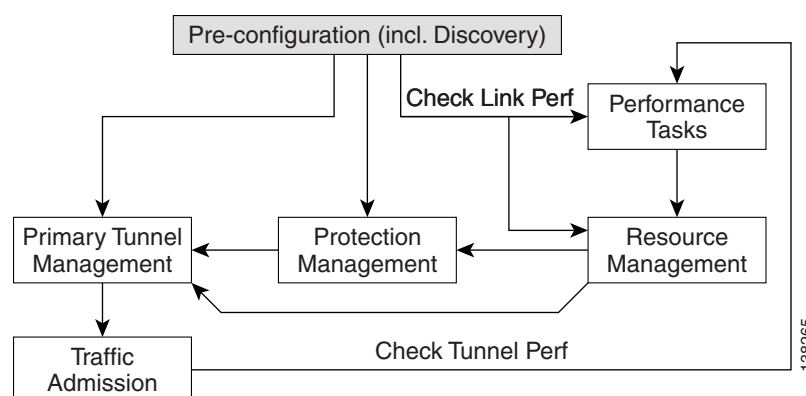




TE Network Discovery



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.

This chapter includes the following sections:

- [Overview, page 3-2](#)
- [TE Discovery Prerequisites, page 3-2](#)
 - [Accessibility, page 3-2](#)
 - [Memory Shortage on Large Networks, page 3-2](#)
 - [IOS-XR and Enable Passwords, page 3-2](#)
- [Creating a TE Discovery Task, page 3-3](#)
- [Verifying a TE Discovery Task, page 3-7](#)
 - [Task Logs, page 3-7](#)
 - [TE Topology, page 3-11](#)
 - [View Network Element Types, page 3-11](#)
- [Setting Up Management Interfaces, page 3-11](#)
 - [MPLS-TE Management Process, page 3-12](#)
 - [Making SSH Work With IOS-XR, page 3-12](#)
 - [Configuring Ethernet Links, page 3-12](#)

Overview

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

The 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 if the device entry does not exist in the repository. The Management IP address will be used to access the device if the device entry exists in the Repository.

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

The following prerequisites apply mainly to TE discovery.

For an overview of the general ISC TEM prerequisites, see [Prerequisites and Limitations, page 2-2](#).

Accessibility

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 a loopback ip address, but not always.

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

See [Preconfiguration Process Overview, page 2-3](#) for instructions on how to select Telnet or SSH when setting up a seed router.

Memory Shortage on Large Networks

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

Edit the `watchdog.server.worker.java.flags` property in the `vpnsc.properties` file to a value, for example `-Xmx1024m`, instead of the default value `-Xmx512m`. This increases the heap size of the discovery task, which will clear up the `OutOfMemoryException` problem.

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

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, may 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 - 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, 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 ISC TEM from gathering all the relevant data. These other IOS routers will show up as **'unknown'** devices in the **Devices** window).

Creating a TE Discovery Task

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

- Step 1** Navigate **Monitoring > Task Manager**. The window in [Figure 3-1](#) appears.

Figure 3-1 Tasks

The screenshot shows the Cisco IP Solution Center interface. The top navigation bar includes tabs for Service Inventory, Service Design, Monitoring, Diagnostics, and Administration. The 'Monitoring' tab is selected, and the 'Task Manager' sub-tab is active. The main content area displays a table of tasks. The table has columns for Task Name, Type, Targets, Schedule, User Name, and Created on. Two tasks are listed: 'TE Interface Performance 2005-10-24 22:57:59.074' and 'TE Discovery 2005-10-20 17:54:27.684'. The 'TE Discovery' task is highlighted. The page also includes a search bar, a 'Find' button, and a 'Go to page' dropdown.

#	Task Name	Type	Targets	Schedule	User Name	Created on
1.	TE Interface Performance 2005-10-24 22:57:59.074	TE Interface Performance	TeLink:10.2.4.14<->10.2.4.13 TeLink:10.2.3.54<->10.2.3.53	Single run at 2005-10-24 23:00:00.0	admin	2005-10-24 22:58:02.562
2.	TE Discovery 2005-10-20 17:54:27.684	TE Discovery		Single run at 2005-10-20 17:54:00.0	admin	2005-10-20 17:54:27.684

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

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

Create Task

Name *: TE Discovery 2005-10-24 23:12:09.646

Type: TE Discovery

Description: Created on 2005-10-24 23:12:09.646

Note: * - Required Field

- Step 1 of 2 -

< Back Next > Finish Cancel

Step 3 Optionally alter the **Name** and/or **Description** fields and click **Next**. The Select TE Provider window in [Figure 3-3](#) appears.

Figure 3-3 Select TE Provider

Select TE Provider

Show TE Providers with Name matching * Find

Showing 1 - 1 of 1 record

#	Provider Name	PE Region Name
1.	Provider2	region_2

Rows per page: 10 Go to page: 1 of 1 Go

- Step 1 of 4 -

< Back Next > Finish Cancel

Step 4 Select a TE provider and click **Next**. The Select Seed Device window in [Figure 3-4](#) appears. Non-Cisco devices, if any, are excluded from the list.

Figure 3-4 **Select Seed Device**

Select Seed Device

Show Devices with matching

Showing 1 - 10 of 22 records

#		Device Name	Management IP Address	Type
1.	☐	pe1		Cisco IOS Device
2.	☐	pe3		Cisco IOS Device
3.	☐	sw2		Cisco IOS Device
4.	☐	sw3		Cisco IOS Device
5.	☐	sw4		Cisco IOS Device
6.	☐	ce3		Cisco IOS Device
7.	☐	ce8		Cisco IOS Device
8.	☐	ce13		Cisco IOS Device
9.	☒	isctmp1		Cisco IOS Device
10.	☐	isctmp11		Cisco IOS-XR Device

Rows per page:

Step 2 of 4 -

- Step 5** Select the seed device for discovery of the network and click **Next**. The Task Schedules window in [Figure 3-5](#) appears.

Figure 3-5 **TE Discovery Task Schedules Window Before Scheduling**

Task Schedules

Showing 0 of 0 records

#	☐	Schedule	Start Date and Time	End Date and Time	Max Runs	Max Instances
---	--------------------------	----------	---------------------	-------------------	----------	---------------

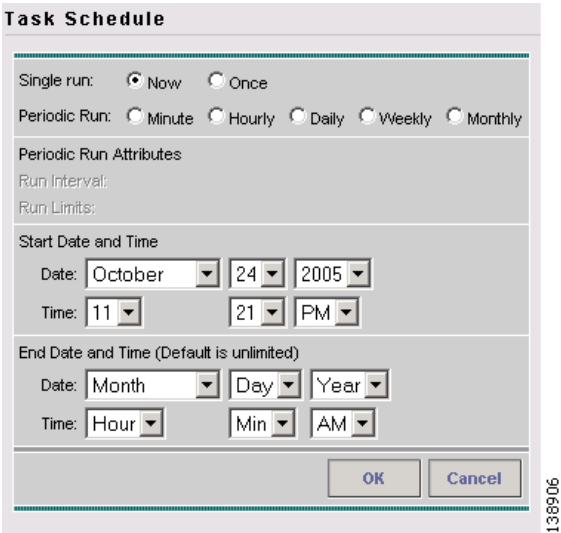
Rows per page:

Step 3 of 4 -

- 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 3-7](#)).

- Click **Create** to create a scheduler for this task, in which case the Task Schedule window in [Figure 3-6](#) appears.

Figure 3-6 Task Schedule



The Task Schedule dialog box contains the following sections:

- Single run:** Radio buttons for **Now** (selected) and **Once**.
- Periodic Run:** Radio buttons for **Minute**, **Hourly**, **Daily**, **Weekly**, and **Monthly**.
- Periodic Run Attributes:**
 - Run Interval:** (Label)
 - Run Limit:** (Label)
- Start Date and Time:**
 - Date:** Month (October), Day (24), Year (2005)
 - Time:** Hour (11), Min (21), AM/PM (PM)
- End Date and Time (Default is unlimited):**
 - Date:** Month, Day, Year
 - Time:** Hour, Min, AM/PM
- Buttons:** OK, Cancel

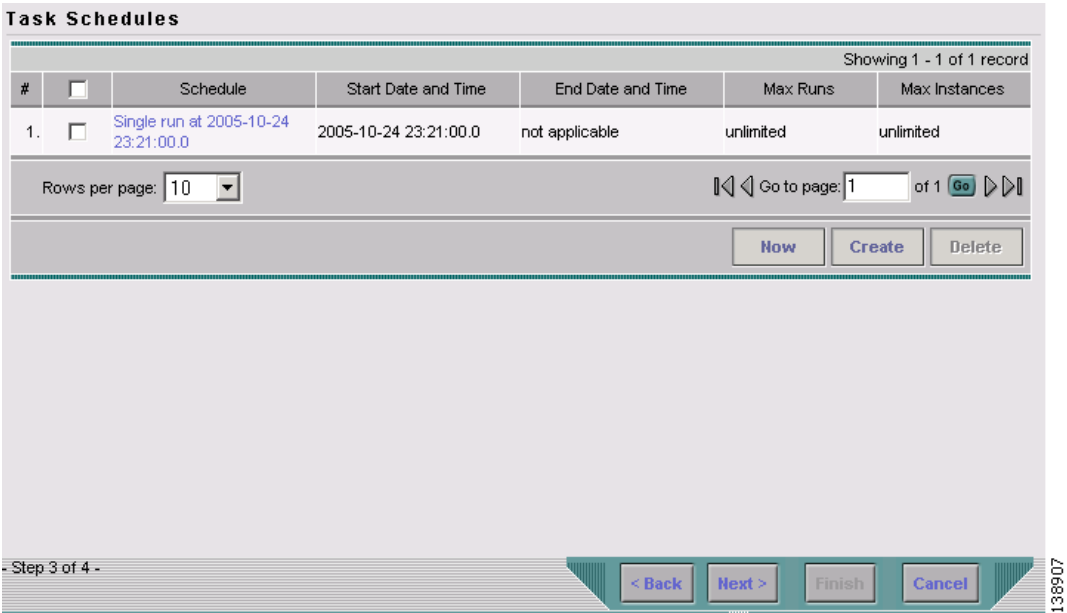
Step 7 In the Task Schedule window, make your selections to define when and how often the task should be run.



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 3-7](#).

Figure 3-7 TE Discovery Task Schedules Window After Scheduling



The Task Schedules window displays a table with the following data:

#	☐	Schedule	Start Date and Time	End Date and Time	Max Runs	Max Instances
1.	☐	Single run at 2005-10-24 23:21:00.0	2005-10-24 23:21:00.0	not applicable	unlimited	unlimited

Below the table, there is a "Rows per page" dropdown set to 10, a "Go to page: 1 of 1" field with a "Go" button, and buttons for "Now", "Create", and "Delete".

At the bottom, there is a status bar showing "Step 3 of 4" and navigation buttons: "< Back", "Next >", "Finish", and "Cancel".

Step 9 Click **Next**. A summary of the scheduled task in [Figure 3-8](#) appears.

Figure 3-8 *Discovery Task Summary*

Discovery Task Summary	
Name:	TE Discovery 2005-10-24 23:12:09.646
TE Provider:	Provider2
Seed TE Router:	isctmp1
Schedules:	Single run at 2005-10-24 23:21:00.0

- Step 4 of 4 -

< Back Next > Finish Cancel

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Step 10 Click **Finish**. This will add the task to the list of created tasks in the Tasks window ([Figure 3-1](#)).

Verifying a TE Discovery Task

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

- [Task Logs](#)—View a summary log of any changes that have occurred 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.

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 Navigate **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 3-9](#) appears.

Figure 3-9 Task Logs - TE Discovery

Task Logs

Show Runtime Tasks with Task Name matching

Showing 1 - 6 of 6 records

#	☐	Runtime Task Name	Action	Start Time	End Time	Status
1.	☒	TE Discovery 2005-11-02 15:50:25.705_Wed_Nov_02_15:50:45_PST_2005_4	Discovery Task	2005-11-02 15:50:46.47	2005-11-02 15:55:01.306	Completed successfully
2.	☐	TE Discovery 2005-11-02 15:48:32.554_Wed_Nov_02_15:48:54_PST_2005_3	Discovery Task	2005-11-02 15:48:55.386	2005-11-02 15:49:05.346	Failed
3.	☐	Deploy Primary SR-ID 8 2005-10-31 12:20:45.471_Mon_Oct_31_12:20:49_PST_2005_2	ConfigAudit	2005-10-31 12:21:01.944	2005-10-31 12:22:17.846	Completed with 1 errors
4.	☐	Deploy Primary SR-ID 8 2005-10-31 12:20:45.471_Mon_Oct_31_12:20:49_PST_2005_2	Deployment Phase C	2005-10-31 12:21:00.421	2005-10-31 12:21:01.92	Completed successfully
5.	☐	Deploy Primary SR-ID 8 2005-10-31 12:20:45.471_Mon_Oct_31_12:20:49_PST_2005_2	Deployment Phase B	2005-10-31 12:20:59.453	2005-10-31 12:21:00.398	Completed successfully
6.	☐	Deploy Primary SR-ID 8 2005-10-31 12:20:45.471_Mon_Oct_31_12:20:49_PST_2005_2	Deployment Phase A	2005-10-31 12:20:51.009	2005-10-31 12:20:59.425	Completed successfully

Rows per page:

Auto Refresh: ☒

For an explanation of the various window elements, see [Task Log, page A-68](#).

The status of each task is shown in **Status** column. This updates automatically and indicates when the 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 3-10](#).



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

Figure 3-10 TE Discovery Task Log - Devices/Interfaces

```
[Step 1 of 6] Process Device(s)/Interface(s)

ADD: Device(s)/Interface(s) to Repository:

SKIP: Matching Device(s)/Interface(s) in Repository:

1. isctmpl2., TEID: 192.168.118.168, Vendor: Cisco
1.1. POS0/1/0/1 -- 10.2.4.13

2. isctmpl3., TEID: 192.168.118.171, Vendor: Cisco
2.1. GigabitEthernet2/0/0 -- 10.2.4.46
2.2. GigabitEthernet1/0/0 -- 10.2.4.50

3. isctmpl., TEID: 192.168.118.176, Vendor: Cisco
3.1. FastEthernet3/1/0 -- 10.2.3.93
3.2. FastEthernet1/1/0 -- 10.2.2.110
3.3. FastEthernet3/0/1 -- 10.2.3.89
3.4. FastEthernet2/1/0 -- 10.2.3.54
3.5. FastEthernet2/1/1 -- 10.2.3.57
```


Figure 3-11 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 3-12 TE Discovery Task Log - Explicit Paths

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

ADD: Explicit Path(s) to Repository:

1. isctmp11.
1.1. p11-p8: 10.2.4.5 :
1.2. p11-p12-p7-p8: 10.2.4.14 : 10.2.4.29 : 10.2.3.49 :
1.3. isctmp11-isctmp8-1: 10.2.4.13 : 10.2.4.30 : 10.2.2.126 :
1.4. isctmp11-isctmp12-1: 10.2.4.9 :

2. isctmp10.
2.1. p10-p12-p11: 10.2.4.21 : 10.2.4.10 :
2.2. p10-p12-p7-p1: 10.2.4.21 : 10.2.4.30 : 10.2.2.110 :
2.3. loopback-p10-p12-p11: 192.168.118.168 : 192.168.118.166 :

3. isctmp12.
3.1. p12-p7-p8-p11: 10.2.4.30 : 10.2.2.126 : 10.2.4.6 :
3.2. isctmp12-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 3-13 TE Discovery Task Log - Primary Tunnels

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

ADD: Primary Tunnel(s) to Repository:

1. tunnel-te2 : isctmp11 -- isctmp10
2. tunnel-tel000 : isctmp11 -- isctmp1
3. tunnel-tel : isctmp10 -- isctmp6
4. tunnel-te2 : isctmp10 -- isctmp1
5. tunnel-tel33 : isctmp12 -- isctmp7
6. tunnel-te212 : isctmp12 -- isctmp7
7. tunnel-tel000 : isctmp12 -- isctmp2
8. tunnel-tel001 : isctmp12 -- isctmp2
9. Tunnel2 : isctmp1 -- isctmp8
10. Tunnel3 : isctmp1 -- isctmp5
11. Tunnel138 : isctmp1 -- isctmp3
12. Tunnel300 : isctmp1 -- isctmp2
13. Tunnel1000 : isctmp1 -- isctmp11
14. Tunnel2000 : isctmp1 -- isctmp2

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

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Figure 3-14 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 : isctmpl1 -- isctmp2
    5. Tunnel4 : isctmpl1 -- isctmp2
    6. Tunnel5 : isctmpl1 -- isctmp3
```

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Figure 3-15 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. isctmpl1
    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 3-10)
2. Links (Figure 3-11)
3. Explicit paths (Figure 3-12)
4. Primary tunnels (Figure 3-13)
5. Backup tunnels (Figure 3-14)
6. Static routes (Figure 3-15).

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 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 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 ISC TEM. This indicates that more investigation is required in order 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 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 11, “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, navigate **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 *Cisco IP Solution Center Infrastructure Reference, 4.1* 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 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 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.

Making SSH Work With IOS-XR

To make SSH work with IOS-XR, enter the following commands on the IOS-XR device:

```
(config)# domain name <domain name>
# crypto key gen rsa
```

Verify the crypto configuration by way of the following command:

```
# sh crypto key mypubkey rsa
```

Next, configure all links as point-to-point as described in [Configuring Ethernet Links, page 3-12](#).

Configuring Ethernet Links

Only point-to-point links are supported in 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:

```
# ip ospf network point-to-point
```

For IOS-XR, enter the following command:

```
# router ospf <id> area 0 interface <name> network point-to-point
```