

# Spirent AION

## Spirent TestCenter Conformance 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.

### Conformance Bundle

The latest generation of integrated network devices and services are more complex than ever before relying, as they do, on a plethora of underlying technologies and protocols. The resulting increased complexity and scarcity of testing skills impact the ability of manufacturers to ship quality assured products on time and limit service providers' ability to deploy networks that get Quality of Experience (QoE) right the first time.

Spirent TestCenter helps address these challenges. Now you can create and execute more complex test cases in less time with the same resources—and scale tests higher while debugging problems faster. The results: Lower CAPEX and OPEX, faster time-to-market, greater market share and higher profitability.

The **Conformance Bundle** helps reduce development costs and improve product interoperability by identifying correct protocol operation earlier in the development cycle. Multiple test suites can be run sequentially without user intervention. This key capability saves time by allowing users to configure and then execute multiple test suites without any further interaction, allowing them to move on to other tasks and analyze the data later once all tests are completed.

A hierarchical view of pass, fail, or inconclusive results enables users to quickly find any issues when looking through hundreds or thousands of results. Multiple results views are available including pass/fail, packet decodes, ladder diagrams and raw hex views which facilitate rapid identification and analysis of failure or inconclusive conditions.

- **Improved Interoperability**—determine the level of compliance with the standards and specifications across a large range of protocols and applications
- **Reduced Test Time**—identify protocol failures earlier in the development and integration cycles to reduce project costs
- **Trusted Partner**—benefit from decades of testing experience with Spirent as your guide through a world of complex testing in numerous technologies including Ethernet, IPv6, Routing, Broadband Access, Multicast, MPLS, Mobile Backhaul, Data Center and Security
- **Support** on all Spirent TestCenter Layer 2-3 test modules



User can rerun tests based on their conclusion in a previous test (e.g., pass, fail, or inconclusive). This unique ability allows users to quickly focus on problem areas during troubleshooting phases of the test cycle and easily compare the results from multiple test runs to facilitate bug-tracking metrics through regression cycles.

### Features and Benefits

- Reduce time to market for products and services: testers can dramatically decrease the time required to test their network devices and qualify their new network services
- User interaction with the test execution is eliminated. There is no need for the user to actively monitor the system to reconfigure the device under test or to manually start new tests.
- Multiple test suites can be run simultaneously from a single Spirent TestCenter Conformance Application instance. This change enables chaining multiple test suites together for sequential execution or to run multiple test suites in parallel to reduce test execution time.
- Each test case is fully documented in the application. The documentation includes the specification section reference, the actual text from the section, if the specification is in the public domain, an indication of the number of ports required for the test case, and a graphical depiction of the configuration being tested.
- Multiple results views and execution options facilitate the rapid identification, comparison, troubleshooting and retesting of test cases.

## Technical Specifications

| Test Package                  | Functionality   | Related Standards   |
|-------------------------------|---|---|
| BGP-4 IPv6                    | <b>BGP-4 for IPv6</b> <ul style="list-style-type: none"> <li>BGP/OSPF Interaction</li> <li>BGP Communities Attribute</li> <li>BGP Route Flap Damping</li> <li>Route Refresh for BGP-4</li> <li>AS Confederations</li> <li>Multiprotocol Extensions for BGP-4</li> <li>Use of Multiprotocol Extensions</li> <li>BGP Support for Four-octet AS Number Space</li> <li>Graceful Restart Mechanism for BGP</li> <li>Cooperative Route Filtering Capability for BGP-4</li> <li>BGP Extended Communities Attribute</li> <li>Capabilities Advertisement with BGP-4</li> <li>Address Prefix Based Outbound Route Filter for BGP-4</li> </ul>   | <ul style="list-style-type: none"> <li>RFC 4271</li> <li>RFC 1403</li> <li>RFC 2439</li> <li>RFC 2918</li> <li>RFC 4360</li> <li>RFC 3392</li> <li>RFC 2545</li> <li>draft-ietf-idr-rfc3065bis-05</li> <li>draft-ietf-idr-rfc2796bis-02 (obsolete RFC 2796)</li> <li>draft-ietf-idr-rfc2858bis-08</li> <li>draft-ietf-idr-as4bytes-12</li> <li>draft-ietf-idr-restart-10</li> <li>draft-ietf-idr-route-filter-11</li> <li>draft-ietf-idr-bgp-prefix-orf-02</li> </ul> |
| BGP-4 IPv4                    | <b>BGP-4 for IPv4</b> <ul style="list-style-type: none"> <li>BGP/OSPF Interaction</li> <li>BGP Communities Attribute</li> <li>BGP Route Flap Damping</li> <li>Route Refresh for BGP-4</li> <li>AS Confederations</li> <li>Multiprotocol Extensions for BGP-4</li> <li>BGP Support for Four-octet AS Number Space</li> <li>Graceful Restart Mechanism for BGP</li> <li>Cooperative Route Filtering Capability for BGP-4</li> <li>BGP Extended Communities Attribute</li> <li>Capabilities Advertisement with BGP-4</li> <li>Address Prefix Based Outbound Route Filter for BGP-4</li> </ul>  | <ul style="list-style-type: none"> <li>RFC 4271</li> <li>RFC 1403</li> <li>RFC 2439</li> <li>RFC 2918</li> <li>RFC 4360</li> <li>RFC 3392</li> <li>RFC 2545</li> <li>draft-ietf-idr-rfc3065bis-05</li> <li>draft-ietf-idr-rfc2796bis-02 (obsolete RFC 2796)</li> <li>draft-ietf-idr-rfc2858bis-08</li> <li>draft-ietf-idr-as4bytes-12</li> <li>draft-ietf-idr-restart-10</li> <li>draft-ietf-idr-route-filter-11</li> <li>draft-ietf-idr-bgp-prefix-orf-02</li> </ul> |
| IPv4/V6 Interworking          | <ul style="list-style-type: none"> <li>Common tunneling transition mechanisms, including configured tunneling and automatic tunneling</li> <li>NAT-PT TCP, UDP and ICMP checksum calculation and checking</li> <li>NAT-PT FTP Application Level Gateway (ALG) functionality check</li> <li>Intra-Site Automatic Tunnel Addressing Protocol (ISATAP) verification</li> <li>Stateless IP/ICMP protocol translation algorithm verification for both IPv4 to v6 and IPv6 to v4 protocol translation</li> <li>Exercise IPv4 over an IPv6 tunnel in the dual stack transition mechanism</li> <li>Verify generic packet tunneling including nested encapsulation, tunnel packet size and tunnel error process validation</li> <li>Functionality verification of the connection of IPv4-IPv6 domains via IPv4 clouds</li> </ul> | <ul style="list-style-type: none"> <li>draft-ietf-ngtrans-dstm-07</li> <li>RFC 2473</li> <li>RFC 2893</li> <li>RFC 3056</li> </ul>  |
| IPv4v6 Interworking Extension | <ul style="list-style-type: none"> <li>NAT-PT TCP, UDP and ICMP checksum calculation and checking</li> <li>NAT-PT FTP Application Level Gateway (ALG) functionality check</li> <li>Intra-Site Automatic Tunnel Addressing Protocol (ISATAP) verification</li> <li>Stateless IP/ICMP protocol translation algorithm verification for both IPv4 to v6 and IPv6 to v4 protocol translation</li> </ul>  | <ul style="list-style-type: none"> <li>RFC 2766</li> <li>RFC 2765</li> <li>RFC 4214</li> </ul>  |

## Technical Specifications (cont'd)

| Test Package      | Functionality  | Related Standards  |
|-------------------|--|--|
| IPV6              | <ul style="list-style-type: none"> <li>• NDP</li> <li>• Stateless Autoconfiguration</li> <li>• Path MTU Discovery</li> <li>• IPv6 Jumbograms</li> <li>• ICMP</li> <li>• Connecting IPv6 Domains via IPv4 Clouds</li> <li>• Inverse Discovery for NDP</li> </ul>  | <ul style="list-style-type: none"> <li>• draft-ietf-ipngwg-icmp-v3-02</li> <li>• RFC 1981</li> <li>• RFC 2374</li> <li>• RFC 2460</li> <li>• RFC 2461</li> <li>• RFC 2675</li> <li>• RFC 3056</li> <li>• RFC 3122</li> <li>• RFC 4443</li> <li>• RFC 2462</li> </ul> |
| OSPFv3            | <ul style="list-style-type: none"> <li>• Adjacency establishment, maintenance, and deletion</li> <li>• Designated router election</li> <li>• Error handling</li> <li>• Preferred path hierarchical routing</li> <li>• Database exchange</li> <li>• Neighbor state verification</li> <li>• Support for virtual link</li> <li>• LSA operation and support for the various LSA fields Support for different types of routers— such as internal routers, area border routers,</li> <li>• Backbone routers, and AS boundary routers</li> <li>• OSPFv3 header and IPv6 header format checking for OSPFv3 protocol packets</li> <li>• OSPFv3 packet format checking</li> <li>• Verification of OSPFv3 operation per-link basis</li> <li>• Verification of OSPFv3 multiple protocol instance operation over a single link</li> <li>• Support of multiple prefixes on a single interface</li> <li>• Point-to-point, NBMA (non-broadcast multi-access) and Ethernet network operation</li> </ul> | <ul style="list-style-type: none"> <li>• RFC 2328</li> <li>• RFC 2740</li> </ul>   |
| IPV6 Host Testing | <ul style="list-style-type: none"> <li>• IPv6 tests <ul style="list-style-type: none"> <li>– Extension headers</li> </ul> </li> <li>• Neighbor Discovery tests <ul style="list-style-type: none"> <li>– Router Prefix Discovery</li> <li>– Address Resolution &amp; Neighbor Unreachability Detection</li> </ul> </li> <li>• ICMPv6 tests <ul style="list-style-type: none"> <li>– Processing rules</li> <li>– Error messages</li> <li>– Informational messages</li> </ul> </li> <li>• IPv6 stateless address autoconfiguration</li> </ul>   | <ul style="list-style-type: none"> <li>• RFC 2460</li> <li>• RFC 2461</li> <li>• RFC 4443</li> <li>• RFC 2462</li> </ul>   |
| OSPFV2            | <ul style="list-style-type: none"> <li>• Adjacency establishment, maintenance, and deletion</li> <li>• Designated router election</li> <li>• Error Handling</li> <li>• Preferred path hierarchical routing</li> <li>• Database exchange</li> <li>• Neighbor state verification</li> <li>• Support for virtual link</li> <li>• LSA operation and support for the various LSA fields</li> <li>• Support for different types of routers, including internal routers, area border routers, backbone routers, and AS boundary routers</li> <li>• Point-to-point, non-broadcast Multi Access (NBMA) and broadcast operation</li> </ul>   | <ul style="list-style-type: none"> <li>• RFC 1587</li> <li>• RFC 1765</li> <li>• RFC 1793</li> <li>• RFC 2328</li> <li>• RFC 2370</li> </ul>   |
| RIPV1V2           | <ul style="list-style-type: none"> <li>• RIPv1 and RIPv2 interoperability</li> <li>• Request message processing</li> <li>• Response message processing</li> <li>• Packet forwarding via RIP learned routes</li> <li>• Split horizon</li> <li>• Timers</li> <li>• Text authentication</li> </ul>  | <ul style="list-style-type: none"> <li>• RFC 2082</li> <li>• RFC 2453</li> </ul>   |

## Technical Specifications (cont'd)

| Test Package | Functionality   | Related Standards   |
|--------------|---|---|
| VRRP         | <ul style="list-style-type: none"> <li>• VRRP protocol requirements and overview</li> <li>• VRRP packet format</li> <li>• Protocol state machines</li> <li>• Sending and receiving validation</li> <li>• Response to host ARP requests</li> <li>• Multiple Virtual Routers scenario</li> </ul>  | <ul style="list-style-type: none"> <li>• RFC 3768</li> </ul>  |
| IS-ISv4      | <ul style="list-style-type: none"> <li>• Can be concurrently or separately run in IPv4, and OSI environments</li> <li>• Level 1 and Level 2 adjacency operations, including establishment, maintenance, and deletion for point-to-point and broadcast operations</li> <li>• IPv4 extensions for adjacency establishment</li> <li>• Level 1 and Level 2 adjacency independence for point-to-point and broadcast operations</li> <li>• Designated IS election and resignation</li> <li>• IS-IS Update process integrity for point-to-point and broadcast operations</li> <li>• IS-IS Decision process operation</li> <li>• IPv4 extension summary address operation</li> <li>• Manual routing information propagation</li> <li>• Attach flag management</li> <li>• Address summarization</li> <li>• External link operation</li> <li>• Adjacency state table operation, including maintenance, establishment, and deletion OSI and IP authentication for link, area, and domain authentication</li> <li>• Level 1 and Level 2 routing</li> <li>• ESH PDU handling/soliciting ES configuration</li> <li>• Protocol error scenarios</li> <li>• PDU encoding errors</li> <li>• Timer jitter measurement</li> </ul> | <ul style="list-style-type: none"> <li>• ISO/IEC 10589:1992</li> <li>• ISO/IEC 10589:1992/Cor.1: 1993</li> <li>• ISO/IEC 10589:1992/Cor.2: 1996</li> <li>• ISO/IEC 10589:1992/Cor.3: 1996</li> <li>• IETF RFC 1195</li> </ul>                               |
| IS-ISv6      | <ul style="list-style-type: none"> <li>• Can be concurrently or separately run in IPv6, and OSI environments</li> <li>• Level 1 and Level 2 adjacency operations, including establishment, maintenance, and deletion for point-to-point and broadcast operations</li> <li>• IPv6 extensions for adjacency establishment</li> <li>• Level 1 and Level 2 adjacency independence for point-to-point and broadcast operations</li> <li>• Designated IS election and resignation</li> <li>• IS-IS Update process integrity for point-to-point and broadcast operations</li> <li>• IS-IS Decision process operation</li> <li>• IPv6 extension summary address operation</li> <li>• Manual routing information propagation</li> <li>• Attach flag management</li> <li>• Address summarization</li> <li>• External link operation</li> <li>• Adjacency state table operation, including maintenance, establishment, and deletion OSI and IP authentication for link, area, and domain authentication</li> <li>• Level 1 and Level 2 routing</li> <li>• ESH PDU handling/soliciting ES configuration</li> <li>• Protocol error scenarios</li> <li>• PDU encoding errors</li> <li>• Timer jitter measurement</li> </ul> | <ul style="list-style-type: none"> <li>• Draft-ietf-isis-ipv6-05</li> <li>• ISO/IEC 10589:1992</li> <li>• ISO/IEC 10589:1992/Cor.1: 1993</li> <li>• ISO/IEC 10589:1992/Cor.2: 1996</li> <li>• ISO/IEC 10589:1992/Cor.3: 1996</li> <li>• RFC 1195</li> </ul> |
| RIPNG        | <ul style="list-style-type: none"> <li>• Request Message Processing</li> <li>• Response Message Processing</li> <li>• Split Horizon</li> <li>• Timers</li> <li>• Forwarding</li> </ul>  | <ul style="list-style-type: none"> <li>• RFC 3623</li> <li>• RFC 2328</li> </ul>  |

## Technical Specifications (cont'd)

| Test Package                  | Functionality  | Related Standards  |
|-------------------------------|--|--|
| OSPFV2<br>Graceful<br>Restart | <ul style="list-style-type: none"> <li>• Message Format</li> <li>• Restarting Router</li> <li>• Helper Mode</li> </ul>   | <ul style="list-style-type: none"> <li>• RFC 3623</li> <li>• RFC 2328</li> </ul>   |
| OSPFV3<br>Graceful<br>Restart | <ul style="list-style-type: none"> <li>• Message Format</li> <li>• Restarting Router</li> <li>• Helper Mode</li> </ul>   | <ul style="list-style-type: none"> <li>• draft-ietf-ospf-ospfv3-graceful-restart-07.txt</li> <li>• RFC 3623</li> <li>• RFC 2328</li> </ul>   |
| PIM-SM IPV6                   | <p>PIM-SM operation over IPV6</p> <ul style="list-style-type: none"> <li>• PIM-SM Finite state machines</li> <li>• Hello message processing and Designated Router Election</li> <li>• Register message processing</li> <li>• Join/Prune message processing</li> <li>• Assert message processing</li> <li>• PIM-SM Timers</li> <li>• PIM-SM packet format</li> <li>• Optional Informational (these test cases verify optional requirements and provide helpful information regarding the support of such requirements on the IUT)</li> <li>• SSM-Source Specific Multicast</li> <li>• Interoperability of PIM-SM with the following host routing protocols: MLDv1 and MLDv2</li> <li>• Support of RIP and BGP unicast routing protocol for creating the PIM-SM multicast routing table</li> <li>• Support for the following Layer 2 types: Broadcast, NBMA and PPP</li> </ul> | <ul style="list-style-type: none"> <li>• Draft-ietf-pim-sm-v2-new-07</li> </ul> <p>Supplementary:</p> <ul style="list-style-type: none"> <li>• Draft-vida-mld-v2-07</li> <li>• RFC 2710</li> <li>• RFC 2715</li> </ul> |
| PIM-SM IPV4                   | <p>PIM-SM operation over IPV4</p> <ul style="list-style-type: none"> <li>• PIM-SM Finite state machines</li> <li>• Hello message processing and Designated Router Election</li> <li>• Register message processing</li> <li>• Join/Prune message processing</li> <li>• Assert message processing</li> <li>• PIM-SM Timers</li> <li>• PIM-SM packet format</li> <li>• Optional Informational (these test cases verify optional requirements and provide helpful information regarding the support of such requirements on the IUT)</li> <li>• SSM-Source Specific Multicast</li> <li>• Interoperability of PIM-SM with the following host routing protocols: MLDv1 and MLDv2</li> <li>• Support of RIP and BGP unicast routing protocol for creating the PIM-SM multicast routing table</li> <li>• Support for the following Layer 2 types: Broadcast, NBMA and PPP</li> </ul> | <ul style="list-style-type: none"> <li>• Draft-ietf-pim-sm-v2-new-07</li> </ul> <p>Supplementary:</p> <ul style="list-style-type: none"> <li>• Draft-vida-mld-v2-07</li> <li>• RFC 2710</li> <li>• RFC 2715</li> </ul> |
| PIM-BSR IPV4                  | <p>PIM-BSR IPv4</p> <ul style="list-style-type: none"> <li>• State transitions for Candidate BSR</li> <li>• State transitions for Non-Candidate BSR</li> <li>• Admin-Scope and Non-Admin scope operation</li> <li>• Periodic Transmission</li> <li>• Updating the RP to group mapping</li> <li>• BSM validation</li> <li>• Bootstrap Message format</li> <li>• C-RP Adv message format</li> </ul>  | <ul style="list-style-type: none"> <li>• Draft-ietf-pim-sm-bsr-06</li> </ul>   |
| PIM-BSR IPV6                  | <p>PIM-BSR IPv6</p> <ul style="list-style-type: none"> <li>• State transitions for Candidate BSR</li> <li>• State transitions for Non-Candidate BSR</li> <li>• Admin-Scope and Non-Admin scope operation</li> <li>• Periodic Transmission</li> <li>• Updating the RP to group mapping</li> <li>• BSM validation</li> <li>• Bootstrap Message format</li> <li>• C-RP Adv message format</li> </ul>  | <ul style="list-style-type: none"> <li>• Draft-ietf-pim-sm-bsr-06</li> </ul>   |

## Technical Specifications (cont'd)

| Test Package        | Functionality   | Related Standards   |
|---------------------|---|---|
| IGMPv3              | <ul style="list-style-type: none"> <li>Format verification for IGMPv3 Query and IGMPv3 Report messages</li> <li>Operation as an IGMPv3 Group Member</li> <li>Operation as an IGMPv3-capable Multicast Router</li> <li>Multicast data forwarding</li> <li>Interoperability with IGMPv2</li> </ul>  | <ul style="list-style-type: none"> <li>RFC 2236</li> <li>RFC 3376</li> </ul>  |
| IGMPv2              | <ul style="list-style-type: none"> <li>Format verification for IGMPv2 Query and IGMPv2 Report message</li> <li>Operation as IGMPv2 Group Member</li> <li>Operation as IGMPv2 capable Multicast Router.</li> <li>Interoperability with IGMPv1</li> </ul>   | <ul style="list-style-type: none"> <li>RFC 2236</li> </ul>  |
| IGMP Snooping       | <ul style="list-style-type: none"> <li>IGMPv2 and IGMPv3 message forwarding</li> <li>Multicast data forwarding</li> <li>IGMP v2/v3 interoperability</li> <li>IGMPv2 and IGMPv3 Snooping Querier</li> </ul>  | <ul style="list-style-type: none"> <li>RFC 4541</li> </ul>  |
| MLDV2               | <ul style="list-style-type: none"> <li>Format verification for MLDv2 Query and MLDv2 Report message</li> <li>Operation as MLDv2 Listener</li> <li>Operation as MLDv2 capable multicast router</li> <li>Multicast data forwarding</li> <li>Informational (these test cases are for optional specifications and provide information regarding the protocol implementation under test)</li> <li>Interoperability with MLDv1</li> </ul>   | <ul style="list-style-type: none"> <li>RFC 4541</li> </ul>  |
| MLD Snooping        | <ul style="list-style-type: none"> <li>MLDv1 and MLDv2 message forwarding</li> <li>Multicast data forwarding.</li> <li>MLDv1/v2 Interoperability</li> <li>MLDv1 and MLDv2 Snooping Querier</li> </ul>   | <ul style="list-style-type: none"> <li>RFC 4541</li> </ul>  |
| MLDV1               | <ul style="list-style-type: none"> <li>IPv6 header options, source and destination addresses formatting</li> <li>MLD messages formatting and contents validation</li> <li>Reserved fields handling</li> <li>Multicast group joining/leaving procedures</li> <li>Startup procedures</li> <li>Multicast group solicitation procedures</li> <li>Querier and Non-Querier operations and transition procedures</li> </ul>  | <ul style="list-style-type: none"> <li>RFC 4541</li> </ul>  |
| MSDP                | <ul style="list-style-type: none"> <li>MSDP Protocol Operation <ul style="list-style-type: none"> <li>Caching SA-messages</li> <li>MSDP Peer-RPF forwarding</li> <li>MSDP mesh group operation</li> <li>Source-Active Filtering</li> </ul> </li> <li>MSDP Packet Format Verification <ul style="list-style-type: none"> <li>Source-Active Message processing</li> <li>Source-Active TLV format verification</li> <li>Packet Format Error processing</li> </ul> </li> <li>MSDP Timers</li> </ul>   | <ul style="list-style-type: none"> <li>RFC 3618</li> </ul>  |
| PWE3 Ethernet ENCAP | <p>Ethernet, Ethernet VLAN</p> <ul style="list-style-type: none"> <li>Pseudowire signaling (using LDP) including tunnel establishment, tunnel deletion and tunnel error handling</li> <li>Pseudowire signaling support for capability exchange for control word usage, FCS retention, Fragmentation, VCCV</li> <li>Pseudowire status notification using either label withdraw, PW Status TLV or wildcard withdraw</li> <li>Pseudowire signaling support for Generalized PWID FEC (129), including support for related TLVs (Group ID TLV and PW Interface Parameters TLV)</li> <li>Layer 2 error handling</li> <li>Sequence number processing</li> <li>Virtual Circuit Connectivity Verification (VCCV) with LSP-Ping Encapsulation</li> <li>Ethernet encapsulation FCS retention</li> <li>Ethernet encapsulation fragmentation</li> <li>RSVP-TE or LDP as core tunneling protocol</li> </ul> | <ul style="list-style-type: none"> <li>draft-ietf-pwe3-control-protocol-17</li> <li>draft-ietf-pwe3-ethernet-encap-11</li> <li>RFC 4385</li> <li>draft-ietf-pwe3-fcs-retention-04</li> <li>draft-ietf-pwe3-fragmentation-10</li> <li>draft-ietf-pwe3-vccv-07</li> </ul> |

## Technical Specifications (cont'd)

| Test Package                | Functionality  | Related Standards   |
|-----------------------------|--|---|
| VPLS                        | <ul style="list-style-type: none"> <li>• Supports different MPLS label distribution mechanisms (RSVP-TE, LDP) for tunnel label distribution within the MPLS core network</li> <li>• Supports the following layer 2 encapsulations               <ul style="list-style-type: none"> <li>– Ethernet</li> <li>– Ethernet VLAN</li> <li>– Control Word usage</li> </ul> </li> <li>• Verifies VC Tunnel Set Up               <ul style="list-style-type: none"> <li>– VC tunnel establishment</li> <li>– Control Word negotiation</li> <li>– VC tunnel deletion</li> </ul> </li> <li>• Verifies VPLS topological model               <ul style="list-style-type: none"> <li>– Data flooding (proper operation w/ various multicast, broadcast and unknown addresses)</li> <li>– Spanning tree protocol PDU handling</li> </ul> </li> <li>• Verifies Control Plane functionality—MAC TLV handling in Address Withdraw message</li> <li>• Verifies data forwarding functionality—Support of qualified and unqualified learning for overlapping and unique customer MAC address space</li> <li>• Verifies Hierarchical Model support               <ul style="list-style-type: none"> <li>– Interworking of the IUT with MTUs or PEr</li> <li>– Exercises the redundant spoke connections</li> </ul> </li> <li>• Functional Tests               <ul style="list-style-type: none"> <li>– Checks for proper MAC address learning across user-specified range of MAC addresses and/or VLAN IDs from directly connected customer interfaces and from pseudo-wire connected interfaces.</li> <li>– Checks for proper packet forwarding across user-specified range of MAC addresses and/ or VLAN IDs from core to edge and from edge to core.</li> <li>– Checks for proper packet forwarding with different ether type fields</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• RFC 4762</li> <li>• RFC 4447</li> <li>• RFC 4448</li> <li>• RFC 4665</li> <li>• RFC 4385</li> </ul>  |
| Point-to-Multipoint RSVP-TE | <p>This test suite includes coverage for the following areas:</p> <ul style="list-style-type: none"> <li>• P2MP Mechanism</li> <li>• P2MP Path Message</li> <li>• Multiple sub LSPs in single Path</li> <li>• Multiple Path messages</li> <li>• P2MP Resv Message</li> <li>• Resv Message Throttling</li> <li>• ERO/SERO Processing</li> <li>• RRO/SRRO Processing</li> <li>• Path Tear Message</li> <li>• Notify Messages</li> <li>• ResvConf Messages</li> <li>• P2MP State Management</li> <li>• Error Processing: PathErr/ResvErr and Branch Failure Handling</li> <li>• Compatibility with P2P</li> <li>• LSP Reremerge</li> <li>• P2Mp Message Object encodings</li> <li>• Invalid Packet handling</li> </ul>  | <ul style="list-style-type: none"> <li>• RFC 4875 Extensions to Resource Reservation Protocol—Traffic Engineering (RSVP-TE) for Point-to-Multipoint TE Label Switched Paths (LSPs)</li> </ul>   |
| BGP-VPLS                    | <ul style="list-style-type: none"> <li>• Different MPLS label distribution mechanisms (RSVP-TE, LDP) for tunnel label distribution</li> <li>• PE Auto-Discovery</li> <li>• Signaling</li> <li>• Multi-AS VPLS (Option B and Option C)</li> <li>• Multi-homing and Path Selection</li> <li>• Layer 2 Encapsulation</li> <li>• Data Forwarding</li> </ul>  | <ul style="list-style-type: none"> <li>• RFC 4761 Virtual Private LAN Service (VPLS) Using BGP for Auto-Discovery and Signaling RFC 3748</li> <li>• RFC 4360 BGP Extended Communities Attribute RFC 3579</li> <li>• RFC 4760 Multiprotocol Extensions for BGP-4 RFC 1994</li> <li>• RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks</li> <li>• RFC 4385 Pseudowire Emulation Edge-to-Edge (PWE3) Control Word for Use over an MPLS PSN</li> </ul> |



## Technical Specifications (cont'd)

| Test Package                                 | Functionality   | Related Standards  |
|--|---|--|
| RSVP   | <p>Resource Reservation Protocol—Traffic Engineering (RSVP) Conformance Test Suite performs conformance testing for RSVP-TE implementations and verifies the following functions:</p> <ul style="list-style-type: none"> <li>• Operation of Tunnels</li> <li>• Reservation Styles</li> <li>• Path MTU</li> <li>• Message Format</li> <li>• LSP Objeencoding and decoding rules</li> </ul>   | <ul style="list-style-type: none"> <li>• RFC 3209 RSVP-TE: Extensions to RSVP for LSP Tunnels</li> </ul>   |
| LDP  | <ul style="list-style-type: none"> <li>• Hello Extension</li> <li>• LDP Discovery: this test group includes test cases related to LDP Discovery mechanism, including the basic discovery mechanism and the extended discovery mechanism</li> <li>• LDP Session Establish: this test group includes test cases related to LDP session establishment and transport connection establishment</li> <li>• LDP Session Initialization: this test group includes test cases related to LDP session initialization, including Hello adjacencies maintenance and LDP sessions maintenance</li> <li>• LDP Loop Detection: this test group includes test cases related to the LDP loop detection</li> <li>• LDP Messages: this test group includes test cases related to the LDP messages, including the Label Request message, Label Mapping message, Initialization message, Notification message, Hello message, KeepAlive message, Address message, Address Withdraw message, Label Abort Request message, Label Withdraw message and Label Release message</li> <li>• LDP Events: this test group includes test cases related to a Label Switch Router's behaviour under different LDP events, including recognizing new FECs, receiving label requests, receiving label mappings, detecting next hop changes, receiving label abort requests, receiving label releases, receiving label withdrawals and receiving notification messages</li> </ul> | <ul style="list-style-type: none"> <li>• RFC 5036 LDP Specification</li> </ul>   |
| 802.1X                                       | <ul style="list-style-type: none"> <li>• Verifies both the Authenticator and the Supplicant functionalities</li> <li>• Authenticator verification supports the use of a third-party Authentication Server (for example FreeRadius) or Spirent's own emulated RADIUS server</li> <li>• Exercises the test scenarios between the Backend Authentication state machine and the RADIUS server</li> <li>• Supports the use of either IPv4 or IPv6 for the RADIUS session</li> <li>• Supports the use of either IPv4 data packets or IPv6 data packets for verifying data path connectivity</li> </ul>  | <ul style="list-style-type: none"> <li>• IEEE 802.1X-2004</li> </ul> <p>Supplementary standards from the IETF:</p> <ul style="list-style-type: none"> <li>• RFC 3748</li> <li>• RFC 2865</li> <li>• RFC 3579</li> <li>• RFC 3850</li> <li>• RFC 1994</li> <li>• RFC 2246</li> <li>• RFC 2716</li> <li>• draft-josefsson-pppext-eap-tls-eap-06.tx</li> </ul>  |
| IEEE 802.1X<br>Advanced with<br>PEAP and TLS | <ul style="list-style-type: none"> <li>• Verifies both the Authenticator and the Supplicant functionalities</li> <li>• Uses Spirent's own emulated RADIUS server — the RADIUS server is emulated within the test suite itself and exercises the test scenarios between the Backend Authentication state machine and the RADIUS server</li> <li>• Supports MD5, EAP-TLS and PEAP based authentication type PDUs</li> <li>• Supports the use of IPv4 for the RADIUS session</li> <li>• Supports the use of either IPv4 data packets or IPv6 data packets for verifying data path connectivity</li> </ul>  | <ul style="list-style-type: none"> <li>• IEEE 802.1X-2004</li> </ul> <p>Supplementary standards from the IETF:</p> <ul style="list-style-type: none"> <li>• RFC 3748</li> <li>• RFC 2865</li> <li>• RFC 3579</li> <li>• RFC 3850</li> <li>• RFC 1994</li> <li>• RFC 2246</li> <li>• RFC 2716</li> <li>• draft-josefsson-pppext-eap-tls-eap-06.txt</li> </ul> |
| Ethernet CFM<br>(802.1ag)                    | <p>Verifies:</p> <ul style="list-style-type: none"> <li>• Connectivity Check Protocol</li> <li>• Linktrace Protocol</li> <li>• Loopback Protocol</li> <li>• MEP and MHF functions</li> <li>• Validation tests of CFM PDUs and TLVs</li> </ul>   | <ul style="list-style-type: none"> <li>• IEEE 802.1ag-D8</li> </ul>  |

## Technical Specifications (cont'd)

| Test Package                | Functionality  | Related Standards   |
|-----------------------------|--|---|
| Ethernet Link OAM (802.3ah) | <p>Verifies:</p> <ul style="list-style-type: none"> <li>• OAM sublayer for Active and Passive mode functionalities</li> <li>• OAMPDU Reception</li> <li>• OAMPDU Transmission</li> <li>• Verify the OAM discovery mechanism</li> <li>• Verify the OAM transmit state diagram</li> <li>• Verify the OAM sublayer multiplexer state diagram</li> <li>• Verify the OAM Parse state diagram</li> <li>• Verify the OAM functions for monitoring link operation such as remote loopback control</li> <li>• Initiating OAM Remote Loopback</li> <li>• During OAM Remote Loopback</li> <li>• Exiting OAM Remote Loopback</li> <li>• Verify the OAM Event Notification for link operation</li> </ul>  | <ul style="list-style-type: none"> <li>• IEEE 802.3ah</li> </ul>  |
| MEF9                        |  | <ul style="list-style-type: none"> <li>• MEF 1</li> <li>• MEF 14</li> </ul>   |
| MSTP                        | <ul style="list-style-type: none"> <li>• Verify BPDU handling and bridge operation</li> <li>• Verify that the bridge correctly updates the learned station location information</li> <li>• Verify the configuration of active topology into a single spanning tree for any given VLAN</li> <li>• Verify that an implementation is compatible with previous standard, and can coexist with RSTP and legacy bridges</li> <li>• Verify the operation of each bridge port that is represented by a set of state machines: <ul style="list-style-type: none"> <li>– Port timers state machine</li> <li>– Port information state machine</li> <li>– Port role selection state machine</li> <li>– Port role transitions state machine</li> <li>– Port state transition state machine</li> <li>– Topology change state machine</li> <li>– Port protocol migration state machine</li> <li>– Port receive state machine</li> <li>– Port transmit state machine</li> </ul> </li> <li>• Verify general procedures such as: <ul style="list-style-type: none"> <li>– Packet format</li> <li>– BPDUs validation</li> <li>– Functional procedures</li> <li>– Port variables</li> <li>– Priority vector calculations</li> <li>– Verify the setting of the MSTP parameters</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• IEEE 802.1Q-2003</li> <li>• IEEE 802.1s</li> <li>• IEEE 802.1w-2001</li> </ul> |
| MEF 14                      | <ul style="list-style-type: none"> <li>• Allows user to use different EVC type (EPL, EVPL, and ELAN)</li> <li>• Performance Service Attributes Frame Delay Performance <ul style="list-style-type: none"> <li>– Frame Delay Variation Performance</li> <li>– Frame Loss Ratio Performance</li> </ul> </li> <li>• Bandwidth Profile Service Attributes Per Ingress UNI <ul style="list-style-type: none"> <li>– Per EVC</li> <li>– Per Class of Service</li> </ul> </li> </ul>  | <ul style="list-style-type: none"> <li>• MEF 10</li> <li>• MEF 14</li> </ul>  |
| Provider Bridges (802.1AD)  | <ul style="list-style-type: none"> <li>• Customer VLAN aware component conformance</li> <li>• Service VLAN aware component conformance</li> <li>• Layer 2 Protocol message processing</li> <li>• Provider Bridge Network Operation</li> </ul>  | <ul style="list-style-type: none"> <li>• IEEE P802.1ad/D6.0</li> <li>• IEEE P802.1ad/D2.0</li> </ul>                    |

## Technical Specifications (cont'd)

| Test Package  | Functionality  | Related Standards  |
|---------------|--|--|
| 802.1ah (PBB) | <ul style="list-style-type: none"> <li>• <b>Customer Service Interfaces</b>—Three types of service interface defined for a Provider Backbone Bridge are tested for conformance: Port-based, S-tagged based and I-tagged based service interfaces. Also, the S-tagged service interface can be one of two types: One to one or bundled</li> <li>• <b>Provider Instance Ports</b>—A Provider Backbone Bridge is made up of I-components and a B-component. The I-component is the customer facing service interface. It comprises an S-VLAN component with the EISS on each Customer Network Port supported by the use of a Service VLAN tag, and the EISS for each Virtual Instance Port configured on a Provider Instance Port supported by the use of both a Service VLAN tag and a Backbone Service Instance tag. This test group tests the EISS for each Virtual Instance Port configured on a Provider Instance Port</li> <li>• <b>Customer Backbone Ports</b>—A Provider Backbone Bridge is made up of I-components and a B-component. A B-component comprises an S-VLAN component with the EISS on each Provider Network Port supported by the use of a Service VLAN tag, and the EISS on each Customer Backbone Port supported by the use of both a Service VLAN tag and a Backbone Service Instance tag. This test group tests the EISS on a Customer Backbone Port</li> <li>• <b>Functional Tests</b>—A set of test cases which provide the functional testing for the three types of service interface: Port-based service interface, S-tag based service interface and I-tag based service interface</li> </ul> | <ul style="list-style-type: none"> <li>• IEEE Std 802.1ah-2008: Virtual Bridged Local Area Networks - Amendment 7: Provider Backbone Bridges</li> <li>• IEEE Std 802.1Q-2005: Virtual Bridged Local Area Networks</li> <li>• IEEE Std 802.1ad-2005: Virtual Bridged Local Area Networks—Amendment 4: Provider Bridges</li> </ul> |
| MEF 21        | <ul style="list-style-type: none"> <li>• Abstract Test Cases for UNI-C Type 2 Link OAM OAM Functional Specifications <ul style="list-style-type: none"> <li>- OAM Event Notification Generation and Reception</li> <li>- OAM PDUs</li> <li>- OAM Local Information TLVs</li> <li>- OAM Remote Information TLVs</li> <li>- OAM Organization Specific Information TLVs</li> <li>- Link Events TLVs</li> <li>- Variable Descriptor &amp; Containers</li> <li>- OAM Additional Conformance Tests</li> </ul> </li> <li>• Abstract Test Cases for UNI-N Type 2 Link OAM OAM Functional Specifications <ul style="list-style-type: none"> <li>- OAM Event Notification Generation and Reception</li> <li>- OAM PDUs</li> <li>- OAM Local Information TLVs</li> <li>- OAM Remote Information TLVs</li> <li>- OAM Organization Specific Information TLVs</li> <li>- Link Events TLVs</li> <li>- Variable Descriptor &amp; Containers</li> <li>- OAM Additional Conformance Tests</li> </ul> </li> </ul>   | <ul style="list-style-type: none"> <li>• MEF 21 Abstract Test Suite for UNI Type 2 Part 1: Link OAM</li> <li>• MEF 20 UNI Type 2 Implementation Agreement</li> <li>• IEEE 802.3-2005 Clause 57 Operations, Administration, and Maintenance</li> </ul>  |
| Y.1731        | <ul style="list-style-type: none"> <li>• Continuity Check Protocol (CCP)</li> <li>• Link Trace Protocol</li> <li>• Loopback protocol</li> <li>• Multicast and Unicast</li> <li>• Alarm Indication Signal</li> <li>• Locked Signal</li> <li>• Ethernet Test messaging</li> <li>• Ethernet RDI</li> <li>• Frame Loss Measurement <ul style="list-style-type: none"> <li>- Single-Ended</li> <li>- Dual-Ended</li> </ul> </li> <li>• Delay measurement <ul style="list-style-type: none"> <li>- One-Way</li> <li>- Two-Way</li> </ul> </li> <li>• OAM PDU format and validation</li> </ul>  | <ul style="list-style-type: none"> <li>• ITU-T Y.1731</li> </ul>   |

## Technical Specifications (cont'd)

| Test Package                                | Functionality   | Related Standards  |
|---|---|--|
| E-LMI                                       | <ul style="list-style-type: none"> <li>UNI-C E-LMI Framing Mechanism               <ul style="list-style-type: none"> <li>E-LMI Messages</li> <li>E-LMI Procedures</li> <li>E-LMI Impairments</li> </ul> </li> <li>UNI-N E-LMI Framing Mechanism               <ul style="list-style-type: none"> <li>E-LMI Messages</li> <li>E-LMI Procedures</li> <li>E-LMI Impairments</li> </ul> </li> </ul>  | <ul style="list-style-type: none"> <li>MEF 24 Abstract Test Suite for UNI Type 2 Part 1: E-LMI</li> <li>MEF20 UNI Type 2 Implementation Agreement</li> <li>MEF 16 Ethernet Local Management Interface (E-LMI)</li> </ul> |
| Ethernet Ring Protection Switching (G.8032) | <ul style="list-style-type: none"> <li>Single ring topology</li> <li>Multi-ring/Ladder topology</li> <li>Revertive and Non Revertive Mode support</li> <li>Priority Logic verification</li> <li>R-APS State Machine</li> <li>Flush Logic verification</li> <li>Backward Compatibility Logic tests</li> <li>R-APS Message transmission</li> <li>R-APS Block Logic tests</li> <li>Protection Switching behavior</li> <li>Manual and Forced Switch support</li> <li>R-APS PDU Format</li> </ul>  | <ul style="list-style-type: none"> <li>ITU-T G.8032/Y.1344 (2010)</li> </ul>   |
| DHCPV6 Host                                 | <ul style="list-style-type: none"> <li>Message Validation</li> <li>DHCP Server Solicitation</li> <li>Client Initiated Config Exchange</li> <li>Server Initiated Config Exchange</li> <li>DHCP Options</li> </ul>  | <ul style="list-style-type: none"> <li>RFC 3315</li> <li>RFC 3633</li> <li>RFC 3646</li> <li>RFC 3736</li> </ul>   |
| DHCPV6 Server                               | <ul style="list-style-type: none"> <li>Message Validation</li> <li>DHCP Server Solicitation</li> <li>Client Initiated Config Exchange</li> <li>Server Initiated Config Exchange</li> <li>DHCP Options</li> </ul>  | <ul style="list-style-type: none"> <li>RFC 3315</li> <li>RFC 3633</li> <li>RFC 3646</li> <li>RFC 3736</li> </ul>   |
| ANCP  | <ul style="list-style-type: none"> <li>ANCP Connection</li> <li>TCP Connection</li> <li>Adjacency Format</li> <li>Adjacency State</li> <li>Capability Negotiation</li> <li>GSMP Extensions</li> </ul>   | <ul style="list-style-type: none"> <li>draft-ietf-ancp-protocol-02</li> <li>RFC 3292</li> <li>RFC 3293</li> </ul>  |
| VLAN  | <ul style="list-style-type: none"> <li>Ingress, Forwarding and Egress Rules</li> <li>Frame Reception and Transmission</li> <li>Learning Process</li> <li>VLAN Classification</li> <li>Filtering Database</li> <li>Tagged Frame Format</li> <li>Tagging/Untagging of layer2 data</li> <li>GVRP (GARP VLAN Registration Protocol)               <ul style="list-style-type: none"> <li>Static VLAN Registration</li> <li>VLAN message propagation</li> <li>GARP state transitions for Applicant and Registrar state machines</li> <li>GARP Timers</li> </ul> </li> <li>GMRP (GARP Multicast Registration Protocol)               <ul style="list-style-type: none"> <li>Static MAC Multicast address registration</li> <li>Forwarding/Filtering of multicast traffic</li> <li>GARP state transitions for Applicant and Registrar state machines</li> <li>GARP Timers</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>IEEE 802.1Q-2005</li> <li>IEEE 802.1D-2004</li> </ul>   |

## Technical Specifications (cont'd)

| Test Package | Functionality  | Related Standards  |
|--------------|--|--|
| LACP/802.3AD | <p>LACP</p> <ul style="list-style-type: none"> <li>LACPDU Format Verification</li> <li>Receive State Machine</li> <li>Periodic Transmission State Machine</li> <li>Mux State Machine</li> </ul> <p>Marker Protocol</p> <ul style="list-style-type: none"> <li>PDU structure verification</li> <li>Marker protocol operation</li> </ul> <p>Functional</p> <ul style="list-style-type: none"> <li>Capability to perform Link Aggregation</li> <li>Dynamic reallocation of conversation to different ports</li> </ul>   | <ul style="list-style-type: none"> <li>IEEE 802.3-2005</li> </ul>  |
| STP          | <ul style="list-style-type: none"> <li>Communication of the bridge protocol entity with its peer entities</li> <li>Update of stored protocol variables and timers</li> <li>State change of the Bridge ports</li> <li>Verifies all the procedures associated with the Bridge Protocol entity such as: <ul style="list-style-type: none"> <li>Validation of Transmit Configuration Bridge Protocol Data Units (BPDUs)</li> <li>Recording of configuration information and configuration timeout value</li> <li>Reply to Configuration BPDUs</li> <li>Response to Transmit Topology Change Notification BPDUs</li> <li>Configuration updates</li> <li>Root selection process</li> <li>Designated port selection</li> </ul> </li> <li>Topology change detection and acknowledgement</li> <li>Verifies Processing of frames received from individual MAC entities associated with the port, the submission of frames to the MAC entity for transmission, and the possible inclusion of the port in the active topology of the bridged LAN.</li> <li>Verifies the basic functions of a bridge when it is selected to play roles such as a Root, Designated Bridge, or an Alternate Bridge.</li> <li>Verifies the structures and encoding of the BPDUs that are exchanged between the Bridge Protocol Entities</li> </ul> | <ul style="list-style-type: none"> <li>IEEE 802.1D-1998</li> </ul> |
| RSTP         | <ul style="list-style-type: none"> <li>Verifies proper Bridge Port behavior</li> <li>Verifies the information contained in the BPDU may be used by a Bridge in calculating its own BPDU to transmit and may stimulate that transmission.</li> <li>Verifies the bridge updating the learned station location information correctly</li> <li>Verifies the operation of each Bridge Port that is represented by a set of state machines: <ul style="list-style-type: none"> <li>Port Timers state machine</li> <li>Port Information state machine</li> <li>Port Role Selection state machine</li> <li>Port Role Transitions state machine</li> <li>Port State Transition state machine</li> <li>Topology Change state machine</li> <li>Port Protocol Migration state machine</li> <li>Port Transmit state machine</li> </ul> </li> <li>Verifies the general procedures such as: <ul style="list-style-type: none"> <li>Packet format</li> <li>BPDUs Validation</li> <li>Functional procedures</li> </ul> </li> <li>Verifies the setting of the RSTP parameters</li> </ul>   | <ul style="list-style-type: none"> <li>IEEE 802.1D-2004</li> </ul> |

## Technical Specifications (cont'd)

| Test Package             | Functionality   | Related Standards   |
|--------------------------|---|---|
| LLDP (802.1AB)           | <p>LLDP Transmit</p> <ul style="list-style-type: none"> <li>• Protocol initialization</li> <li>• Frame transmission</li> <li>• Transmission</li> <li>• LLDP DU construction</li> <li>• LLDP frame formatting transmission</li> </ul> <p>LLDP Receive</p> <ul style="list-style-type: none"> <li>• Protocol initialization</li> <li>• Frame reception</li> <li>• Frame recognition</li> <li>• LLDP DU Validation</li> <li>• LLDP remote MIB update</li> <li>• Statistical counter</li> </ul>   | <ul style="list-style-type: none"> <li>• IEEE Std. 802.1AB-2005</li> </ul>  |
| LLDP-MED (ANSI/TIA-1057) | <ul style="list-style-type: none"> <li>• LLDP-MED initialization</li> <li>• LLDP-MED Capabilities TLV</li> <li>• Network Policy TLV</li> <li>• Location Identification TLV</li> <li>• Extended Power Via MDI TLV</li> <li>• Inventory Management TLV Set</li> <li>• LLDP TLV update</li> <li>• LLDP-MED transmission</li> <li>• LLDP-MED reception</li> <li>• Remote MIB TTL expiration</li> <li>• Frame Validation</li> </ul>  | <ul style="list-style-type: none"> <li>• IEEE Std. 802.1AB-2005</li> </ul>  |
| MMRP (802.1AK)           | <ul style="list-style-type: none"> <li>• Multiple MAC Registration Protocol</li> <li>• MRP State Transitions</li> <li>• MRP Timers</li> <li>• Forwarding and Filtering Rules for Data traffic</li> <li>• Validation of PDUs</li> </ul>  | <ul style="list-style-type: none"> <li>• IEEE P802.1ak/D8</li> <li>• IEEE P802.1ak/D8 Corrigendum</li> </ul>  |
| DCBX                     | <ul style="list-style-type: none"> <li>• DCBX</li> <li>• Test the DCBX specific requirements beyond LLDP</li> <li>• DCBX_Control_State_Machine</li> <li>• DCBX_Feature_State_Machine <ul style="list-style-type: none"> <li>– Priority_Group_Feature</li> <li>– Priority_Based_Flow_Control_Feature</li> <li>– FCoE_Application_Feature</li> </ul> </li> <li>• Other_Feature_TLVs (BCN TLV and Logical Link Status TLV)</li> </ul>  | <ul style="list-style-type: none"> <li>• DCB Capability Exchange Protocol Base Specification Rev 1.03</li> <li>• DCB Capability Exchange Protocol Base Specification Rev 1.0</li> </ul> |
| FIP                      | <ul style="list-style-type: none"> <li>• Discovery Protocol: This test group verifies the FIP FCF Discovery between E-Node and FCF, and FCF-FCF</li> <li>• Virtual Link Instantiation: This test group verifies the FLOGI procedure used by E-Nodes to login/logout into the fabric and the creation of VN ports and creation of VE ports for FCF</li> <li>• Virtual Link Maintenance: Verifies the IUT's implementation of virtual link maintenance using FIP Keep Alive and periodic Discovery Advertisement messages</li> <li>• VLAN Discovery: Verifies the procedure used by E-Node or FCF to get the VLANs supported by other FCFs for FIP operation</li> <li>• FIP Frame Format: Verifies the format of the various FIP messages and descriptor formats used in FIP</li> </ul> | <ul style="list-style-type: none"> <li>• INCITS xxx-200x Fibre Channel Backbone-5 Rev 1.05 March 30, 2009: Fibre Channel—Fibre Channel Backbone-5</li> </ul>                            |
| FIP Snooping             | <ul style="list-style-type: none"> <li>• Premiere ACLs (Access Lists)</li> <li>• Reconfigure Auto ACLs (Access Lists)</li> </ul>  | <ul style="list-style-type: none"> <li>• INCITS xxx-200x Link Services Rev 2.11</li> </ul>  |

## Technical Specifications (cont'd)

| Test Package         | Functionality   | Related Standards   |
|----------------------|---|---|
| Synchronous Ethernet | <ul style="list-style-type: none"> <li>Verifies the ESMC PDU format and QL TLV format</li> <li>Verifies the protocol behavior of ESMC message                             <ul style="list-style-type: none"> <li>QL generation</li> <li>QL reception</li> </ul> </li> <li>Verifies the synchronization principles in the clock selection processes                             <ul style="list-style-type: none"> <li>Synchronization source signal/interfaces not supporting SSM transport</li> <li>Synchronization source selection algorithm</li> <li>Signal fail activated</li> <li>External commands</li> <li>Preventing timing loop</li> <li>Delay times for NEs with SEC</li> </ul> </li> </ul>  | <ul style="list-style-type: none"> <li>ITU-T G.8264</li> <li>ITU-T G.781</li> </ul>   |
| IEEE 1588V2 PTP      | <p>Ordinary and Boundary Clocks State Protocol (SM and Events)</p> <ul style="list-style-type: none"> <li>Best master Clock algorithm</li> <li>Grandmaster Clock</li> <li>Message Processing</li> </ul> <p>Transparent Clocks</p> <ul style="list-style-type: none"> <li>End to End</li> <li>Peer to Peer</li> </ul> <p>Corrections Clock Offset</p> <ul style="list-style-type: none"> <li>Delay Request-Response</li> <li>Peer Delay</li> <li>Residence time for Transparent clocks</li> <li>Asymmetry corrections</li> </ul> <p>PTP Message Format</p> <ul style="list-style-type: none"> <li>Management node</li> <li>Unicast negotiation</li> <li>Path Trace Optional tests</li> <li>Compatibility (Version1 and Version 2 translations)</li> <li>Telecom profile Profile specifications</li> <li>Message Rates</li> <li>Unicast Negotiation</li> <li>PTP over UDPv4</li> <li>Alternate Best master Clock Algorithm</li> <li>Attributes and Unicast message</li> </ul> | <ul style="list-style-type: none"> <li>IEEE 1588—2008 Precision Clock Synchronization protocol</li> <li>ITU-T G.8265 PTP Telecom Profile for Frequency Synchronization</li> </ul>         |
| MPLS-TP OAM          | <ul style="list-style-type: none"> <li>Fault OAM AIS, LKR, LDI</li> <li>Clearing of errors</li> <li>Refresh interval</li> <li>TLVs</li> <li>PW Status Status messages</li> <li>Acknowledgement</li> <li>Clearing of errors</li> <li>Refresh interval</li> <li>S-PE Bypass</li> <li>SP-PE TLV</li> </ul>   | <ul style="list-style-type: none"> <li>Draft-ietf-mpls-tp-fault-xx</li> <li>Draft-ietf-pwe3-static-pw-status-xx</li> <li>Additional MPLS-TP OAM are planned for future release</li> </ul> |

## Technical Specifications (cont'd)

| Test Package | Functionality  | Related Standards  |
|--------------|--|--|
| IPSEC        | <ul style="list-style-type: none"> <li>IPv4 and IPv6 data protection</li> </ul>  | <ul style="list-style-type: none"> <li>RFC 4301</li> </ul>   |
| IPSEC- IKE   | <ul style="list-style-type: none"> <li>ESP, AH, and ESP and AH protection:</li> </ul>  | <ul style="list-style-type: none"> <li>RFC 4302</li> </ul>   |
| IPSEC –ESP   | <ul style="list-style-type: none"> <li>ESP Supports the following encryption/ decryption algorithms: data encryption, Standard (DES), 3DES, advanced encryption standard (AES), NULL (uses ESP without encryption/decryption)</li> </ul>   | <ul style="list-style-type: none"> <li>RFC 4303</li> </ul>   |
| IPSEC –AH    | <ul style="list-style-type: none"> <li>Supports the following authentication algorithms: Hash-function message, Authentication codes (HMAC)-Message Digest version 5 (MD5), HMACsecure, Hash algorithm (SHA), NULL (uses ESP without authentication)</li> <li>AH Supports the following authentication algorithms: HMAC-MD5, HMAC-SHA</li> <li>Five (5) different Phase 1 authentication modes: <ul style="list-style-type: none"> <li>Supports the use or non-use of Perfect Forward Secrecy (PFS)</li> <li>Tunnel Mode and Transport Mode</li> <li>Main Mode and Aggressive Mode for Phase 1 negotiations</li> <li>Quick Mode for Phase 2 negotiations</li> <li>New Group Mode</li> </ul> </li> <li>Supports Extended Sequence Number</li> </ul> | <ul style="list-style-type: none"> <li>RFC 2409</li> <li>RFC 2408</li> <li>RFC 2403</li> <li>RFC 2404</li> <li>RFC 2405</li> <li>RFC 2407</li> <li>RFC 2410</li> <li>RFC 2451</li> <li>RFC 3602</li> </ul> |

## Ordering Information

| Product Number | Description                        |
|----------------|------------------------------------|
| AON-PB-CTS     | AION Conformance Test Suite Bundle |

### 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](http://www.spirent.com)

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