# **Spirent AION**

# Spirent TestCenter SDN Bundle

### Overview

**Spirent AION** is a flexible delivery platform that enables users to achieve improved deployment and provisioning for all their cloud and network testing needs. It is designed to deliver ultimate flexibility in how Spirent TestCenter platforms are purchased and utilized.

The extended platform combines a wealth of industry-leading test solutions with a flexible licensing architecture to support a wide range of next-generation solution-based domain applications.

AION offers a centralized management hub to help leverage software and hardware functionalities across all lab users and locations for a simplified management and decision-making process:

- Flexible purchasing options available via subscription, consumption-based, and perpetual plans, with the ability to license different bandwidth, scale, and protocol bundles.
- Flexible deployment options offered include cloud-delivery, on-prem, and laptop-hosted licensing services.

Enhanced user serviceability delivers always-on platform services from auto-discovery and inventory management to user and workspace administration, notifications, and log aggregation.

## Software-Defined Networking (SDN) Bundle

Software-Defined Networking (SDN) promises to improve the elasticity and agility of networks, enabling service providers to rapidly respond to customer demands for new services. These promises need to be put to the test. In addition, the challenges posed by SDN networks on maintaining reliability, improved scalability and security need to be analyzed and tested.

#### **Critical SDN test objectives include:**

- Programmability-interoperability in multi-vendor environments
- Scalability–program millions of traffic engineering paths
- Performance time needed to program millions of paths
- Reliability quick recovery from failures
- Redundancy and high availability verify load sharing and state synchronization
- Security—handle malicious and DDoS attacks

**Path Computation Element Communication Protocol (PCEP)** provides an evolutionary approach to provide centralized SDN functionalities so that core SP network requirements such as provisioning TE service paths, SLA maintenance, fast fail-over convergence, fault-OAM capabilities can be satisfied at the same time.



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- 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 PECP, BGP-LS, segment routing commands via Command Sequencer
- Cost-Effective Solution comprehensive SDN protocol emulation suite in a single, affordable package

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**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 reused 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 PECP 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 PECP, BGP-LS, segment routing commands available in Command Sequencer

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### **Technical Specifications**

Parameter	Description
PCEP	
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 MPSL-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
BGP LS	
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
Segment Routing	
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
SRv6	
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
BGP Flowspec	
RFC 5575	Dissemination of Flow Specification Rules

### **Ordering Information**

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

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