

Save Time and Ensure Improved Network Services with Test Process Automation

Introduction to Test Process Automation

Network service activation and troubleshooting spans many diverse technologies from wireline to wireless such as Ethernet consumer and business services, optical transport, 4G/5G, etc. Traditionally, field technicians and network operations staff use network testing instruments to activate and troubleshoot the network services. Most processes are still more manual, inconstant, and error prone than they could be.

Test Process Automation offers communications service providers a suite of tools to improve field operations efficiency. The VIAVI approach encompasses both the tests as well other documentation tasks that are all critical to ensure high quality network operation. An example is shown in Figure 1, which is a generalized Ethernet business service network.

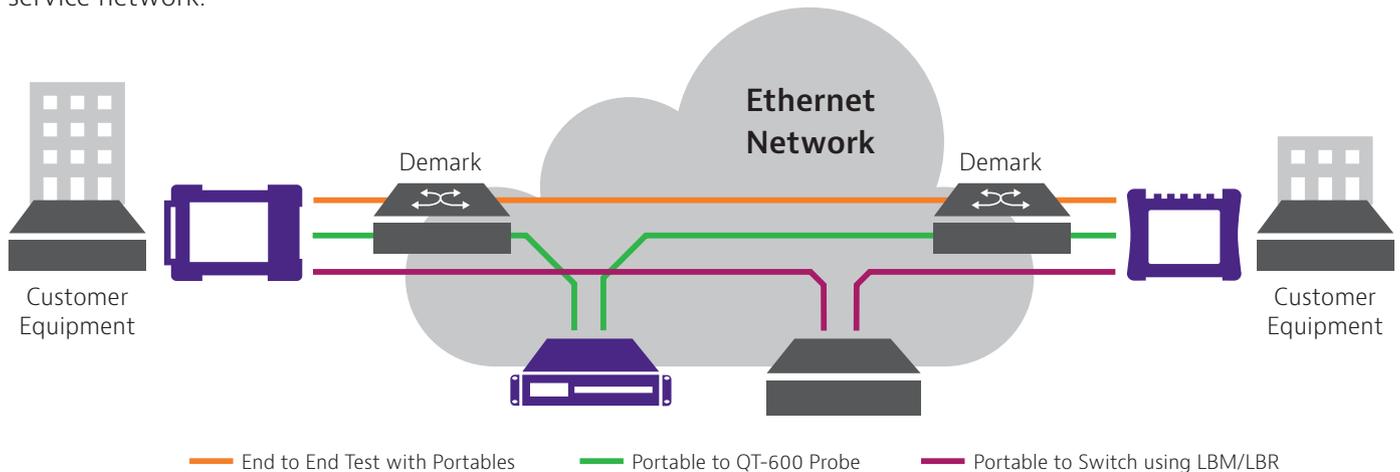


Figure 1: General Ethernet Business Service Activation

Best practice tests include:

1. Fiber inspection
2. RFC 2544 Layer 2 / 3 service level testing
3. RFC 6349 Layer 3 / 4 TCP service level testing

Best practice documentation include:

1. 1. Craftsmanship Pictures
2. 2. Network equipment serial numbers
3. 3. Customer sign off

Each step is critical and if a step is skipped due to a manual process (or technician experience), then simple fiber connector issues can be missed which in turn will cause the RFC 2544 test / RFC 6349 tests to fail.

Automating each step ensures the proper test sequence is executed, time is not wasted, and service results are consistent.

The main benefits of test process automation (TPA) are:

- **Consistency, repeatability and compliance.** Test processes and workflows are defined centrally and “pushed” to test instruments. This eliminates the variability of manual procedures and ensures results are consistent and repeatable, regardless of technician skillset. TPA ensures compliance with execution of specific tests, test thresholds, test order and the correct network locations.
- **Streamlined training.** The training focus shifts to the test process itself with less emphasis on technical training that is generally overwhelming for less seasoned technicians.
- **Actionable insight and problem resolution.** Repeatable results yield accurate diagnosis of network issues to allow your team to constantly improve the network design and avoid building new sections with problems revealed by the data.
- **Systems integration.** TPA deploys open software interfaces so that test process creation and results reporting can tie instruments into a provider’s existing network management systems or field mobile applications.

All network technologies can benefit from TPA. Examples VIAVI supports include CATV, Access, Metro/Transport, Ethernet, Fiber, Wireless 3G-5G, WiFi, and Enterprise network testing. In this white paper, the work group examined will be for Business Services, Core Networks, and Cell Site Maintenance. Nevertheless, the same practices apply to other network technologies and services.

1.0 Test Process Automation for Business Services, Core Networks, Cell Site Maintenance Work Groups

Efficient and “first-time right” activation of new metro Ethernet services is critical to an operator’s overall profitability, saving up to 30-45% of OPEX. Different Ethernet technologies require specific test processes and service activation inefficiencies arise because testing is not simplified or consistent.

The solution to this testing problem requires an automated service activation test process. Referencing Figure 1, an automated service activation workflow must possess the following attributes:

- Using a centralized management server, create workflow jobs which comprise a customized series of service activation tests
- Push the workflow jobs to the test instrument via the Internet
- On the test instrument, single “one button” execution of the workflow jobs
- Bundle all individual test reports into single “job report”; enriched by site pictures, equipment connections, etc.
- Upload the test reports to the centralized job management server for activation certification and acceptance

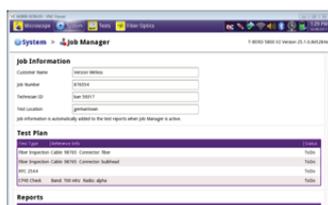
The VIAVI solution to test process automation comprises the following tools shown in Figure 3.

T-BERD/MTS-5800 Test Process Automation Tools



Expert Tests

- One button test for a sequence of measurements
- Load saved configuration and run the test
- Easy Pass/Fail results with built-in analysis
- RFC 2544, Y.1564, TrueSpeed, CPRI Check, OTN Check, PTP Check



Job Manager

- On instrument tool
- Guides technicians through the job
- Creates a single summary report



Mobile Tech App

- iOS & Android app
- Eases transfers of files between instrument and email
- Makes use of phone's camera & GPS



StrataSync

- Cloud asset & data management tool
- Instruments assignments, upgrade software
- Distribute configs and jobs
- Central repository for test reports

Figure 3: VIAVI Test Process Automation Product Suite

Each of these product / features are detailed in the following sections.

2.1 StrataSync overview

As illustrated in Figure 3, StrataSync forms a cloud hosted solution supporting VIAVI instruments providing integrated centralized asset, inventory, configuration, and test data management. All cloud enabled process are designed to facilitate workflow and management of tools thereby eliminating email dispatches, manual test procedure set up, manual reporting, and management dashboarding. StrataSync covers a wide range of products including CATV, Access, Metro/Transport, Ethernet, Fiber, Wireless, WiFi, and Enterprise instruments to support TPA across your network infrastructure.

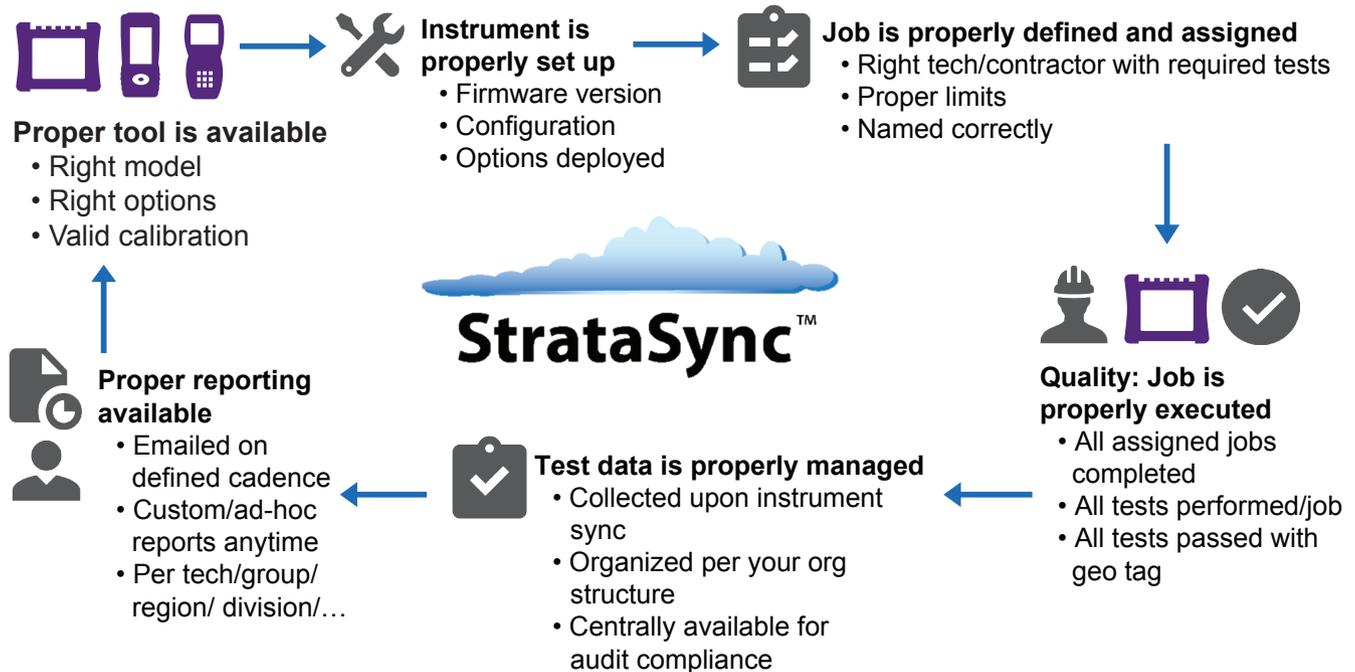


Figure 4: StrataSync Overview

Dashboards: StrataSync provides at-a-glance dashboards and reporting with real-time views of asset status and group/department/tech performance (test data trends and stats, instrument serial number, HW & SW versions, SW options, calibration date, etc.). Organization chart-based views allow tracking of assets, assignment of instrument configurations and test data management per region or department, while floating license and options management allows efficient allocation of key test capabilities.

Upgrades and Software Options: Field personnel operate at maximum capability and efficiency by knowing immediately when firmware upgrades and instrument options are available. They receive proactive, application-aware notifications, and distribution is managed for specific groups or individuals.

Configuration Templates: User-authored standard templates to ensure instruments are aligned to a specific configuration. StrataSync lets users monitor and update asset data, modules, configurations, test plans and scripts, templates, and groups, ensuring technicians consistently have the right instrument configurations when performing tests—increasing first-time success rates and reducing repeat rates.

Test Data Storage: A common test data repository makes baselining performance practical and enables the analysis of network trends for proactive maintenance, improved reliability, and customer satisfaction. StrataSync performs file storage, printing, and exporting, and provides clear dashboards and basic reports.

Job Completion Statistics: Finally, automatically track whether assigned jobs are being completed and their pass/fail rate. Results can be viewed per-technician, per region, per subcontractor.

2.2 Job Manager overview

It is imperative that an operator's service activation workflow be rigorously defined and simple to follow by all technician skill levels. VIAVI Job Manager application, included with all T-BERD/MTS-5800 instruments, is the cornerstone of test process automation and provides these key benefits:

- Enables an operator's lead field services team to define the proper workflow on a per customer basis, interface with the operator's back office system, and pushes the workflow to the instrument
- Provides the field technician with simple, step-by-step instructions and check list for each piece of the test workflow
- Provide a single summary report which provides an easy to read indication that all tests pass

Figure 5 is an overview of the benefits and functions provided by Job Manager.

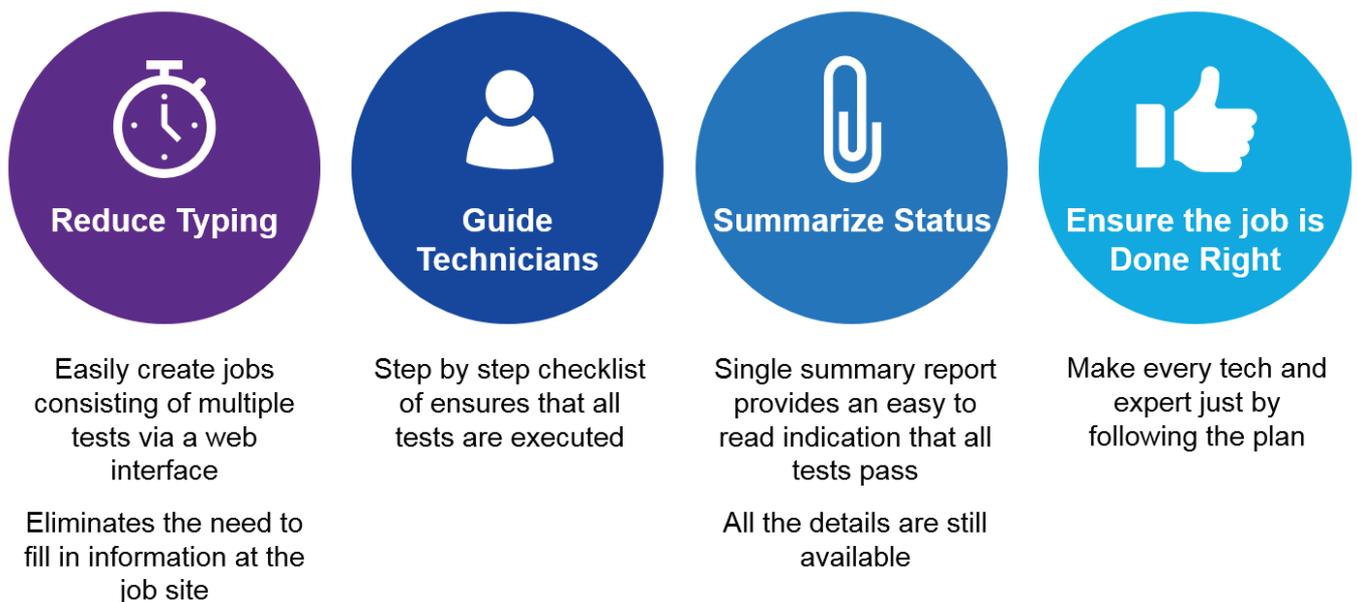


Figure 5: Job Manager benefits and key features

The Jobs can be created by the technician, 3rd party or even via the Job Manager API, which enables integration with the network provider OSS systems.

2.3 VIAVI Expert Applications: Load, Run and Done

VIAVI Expert applications can be run from a variety of VIAVI instruments at rates up to 100 GigE and in some cases can also be conducted using Virtual Network Functions (NFVs). The Expert applications are easy to configure and run a test in a simple "Load", "Run", and "Done" workflow with an emphasis on user experience consistency as seen in Figure 6.

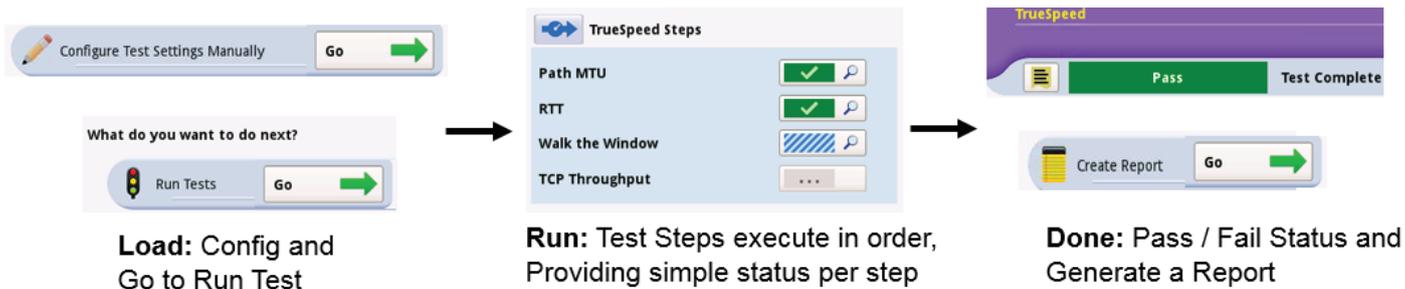


Figure 6: VIAVI Expert Applications, "Load, Run, and Done"

The following table provides an overview of the VIAVI Expert applications for the T-BERD/MTS-5800 line of products.

Expert Application	Description
J-QuickCheck	Conduct basic connectivity and throughput tests before wasting time running the extensive RFC 2544 and/or Y:1564 tests
Enhanced RFC 2544	The industry standard service activation test for single-service Ethernet and IP (i.e. "pipe" test). Measure Key Performance Indicators and Bandwidth Profile such as: throughput, latency, packet Jitter, frame Loss, and Committed Burst Size (CBS)
Y:1564 SAMComplete	The industry standard service activation test for multi-service Ethernet and IP (i.e. Triple Play). Measure Key Performance Indicators 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
J-Proof	Verify that that Ethernet control plane traffic (ARP, STP, CDP, etc.) flows transparently from end to end. Example: enterprise Cisco switch protocols flow through service provider network and do not get altered
RFC 6349 TrueSpeed	Automated and repeatable TCP throughput test per IETF RFC 6349, including key performance metrics of TCP Efficiency and Buffer delay
CPRI Check	Automated test to ensure proper Remote Radio Head (RRH) installation. Includes tests for the CPRI interface, passive intermodulation (PIM), narrow band interference, and remote electronic tilt (RET) devices.
OTN Check	Simple one button test for OTN circuits. Measures bit error rates on the OTN payload and overhead bytes as well as delay in one simple test.
PTP Check	Ensure that the network is capable supporting timing distribution via IEEE 1588v2 PTP. Tests for connectivity to the PTP grandmaster and the quality of the end-to-end network through time error analysis.

2.4 Mobile tech application overview

Not only is it important to automate the test workflow, but the technician's efficiency can be greatly improved with the ability to interact with the instrument via the VIAVI Mobile Tech application to allow the technician more ability to multi-task and remote control of the instrument. The VMT app adds convenience and comfort for the technician who may be running several tests at one time or may be working in inclement, non-ergonomic conditions. They can attach their instrument to the network and step away while controlling it from their mobile phone. This application runs on both Apple iOS and Android devices and provides these key features:

- Generate and share Smart Access Anywhere code. This allows expert staff to remotely control the instrument for those who need help
- Transfer files between email and test set
- Add pictures to the final report via Job Manager. Document the site conditions by adding pictures of the network racks, network connections, rack location, etc.
- Capture Customer Signature. Allow the end customer to sign off on the test results and again incorporate this directly into the final report.
- Add geolocation to test reports to verify the network test location.

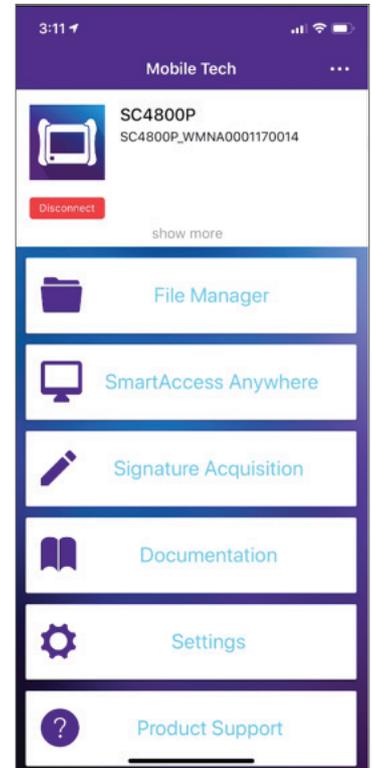


Figure 7: Mobile Tech App*

3.0 Example of Test Process Automation

In this section, test process automation will be illustrated using a workflow job comprised of and RFC 2544 test followed by an RFC 6349 TrueSpeed test.

Example of TPA Implementation At a Glance



Within the provider's centralized management NOC:

Step 1: Create the workflow job in Job Manager

The screenshot shows the Viavi Job Manager interface. On the left, a yellow box highlights the text "Enter information that applies to the whole job" next to a form titled "Job information". The form includes fields for Job Number (87639), Customer (VIP Customer), Location (New York City), Technician ID (48973), and Report Logo File (Broadband Internet America). On the right, a "Test Plan" configuration screen is shown with two test configurations. Red boxes highlight the "Select a test type" dropdowns, "Configuration File" fields, and "Methods & Procedures File" fields for both configurations. A yellow box in the center contains the text: "Select the type of tests to perform" and "And information specific to each tests such as a configuration file and method and procedure guide".

Step 2: Send the job to an instrument via StrataSync

The screenshot shows a "Select a Technician" dialog box. It contains two buttons: "Michael Bangert (041124)" and "Bill Benet (billy)". Below the buttons is a "Send to Instrument" button.

Step 3: Push the job to technician's instrument (sync on instrument).

System > StrataSync

Server address: stratasync.viavisolutions.com

Proxy server:

Account ID: 54030105

Technician ID: barry

Start Sync Successfully synchronized with server.

Now off to the technician steps:

Step 4: Technician launches Job Manager application on the instrument and loads the RFC 2544 / RFC 6349 job

System > Job Manager

Load Job Deactivate Job Create Report

Job Information

Customer Name: VIP Customer

Job Number: 87639

Technician ID: barry

Test Location: New York City

Test Type	Reference Info	Status
Fiber Inspection	Connector: Fiber , Cable: RX	To Do
Fiber Inspection	Connector: Fiber , Cable: TX	To Do
RFC 2544		To Do
RFC 6349 TrueSpeed		To Do

Step 5: Technician can look at job quick guides instructions

Test Plan

Test Type	Reference Info	Status
Fiber Inspection	Connector: Fiber , Cable: RX	To Do
Fiber Inspection	Connector: Fiber , Cable: TX	To Do
RFC 2544		To Do

Launch Guide

1. Insert an appropriate SFP into port 1 (colored purple) of the 5800



2. Inspect the SFP with the fiber microscope and a bulkhead tip



3. After cleaning and inspecting all fibers connect the patch cord fibers from the SFP in the 5800 to the bulkhead connector or SFP in the network equipment under test

Launch

Step 6: Launch the Test

Test Plan ?

Test Type	Reference Info	Status
Fiber Inspection	Connector: Fiber , Cable: RX	To Do
Fiber Inspection	Connector: Fiber , Cable: TX	To Do
RFC 2544		Complete

Launch
Guide

The test set automatically configures to the test to be conducted (in this example, RFC 2544), conducts the test according to a configuration file, and executes the test to completion.



Step 6: Once the tests are completed, the technician can use the Mobile Tech application on Smartphone to add site pictures to the report



4.0 Conclusion section

Efficient and “first-time right” activation of new metro Ethernet services is a critical component of an operator’s overall profitability.

- Enable an operator’s lead field services team to define the proper workflow on a per customer basis, interface with the operator’s back office system, and push the workflow to the instrument
- Provide the field technician with simple, step-by-step instructions and check list for each piece of the test workflow

Please visit the VIAVI Service Activation web site at viavisolutions.com/ethernet-service-activation-test for details of the VIAVI Expert tests.