Ethernet Switch Test Solution Package

Convergence is creating a new generation of integrated network devices and services that are much more complex than ever before. The resulting increased complexity, scarcity of testing skills, and architectural shortcomings in current test systems are hurting the ability of manufacturers to ship products on time at escalating quality levels and slowing service providers' ability to deploy networks that get Quality of Experience (QoE) right the first time.

VIAVI can help you address this challenge. 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. It results in a lower CapEx and OpEx, faster time to market, more significant market share with higher product quality, and higher profitability.

The EthernetSwitch test solution package combines VIAVI Packet Generator and Analyzer Base Package, RFC 2544 Benchmarking Test Package, and RFC 2889 Benchmarking Test Package.

- **Packet Generator and Analyzer Base Package** allows network equipment manufacturers, service providers, and large enterprises to quickly evaluate and troubleshoot the functionality, scalability, and performance of switching and routing devices and networks.
- **RFC 2544 Benchmarking Test Package** provides automated performance testing of L2/L3 network devices per IETF RFC 2544, Benchmarking Methodology for Network Interconnect Devices.
- **RFC 2889 Benchmarking Test Package** provides pre-programmed tests per IETF RFC 2889, Benchmarking Methodology for LAN Switching Devices, which is the standard for initial performance testing of Layer 2 switches.

Applications

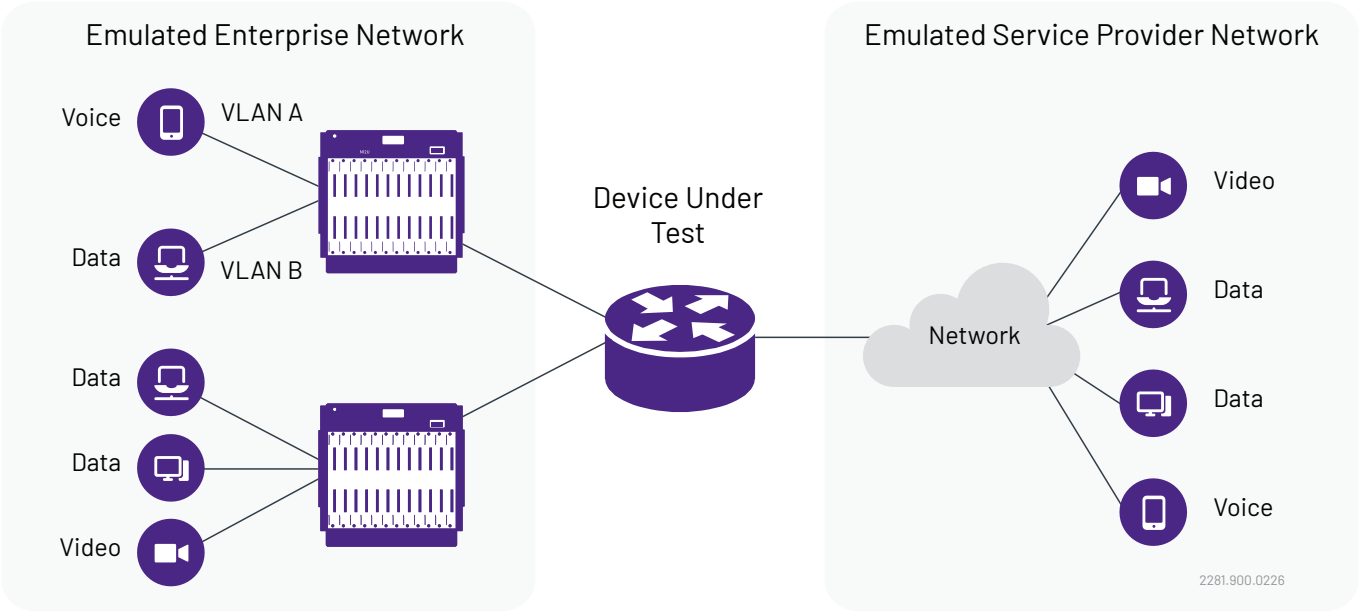
- Evaluate the stability of switches, routers, and edge devices under static or dynamic load conditions for minutes, hours, and days
- Characterize and troubleshoot functional behavior (including negative testing) of new network functionality in the development lab or before deployment into the operational network
- Evaluate key performance parameters such as per-flow QoS, fail-over time, or Access Control Lists (ACL); filtering performance
- Perform a comparative analysis of devices or services with deterministic traffic during product development cycles or vendor comparisons
- When used in conjunction with any of VIAVI TestCenter's additional protocol packages the system can emulate complex network topologies and traffic conditions
- RFC-2544 with VLAN network device benchmark
- RFC-2889 with VLAN switching benchmark

Features and Benefits

Testers want the security of knowing the industry's most intensive and extensive testing and analysis has been performed on their device or service. At the same time, they do not want to expend the cost, engineering effort, and time associated with manually poring through mountains of collected test data.

An interactive tool for customized Layer 2 and Layer 3 test creation and analysis, the Packet Generator and Analyzer Base Package provide the highest degree of control over system configuration, the widest variety of statistical results, and the broadest selection of real-time troubleshooting tools.

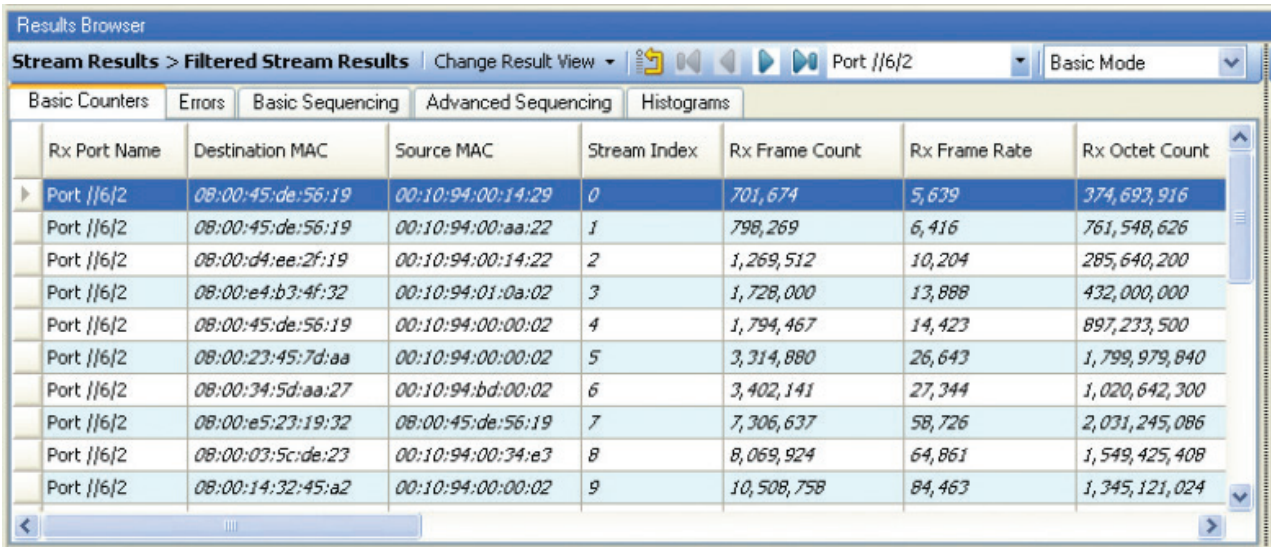
- Wide Ethernet speed modes capability supported from 800Gbps down to 10Mbps.
- Comprehensive support is provided for Ethernet protocols.
- Support for the TCP/IP suite includes IPv4 and IPv6 as well as tunneled and dual-stack configurations.
- Critical protocols such as spanning tree, VLAN, DHCP, IGMP, PPP, MPLS, QoS, and IPTV are integrated. The system supports a broad selection of unicast and multicast routing protocols.



TestCenter's Intelligent Results seeks out the results that represent test anomalies or failures. These are isolated and brought directly to the tester's attention without having to manually search through pages of data.

Intelligent Results

- **Interesting Streams**—This feature allows a user to create search criteria such as frame loss, rate, latency, jitter, or other combinations of measurements; the system will find all the streams matching the criteria and present them in the results view.
- **HyperFilters**—Allow you to separate and view in real-time packet header fields such as MAC DA/SA, IP SA/DA, MPLS labels, VLAN tags, TOS/ DSCP, TCP/UDP ports, ATM VPI/ VCI or other custom values.
- **Stray Frames Detection**—The system can automatically detect stray frames (multicast, L2 and VLAN flooding/leaking) and bring them to the tester's attention.
- **Hierarchical Results (drill down)**—Results are available at the traffic group, stream block, stream (with drill down), and flow levels.
- **Tx to Rx Mapping**—Testers need Tx counts particularly for devices that shape and police traffic; VIAVI TestCenter provides these counts and rates for Tx streams per port with matching statistics on the Rx port.
- **Industry-leading charting capability** feature provides more statistics to chart, high-resolution charts with user-specified triggering, and integrated control and data plane events on the chart with the time reference.
- **Analysis of non-test frames**—VIAVI TestCenter can analyze frames, including applying HyperFilters, to live traffic.



Rx Port Name	Destination MAC	Source MAC	Stream Index	Rx Frame Count	Rx Frame Rate	Rx Octet Count
Port //6/2	08:00:45:de:56:19	00:10:94:00:14:29	0	701,674	5,639	374,693,916
Port //6/2	08:00:45:de:56:19	00:10:94:00:aa:22	1	798,269	6,416	761,548,626
Port //6/2	08:00:d4:ee:2f:19	00:10:94:00:14:22	2	1,269,512	10,204	285,640,200
Port //6/2	08:00:e4:b3:4f:32	00:10:94:01:0a:02	3	1,728,000	13,888	432,000,000
Port //6/2	08:00:45:de:56:19	00:10:94:00:00:02	4	1,794,467	14,423	897,233,500
Port //6/2	08:00:23:45:7d:aa	00:10:94:00:00:02	5	3,314,880	26,643	1,799,979,840
Port //6/2	08:00:34:5d:aa:27	00:10:94:bd:00:02	6	3,402,141	27,344	1,020,642,300
Port //6/2	08:00:e5:23:19:32	08:00:45:de:56:19	7	7,306,637	58,726	2,031,245,086
Port //6/2	08:00:03:5c:de:23	00:10:94:00:34:e3	8	8,069,924	64,861	1,549,425,408
Port //6/2	08:00:14:32:45:a2	00:10:94:00:00:02	9	10,508,758	84,463	1,345,121,024

HyperFilters segregate each stream into different MAC addresses, IP addresses, ToS levels or any other user-defined characteristics of the received traffic.

Jitter

The use of delay-sensitive voice and data services over IP and Ethernet is expanding rapidly. These services are sensitive to not only latency but also variations in latency also known as jitter. The buffering, queuing, and switching architectures of network devices are the most significant source of jitter.

Testing and measuring a device's jitter characteristics are no longer a nice add-on. Today it is a critical task for device manufacture and service deployment.

TestCenter features the industry's best jitter measurements:

- Conforms to MEF (MEF 10) and IETF (RFC 3393) standards
- Jitter measured for all frames within a stream (not just on a sample)
- System can simultaneously analyze jitter on each of 64K streams arriving on a port
- Jitter measured at wire rate up to 800Gbps
- Jitter measured for the entire test duration
- Jitter measured for mixes of constant and bursty traffic
- Jitter measured for mixes of frame sizes
- Jitter histograms
- Real-time charting of min, max, average jitter
- Throughput latency and jitter in a single test (one test run) for RFC 2544 test
- Video Quality Jitter measurements:
  - MDI RFC 4445
  - Packet-to-packet delay variation RFC 3550

Troubleshooting Tools

Testers can spend up to one-third of their entire test time troubleshooting problems. For many labs, this represents the largest single task in the testing calendar. Reduce it and you get your products and services to market faster and with higher quality—while simultaneously reducing the cost of each test cycle.

TestCenter features the industry's best set of tools to quickly isolate, analyze and resolve problems.

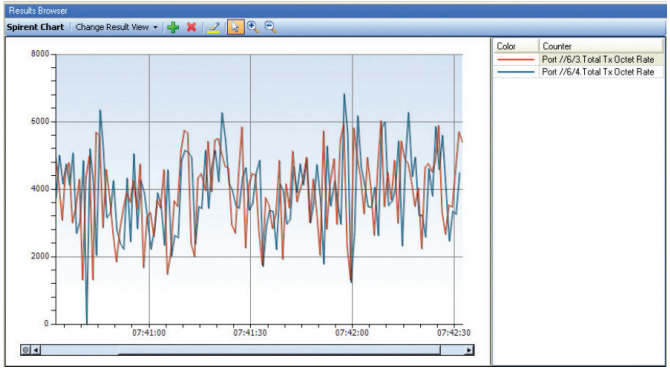
- Intelligent Results allows users to quickly identify the problematic areas
- Real-time Tx controls enables the tester to troubleshoot problems by altering the test while it is running
- Real-time results views allow the user to see how the device responds to changes in the test conditions without having to stop the test and save the results
- Real-time capture/decode—detailed analysis of interactions between VIAVI TestCenter and the DUT without having to halt transmission
- Comprehensive capture filters allow the user to isolate problem frames/exchanges from the traffic torrent at the line rate
- Comprehensive Logging ensures no critical events are missed while allowing the user to filter out all but the key events
- The system can analyze non-TestCenter traffic to troubleshoot production networks

TestCenter User Interface Framework

Customized applications, with windows arranged how the user wants and unnecessary clutter removed, are easier to use. They improve the tester's efficiency and effectiveness—ultimately leading to higher quality products and services brought more quickly to market.

TestCenter is a modern application with a sophisticated graphical user interface. The environment can be customized to meet the unique needs of each tester.

- The Technology Selector allows each tester to customize the application to their combination of technologies; the configuration and results options associated with other technologies are placed in the background.
- The windowing system allows each user to display favorite windows in the most efficient configuration.
- The docking framework allows testers to detach windows for different display needs—including the ability to display them on multiple monitors.
- Configurable results options enable up to 16 different charts and tables to be displayed simultaneously.



Define real-time charts to monitor critical statistics while the test executes.

Traffic Patterns (Scheduling)

Today's networks carry a complex mix of voice, video, and data traffic. The mix varies from that sent by thousands of uncoordinated households to carefully shaped and policed backbone traffic emanating from various aggregation devices.

Only TestCenter has the flexible priority-based scheduling mode that generates realistic Triple Play traffic profiles that your device is likely to experience in the real world. TestCenter scales to simulate tens of thousands of sources all precisely scheduled by the software in just seconds.

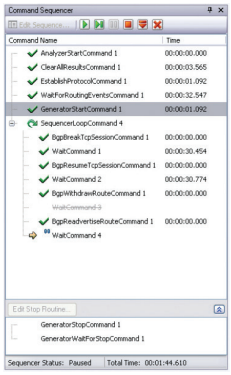
- TestCenter features three different scheduling modes to meet the demands of different test scenarios.
- Users can define the collection of constant and bursty traffic sources required to realistically emulate voice, video, and data sources on a single port.
- Each stream can be considered an independent traffic source with its own information rate, burst size, and other shaping parameters; the tester controls contention using 32 levels of priority which simulate different service level attributes.
- Users can configure the burst characteristics of each stream— burst size, IFG, IBG, frame size mixes—for thousands of traffic sources on each port.
- The system mixes this traffic to create a realistic simulation of different voice, video, and data sources—emulating traffic from either a vast collection of end users or from various aggregation devices that apply to shape and policing functions.
- Real-time control over traffic is maintained—including control over rate—even while generating complex traffic mixes.

NoCode Automation

Improvements centered on automation can enhance organizational productivity by 400 percent or more. Unfortunately, not all test organizations can afford the expense. Scripting requires highly skilled programmers. It takes time to design, code, and troubleshoot the scripts. Investment in programming tools, APIs, and new infrastructure is also required. Often these hurdles are insurmountable even though the potential rewards are huge.

Only TestCenter features "No Code" automation enabling users to immediately produce executable scripts from successful GUI-driven tests with one click. No programming or API knowledge is required. This is beyond simply saving the test configuration. The test logic is also saved from test initiation to pass/fail analysis.

- Change traffic speeds, start/ stop protocols, flap routes, and links in the Command Sequencer; complete control over interactive steps of VIAVI TestCenter.
- Specify Pass/Fail conditions in Command Sequencer, e.g., packet loss greater than 0, links not up, etc.; thousands of user-defined conditions available.
- Full conditional logic—fail test if links stay down or route flap fails—if/then/else, do/while, etc.
- Set your own failure reason in the Stop Sequencer Command— string is passed back to the caller in the generated script.



Users can create detailed and automated control over test events using the command sequencer.

Integrated Control and Data Plane (Dynamic Stream Blocks)

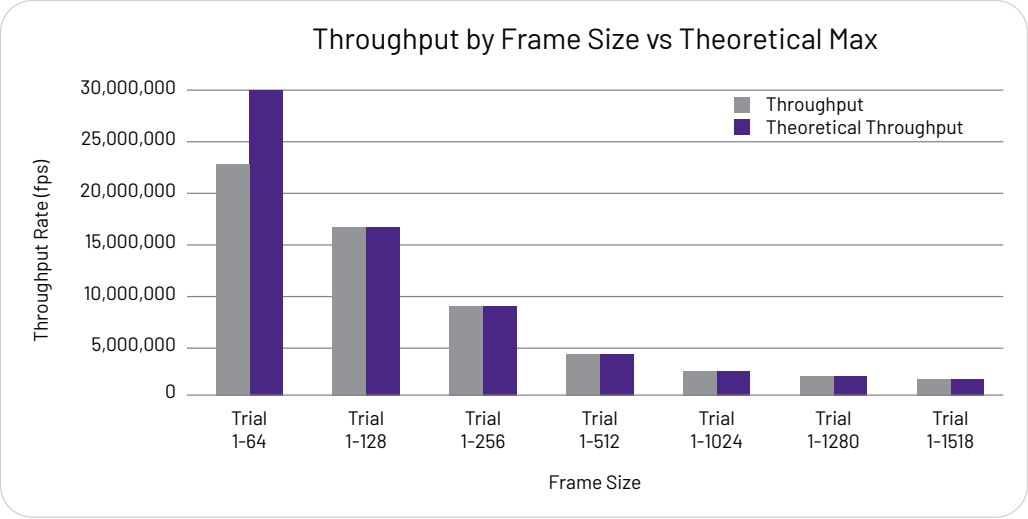
- Testers can spend up to half of their time configuring manual test cases. Often this is the largest effort in the testing calendar. Configurations that can take hours with legacy products take mere minutes on TestCenter. Common test cases that can easily be set up by TestCenter using its interactive GUI simply cannot be attempted using most products without expensive programming—if at all.
- By using TestCenter, testers configure their network topology and quickly build traffic on top of it using one of several configuration Wizards. No more straining to document and remember address assignments and mappings. TestCenter keeps track of all the mapping, allowing the user to simply indicate flows between endpoints in the emulated topology.
- Not only are these mappings automatically created at configuration time but they are also updated while the test executes providing dynamic assignments unmatched in competing products. For example, MPLS label changes made on the DUT are distributed using the control plane protocols to VIAVI TestCenter which then updates the traffic parameters on the fly, all without user intervention.

The result is significant productivity gains within the testing function, allowing faster time to market while maintaining high quality and cost control.

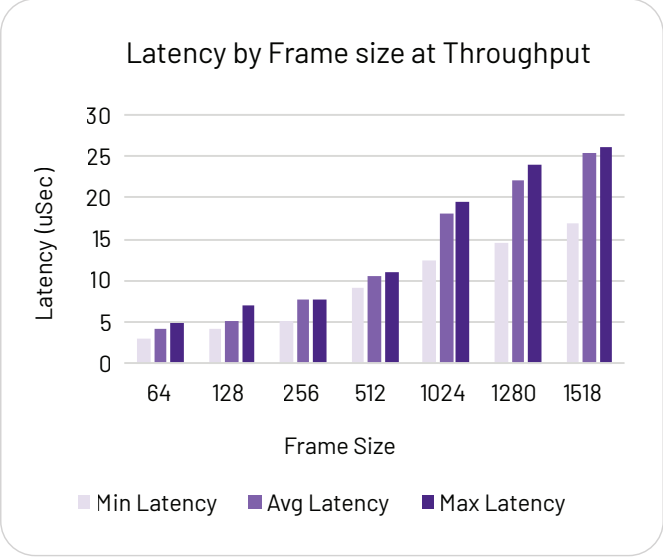
RFC 2544 Benchmarking Test Package

This package 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:

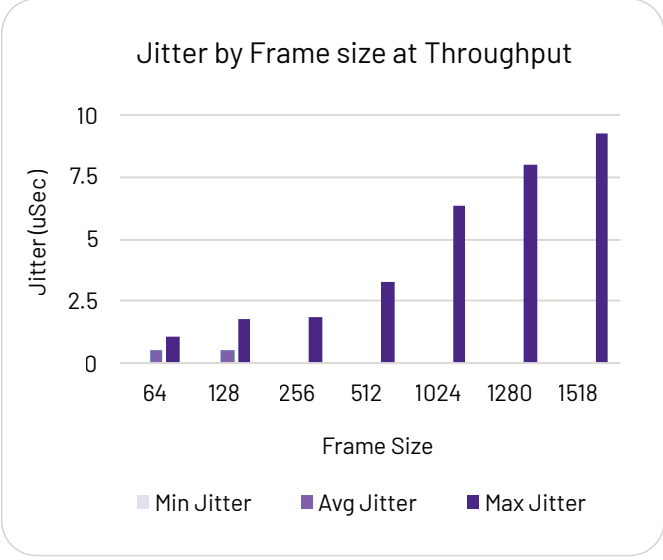
- Device Throughput by finding the maximum rate at which none of the offered frames are dropped
- Latency by measuring the minimum, average, and maximum transmit delay
- Frame Loss rate throughout the entire range of rates and frame sizes
- Back-to-back frames processing of the network device



Throughput by Frame Size vs Theoretical Max



Latency by Frame size at Throughput

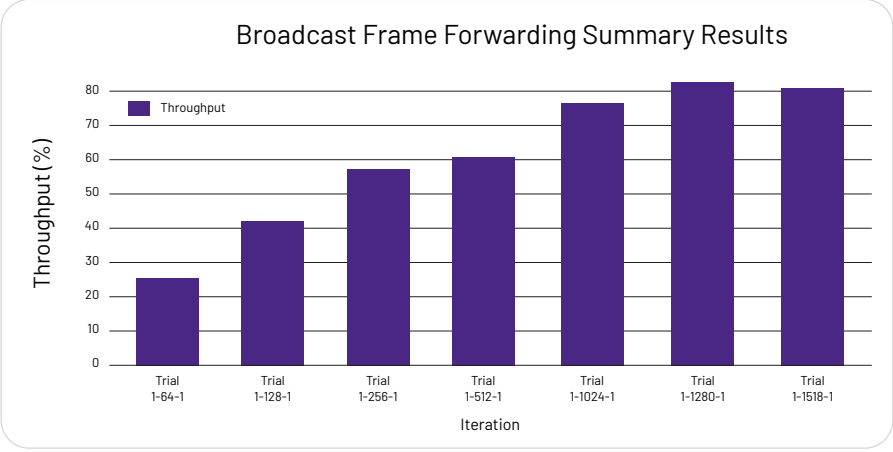


Jitter by Frame size at Throughput

RFC 2889 Benchmarking Test Package

This package provides pre-programmed tests per IETF RFC 2889, Benchmarking Methodology for LAN Switching Devices, which is the standard for initial performance testing of Layer 2 switches. Included in this package are test cases for the following:

- Determine device throughput, frame loss, and forwarding rates with fully meshed or other traffic configurations
- Determine how a device handles congestion
- Forward Pressure and Maximum Forwarding Rate
- Address caching capacity and Address learning rate
- Determine the behavior under error or abnormal frame conditions
- Determine Throughput and Latency when forwarding broadcast traffic



Broadcast Frame Forwarding Summary Results

Supported Modules and Platforms

SPK-0002 is supported on all VIAVI TestCenter test modules and appliances.

NOTE: Please refer to "VIAVI TestCenter Software and Hardware Release Notes" from VIAVI Customer Service Center for Computer System and Operation System requirements.

Ordering Information

SPK-0002	**VIAVI Ethernet Switch Test Solution A**
This solution bundle includes:	
BPK-1001A	Packet Generator and Analyzer Base Package A

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