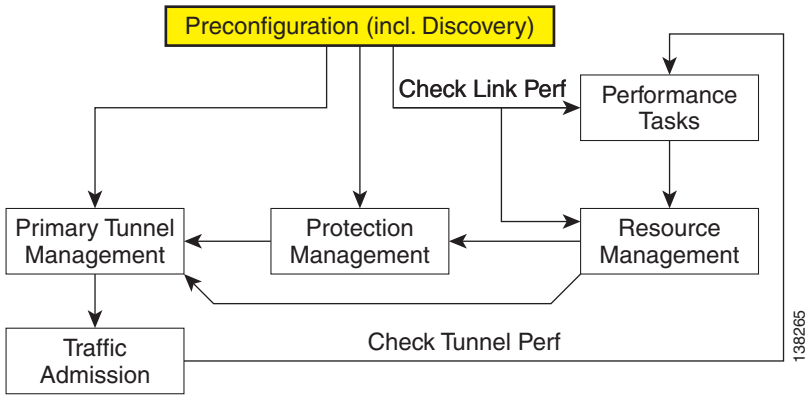
CHAPTER 2

TE Network Discovery

After completing the preconfiguration process and creating a seed router, you can discover the TE network for a particular TE provider. This populates the repository with the network topology. Also, you might need to set up the management interfaces. The necessary steps are described in this chapter.

The highlighted box in Figure 2-1 shows where in TEM the preconfiguration steps takes place.

Figure 2-1 TEM Process Diagram - Preconfiguration



This chapter includes the following sections:

Overview

The purpose of the TE discovery process is to populate the repository with the TE topology, TE tunnels, explicit paths, and static routes to tunnels present in the live network.

The TE discovery process uses a seed device to discover the MPLS TE network topology using either Telnet or SSH. All the Traffic Engineering routers in the network should be accessible via their TE ID.

TE Discovery is a schedulable task that can be run once or on a periodic basis. Any inconsistencies between the repository and the network are reported in the Discovery log. The service state information is updated incrementally by logging tunnel in-use Label Switched Paths (LSPs) and updating the service request (SR) state.

TE Discovery Prerequisites and Limitations

The following prequisites apply mainly to TE discovery.

For an overview of the general TEM prerequisites and limitations, see Prerequisites and Limitations, page 1-2.

Accessing TE Routers for TE Discovery

To successfully run a **TE Discovery** task, the seed router must be directly accessible from the management station.

ALL TE routers must be accessible from the ISC machine via their TE router ID. This is often the loopback IP address, but not always.

For Telnet/SSH, there must be direct Telnet/SSH access from the Cisco IP Solution Center Traffic Management (TEM) management station to each device.

See Preconfiguration Process Overview, page 1-4 for instructions on how to select Telnet or SSH when setting up a seed router.

Note After performing a TE discovery, it is recommended that you do not manually reconfigure RSVP graceful restart on the device. This affects the synchronization with the database and can cause deployment failure, in which case a new TE discovery needs to be performed.

Memory Shortage on Large Networks

When running TE Discovery on a large network (250+ devices or 5000+ tunnels, for example) or an OutOfMemoryException is encountered, do the following:

Step 1 Choose **Administration > Control Center > Hosts**

Step 2 Select a host and click the **Config** button.

Step 3 Select **watchdog > server > worker > java > flags**

Step 4 Change the first part of the property string, for example to **-Xmx1024m** instead of the default value **-Xmx512m**.

This increases the heap size of the **TE Discovery** task, which will clear up the OutOfMemoryException problem.

Step 5 Revert the **watchdog.server.worker.java.flags** property back to its original value to reduce the resource usage when no longer needed.

Note Alternatively, the same memory increase can be achieved by editing the **watchdog.server.worker.java.flags** property in the **vpnsc.properties** file.

IOS XR and Enable Passwords

If an IOS XR device is to be used as a seed device, the enable password should be set in its device record even though IOS XR does not require an enable password,for itself. That way IOS devices in the network, which do require an enable password, can be fully discovered.

When creating an IOS XR device through the **Devices** tab (**Service Inventory > Inventory and Connection Manager > Devices**) to act as a seed device for an initial discovery, it is strictly speaking not necessary to specify the enable password - Cisco ISC TEM will be able to log in and get all the data it needs.

However, if there are other IOS devices in the same network, Cisco ISC TEM will not be able to enter enable mode for those devices. As a result, these are not fully discovered in the sense that the inability to enter enable mode stops Cisco ISC TEM from gathering all the relevant data. These other IOS routers will show up as '**unknown**' devices in the **Devices** window.

Limitations

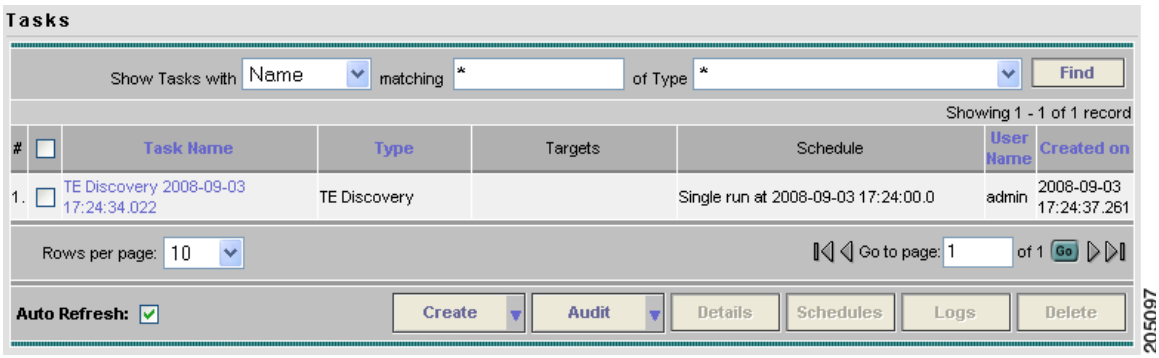
Simultaneous TE discovery is not supported. Only one user can run a **TE Discovery** task at a time.

Creating a TE Discovery Task

To create a TE Discovery task on the TE network, use the following steps:

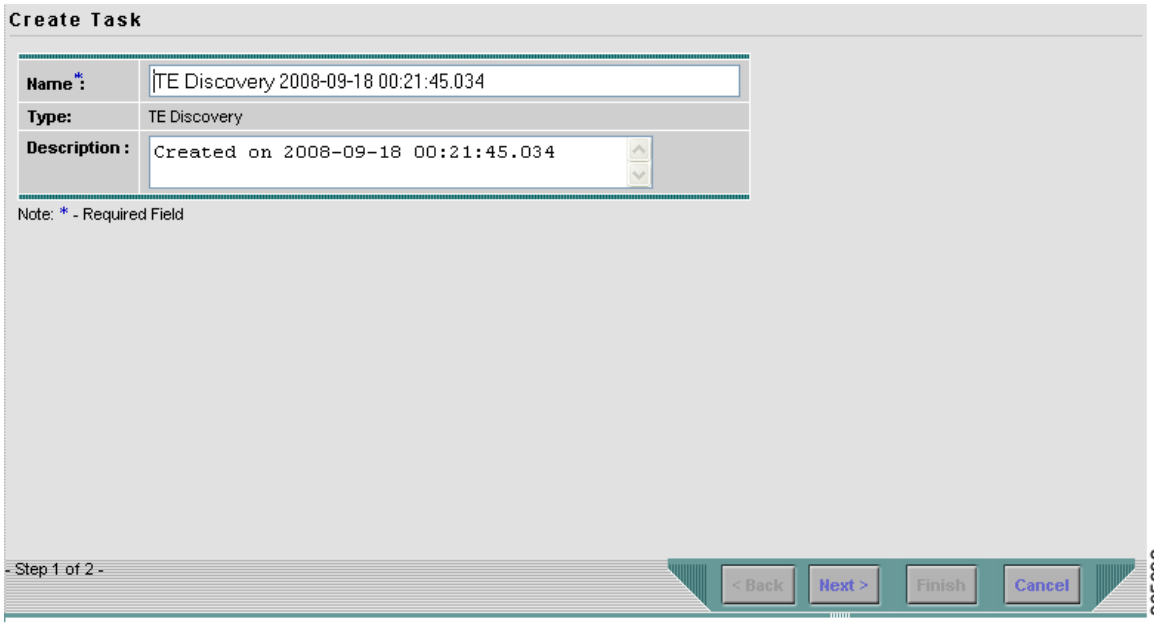
Step 1 Choose **Monitoring > Task Manager**. The window in Figure 2-2 appears.

Figure 2-2 Tasks



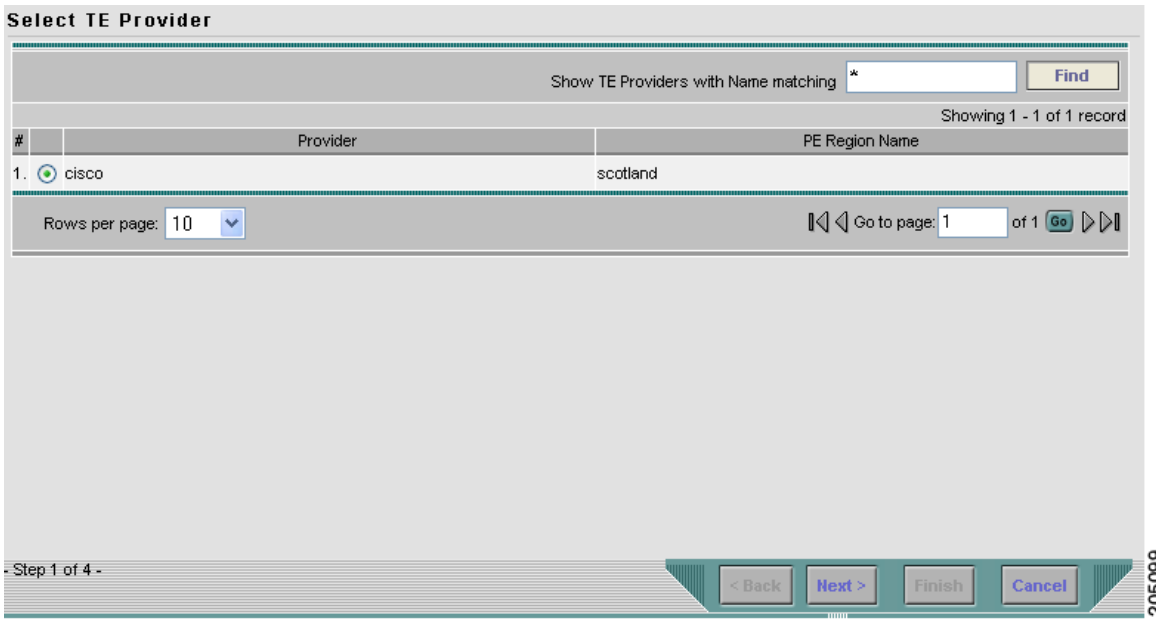
Step 2 Create a new task by selecting **Create > TE Discovery**. The window in Figure 2-3 appears.

Figure 2-3 Create TE Discovery Task (Step 1)



Step 3 Optionally alter the **Name** and/or **Description** fields and click **Next**. The Select TE Provider window in Figure 2-4 appears.

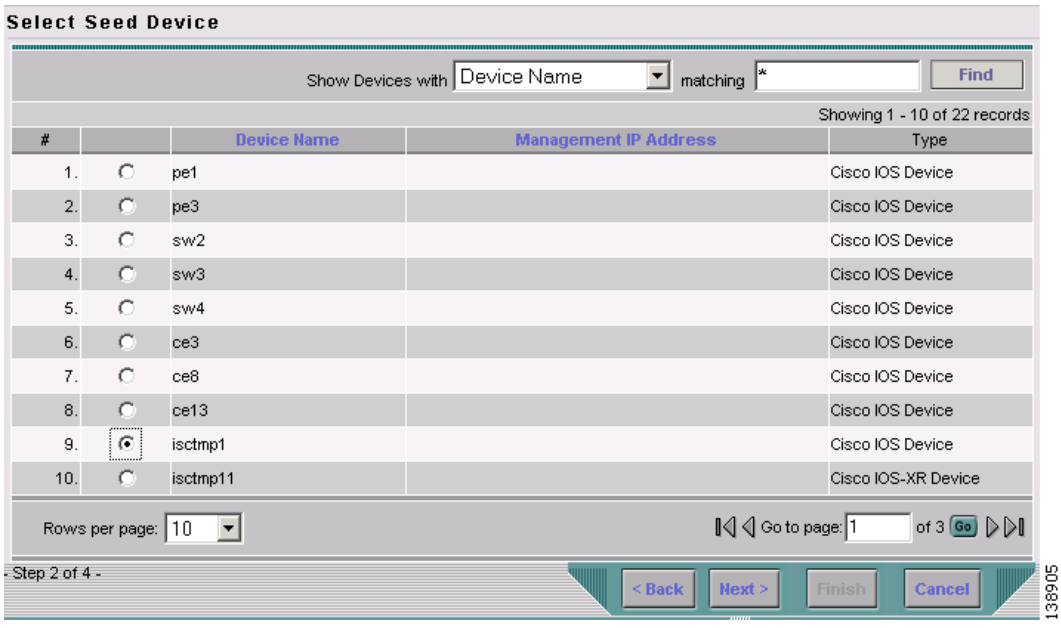
Figure 2-4 Select TE Provider



Step 4 Select a TE provider and click **Next**.

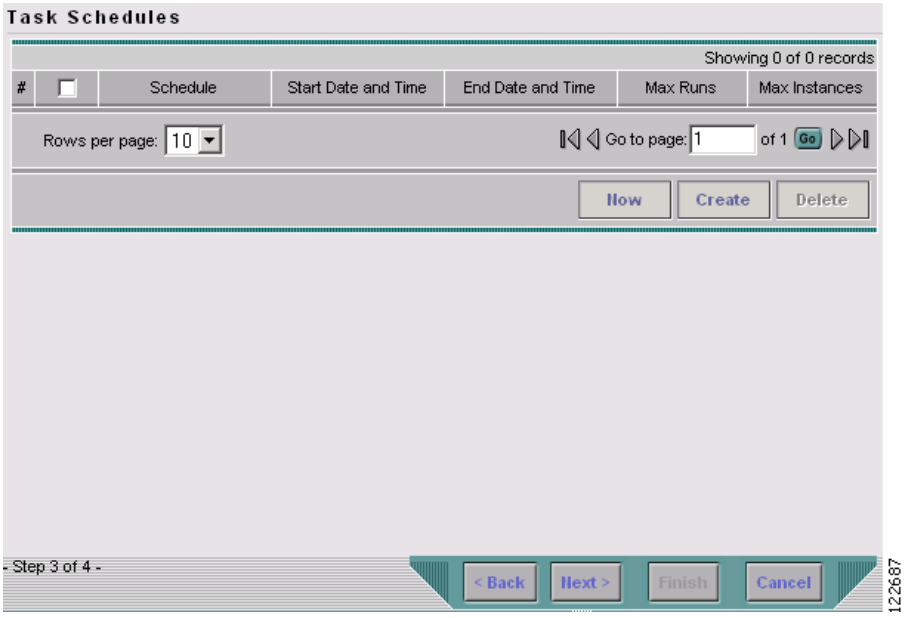
The Select Seed Device window in Figure 2-5 appears. Non-Cisco devices, if any, are excluded from the list.

Figure 2-5 Select Seed Device



Step 5 Select the seed device for discovering the network and click **Next**. The Task Schedules window in Figure 2-6 appears.

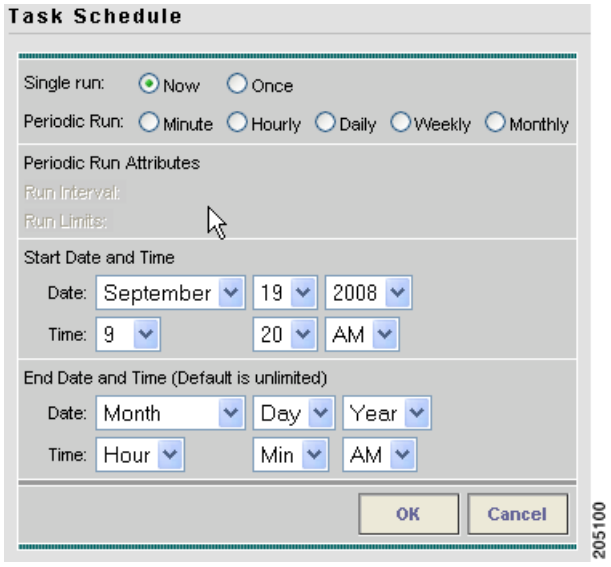
Figure 2-6 TE Discovery Task Schedules Window Before Scheduling



Step 6 Create a task schedule in one of two ways:

- Click **Now** to schedule the task to run immediately, in which case the schedule information is automatically filled into the Task Schedules list (Figure 2-8).
- Click **Create** to create a scheduler for this task, in which case the Task Schedule window in Figure 2-7 appears.

Figure 2-7 Task Schedule



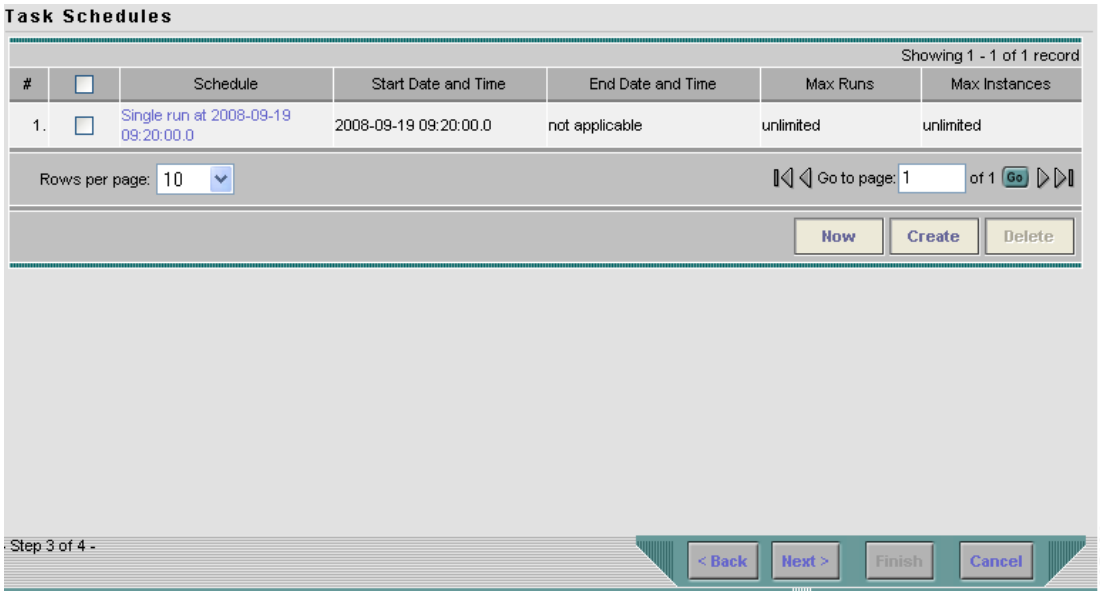
Step 7 In the Task Schedule window, make your selections to define when and how often the task should be run.

Note The default setting is to schedule a single **TE Discovery** task to take place immediately ("**Now**").

Step 8 Click **OK**.

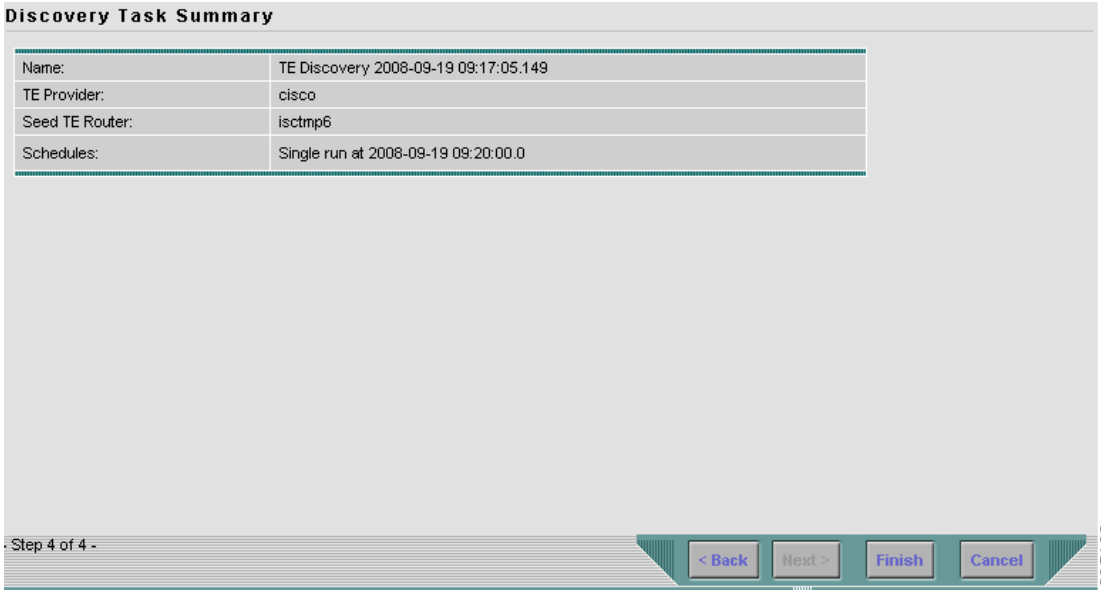
The scheduled task should now appear in the Task Schedules table as shown in Figure 2-8.

Figure 2-8 TE Discovery Task Schedules Window After Scheduling



Step 9 Click **Next**. A summary of the scheduled task in Figure 2-9 appears.

Figure 2-9 Discovery Task Summary



Step 10 Click **Finish**. This will add the task to the list of created tasks in the Tasks window (Figure 2-2).

Managing Per Area Discovery

Before running a per area TE discovery, it is helpful to understand how multiple OSPF areas are managed by TEM.

For background information on this topic, see Multiple OSPF Areas, page F-5.

This section describes the following:

- Performing a Per Area TE Discovery, page 2-8
- Running a Per Area TE Discovery Through an ABR, page 2-8.

Performing a Per Area TE Discovery

When a TE Discovery is run against an area with a selected TE provider, all tunnels and explicit paths associated with that area will be imported into the ISC database.

To initiate a per area TE discovery:

Step 1 Create an ISC Provider.

Step 2 Create an ISC Region.

Step 3 Create a TE Provider.

Step 4 Create a seed device from the Devices window.

Step 5 Choose Monitoring > Task Manager > Create > TE Discover.

Specify a name for the TE Discovery or accept the default and press **Next**.

Step 6 Select a TE Provider and press **Next**.

Step 7 Select a seed device and press **Next**.

Step 8 Select a schedule for the TE Discovery and press **Next**.

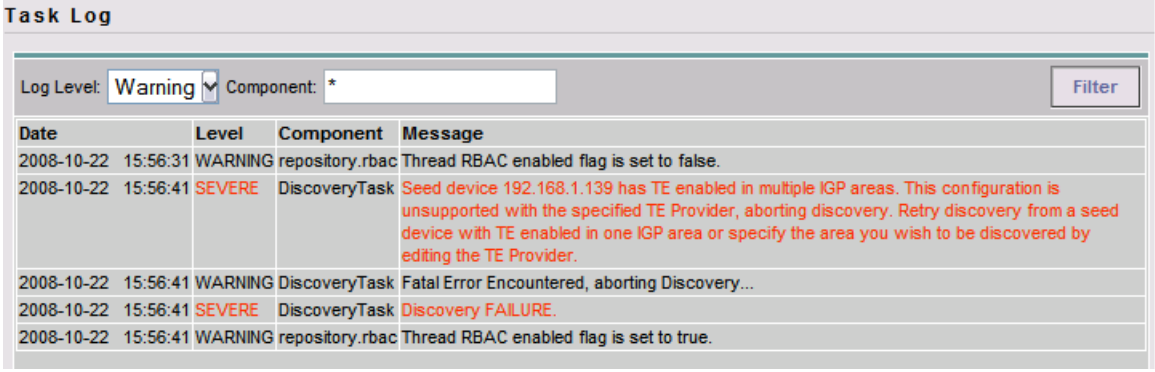
Step 9 Review the summary of the disccovery task.

If it is acceptable, press **Finish** to start the TE Discovery process.

Running a Per Area TE Discovery Through an ABR

If no area identifier is specified in the TE provider configuration and the seed device is an ABR, TE Discovery will abort with the warning message shown in Figure 2-10 informing you to either specify an area identifier for the TE provider or use a non-ABR device as the seed.

Figure 2-10 TE Discovery Through an ABR with no TE Area Identifier Specified



Verifying a TE Discovery Task

The result of running the **TE Discovery** task can be assessed in four ways:

- Task Logs—View a summary log of any changes that have occured in the network.
- TE Topology—Display the latest TE Topology from the repository.
- View Network Element Types—In the Traffic Engineering Management GUI, go to **TE Nodes**, **TE Links**, **TE Primary Tunnels**, and so on to verify the state of specific network element types.
- Viewing the state of discovered devices—Go to the Service Requests window to examine whether the state of the discovered devices is as expected.

Task Logs

The TE Discovery log captures the state of the network and compares it with the most recent snapshot of the repository.

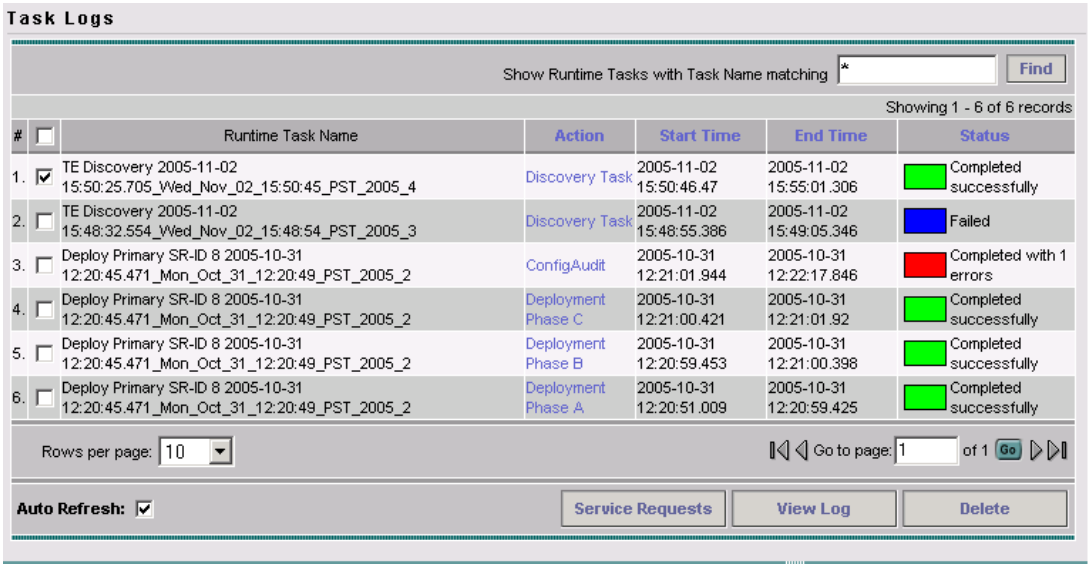
To view the task log for a **TE Discovery** task, use the following steps:

Step 1 Choose **Monitoring** > **Task Manager**.

Step 2 Select **Logs** in the table of contents on the left side of the Tasks window.

The Task Logs window in Figure 2-11 appears.

Figure 2-11 Task Logs - TE Discovery



For an explanation of the various window elements, see TE Task Logs, page B-67.

The status of each task is shown in **Status** column. This updates automatically and indicates when the TE Discovery process is complete.

If the task is not completed and **Auto Refresh** is selected, the table continues to update periodically until it is completed.

Step 3 To view the log for a particular task, click the log name in the **Action** column.

A copy of a TE Discovery log is shown in the following screenshots, starting with Figure 2-12.

Note To find the summary of changes in the network depicted in the following screenshots, scroll to the bottom of the log.

Figure 2-12 TE Discovery Task Log - Devices/Interfaces

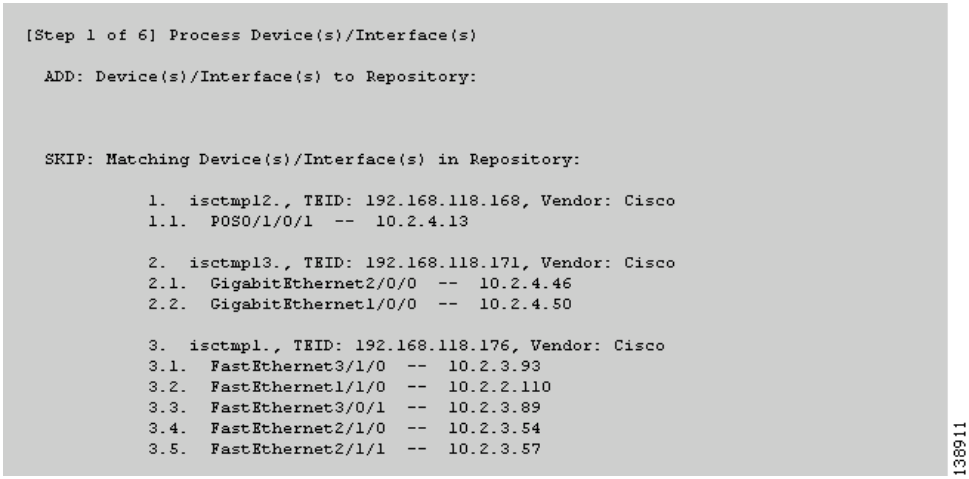


Figure 2-13 TE Discovery Task Log - Links

```
[Step 2 of 6] Process Link(s)

  ADD: Link(s) to Repository:


  SKIP: Matching Link(s) in Repository:

           1.  10.2.4.6  --  10.2.4.5
           2.  10.2.4.10  --  10.2.4.9
           3.  10.2.4.14  --  10.2.4.13
           4.  10.2.4.22  --  10.2.4.21
           5.  10.2.4.49  --  10.2.4.50
           6.  10.2.4.29  --  10.2.4.30
           7.  10.2.4.46  --  10.2.4.45
           8.  10.2.4.53  --  10.2.4.54
           9.  10.2.3.93  --  10.2.3.94
           10.  10.2.2.161  --  10.2.2.174
           11.  10.2.2.110  --  10.2.2.97
           12.  10.2.2.129  --  10.2.2.142
           13.  10.2.2.145  --  10.2.2.158
```

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Figure 2-14 TE Discovery Task Log - Explicit Paths

```
[Step 3 of 6] Process Explicit Path(s)

  ADD: Explicit Path(s) to Repository:

           1.  isctmpl1.
           1.1.  pl1-p8: 10.2.4.5 :
           1.2.  pl1-pl2-p7-p8: 10.2.4.14 : 10.2.4.29 : 10.2.3.49 :
           1.3.  isctmpl1-isctmp8-1: 10.2.4.13 : 10.2.4.30 : 10.2.2.126 :
           1.4.  isctmpl1-isctmpl2-1: 10.2.4.9 :

           2.  isctmpl0.
           2.1.  pl0-pl2-pl1: 10.2.4.21 : 10.2.4.10 :
           2.2.  pl0-pl2-p7-p1: 10.2.4.21 : 10.2.4.30 : 10.2.2.110 :
           2.3.  loopback-pl0-pl2-pl1: 192.168.118.168 : 192.168.118.166 :

           3.  isctmpl2.
           3.1.  pl2-p7-p8-pl1: 10.2.4.30 : 10.2.2.126 : 10.2.4.6 :
           3.2.  isctmpl2-isctmp5-1: 10.2.4.50 : 10.2.4.54 : 10.2.2.81 :

           4.  isctmp8.
           4.1.  isctmp8-isctmp7-1: 10.2.2.113 :
```

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Figure 2-15 TE Discovery Task Log - Primary Tunnels

```
[Step 4 of 6] Process Primary Tunnel(s)

  ADD: Primary Tunnel(s) to Repository:

           1.  tunnel-te2 : isctmpl1  --  isctmpl0
           2.  tunnel-te1000 : isctmpl1  --  isctmpl
           3.  tunnel-te1 : isctmpl0  --  isctmp6
           4.  tunnel-te2 : isctmpl0  --  isctmpl
           5.  tunnel-te133 : isctmpl2  --  isctmp7
           6.  tunnel-te212 : isctmpl2  --  isctmp7
           7.  tunnel-te1000 : isctmpl2  --  isctmp2
           8.  tunnel-te1001 : isctmpl2  --  isctmp2
           9.  Tunnel2 : isctmpl  --  isctmp8
           10.  Tunnel3 : isctmpl  --  isctmp5
           11.  Tunnel138 : isctmpl  --  isctmp3
           12.  Tunnel300 : isctmpl  --  isctmp2
           13.  Tunnel1000 : isctmpl  --  isctmpl1
           14.  Tunnel2000 : isctmpl  --  isctmp2


  SKIP: Matching Primary Tunnel(s) in Repository:
```

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Figure 2-16 TE Discovery Task Log - Backup Tunnels

```
[Step 5 of 6] Process Backup Tunnel(s)

  ADD: Backup Tunnel(s) to Repository:

            1.  tunnel-tel002 : isctmpl1  --  isctmp8
            2.  tunnel-tel005 : isctmpl1  --  isctmpl2
            3.  tunnel-tel000 : isctmpl2  --  isctmp5


  SKIP: Matching Backup Tunnel(s) in Repository:


  MISSING: Backup Tunnel(s) from Network but Found in Repository:

            1.  tunnel-te3 : isctmpl1  --  isctmpl2
            2.  tunnel-tel001 : isctmpl1  --  isctmp8
            3.  Tunnel2 : isctmpl3  --  isctmpl2
            4.  Tunnel1 : isctmpl  --  isctmp2
            5.  Tunnel4 : isctmpl  --  isctmp2
            6.  Tunnel5 : isctmpl  --  isctmp3
```

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Figure 2-17 TE Discovery Task Log - Static Routes

```
[Step 6 of 6] Process Static Route(s)

  ADD: Static Route(s) to Repository:

            1.  isctmpl1
            1.1.  1.2.3.4 [255.255.255.255] --  tunnel-tel000
            1.2.  10.2.4.5 [255.255.255.255] --  tunnel-tel004


  SKIP: Matching Static Route(s) in Repository:


  MISSING: Static Route(s) from Network but Found in Repository:

            1.  isctmpl0
            1.1.  3.3.3.3 [255.255.255.255] --  tunnel-tel  --  distance  --  10

            2.  isctmpl
            2.1.  3.3.3.3 [255.255.255.255] --  Tunnel2  --  distance  --  10
```

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The TE Discovery task log window is organized into sections that each describes particular events in the TE network:

- either the state of the network as recorded in the repository the first time a **TE Discovery** task is run
- or changes in the network since the last time the **TE Discovery** task was run (repository delta).

The summary of changes in the network is reported in six steps:

1. Devices/Interfaces (Figure 2-12)
2. Links (Figure 2-13)
3. Explicit paths (Figure 2-14)
4. Primary tunnels (Figure 2-15)
5. Backup tunnels (Figure 2-16)
6. Static routes (Figure 2-17).

As seen in the figures, in each step a log table reports the changes in the following reporting categories:

- **ADD**—This section lists those elements that the **TE Discovery** task added to the repository. At the initial discovery, all elements should be in the ADD section as nothing existed in the repository beforehand. With every subsequent discovery, the ADD section will list elements that have been added to the network since the discovery independent of Cisco ISC TEM. Thus, the ADD function is synchronizing the repository with the network by adding these elements.
- **SKIP**—This section lists those elements that exist both in the network and in the repository and have all attributes equal. This shows that these elements have not been deleted or modified independently of Cisco ISC TEM.
- **MISSING**—This section lists those elements that exist in the repository but do not exist in the network, implying that they have been deleted independently of Cisco ISC TEM. This indicates that more investigation is required to correct the discrepancy.
- **MISMATCH**—This section lists those elements that exist both in the network and in the repository, but have one or more attributes that are not equal. This implies that these elements have been modified independently of Cisco ISC TEM and that you need to investigate and correct the problem.
- **MODIFY**—This section lists any network elements that have had attributes in the repository modified since the previous run of the **TE Discovery** task to synchronize with the network. These are usually dynamic attributes, such as the time when a tunnel was set up.

Step 4 Click **Return to Logs** to quit the current log with the option to open another log.

TE Topology

The TE Topology tool provides a visual snapshot of the current state of the network. It cannot be used to determine changes that have taken place in the network.

The steps required to generate a topology graph of the network are described in Chapter 10, "TE Topology."

View Network Element Types

Another way to check the state of the network after running TE discovery is to go to the Traffic Engineering Management Services window and select the type of elements you want to verify.

For example, to check the status of the nodes after running TE discovery, choose **Service Inventory > Inventory and Connection Manager > Traffic Engineering Management > TE Nodes**. Look at the updated list of TE nodes to assess which nodes are in the network.

Do the same for TE Links, TE Primary Tunnels, TE Backup Tunnels, and so on.

Setting Up Management Interfaces

Before commencing tunnel management operations, you need to set up management interfaces. However, this step is only necessary if the network devices are not accessible by the hostname from the management station.

For a detailed description of how to set up management interfaces on specific devices, see the *Cisco IP Solution Center Infrastructure Reference, 5.1* in the section on creating devices.

MPLS-TE Management Process

The MPLS-TE management process involves the following steps:

1. Enable MPLS-TE on the network devices and make sure that the IP addresses used as the devices TE IDs are accessible from the management station (this step is not supported by Cisco ISC TEM).
2. Prepare the repository for discovering MPLS-TE network.
3. Set up management interfaces for the discovered devices or update the server host file with resolution for all discovered devices. Again, this is not needed if the hostnames are already accessible from the management station.
4. Discover the MPLS-TE network.

You will then be in a position to run the other MPLS-TE functions available in Cisco ISC TEM.

Note When the repository is empty, or when the management IP addresses are not configured for current devices in the TE network, make sure that the router MPLS TE ID can be reached from the management station. In other words, the TE discovery process does not support seed passthrough.

Configuring Ethernet Links

Only point-to-point links are supported in Cisco ISC TEM. POS links are point-to-point by default but otherwise Ethernet links need to be configured as point-to-point.

For IOS, enter the following command:

```
(config-if)# ip ospf network point-to-point
```

For IOS XR, enter the following command:

```
# router ospf <id> area <area identifier> interface <name> network point-to-point
```