

J3TEL Qual'IT

End-to-End Network Metrology Accuracy Evaluation

EXECUTIVE SUMMARY

Network service providers and operators of sophisticated enterprise networks need to deliver on their promise of service quality to their customers. To achieve that goal, active, real-time, end-to-end network monitoring is required - for two reasons. First, such monitoring can quickly reveal any network anomalies that could impact performance. Second, only accurate active monitoring can prove that network conditions meet or exceed service level requirements.

J3TEL commissioned Tolly to evaluate the accuracy of its Qual'IT end-to-end network metrology (network measurement) solution. Tolly engineers simulated wide-area network (WAN), metropolitan area network (MAN) and local area network (LAN) environments with speeds up to Gigabit Ethernet (GbE). In each environment, Tolly engineers generated specific traffic levels and, using a network emulation tool, specific network conditions related to packet loss, latency and jitter. Subsequently, Tolly outfitted each network environment with a pair of J3TEL Qual'IT network monitoring devices to monitor, measure and report the network conditions that it was observing. The J3TEL solution provided accurate reporting in all scenarios.

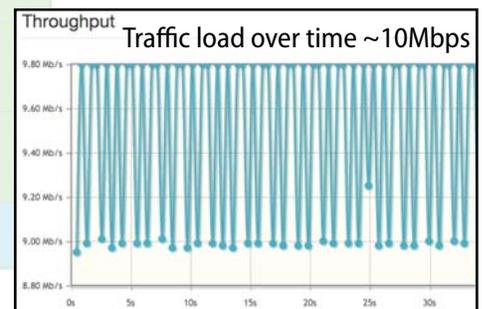
THE BOTTOM LINE

J3Tel Qual'IT provides accurate monitoring of bandwidth/throughput, packet loss, latency and jitter in the following network scenarios:

- 1 Wide-Area Network (WAN) 10Mbps environment
- 2 Metropolitan Area Network (MAN) 100Mbps environment
- 3 Local Area Network (LAN) 1Gbps environment

Qual'IT - Wide-Area Network Metrology Results: 10Mbps, 0.5% loss, 60ms latency, 40ms jitter as reported by Qual'IT Management Console

Indicator	Results	Threshold direction	Threshold
Throughput Average	9.44 Mb/s	>	9.4 Mb/s
Lost datagrams percentage	0.49 %	<	0.6 %
Jitter	38.75 ms	<	41 ms
One Way Delay Average	61.514 ms		



Note: Qual'IT measurements of network. Threshold and Threshold Direction fields used for setting monitoring alarms. Inset shows Qual'IT screen that displays traffic over time.

Source: Tolly, October 2014

Figure 1



Test Results

Wide-Area Network Monitoring

Scenario

Tolly engineers configured a simulated WAN environment that had the following characteristics: bandwidth: 10Mbps, packet loss: 0.5%, jitter: 40ms, latency: 60ms.

A Qual'IT endpoint, known as a BOX, was connected to each end of the network and communicated with the Qual'IT management console.

The Qual'IT system generated a traffic stream and measured the key characteristics of the network. See Figure1.

Results

The Qual'IT system accurately reported the network condition reflecting the impairments that Tolly engineers had imposed on the simulated network. The system was able to run 9.44Mbps of application traffic establishing that the network bandwidth was in the range of 10Mbps. Given packet and protocol overhead, the actual application traffic throughput will always be somewhat lower than the specified network bandwidth. Any discrepancies were related to particular configuration of the emulator.

Metropolitan Area Network Monitoring

Scenario

Tolly engineers configured a simulated MAN environment that had the following

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Tested October 2014

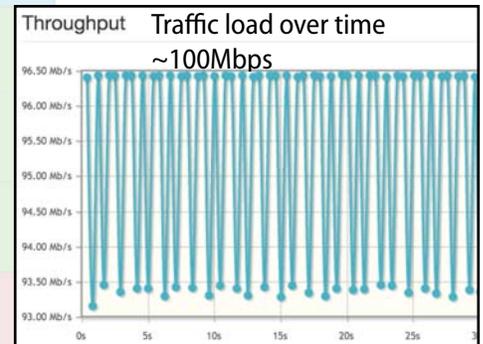
characteristics: bandwidth: 100Mbps, packet loss: 0.5%, latency: 30ms, jitter: 20ms. As before, J3TEL endpoints were connected to the emulated network and traffic was generated to determine available application bandwidth. See Figure 2.

Results

The Qual'IT system accurately reported the network condition reflecting the

Qual'IT - Metropolitan Area Network Metrology Results: 100Mbps, 0.5% loss, 30ms latency, 20ms jitter as reported by Qual'IT Management Console

Indicator	Results	Threshold direction	Threshold
Throughput Average	95.22 Mb/s		
Lost datagrams percentage	0.5 %	←	0.6 %
One Way Delay Maximum	36.66 ms	←	50 ms
One Way Delay Minimum	28.246 ms	←	30 ms
Jitter	14.738 ms	→	19 ms



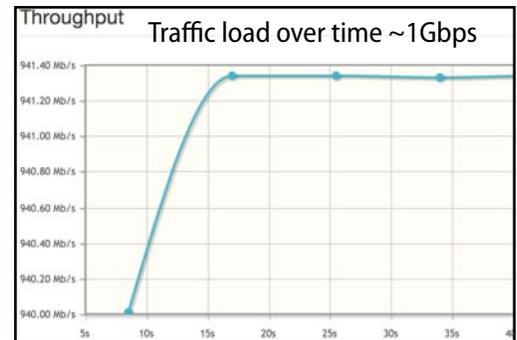
Note: Qual'IT measurements of network. Threshold and Threshold Direction fields used for setting monitoring alarms. Inset shows Qual'IT screen that displays traffic over time.

Source: Tolly, October 2014

Figure 2

Qual'IT - Local Area Network Metrology Results: 1Gbps, No Impairments as reported by Qual'IT Management Console

Indicator	Results	Threshold direction	Threshold
Throughput Minimum	940 Mb/s		
Throughput Average	941.17 Mb/s	➔	940 Mb/s
Throughput Maximum	941.33 Mb/s		
TCP retransmits Minimum	0		
TCP retransmits Average	0		
TCP retransmits Maximum	0		



Source: Tolly, October 2014

Note: Inset shows Qual'IT screen that displays traffic over time.

Figure 3

impairments that Tolly engineers had imposed on the simulated network. The system was able to run 95.23Mbps of application traffic establishing that the network bandwidth was in the range of 100Mbps. As noted previously, given packet and protocol overhead, the actual application traffic throughput will always be somewhat lower than the specified network bandwidth. Any discrepancies were related to particular configuration of the emulator.

Local Area Network Monitoring

Scenario

Tolly engineers configured a simulated LAN environment that had the following characteristics: bandwidth: 1,000Mbps (1Gbps), impairments: none. As before, J3TEL endpoints were connected to the emulated network and traffic was generated to determine available application bandwidth. See Figure 3.

Results

The Qual'IT system accurately reported the network condition reflecting the configuration that Tolly engineers had set for the simulated network. The system was able to run 941.17Mbps of TCP and 950.76Mbps of UDP traffic establishing that the network bandwidth was in the range of 1000Mbps. As noted previously, given packet and protocol overhead, the actual application traffic throughput will always be somewhat lower than the specified network bandwidth. Any discrepancies were related to particular configuration of the emulator.

Management Interface

All system functionality is addressable via the graphical management user interface. While not a formal element of this evaluation, Tolly engineers interacted extensively with the management interface.

The interface itself is well organized, With just a few clicks a user can launch a quick

test, or schedule tests to be run at specific intervals. Figure 4 provides a look at some key functions in the management interface.

Test Case Definition

When defining test cases, the system provides a great deal of flexibility. One can define the TCP stream settings such as window size, "send" data size and rate, QoS tag as well as the source/destination ports. These parameters are then packaged into specific scenarios that can be launched via a drop-down menu in the Quick Test pane.

Real-Time Dashboard

The dashboard is clean and concise, showing a graph of test activity over the past 24 hours, and allows one rapidly to determine pass/fail ratios as well as to drill-down into specific tests. When viewing individual test results, the application generates useful graphs and tables which quickly indicate the status of a given threshold item.

Qual'IT Management Interface Examples

Quicktest
Link validation

Quicktest

Duration

Direction → ⇌

Source box

Destination box

Network script

QoS profile

Validate

Test management
Scheduler

Scheduler

Scheduler / Test scheduling

Test to schedule

Recurrence

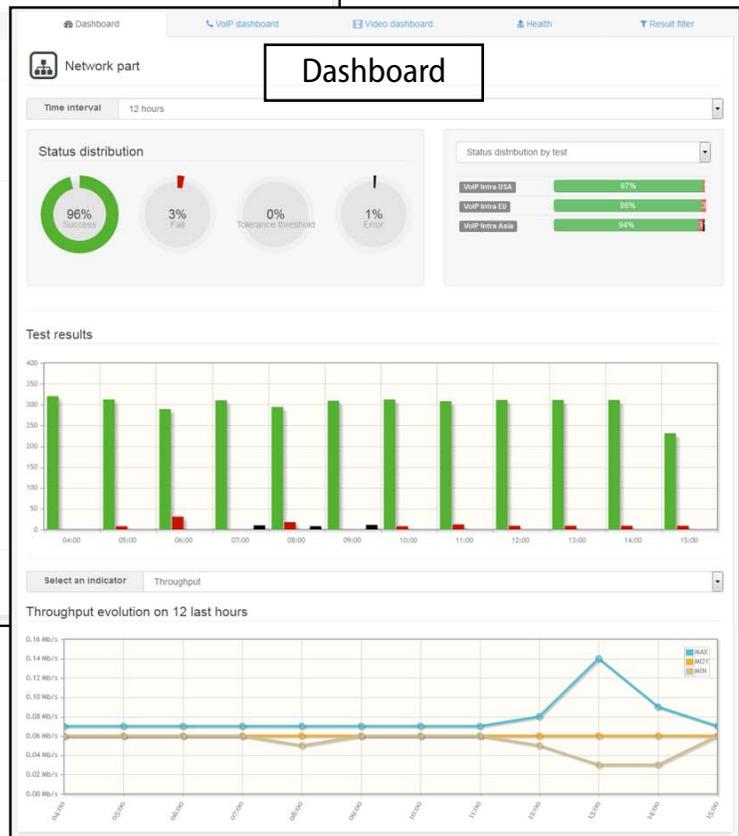
Change scheduling mode ⌵

Execute the test every Minutes

Between the and to

From : at :

Validate



Source: Tolly, October 2014

Figure 4

Test Setup & Methodology

Tolly engineers simulated WAN, MAN and LAN environments. These environments would be subjected to different levels of traffic as well as to packet loss, latency and jitter conditions imposed externally by a commercial-grade network emulation device. The J3TEL solution would be used to measure the network characteristics of these environments and compare them to the known conditions imposed to validate the accuracy of the J3TEL Qual'IT solution.

Environment

The test environment consisted of one J3TEL server running version 5.1.15 of the Qual'IT console, and two Qual'IT BOX

endpoints connected over a simulated WAN link. Tests were run separately in both directions to demonstrate the client/server functionality of each endpoint.

A WAN emulator equipped with two Gigabit Ethernet modules was used to simulate various physical link conditions between the two endpoints. The emulator was placed in router mode, emulating a different subnet on either interface. See Figure 5.

The Qual'IT endpoints were connected to separate interfaces on the WAN emulator and to the server via a management network with 1GbE copper links.

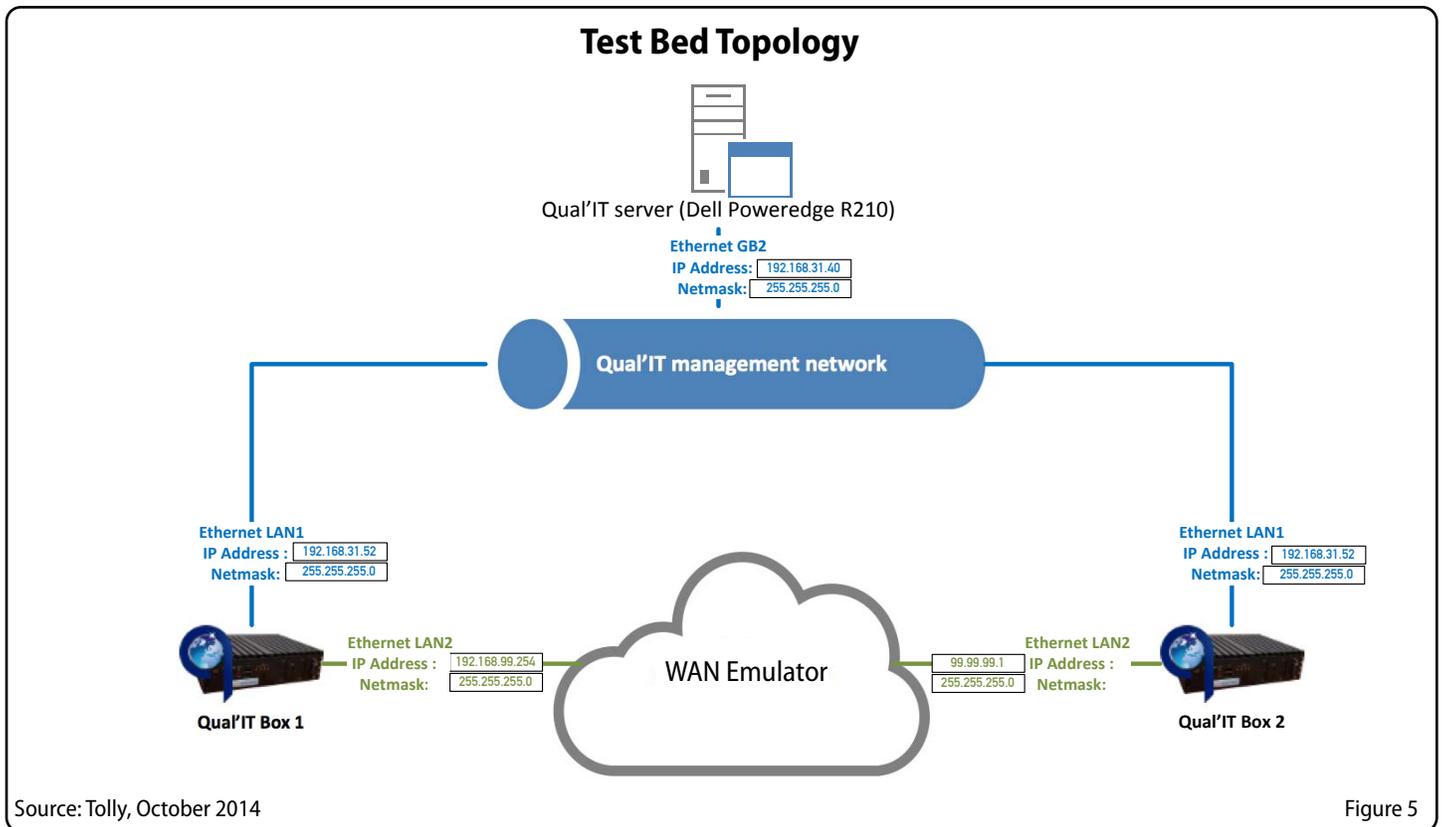
Tolly engineers emulated three different network conditions, simulating common WAN, MAN, and LAN conditions. All tests

were run for a total of three iterations, for both TCP/UDP upstream/downstream.

For the WAN scenario, engineers configured the emulator for a bidirectional 10Mbps with 0.5% packet loss. 60ms of latency was added, with a 40ms uniform jitter on each port.

For the Metropolitan area network (MAN) scenario, engineers configured the emulator impairments such that the link would become 100Mbps with 0.5% packet loss. A constant delay of 30ms was also imposed, with a uniform jitter of 20ms.

For the LAN Scenario, engineers removed all limitations from the WAN emulator, such that the link was a nominal 1Gbps connection, without latency, jitter, or packet loss.



Source: Tolly, October 2014

Figure 5



About Tolly

The Tolly Group companies have been delivering world-class IT services for more than 25 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services.

You can reach the company by E-mail at sales@tolly.com, or by telephone at +1 561.391.5610.

Visit Tolly on the Internet at: <http://www.tolly.com>

About J3TEL

J3TEL, an affiliate of Interdata, is part of the HBG Group. J3TEL is an integration solution network metrology company. Its team of experts offers a wide range of services including audit services or architectural validations before and after deployment



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