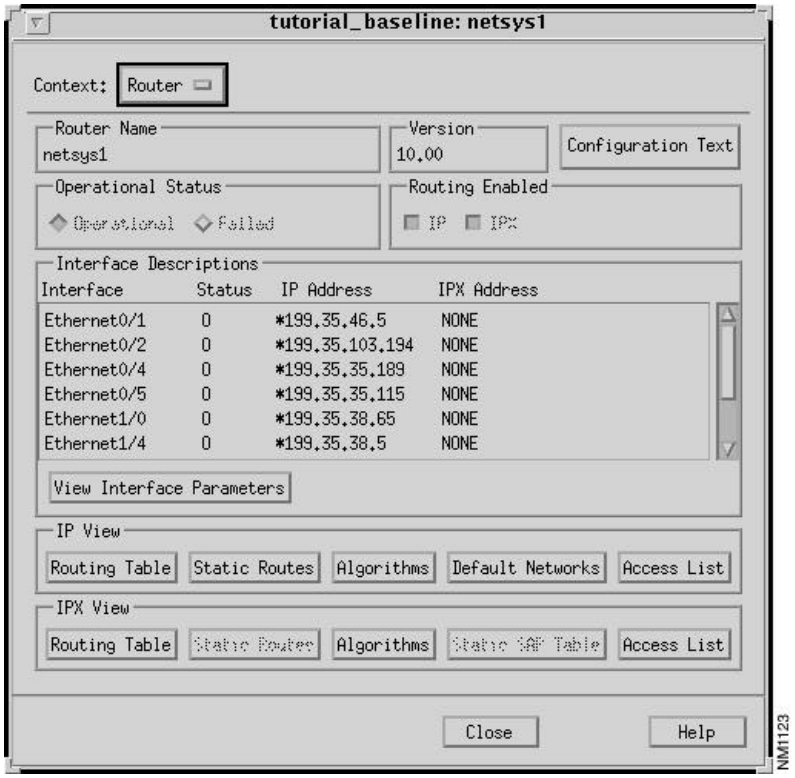

Figure 9-8 Router Configuration Window: netsys1 Router

Step 11 Click on the IP View **Routing Table** button.

The IP Routing Table window, partially shown in Figure 9-9, is displayed. Inspect the Routing Table predicted for **netsys1**. The following information is provided:

- **ALG** - the protocol the IP Routing Table entry is derived from
- **Dest. Address** - IP address of the remote host/device or remote network
- **Subnet Mask** - IP subnet mask corresponding to the destination address
- **Cost** - the first number in the bracket is the administrative distance of the routing information source. The second number is the metric for the route.
- **Forward To** - the local router's interface to use to get to the next router along the path to the destination network
- **Next Router** - the next router along the path to the destination.

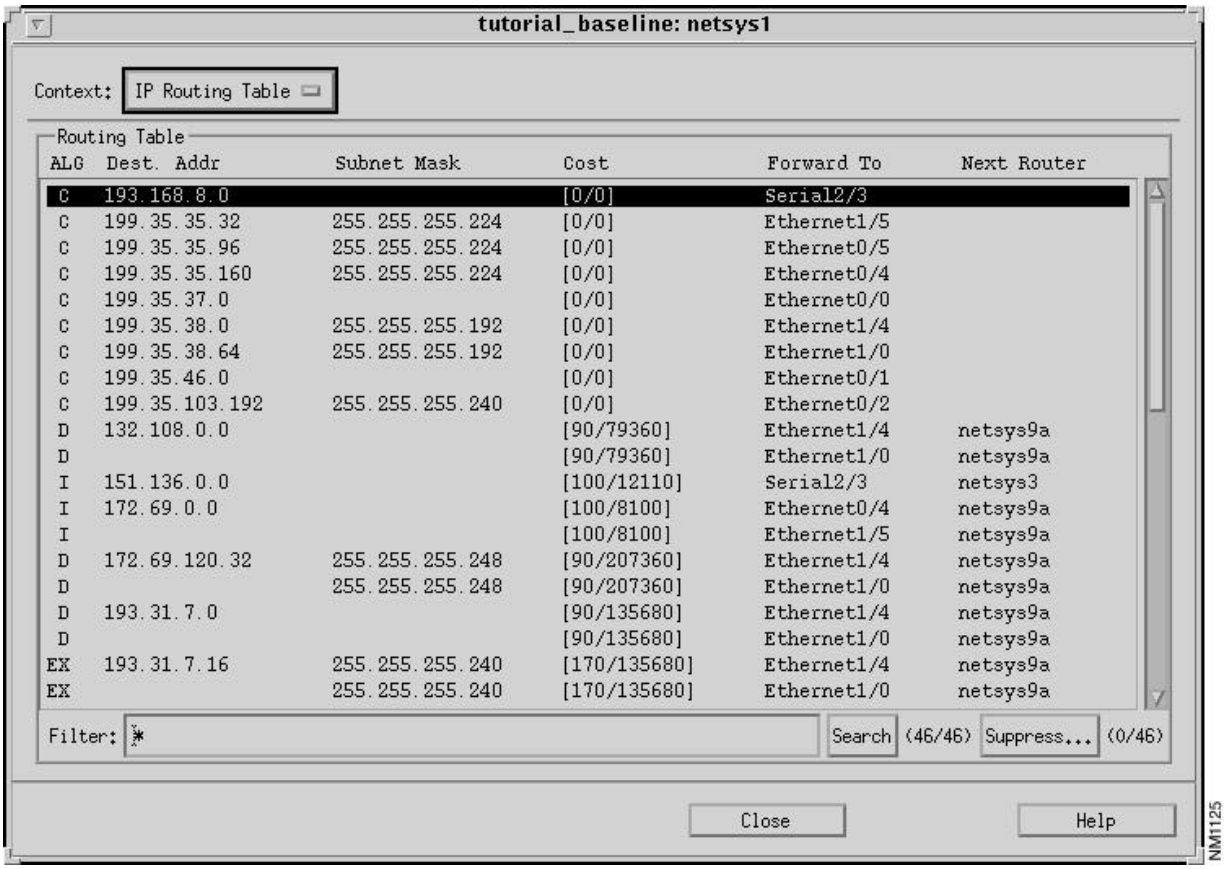

Figure 9-9 Routing Table: netsys1 Router

Step 12 Scroll through the Routing Table until the entry with Destination Address `199.35.36.0` is found.

This entry describes a route derived from the IGRP routing algorithm in which the administrative distance is `100` and the metric value is `10000105`. The next router along the route's destination path is **netsys9a**. There are two interfaces on **netsys1** (`Ethernet0/4` and `Ethernet1/5`) the route can pass through to reach **netsys9a** using the same metric value. The `Ethernet0/4` interface's delay metrics will be modified to show the affect on the **netsys1**Routing Table and the round trip path.

Step 13 Select the **Scenario>Create New** option.

The *tutorial_baseline+* scenario is created, selected, and displayed in the Connectivity Tools window, as shown in Figure 9-10. This newly created scenario is used for simulation and analysis purposes. A new scenario *must* be created to modify router attributes (e.g. interface operational/failure status, interface metrics, Routing Table updates.)

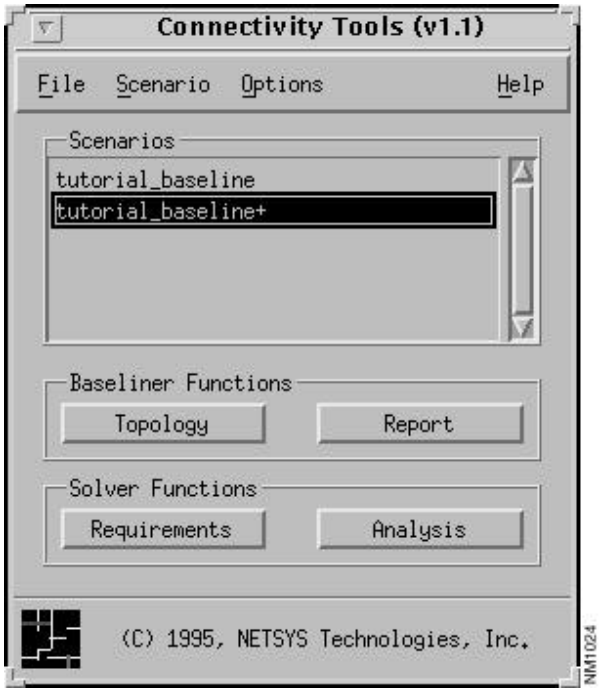

Figure 9-10 Connectivity Tools Window: New Scenario Created

Step 14 Click on the **Analysis** button in the Connectivity Tools window.

The connectivity requirements imposed on the *tutorial_baseline+* scenario are assessed and displayed in the Requirements Analysis window, as partially shown in Figure 9-11. As the *srb_ring_1857* connectivity requirements are already loaded, the analysis results are the same as previously observed.

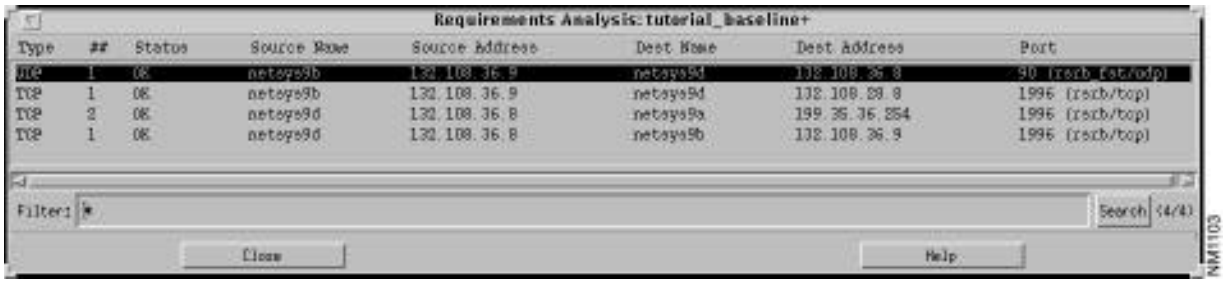

Figure 9-11 Requirements Analysis Window: srb_ring_1857 Requirements Analyzed

Step 15 Click on the entry in the Requirements Analysis window with the Source name **`netsys9d (132.108.36.8)`** and Destination name **`netsys9a (199.35.36.254)`**.

The path is highlighted in the *tutorial_baseline+* Topology window, as shown in Figure 9-12.

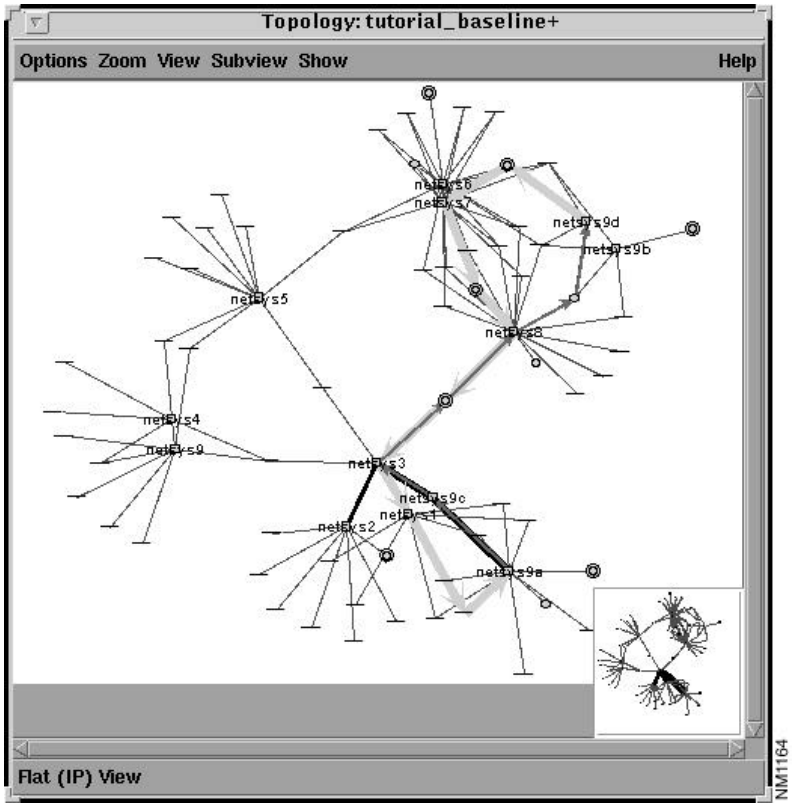

Figure 9-12 Topology Window: New Path Displayed

Step 16 Double-click on the selected entry in the Requirements Analysis window.

The Round Trip Path window, shown in Figure 9-13, is displayed. The **netsys1** router uses the `Ethernet0/4` (`199.35.35.189`) interface to forward to the next router in the **Round Trip Path** list. The entry can be found by scrolling through the **Round Trip Path** list.

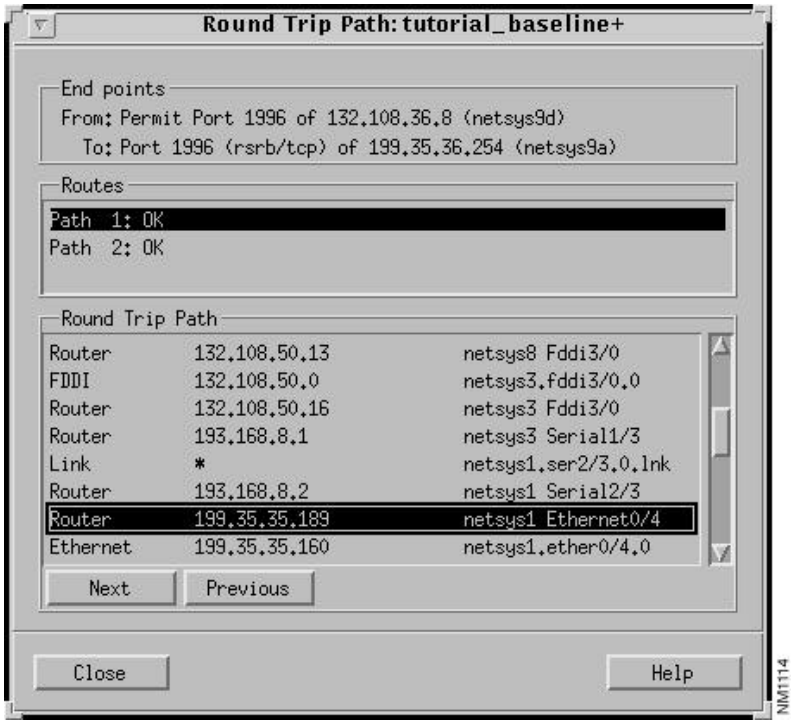

Figure 9-13 Round Trip Path Window: tutorial_baseline+ Scenario

Step 17 Double-click on the **`netsys1 Ethernet0/4`** entry in the **Round Trip Path** list.

The **netsys1**Router Configuration window is displayed.

Step 18 Select the Interface entry **`Ethernet0/4`** from the **Interface Descriptions** list, then click on the **View Interface Parameters** button.

The Interface Parameters window, shown in Figure 9-14, is displayed.

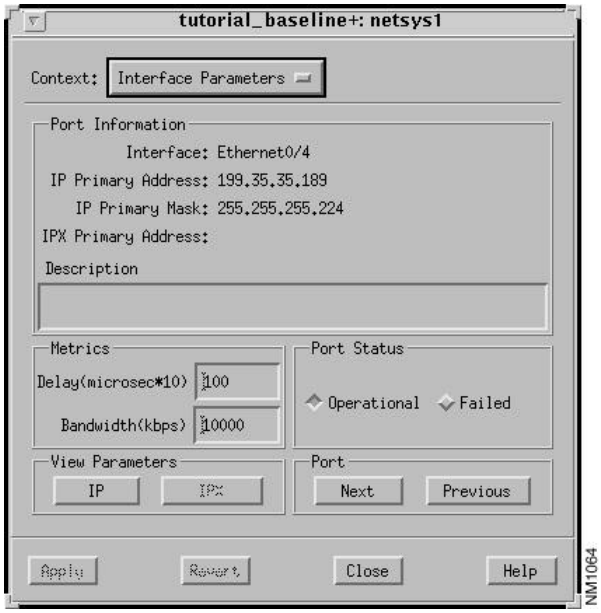

Figure 9-14 Interface Parameters Window: Ethernet0/4 Interface

Step 19 Change the **Delay** metric value for **`Ethernet0/4`** from **`100`** to **`10000`** then press **Return**. Click on the **Apply** button.

Step 20 Click on the **Analysis** button in the Connectivity Tools window.

The new connectivity requirements imposed on the *tutorial_baseline+* scenario are analyzed and displayed in the Requirements Analysis window, as partially shown in Figure 9-15. Note there is only one path available now between routers **netsys9d** and **netsys9a**.

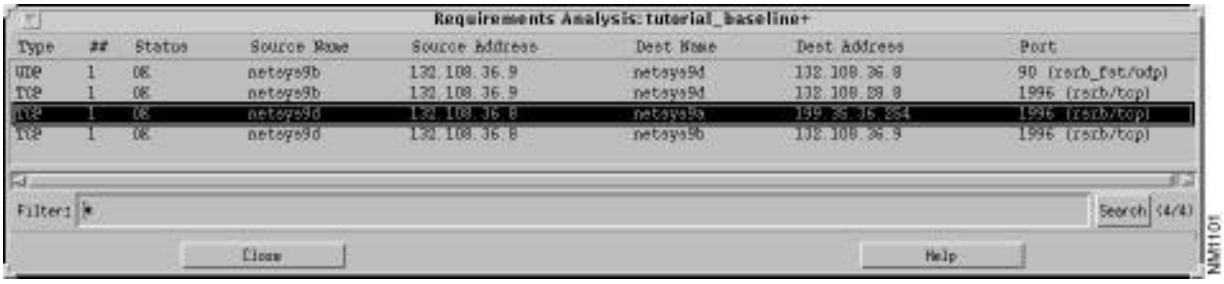

Figure 9-15 Requirements Analysis Window: Reanalysis Performed

Step 21 Click on the entry in the Requirements Analysis window with the Source name **`netsys9d (132.108.36.8)`** and Destination name **`netsys9a (199.35.36.254)`**.

The new path in the Topology window, shown in Figure 9-16, is highlighted.

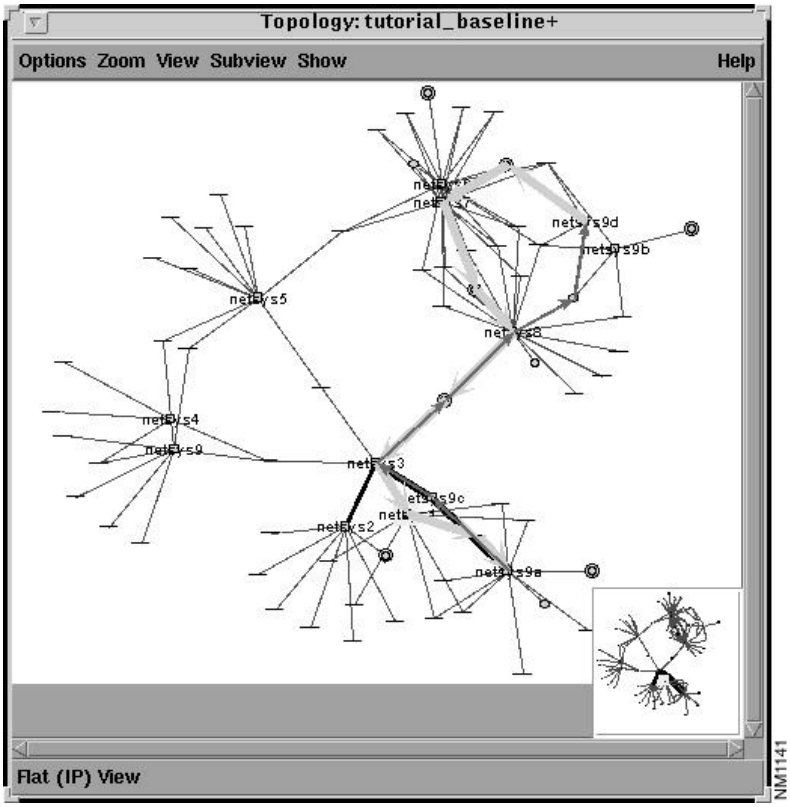

Figure 9-16 Topology Window: New Path Highlighted

Step 22 Verify a new path has been taken by examining the Round Trip Path window.

Note router **netsys1** now forwards through the `Ethernet1/5` (`199.35.35.37`) interface to reach **netsys9a**, as shown in Figure 9-17.

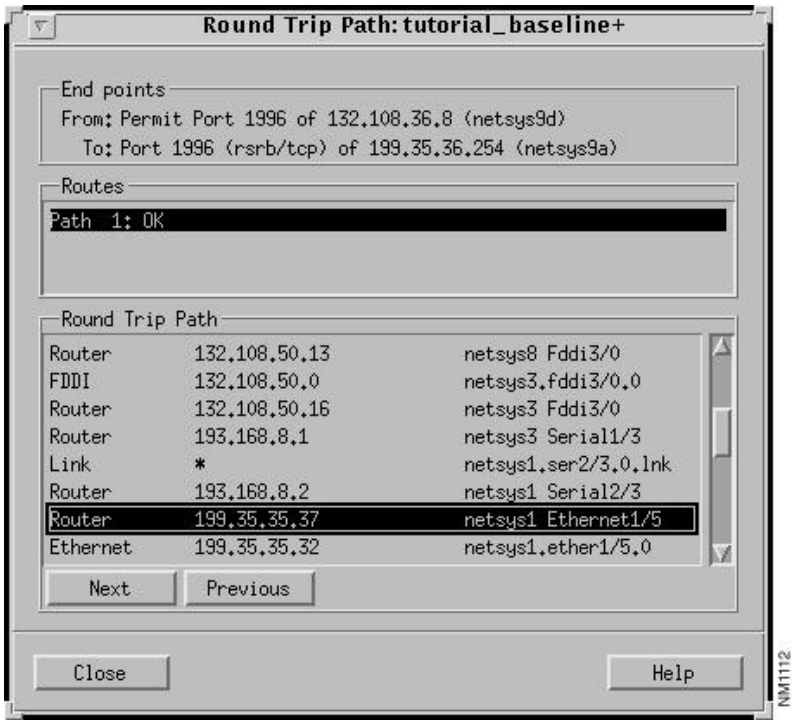

Figure 9-17 Modified tutorial_baseline+ Round Trip Path Window

Step 23 From the **netsys1** Interface Parameters window, examine the `Ethernet1/5` (`199.35.35.37`) interface to verify that its **Delay Metric** value (`100`) is less than the `Ethernet0/4` interface's **Delay Metric** value (`10000`).

Step 24 Select the IP View **Routing Table** button in the **netsys1** Router Configuration window.

Verify the Destination Address `199.35.36.0` Routing Table entry, partially shown in Figure 9-18, lists `Ethernet1/5` as the interface to be used along the path to the destination (**netsys9a**).

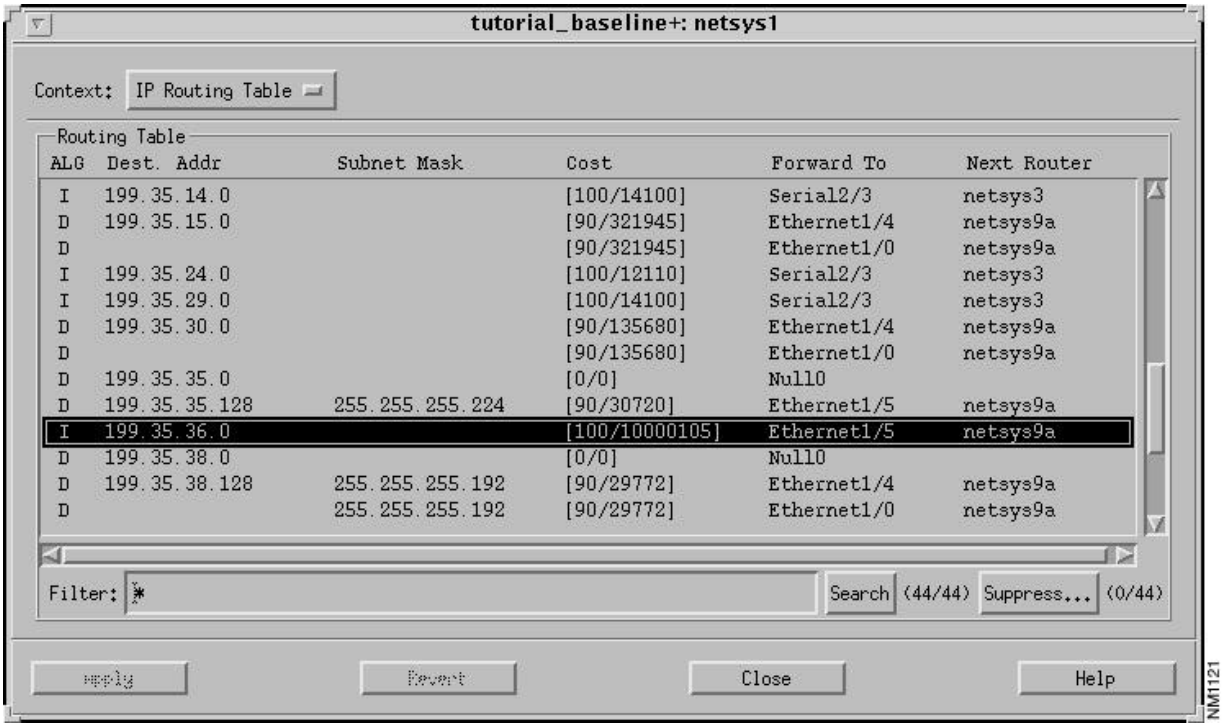

Figure 9-18 Modified netsys1 Routing Table

Create a Static Route

In this section of the tutorial, a new "what-if" scenario is created by adding an IP Static Route to the **netsys1** router's configuration. The result includes an update to **netsys1**'s IP Routing Table and a new path taken to the destination. This tutorial starts from where the last tutorial ended, in the **netsys1** IP Routing Table window. Note the route to the destination network `199.35.36.0` is forwarded through the `Ethernet1/5` interface to reach router **netsys9a**.

Step 1 Select the **Context>Router** option in the IP Routing Table window.

The IP Routing Table window is dismissed and the **netsys1** Router Configuration window is displayed.

Step 2 Click on the IP View **Static Routes** button.

The IP Static Routes window, shown in Figure 9-19, is displayed. Notice no IP static routes are currently configured for the **netsys1** router.

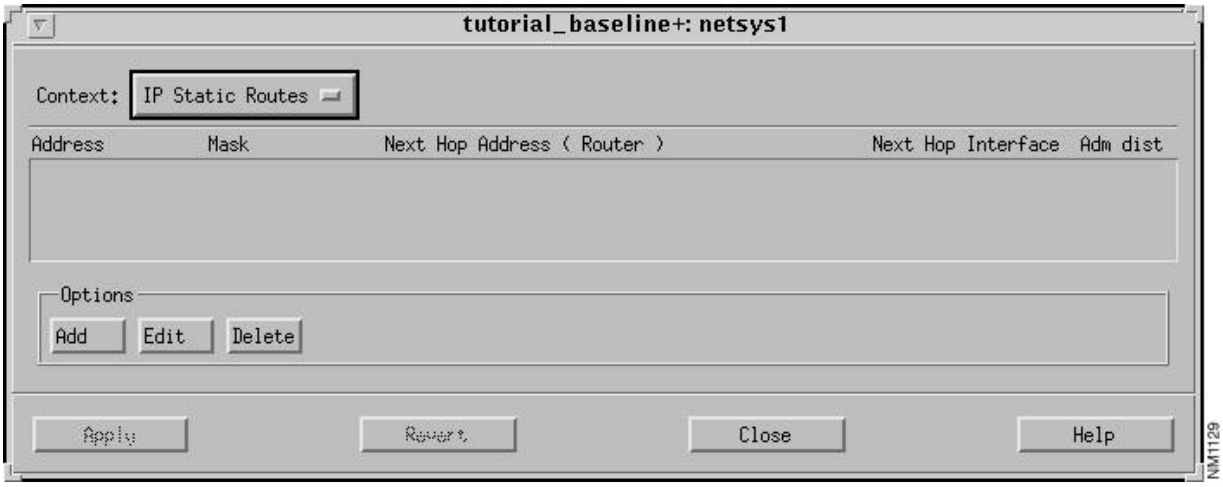

Figure 9-19 Static Routes Window

Step 3 Click on the **Add** button in the IP Static Routes window.

The Edit IP Static Routes List window, shown in Figure 9-20, is displayed.

Step 4 Enter the destination address (**`199.35.36.254`**) in the **Destination Address** field and the address mask (**`255.255.255.254`**) in the Destination **Mask** field.

For this example, a static route is added to the **netsys9a** router's destination interface (`199.35.36.254`). The route follows the path from the **netsys1** router to the **netsys9a** router's incoming `Ethernet2/4` (`199.35.38.6`) interface.

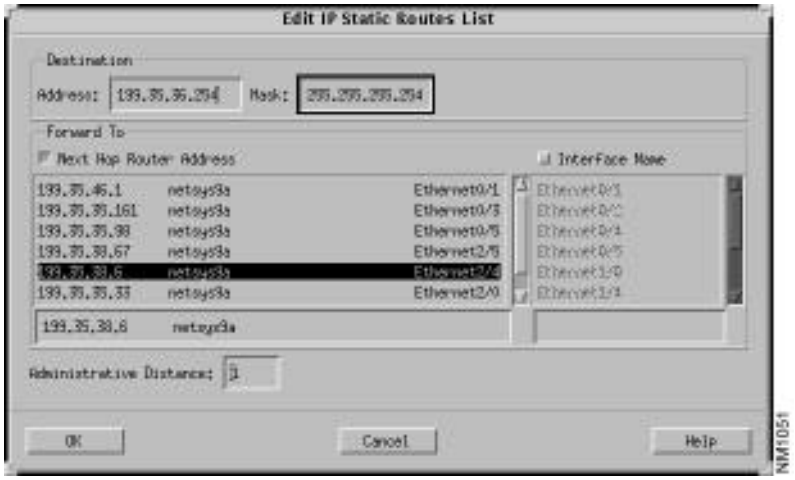

Figure 9-20 Edit IP Static Routes List Window

Step 5 Click on the **OK** button.

The static route is added to the list of static routes, as shown in the IP Static Routes window in Figure 9-21.

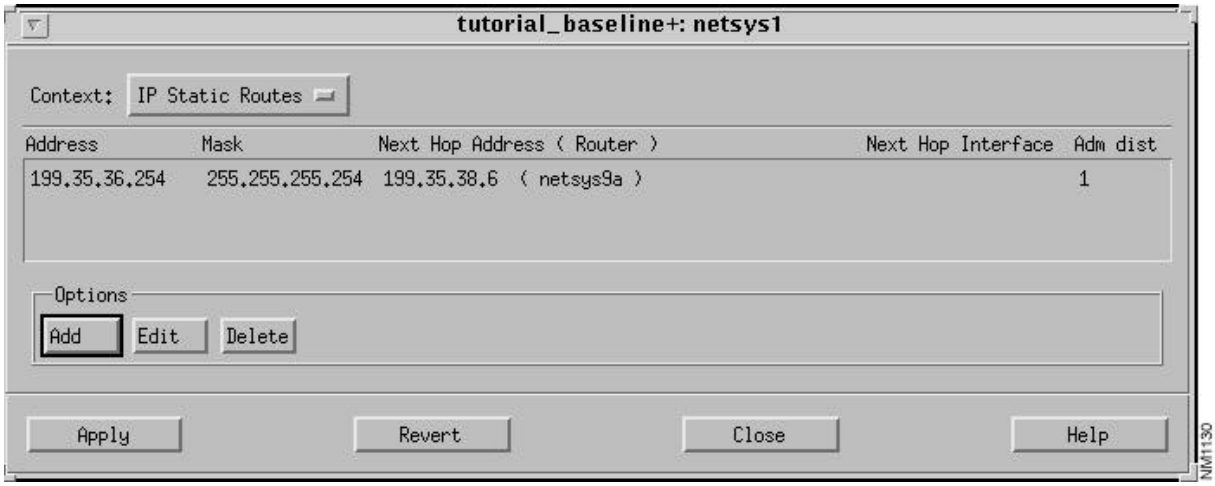

Figure 9-21 Modified IP Static Routes Window

Step 6 Verify the static route entry, then click on the **Apply** button.

The new static route is added to the current **netsys1** router configuration. Next, the affect this router configuration change has on the *tutorial_baseline+* scenario is examined.

Step 7 Click on the **Analysis** button in the Connectivity Tools window.

Step 8 Click on the entry in the Requirements Analysis window with the Source name **netsys9d** and Destination name **netsys9a.**

The new path in the Topology window is highlighted.

Step 9 Verify a new path has been taken by examining the Round Trip Path window.

Note router **netsys1** now forwards through interface `199.35.38.5` to reach the **netsys9a** router's input interface `199.35.38.6`.

Step 10 Examine the entry in the **netsys1** IP Routing Table window.

Note the “S” in the **netsys1** IP Routing Table entry, shown in Figure 9-22, indicating the route to **netsys9a** over the `Ethernet1/4` interface is a static route with a default administrative distance cost of 1.

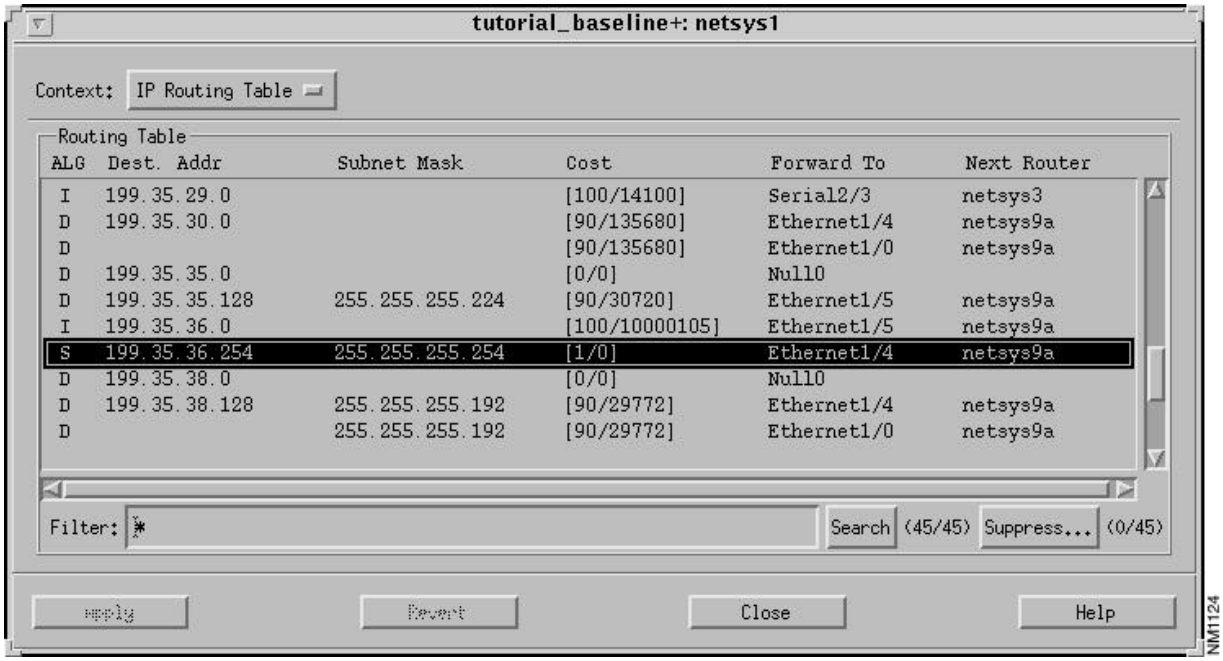

Figure 9-22 Modified netsys1 Routing Table with Static Route Entry

Induce Router Port Failure

In this example, a new “what-if” scenario is created to introduce a router port failure on the **netsys1** router thereby altering the route to the destination (**netsys9a**). This tutorial focuses on the paths between the **netsys3**, **netsys1**, and **netsys9a** routers.

Step 1 Click on the IP View **Routing Table** button in the **netsys1** Router Configuration window.

Note the Routing Table entry for destination address `199.35.36.254` indicates the route is forwarded to the **netsy9a** router through the `Ethernet1/4` interface.

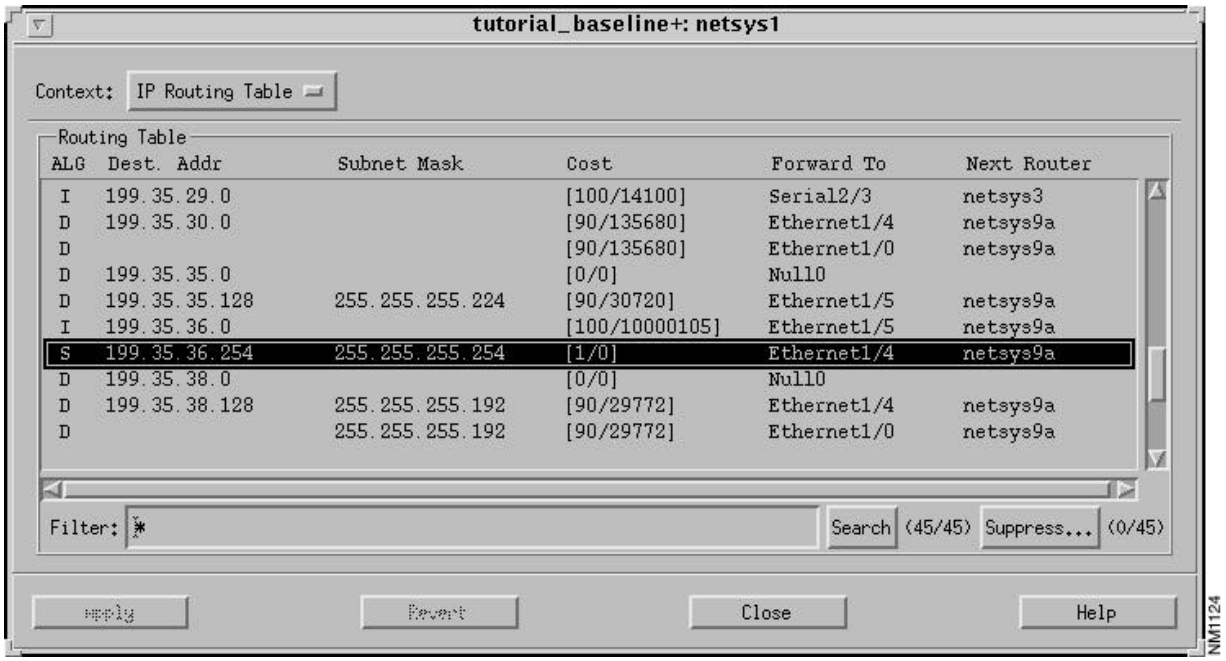

Figure 9-23 IP Routing Table: netsys1 Router

Step 2 Select the **`Ethernet1/4`** entry from the **Interface Descriptions** list in the **netsys1** Router Configuration window then click on the **View Interface Parameters** button.

The **netsys1**Interface Parameters window, shown in Figure 9-24 is displayed.

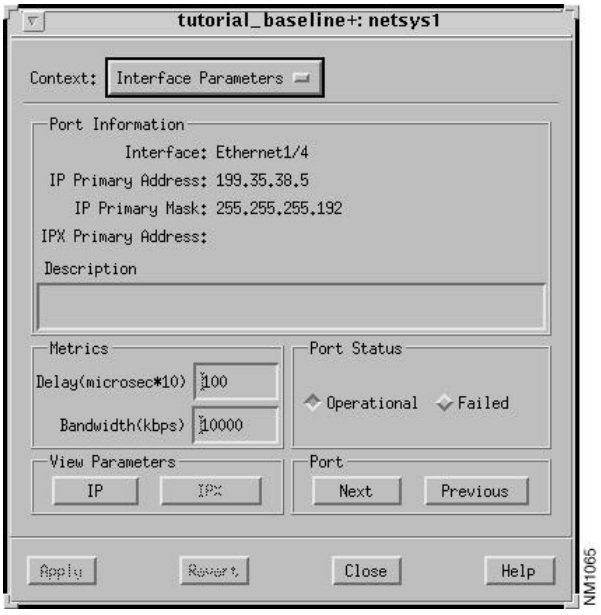

Figure 9-24 Interface Parameters Window: Ethernet1/4 Interface

Step 3 Click on the Port Status **Failed** button then click on the **Apply** button.

This introduces a failure on the **netsys1** router's `Ethernet1/4` interface.

Step 4 Click on the **Analysis** button in the Connectivity Tools window.

Step 5 Click on the entry in the Requirements Analysis window with the Source Name **netsys9d** and Destination name **netsys9a**.

The new path (bypassing the `Ethernet1/4` interface on router **netsys1**) is highlighted in the Topology window, as shown in Figure 9-25.

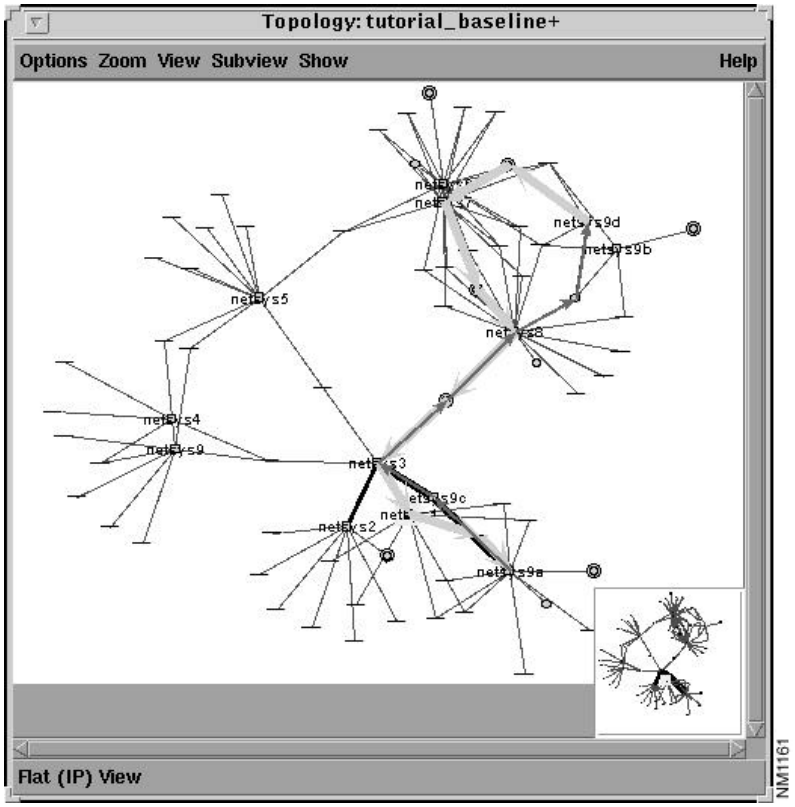

Figure 9-25 Topology Window: netsys1 Ethernet1/4 Failure

Step 6 Double-click on the same entry in the *tutorial_baseline+* Requirements Analysis window.

The Round Trip Path window, shown in Figure 9-26 is displayed. Examine the updated round trip path components list in the **Round Trip Path** pane.

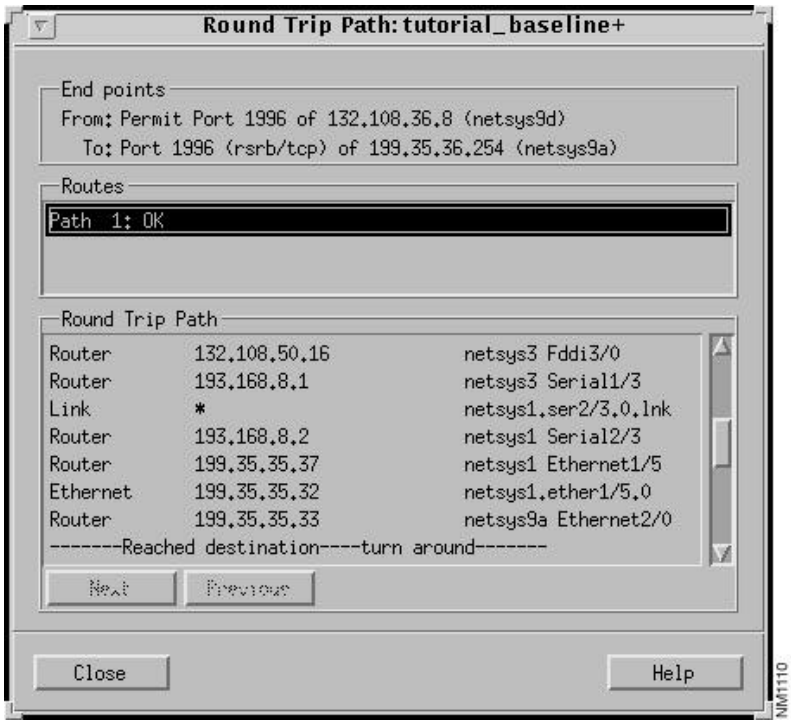

Figure 9-26 Round Trip Path Window: After netsys1 Ethernet1/4 Failure

Step 7 Examine the IP Routing Table window for router **netsys1**.

Note the Routing Table entry for destination address `199.35.36.254` is no longer in existence, as shown in Figure 9-27.

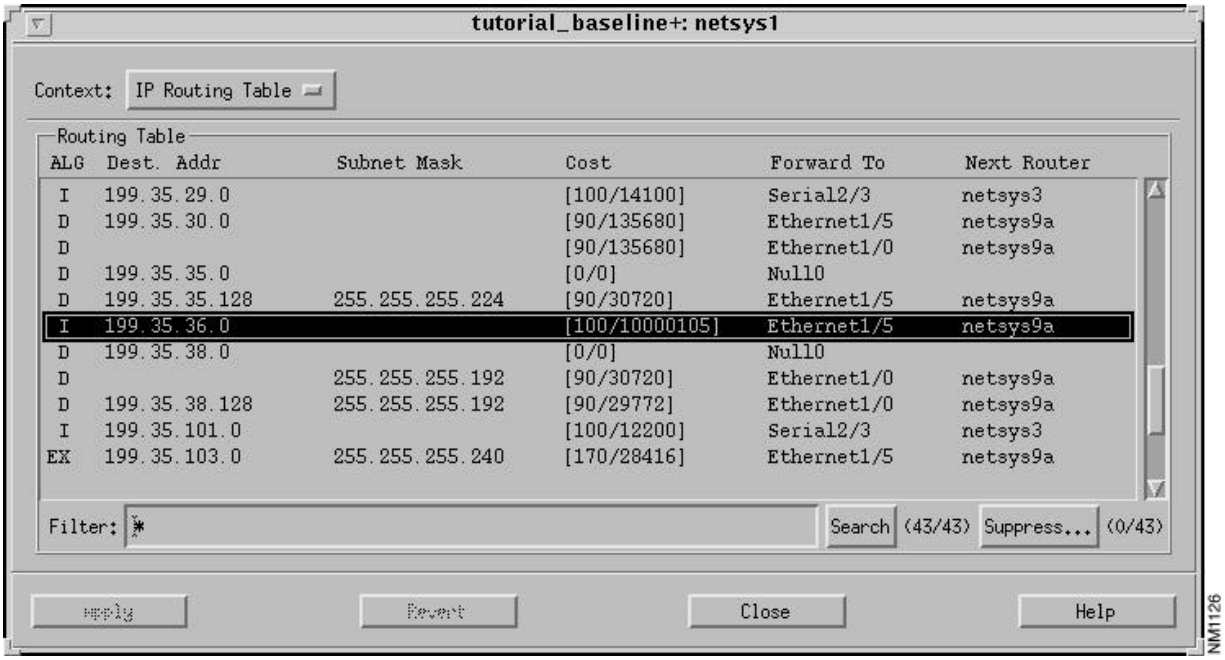

Figure 9-27 netsys1 IP Routing Table: Modified Entry

Specify a Passive Interface

In this example, a new "what-if" scenario is created showing the effects on the path to the destination when an interface is added to a router's Passive Interface list. A router interface specified as a passive interface is disabled from sending routing updates.

Step 1 Reset the delay metric for the **netsys1** router's **`Ethernet0/4`** interface to **`100`**, press **Return**, then click on the **Apply** button.

Follow the steps described earlier in this tutorial where the delay metric was changed from **`100`** to **`10000`**.

Step 2 Delete the **netsys1** router's IP static route to destination address **`199.35.36.254`** then click on the **Apply** button.

Follow the steps described earlier in this tutorial where the static route was created.

Step 3 Set the **netsys1** router's **`Ethernet1/4`** serial interface back in operation by clicking on the Port Status **Operational** button then click on the **Apply** button.

Step 4 Click on the **Analysis** button in the Connectivity Tools window.

Step 5 Click on the entry with the Source name **netsys9d** and Destination name **netsys9a.**

The path is highlighted in the Topology window, as shown in Figure 9-28. Examine the Round Trip Path window and note the path taken.

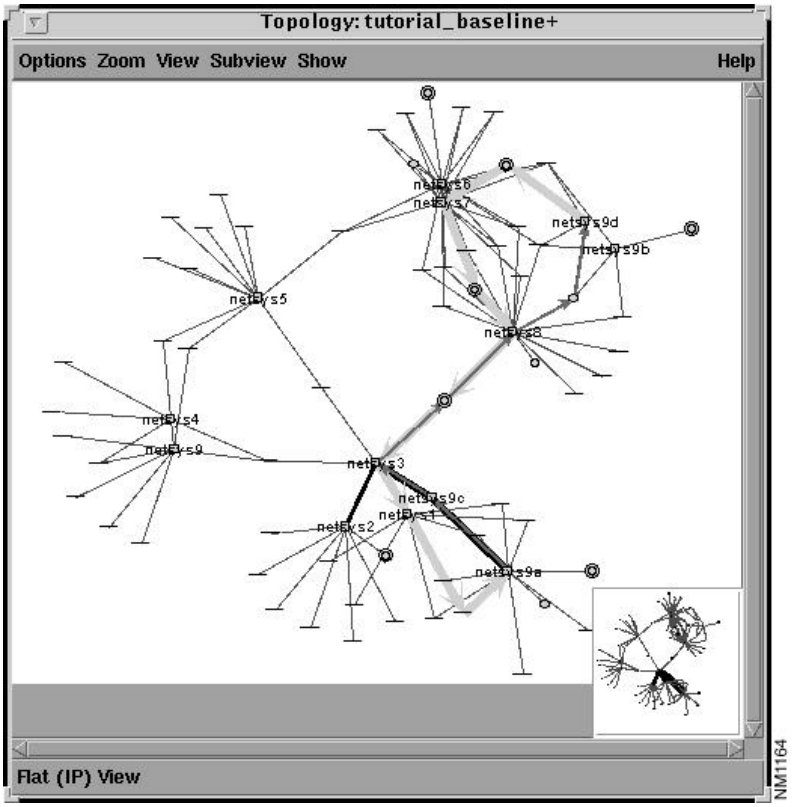

Figure 9-28 Topology Window

Step 6 Click on the IP View **Algorithms** button in the **netsys1** Router Configuration window.

The IP Routing Algorithms window, shown in Figure 9-29, is displayed. Display the **netsys9a** IP Routing Algorithms window, shown in Figure 9-30, using the same method. The IP Routing Algorithms supported by the **netsys1** and **netsys9a** routers are displayed in the **Algorithms** list in the IP Routing Algorithms window.

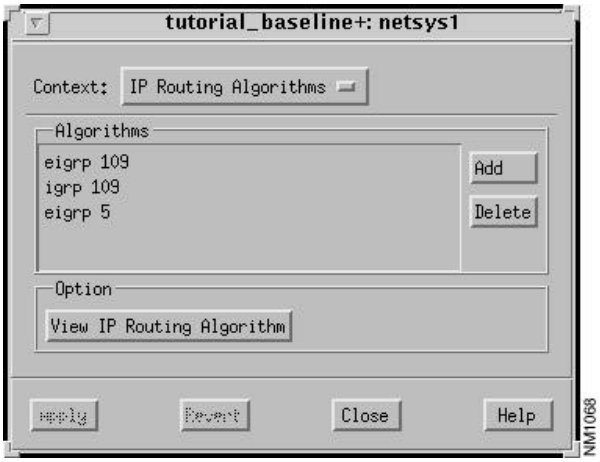

Figure 9-29 netsys1 IP Routing Algorithms Window

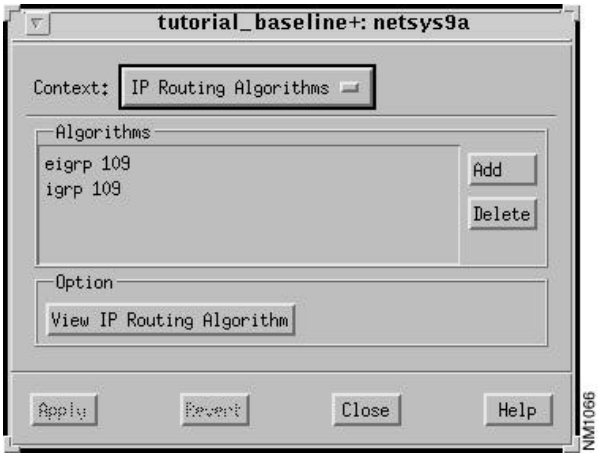

Figure 9-30 netsys9a IP Routing Algorithms Window

Step 7 Select the **Algorithms** entry **`igrp 109`** then click on the **View IP Routing Algorithm** button, in both windows.

The **netsys1** IGRP 109 window, partially shown in Figure 9-31, is displayed and the **netsys9a** IGRP 109 window, partially shown in Figure 9-32, is displayed. Note both routers exchange their IGRP routing updates via network `199.35.35.0` as indicated in the Networks pane. Refer back to the Topology window to see how the path goes through subnet `199.35.35.32`. This is possible since router **netsys9a** advertises the route through that subnet from the `Ethernet2/0` interface.

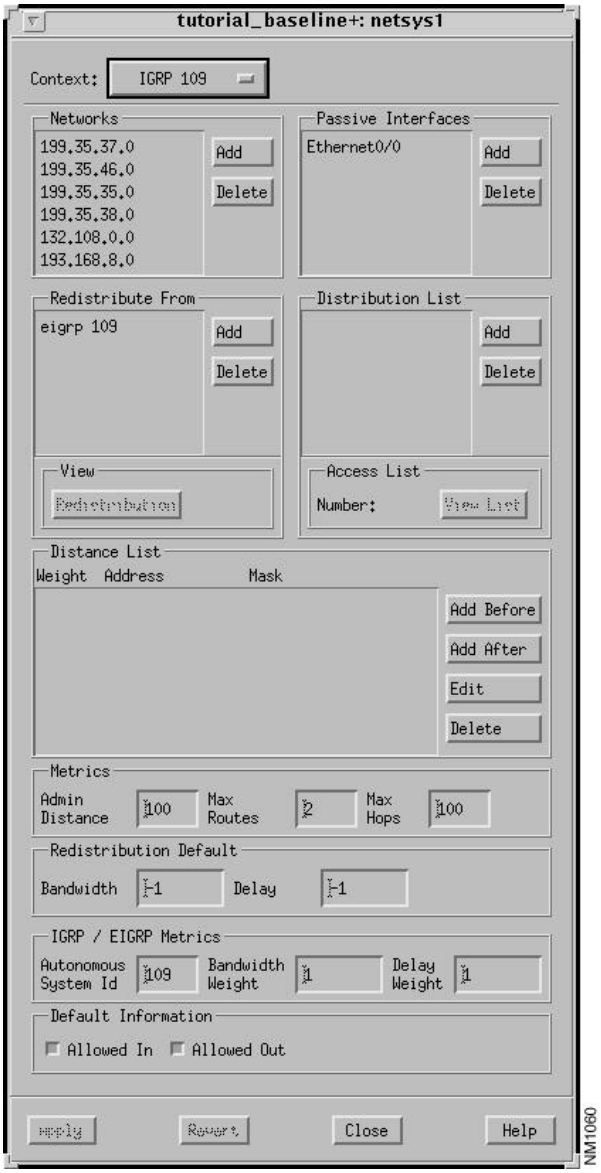

Figure 9-31 netsys1 IGRP 109 Window

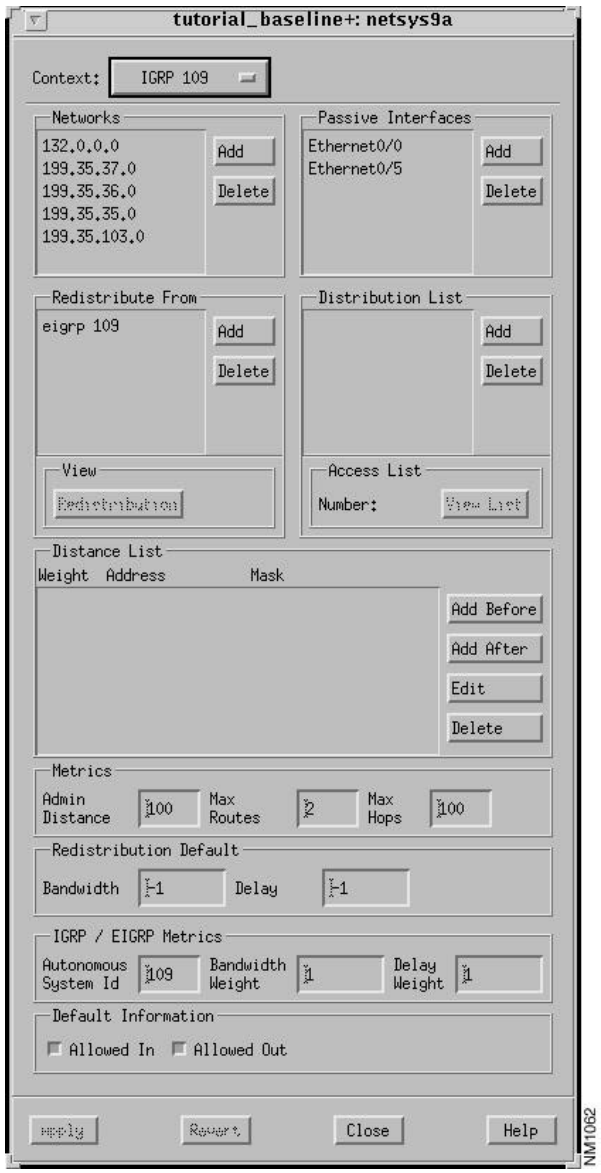

Figure 9-32 netsys9a IGRP 109 Window

Step 8 Click on the Passive Interfaces **Add** button in the **netsys9a** Algorithms window.

The Edit Passive Interface List window, shown in Figure 9-33, is displayed. Disable interface `Ethernet2/0` from sending IGRP routing updates to router **netsys9c** via subnet `199.35.35.32`.

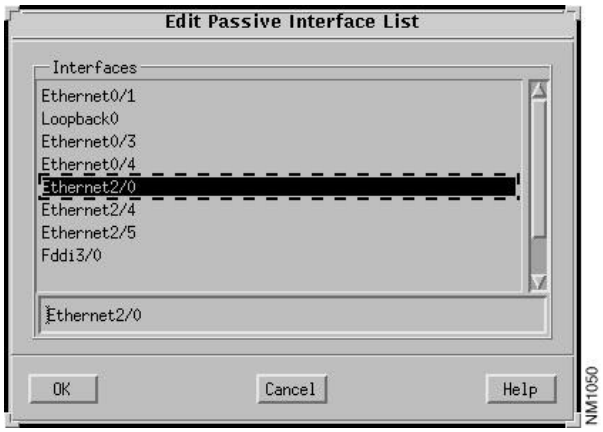

Figure 9-33 Edit Passive Interface List Window

Step 9 Select the **`Ethernet2/0`** interface then click on the **OK** button.

Step 10 Confirm the **Passive Interfaces** list for router **netsys9a** has been updated, then click on the **Apply** button in the Algorithms window.

The modified IGRP 109 window is displayed, as partially shown in Figure 9-34.

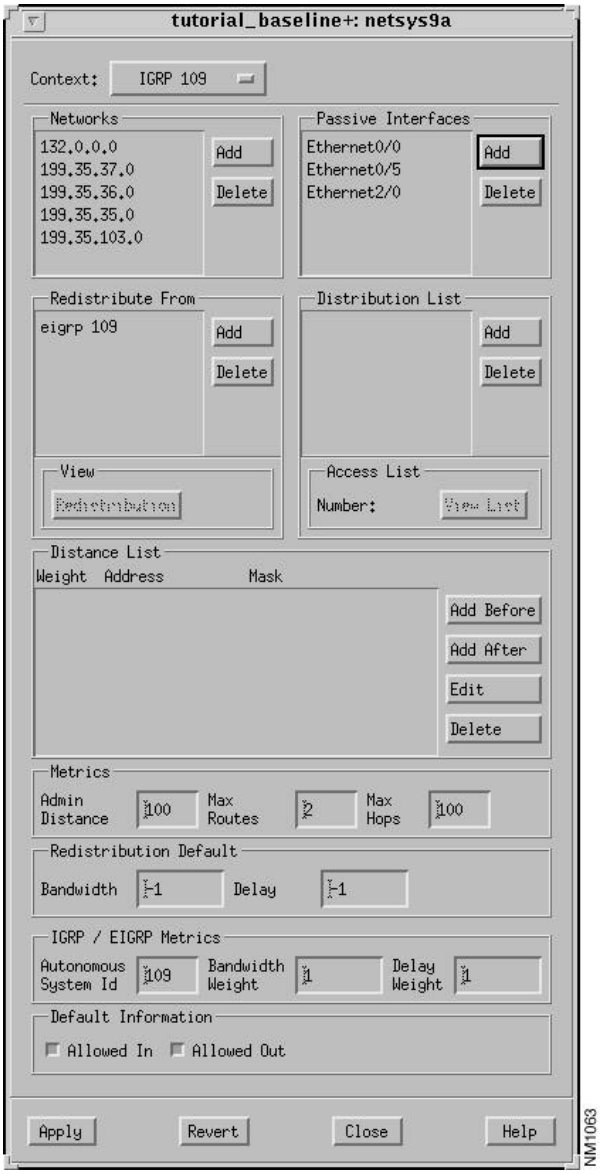

Figure 9-34 Modified netsys9a IGRP 109 Window

Step 11 Click on the **Analysis** button in the Connectivity Tools window.

Step 12 Click on the entry with the Source Name **netsys9d** and Destination name **netsys9a.**

The new path is highlighted in the Topology window, as shown in Figure 9-35.

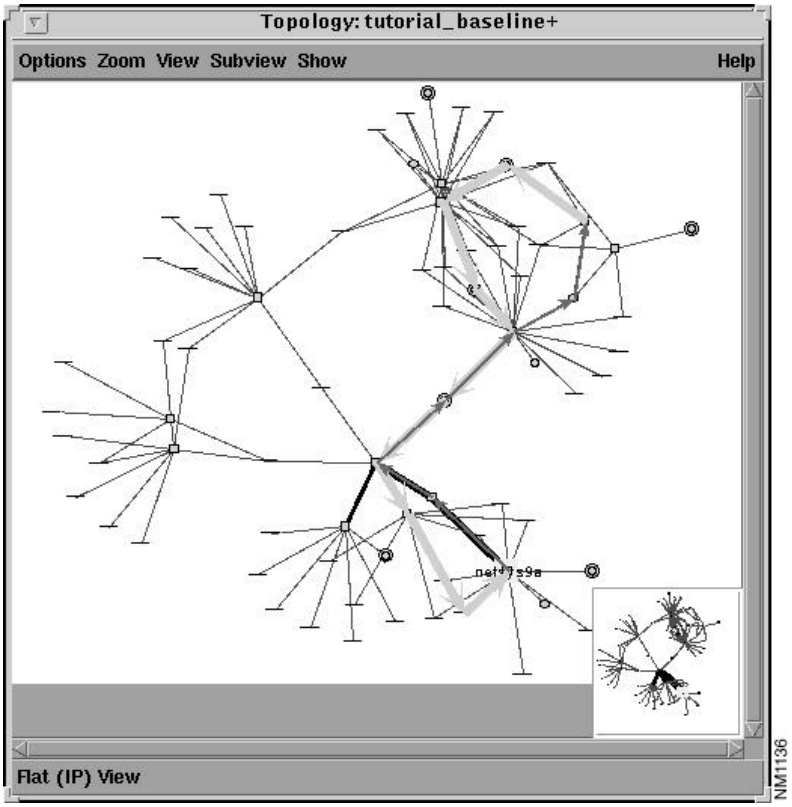

Figure 9-35 Modified Topology Window

Step 13 Examine the updated Round Trip Path window to verify the new path to the destination.

Modify the Routing Algorithm Networks List

In this example, a new "what-if" scenario is created describing how to modify the Routing Algorithm **Networks** list to change the route to the destination. The Networks pane in the Routing Algorithm Window lists the networks a router is directly connected to. The routing algorithm uses this information to update a router's Routing Table.

Step 1 Examine the **netsys1** IP Routing Table.

Note the current routing entry for destination network `199.35.36.0` forwards the route through the `Ethernet0/4` interface to reach router **netsys9a**, as shown in Figure 9-36.

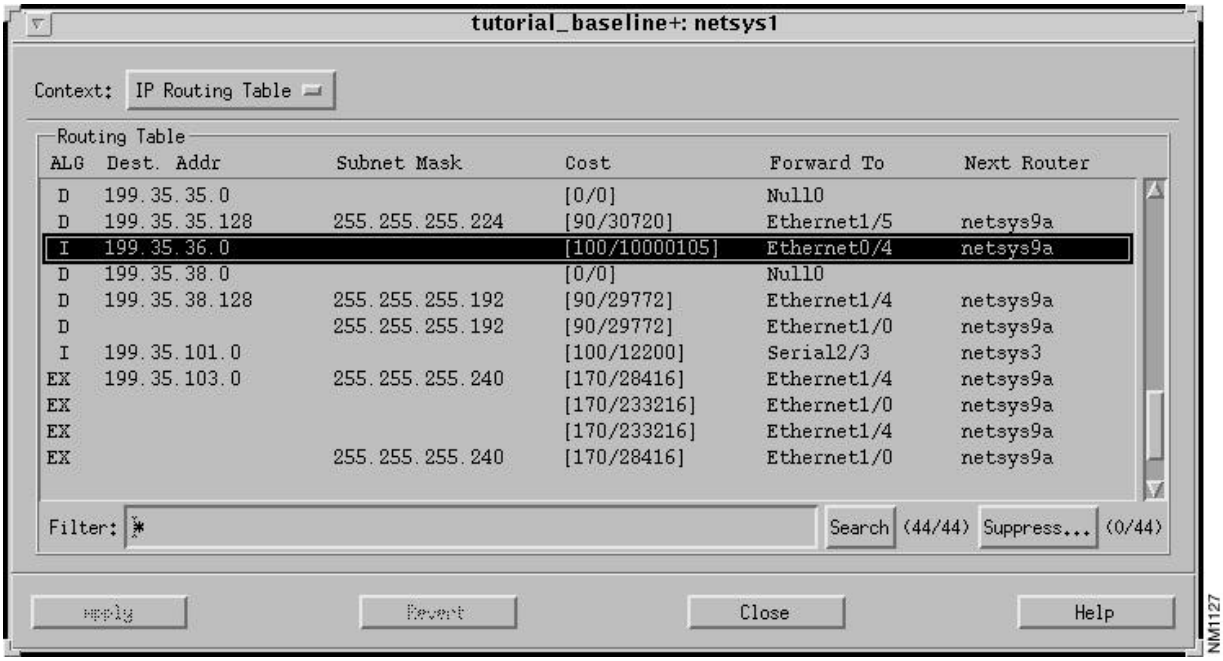

Figure 9-36 netsys1 Routing Table: Ethernet0/4 Interface Entry

Step 2 Select network address **`199.35.35.0`** from the Networks pane in the **netsys1** IGRP 109 Routing Algorithm window, click on the **Delete** button, then click on the **Apply** button.

The **netsys1** IGRP 109 window is partially shown in Figure 9-37.

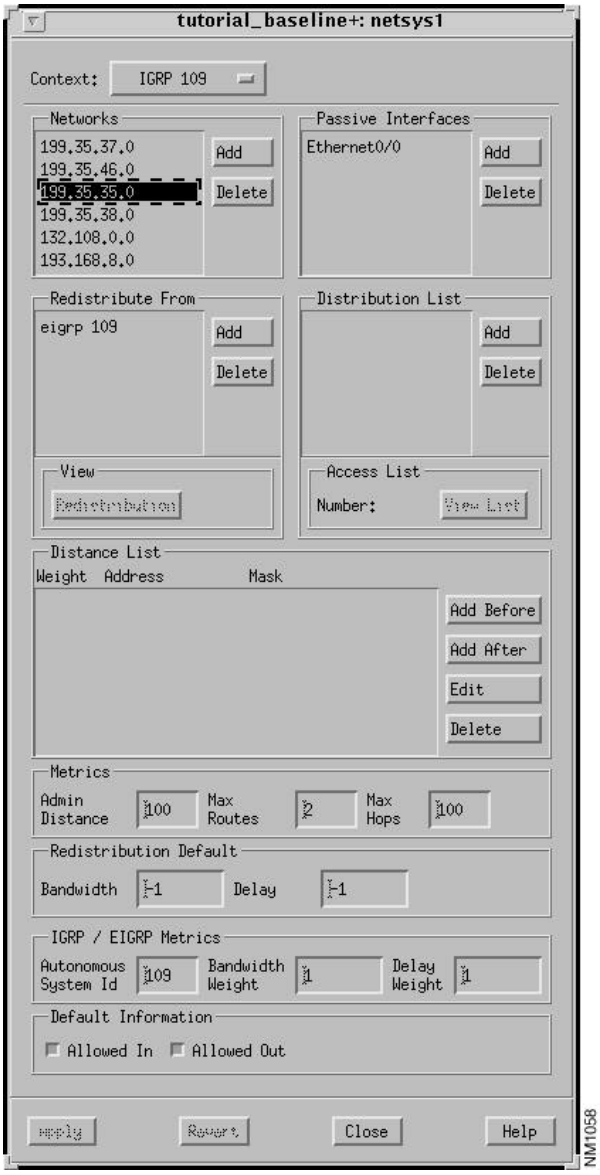

Figure 9-37 netsys1 IGRP 109 Window: Networks List

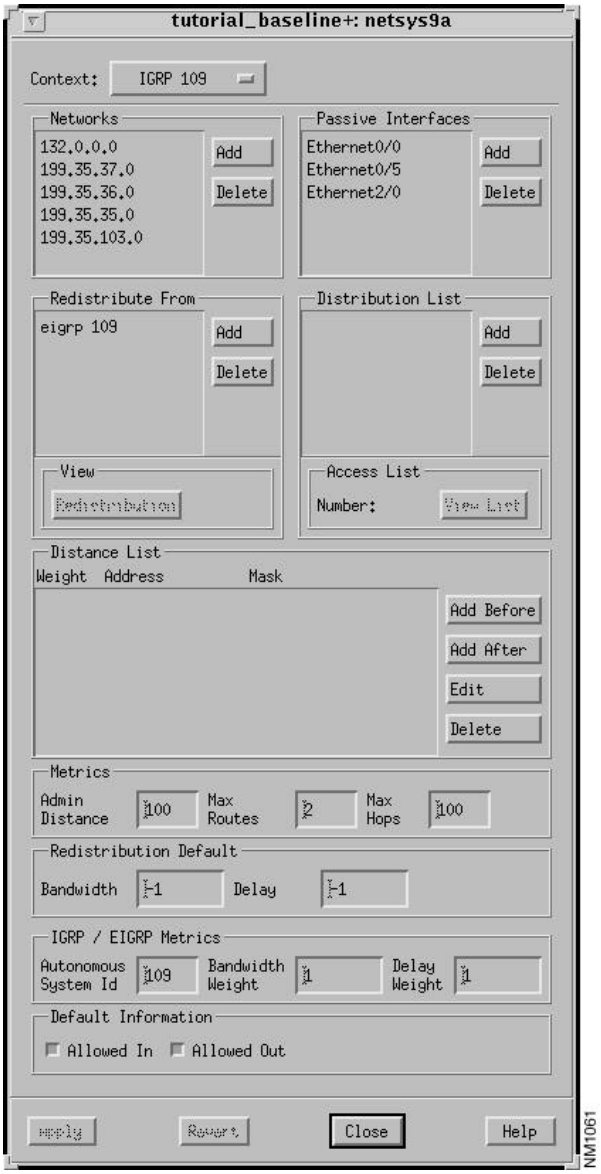

Figure 9-38 netsys9a IGRP 109 Window: Networks List

Step 3 Click on the Networks **Add** button in the **netsys9a** IGRP 109 Algorithm window.

The Edit Network List window, shown in Figure 9-39, is displayed. Select network address **199.35.46.0** from the **Network Addresses** list.

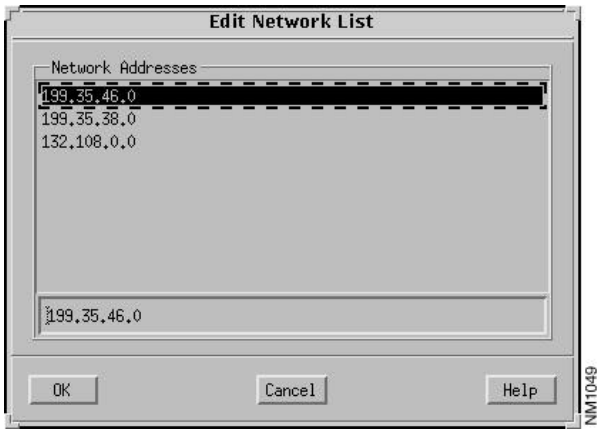

Figure 9-39 Edit Network List Window: netsys9a Router

Step 4 Click on the **OK** button.

The `199.35.46.0` network address is added to the **Networks** list in the **netsys9a** IGRP 109 Algorithm window, as partially shown in Figure 9-40.

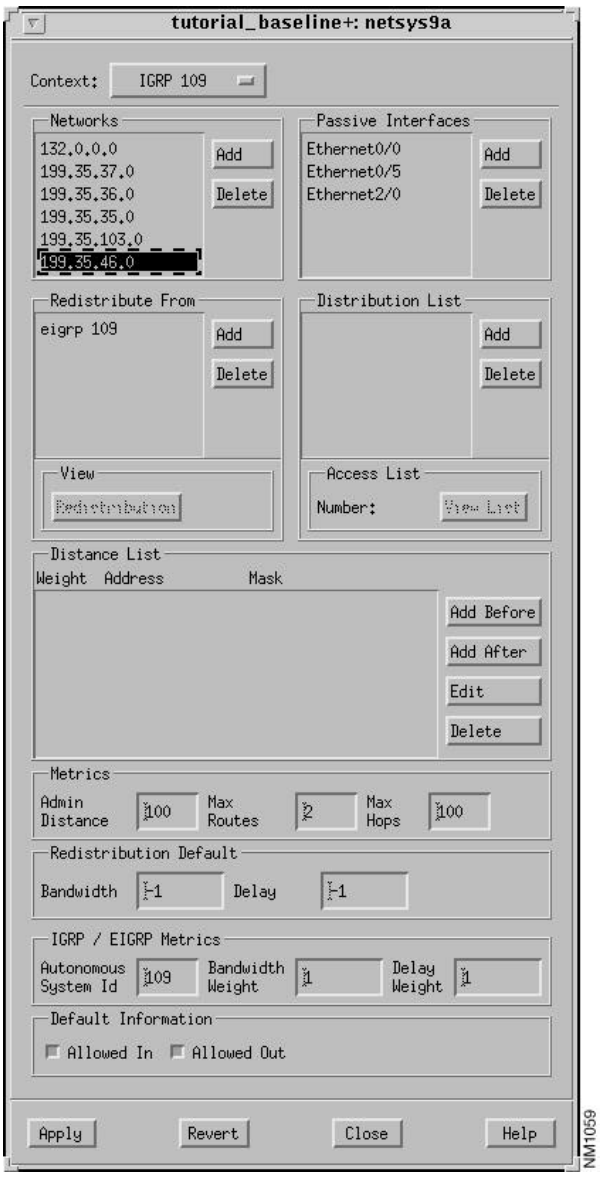

Figure 9-40 Modified netsys9a IGRP 109 Window

Step 5 Click on the **Analysis** button in the Connectivity Tools window.

Step 6 Click on the entry with the source name **netsys9d** and destination name **netsys9a** in the *tutorial_baseline+* Requirements Analysis window.

The new path is highlighted in the Topology window, as shown in Figure 9-41.

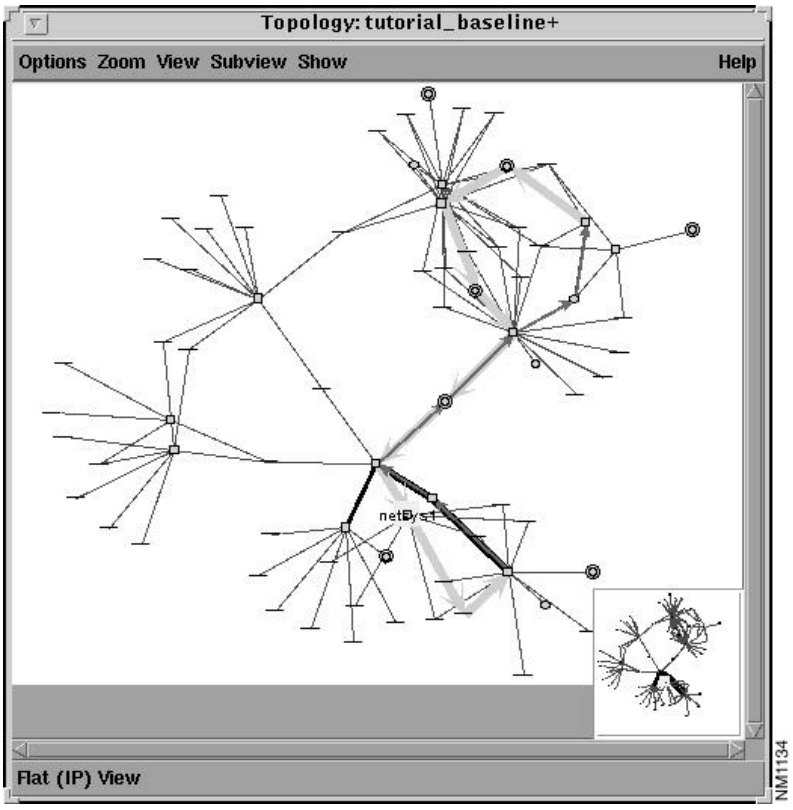

Figure 9-41 Topology Window: Modified Path

Step 7 Examine the updated Round Trip Path window to verify the new path to the destination.

Step 8 Reinspect the **netsys1** IP Routing Table window to verify the updated destination network (`199.35.36.0`) entry.

The netsys1 Routing Table is shown in Figure 9-42. Note the current routing entry for destination network `199.35.36.0` forwards the route through the `Ethernet0/1` interface to reach router **netsys9a**. Initially, the `Ethernet0/4` interface was used to reach router **netsys9a**.

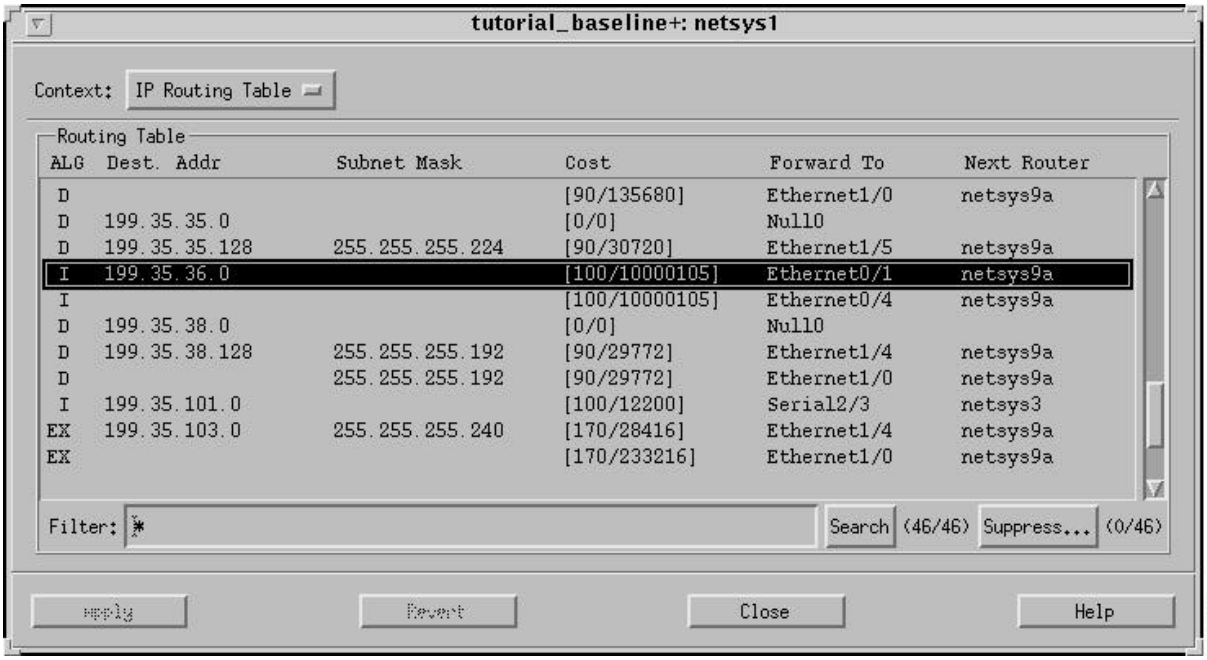

Figure 9-42 Updated netsys1 Routing Table

Specify an Interface in the Distribution List

In this example, a new "what-if" scenario is created showing the effects on the destination path when an interface is added to a router's Distribution List. The Distribution List allows the specification of a router interface to filter inbound and/or outbound routing updates according to an access list.

Step 1 Click on the **netsys1** IGRP 109 Routing Algorithms window's **Add** button in the Distribution List pane.

The Edit Distribution List window, shown in Figure 9-43, is displayed allowing you to add a new router interface to the router's distribution list.

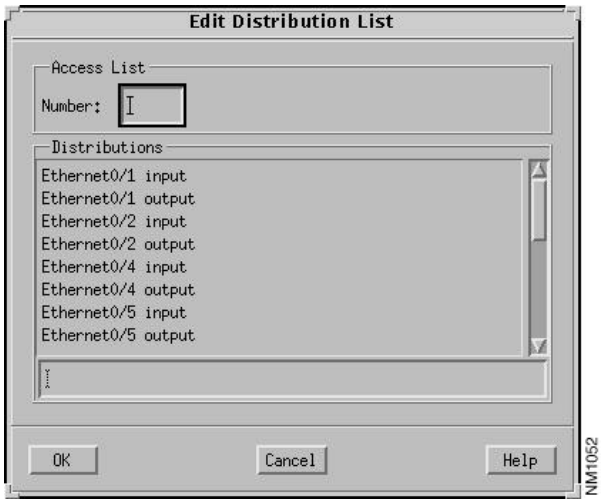

Figure 9-43 Edit Distribution List Window

Step 2 Select the **`Ethernet0/1 input`** interface.

The `Ethernet0/1 input` interface was selected in order to filter incoming routing updates.

Step 3 Specify an access list number (**`10`**) then click on the **OK** button.

Valid standard IP access list numbers range from 1 through 99.

Step 4 Verify the Distribution List pane in the IGRP 109 Algorithm window has been updated, then click on the **Apply** button.

The modified **netsys1** IGRP 109 Algorithms window is partially displayed in Figure 9-44.

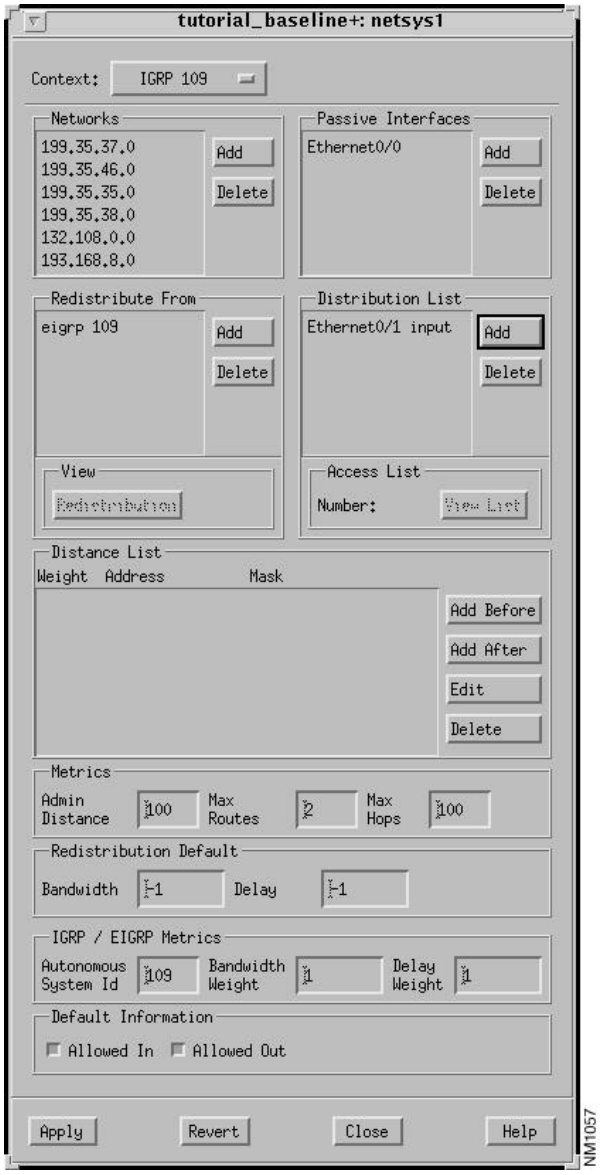

Figure 9-44 netsys1 IGRP 109 Algorithms Window: Modified Distribution List

Step 5 Select the **`Ethernet0/1 input`** entry in the **Distribution List**, then click on the access list **View List** button.

Examine the access list associated with the `Ethernet0/1` Distribution Filter List entry. The Distribution Filter List Window, shown in Figure 9-45, is displayed showing the existing access list entries. In this example, all input routing updates coming into the `Ethernet0/1` interface are blocked.

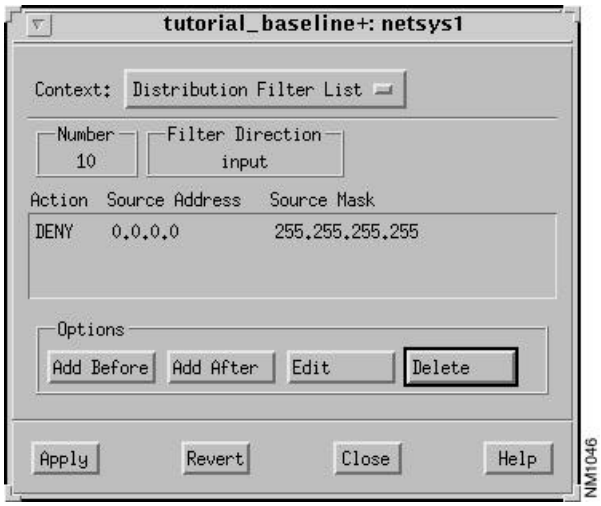

Figure 9-45 Distribution Filter List Window

Step 6 Repeat the previous steps using the **netsys1** EIGRP 109 Algorithm window.

As the **netsys1** and **netsys9a** routers pass routing updates via the EIGRP 109 routing algorithm as well as the IGRP 109 routing algorithm, the same interface added to the **netsys1 IGRP 109 Distribution List** must be added to the **netsys1 EIGRP 109 Distribution List**.

Step 7 Click on the **Analysis** button in the Connectivity Tools window.

Step 8 Click on the entry with the source name **netsys9d** and destination name **netsys9a.**

The new path is highlighted in the Topology window, as shown in Figure 9-46.

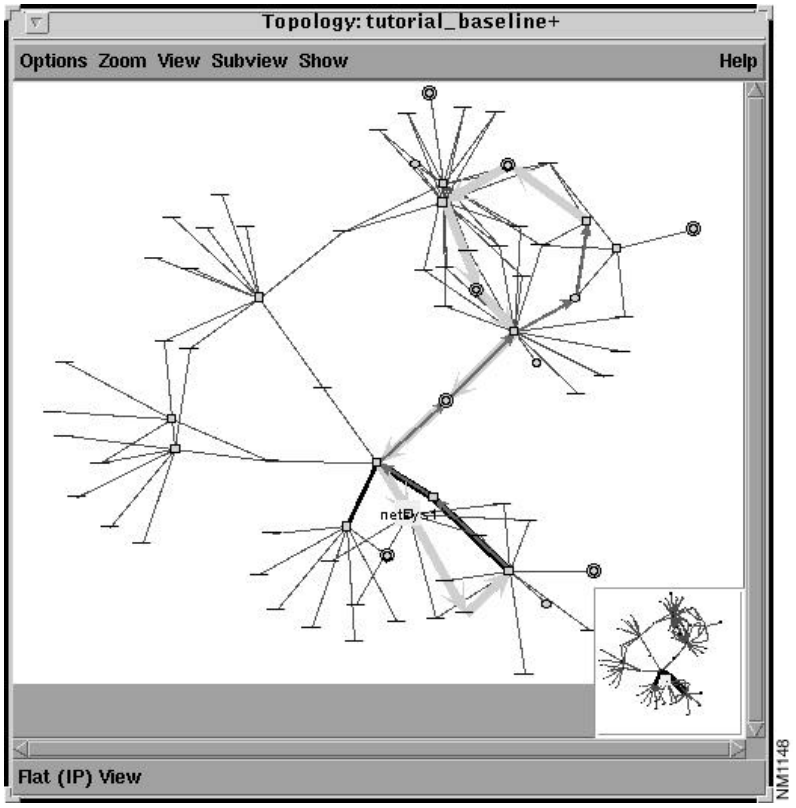

Figure 9-46 Topology Window: Distribution Filter List Modified

Step 9 Examine the updated Round Trip Path window to verify the new path to the destination.

Step 10 Inspect the **netsys1** IP Routing Table window to verify the updated destination network `199.35.36.0` entry.

The **netsys1** Routing Table Window is displayed in Figure 9-47. Note the **netsys1** `Ethernet0/4` interface is now used as the forwarding interface to destination network `199.35.36.0` instead of the `Ethernet0/1` interface. `Ethernet0/1` now filters out all incoming route updates.

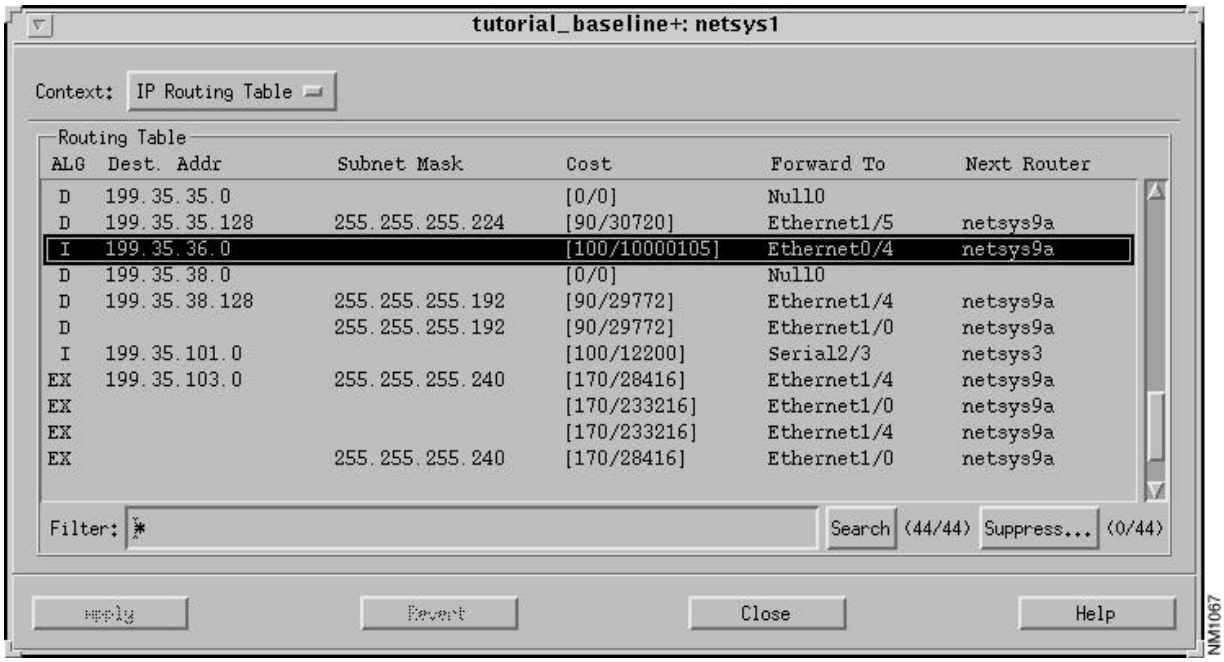

Figure 9-47 Modified netsys1 Routing Table Window