



# Spirent TestCenter™

## MPLS TECHNOLOGIES

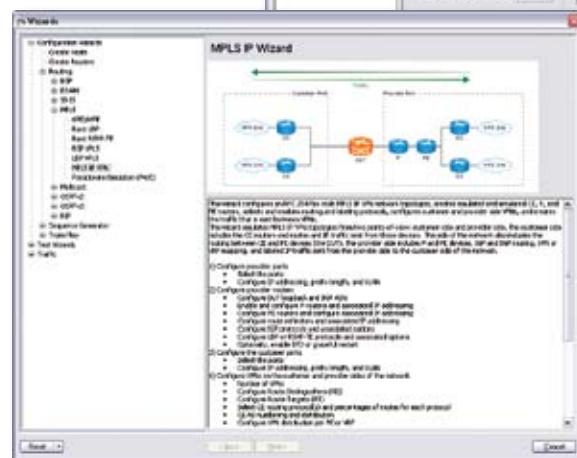
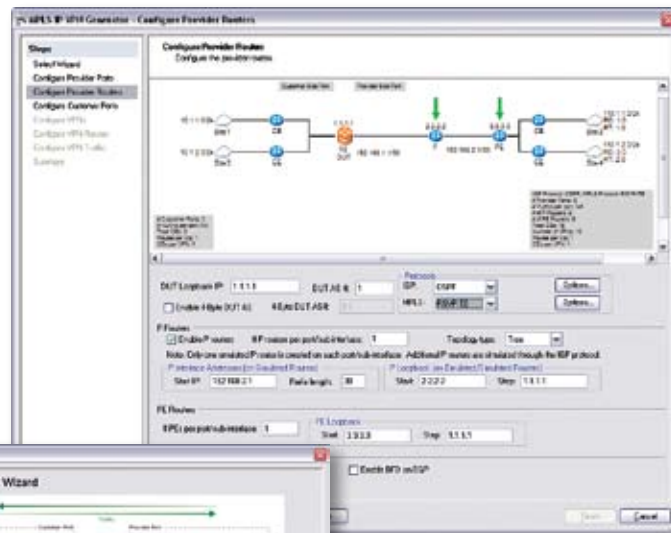
The MPLS Base Package enables network equipment manufacturers, service providers and large enterprises to quickly evaluate and troubleshoot MPLS and VPLS functionality. This includes performance and scalability of any routing-enabled device or network with traffic engineering or VPN technologies.

### APPLICATIONS

- Evaluate key performance parameters of routers or networks under typical or extreme traffic load conditions for minutes, hours and days
- Quickly set up large MPLS or VPLS network emulations on all ports with data-plane traffic going to each network advertised from all transmitting ports
- Use the Command Sequencer and real-time graphs with integrated events, to evaluate key performance parameters of routers or networks while responding to common undesirable network events on the control plane
- The MPLS Base package supports testing high availability routing features including Graceful Restart for OSPF, IS-IS and BGP, and can be used with the BFD Base Package for integrated BFD testing
- The MPLS Routing Base Package qualifies routers during development, quality assurance, and final regression testing to re-qualify routers after software or firmware upgrades and to perform comparative analysis of routers during vendor selection

The MPLS Base Package works with the Unicast Routing Base Package to allow users to emulate RSVP-TE and LDP sessions in realistic and advanced applications. Show the true performance of an MPLS-enabled devices by providing stress testing of the routing software, the data forwarding hardware and the overall system architecture under static and dynamic conditions.

Because it is an integrated component of Spirent TestCenter, this package works with other Spirent TestCenter components to deliver easy, consistent TCL support for all key metropolitan and enterprise protocols. Protocols include spanning tree, VLANs, QoS, IPv4/IPv6 data-plane traffic and routing.



## FEATURES & BENEFITS

- Quickly configure complex tests that include configuring routers, routing and labeling protocols, routes and label allocation, LSPs and dynamically labeled traffic
- Advanced command sequencer with TCL scripts to send SNMP commands, get SNMP data, configure the device under test, run entire test and generate pass/fail results
- Use Command Sequencer Conditional test logic to automate complex test cases without writing any TCL code.
- Create large scale tests generating thousands of LSPs, VPNs, pseudowires or tunnels
- Integrated traffic generator and analyzer send and analyze control and data plane traffic from a single application interface in real-time
- Dynamically map and view MPLS label to FEC bindings for up to 3 labels
- Traffic Analyzer supports filtering MPLS traffic based on any field in the header including MPLS labels, Experimental (Exp) bit, or Bottom-of-Stack (S) bit with detailed real-time results
- Dynamic support for generating and processing implicit and explicit-null labels
- Support for discontinuous label assignments and dynamic label rebinding upon configuration changes
- Generate and send labeled traffic and gather statistics
- Quickly build traffic patterns through integration with the traffic wizard and analyzer
- Simulate real network conditions and view results on demand at any time during a test without starting and stopping the protocols or traffic with interactive controls
- Use interactive commands to flap (withdraw or age-out, and readvertise) individual routes or route blocks or by route type
- Log the real-time exchange of control-plane messages to test over any media type or encapsulation supported by Spirent TestCenter
- Test data-plane outer convergence and network high availability features like BFD and Graceful Restart and monitor the affects of router configurations on traffic and QoS classes in real time
- Test scalability and protocol functionality in the same test by running multiple protocols concurrently on each port
- LDP wizard to quickly configure MPLS label switched topologies with routers, routing and labeling protocols, routes, LSPs, labels and traffic
- VPLS wizards for LDP and BGP signaled VPLS to quickly configure VPLS topologies with routers, routing and labeling protocols, routes, VCs, hosts, labels and traffic
- Pseudowire Emulation Edge-to-Edge (PWE3) wizard quickly configures PWE3 tests with routing protocols, routes and labeled traffic
- MPLS IP VPN wizards to quickly configure MPLS IP VPN, 6VPE or 6PE topologies with routers, routing and labeling protocols, routes, VRFs and labeled traffic
- Interactive configuration and testing configuration wizards for each MPLS test type including: MPLS IP VPN (RFC 2547bis) for IPv4, 6VPE or 6PE for IPv6 IP VPN, BGP signaled VPLS, LDP signaled VPLS, PWE3, MPLS LDP LSPs and RSVP-TE tunnels that configure the entire test and generate labeled traffic
- Test InterAS VPN options A-C with dynamically labeled traffic and detailed test results
- Graceful Restart signaling for LDP with support for Helper and Restarter modes and configurable Recovery and Reconnect timers
- Integrated with BFD for convergence and scalability testing including Interactive BFD commands: Admin Up or Down, Stop and Resume PDUs, Enable or Disable Demand Mode, Initiate Poll, and Set Diagnostic State and per router BFD results
- Direct and targeted hellos with user specified transport mode
- Downstream unsolicited and downstream on demand LSPs
- Configurable hello and keep alive timers
- Support for generating and receiving implicit and explicit-null labels for IPv4 and IPv6 traffic and user defined label space
- VC encapsulation for Pseudowire Emulation and VPLS LSPs
- Configure Pseudowire LSP values including: IPv4 prefixes, prefix length and IPv4 prefix increment
- Configure VPLS VC LSP values including: starting VC ID, VC ID increment, encapsulation, group ID and MTU
- Interactive and Command Sequencer events: Start or stop LDP, Establish LDP, Advertise LDP, Stop or Resume Hellos, Stop or Resume Keepalives and Restart Router
- Detailed per-router LDP protocol and state counters including: Router State (Not Started, Up, Down, Connecting), TX/RX Direct Hellos, TX/RX Target Hellos, LSPs Up, LSPs Down, TX/RX Keepalives, RX Label Requests, TX/RX

## TECHNICAL SPECIFICATIONS FOR MPLS ROUTING

### LDP Features

- Hundreds of LDP sessions per port
- Generate thousands of LSPs per port

Label Mapping, TX/RX Label Abort, TX/RX Label Withdraw, TX/RX Label Release, TX/RX Notification, TX/RX Notify Code (26 codes supported and decoded), Prefix/Host Count and VC Route Count

- Detailed LDP LSP counters including: Router Name, Label, State (up/down), Type (Ingress/Egress), Mode (downstream unsolicited or downstream on demand), FEC Info (IPv4 address or VC ID), FEC Type (Prefix, Host Address or Virtual Circuit (VC))
- Per test, port, and router LDP protocol and LSP summaries include: number of LDP ports per test, number of LDP routers per test, number of active LDP routers per port and test, number of Prefix/Hosts, number of VC LSPs, summary statistics for the number of LDP routers in the following states: Up, Down, Open, Failed, Connected, and Graceful Restart Restarted and Helper
- View FEC to LDP label mappings per router or per stream

#### RSVP-TE Features

- Thousands of RSVP-TE sessions per port
- Integrated support for OSPF-TE and IS-IS-TE
- RSVP-TE tunnel signaling extensions for IS-IS and OSPFv2
- RSVP-TE wizards to quickly configure traffic engineering topologies with routers, routing and labeling protocols, routes, tunnels, labels and traffic
- MPLS IP VPN wizards to quickly configure RFC 2547 or 6VPE/6PE topologies with routers, routing and labeling protocols, routes, VRFs and labeled traffic
- Test InterAS VPN options A-C with RSVP-TE signaling using dynamic label binding
- Integrated with BFD for convergence and scalability testing including Interactive BFD commands: Admin Up or Down, Stop and Resume PDUs, Enable or Disable Demand Mode, Initiate Poll, and Set Diagnostic State and per router BFD results
- RSVP Graceful Restart, Helper and Restarter modes with configurable Restart and Recovery timers
- RSVP Fast Re-Route emulation for high availability and topology convergence testing support
- Support for generating and receiving implicit and explicit-null labels for IPv4 and IPv6 traffic and user defined label space
- Route Configuration Options: label configuration (including egress label type, transit label behavior, min and max label allocation), BFD and Graceful Restart configuration options

- LSP Configuration Path and Reservation Options: source and Destination IP address, tunnel ID, extended tunnel ID, ERO/RRO, Session Attributes, T-Spec and Fast ReRoute options
- ERO and RRO support including loose and strict options and wizard support for automatic ERO/RRO configuration
- Configurable session attributes including session names, setup priority, hold priority and flags (Local protection, label record, SE style, bandwidth protection, and node protection) and optional include or exclude affinities
- Configurable RSVP parameters including request RESV CONF message, hello message interval, bundle interval and refresh reduction
- Configurable Reliable delivery options including retransmission interval, retransmission limit, and retransmission delta
- Configurable T-Spec values including: token bucket size, token bucket rate, peak data rate, min policed unit and max packet size
- Interactive and Command Sequencer events: Start or stop RSVP-TE, Establish RSVP-TE, Advertise RSVP-TE, Stop or Resume Hellos, and Restart Router
- Detailed per-router RSVP-TE protocol and state counters including: Router State (Not Started, Up, Down), LSP Up, Down, or Connecting, Egress LSP Up, TX/RX Hello, TX/RX PATH, TX/RX RESV, TX/RX PATH Error, TX/RX RESV Error, TX/RX RESV Confirm, TX/RX PATH Tear, TX/RX RESV Tear, Min/Max/Average LSP Setup Time, Last TX/RX RESV Error Code, Last TX/RX PATH Error Code and TX/RX PATH Recovery
- Detailed RSVP-TE tunnel LSP counters including: Tunnel Head-end (PATH) count, Tunnel Tail-end (RESV) count, Tunnel State (Not Started, Up, Down or Connecting), Direction (Ingress or Egress), Source IP Address, Destination IP Address, Tunnel ID, LSP ID, Extended Tunnel ID, Label, TX/RX PATH Message, TX/RX RESV Message
- Per test, port, and router RSVP-TE protocol and LSP summaries include: number of RSVP-TE ports per test, number of RSVP-TE routers per test, number of active RSVP-TE routers per port and test, number of Headend and Tail-end tunnels, summary statistics for the number of RSVP-TE routers in the following states: Total Up, Down, Up, Down and Init
- View FEC to LDP label mappings per router or per stream
- Integrated support for MPLS PWE3 Ethernet protocol conformance testing with the BPK-1024A Conformance Application Base Package and the TPK-00254 for PWE3 protocol testing

## SUPPORTED MODULES/PLATFORMS

- Supports all Spirent TestCenter test modules and personality cards

## SYSTEM REQUIREMENTS

### Minimum PC, UNIX, or Linux

#### Requirements by System Size

- For Small Port System (2-25 ports)
  - Minimum Requirement – 2.4 GHz Intel Pentium 4 processor (or equivalent), 512 MB RAM and 10 GB of free disk space
  - Recommended System – Intel Core™ 2 Duo E6300 processor (or equivalent), 2 GB of free RAM, and 10 GB of free disk space
- For Medium Port System (26-75 ports)
  - Minimum Requirement – 3 GHz Intel Pentium 4 processor (or equivalent), 2 GB of free RAM, 15 GB of free disk space
  - Recommended System – Intel Core 2 Duo E6400 processor (or equivalent), 4 GB free RAM, 100 GB of free disk space
- For Large System (76 ports and above)
  - Minimum Requirement – Intel Core 2 Duo E6400 processor (or equivalent), 3 GB free RAM, 100 GB free space on hard drive
  - Recommended System – Intel Core 2 Duo E6600 processor (or equivalent), 4 GB of RAM, 100 GB of free disk space

### Spirent TestCenter Hardware

#### Requirements

- Pentium® or greater PC running Windows® XP Professional SP2 with mouse/color monitor required for GUI operation (See Minimum PC Requirements section)
- One Ethernet cable and one 10/100/1000Mbps Ethernet card installed in the PC A SPT-2000A Spirent 2U Chassis and Controller, SPT-5000A Spirent 5U Chassis and Controller or SPT-9000A Spirent 9U Chassis and Controller
- Operating system languages supported: English, French, German, Italian, Japanese, Korean and Chinese (traditional and simplified)
- Operating systems supported: Windows XP SP2, Windows 2003 Server (32 bit), RedHat EL3 and EL5, Solaris 8.0 and 10.0
- BPK-1066A required for BFD protocol testing

- BPK-1004A/B required for Unicast routing protocol support
- BPK-1001A/B required for packet generator/analyzer features
- BPK-1029A required for real-time capture/decode feature
- BPK-1024A required for Conformance Testing
- TPK-0025 required for MPLS PWE3 protocol conformance testing

## ORDERING INFORMATION

### MPLS/LDP/RSVP-TE Base Package A –

Supports up to 10 LDP/RSVP sessions per port: BPK-1006A

### MPLS/LDP/RSVP-TE Base Package B –

Supports up to the maximum LDP/RSVP sessions per port: BPK-1006B

## RELATED STANDARDS

- RFC 4364 – Describes MPLS IP VPNs with InterAS VPN options A-C
- RFC 4360 – Describes BGP extended communities
- RFC 2547bis – MPLS BGP VPNs
- RFC 4798 – IPv6 MPLS BGP VPNs (6PE)
- RFC4659 – BGP MPLS IP VPN Extension for IPv6 VPN (6VPE)
- RFC 3107 – Carrying Label Information in BGP4
- RFC 3031 – MPLS Architecture
- RFC 3032 – MPLS Label Stack Encoding
- RFC 3036 – LDP Specification
- RFC 3037 – LDP Applicability
- RFC 3215 – LDP State Machine
- RFC 3478 – Graceful Restart Mechanism for Label Distribution Protocol
- RFC 2205 – Resource ReSerVation Protocol (RSVP)
- RFC 3209 – RSVP-TE: Extensions to RSVP for LSP Tunnels
- RFC 4090 – Fast Reroute Extensions to RSVP-TE for LSP Tunnels
- Draft-ietf-ccamp-rsvp-restart-ext
- Draft-ietf-ppvpn-vpls-ldp-01
- Draft-martini-l2circuit-encap-mpls
- Draft-martini-l2circuit-trans-mpls
- Draft-martini-ethernet-encap-mpls-01
- Draft-martini-ppp-hdlc-encap-mpls-00
- Draft-martini-frame-encap-mpls-01
- Draft-martini-atm-encap-mpls-01
- Draft-lasserre-vkompella-ppvpn-vpls
- Draft-ietf-l2vpn-bgp-00 and 02
- Draft-ietf-idr-bgp-identifier-08.txt – Describes BGP 4-byte AS



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