



J-Complete – Service Activation Made Simple



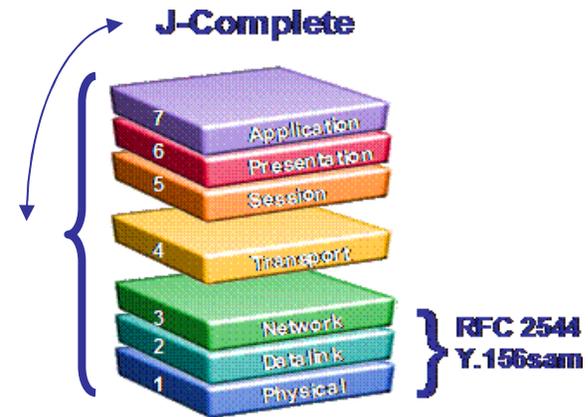
The IETF RFC2544 recommendation has been used by service providers to verify Service Level Agreements (SLAs) provided to their customers, and thereby ensure revenue generation for the services sold. With the evolution of Ethernet/IP networks and the stringent requirements of various Triple Play applications, service providers have come to the realization that a successful RFC2544 test result does not guarantee end-user satisfaction.

New draft recommendations are emerging to address the need to verify more robustly end-customer services before service activation. One of such new draft recommendations is ITU Y.156sam, also known as “Ethernet Service Activation Methodology”. In summary, the draft Y.156sam specifies that: first, each Ethernet service should be independently verified to be properly configured in the network, and second that multiple Ethernet service instances should be verified simultaneously on that network, each meeting its assigned Committed Information Rate (CIR). The terminology CIR is often used interchangeably to note the SLA bandwidth requirement for a specific service.

JDSU’s portfolio of Carrier Ethernet portable solutions (namely HST-3000 Ethernet SIM, TB/MTS 6000A MSAM and TB/MTS 8000 Dual Module Carrier supports ITU Y.156sam methodology of testing with an automated RFC2544, as well as Multiple Streams application (patent pending). Additionally, JDSU portable solutions test prioritization (effect of excessive network bandwidth of one service over another) to ensure that the network will carry customer traffic as promised, ensuring revenue streams and solving dissatisfaction.

Solution Description

J-Complete is JDSU’s suite of test applications and solutions that comprehensively verify service prioritization, SLA parameters (such as CIR, etc), higher-layer application performance (VoIP/Video/Data), and proper forwarding of various protocols.



The test suite includes:

- **Expert RFC2544 Test and J-QuickCheck:** dramatically reduce traditional RFC2544 test time by 60% on average and accurately quantify network bandwidth in the midst of normal network operation/buffering
- **Multiple Service Testing (L2 to L4) and Triple Play Test/CoS:** simultaneously configure and emulate Voice, Video, and Data services and ensure that each service receives proper network priority
- **TCP Wirespeed:** test live TCP sessions (up to 64) and background (lower priority) traffic concurrently, up to 10GigE
- **J-Proof:** verify that customers’ control management traffic is indeed transparently flowing end-to-end, ensuring SLAs are met via third party networks.

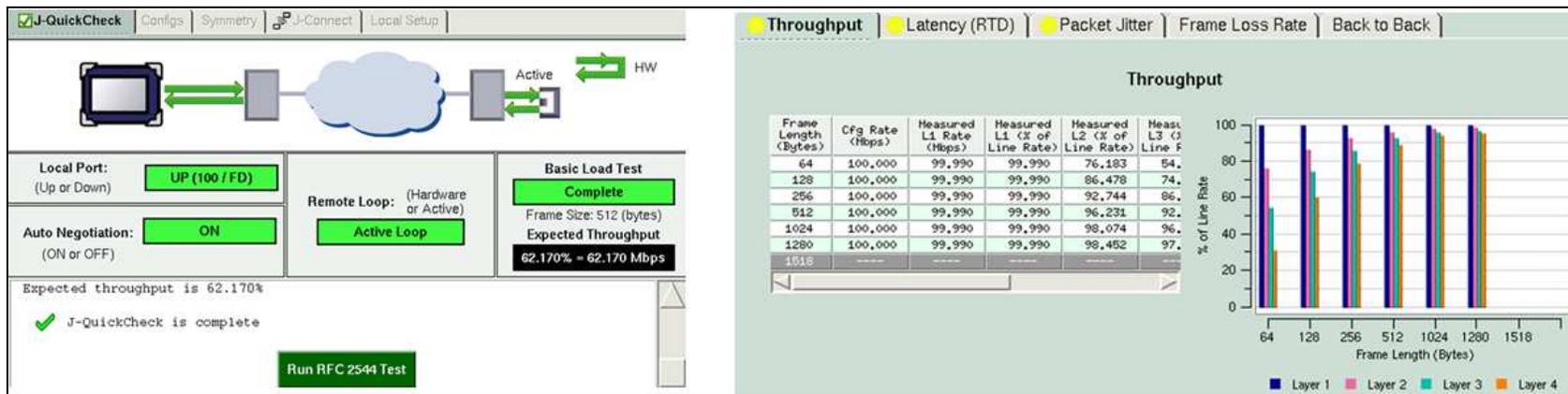
Service Activation Suite: Feature/Benefit Summary

Feature	Description	Advantage	Benefit
Expert RFC2544 and J-QuickCheck 	JDSU's Expert RFC2544 test dramatically improves the standard RFC2544 flow by taking into consideration network buffering effects. It continuously monitors for packet loss events during the test, notifying the user at which bandwidth packet loss occurs.	By considering network buffer effects, the Expert RFC2544 test does not "overshoot" the expected throughput.	The Expert RFC2544 test results in much faster test times than the traditional RFC2544 since it eliminates additional test steps caused by RFC2544 overestimation of attainable throughput. By notifying the user when packet loss occurs, the Expert RFC2544 provides expert information and problem solving tips with its J-Assist help system.
Multiple Service Testing (L2 to L4)	The Multiple Services application tests simultaneously 8-10 user customizable services & measure SLA metrics - throughput, loss, delay, and jitter.	Test the impact of one service upon another by exceeding the network bandwidth either with constant or ramped loads.	The services are not just verified to be within the SLA or meet the CIR. This test ensures that the SLAs are met while not overburdening the network and keeping within the prioritization limits assigned to each service.
Triple Play Service Test (for TB/MTS 6000A MSAM and TB/MTS 8000 DMC) and Class of Service Test (for HST-3000)	The JDSU Triple-Play Service Test and CoS Test simplify the setup, results interpretation of Triple Play services, and eliminate the need for the user to be a voice, video, and data expert.	Test the impact of one best effort data service (for example) upon business VoIP or Video services by exceeding the network bandwidth either with constant or ramped loads	Interpreting the Triple Play test results is greatly simplified by viewing graphs for the various network performance metrics such as throughput, frame loss, delay, and jitter for each of the emulated Triple Play service streams.
TCP Wirespeed * 	Wirespeed TCP throughput verification with concurrent background service streams	Test up to 64 TCP sessions and background streams at rates up to 10GigE	Emulate realistic customer conditions by generating multiple client traffic. Verify customer TCP vs. UDP traffic is prioritized properly
J-Proof 	Verify that control frames such as CDP, GMRP/GVRP & STP/RSTP/MSTP etc. are transparently carried over the network. Test transparency over Virtual LANs, i.e. automatically "walk the Priority-bits", etc.	Verify transparency of a specific customer or customer's traffic flow/service, confirm control plane Ethernet frame priority	Fine tune troubleshooting to specific VLAN / service that is having problem. Ensure control messages do not time-out and/or are dropped.

* Now available on the TB/MTS 6000A MSAM and TB/MTS 8000 DMC

Use Case: Expert RFC2544 Test and J-QuickCheck

The standard RFC 2544 tests do not consider network port buffering and this causes the RFC algorithm to “overshoot” the estimated throughput rate. This overshoot causes additional test trials and results in longer test duration. JDSU’s Expert RFC2544 test dramatically improves the standard RFC2544 and takes into consideration network buffering effects. Expert RFC2544 runs Throughput, Latency and Packet Jitter simultaneously. It offers pre-defined test profiles optimized for typical network connections. Additionally, JDSU’s Expert RFC2544 offers a “J-QuickCheck” function, which also reduces RFC2544 test time by conducting a short connectivity test before running a complete RFC test.



Use Case: Multiple Service Testing (L2 to L4)

The Multiple Service Testing (patent pending) simultaneously tests 8-10 customizable services and measure throughput (CIR), packet loss, packet delay, and packet jitter for each. The services are not only tested to be within the SLA, but that prioritization is occurring between end-customer’s services. Each service stream is easily configured and results are tracked simultaneously in graphical format. Streams can be tagged with VLAN, TOS/DSCP & L4 Port IDs.

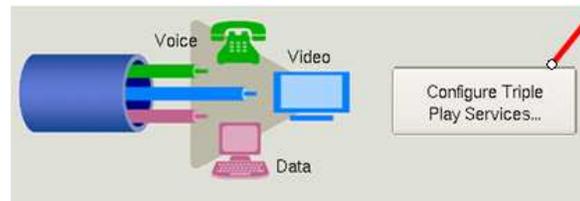
Graphical view of services provides snapshot of all traffic in the “pipe”; up to Layer 4 traffic can be emulated on up to 10 service streams

	Rx Load (%)	Rx Source Port	Rx Destination Port	Tx Traffic Mode	Tx Load (%)	Tx Source Port	Tx Destination Port	ATP Listen Port
✓ 1	9.999	10,001	10,004	TCP	0.999	10,001	80	10,004
✓ 2	9.999	10,001	10,004	TCP	0.999	10,001	22	10,004
✓ 3	9.999	10,001	10,004	TCP	1.003	10,001	25	10,004
✓ 4	9.999	10,001	10,004	TCP	0.997	10,001	445	10,004
✓ 5	9.999	10,001	10,004	TCP	1.003	10,001	443	10,004
✓ 6	9.999	10,001	10,004	TCP	0.003	10,001	110	10,004
✓ 7	9.999	10,001	10,004	UDP	1.000	10,001	5,060	10,004
✓ 8	9.999	10,001	10,004	TCP	1.000	10,001	5,060	10,004
✓ 9	9.999	10,001	10,004	UDP	10.001	10,001	10,004	10,004
✓ 10	9.989	10,001	10,004	UDP	10.001	10,001	10,004	10,004

Use Case: Triple Play Services Testing and CoS Testing

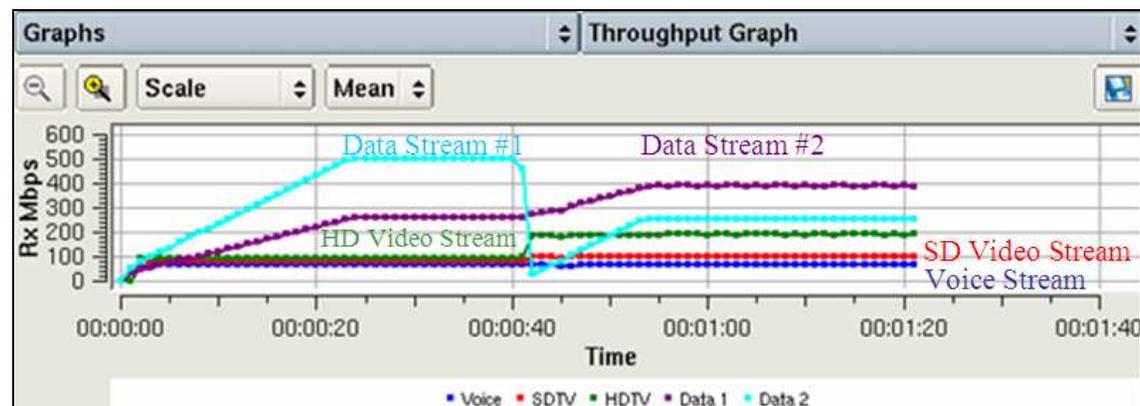
Class of Service (CoS) or prioritization testing should emulate the profile of the Triple Play (voice, video, and data) traffic, ensuring that service prioritization is verified while the SLA parameters are met. It can be very cumbersome to configure the various test streams in terms of representative frame lengths, bit rates, and CoS settings to properly emulate Triple Play customer traffic. Triple Play application provides all the standard SLA results, including Throughput, Packet Loss and Latency. In addition, it properly interleaves traffic to show real packet jitter values, related to one single VoIP call or IPTV stream. If the application provided only average Packet Jitter values across all the streams, the jitter results would appear too good and not realistic. JDSU has simplified this process by providing a Triple Play Services application that greatly simplifies the test and verification of a network's capability to carry Triple Play traffic. Figure 4 represents the Triple Play services that ride on various physical network links.

Configure Codec type for Voice stream; SD / HD video streams and compressions; Data streams that ramp to exceed network capacity



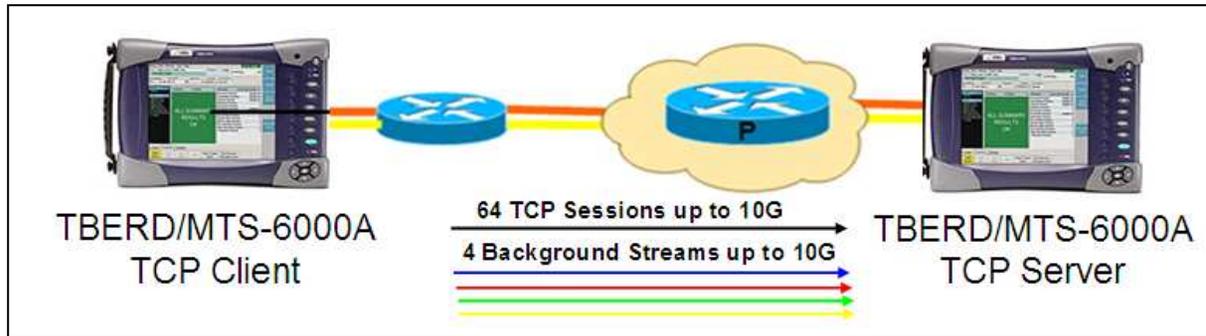
Define Triple Play Services						
Voice						
<input checked="" type="checkbox"/>	Codec	Sampling Rate (ms)	# Calls	Per Call Rate (Kbps)	Total Rate (Mbps)	Total Basic Frame Size (Bytes)
<input checked="" type="checkbox"/>	G.723 6.3K	30	119	27	3.213	82
Video						
<input checked="" type="checkbox"/>	# Channels	Compression	Rate (Mbps)	Total Basic Frame Size (Bytes)		
<input checked="" type="checkbox"/>	SDTV 2	MPEG-2	8.000	1372		
<input checked="" type="checkbox"/>	HDTV 3	MPEG-2	57.000	1372		
Data						
<input checked="" type="checkbox"/>	Start Rate (Mbps)	Load Type	Time Step (Sec)	Load Step (Mbps)	Total Basic Frame Size (Bytes)	<input type="checkbox"/> Random
<input checked="" type="checkbox"/>	Data 1 0.0100	Ramp	1	10.0000	128	<input checked="" type="checkbox"/> Random
<input checked="" type="checkbox"/>	Data 2 10.0000	Constant	1	10.0000	128	<input checked="" type="checkbox"/> Random
Total (Mbps)						78.223
Max Util Threshold						100

Graphically verify prioritization of Voice, Video, and Data Services (also graph loss, delay, and jitter)



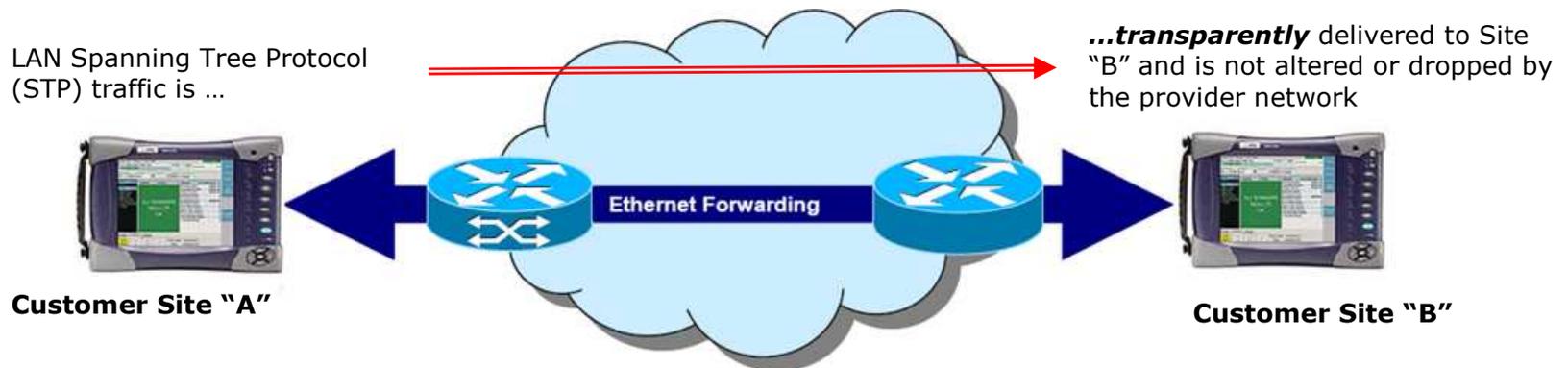
Use Case: TCP WireSpeed Testing*

To verify proper CoS/QoS prioritization in the operator's network, an end-end test with concurrent TCP and background streams should be conducted. This test proves that customer application sessions (up to 64 stateful TCP sessions) will receive expected priority versus background traffic types, i.e., UDP streams. This test capability is at line rates up to 10 GigE.



Use Case: J-Proof Testing

When provisioning a point-to-point Ethernet circuit, the typical procedure includes a sequential set of tests. First, an Ethernet Connectivity verifies that a signal is present and link has been acquired. This is followed by an Ethernet BERT test to confirm the SLA has been properly configured. Lastly, an expert RFC2544 test will automate the process of confirming throughput, latency and frame loss at different traffic rates with different packet sizes. By adding a J-Proof Test, the transparent Ethernet forwarding of traffic between endpoints can be confirmed. This additional test will avoid customer calls and trouble tickets if they are later unable to pass Cisco CDP/VTP traffic, Spanning Tree Protocol Traffic, or the GARP family of topology discovering Ethernet traffic.



FAQ

Q: What is JDSU's involvement in standards bodies work concerning advanced application (Ethernet/IP/TCP) testing processes?

A: JDSU is actively working with various standards bodies including the IETF and MEF. Central to our standards' bodies work is the focus on realistic customer service verification, in other words TCP (Layer 4) service level verification and acceptance.

Q: How does JDSU's current testing capabilities compare to the new ITU draft services test specification (Y.156sam.doc)?

A: Draft ITU specification Y.156sam (EtherSAM) proposes that Ethernet service instances be tested and measured concurrently, and JDSU's portable test solutions have always supported concurrent service testing, up to 10 service streams at one time. Additionally JDSU's solutions also test prioritization of service instances when a service(s) exceed the CIR. ITU Y.156sam specifies that multi-services are only to be tested up to the CIR, which does not determine how a customer's SLAs, will be affected by other services (which at times may exceed the allocated CIR).

Q: Why do I need to test stateful TCP sessions and what is the advantage of testing stateful TCP and background traffic streams?

A: Stateful TCP sessions represent live customer application traffic (such as HTTP, SMTP, etc.) while background traffic streams do not. Traffic streams are certainly an important element of SLA verification, but by themselves do not guarantee the proper performance of customer applications. JDSU's approach is to focus on testing customers' application traffic (at the stateful TCP layer), while supporting simultaneously traditional background traffic, which can severely affect performance of higher-layer services, if left unverified.

Q: Are the JDSU J-Complete options described in this document software or hardware upgrade to existing units in the field?

A: Test options described in the document are software upgrades for the TB/MTS 6000A MSAM and TB/MTS 8000 Dual Module Carrier. Most of these options are available for the HST-3000 Ethernet SIM (with the exclusion of TCP Wirespeed) and are available as software upgrades. Please contact your JDSU Representative for more information.