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

VIAVI MASTER Distributor

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QT-200 DSL Test Solution

FROST & SULLIVAN

2007

Global Communications
Test & Measurement
Company of the Year Award

Key Features

- **Reduces operational costs by eliminating erroneous dispatches**

- **Improves MTTR, reducing customer churn**

- **Robust copper and xDSL service level testing, including IP video, Voice over IP analysis, and integrated test access control yields rapid return on investment**

- **Patented, single-ended, wideband copper test technology eliminates costly dual-ended testing requirements**

- **Wideband copper test works through splitters without interrupting POTS service**

- **1U high probe**

- **Test Access Matrix (TAM) control through the QT-200 simplifies installation and management**

- **External POTS test port allows for the re-use of the existing POTS line test system**

- **A component of the JDSU NetComplete™ end-to-end testing solution, allowing for comprehensive test scheduling and results management**

- **Web-based user interface eliminates the need to install and manage end user software**

The NetComplete portfolio, a JDSU Service Assurance Solution, combines the QT-200 xDSL & Triple-Play Probe and NetAnalyst™ Test Management Software, providing an unsurpassed ability to pre-qualify, provision, maintain, monitor, and troubleshoot DSL triple-play services as well as copper loop and POTS lines. By delivering DSL service testing, copper prequalification, and non-intrusive monitoring in one probe, service providers gain the visibility and remote testing capabilities needed to accurately sectionalize faults and properly dispatch technicians, resulting in drastically reduced maintenance costs, improved customer satisfaction, reduced customer churn, and improved service profitability.

Making DSL Service Profitable

The JDSU DSL test solution, featuring the QT-200 xDSL & Triple-Play Probe, provides service providers with the ability to troubleshoot customer or network problems and pre-qualify copper loops, increasing the number of potential subscribers. Furthermore, the QT-200 provides higher layer service testing, which enables the deployment of new services while reducing overall maintenance costs.

By deploying the QT-200 probe near the DSLAM, technicians are able to perform "lookout" testing toward the customer premises and "look-in" testing toward the IP network and the ISP to rapidly sectionalize problems and reduce MTTR. Furthermore, many of these tests, including line qualification, can be performed without causing a POTS service outage. This eliminates potential customer complaints and also eliminates the need to delay testing until the next maintenance window. In addition, technicians can perform non-intrusive DSL and/or POTS testing. All of these capabilities, plus features that include a small, 1U high footprint and a Web-based user interface, contribute to ensuring profitability for DSL services.

JDSU DSL Test Solution Overview

The JDSU QT-200 xDSL & Triple-Play Probe is installed at the DSLAM and utilizes a Test Access Matrix Switch (TAMS)–internal (ITAM), external (ETAM), or frame-based (FTAM)–to gain access to the copper loop. This arrangement allows for testing out to the end user to verify the quality of the copper loop and the remote xDSL modem. In addition, testing into the network to verify DSL, ATM, IP connectivity, and video and voice over IP is also possible. Graphical representations of the network and the locations of faults, along with a pass or fail test result, provide for rapid and very accurate trouble ticket routing to the proper group for resolution. Remote connectivity to individual QT-200 probes is via Ethernet (10BaseT or 100BaseT).

The JDSU NetAnalyst QT-EMS is utilized to perform software maintenance and probe provisioning, and testing is performed using the robust JDSU NetAnalyst test operation support system (OSS). If another test OSS is already in use, the open systems interfaces (SNMP, CORBA, and XML) provide straightforward integration into existing systems. The completely Web-based user interface supports up to 300 simultaneous users with various user privileges and requires no software installation on the users' PCs, thus eliminating the overhead costs associated with maintaining a PC-based application. In addition, concurrent multi-language support provides access to the user interface in the user's native language.

Testing out to the Customer Premises Equipment (CPE)

The QT-200 xDSL & Tripe-Play Probe incorporates a number of unique patents that provide an unparalleled ability to test from the DSLAM out to the customer network (Figure 1). A complete list of tests is available in Table 1. Key among these tests is patented use of Frequency Domain Reflectometry (FDR) to perform Single-Ended Loop Qualification (SELQ). This test, as well as a host of others, can be performed remotely without causing a POTS service outage. The SELQ test provides key information, such as noise interference spectrum, attenuation, line length, and distance to a line fault (open or short). The single-ended nature of this test eliminates the need to send a technician to the customer premises in order to qualify the copper loop, saving both time and money. Other CPE-focused tests include a full suite of narrowband and wideband tests as well as Power Spectral Density (PSD) measurements and inline monitoring. The JDSU QT-200 Probe can also emulate the service provider's network and provide service level testing, including DSL modem synchronization and verification of end-user IP connectivity.
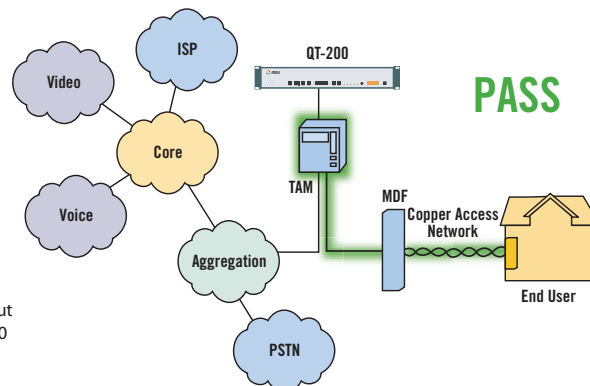

Figure 1 Testing from the Central office out to the customer network using the QT-200

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Testing into the Network

JDSU is acutely aware of the service provider's need to rapidly sectionalize and identify problems. By taking advantage of the location of the QT-200 probe at the edge of the network, technicians can test into the network and verify connectivity through the service provider's network out to the ISP (Figure 2). This includes verifying proper ATM transport, PPP negotiation, and IP connectivity out to the public Internet. In addition, the QT-200 probe provides IP Video test capabilities to ensure the availability and quality of the video transport stream. These tests provide definitive information regarding the location of the reported problem and allow for rapid and correct trouble ticket routing and technician dispatching. The result is reduced MTTR and improved customer satisfaction. The QT-200 probe also provides VoIP and Analog Pots Voice testing to ensure the transition from legacy Pots switch to full IP network.

Test	In-service monitoring	Out-of-service testing Toward the CPE	the network/ISP
Phone continuity	✓	✓	✓
Automatic line ID authentication			✓
On/off hook check	✓		
Dial tone check	✓		
AC/DC voltage		✓	
2-way resistance		✓	
2-way capacitance		✓	
3-way Resistance		✓	
3-way Capacitance		✓	
CPE signature		✓	
Fault and Statement		✓	
Longitudinal balance		✓	
Load coil detection		✓	
TDR		✓	
Wideband noise	✓ (*)	✓ (*)	✓ (*)
Disturber identification	✓(*)	✓ (*)	
HTU-R modem detection	✓(*)	✓ (*)	
Noise spectrum analysis	✓ (*)	✓ (*)	
Carrier sets detection (ITU-T G.994) and analysis	✓ (*)	✓ (*)	
PSD measurement and mask comparison	✓ (*)	✓ (*)	
FDR (loop length, attenuation versus frequency)		✓ (*)	
ADSL and ADSL2+ bit rate prediction		✓ (*)	
HTU-C emulation		✓ (*)	
HTU-R emulation			✓ (*)
Modem training		✓ (*)	✓ (*)
Report modem activation and training failure status		✓ (*)	✓ (*)
Report upstream and downstream parameters		✓ (*)	✓ (*)
Report errors from the physical transmission		✓ (*)	✓ (*)
Check DSL bit rates and noise margin		✓ (*)	✓ (*)
Check ATM layer		✓ (*)	✓ (*)
Check PPP negotiation		✓ (*)	✓ (*)
Check IP ping connectivity		✓ (*)	✓ (*)
Check IP HTTP connectivity			✓ (*)
Display the IP traceroute			✓ (*)
IPTV and VoD check			✓ (*)
Voice Testing (PESQ and Echo)			✓
Analog Voice POTS tests			✓
VoIP (E-model MOS Score)			✓

(*) Test performed without interrupting the POTS service

Table 1 JDSU DSL Test Solution Measurements
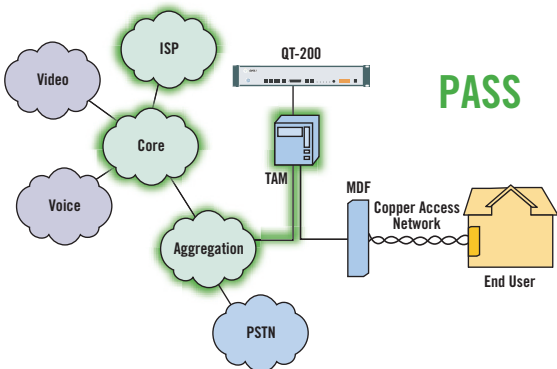

Figure 2 Testing through the service provider's network out to the ISP using the QT-200

Specifications

QT-200 xDSL & Triple-Play Probe

Mechanical dimensions

Width	440 mm (17.32 in) compatible ETSI and ANSI rack [515 mm (20.28 in) between fixing screws]
Height	44.5 mm (1.75 in)
Depth	235 mm (9.25 in)
Weight	5 kg (11 lbs)

Power supply specifications

The QT-200 is powered from 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	<20 W

Regulatory compliance

CE Certified	(ETS 300 386 v1.3.1 and EN 60950)
NEBS certified	(QT-200 MK1)
	(GR-1089-CORE Issue 3, GR-63-CORE Issue 3, and GR-78-CORE Issue 3)

DSL standards

ADSL over POTS	ITU-T G.992.1 (Annex A)
G.SHDSL	ITU-T G.991.2 (G.SHDSL)
ADSL2+ over POTS	ITU-T G.992.5 (Annex A)
ADSL2+ over ISDN	ITU-T G.992.5 (Annex B)
Encapsulation	LLC-SNAP or VC-MUX
PPP/IP connectivity	PPPoA, PPPoE, Bridged Ethernet (RFC 1483), IPoE, IPoA

ADSL, ADSL2+ layer

Up/down connect rate
Max up/down rate
Up/down noise margin
Up/down transmitter power
Remote equipment vendor/model
Training time
Up/down attenuation
Up/down CRC errors

G.SHDSL layer

Minimum connect rate	192 kbps to 2320 kbps

SNR
Transmitter power
Remote equipment vendor/model
Training time
Local/remote CRC errors
Receiver gain
Local/remote errored seconds

ATM layer

VPI/VCI
AAL1, AAL5

Encapsulation	LLC-SNAP or VC-MUX
PPC encapsulation	PPPoA, PPPoE

Cell count TX/RX

ATM loopback	F4/F5 segment and ETE

Number of cells transmitted and received
Number of F4/F5 segment and ETE cells transmitted and received

PPP layer

User login
Password
Chap authentication
Pap authentication
Local IP address, IP Netmask, DNS address, remote IP address

IP layer

Protocol to be tested
Message count TX/RX
Response time
Min/avg/max in ms
IP-ICMP
IP-HTTP IPERF throughput

Non-intrusive monitoring

Bandwidth	-25 kHz to 4.4 MHz

RMS noise level
Up/down PSD levels
E, F, and G IEEE standard 743 filters
Main disturber levels and frequencies

Wideband copper check

Frequency Domain Reflectometry (FDR)
Attenuation measurement at center frequency
Length/distance to fault/end of line
Echo plot
Cable loss plot
ADSL, ADSL2+ bit rate prediction

Narrowband copper check

AC and DC voltages
Resistance
Capacitance
CPE Signature
Fault and Dispatch statement
Longitudinal balance
Power influence and Balance
POTS test capabilities
Time Domain Reflectometry (TDR)
Wiring check

Video service

MPEG-2 Transport Stream analysis over UDP/RTP/UTStarcom's RollingStream™ protocol
Set top box (STB) emulation
IGMP V2/V3 and RTSP protocols

Voice service

PESQ MOS score (MOS LQO) and echo on Digital or analog Pots interface
MOS score (MOS LQO)
RTP/ RTCP/MGCP protocol
SIP 2.0 signalization (RFC 3268, RFC4028)
G.711 μ-law and A-law
Analog Pots test (round trip delay/latency, dial tone/post dialling delay, noise, attenuation)

Ordering Information

Please contact your local JDSU sales office for more information about JDSU NetComplete Service Assurance Solutions to meet your needs.

Test & Measurement Regional Sales