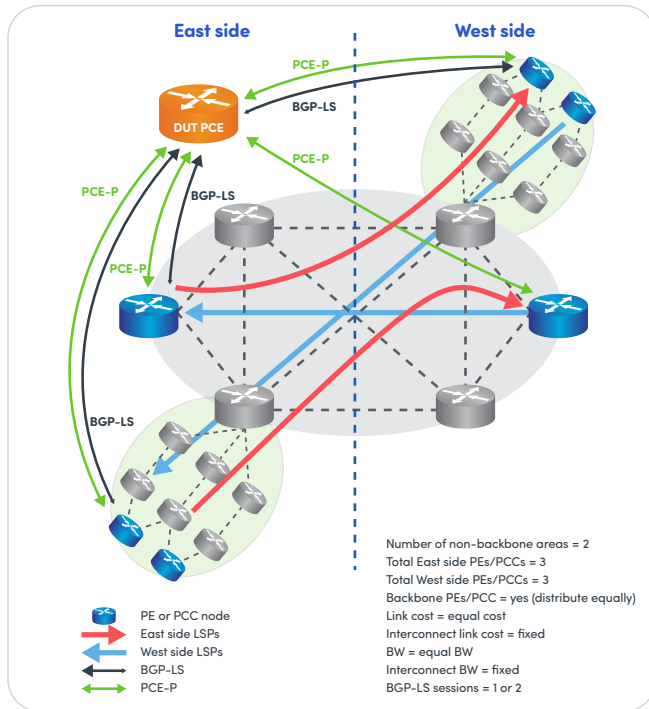


# Spirent TestCenter SDN Bundle

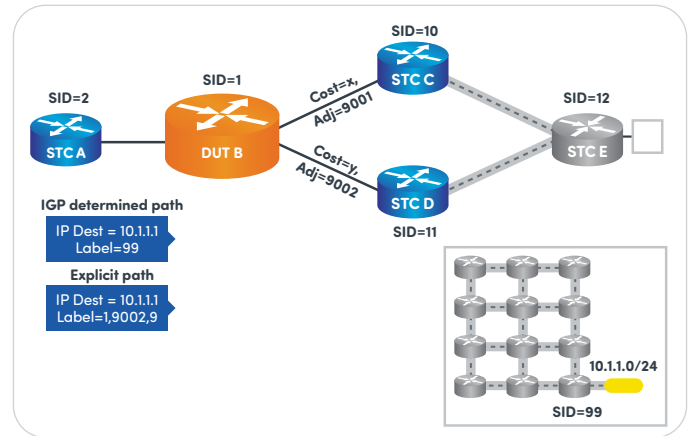
- **Realistic Network Emulation—**  
emulate complex, real world network topologies and functional, scalability, performance, high availability and failover convergence of SDN networks under typical and extreme traffic load conditions
- **Comprehensive SDN Protocol Support—**Spirent SDN test solution include PCEP, BGP-LS, BGP Flowspec, Segment Routing and SRv6 protocol emulation with the capability to create comprehensive test scenarios for dynamic and large service provider networks
- **Increased Productivity—**  
Configuration wizards allow quick setup of large-scale test topologies, complex test scenarios can be easily automated using interactive PCEP, BGP-LS, segment routing commands via Command Sequencer
- **Cost-Effective Solution—**  
comprehensive SDN protocol emulation suite in a single, affordable package

**Spirent PCEP Emulation** provides the ability to emulate PCE Controller and PCE Client (PCC) and enables functional, scalability, performance and interoperability testing of PCE protocol. It allows the user to test complex scenarios such as high availability and failover-convergence for PCE. It is part of the Spirent SDN test solution that consists of other SP-SDN protocols such as BGP-LS, BGP Flowspec, Segment Routing and SRv6. Together these protocols provide the capability to create comprehensive test scenarios for the dynamic and large service provider networks.

**BGP-LS** becomes important when LSP paths cross multiple routing domains or when IGP routing information is required by external entities such as Application-Layer Traffic Optimization (ALTO) or PCE servers for optimized path computation. In both these scenarios IGP protocols are unsuitable for distributing the routing information (including traffic engineering information) appropriately. Recent adoption of SP-SDN protocols has fueled the BGP-LS deployment and hence the need to test scalability and performance of BGP-LS in scenarios where BGP-LS implementations interoperate or co-exist with other SP-SDN protocols such as PCEP and segment routing.



Segment Routing is based on source routing. The key motivation behind segment routing is to reduce the complexity that exists in today's network nodes due to MPLS control plane. Segment Routing obviates the need for MPLS control plane by using IGP protocols such as OSPF, ISIS, and BGP to distribute the forwarding labels or segment IDs. As a result, only the ingress node needs to maintain the state for the traffic flows but the MPLS forwarding plane can be re-used for forwarding traffic using segment routing labels.



Since the forwarding state of the traffic flow is in the segment routing header of the packet, it paves the way for network programmability or SDN functionality with less disruptive changes to the existing network. Policies may be defined administratively at the ingress node or dynamically using a centralized SDN controller.

Segment Routing is an evolutionary approach towards SDN and reducing complexity in the existing network nodes, in addition to testing the scalability, functionality, performance of the protocol implementation, it is important to verify the interoperation between SR and non-SR capable network nodes.

**Spirent Segment Routing Emulation** enables functional, scalability, performance and interoperability testing of the Segment Routing protocol. The solution supports OSPF, ISIS, and BGP extensions for Segment Routing.

This bundle is an integrated component of Spirent TestCenter and works with other Spirent TestCenter components. SDN Bundle protocols can also be combined with Routing and Switching, Access or Data Center protocols.

## Features and Benefits

- PCEP emulation support both PCE and PCC modes
- Support for Stateful PCE and PCE Initiated LSPs
- Support capability negotiation
- Support Request/Reply messages
- Support RSVP-TE LSP protection and auto bandwidth scaling
- Support SR-TE LSP with SR ERO and SR RRO sub-TLV
- Ability to configure PCEP session parameters
- Support ERO, RRO, Metric, Bandwidth, SRP, LSP and LSP Attribute Objects
- Support LSP Path Verification using ERO/RRO mapping
- Support Custom PCEP TLVs
- Verify PCE path selection and path optimization within constraints and on network failure
- Support high availability test scenarios with STC emulating primary and backup PCE controllers, PCE Overloading and PCE not responding
- Support PCEP interactive commands such as sending report messages with mandatory and optional objects, remove LSPs, delegation or revoke delegation, sending update messages with the desired objects
- Auto-response as well as more granular control to message response using Command Sequencer
- Support negative testing. Ability to generate unknown messages, Illegal PDUs and TLVs
- Support emulation of complex IGP topologies using OSPF or ISIS behind the BGP-LS emulated router
- Advertise multi-domain or multi-area topologies using OSPF or ISIS via BGP-LS
- Support BGP router reflector mode and BGP client mode for BGP-LS emulation
- Ease of configuring large-scale test topologies for BGP-LS via the BGP wizard
- Support link state NLRI for link, node, IPv4/IPv6 prefix
- Support specifying TE parameters for OSPF and ISIS
- Support BGP capabilities for VPN and non-VPN AFI types
- Ability to peer with multiple IPv4 or IPv6 BGP-LS routers at the same time
- Support BGP-LS interactive commands such as withdraw or re-advertise link state NLRI
- Support BGP community and extended community support
- Support interactive commands to age or advertise segment routing information
- Support auto generating segment routing objects and TLVs in the IGP protocol wizards
- Support OSPF, ISIS, and BGP extensions for Segment Routing
- Support data plane traffic binding with segment routing control plane
- Support segment routing LAN Adj SID
- Support segment routing ISIS Mapping server TLV
- Support segment routing with up to 20 Label stack with SR MPLS labels
- Support segment routing with L2VPN (VPLS, VPWS (martini) and L3VPN (6PE/6VPE) wizards
- Support ISIS segment routing for IPv6 – TE for IPv6 and Traffic binding for IPv6
- Wireshark dissector support for PCEP and BGP-LS messages, segment routing objects and TLVs
- Easy automation for complex test scenarios using interactive PCEP, BGP-LS, segment routing commands available in Command Sequencer

## Technical Specifications

| Parameter   | Description   |
|---|---|
| <b>PCEP</b>   |   |
| RFC 5440  | Path Computation Element (PCE) Communication Protocol (PCEP)  |
| RFC 5521  | Extensions to the Path Computation Element Communication Protocol (PCEP) for Route Exclusions                               |
| RFC 8231  | Path Computation Element Communication Protocol (PCEP) Extensions for Stateful PCE  |
| RFC 8232  | Optimizations of Label Switched Path State Synchronization Procedures for a Stateful PCE                                    |
| RFC 8281  | Path Computation Element Communication Protocol (PCEP) Extensions for PCE-Initiated LSP Setup in a Stateful PCE Model       |
| RFC 8408  | Conveying Path Setup Type in PCE Communication Protocol (PCEP) Messages   |
| draft-ietf-pce-segment-routing-14                     | PCEP Extensions for Segment Routing   |
| draft-ietf-pce-association-group-07                   | PCEP Extensions for Establishing Relationships Between Sets of LSPs   |
| draft-ananthakrishnan-pce-stateful-path-protection-03 | PCEP Extensions for MPLS-TE LSP Path Protection with stateful PCE   |
| draft-sivabalan-pce-binding-label-sid-06              | Carrying Binding Label/Segment-ID in PCE-based Networks   |
| draft-tanaka-pce-stateful-pce-mbb-07                  | Make-Before-Break (MBB) MPLS-TE LSP restoration and re-optimization procedure using Stateful Path Computation Element (PCE) |
| draft-li-pce-sr-path-segment-04                       | Path Computation Element Communication Protocol (PCEP) Extension for Path Segment in Segment Routing (SR)                   |
| draft-cheng-spring-mpls-path-segment-00               | Path Segment in MPLS Based Segment Routing Network  |
| draft-ietf-pce-segment-routing-ipv6-06                | PCEP Extensions for Segment Routing leveraging the IPv6 data plane  |
| <b>BGP LS</b>   |   |
| RFC 7752  | North-Bound Distribution of Link-State and Traffic Engineering (TE) Information Using BGP                                   |
| draft-ietf-idr-bgp-ls-segment-routing-ext-11          | BGP Link-State extensions for Segment Routing   |
| draft-ietf-idr-bgpls-segment-routing-epe-15           | BGP-LS extensions for Segment Routing BGP Egress Peer Engineering   |
| <b>Segment Routing</b>                                |   |
| RFC 8665  | OSPF Extensions for Segment Routing   |
| RFC 8666  | OSPFv3 Extensions for Segment Routing   |
| RFC 8667  | IS-IS Extensions for Segment Routing  |
| draft-ietf-isis-segment-routing-msd-15                | Signaling MSD (Maximum SID Depth) using IS-IS   |
| RFC 8669  | Segment Routing Prefix Segment Identifier Extensions for BGP  |
| draft-ietf-lsr-flex-algo-06                           | IGP Flexible Algorithm  |
| draft-ietf-idr-segment-routing-te-policy-03           | Advertising Segment Routing Policies in BGP   |
| <b>SRv6</b>   |   |
| draft-previdi-isis-ipv6-prefix-sid-01                 | Segment Routing IPv6 Prefix-SID   |
| draft-li-ospf-ospfv3-srv6-extensions-07               | OSPFv3 Extensions for SRv6  |
| draft-ietf-6man-segment-routing-header-14             | IPv6 Segment Routing Header (SRH)   |
| draft-ietf-lsr-isis-srv6-extensions-07                | IS-IS Extensions to Support Routing over IPv6 Dataplane   |
| draft-bonica-6man-comp-rtg-hdr-08                     | The IPv6 Compact Routing Header (CRH)   |
| draft-ietf-bess-srv6-services-01                      | SRv6 BGP based Overlay services   |
| <b>BGP Flowspec</b>                                   |   |
| RFC 5575  | Dissemination of Flow Specification Rules   |
| draft-ietf-idr-flow-spec-v6-08                        | Dissemination of Flow Specification Rules for IPv6  |

## Ordering Information

| Product Number | Description |
|----------------|-------------|
| AON-DL-SDN     | SDN Bundle  |

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