

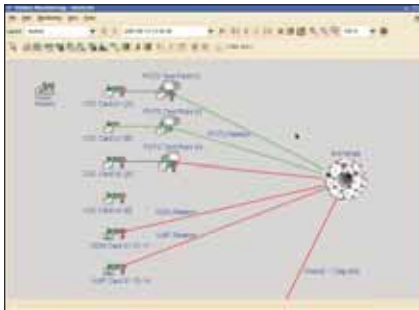
## NQMS*voice*

NETWORK TESTING—MONITORING



### Breaking down the traditional sound barriers of voice services

- 24/7 detection and location of service quality degradation
- Fault prediction through long-term performance trending
- Proof of compliance with service-level agreements (SLAs)
- Turnkey and customized client-server applications
- QoS monitoring of PSTN, VoIP, cellular and hybrid networks
- Automated creation of network management reports
- On-net and off-net testing



## Meeting the Voice Quality Challenge

Managing today's voice services is more challenging than ever before. With a dizzying array of technologies in the mix, it can be a daunting task to ensure that end users experience the quality they've come to expect from the traditional PSTN network. In addition to the challenges of maintaining an SS7 network, operators now must cope with the addition of new protocols such as SIP, H.323, CDMA and GSM. All these technologies combine to create an extremely complex networking environment with potentially hundreds of quality metrics to understand, monitor and maintain.

In order to successfully manage these disparate technologies and maintain toll quality in these hybrid networks, operators require a complete view—in-depth but still understandable—of the networks' performance, covering both real-time and historical activities. Only with complete visibility will operators be able to react in a timely and focused fashion to current problems as well as have the long-term perspective that allows for proactive maintenance to avoid many outages altogether.

### MOS—TRUE QUALITY GUARANTEED

It can be difficult to accurately monitor true end-to-end user experience across multiple technologies. And despite its versatility, digital network technology is being pushed to extremes in the area of real-time communications. For instance, bandwidth optimization techniques like silence suppression often result in degradation of transmitted speech quality in both fixed and cellular networks. For this reason, traditional measurements like frequency response, round-trip delay and packet loss fail to properly predict the quality of a true voice conversation.

In order to overcome these limitations, the ITU-T has standardized the PESQ (perceptual evaluation of speech quality) algorithm for voice quality assessment. This measurement method is universally recognized as the most thorough and accurate way to analyze voice quality on any network. End-to-end call analysis utilizing PESQ is the only testing methodology that provides consistent, repeatable and meaningful results regardless of a network's underlying technology and is absolutely essential in the monitoring of today's hybrid networks.

### NQMS*voice*™, A TOTAL SOLUTION FOR MONITORING VOICE SERVICES

EXFO's NQMS*voice* is a proven, carrier-class system designed to evaluate the voice quality in both wired and wireless networks. A sophisticated and flexible distributed monitoring solution for voice services, NQMS*voice* provides the tools required to ensure that voice services are running at peak condition.

NQMS*voice* has been deployed for over a decade throughout the world and has been used by operators, regulators and enterprises in a variety of environments and applications, which include:

- Pre-qualification testing
- Service activation
- Proactive quality monitoring
- Hybrid network testing
- SLA guarantees
- Media gateways
- Least cost routing
- International calling and roaming

### COMPREHENSIVE COVERAGE

NQMS*voice* makes reaching your test goals easy by supporting an exhaustive array of test points allowing for test access in every conceivable scenario. For example, most connection tests (e.g., post-dial delay, or PDD) can be accomplished by using any generic voice terminal (analog handset, VoIP soft client, etc). And for quality testing, calls can be made to test numbers available at most exchanges around the world. Also supported are many other proprietary and generic test points, providing unsurpassed test coverage and flexibility. For a full list of test points supported, see the Specifications section at the end of this document.

### ENTERPRISE CLASS AND WEB FRIENDLY

NQMS*voice*'s enterprise-class data collection center (DCC) runs on proven Oracle technology. Millions of pieces of data are collected, sorted and displayed through meaningful reports that allow operators to make informed decisions. Whether for drilling down into a single failed test or trending a problem that has been evolving over months, access to the proper data is quick and easy. Lastly, thanks to a flexible, open architecture, Web-based reports and Web portal integration is an option that can give additional value to a provider's service offering.

### REAL-TIME ALARMS AND HISTORICAL TRENDS

Real-time alarms based on specific, user-definable parameters, provide for timely reactions in the event of malfunctions or performance degradation. Additionally, long-term trending of quality metrics obtained through intelligent, fully automated test campaigns predict impending failures long before they occur, allowing for proactive maintenance and avoiding many service interruptions altogether.

### AUTOMATED SYSTEM

EXFO's NQMS*voice* system boasts an intelligent automation architecture with scheduling, conflict resolution and alarming features so "intelligent" that, once configured, will truly run itself. With comprehensive OSS integration available, NQMS*voice* will become the cornerstone of any high-quality voice network.

# A Customizable, Three-Tiered Element Management Server (EMS)

## OPEN AND EXTENSIBLE SOFTWARE ARCHITECTURE

Based on flexible, robust Linux and Oracle software architecture, the NQMSvoice system can be customized to your particular needs.

## DATA COLLECTION CENTER (DCC)

The DCC is the nerve center of the NQMSvoice system. Powered by Linux and an Oracle 10g database, it delivers the robustness required for a mission-critical application. The DCC manages the network by distributing test campaign information while managing every single test point to ensure potential test resource conflicts are managed gracefully. Data collection, storage and access is supplied by the market leader in database technology to guarantee that critical test data is always available when needed. The DCC can provide trending data for multiple months—and even years—depending on customer requirements.

## ADMINISTRATIVE WORKSTATION (AW)

The AW user interface is NQMSvoice's main software application. System administrators, network maintenance managers and NOC operators use it to control the system, configure test setups, create schematic views of the network, document the network, locate, view and manage alarms, browse test results, and perform various system operation and maintenance tasks.

## A WIDE RANGE OF SYSTEM MANAGEMENT FUNCTIONS

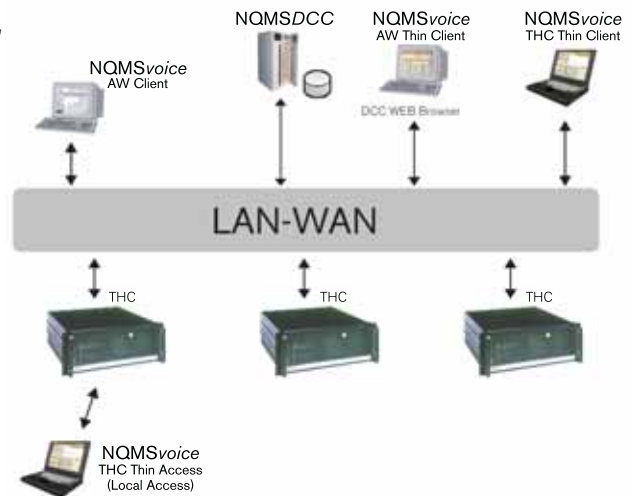
The AW user interface offers numerous functions; namely, it allows you to:

- Define user properties
- Assign users on-duty schedules for sending alerts
- Configure tests and establish schedules
- View and manage alarms
- Look up test results
- Create topology views and set background images
- Set alert parameters and channels (e-mail, SMS, etc.)
- Perform on-demand testing using pre-defined test setups
- Automatically generate reports
- View status for the system and monitored routes

## WEB ACCESS TO SERVER DATA

With this user interface (AW Web browser), NOC operators and field technicians can quickly access the current network QoS and drill down into specific information of interest. They can view problems that are not yet resolved and see if an alarm has been acknowledged (and if so, by whom). The NQMSvoice AW Web browser allows multiple thin clients to concurrently:

- Obtain the network status from a QoS perspective
- View and manage current and historical alarms
- Perform on-demand testing



NQMSvoice Architecture

Hardware and software status

- Communication status
- Current network configuration
- Current and scheduled test activities
- Event history in an audit log
- On-demand test scheduling and results display

## SYSTEM COMPONENTS

### Test Head Controller (THC) / Remote Test Unit (RTU)

#### NQMSvoice

##### Hardware

Rack-mount or portable platform  
AC (100-240 VAC, 50/60 Hz) or DC Power supply (AC or DC)  
Ethernet or modem communication interfaces  
PSTN, T1/E1, Ethernet, modem test interfaces in combination

##### Software

Linux Operating System  
NQMSvoice THC application software  
Thin Client THC Web GUI (Graphical User Interface)

### NQMS Data Collection Center (DCC)

Server platform (typical)

##### Hardware

Intel® XEON 1.66GHz Dual-Core  
5 Gbyte RAM  
5 x 80 Gbyte HDDs, RAID  
Redundant AC 835 W power supplies  
Remote access adapter (IP-based)

##### Software

Red Hat Enterprise® Linux operating system  
NQMSvoice DCC server and client software  
RDBMS

### NQMSvoice Administrative Workstation (AW)

##### Hardware

Intel Pentium or equivalent PC

##### Software

Linux or Windows XP operating system with X-Interface  
NQMSvoice AW application software

## SUPPORTED INTERFACES AND TECHNOLOGIES

PSTN (2-wire analog)	Fax
Wireless (GSM / CDMA)	Modem
Ethernet / VoIP	Codecs: G.711, G.729 a&b, G.726, G.723
ISDN BRI / PRI	Signaling: pulse dial, DTMF, H.323, SIP
E1 / T1	

## SELECTED SETUP QUALITY MEASUREMENTS

Dial tone detected	Connection time
Ringback detected	RTP time
Busy detected	Call Completion Rate
Post-dial delay	

## SELECTED TRANSMISSION QUALITY MEASUREMENTS

PSTN	PSTN Modem	
Dropout count	Transmission Speed	Sent, received & errored bits
Impulse noise	Transmitted Bits	MOS with PAMS
Attenuation	BERT	MOS with PESQ
Noise	Erroneous	<b>VoIP</b>
Frequency offset	bits/seconds/minutes	Packet Loss
DTMF	<b>105 Responder</b>	Packet Delay
23-Tone	Attenuation	Jitter
MOS with PAMS	Noise	RTD
MOS with PESQ	Gain-Slope	MOS with PAMS
E-Model R-Factor	Echo Return Loss	MOS with PESQ
Echo & RTD	Singing Return Loss	<b>Hybrid Networks</b>
<b>PSTN Fax</b>	<b>ISDN BRI / PRI</b>	MOS with PAMS
Errored lines	BERT	MOS with PESQ
Errored pages	Errored Seconds / minutes	
Severely errored pages	Sent & received packets	

## ORDERING INFORMATION

For ordering information please contact your nearest sales office.

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