Introduction

This chapter provides an overview of the Cisco MPLS Diagnostics Expert application.

This chapter contains the following sections:

1.1 Cisco MPLS Diagnostics Expert Overview

The Cisco MPLS Diagnostics Expert application is designed for network operations center (NOC) fault and assurance operators. It provides automated troubleshooting and diagnostics for access circuits, edge, and core failures in Layer 3 Multiprotocol Label Switching (MPLS) VPN deployments.

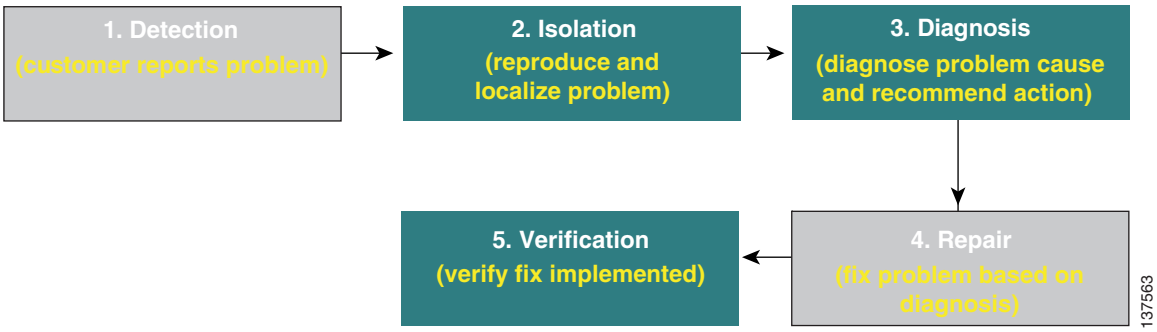
Cisco MPLS Diagnostics Expert significantly reduces the time to isolate and diagnose failures in these networks by employing an automated, workflow-based troubleshooting approach. This workflow-based troubleshooting uses a Cisco-unique MPLS VPN Failures Knowledge Base to diagnose failure conditions and provide intelligent recommendations of potential causes of failure. Cisco MPLS Diagnostics Expert can be used as a standalone application by customers who do not use any of the ISC product family applications, or it can be used alongside the other ISC product family applications. ISC MPLS VPN provisioning is not mandatory for use of the Cisco MPLS Diagnostics Expert. Cisco MPLS Diagnostics Expert is the latest addition to the ISC product family.

In effective fault finding and troubleshooting, there are five steps:

1. Detection
2. Isolation
3. Diagnosis
4. Repair
5. Verification

This release of the Cisco MPLS Diagnostics Expert is designed to support reactive situations in which an end customer reports a problem with their VPN service. This is essentially the Detection step in Figure 1-1. The Repair function is also not supported because many providers prefer to be in complete control of any changes made to router devices and might have specific in-house procedures for doing so.

Figure 1-1 The Reactive Fault Lifecycle



Note Steps 2, 3, and 5 are performed by Cisco MPLS Diagnostics Expert. Steps 1 and 4 must be performed manually.

Cisco MPLS Diagnostics Expert focuses on the Isolation, Diagnosis, and Verification steps. It provides invaluable functionality for isolating and diagnosing failures in the network, determining the device(s) at fault, and checking appropriate device status and configuration to determine the likely reason for the failure. Cisco MPLS Diagnostics Expert also provides the ability to re-run tests to verify that changes made to the device configuration have resolved the issue.

The functionality can be used on its own, without any dependency on any other modules in ISC (for example, VPN provisioning or Traffic Engineering Management). It can also be used in ISC installations where some or all of the other ISC modules are used. If the MPLS VPN Provisioning functionality is used, then Customer and VPN data can be used as a starting point for troubleshooting, in order to locate the endpoints (Customer Edge devices) between which connectivity is tested.

In addition to troubleshooting, Cisco MPLS Diagnostics Expert can also be used for VPN post-provisioning checks. After deploying a VPN, either manually or using ISC VPN provisioning, a connectivity test can be run to verify that the VPN has been provisioned successfully.

1.2 Prerequisite Knowledge

Cisco MPLS Diagnostics Expert has been designed for use by users who have minimal MPLS VPN knowledge. However, due to the complex nature of MPLS VPNs, it is recommended that you will gain maximum advantage from Cisco MPLS Diagnostics Expert if you are familiar with MPLS VPNs, in accordance with RFC 2547. In particular, knowledge of RFC 2547 architecture, topology, control, and data planes is helpful to understand how to best use the application and interpret the results.

A Cisco MPLS Diagnostics Expert MPLS VPN Connectivity Verification Test can be performed by a user with little or no MPLS VPN knowledge, and, where necessary, the test results can be exported for interpretation by an engineer familiar with MPLS VPNs.

Recommended reading:

- MPLS and VPN Architectures: Ivan Pepelnjak, Jim Guichard, Cisco Press
- Troubleshooting Virtual Private Networks: Mark Lewis, Cisco Press
- RFC 2547: http://www.ietf.org/rfc/rfc2547.txt?number=2547

1.3 Supported Hardware and IOS Versions

For details of Provider (P) and Provider Edge (PE) device types and IOS versions supported by Cisco MPLS Diagnostics Expert 1.0 for ISC 4.1, see *Cisco IP Solution Center Installation Guide, 4.1*.

Note Support for additional device types and IOS versions could be added in patch releases. For details of the latest patch releases and the supported device types and IOS versions see Cisco.com.

The device types and IOS versions detailed in the *Cisco IP Solution Center Installation Guide, 4.1* support the MPLS label switched path (LSP) Ping and Traceroute feature. This feature is required for MPLS Diagnostics Expert troubleshooting. If all P and PE devices comply with the list of supported device types and IOS versions, Cisco MPLS Diagnostics Expert can troubleshoot access circuit, MPLS VPN, and MPLS core problems. Cisco MPLS Diagnostics Expert is tolerant to other device types and IOS versions, including other vendors equipment. However, when the network includes P or PE devices that do not comply with this list, a complete diagnosis might not be possible. Table 1-1 shows the possible scenarios and likely outcome.

Table 1-1 Hardware and IOS Version Compliance

Scenario	Outcome
All P and PE devices comply with the supported Cisco hardware and IOS versions.	MPLS VPN Connectivity Verification test successfully troubleshoots access circuit, MPLS VPN, and MPLS core issues.
All PE devices comply with the supported Cisco hardware and IOS versions. One or more P device(s) do not comply with the supported Cisco hardware and IOS versions, including other vendors equipment.	MPLS VPN Connectivity Verification test successfully troubleshoots access circuit and MPLS VPN issues, but might be unable to complete troubleshooting of MPLS core issues.
PE device(s) do not comply with the supported Cisco hardware and IOS versions, including other vendors equipment.	MPLS VPN Connectivity Verification test cannot be run.

Cisco MPLS Diagnostics Expert supports both managed and unmanaged CE routers from any vendor. There are no device type or IOS version requirements for CE devices.

Cisco MPLS Diagnostics Expert can work with other device types and IOS versions that support the MPLS LSP Ping and Traceroute feature. Use the Cisco Feature Navigator for details of device types and IOS versions that support this feature see, http://tools.cisco.com/ITDIT/CFN/jsp/index.jsp

Note MPLS Diagnostics Expert is supported only for the device types and IOS version detailed above. Additional device types and IOS versions are not supported.

1.4 MPLS Diagnostics Expert Features

MPLS Diagnostics Expert troubleshooting and diagnostics supports the following three domains:

- Access Circuit
- MPLS Core
- Layer 3 VPN

Access circuit troubleshooting includes basic layer 1 and layer 3 troubleshooting and advanced layer 2 troubleshooting for ATM, Frame Relay, and Ethernet.

MPLS core troubleshooting supports data plane, and control plane diagnostics. This is provided for all MPLS core and edge devices running a Cisco IOS version with MPLS Operation, Administration, and Maintenance (OAM) support. For details of Cisco IOS versions with MPLS OAM support see 1.3 Supported Hardware and IOS Versions, page 1-3.

Layer 3 VPN troubleshooting supports MPLS/MP-BGP VPNs based on RFC2547. The following topologies are supported: hub and spoke, central services, full mesh, and intranet/extranet VPN.

MPLS Diagnostics Expert does not troubleshoot routing protocols, IP connectivity within the core, inter-Autonomous Systems (AS), Carrier-Supporting-Carrier or traffic engineered MPLS cores. For further details of unsupported scenarios see Appendix B, “Unsupported Scenarios”.