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## **Making XoIP Deliver QoE: Customer & Service Awareness is Key**

by Eileen Haggerty, NetScout Systems

### **Introduction**

We see it everywhere - people are surfing the web on their laptops over lattes in coffee shops and participating in web-based demos over business lunches in restaurants; doctors and nurses are using advanced PDA devices in hospitals and clinics to review patient EKGs and drug interactions; airports are filled with travelers using their mobile phones and BlackBerries for talking, sending photos, or checking emails; and the virtual office is really here with employees on computers in home offices participating in live video conferences with their corporate headquarters. These are just a few examples of how individual subscribers, enterprise businesses, and government agencies are all driving demand for XoIP services. Be it personal interest, recreational / entertainment pursuits, or strictly business, the opportunity for capturing revenue with the growth in demand for IP-based services is increasing steadily. However, the opportunity brings with it challenges never before encountered when it comes to a quality end-user experience.

### **Opportunities and Challenges**

The opportunity for service providers is to offer competitively designed and priced services to capture subscribers, network access, and IP service delivery for as many of these uses as possible. Once upon a time, it was easy to identify the different operators for different services, such as fixed wire voice, fixed wire data, cable, and mobile services. Today, the lines have blurred due to mergers, acquisitions, and partnerships, new business models like VNOs, as well as newly developed and deployed network architectures like IMS. Any provider interested in sustained growth must embrace this chance to attract new customers by offering combinations of these services. The challenge faced by these providers is subscribers' expectations - that is they expect a high-quality service experience regardless of the access method or which service is in play.

Think about your own personal experiences with IP-based services over the last five years - would you say your tolerance for the quality of delivery for your cellular

phone service has evolved over time? Perhaps five years ago you tolerated a slow dial-up connection from home for accessing personal email, but today do you become frustrated if you have slow internet access over your broadband or if your WiFi connection at Starbucks keeps dropping? This change in expected QoE levels has created an even greater challenge for providers now wanting to deliver XoIP services across any number of fixed line broadband, wireless, cable, and/or metro Ethernet access methods. As operators move into each of these new areas of IP service delivery, they will face what wireless providers contend with daily -- subscriber loyalty, or lack thereof, and the subsequent ever-present threat of customer churn.

### Service Assurance

The answer to avoiding churn is to maintain the balance between service mix, price, and customer experience. The IP revolution has certainly brightened the future for service mix flexibility, and price is driven by market conditions. The greatest remaining challenge lies in understanding and managing service quality and customer experience. New strategies for customer-centric service assurance are required to address this formidable challenge. Regardless of the access technology deployed, providers must be able to monitor, track, and trend network and service performance.

You've probably heard the adage "you can't manage what you can't measure," and in the case of IP, being able to measure starts with establishing direct visibility into the IP service delivery fabric to understand the activity and behavior of each customer's service usage. Further, that visibility needs to be available in real-time so that customer care inquiries can be addressed without delay and, better yet, service-affecting issues can be anticipated and corrected before subscribers start complaining. Device management and signaling management have a long-standing history in service provider networks, however the actual service flows of subscriber activity are not revealed with either of these tool sets. Monitoring and analysis of the metrics and KPIs, subscriber service flows and conversations, including easy access to the packet streams that comprise the services delivered, is the missing link.



Performance monitoring solutions that leverage packet inspection technology are available and deliver real-time operational intelligence spanning from high level application and conversation flow information all the way down to a reservoir of the actual packet flows. Depending on the type of network, there are a number of critical network segments where strategically deployed instrumentation will provide essential visibility. Fixed line operators with IP MPLS or metro Ethernet networks will find they need to instrument critical OC-12/OC-48 POS, Gigabit Ethernet, or 10 Gigabit Ethernet segments across the backbone. Mobile operators with GSM/UMTS or CDMA2000 may find they need to instrument Gn or A10/A11 interfaces, Gi or Pi interfaces, interfaces to roaming partners, or ATM / MPLS VRF segments in the backbone to achieve visibility.

With instrumentation in place, service providers can use the information for evaluating the performance of AAA services, VoIP calls, internet services, and even networking activities that are often unknown to subscribers but affect their quality of experience (QoE), such as DNS or DHCP. Visibility into the KPIs, service flows, and packets enables service providers to reduce MTTR and improve network and service assurance with advanced customer/service-aware performance monitoring. The following examples illustrate the importance of visibility.

#### AAA Services

AAA (authentication, authorization and accounting) systems in service provider IP-based networks control what resources individual customers or subscribers have access to while simultaneously maintaining their activity over the network for billing purposes. If the AAA system, such as RADIUS or TACACS, is not performing as required, subscribers may not be able to gain access to services and the result will often be a direct loss of revenue or at least a loss of subscriber confidence.

A performance monitoring solution can gather and analyze the efficiency and behavior of AAA services and provide refined graphs, reports, and tables that can be used for troubleshooting degradations, traffic engineering, and/or capacity planning purposes. The analysis of the AAA traffic flows can reveal:

- Total AAA traffic volume in bytes or packets in real-time and over time to pinpoint peak activity times of the day
- Utilization for specific AAA servers to verify and validate load balancing is performing as designed
- Response times for specific services with proactive alarms to alert when expected performance levels are degrading

## Internet Services

Web-based services (SOA applications) have become increasingly more popular for enterprises to develop and host for customers, partners, and employees. Internet-based services for downloading content, whether it be the latest YouTube phenomena, requests for stock trades, streaming Internet radio, or streaming sporting events, has created a unique set of opportunities and challenges for service providers. Poor QoE of internet services for subscribers can be an immediate and primary cause of customer churn. From a service assurance perspective, the internet has a substantial volume of conversation traffic that represents high value services to an operator, making it an essential area of the network to establish performance monitoring and visibility.

Strategically deployed, passive instrumentation on internet access links provides an ideal vantage point to monitor for metrics and KPIs, service flows, and packets for gathering statistics and then analyzing them. Detailed performance views via refined graphs, reports, and tables can be utilized to reduce overall MTTR associated with troubleshooting, traffic engineering, and/or capacity planning for these critical, value-added service links. The analysis of internet services will reveal:

- Total Internet traffic volume by customer in real-time and over time to identify busiest sites and areas of the network
- Utilization of different subscriber services and content types, such as streaming voice and audio media, VoIP, web browsing, or email to validate prioritization and routing decisions
- Hosts, conversations, and response times for specific URLs to troubleshoot HTTP errors

## IP MPLS Core Bearer Network

Many telecommunications providers have introduced MPLS-based VPN service offerings to satisfy increasing demands for secure, cost-effective transport of converged voice and application traffic to high-value business customers. As enterprises take advantage of newly introduced services that break out delivery for voice and video into high priority classes and tiered choices for their more latency-tolerant business applications, service providers are challenged to meet service quality expectations.

Again, sophisticated performance monitoring solutions that gather and analyze the collected statistics from MPLS-based VPN networks offer essential services visibility in the form of real-time and historical graphs, reports, and tables that can be used for troubleshooting, traffic engineering, and/or capacity planning purposes. The analysis of traffic flows over MPLS core bearer networks will reveal:

- Services-aware analysis of utilization and traffic volume across the MPLS core
- Traffic-flow and response times between individual customers and locations by services such as voice, data, and internet services to troubleshoot problems with valuable new Triple Play offerings

- In-depth, packet-level details of an individual customer's activity to analyze and discover the root cause of degradations
- Bandwidth and services utilization of circuits highlighting individual VRFs to recognize changes in bandwidth or new QoS traffic prioritization schemes that may be needed to accommodate "power user" customers or locations.

It is easy to see the opportunity to increase market share and revenue from fast-rising demand for XoIP services for providers around the world. Reducing customer churn will be the challenge regardless of which technologies are deployed. Having the appropriate visibility into the services delivered, the customers using them, and the network infrastructure delivering them will be an essential part of a successful service delivery strategy. Service providers that embrace customer experience by moving beyond traditional infrastructure-centric approximations of service delivery will be in the best position to retain customers and assure their portion of success within the XoIP services market.