MPLS EMULATION OPTIONS (RSVP-TE AND CR-LDP/LDP)

The AX/4000 MPLS RSVP-TE and CR-LDP/LDP Emulation Options from Spirent Communications provide users with the tools they need for effective debugging, development and performance analysis of MPLS-enabled equipment. These products incorporate MPLS signaling emulation, MPLS-labeled traffic generation and analysis, and protocol decodes. They enable the AX/4000 to emulate an MPLS node or network and allow it to provide quality of service (QoS) performance measurements at line speeds up to 10 Gbps.

BENEFITS

- **Save time debugging**: Extensive logs, real-time tunnel status, bi-directional real-time protocol decoding, combined with the industry’s most effective traffic analyzer, make finding and debugging problems easy.

- **Reduce lab equipment costs**: The tremendous MPLS tunnel scalability of the AX/4000 allows users to reduce the amount of test equipment and router DUT ports required for MPLS scale testing.

- **Improve product quality**: Flexible parameter configuration, full line-rate traffic generation, and in-depth traffic and protocol analysis improves product quality.

Test modules supported include the AX/4000 1 Gbps, 2.488 Gbps and 10 Gbps IP generator/analyzers. Once installed, they allow these modules to perform a variety of MPLS test and emulation functions.

APPLICATIONS

MPLS routers perform three main functions: ingress, core and egress label switching. The MPLS RSVP-TE and CR-LDP/LDP Emulation Options have the ability to replicate any of the three functions, allowing the user to test the full functionality of their implementation. Combining this option with other routing emulation options and the standard AX/4000 MPLS-labeled traffic generation and analysis capabilities provides a full-featured MPLS and IP testing solution.

Effective functional and debug capability is provided via error logs and detailed, real-time tunnel status and bi-directional protocol decode. Users can choose and configure objects and type length values (TLVs) that cover traffic-engineering testing and label distribution protocol forwarding equivalence classes (LDP FECs).

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1 Requires IP Decode Suite (P/N 400472)
The AX/4000 Broadband Test System also provides the most powerful platform for tunnel scalability testing. Up to 30,000 RSVP-TE tunnels or 65,535 LDP FECs are supported per port on Spirent’s most powerful routing test system.

KEY FEATURES
- Support for RSVP-TE Fast Reroute via facility or one-to-one backup mechanisms
- LDP Graceful Restart restarting router and helper router emulation
- Supports standard LDP FECs along with Martini FEC and PWE3 PW and GID FECs
- RSVP-TE support for DiffServ via E-LSP and L-LSP signaling and traffic generation
- Bi-directional, real-time protocol decode
- Real-time error logs
- Independently set up and measure traffic QoS for thousands of established LSPs
- Emulate ingress, egress and intermediate router behavior
- Combine with routing protocol emulation options for realistic control plane messaging and traffic engineering testing

TECHNICAL SPECIFICATIONS

Supported Interfaces
- 10/100Mb/s, 1Gb/s and 10Gb/s Ethernet
- OC-3c/12c/48c/192c POS
- OC-3c/12c/48c IPoATM
- Channelized OC-12/48/192 POS

User-Configured RSVP-TE PATH Message Objects
- Sender TTL
- Session
- Explicit route
- Session attribute
- Sender descriptor

RSVP-TE Messaging Options
- ResvConf include/exclude
- Record route enable/disable
- Reliable delivery enable/disable
- Refresh reduction enable/disable
- Bundle messages enable/disable
- Hello messages enable/disable

RSVP-TE Message IP Header Options
- Precedence: routing or inter-network control
- Router alert option enable/disable
- TTL value

RSVP-TE Configured Limits
- Maximum PDU length
- Min/max LSP label values

RSVP-TE Configured Timers and Counters
- Message timeouts:
  - Path state refresh
  - Number of path state timeouts
  - Resv state refresh timeout
  - Number of Resv timeouts
- Hello interval
- Number of Hello intervals
- Rapid retransmission interval
- Rapid retransmission limit
- Rapid retransmission delta
- Bundle interval
- Srefresh interval
- Restart time
- Recovery time
### RSVP-TE Per-Session Statistics
- LSPs created
- LSPs deleted
- LSPs up
- LSPs down
- LSPs connecting
- LSP setups attempted
- LSP setups successful
- Minimum LSP setup time
- Maximum LSP setup time
- Average LSP setup time
- LSP success rate
- Received setup messages
- Accepted setup messages
- LSP acceptance rate
- Timeouts
- Errors
- Total failures
- Messages received
- Messages transmitted
- Hellos received
- Hellos transmitted
- ResvConfs received
- ResvConfs transmitted
- PathErrors received
- PathErrors transmitted
- ResvTears received
- ResvTears transmitted

### RSVP-TE Outgoing and Incoming Per-Tunnel Statistics
- Status - up, down, connecting
- Egress/ingress address
- Tunnel ID
- Extended tunnel ID
- LSP value
- Label code
- Session name
- Setup time in msec (outgoing only)

### User-Configured LDP Label Request or Label Mapping Message TLVs
- Prefix address FEC
- Host address FEC
- Pseudowire ID (PWID) FEC
- Generalized ID (GID) FEC
- User-defined

### User-Configured CR-LDP Label Request TLVs
- CR-LSP FEC
- Explicit route
- Traffic
- Pinning
- Resource class
- Preemption
- LSP ID

### LDP/CR-LDP Messaging Options
- Optional transport address
- Label space value
- Send/use transport address TLV enable/disable
- Send optional configuration sequence number enable/disable
- Respond to targeted hellos enable/disable
- Downstream unsolicited mode enable/disable
- Loop detection enable/disable
- Ignore C-bit enable/disable
- Accept unknown TLVs enable disable

### LDP/CR-LDP Configured Limits
- Configuration sequence number
- Path vector limit
- Max PDU length

### LDP/CR-LDP Configured Timers and Counters
- Hold time
- Hello interval time
- Keep alive time

### LDP Graceful Restart Options
- Restarting router and helper router mode enable
- Helper router mode only enable
- Fault tolerant reconnect timeout
- Forwarding state holding time
- Neighbor liveliness time
- Max recovery time
- User-defined list of router peers to deny graceful restart to

### TCP MD5 Signature
- Enabled/disabled for each peer
- Individual password for each peer
LDP Per-Peer Session Statistics
- Peer address
- Session state
- Linked hellos transmitted
- Linked hellos received
- Targeted hellos transmitted
- Targeted hellos received
- Total outgoing LSPs
- Total established outgoing LSPs
- Total incoming LSPs
- Graceful restart state
- Stale graceful restart LSPs
- Refreshed graceful restart LSPs
- Un-refreshed graceful restart LSPs

LDP Per-LSP Statistics
- Status – up, down, connecting
- Graceful restart status
- FEC type
- FEC value
- Label value
- Mode – DoD or DU
- Group
- MTU

SUPPORTED IETF RFCs
Supported General MPLS Standards
- Multiprotocol Label Switching Architecture, RFC 3031
- MPLS Label Stack Encoding, RFC 3032

Supported LDP/CR-LDP Standards
- LDP Specification, RFC 3036
- Constraint-Based LSP Setup using LDP, RFC 3212
- LDP State Machine, RFC 3215
- Graceful Restart Mechanism for Label Distribution Protocol, RFC 3478
- Pseudowire Setup and Maintenance using the Label Distribution Protocol (IETF draft)

Supported RSVP-TE Standards
- Resource ReSerVation Protocol (RSVP), RFC 2205
- Extensions to RSVP for LSP Tunnels, RFC 3209
- MPLS Support of Differentiated Services, RFC 3270
- Fast Reroute Extensions to RSVP-TE for LSP tunnels, RFC 4090

REQUIREMENTS
- AX/4000 mAX, mAX-IP or 10Gig test module with IP interface
- AX/4000 Windows or Solaris controller software, RPT application or Tcl-clib API

ORDERING INFORMATION
MPLS RSVP-TE Emulation (P/N 401570)
MPLS CR-LDP/LDP Emulation (P/N 401571)

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