

Global Assurance for GSM/UMTS Networks

As the most common worldwide standard for mobile services, GSM/UMTS networks are at the heart of how people around the globe communicate. Long the basis for digital voice services, GSM has been extended via GPRS and UMTS to allow the same providers to offer non-voice services, such as text messaging, internet browsing, and multimedia images and video. Operators offering these combined voice and high speed data services are facing great opportunities as the popularity of these services grow, however they also face significant challenges in assuring that their networks, services and customer experience quality don't suffer as adoption expands.

Business Challenges for Mobile Operators

Today's mobile service providers operate in a very competitive environment. Despite fickle customers and a rapid pace of changing technology, they must continue to attract and retain customers to maintain revenue growth. Hurdles they constantly must overcome include:

- Attracting new customers
- Reducing customer churn/improving customer retention and loyalty despite the ease of changing providers via number portability
- Creating/defining/promoting differentiation from competitive operators
- Developing new and innovative services at a competitive price
- Maintaining customer service quality and equality throughout mergers and acquisitions

Back office OA&M activities are also a critical component to improving customer retention. Reliable performance by call center applications, CRM, self-service portals, and timely and accurate billing systems are all important factors in the customer satisfaction equation.

GSM/UMTS Network Challenges

The 3GSM / UMTS / UTRAN networks deployed in support of mobile services represent a substantial investment in infrastructure equipment, real-estate, and manpower, so it is no surprise that operators want to ensure that ROI is as strong as possible, the capacity supports the business growth, and the service coverage meets user demand. Other network operations challenges include:

- Traffic Engineering throughout ongoing infrastructure rollout and refresh processes
- Troubleshooting problems affecting service quality or availability, such as intermittent congestion problems on high volume segments, excessive dropped calls, or inability to activate a message waiting icon on handsets
- Trending the demand in services such as ring tone downloads versus IP voice call volume versus demand for internet access, and recognizing impact on the underlying network transporting them

Geography also plays an aggravating role, as operators attempt to support networks that span a single country or may cover multiple countries and continents as well as supporting connectivity to roaming partners. It is no small endeavor to successfully assure services within the resulting network architectures.

Network Considerations

In the GSM/UMTS core, voice, video, and data traffic will traverse within and across the multiple data centers that make up the mobile providers' network. Services will be accessed from many different terminal types, such as cell phones, personal computers, PDAs (personal digital assistants), as well as from various locations including their homes, offices, and an ever increasing number of wireless enabled restaurants, cafes, hotels and public buildings via cell towers and public internet. (See figure 1.) It is critical to have visibility into the services and the network that is carrying those services. Most importantly, visibility is required within the data center and on the network links that inter-connect them.

nGenius Solutions meet the needs for GSM/UMTS Service Assurance

The hypothetical GSM/UMTS network shown in Figure 1 shows several key types of links where traffic passes through and each one has its own role and set of challenges when it comes to network, service, and customer assurance. The nGenius Performance Management Solution leverages packet inspection technology to deliver real-time operational intelligence spanning from high level application and conversation flow information all the way down to actual packets, enabling service providers to reduce MTTR and improve network and service assurance with advanced, customer/service-aware performance monitoring.

Gn Interface Service Assurance

From a service assurance perspective, the Gn interfaces between multiple SGSNs or between an SGSN and a GGSN node represent critical points for establishing performance visibility. Individual subscriber service packets are transported between nodes in GTP tunnels across these links, putting them directly in the delivery path for all IP-based services.

nGenius Probes and nGenius AFMONs passively and non-intrusively tapping the physical link between the SGSN and GGSN nodes provide an ideal means of network and service performance monitoring. nGenius Performance Manager gathers and analyzes the statistics collected by the nGenius Probes and AFMONs to provide real-time and historical performance information that can be used for troubleshooting, traffic engineering, and/or capacity planning purposes. The nGenius Solution provides complete visibility, from KPIs to flow data to packet details, into service metrics and statistical information gathered from monitoring the Gn interface.

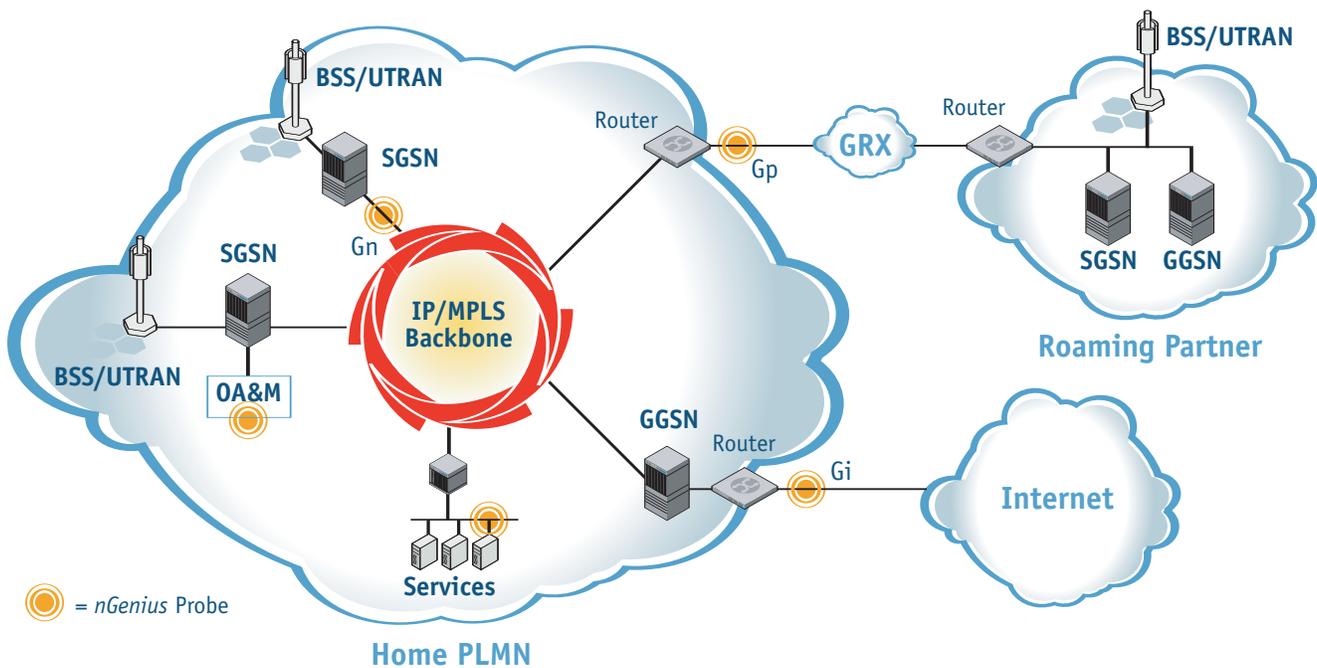


Figure 1. A typical GSM/UMTS network deployment for mobile operations will have base stations, edge routers, access to the public switched telephone network for land line call completion and access to the mobile operator core for completing other cell based calls and delivery of IP-based data services. Shown here are key points where NetScout's *nGenius* Probe and *nGenius* AFMon instrumentation are placed to provide operations performance intelligence.

In addition to providing visibility into all the services flows and conversations and all the packets on the Gn interface, the *nGenius* Probes and AFMons provide specific KPIs focused on particular critical monitored information, such as all the GTP tunnels created between the SGSN and GGSN nodes. These KPIs include such measures as responsiveness, errors, and the number of successful transactions. *nGenius* Probes and AFMons are also able to track high-value customer service flows based on MSISDN or IMSI numbers.

Gi Interface Service Assurance

With mobile offerings supporting Internet based services becoming more and more popular, requests for stock prices, news updates, and sports scores will be transported from the GGSN node over a Gi inter-

face to the internet site requested and back again to the subscriber. From a service assurance perspective, the Gi interfaces from the GGSN node to the internet has a substantial volume of conversation traffic that represents high value services to a mobile operator which makes it an essential place to establish performance monitoring and visibility.

nGenius Probes and *nGenius* AFMons passively and non-intrusively tapping the GGSN's outbound Gi interface link provide an ideal means for monitoring network and service performance. *nGenius* Performance Manager gathers and analyzes the statistics collected by the *nGenius* Probes and AFMons and provides real-time and historical performance information that can be used for troubleshooting, traffic engineering, and/or capacity planning purposes. It provides complete visibility, from KPIs to flow data to packet details, into the service activity and statistical information gathered from monitoring internet access traffic.

In addition to providing visibility into all the services flows and conversations and all the packets on the Gi interface, the *nGenius* Probes and AFMons provide deeper, more detailed information, such as internet web-browsing including URLs of sites visited, e-mail traffic, as well as all conversations across the internet interface. KPIs include such measures as responsiveness, errors, and the number of successful transactions. *nGenius* Probes and AFMons are also able to track high-value internet activity such as for movie clip or music downloads on a URL and/or subscriber basis.

Gp Interface Service Assurance

Subscribers are often outside the service area for their operator and move into a "roaming" mode of operation. In these cases, subscriber services are facilitated by partners. The Gp interface in the GSM/UMTS network is an IP Based interface between GGSN nodes across the GRX network which facilitates roaming services. Typically GTP tunneling is employed on this interface.

nGenius Probes and *nGenius* AFMons passively and non-intrusively tap the physical Gp interface from the GGSN nodes to the roaming partners, providing an excellent means for monitoring network and service performance. *nGenius* Performance Manager gathers and analyzes the statistics collected by the *nGenius* Probes and AFMons and provides real-time and historical performance information that can be used for troubleshooting, traffic engineering, and/or capacity plan-

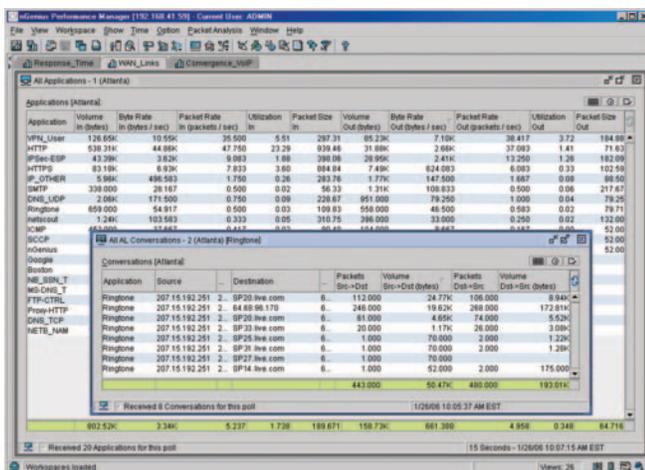


Figure 2. The *nGenius* Solution can provide a break down of services and applications being monitored, as well as a drill down to the response time for valuable subscriber services (ring tone downloads, in this example).

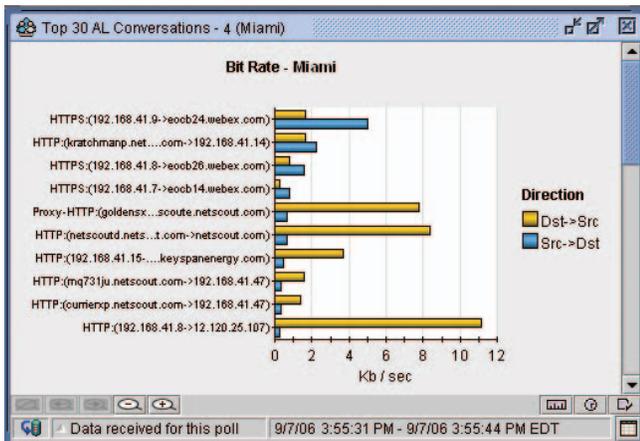


Figure 3. The *nGenius* Solution can identify and present active conversations from the GGSN node over the Gi interface to the Internet to be used in troubleshooting problems in real time.

ning purposes. The *nGenius* Solution provides complete visibility, spanning KPI to flow data to packet details into the service activity and traffic statistics gathered from monitoring the roaming partner interface.

In addition to providing visibility into all the services flows and conversations and all the packets on the Gp interface, the *nGenius* Probes and AFMONs provide specific KPIs focused on particular critical monitored information, such as all the GTP tunnels created from the GGSN nodes to the requested roaming partner and back again to the subscriber. These KPIs included such measures as responsiveness, errors, and the number of successful transactions. Given the revenue importance of roaming traffic, the *nGenius* Probes and AFMONs provide an excellent mechanism to assure performance of conversation flows and delivering visibility based on MSISDN or IMSI.

IP/MPLS Core Bearer Network Service Assurance

High volumes of voice and data traffic are transported across the IP/MPLS Core Bearer Network of a GSM/UMTS infrastructure and as a result needs to be monitored for service assurance purposes. However, it isn't the physical plumbing that often needs to be monitored -- it is the traffic flowing across pre-designed virtual route forwarding (VRF) paths. Many mobile service providers establish unique VRFs for each service (i.e. voice, video, SMS, push to talk), while others use VRFs to segment out high profile business customer accounts, or even their own internal traffic when that traffic is sharing a common transport backbone.

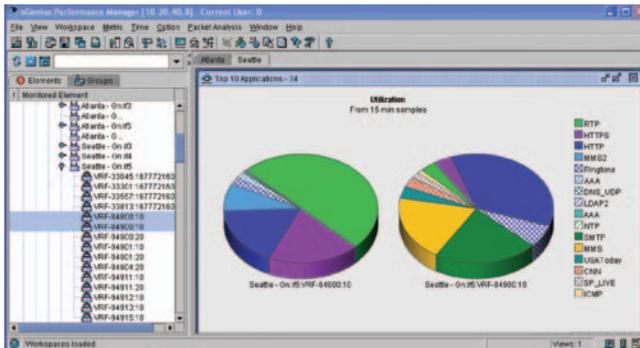


Figure 4. The *nGenius* Performance Manager can provide KPIs to flows to packet information on VRFs individually or allows you to compare two or more VRFs at the same time.

The *nGenius* Probes have an innovative, dynamic routing-aware approach to identify VRFs for tracking services or customer traffic groups as they utilize the IP/MPLS core bearer network. Once the VRF virtual interfaces are defined in *nGenius* Performance Manager, it provides complete visibility into all the services activity and traffic statistics gathered from monitoring the core network.

Triple Play Services, for example, are extremely important to mobile operators from a revenue perspective and network service degradations can impact customer satisfaction, loyalty and lead to churn. The *nGenius* Solution can monitor and track all the voice (e.g.: RTP voice, SIP, H.323), video (e.g.: RTP video), as well as data (e.g.: HTTP, e-mail) services and conversations associated with Triple Play offerings and delivered across an IP/MPLS core network.

Further, real-time monitoring and historical analysis of these services can be supported regardless of the particular topology architecture of the core network. The *nGenius* Solution can be flexibly deployed in IP/MPLS with VRFs as described or in ATM, POS, Frame Relay and/or Ethernet environments. Further, it provides insight into the trunk level activity simultaneously with the associated virtual circuits, such as PVCs and VLANs, as well as any QoS service classes configured to deliver services using multi-tiered prioritization.

Case In Point

A leading Pan-African mobile operator deployed NetScout's *nGenius*® Performance Management System to gain real-time visibility into the traffic and performance of services and applications traversing its MPLS-based core network as part of a strategy to deliver market-leading service quality. This provider had made the move to an MPLS-based core to eliminate redundant networks, but a new challenge emerged – how to gain visibility into customer and user traffic per VRF, by service or application, which was obscured due to the shared MPLS infrastructure.

Once the *nGenius* Performance Management System was deployed, the network operations staff gained comprehensive application-layer visibility within all MPLS VRFs in real-time as well as post-event forensic analysis using extended packet recording. They realized immediate benefits from the *nGenius* Solution's operational intelligence by being able to pinpoint service degradations for reducing mean time to restore, report on network and applications trends for reality-based capacity planning, and identify subscribers and traffic types for ensuring proper network usage.

nGENIUS®

The nGenius Performance Management System

The nGenius Solution addresses the complex requirements of network and application performance management in today's converged, virtualized environment and is comprised of:

- **nGenius Performance Manager:** Software that analyzes the information collected by nGenius Probes, Collectors, Application Fabric Monitors, and other intelligent network devices and delivers integrated network and service monitoring, troubleshooting, capacity planning, and reporting in a single product.
- **nGenius Probes:** Dedicated hardware monitoring devices that passively identify, collect, and analyze service traffic data across the enterprise.
- **nGenius Collectors:** Dedicated hardware devices that collect application conversation data via NetFlow records and service level information from IP SLA tests.
- **nGenius Application Fabric Monitors:** Appliances that combine nGenius Flow Recorder and nGenius Probe functionality for high performance, high reliability, high capacity recording and infrastructure monitoring.
- **nGenius Analytics:** Appliance-based software that delivers automated, proactive early detection and diagnosis of network and service performance anomalies.



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