Spirent **TestCenter**™

MPLS-TP Base Package

The MPLS-TP Base Package enables Network Equipment Manufacturers, Service Providers and large Enterprises to quickly evaluate and troubleshoot MPLS-TP functionality. The package provides support for testing connection setup, forwarding, OAM, and protection switching capabilities of MPLS-TP enabled LSRs as specified by the MPLS-TP IETF drafts and RFCs. By combining MPLS-TP, Carrier Ethernet, 1588v2 and Synchronous Ethernet packages, the Spirent TestCenter system provides the industry's most complete solution for testing converged mobile backhaul networks and devices.

Applications

- MPLS-TP and PWE3 compliance, performance, and interoperability testing for mobile backhaul and seamless MPLS applications

- Spirent TestCenter supports configuration of both static and control-plane signaled MPLS-TP connections. This capability enables testing of MPLS-TP nodes operating in both non-IP (static, element-management driven) and IP/MPLS environments

- The MPLS-TP Base package supports both single and multisegment MPLS-TP topologies—enabling intra and inter AS provider testing and interoperability testing of both MPLS-TP and IP/MPLS domains
  - Emulate thousands of x2 connections of an LTE backhaul on one Spirent TestCenter port using multi-segment pseudowires

- Emulate thousands of P2P MPLS-TP connections between cell site routers and Provider Edge routers in a 2G/3G backhaul

- Emulate MPLS pseudowires to test Seamless MPLS procedures between IP DSLAMs and Provider Edge routers in a residential backhaul

- Test the TDM-like OAM capabilities of your MPLS-TP domain by using a number of OAM tools. Spirent TestCenter™ supports both BFD/LSP Ping and Y.1731-based OAM procedures for testing LSRs and switches
  - Using the optional Spirent Anue 3500 network emulator, generate inline signal fail or signal degrade conditions for OAM failure testing

- Test the TDM-like redundancy capabilities of your MPLS-TP domain
  - Using the pseudowire redundancy features of Spirent TestCenter, trigger pseudowire failures and test the switchover of user-plane traffic to a backup pseudowire in your DUT
  - Using redundancy testing capabilities of Spirent TestCenter, trigger failures and test the switchover of user plane traffic from primary to backup LSPs or pseudowires in your DUT
  - Measure the switchover time for user traffic from primary to backup LSPs or pseudowires after occurrence of failure conditions

- MPLS-TP Base Package is an integrated component of Spirent TestCenter. It can be combined with Unicast Routing, MPLS Technologies, Access, Timing, and Carrier Ethernet Base packages to enable end-to-end testing of real-world networks
  - Use topology emulation capabilities of Spirent TestCenter to provide control-plane over MPLS emulation with stateful or stateless data-plane traffic
  - The protocols that can be tested over MPLS include DHCP, IGMP/MLD, HTTP, FTP, and SIP data-plane traffic
  - Test the DUT's ability to provide QoS to user data carried by MPLS-TP pseudowires, in adherence to SLAs.

Features & Benefits

Provisioning MPLS-TP

- Spirent TestCenter allows creation of static MPLS-TP connections. Creating a static MPLS-TP connection on an emulated PE involves configuration of incoming and outgoing labels, a destination MAC address, and LSP/PW Source & Destination IDs
  – This capability allows testing of MPLS-TP transport nodes that are not capable of IP/MPLS control plane signaling
  – An easy-to-use MPLS-TP wizard drastically reduces chances of user-error when creating 1000s of MPLS-TP connections and makes the provisioning tasks less tedious

- Spirent Test Center also allows creation of bi-directional LSPs & PWs using GMPLS & LDP (RFC 4447) signaling procedures
  – Enables testing of MPLS-TP nodes in an IP/MPLS domain
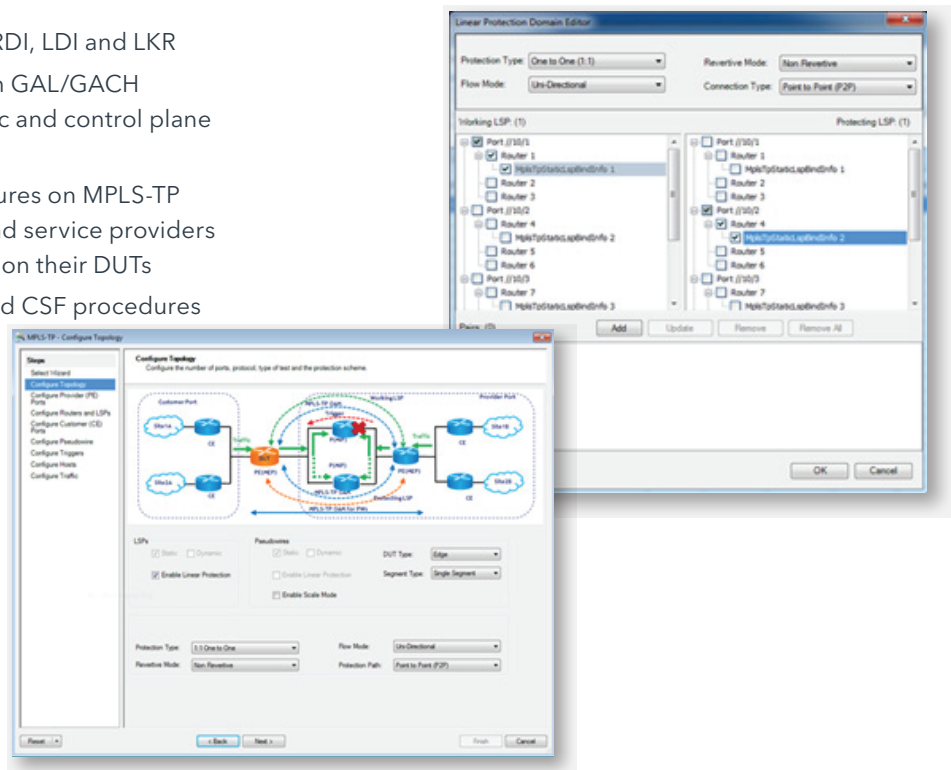
MPLS-TP OAM procedures

- Supports BFD OAM procedures on static and control plane signaled MPLS-TP connections, enabling vendors and service providers who have deployed BFD based OAM on their DUTs
  – BFD CC & CV messages encapsulated in UDP/IP, PW-ACH or GAL/GACH formats
  – Support for BFD over VCCV (FEC 128 & FEC 129 LDP signaling mode)
  – Support for Fault OAM such as AIS, RDI, LDI and LKR
  – Extended LSP Ping and Traceroute in GAL/GACH formats and supported on both static and control plane signaled connections

- Supports Y.1731 Ethernet OAM procedures on MPLS-TP OAM connections, enabling vendors and service providers who have deployed Y.1731 based OAM on their DUTs
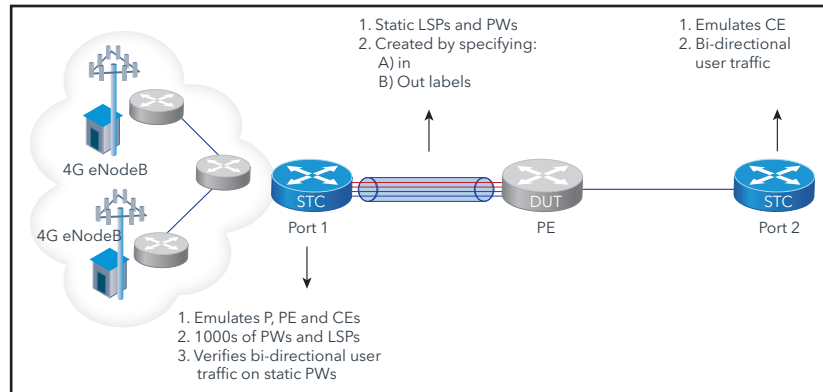 – Test CC, AIS, LCK, LM, DM (2 way) and CSF procedures

MPLS-TP Linear Protection

- Spirent TestCenter allows creation of thousands of primary and backup LSPs on a) one STC port or b) across multiple STC ports (multi-homing scenarios)
  – Primary and backup LSPs can be easily created using MPLSTP wizard
  – BFD OAM can be enabled on the primary and backup LSPs
  – Failure switchover is triggered by injecting AIS from STC toward the DUT or by stopping BFD on the STC
  – Users can easily compute the time needed by the DUT to switch user traffic to backup LSP after failure is injected

Seamless MPLS and pseudowire redundancy

- Spirent TestCenter supports Seamless MPLS procedures, enabling vendors and Service Providers to extend MPLS all the way to access nodes and IP DSLAMs
  – Supports LDP Downstream on Demand procedures
  – Allows provisioning of 1000s of primary and backup pseudowires to test redundancy procedures
  – Injects failures on primary pseudowire and validates the DUT's ability to switchover traffic to backup pseudowire upon failure detection

1. Static LSPs and PWs
2. Created by specifying:
   A) in
   B) Out labels

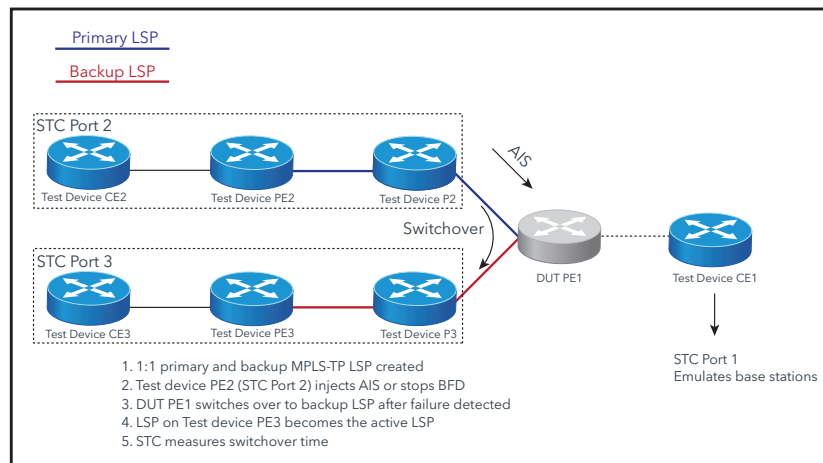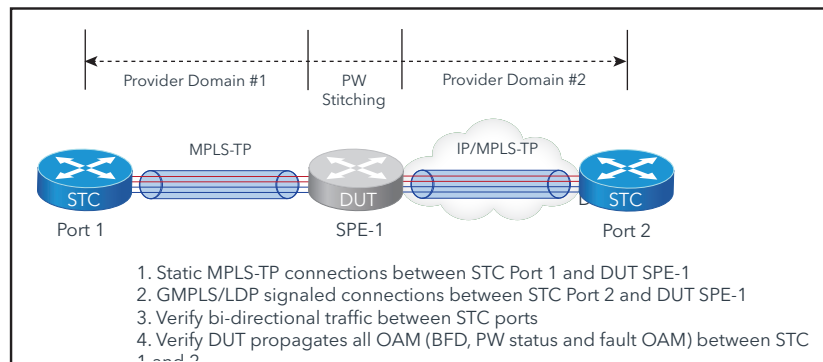1. Emulates CE
2. Bi-directional
   user traffic

4G eNodeB

4G eNodeB

STC
Port 1

DUT
PE

STC
Port 2

1. Emulates P, PE and CEs
2. 1000s of PWs and LSPs
3. Verifies bi-directional user
   traffic on static PWs

Testing static MPLS-TP connections

BFD sessions on each LSP and PW
exchanging heartbeats for continuity

STC
Port 1

P1

DUT
PE-1

Test Device 2

1. Emulates P, PE and CE routers
2. Test BFD slow start and 3.3 ms frequency
3. Test AIS, LDI and CC/CV procedures

1. 1000s of static PWs and LSPs between Test
   Device and PE-1 via P1
2. BFD sessions attached to the LSPs and PWs

Testing BDF OAM on MPLS-TP

Primary LSP

Backup LSP

STC Port 2

Test Device CE2   Test Device PE2   Test Device P2

AIS

Switchover

DUT PE1   Test Device CE1

STC Port 3

Test Device CE3   Test Device PE3   Test Device P3

STC Port 1
Emulates base stations

1. 1:1 primary and backup MPLS-TP LSP created
2. Test device PE2 (STC Port 2) injects AIS or stops BFD
3. DUT PE1 switches over to backup LSP after failure detected
4. LSP on Test device PE3 becomes the active LSP
5. STC measures switchover time

Testing Linear Protection on MPLS-TP

Provider Domain #1   PW
Stitching   Provider Domain #2

MPLS-TP   IP/MPLS-TP

STC
Port 1

DUT
SPE-1

STC
Port 2

1. Static MPLS-TP connections between STC Port 1 and DUT SPE-1
2. GMPLS/LDP signaled connections between STC Port 2 and DUT SPE-1
3. Verify bi-directional traffic between STC ports
4. Verify DUT propagates all OAM (BFD, PW status and fault OAM) between STC
   1 and 2

Testing MPLS-TP and IP/MPLS interoperability

About Spirent Communications

Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks.

We help bring clarity to increasingly complex technological and business challenges.

Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled.

For more information, visit: www.spirent.com

Technical Specifications

MPLS-TP static connections configuration

- Connection type (LSP or PW)
- Source and destination global ID
- PW source & destination node ID
- LSP source & destination node ID
- PW source and destination attachment circuit ID
- LSP source and destination tunnel number

- Incoming label
- Outgoing label
- PW VCCV configuration
- LSP ID
- Enable control word
- Fault OAM configuration

MPLS-TP BFD configuration

- Enable BFD
- Enable GAL/GACH encapsulation
- Encapsulation (Raw or UDP)

- CC/CV
- TLVs for CV message
- BFD My Discriminator

MPLS-TP Y.1731 configuration

- Y.1731 ME level
- Y.1731 ICC formatted string
- MEP ID
- Initial TST sequence number
- Y.1731 AIS, CC, LCK and CSF period
- Y.1731 static incoming and outgoing label

- Enable DM/LM/LB response
- DMM/DMR delay
- LB/LM/DM priority
- CC/AIS/LCK/CSF priority
- Support for configurable MPLS TTL and EXP bits on inner and outer labels

MPLS-TP Control plane configuration (LDP/RSVP/GMPLS)

- Similar to IP/MPLS

MPLS-TP results (LDP/RSVP/BFD/GMPLS)

- Similar to IP/MPLS

MPLS-TP results (LSP/Y.1731 OAM)

- TX AIS/LDI/LKR count
- RX AIS/LDI/LKR count
- TX AIS/LDI/LKR timestamp
- RX AIS/LDI/LKR timestamp
- Latest TX/RX fault type

- CC TX/RX state
- MEPs
- Unexpected MEG IDs/ME Levels/Timeouts
- Bad CC RX count
- Dropped Packet count

Ordering Information

Description	Part Number
MPLS-TP Test Package B	BPK-1160B
MPLS-TP Performance Monitoring Base Package	BPK-1192A
MPLS-TP Protection Switching Base Package	BPK-1191A
Associated MBH Packages	
Synchronous Ethernet Base Package	BPK-1180A
IEEE-1588v2 Timing and Synchronization Base Package	BPK-1155A
802.1AG/Y.1731 EOAM Fault Management Base Package A/B	BPK-1059A/B
Y.1731 EOAM Performance Monitoring Base Package A	BPK-1150A
Unicast Routing Base Package A/B	BPK-1004A/B
MPLS/LDP/RSVP-TE Base Package A/B	BPK-1006A/B

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