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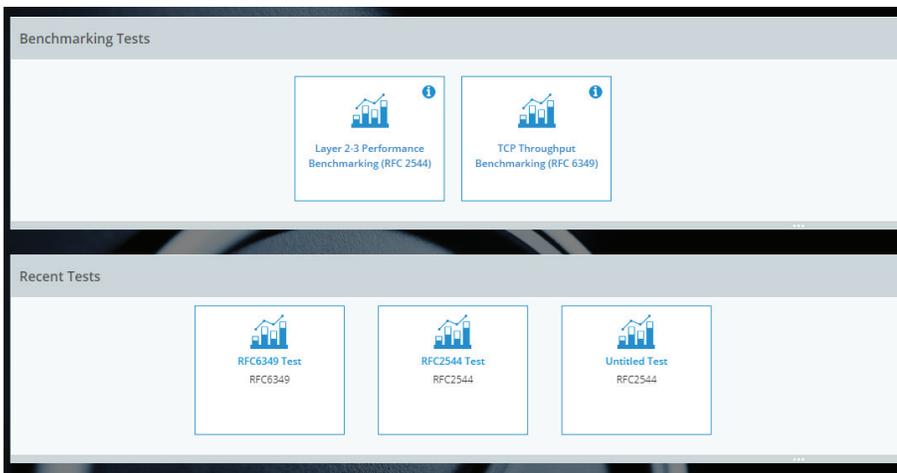
Spirent BenchmarkingApp

Application Overview

Spirent BenchmarkingApp is a web-based test application available in Spirent AION, that includes an array of automated Layer 2-7 benchmarking tests that enable Network Equipment Manufacturers, Service Providers and Enterprises to measure and report the performance characteristics of network devices.

A user can also evaluate network devices from different vendors by comparing the benchmark test results. BenchmarkingApp provides a simplified workflow with visual test topology configuration and automated benchmark test execution.

BenchmarkingApp home screen lists all the available tests:



Currently the tests available in Benchmarking App include:

1. Layer 2 - 3 Performance Benchmarking (RFC 2544)
2. TCP Throughput Benchmarking (RFC 6349)

In future, along with IETF standard based tests, the BenchmarkingApp may include custom benchmark tests based on specifications which are curated to specific industry needs.

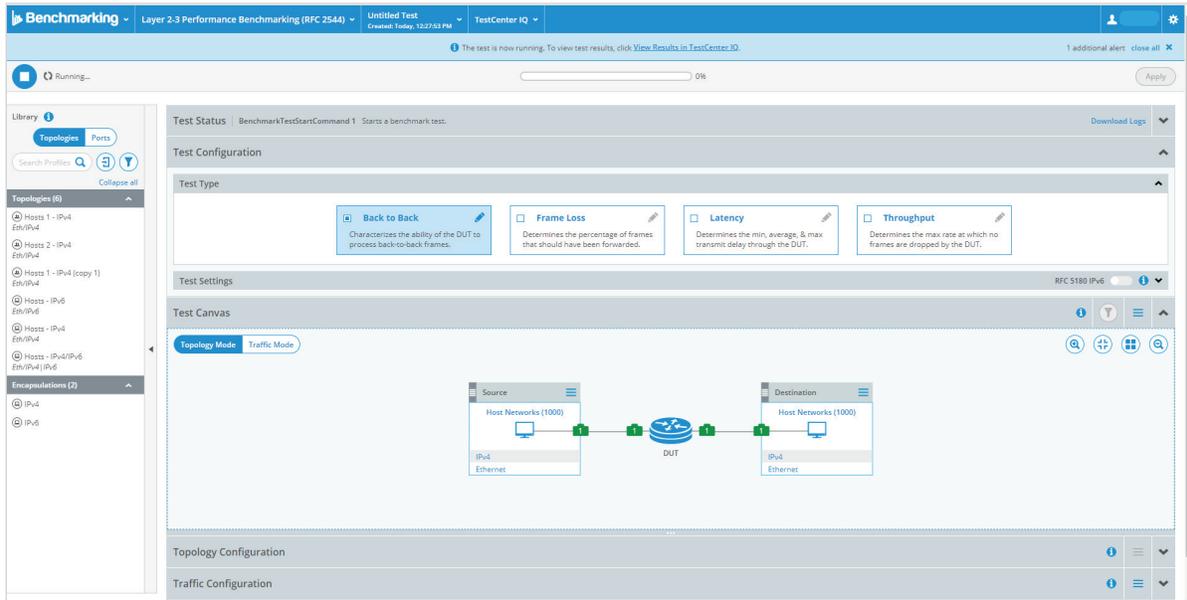
Layer 2-3 Performance Benchmarking (RFC 2544) Test

RFC 2544 is the industry leading Layer 2 and Layer 3 network device benchmarking test specification. Layer 2 - 3 Performance Benchmarking (RFC 2544) test provides automated performance testing of L2/L3 network devices per IETF RFC 2544, Benchmarking Methodology for Network Interconnect Devices. Included in this package are test cases for the following:

- Device Throughput by finding the maximum rate at which none of the offered frames are dropped
- Latency by measuring the minimum, average and maximum transmit delay
- Frame Loss rate throughout the entire range of rates and frame sizes
- Back-to-back frames processing of the network device

- **Network Device Performance Validation**—verify performance of Layer 2-7 devices, quickly and consistently over different network topologies
- **Increase Productivity**—reduce time-to-test through easy-to-use intuitive interface for configuration and fast automated execution
- **Cost-Effective Solution**—same AION benchmarking test package can be used for Benchmarking App and also benchmarking tests available in Spirent TestCenter
- **Actionable Analytics**—get answers you can act upon, not just tables of results
- **Trusted Partner**—benefit from decades of testing experience with Spirent as your guide through a world of complex testing

RFC 5180 is a benchmarking test for IPv6 and is available within Layer 2 - 3 Performance Benchmarking (RFC 2544) test to enable IPv6 option. Utilizing Spirent TestCenter™ high performance test modules, benchmarking tests can execute faster with nanosecond accuracy at high port density and scale.

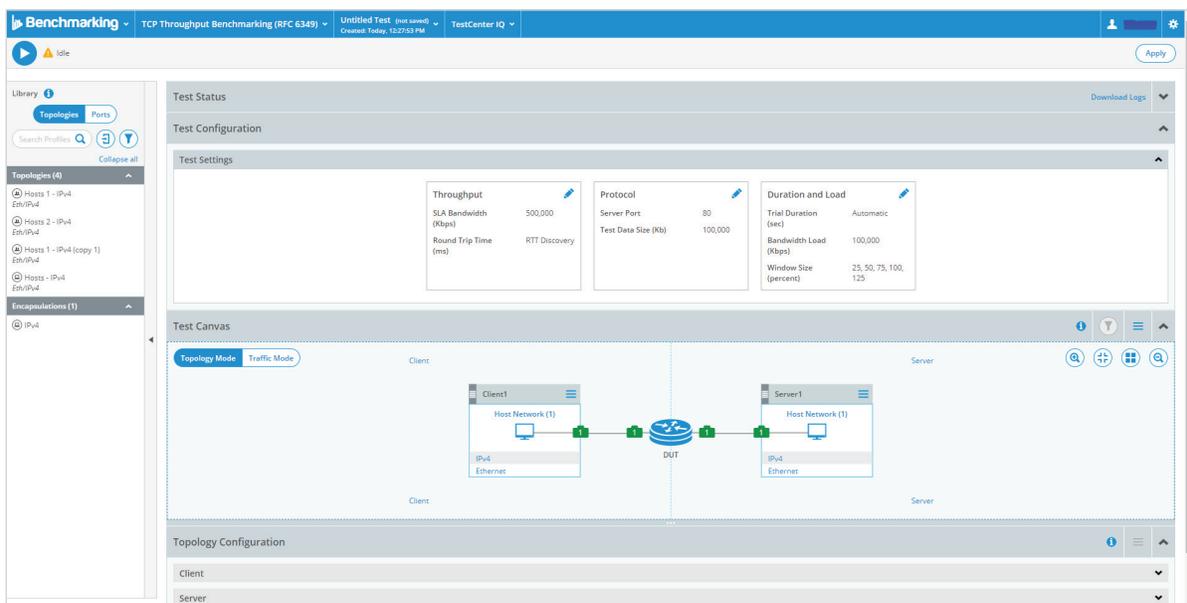


TCP Throughput Benchmarking (RFC 6349) Test

RFC 6349 defines a methodology for testing sustained TCP Layer performance. In addition to finding the TCP throughput at the optimal buffer size, RFC 6349 presents following metrics,

- Path Maximum Transmission Unit (MTU)
- Baseline Round-Trip Time (RTT)
- Bottleneck Bandwidth (BB)

Service providers are particularly interested in TCP throughput measurements to validate bandwidth levels offered to subscribers and ensure policy enforcement. The TCP Throughput Benchmarking (RFC 6349) test allows users to emulate TCP clients and servers with stateful connections. Tests can be run with single or multiple TCP connections, each independently configured. This methodology proposes Layer 2/3 tests should be performed to verify the integrity of the network before conducting TCP tests.



Features and Benefits

BenchmarkingApp

- Intuitive, easy to use web interface to get you started quickly
- Scalable and flexible benchmark testing with a simple to navigate workflow
- Easy to configure complex tests using visual system-provided topologies in a Test Canvas.
- Customize, save, and reuse test configurations including topology, DUT, port and traffic profiles
- Intelligent test results and reports available in Spirent TestCenter IQ
- Configure, execute a test, and analyse test results directly from a web browser
- In-app user assistance provided in UI quick tips, info boxes, hover tips.
- Seamless integrated experience with application, licensing, chassis/test ports (HW/virtual) management in AION platform.
- Recent ran tests can be viewed and loaded for rerun or to check status even after closing the browser session.

Layer 2-3 Performance Benchmarking (RFC 2544) Test

- Measure latency and jitter as part of throughput in a single test
- Test performance of a network device with frame sizes from 64 bytes to Jumbo frames and IMIX distributions
- Test with unidirectional or bidirectional traffic streams over VLAN, IPv4 and IPV6 (RFC 5180) encapsulations
- Measure impact of QoS/DiffServ and latency types, including LILO/LIFO/FIFO with jitter, latency, and throughput in a single test
- Test large port count, full mesh topology through thousands of available streams
- Enable L2/L3 Learning with option to perform learning for once, for every trial, for every frame size or for every iteration

TCP Throughput Benchmarking (RFC 6349) Test

- Supports multiple connections and multiple server port topologies
- Supports both auto-discovery and manual configuration of Round Trip Time (RTT)
- Supports Client to Server, Server to Client or Bi-directional traffic
- Test realistic TCP performance in a multiport scenario
- Verify bandwidth levels for subscribers
- Pinpoint bottlenecks due to either bandwidth or latency

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

Technical Specifications

Layer 2 - 3 Performance Benchmarking (RFC 2544)

| | |
|------------------|--|
| Key Tests | RFC 2544 Benchmarking Methodology for Network Interconnect Devices <ul style="list-style-type: none"> • Throughput test • Latency test • Frame loss test • Back-to-back frames test RFC 5180 Benchmarking Methodology for IPv6 |
|------------------|--|

| | |
|----------------------------|---|
| Test Configurations | <ul style="list-style-type: none"> • Test trial counts and duration • Traffic load in percentage, FPS, Inter-Burst-Gap, Kbps, Mbps • Frame size – Random, custom, IMIX • Jitter measurement • Start traffic delay • Stagger start traffic • Delay after transmission • Latency type – LIFO, FIFO, LILO • IPV4 and IPV6 traffic mix • IPV6 header extensions |
|----------------------------|---|

| | |
|-------------------------|--|
| Learning Options | <ul style="list-style-type: none"> • Option to enable and select Layer 2 or Layer 3 learning • Delay before learning • Rate of learning and retry count • Learning frequency |
|-------------------------|--|

TCP Throughput Benchmarking (RFC 6349)

| | |
|----------------------------|---|
| Test Configurations | <ul style="list-style-type: none"> • Test trial duration – Automatic, manual • Bandwidth load • Window size percentage list • Round trip time – Auto-discovery, manual • SLA bandwidth |
|----------------------------|---|

| | |
|--------------------|---|
| TCP Options | <ul style="list-style-type: none"> • Server port • Test data size |
|--------------------|---|

Supported Platforms and Modules

Supported with most flavours of the Spirent Appliances - A1-400G, DX3-400G, PX3-400G, and Test Modules - MX3-100G, FX3-100G, PX3-100G, DX3-100G, MX2/FX2-10G. Please contact your Spirent Sales Representative to find the right hardware for your testing needs.

Ordering Information

| Product Number | Description |
|------------------|----------------------|
| AON-PB-BENCHMARK | AION BenchmarkingApp |