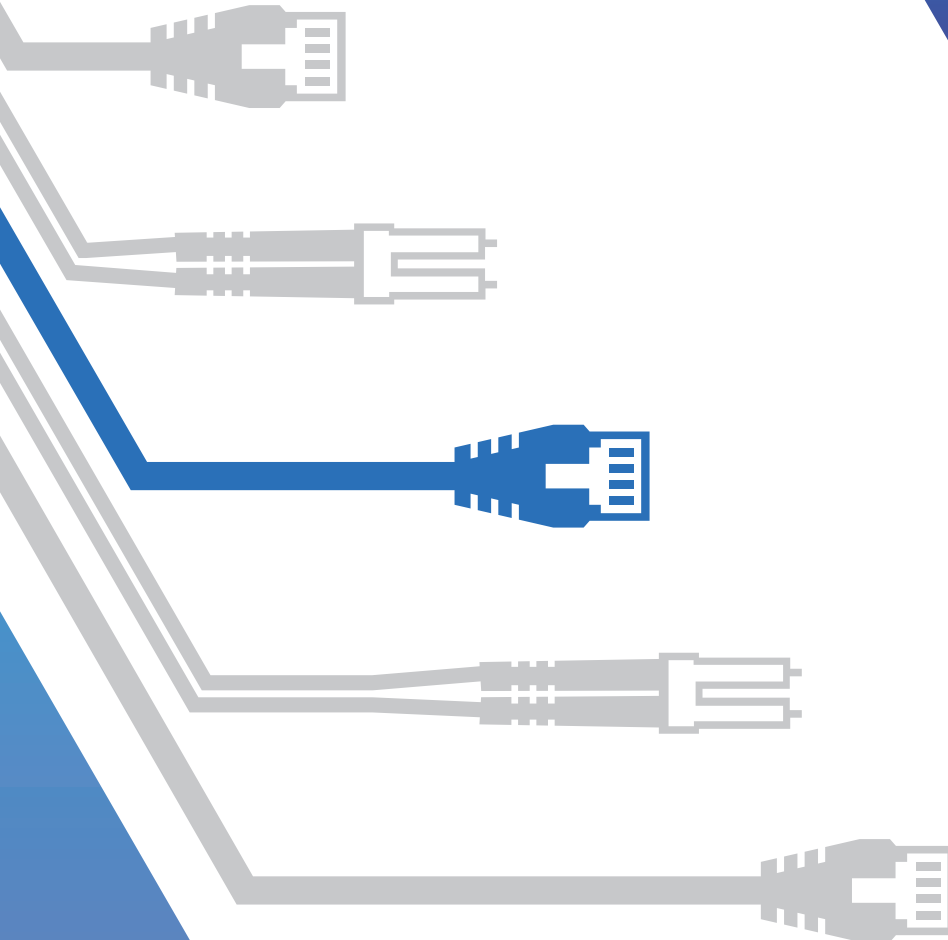Brochure

The Essentials of Ethernet Service Activation

3. Multi-Service Y.1564 SAMComplete

Global growth in communications and data services is driving increasing demand for Ethernet. As businesses and consumers demand more and more data, the pressure is on service providers (SP) to supply reliable Ethernet with the capacity for growth – and to do it quickly. Customers want easy, well-priced access to reliable high-speed, cloud-based data services such as streaming, Internet of Things, and next-generation networks. At the same time, service providers are keen to supply new services—and benefit from new, growing revenues. To capitalize on demand and manage operational costs, service providers will rely on testing tools that help them turn up and monitor Ethernet connections quickly, safely, and cost-effectively with minimal complications.
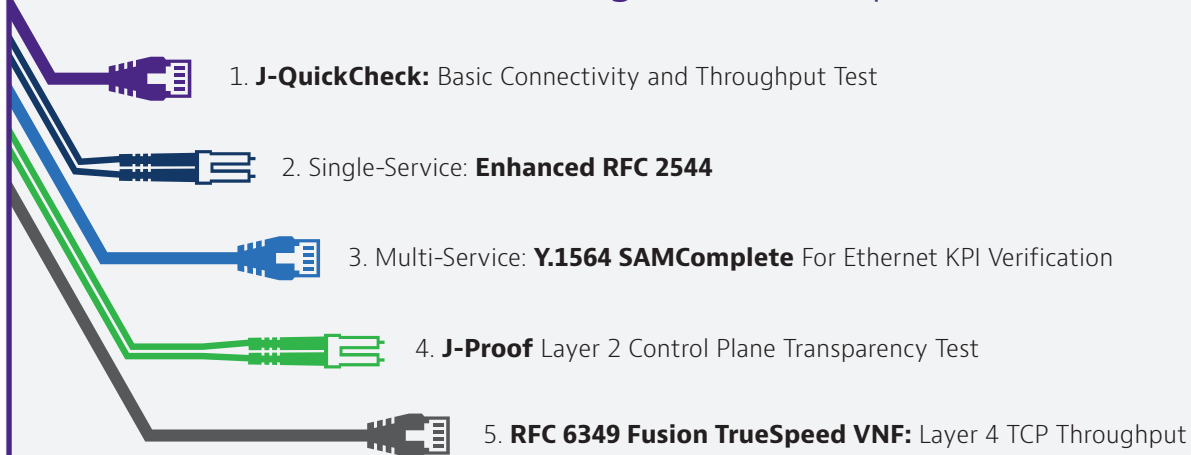
Key Advantage:

VIAVI enhanced Y.1564 (SAMComplete) is the only solution that runs Y.1564 and RFC 6349 tests concurrently. This means the data service is tested using real TCP stateful traffic which is the only way to accurately test multi-service quality of service (QoS).

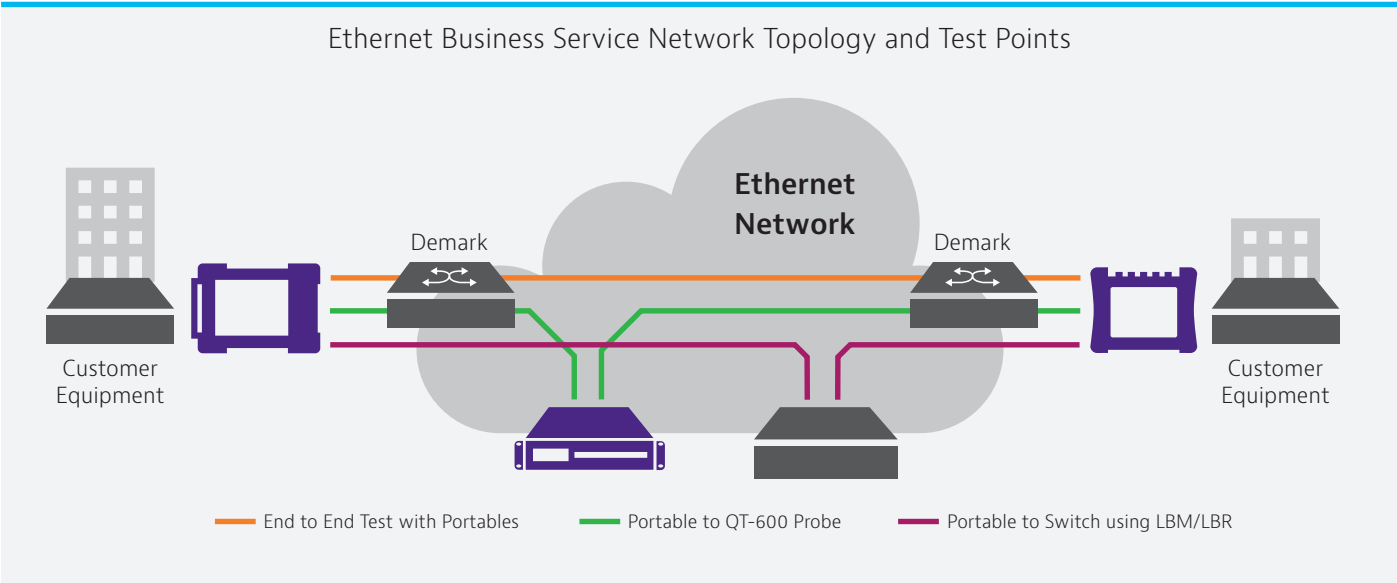## Speed and Efficiency for Multiple Classes of Service

Y.1564 is the industry-standard service activation test for multi-service Ethernet and IP ("Triple Play"). This test measures KPIs and bandwidth profiles such as:

- CIR, EIR (Throughput)

- Frame Delay (FD), Latency

- Frame Delay Variation (FDV), Jitter

- Frame Loss Rate (FLR)

- Committed Burst Size (CBS), Policing

Best Practice Workflow (Single and Multiple Services):

1. **J-QuickCheck:** Basic Connectivity and Throughput Test

2. Single-Service: **Enhanced RFC 2544**

3. Multi-Service: **Y.1564 SAMComplete** For Ethernet KPI Verification

4. **J-Proof** Layer 2 Control Plane Transparency Test

5. **RFC 6349 Fusion TrueSpeed VNF:** Layer 4 TCP Throughput

This test workflow is applicable to Ethernet Business Services and Wireless Backhaul network topologies; a typical Ethernet business service network topology is shown in the following diagram.

Ethernet Business Service Network Topology and Test Points

- End to End Test with Portables
- Portable to QT-600 Probe
- Portable to Switch using LBM/LBR

The diagram above shows the "local" T-BERD/MTS represented on the left side and the "remote" T-BERD/MTS on the right. The most common service activation use case is a loop-back of the remote device and in this case, the device will be the remote T-BERD/MTS.

Enhanced Y.1564 Test Components and Benefits

The following table describes the distinct role of Y.1564 SAMComplete as well as the VIAVI enhancements that provide unique, valuable advantages:

| Service Activation Test	Description	VIAVI Advantage
Y.1564 SAMComplete	· The industry standard service activation test for multi-service Ethernet and IP ("Triple Play") · Measures KPIs and bandwidth profile such as: 　· CIR, EIR (Throughput) 　· Frame Delay (FD), Latency 　· Frame Delay Variation (FDV), Jitter 　· Frame Loss Rate (FLR) 　· Committed Burst Size (CBS), Policing	· Faster Y.1564 configuration test by starting at 100% bandwidth to save time (versus starting from lowest bandwidth value) · Wide variety of loop backs such as OAM and JMEP, etc. · Committed burst size (CBS) testing to ensure proper network policer shaper configuration as well as MEF 34 policer test · Wizard-like UI and test profiles simplify test configuration and results interpretation

| Service Activation Test	Description	VIAVI Advantage
Y.1564 + RFC 6349 Concurrent Testing	· Y.1564 only specifies Layer 2 traffic to test services; however, end-customer applications, such as web browsing and e-mail, ride on TCP (Layer 4). SAMComplete can test live TCP data services with up to 64 user sessions at speeds up to 10 GE.	· VIAVI SAMComplete is the only solution that runs Y.1564 and RFC 6349 tests concurrently. This means that the data service is tested using real TCP stateful traffic and is the only way to accurately test multi-service QoS. It enables network providers to experience the network as their customers do, removing the turn-up testing experience gap.
Integrated J-QuickCheck	· "Pre" test, which conducts basic connectivity and throughput tests before wasting time running the extensive Y.1564 tests	· VIAVI is currently the only vendor on the market to offer this test. The time savings for service activation can be quite substantial, potentially reducing total test time by 75% or more.
Faster Configuration Test	· Y.1564 specifies starting the throughput test at a lower value (i.e. 10%) of the CIR and ramp up to reach the CIR. VIAVI SAMComplete starts at 100% CIR and ramps down to find the achievable throughput.	· When running the VIAVI enhanced "ramp down" throughput technique, the time savings can be up to 75% for the Y.1564 configuration.
Easy Triple-play Emulation	· When emulating specific voice, video, and data traffic, SAMComplete offers customized testing, such as the number of calls to be emulated and the related codec. SAMCompete then automatically creates the right bandwidth profile for the traffic stream.	· Realistically simulates real-world traffic during turn-up and troubleshooting · Users do not need to know the characteristics of specific services, such as frame size used in a VoIP call · Ensures end-customer satisfaction by verifying that SLAs are met under real network conditions
Committed burst size (CBS) Testing	· The CBS test verifies that the actual performance of traffic policers and shapers match the configured settings.	· Network traffic policers and shapers must be properly configured or user performance will suffer. Standard Y.1564 tests do not address this test need, so VIAVI added CBS as part of its enhanced Y.1564 test.
Simple Three-step Workflow	· Users are guided through the test using an easy-to-follow, three-step workflow.	· Effortless test execution · Reliable and repeatable results · Helps avoid configuration or execution errors

Y.1564 + RFC 6349 Concurrent Testing

By integrating RFC 6349-based Fusion TrueSpeed VNF™ testing with Y.1564 SAMComplete, VIAVI provides a robust, automated turn-up capability which tests Layer 2/3 services (i.e. voice / video) concurrently with bursty TCP sessions. This closes the testing gap and allows the provider to turn-up the customer circuit with confidence knowing that end-customer applications will perform as expected. If a Y.1564 test is run without the RFC 6349 integration, then the end-customer may experience poor TCP performance below the network provider's committed information rate (CIR).

The diagram below illustrates a multi-service Y.1564 using UDP like streams for media (Video / Voice) and trucae TCP for the Data server (per RFC 6349).
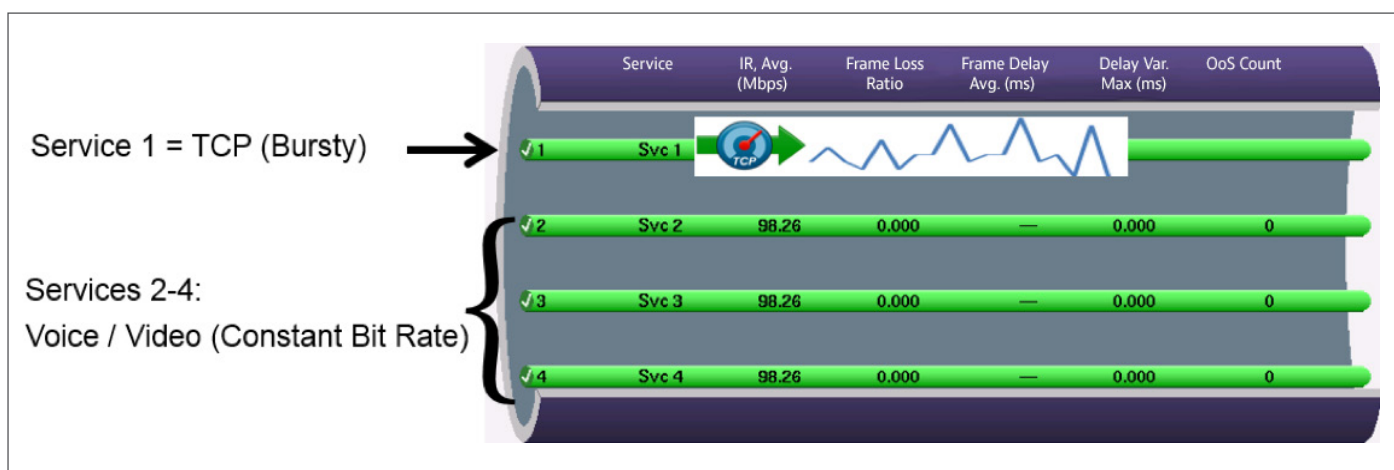

By simply configuring the CIR for the TCP service, all TCP connections are generated and metrics measured per RFC 6349. When the test is complete, the user is presented with a simple dashboard indicating which services passed.
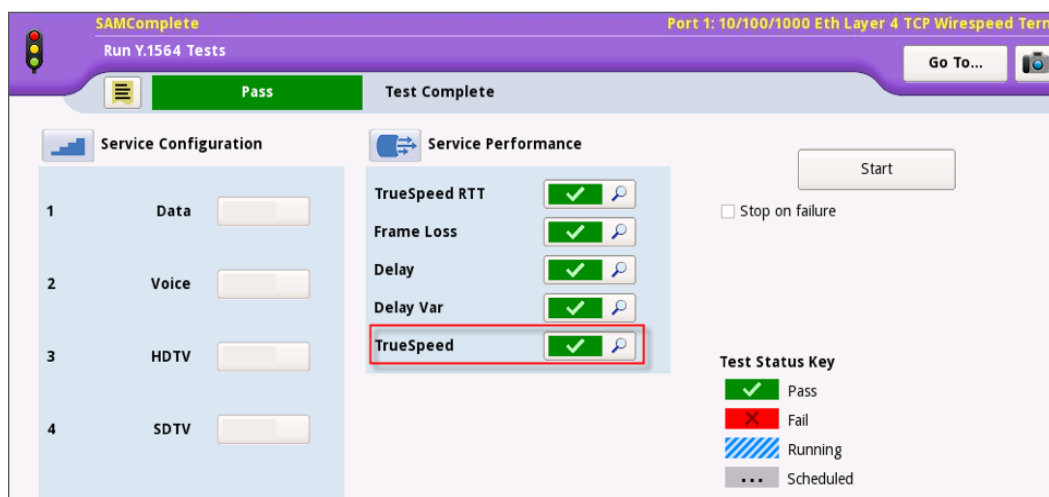
In the example above, the Fusion TrueSpeed VNF RFC 6349 test was passed as well as all the CBR traffic services tests.

The next example shows the VIAVI dashboard where the Fusion TrueSpeed VNF test failed. By clicking on the Fusion TrueSpeed VNF icon, detailed results are shown in the subsequent screen.
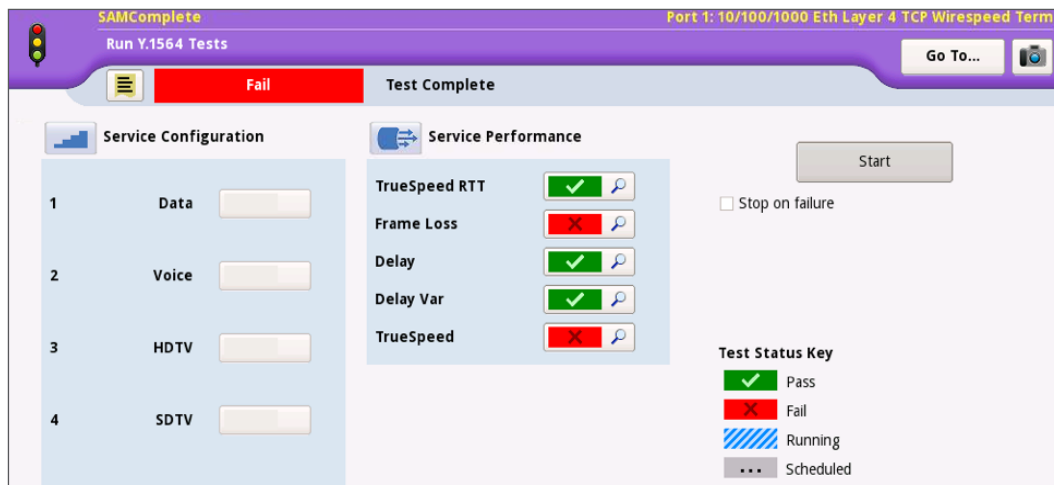
The following example shows that while the customer CIR was nearly 475 Mbps (Layer 4), the TCP test failed badly and only yielded 28 Mbps! While this may sound like an extreme test case, this occurred during a recent initial turn-up of a managed business service. A router's output queue was configured with a very small default value and the bursty TCP traffic experienced substantial loss. Tuning the queue resolved the problem and then the service was handed off to the enterprise customer with confidence in its QoS.
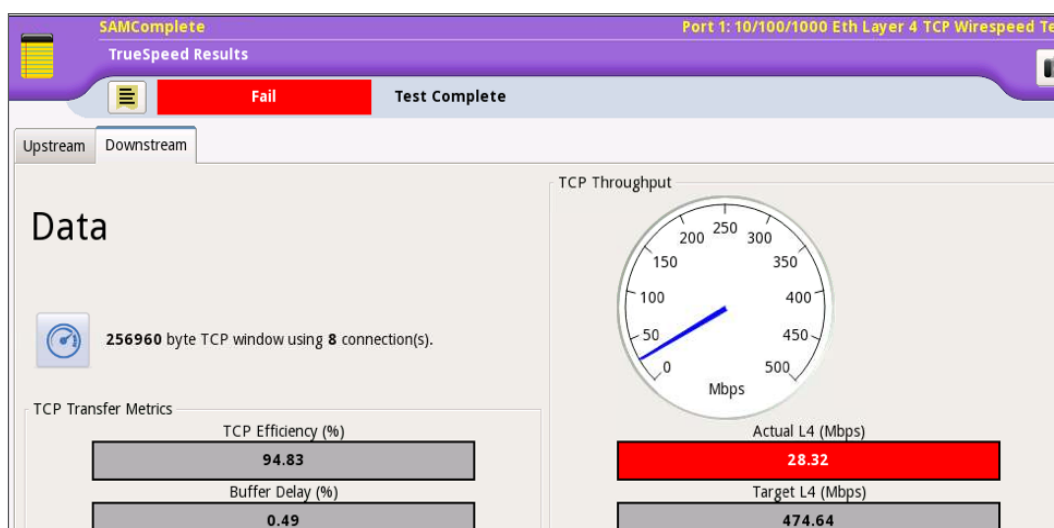
Five Advantages in Speed and Efficiency

Integrated J-QuickCheck

J-QuickCheck test is somewhat of a "pre-test" that verifies basic connectivity of the network very quickly before significant time is wasted trying to run and the Y.1564 test. Important configuration checks include:

• Auto-negotiation Issues

• Mis-configured VLAN

• Basic Throughput / Connectivity Check

The following screenshot shows the J-QuickCheck configuration and results.
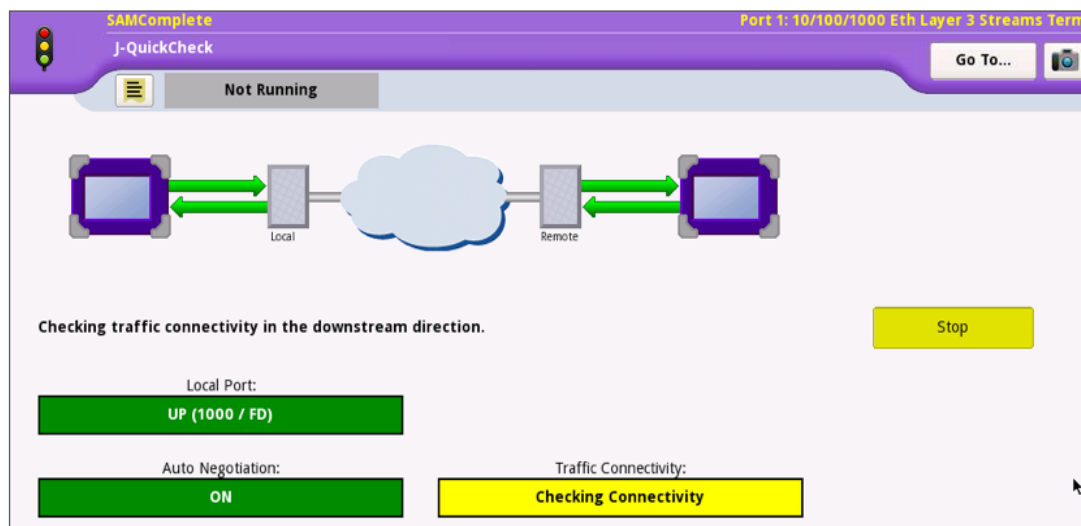
Other areas verified by the integrated J-QuickCheck also include:

• **Auto-negotiation Issues** – When a local test unit is connected to the network, the test unit and network equipment (i.e. Ethernet switch), must negotiate to the proper full-duplex link speed or the interface will default to half-duplex. If the interface cannot negotiate properly and enters half-duplex state, then a Y.1564 test will falsely report a very low throughput for a given CIR. As an example, a CIR of 100 Mbps may only achieve 10 Mbps (or less) if the link is set for half-duplex.

- **Mis-configured VLAN** – Traditionally, the technician must enter the correct VLAN on the local test set. Many times, this VLAN is incorrect or the technician is not even aware that the network is using VLAN tags. An example would be that the network is configured to use VLAN 202 between the local and remote test device. If the technician does not enter a VLAN or enters the incorrect VLAN, the remote device will never see the loopback commands. This again can waste significant amounts of time since the technician must contact advanced engineering / Network Operations Center (NOC) and it can be even more problematic when the network is not well documented.

  The J-QuickCheck VLAN scan test (early 2017) automatically sends loop "hello" commands to all 4096 VLANs and provides a list of remote devices which reply on a VLAN (as well as the VIAVI device ID). This scan takes about 10 seconds to complete. The time savings is again enormous as VLAN misconfiguration is probably the most common test configuration error.

- **Basic Throughput / Connectivity Check** – When running a conventional Y.1564 test, the primary purpose is to establish the ability of the network to transmit / receive network traffic at the service Committed Information Rate (CIR). If there is a connectivity problem between the test sets, it does not make sense to waste time running the Y.1564 test. J-QuickCheck eliminates this connectivity misconfiguration problem altogether by running a very short throughput test and providing immediate feedback (within seconds) to the user if connectivity cannot be made so that the basic set-up problem can be troubleshot before wasting time running the time-consuming Y.1564 test.

Faster Y.1564 Configuration Test

Y.1564 specifies that a ramp-up bandwidth test algorithm should be used. For example, using 100 Mbps CIR, the standard Y.1564 test default to four "steps" of tests, starting at 25%, 50%, 75%, then 100% CIR. The intention of this ramp-up test is to provide diagnosis information regarding the throughput at which a failure first occurred. Often, this can waste a lot of time because the network operator's network is robust and can handle traffic at the CIR.
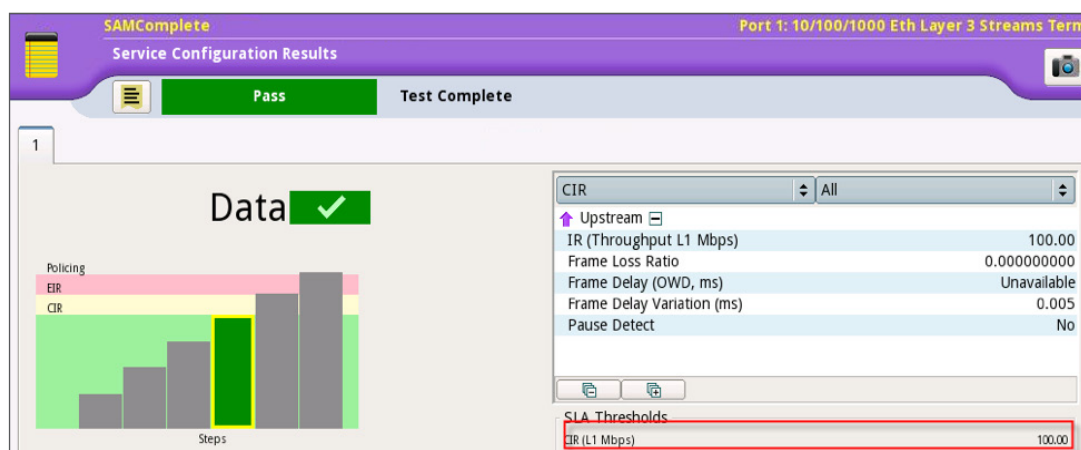
We designed VIAVI enhanced SAMComplete test was designed to start at the 100% CIR. Then it will only conduct other CIR increments if the 100% CIR test fails. In the example below, only the 100 Mbps test was conducted and passed, so testing other rates is unnecessary.

This is a 75% time-savings over the standard Y.1564 and depending upon the interval of each test step, the time savings can be substantial. For example, a two-minute ramp-up test step would take eight minutes to complete with standard Y.1564, versus a total of two minutes for SAMComplete (2 minutes per test step).

Easy Triple-play Emulation

Since Y.1564 is intended for multi-service activation, a common use case is testing during the activation of Triple Play offerings (Voice, Video, and Data). Configuring a Triple Play Test can require a lot of expertise, but VIAVI SAMComplete dramatically simplifies Triple Play configuration and emulation by eliminating the mapping of voice/video codecs to the appropriate bandwidth and frame sizes.

First the user is prompted to configure each service and can select the "Configure Triple Play" option.

Then the user can simply select the type of service (HDTV shown here) and the service specific parameters such as the video compression (MPEG-2 shown below).

After the Triple Play test is configured, the Y.1564 test executes using the specified service parameters.

Committed burst size (CBS) testing

Traditional Ethernet service-activation test methodologies such as Y.1564 focus on testing with constant bit rate traffic. While testing with constant bit-rate traffic can validate important KPIs, it does not validate how well the network will perform when transporting real world traffic which will consist of a mix of constant bit-rate voice, video traffic, and bursty TCP data traffic. Ensuring that this bursty TCP traffic can pass through the network without frame loss and without impacting other services are the two goals of burst testing.

The images below show the Configuration and Results screens for the VAIVI test. Configuring a burst test in VIAVI SAMComplete workflow is very easy: the user must simply enable CBS test and specify the CBS size (which is part of the network provider's SLA). The screenshot below illustrates the results after a test was conducted with CBS. Note the simple dashboard style PASS / FAIL results.
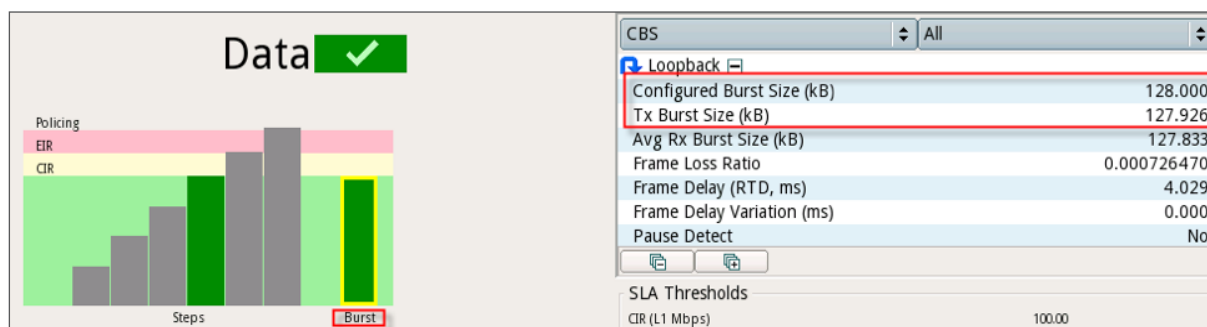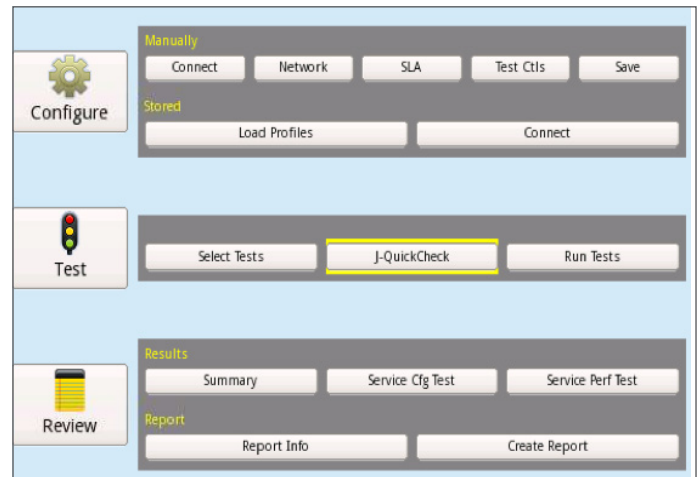
Simple Three-step Workflow

The standard Y.1564 can be a very complex test to configure, but VIAVI SAMComplete is a simple three-step process:

- **Configure:** parameters such as stream CIR, VLAN tagging, DSCP, etc.

- **Test:** select whether to run Y.1564 Configure and/or Performance tests, test execution times, etc.

- **Review:** provides dashboard status for each test, reports, etc.

The SAMComplete user interface was designed with simplicity in mind for every technician, including:

• A wizard-like user interface, providing guided assistance for each test configuration step

• Intuitive, context-sensitive help

• Easy "short cut" navigations for more experienced users

• Saved test configurations that can be loaded and executed quickly
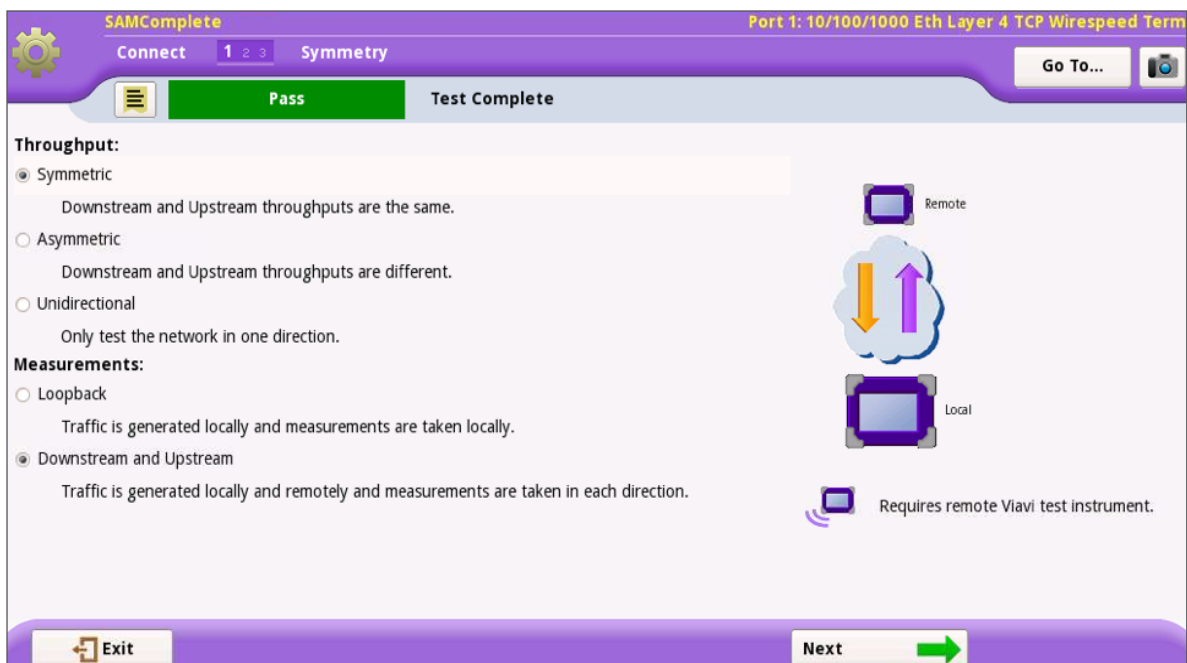
The SAMComplete user interface

Conclusion

Ethernet service activation is your first step to ensure customer satisfaction. Service providers need to conduct service activation set up in a cost-effective manner and be confident that their services are operating at or above their SLA. VIAVI test solution for the multi-service Y.1564 SAMComplete test provides an advantage in time, efficiency and accuracy to make your service activation workflow as smooth and easy as possible.

For more details on VIAVI test and measurement solutions, please go to **viavisolutions.com**

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