



*Enabling Australia's Field Technicians to build, troubleshoot and maintain better communications networks.*



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**FREECALL 1800 680 680**

## QT-600

### Ethernet & Triple-Play Probe



#### Key Features

- Uses a centralized approach with carrier-class, scalable, multiservice probes distributed at key points in the network
- Simplifies fault isolation and troubleshooting
- Supports proactive service-based performance monitoring
- Combines 24x7 monitoring with on-demand and scheduled testing by a single probe
- Performs active and passive testing and monitoring



The JDSU QT-600 is a carrier-grade, scalable, multiservice Ethernet & Triple-Play probe that combines active and passive QoS monitoring and analysis, 24x7, with flexible, on-demand, and scheduled testing.

Worldwide, service providers delivering triple-play services over a converged carrier Ethernet network must cost effectively bulletproof the transport layer as well as ensure the quality of services such as VoIP and IPTV that ride on top. While customers expect their new services to be inexpensive and high quality, service providers expect to more efficiently manage complex network architectures and still reduce operational costs, maximize revenue, and increase customer retention.

An integral component of the JDSU NetComplete™ Service Assurance Solution, the QT-600 addresses both sets of expectations. Through proactive monitoring, the QT-600 detects patterns of QoS degradation and then, from a centralized location, quickly segments the network to identify the source of the problem. The detailed view of network and service performance that is the by-product of the QT-600's distributed data gathering and consolidated reporting capabilities gives service providers the confidence to guarantee service level performance. Converting this information into proactive measures has a positive impact—building greater customer retention and loyalty and contributing to reduced operational costs by decreasing the deployment of multiple technicians to remote locations.

The QT-600 is easily integrated into JDSU's world-class OSS infrastructure, which includes NetAnalyst™ Test OSS for automated and on-demand test and results management and NetOptimize™ Performance Management for performance monitoring and capacity management. The QT-600 leverages the operational synergies between departments' roles and responsibilities for proactively identifying service degradation, isolating problems, troubleshooting, and resolving problems.

## Product Features

### Carrier-class Ethernet network probe

Built for carrier-class networks worldwide, the QT-600 has both Nebs level 3 and CE mark certifications. Its scalable architecture includes 10/100 RJ45, 1000BaseT and 1000 optical GBIC testing interfaces, allowing up to four concurrent active synthetic tests to run simultaneously. A centralized EMS takes care of all configuration requirements and an automated software upgrade function allows the system administrator to specify all or a subset of the QT-600 to upgrade in a single command.

### Simplified, error-proof testing

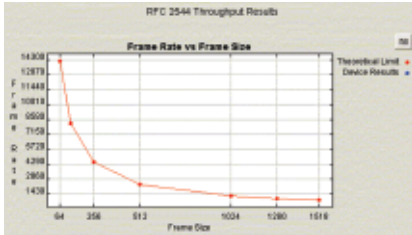
The QT-600, via its open XML API, seamlessly integrates with the JDSU NetAnalyst Test OSS, providing centralized test creation and management that ensures standardized, consistent test procedures are followed, thereby reducing user error. Additionally, through its scheduling capability, NetAnalyst can run repeatable test campaigns at specific times and intervals to assess network and service level quality. Test results can be automatically emailed and also can serve as a baseline for future, over-time comparisons. Its customer-to-QT-600 mapping function enables tests to be created and run against customer services rather than against specific QT-600 probes, making the testing process more intuitive, simpler, and less prone to error.

### Intelligence based on proactive monitoring

The QT-600 calculates QoS data at physical line rates—ensuring information is not lost and results are accurate—and sends the data to NetOptimize, the performance and monitoring OSS. NetOptimize augments the QT-600's QoS information with customer/service information from other sources and uses a flexible reporting engine to aggregate high-level statistics. The flexible reporting engine also provides detailed views of the networks and services performance along with trends in use, capacity, and traffic over specified time periods, with areas of degradation highlighted. The intelligence gained through this in-depth analysis enables service providers to initiate proactive troubleshooting and prevent problems from developing. With the added advantage of continuous service monitoring, service providers can quickly pinpoint trouble areas and immediately correct problems before they severely impact network performance and customer services.

### Scheduled, automated testing

The QT-600 optimizes resources by automatically scheduling and queuing tests to run when resources become available. Automated test access and management control is achieved through the QT-600's ability to configure the service provider's switch, expediting and simplifying the workflow process. In addition, the QT-600 manages service turn-up end-to-end by automatically looping edge and CPE devices and test equipment that may include JDSU FST-2802, other QT-600s in the network, and third-party NIUs.



Throughput results

### Active triple-play testing

The QT-600 can emulate end-user equipment and actively generate traffic that simulates actual customer traffic patterns. Connectivity is tested and validated using ping and traceroute while service turn-up and fulfillment are verified with RFC-2544 throughput, latency, frame loss, and back-to-back tests. By placing and terminating VoIP calls, the QT-600 acts as a VoIP endpoint and then reports MOS/R-factor results and packet statistics for these synthetic transactions. It also can mimic IPTV channel change and video on demand requests and measure QoS parameters such as jitter, PCR jitter, packet loss, and packet rates and the time it takes to service a channel change request. In all cases, once the tests are completed, the QT-600 automatically reports the QoS results pertinent to the active transaction. Up to four active tests can run concurrently.



NetAnalyst test

### Passive triple-play testing and monitoring

The QT-600, working with NetComplete, provides a flexible interface that intelligently reduces the traffic captured on a per port and/or VLAN basis and distinguishes between transmit and receive directions. Monitoring can be continuous or scheduled for specific time intervals. The QT-600 also captures data at full line rates and provides 120 MB of nonvolatile cache. Working in conjunction with NetAnalyst, the QT-600 uses JDSU Examine software to automatically transfer all captured cache data for archival and decode purposes.

The QT-600 can monitor over 8000 simultaneous VoIP calls measuring and reporting packet statistics, jitter, and MOS/R-factor. The QT-600 can also monitor over 1000 simultaneous MPEG-2 transport streams reporting on key performance indicators such as MDI, packet loss, jitter, PCR jitter, channel bandwidth, PAT, PMT and PID errors. Users have the flexibility to define alarm thresholds based on these KPIs. For more in-depth troubleshooting, analysis, and monitoring, the QT-600 can display data utilization trends that include frame distribution statistics as well as broadcast, unicast, and multicast frame counts over a 15-minute window. Tracking and reporting topN statistics and displaying the worst offenders along with setting filters on the fly enables the user to easily drill down further into the data to pinpoint the root cause of a problem.

## Service Assurance Applications

### Metro Ethernet

The QT-600 for Metro Ethernet can characterize the performance of a customer VLAN before turning up service to the end customer. Adding the 802.1q VLAN tag enables the QT-600 to emulate the end customer's traffic and operate in a QinQ or preserved VLAN environment. Additionally, the QT-600 can control VLAN priority or IP priority settings using Diffserv and ToS bits. This allows the traffic being generated to take on characteristics of the customer's traffic patterns, eliminating the need for coordinated dispatches to multiple remote sites to turn up service. This, in turn, reduces operational costs and ultimately speeds up the service fulfillment process.

With the capability to run multiple tests such as ping, traceroute, throughput, latency, and frame loss as well as back-to-back tests (RFC-2544), service providers can rapidly troubleshoot and isolate faults remotely from a single location. Input parameters for each QT-600 test are highly configurable, giving service providers maximum flexibility when troubleshooting.

The QT-600 can be placed into loopback mode and can also automatically loopback various edge and CPE devices. Running loopback tests from QT-600 to QT-600 and out to the customer premises quickly segments the network and clearly identifies problems to be within or outside of the service provider's domain.

The QT-600 also combines active testing with passive monitoring of Metro Ethernet. During passive monitoring of customer traffic, service providers can apply filters to highlight data of interest and perform total vs. filtered data reporting. The data includes utilization trend graphs; frame utilization statistics and distribution; and topN classifiers such as talkers, protocols, conversations, applications, and IP/MAC listeners and pairs. The ability to apply filters and change the classifier settings on the fly lets service providers drill down into the data and pinpoint problems.

### Voice over IP (VoIP)

Ensuring the availability and quality of VoIP service is an integral component of any service assurance solution. Users can initiate active synthetic call campaigns to proactively monitor and ensure high-quality services across the network. This advanced functionality allows multiple QT-600 units to be placed at key points in the network to originate and answer VoIP calls at user-defined intervals. Test results include full quality analysis and verify that service is available and has acceptable quality. With this proactive testing, problems are identified and resolved before they are experienced by end-users. Once problems are encountered, the on-demand active testing feature allows service providers to drill down, sectionalize the network, and rapidly isolate faults for troubleshooting.



NetOptimize

The QT-600 has the capacity to continuously monitor more than 8000 VoIP calls simultaneously for QoS. User defined thresholds let the QT-600 identify poor-quality calls and report call quality statistics such as MOS/R-Factor, jitter, and packet loss for each identified call. Call signaling messages also can be captured and decoded to resolve connection problems quickly.

In addition to calculating both conversational and listening quality estimates (CQE, LQE) as defined by industry standards, the QT-600 uses patent-pending algorithms to perform a network performance estimate (NPE) that aids in quickly identifying the root cause of service degradation within the network.

### **IPTV testing and performance monitoring**

As IPTV gains traction in the marketplace, the QT-600 is poised to support the delivery of broadcast-quality video over a converged Ethernet infrastructure that equals the performance of a cable network. The QT-600 provides an operator with the tools necessary to detect, segment and troubleshoot any IPTV quality issues resulting from the content travelling through the network. By passively monitoring over 1000 simultaneous IPTV transport streams and reporting and alarming on key quality indicators such as VMOS, MDI, loss distance, loss period, PCR jitter, and packet loss, operators are alerted of situations that could impact customers' QoE.

## Specifications

### Metro Ethernet Testing

|                                                                                                                    |                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ping                                                                                                               |                                                                                                                                                            |
| Traceroute                                                                                                         |                                                                                                                                                            |
| RFC 2544 tests                                                                                                     | Throughput, Frame Loss,<br>Latency, Back to back                                                                                                           |
| QT-600 loopback                                                                                                    |                                                                                                                                                            |
| In-band loopback interoperability with Accedian EtherNID,<br>FST-2802, MTS-8000, and SmartClass Ethernet Portables |                                                                                                                                                            |
| Out of band loopback interoperability with Canoga Perkins<br>and Advantia NIUs                                     |                                                                                                                                                            |
| Data analysis troubleshooting with capture and filters                                                             |                                                                                                                                                            |
| Rolling 15 minute data utilization trending graph                                                                  |                                                                                                                                                            |
| Frame statistics and distribution                                                                                  |                                                                                                                                                            |
| TopN analysis                                                                                                      | Top conversations, Top applications,<br>Top VLANs, Top VLAN priorities,<br>Top pairs (Mac and IP), Top listeners (Mac and IP),<br>Top talkers (Mac and IP) |

### VoIP Active Performance Monitoring and Testing

|                                                                                       |                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| One-way and two-way calls                                                             |                                                                                                                                                                                                                                                               |
| Pre-canned voice samples                                                              |                                                                                                                                                                                                                                                               |
| Call generation configurable input parameters                                         |                                                                                                                                                                                                                                                               |
| SIP, MGCP signaling                                                                   | Codec (G.711, G.729 u-law and a-law)                                                                                                                                                                                                                          |
| NCS loopback support                                                                  |                                                                                                                                                                                                                                                               |
| Jitter buffer emulation with configurable buffer size                                 |                                                                                                                                                                                                                                                               |
| Standard versus reference tone frequencies                                            |                                                                                                                                                                                                                                                               |
| Interoperability with JDSU HST                                                        |                                                                                                                                                                                                                                                               |
| Configurable test pass/fail threshold criteria (MOS/R-Factor)                         |                                                                                                                                                                                                                                                               |
| RTCP                                                                                  |                                                                                                                                                                                                                                                               |
| QoS analysis results                                                                  | MOS score LQE, CQE, NPE;<br>R-Factor LQE, CQE, NPE; jitter RFC and instantaneous<br>(min, max, average, and standard deviation);<br>Clock skew; Packet statistics (total, lost, dropped)<br>RTCP Jitter, Round Trip Delay, Packet Loss<br>Degradation Factors |
| Per call signaling and RTP capture with post analysis through<br>Examine and PVA 1000 |                                                                                                                                                                                                                                                               |

### VoIP Passive Performance Monitoring

|                                                                                                                                                                                       |                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Continuous monitoring of over 8000 VoIP calls with interim and summary reporting of call quality statistics and thresholding                                                          |                                     |
| MOS score LQE, CQE, NPE; R-Factor LQE, CQE, NPE;<br>Jitter; Clock skew; Packet statistics (total, lost, dropped)<br>RTCP Jitter, Round Trip Delay, Packet Loss<br>Degradation Factors |                                     |
| Continuous reporting of statistics for 20 worst calls and end of test averages, min, max, and standard deviation                                                                      |                                     |
| Quick quality reference bands                                                                                                                                                         | Excellent, Good,<br>Fair, Poor, Bad |
| Control plan capture (SIP, MGCP, Cisco Skinny, H.323) and viewing through Examine                                                                                                     |                                     |
| Sophisticated Filter and Trigger options                                                                                                                                              |                                     |

### IPTV Testing and Troubleshooting

|                                                                                                                                                              |                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Continuous monitoring of over 1000 simultaneous Transport Streams with interim and summary reporting of key quality statistics and user defined thresholding |                                                                                 |
| IP/RTP Stream Statistics                                                                                                                                     | MDI-DF, MDI-MLR, Loss Distance, Loss Period, RTP Jitter, packet loss, bandwidth |
| MPEG Statistics                                                                                                                                              | PCR Jitter, PID, PAT, PMT, continuity and sync errors                           |
| Support for Single and Multi Program Transport Streams, IGMP, Microsoft ICC and RUDP statistics, multicast and unicast statistics                            |                                                                                 |
| Channel change emulation with ZAP times                                                                                                                      |                                                                                 |

### Operations

|                                                      |
|------------------------------------------------------|
| Multiuser support for four simultaneous active tests |
| Single passive monitoring test                       |
| Centralized administration via EMS                   |
| Carrier grade                                        |
| Automated test access management (TAM) control       |

### Filtering/Triggering

|                     |                                                                            |
|---------------------|----------------------------------------------------------------------------|
| Multifilter support |                                                                            |
| Sliding window      |                                                                            |
| Fixed offset        |                                                                            |
| Packet              | VLAN, MPLS, VLAN Priority, Dest/Src IP,<br>application, ToS/DSCP, IP flags |

### Capture

|                                                             |                                          |
|-------------------------------------------------------------|------------------------------------------|
| Various stop conditions                                     | On-trigger, Time,<br>Network Utilization |
| Buffer optimization and status reporting                    |                                          |
| Post capture viewing and analysis with Examine and PVA 1000 |                                          |

### Interfaces

|                                   |                             |
|-----------------------------------|-----------------------------|
| Ethernet ports                    | 10/100 Mbps RJ-45 connector |
| 1000 Mbps GBIC optical interface  |                             |
| 1000BaseT interface               |                             |
| Duplex modes                      | Full/Half                   |
| Flow control (Ethernet) supported |                             |

### Mechanical dimensions

|                                                                                       |             |
|---------------------------------------------------------------------------------------|-------------|
| Width                                                                                 | 17.3 inches |
| Height                                                                                | 1.75 inches |
| Depth                                                                                 | 9.25 inches |
| Weight                                                                                | 8.8 pounds  |
| Compatible with ANSI (19" or 23") and ETSI (21") racks (515 mm between fixing screws) |             |

### Power supply

|                                                                                                                                    |                     |
|------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| The QT-600 meets the following electrical specifications:                                                                          |                     |
| ETSI ETS 300 132-2 Equipment Engineering (EE)                                                                                      |                     |
| The QT-600 has an AC power option using an AC power adaptor                                                                        |                     |
| The QT-600 has a DC power option using one or two -48 VDC supply input ports that operate from a nominal supply voltage of -48 VDC |                     |
| Range                                                                                                                              | 35 VDC up to 60 VDC |
| Power consumption                                                                                                                  | <50 W               |

### Compliance

|                                                                       |
|-----------------------------------------------------------------------|
| CE                                                                    |
| NEBS3 GR-1089-CORE Issue 3, GR-63-CORE Issue3, and GR-78-CORE Issue 3 |

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