

**Product Bulletin**

# PIQUA™ System Quality Management for IP-Based Services

**Overview**

Inherent advantages are driving the rapid rise in both public and private networks based on Internet Protocol (IP) technology. Both communications service providers and enterprise IT organizations are migrating to IP networks because of the cost-effectiveness of the underlying technology, its scalability and the fact that it can more easily accommodate multimedia-rich services that represent new revenue-generating opportunities for operators.

While many of the basic enabling technologies for applications like voice over IP (VoIP) and other IP-based services are being put in place, management and control systems to ensure the quality of these IP-based services have lagged because of the distributed nature of IP networks. In contrast to circuit-switched networks where much of the network's intelligence is concentrated in central offices, IP networks distribute it to edge devices, including customer premises equipment (CPE) such as IP phone systems, residential gateways, DSL and cable modems, set-top boxes, IP-PBXs, wireless routers and access points,

among others. This complicates the task of gathering and compiling the real-time data that is required for a comprehensive management and control system.

**Tapping into Texas Instruments (TI's) Embedded Resources**

TI's PIQUA™ software capitalizes on TI's strategic positioning throughout IP networks to providing powerful quality management and control elements. Emanating from CPE devices such as IP-PBXs, IP phones and other systems at the edge of the network, TI's DSP-based system-on-a-chip (SoC) processors, as well as its embedded software, extend well into carrier-class switches, media gateways and other transport-oriented systems that constitute the IP infrastructure. Based on this pervasive perspective, PIQUA technology can gather and report the real-time operational data that is the lifeblood of every quality management system. And most importantly, it can invoke real-time proactive adaptation as external network conditions affect service quality.

Taken as a whole, PIQUA technology's quality elements constitute a management fabric that addresses the discovery,

**Key Features**

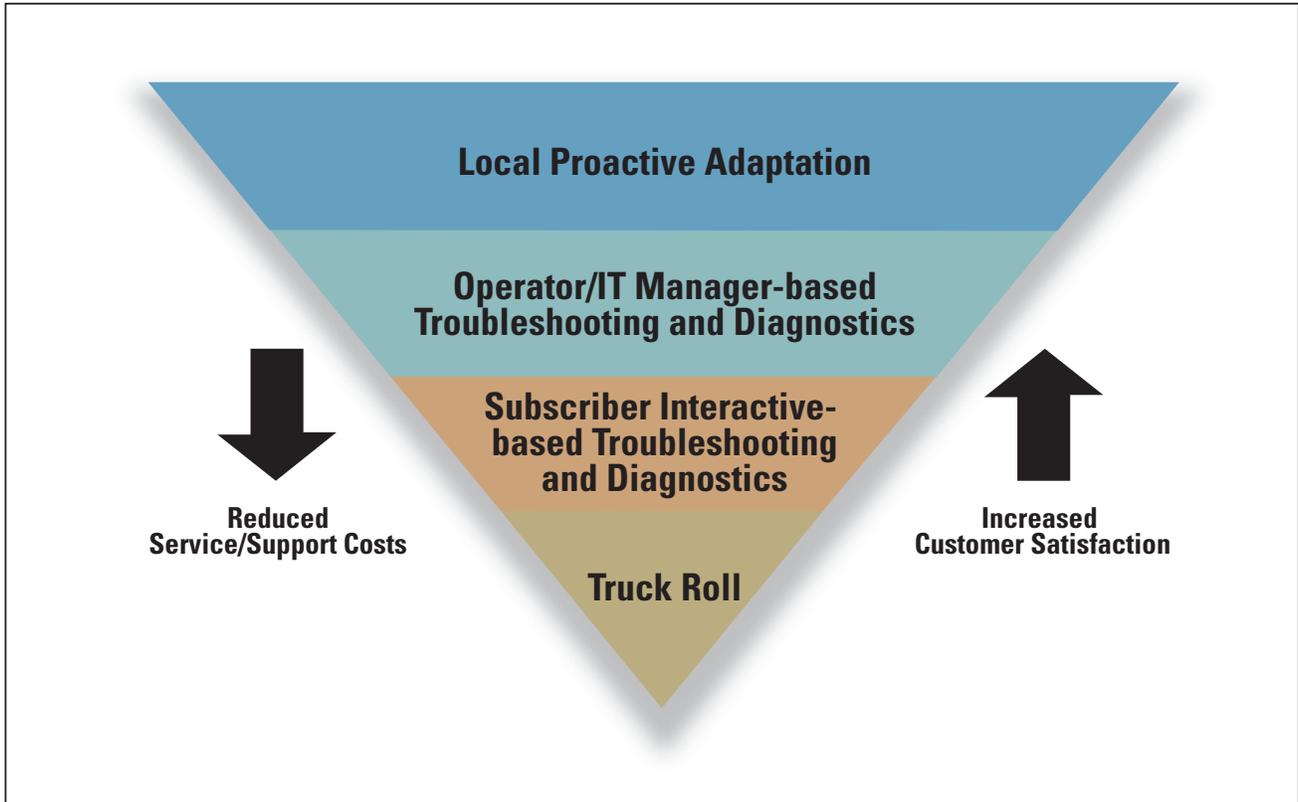
- Management and control of quality of service (QoS) on IP networks
- Proactive service impairment remediation
- Real-time diagnostics based on information measured throughout IP networks
- Gathered data can drive analytical tools as well as management and reporting systems

configuration, monitoring and repair tasks in the diverse, widely distributed and autonomous operating structures that make up IP networks.

PIQUA technology gives service providers and IT administrators unprecedented visibility into the ongoing operations of their IP networks. Moreover, this data can be instantaneously interpreted by statistical analysis that mimic the subjective human perceptions that ultimately determine the quality of the service on an IP network. PIQUA technology can gather and compile operational data related to a wide variety of network and line impairments including jitter, delay, dropped packets, echo, signal loss and dropouts, background noise, signal attenuation/gain changes, level clipping and others.

Undoubtedly applications and services on IP networks will continue to become richer and more comprehensive in terms of their multimedia information. And many new applications such as video-on-demand, IPTV and others will have stringent real-time QoS requirements. Any sort of network impairment will have serious repercussions for these applications, diminish-

## ***IP Services Quality Management Service Model***



ing the compelling nature of the user experience, stunting the marketplace's initial adoption of next-generation IP services and increasing churn in the user base. TI's PIQUA technology is well positioned to ensure the high user satisfaction that is needed to retain users who subscribe to new services and, at the same time, to create the viral marketing buzz that is essential for attracting new subscribers to multimedia-rich services.

### ***Monitoring and Gathering Data***

Central to PIQUA technology, the PIQUA System Agent (PSA) is a software module for invoking diagnostic tools, and collecting measurements and statistics. Information gathered by the PSA can be provided to management clients that are either internal or external to

the PIQUA-based system, including third-party diagnostic or management applications.

Tools that can be invoked by the PSA include packet traces, bit error rate calculations, diagnostic loop backs, call and error statistics, echo cancellation modes, time stamps, action-oriented triggers and others. PIQUA technology also includes an intuitive application programming interface (API) that simplifies and accelerates implementing an IP-based quality management system.

### ***VoIP: An Example of PIQUA Functionality***

Because of the rapid deployment of VoIP applications and service offerings, PIQUA technology is already being implemented in these types of applications. Valuable insight has been gained and will be

transferred to other applications such as IP video, IPTV and Internet-based music services.

For example, in VoIP applications PIQUA technology is often able to quickly isolate the root cause of voice quality problems such as intermittent and random echo conditions. In the past, correcting this type of echo problem on a voice channel could take weeks or even months, usually leading to heightened user dissatisfaction and increased churn in the subscriber base. With TI's PIQUA technology, statistical thresholds can trigger the automatic gathering of information that is needed to diagnose and correct the echo problem. With this information, a PIQUA-based management system can correlate calling patterns to echo conditions and trigger pulse code modulation (PCM)

and packet trace captures at CPE systems – all without dispatching a technician to a user’s site. With the information generated and collected by PIQUA technology, the network’s operational management system will be able to quickly determine the cause of the echo problem and recommend the most effective corrective measures.

**The PIQUA Community**

PIQUA technology by itself does not constitute a management system. A community of developers is emerging who can tap into the pervasive power of PIQUA technology as well as its standard interfaces to create comprehensive management solutions for IP services. For example, hardware manufacturers (OEMs and ODMs) take TI’s reference designs and build them into market-ready products for network operators and retailers. Manufacturers that already have their own network management offering can quickly

tap into PIQUA’s standard interfaces to extract the critical performance information required of their systems.

In some cases, manufacturers write their own software to interact with PIQUA’s APIs or its standard interfaces such as RTCPXR, Syslog, SIP Notify, RTSP and TR-069. Proprietary extensions to these standard interfaces tap into the full suite of PIQUA measures. By interfacing to PIQUA technology, manufacturers can leverage a single development effort and still interoperate with multiple network management systems (NMSs). As a result, equipment manufacturers are “RFP ready” when operators call.

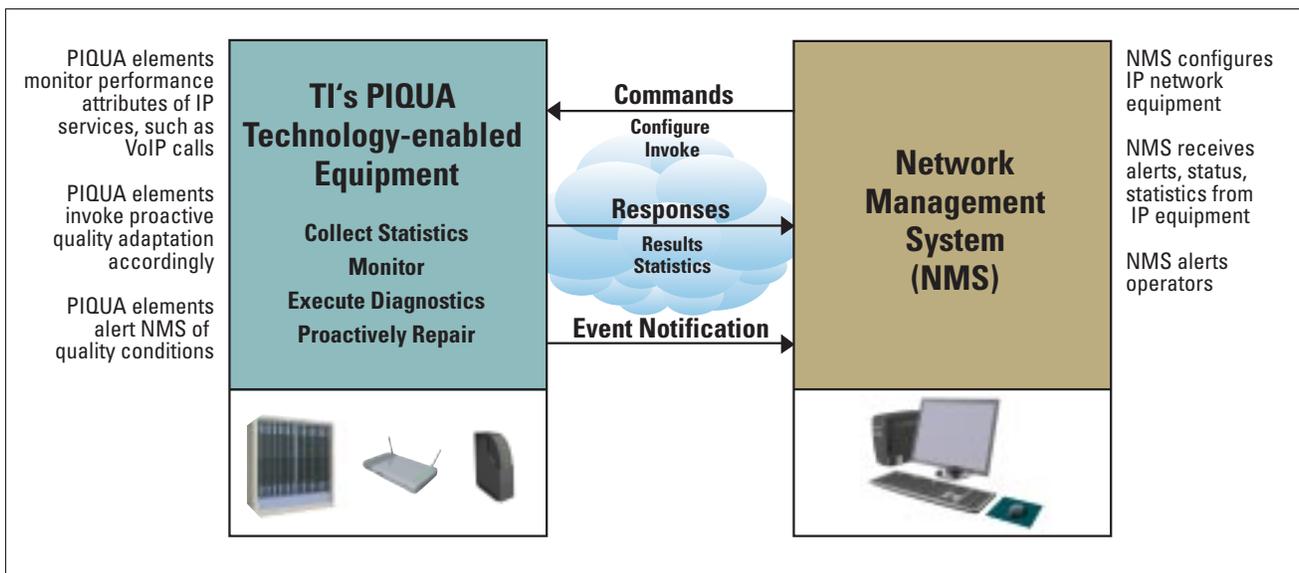
Vendors of third-party NMSs also play a role in the PIQUA development community. These systems can extract information from PIQUA’s APIs and standard interfaces, so that PIQUA-enabled CPE and infrastructure equipment can report to the NMS in the same fashion that proprietary probes would. NMS

vendors are able to offer operators comprehensive measurement and reporting capabilities that combine their own probe-based measures with PIQUA’s embedded measures. As a result, NMS vendors can concentrate on developing the management tools and reporting mechanisms that operators use to evaluate NMSs. By interfacing directly to PIQUA, an NMS will likely interface seamlessly to end equipment from several suppliers and the NMS vendor will not have to undertake major development efforts to support each equipment supplier. In fact, service operators prefer this approach because it gives them several equipment suppliers to choose from.

**For More Information**

For more information on TI’s PIQUA quality management technology, please visit [www.ti.com/PIQUA](http://www.ti.com/PIQUA), or contact your local TI representative.

**TI’s PIQUA Technology Embedded in Equipment Working with NMS Partners**



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