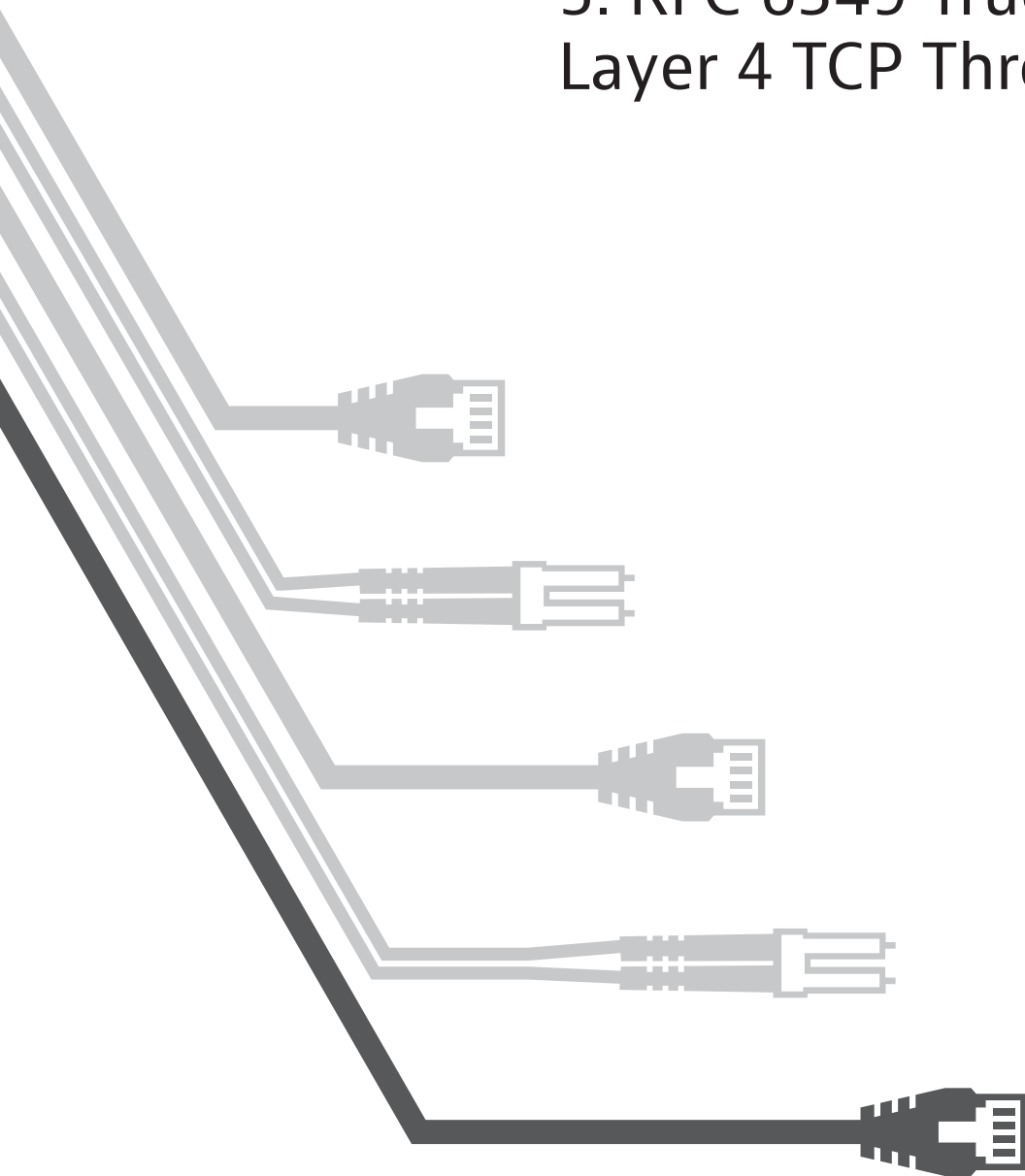# VIAVI

The Essentials of Ethernet Service Activation

5. RFC 6349 TrueSpeed™ Layer 4 TCP Throughput

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.
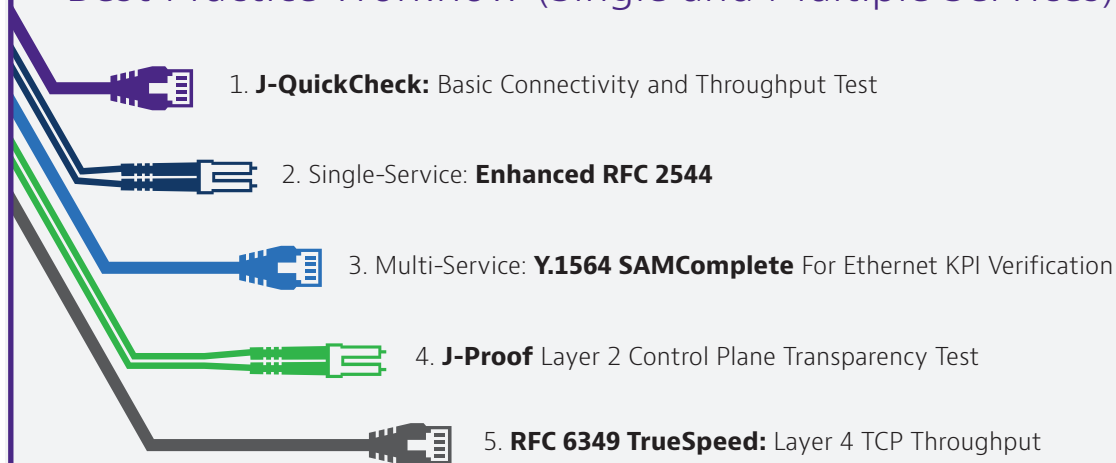
Key Advantage

TrueSpeed is the industry's easiest and fastest RFC 6349 implementation test. It is available in physical test instruments and as Virtualized Network Functions (VNFs).

TCP Throughput for Physical and Virtual Networks

This brief will focus on Viavi's TrueSpeed test which is an automated and repeatable TCP-throughput test per IETF RFC 6349 standards, including key performance metrics of TCP efficiency and Buffer delay. TrueSpeed is a "one button" implementation of RFC 6349 that runs on physical instruments or VNFs and includes differentiating features such as:

• Interoperability between Viavi TBERD/MTS, ONX, QT-600, software clients, and integrated network-element VNFs

• "TCP Doctor" provides expert diagnosis of test results that can identify root cause of poor TCP performance

• Integrated traffic shaper is easy to use and demonstrates TCP performance with and without a shaper

• Centralized server reporting, accessible via Web interface (VNF only)

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 TrueSpeed:** 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
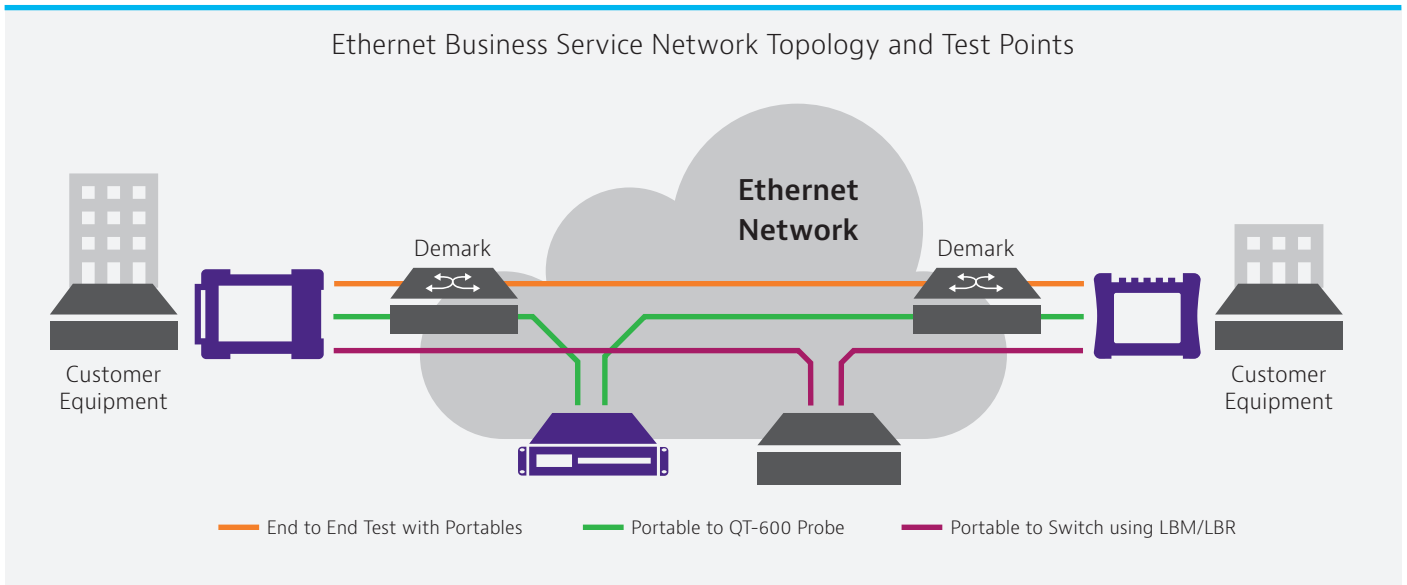
In the diagram above, the "local" TBERD is represented on the left side and the "remote" TBERD is on the right side. The most common service activation use case is a loop-back of the remote device. In this case, the remote device will be the handheld TBERD/MTS device.

TrueSpeed Components and Benefits

The following table describes the distinct role of TrueSpeed as well as the Viavi enhancements that provide unique, valuable advantages:

Service Activation Test	Description	Viavi Advantage
RFC 6349 TrueSpeed	· Automated and repeatable TCP-throughput test per IETF RFC 6349 standards, including key performance metrics of TCP efficiency and Buffer delay	· TrueSpeed is a "one button" implementation of RFC 6349 that runs on physical instruments or VNFs and includes differentiating features such as: · Interoperable between Viavi TBERD/MTS, ONX, QT-600, software clients, and integrated network-element VNFs · "TCP Doctor" provides expert diagnosis of test results that can identify root cause of poor TCP performance · Integrated traffic shaper is easy to use and demonstrates TCP performance with and without a shaper · Centralized server reporting, accessible via Web interface (VNF only)

Service Activation Test	Description	Viavi Advantage
TrueSpeed is a one-button RFC 6349 implementation	· RFC 6349 defines a structured sequence of steps to properly test TCP throughput in a repeatable manner	· TrueSpeed RFC 6349 ensures repeatability by removing almost all manual configuration and executes all RFC 6349 test steps automatically. The user simply needs to enter the IP of the remote test point, CIR, and then push Go.
Interoperable between Viavi instruments and VNFs	· TrueSpeed runs on instruments at rates up to 10 Gbps, and can be hosted on VNFs such as Windows and Linux as well as actual network elements	· The ability to run RFC 6349 tests between instruments, PCs, servers, and network elements provides unprecedented testing scale and network performance isolation.
TCP Doctor - expert diagnosis of test results	· RFC 6349 defines the procedure and metrics of a TCP throughput test; TrueSpeed uses proprietary expert knowledge to decode the results into actionable diagnoses	· TrueSpeed provides an easy to understand diagnosis of poor TCP performance problems on both instrument and VNF products. The diagnoses engine continues to evolve and is customizable per specific customer network best practices and expertise.
Integrated traffic shaper functionality	· TCP performance is greatly affected by network loss including policers and small network queues. Traffic shaping is considered a best practice to improve TCP performance under these conditions, but many times is not configured correctly or simply not implemented	· True Speed's integrated traffic shaper is easy to use and demonstrates TCP performance with and without a shaper. For a network provider, the integrated traffic shaper can prove that the provider's network is configured as intended (with a policer for example) and that the end customer must activate traffic shaping to experience optimal TCP performance.
Centralized server reporting, accessible via Web interface (VNF only)	· TrueSpeed VNF is a server-based RFC 6349 solution and enables centralized test configuration, execution, and reporting	· Centralized reporting enables the collection of historical data from tests executed by field technicians using physical instruments and by end customers using VNF clients. This centralized reporting provides easy access to the entire network operations team.

## The Keys to Speed for the RFC 6349 TrueSpeed

"One button" RFC 6349

Even though RFC 6349 defines a structured sequence of steps to properly test TCP throughput in a repeatable manner, the test process requires a certain level of TCP expertise. TrueSpeed automates all components of the RFC 6349 test including:

• Calculation of the Bandwidth Delay Product (BDP), determining the optimal TCP window size and connection number for the throughput tests

• Single "chain" execution of all RFC 6349 steps including MSS, RTT, and throughput tests

• Upload and download tests are conducted in a single test execution

The user must simply enter the IP address of the remote TCP instrument (or VNF) and enter the target CIR to execute the RFC 6349 tests as shown in the screenshot below. Upon test completion, a simple dashboard result is presented to the user and a detailed report is prepared on the instrument or even stored centrally on a VNF server (see Centralized Reporting in subsequent section).
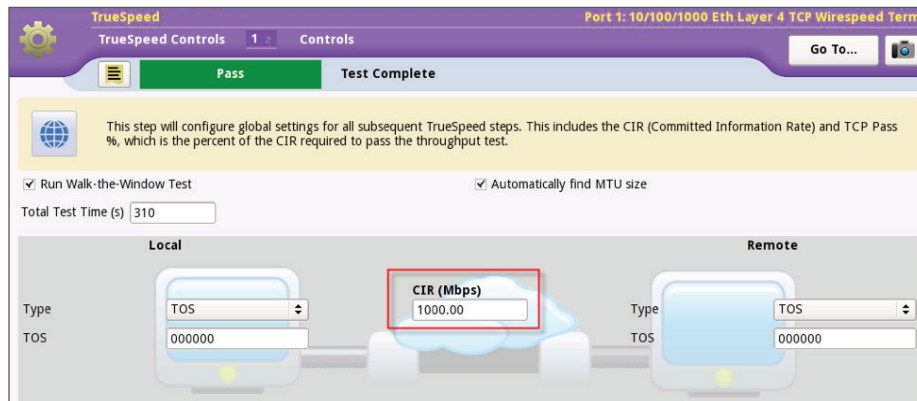

Interoperable with Viavi Instruments and VNFs

TrueSpeed can be executed between Viavi physical instruments and at the time of this publication, the list of compatible Viavi physical instruments is as follows:

- TBERD 5800 and TBERD 6000v2: Handheld Ethernet service instruments targeted to business services, mobile operators, Ethernet backhaul, Enterprise customers

- ONX – Handheld Ethernet service instrument targeted to consumer services (cable, FIOS, etc.)

- QT-600 – Ethernet network probe that is located throughput various points in the network

- WiFi Advisor – Small device used to qualify consumer / business WiFi networks

In addition, Truespeed offers the powerful inter-operability between physical instruments and VNF servers. The following diagram is an example of a TBERD/MTS physical instrument executing a TrueSpeed RFC 6349 test with a TrueSpeed VNF server located within a provider's network.

The ability to test against a VNF server or even VNFs located within network elements (such as CPE, routers, etc.) provides unprecedented segmentation testing throughout a multi-technology / multi-operator network environment.

Network technician with T-BERD/MTS portable test instrument — CPE — Operator Network — Provider Edge Router — TrueSpeed VNF
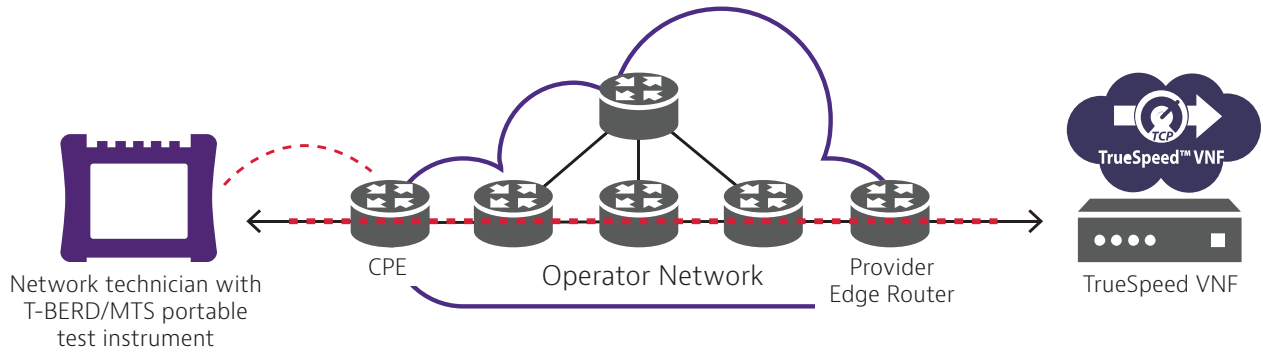
TCP Doctor Diagnoses

RFC 6349 defines the procedure and metrics of a TCP throughput test with a feature called the "TCP Doctor." It uses proprietary expert knowledge to decode the results into actionable diagnoses. TrueSpeed provides an easy to understand diagnosis of poor TCP performance problems on both the instrument and VNF products.

For example, "down-shifts" in network speed refer to situations where a higher speed LAN connection is transported over a lower speed WAN. In the following case, the enterprise data center LAN is 10 GigE and the physical WAN connection is 1 GigE. The throughput attempted was 1000 Mbps (Layer 1) but the result was very poor. TrueSpeed's TCP Doctor provides a clear description of the possible problem – in this case noting that the inadequate interface buffer size or shaping was the source of the problem.
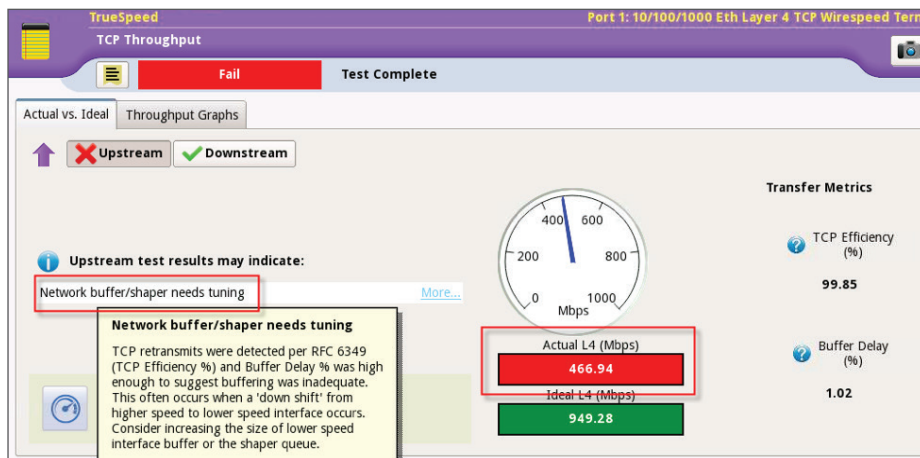
## Integrated Traffic Shaper

As illustrated in the previous section, TCP performance is greatly affected by network loss including policers and small network queues. The TrueSpeed diagnosis suggested that traffic shaping could improve performance and the next logical step is to prove this conclusion to the end customer. This can be quite complicated since network element configurations must be changed which could further cloud the testing situation.

TrueSpeed's integrated, hardware-based traffic shaping function allows the provider to demonstrate the difference in performance when traffic shaping is enabled, and provides definitive proof that the WAN can properly transport end customer TCP traffic.

In the next example, an enterprise customer's LAN is 1 GigE and the network provider's WAN transport was also 1 GigE. However, the enterprise customer purchased a 100 Mbps service but did not traffic shape to the 100 Mbps policed rate before handing off traffic to the WAN. As a result, the performance was quite poor and the enterprise customer blamed the network provider's WAN as the source of the problem.

The example below shows that with the integrated TrueSpeed traffic shaping function, the network provider could show a similar result for Unshaped traffic (left side) and a perfect result for Shaped traffic (right side). Moreover, the unshaped / shaped test is all part of the TrueSpeed "one button" approach to TCP testing. The shaping tests can be configured to automatically execute during the single-test chain of execution.
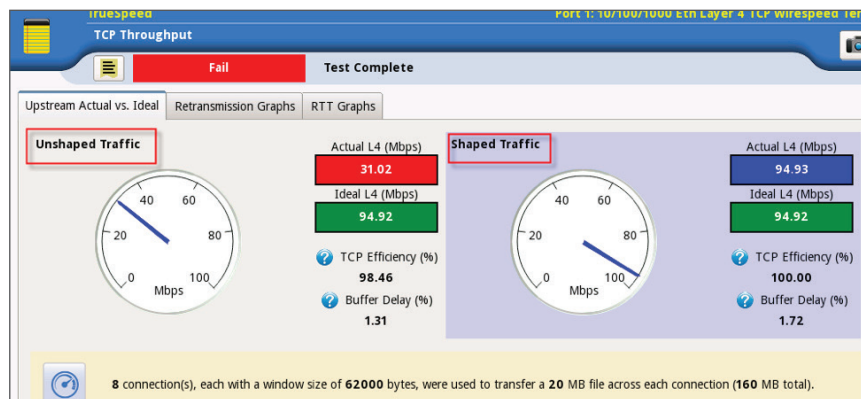
Centralized Server Reporting

TrueSpeed VNF is a server-based RFC 6349 solution and enables centralized test configuration, execution, and reporting. Centralized reporting enables the collection of historical data from tests executed by physical instruments or VNF clients and provides easy, consistent access to the various team members of the network operations groups.

An additional benefit of a TrueSpeed VNF server implementation is even more detailed TCP diagnoses of problems encountered during the test. Since the TrueSpeed VNF server is intended for more experienced network operations team members, this level of diagnosis can greatly assist in the rapid resolution of tough customer problems. The following report excerpt is from a TBERD/MTS-to-VNF server test and it illustrates the detailed diagnoses that are provided to network operations staff.

When the originating TCP client is an end-user PC (Windows or Linux OS), the report contains information regarding the PC hardware configuration as well as CPU/process level utilization. This is an enormous benefit to the network operations team since it can prove that TCP performance issues may be due to the end customer's PC-level processing constraints.

In addition, because the reporting is centralized, an operator can easily share the information among functional groups and archive reports for future reference as shown below (for cases where repeat customer problems occur).
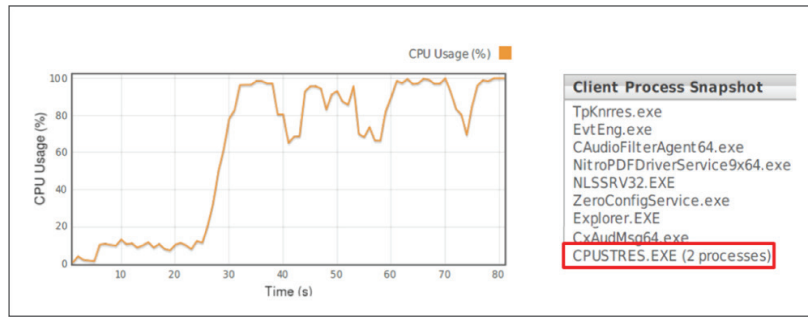
Conclusion

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. Viavi's TrueSpeed solution for the RFC 6349 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**

VIAVI

Contact Us   **+1 844 GO VIAVI**
(+1 844 468 4284)

To reach the Viavi office nearest you,
visit viavisolutions.com/contacts