Enhancing Service Centric Operations with Service Quality Management

Delivering Customer Specific Wireless Services for Higher Profits

This overview addresses:

- Service Operations Requirements
  - Managing service quality for next generation enterprise and consumer mobile services
  - Manage QoS in complex multi-technology, multi-partner network environments
- Lucent's VitalSQM™ solution enabling wireless providers to
  - Achieve business and operational objectives through
    - Flexible modeling and end to end monitoring of service quality from customers' perspective
    - Real-time service mapping and mediation to support large-scale networks and service deployments
    - Pro-active identification, isolation, and drill-down to root cause in case of service degradation and operational problems
  - Adopt new technologies and offer new services quickly and easily through flexible integration points and tool kits
  - Simplify operations management with "at-a-glance" view of service quality and provide decision makers the information they need
- Demonstrable business value and benefits of the *VitalSQM*™ solution in increasing customer loyalty, reducing operating costs, and opening up profitable new revenue opportunities

Lucent Technologies
Bell Labs Innovations



Introduction

In today's competitive environment, wireless providers are offering mobile value-added services with differentiated service level guarantees and monitored with internal service level objectives. The critical success factor for generating new margin-rich revenue streams and growing the customer base for these next-generation services will depend on the ability to deliver on these service level commitments.

Service Quality Management (SQM) relies on the ability to automate the process of measuring and reporting on service level agreements (SLAs) and Service Level Objectives (SLOs). SLOs are internally focused business, operational, and network-oriented measurement targets such as MTTR, activation cycle time and application latency. By measuring and monitoring service and business conditions on a per-customer, per-service basis, wireless carriers can ensure compliance with SLAs and exceed customer expectations on service quality.

With an SQM system, a wireless provider can manage its services to achieve best-in-class service level in their mobile voice and data services, and generate more revenue through increase in usage and improvement in customer satisfaction. This will help significantly increase ARPU and avoid loss of customers, whether they are enterprises or consumers in the retail market. Therefore, carriers can increase market share in the fast-growing mobile services segments such as corporate high-speed data, SMS, MMS, etc.

VitalSQM™ brings significant benefits to mobile service providers by reducing customer churn, avoiding SLA penalties, and providing the ability to charge premiums for service level guarantees. The VitalSQM™ product is built on the latest standards for interfaces to other OSSs, and requirements associated with SQM. Lucent also actively participates in standards bodies such as TMF[1] and other industry forums, to help drive implementation of the standards in the Enterprise and Service Provider networks.

Mobile Service Operations Requirements

Service delivery is becoming increasingly complex while customers (large and small enterprises) want simplicity. New value-added services necessitate the use of next-generation technologies such as 25G/3G-based mobile high-speed data, IP/MPLS, etc. - where sessions and services are dynamically set up on request. Moreover, to complete the supply chain for these services, wireless service providers will need to partner with other carriers and content providers and integrate services that they offer (video clips, ring tones, games, etc). The service provider would therefore need to factor in the effectiveness of this supply chain while committing to service quality levels for the end customer.

Even though new technologies are the key enabler of value-added services, the complexity arises when service providers need to deliver on service quality guarantees while ensuring that the intelligent network is optimally utilized.

[1] **The TeleManagement Forum (TMF) offers the following definition of SQM:** SQM lies within the service management layer (of the telecom operations map) and has the ultimate responsibility to ensure that service quality does not fall below the contracted level. A subset of the SQM role covers monitoring the quality of a service, initiating corrective actions when the service quality falls below an acceptable level and initiating preventative actions when the service quality risks falling below an acceptable level. TMF also described customer Quality of Service (QoS) and Service Level Agreement (SLA) management processes for monitoring service level contracts, and as articulated through their Enhanced Telecom Operation Map (eTOM) model (TMF GB921, June 2002), service Management and Operations processes through which a service provider can get a service level view of the network for day-to-day operations

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To do this successfully, the service provider must understand service usage and service quality trends on its network, proactively detect abnormalities in service delivery that impact specific customer experience, and identify opportunities for additional revenue through better utilization of network resources.

Many OSS tools deployed today provide network-element oriented views; the trouble-shooting efforts tend to be network focused, domain-by-domain, and network element by network element. Using such fragmented views, a few operations experts use heuristics and their experience to perform end-customer impact analysis.

In order to proactively monitor service quality and detect/rectify abnormalities, it is necessary to collect data from a variety of sources across the service delivery chain (multiple network elements, domains, technologies and vendors), compute service quality trends, intelligently analyze service quality alerts and provide a service-oriented view for subsequent troubleshooting.

This is essentially the promise and challenge of Service Quality Management. The next several sections detail some of the key requirements for implementing an SQM solution.

Flexibly model services from the perspectives of a service-intelligent edge and end-user experiences

A logical representation that hides the complexities of the underlying network and provides a simplified customer/service oriented view is necessary for management purposes. However the quality of these services will be influenced by the underlying service components. Services can be modeled at the network edge and categorized into either *'customer- oriented'*, if they can be represented on a per-customer basis, or *'network-oriented'*, if they are aggregated into network representations by region, PoP, base station, etc. These services can be represented as either data sessions/calls of a customer or group of customers—'*session-oriented'* services, or fixed '*permanent*' connections between offices of corporate entities.

New generation services such as mobile high-speed data with IP-VPN access are often delivered over multi-layered transport networks that can be represented by '*network/transport-oriented'* service models. The underlining hierarchies associated with such services can be mapped with defined relationships and represented as '*tiered services'*. With such modeling and mapping in place, service quality problems in the core should "bubble-up" on the service views at the edge, thus helping the operator quickly identify service quality degradation as it pertains to a customer.

Consume large amount of data from a variety of data sources to provide real-time views of QoS over complex networks

Given the diverse network points that determine service quality, plus the variety and richness of network and service information, it is critical that the SQM system is extremely scalable and can rapidly interface to new data sources, network elements, Element Management Systems, Network Management Systems, and other business and operations management applications in complex network environments. To accurately measure and ensure service levels delivered over complex network environments, the SQM system must be able to collect and consume a great deal of network, services, and operations data, and provide operator with a near real-time view of the multi-layered network, discrete services, and a variety of operation metrics associated with the network, services, and customers.

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Map mobile services to KQIs & KPIs in real-time and alert on service events intelligently

To ensure service quality on a 24/7 basis , wireless operators need to monitor service instances and map them to the service models and the associated Key Performance Indicators (KPIs), all in real-time. To perform such real-time mapping and extensive computation, the SQM system must be capable of processing thousands of records per second.

Given the sheer number of measurements and potentially large number of service elements, plus the fact that the usage of a service could vary greatly on a time-of-day and day-of-week basis, it is difficult and cumbersome for operators to identify, calculate, or even estimate what the right threshold levels should be for each of the parameters being monitored. The SQM system needs to provide an intelligent service level thresholding mechanism that utilizes historical traffic and usage patterns to generate events based on network abnormalities against these historical norms.

Prioritize service impacting problems and drill down using a user-friendly GUI to isolate root cause

The SQM system should be able to help prioritize performance problems based on service impacts and take preventive measures to resolve them before they cause SLA violations. Beginning with a Key Quality Indicator (KQI), the operators should be able to identify the out-of-range KPIs, drill down to the associated data source, and associate them with topology information to generate a snapshot of all network entities (i.e., in-service virtual network view) that support the service. The relevant KPIs for those network entities can then be examined to localize the problem.

The Lucent VitalSQM™ Solution

VitalSQM™ leverages Lucent Technologies industry-proven OSS software to deliver a comprehensive set of functionality in service modeling, mediation, service mapping, intelligent thresholding and service & customer impact analysis. It provides a multi-tiered, service-oriented, and customer-focused view of the network, enables real-time identification of service quality issues, and proactively ensures successful delivery of services to key customers. This helps service providers detect abnormalities in the delivery of services, reduce operations costs by prioritizing on key customer services and identifying opportunities for better utilization of resources, and ensure consistent quality of the end-user experience.

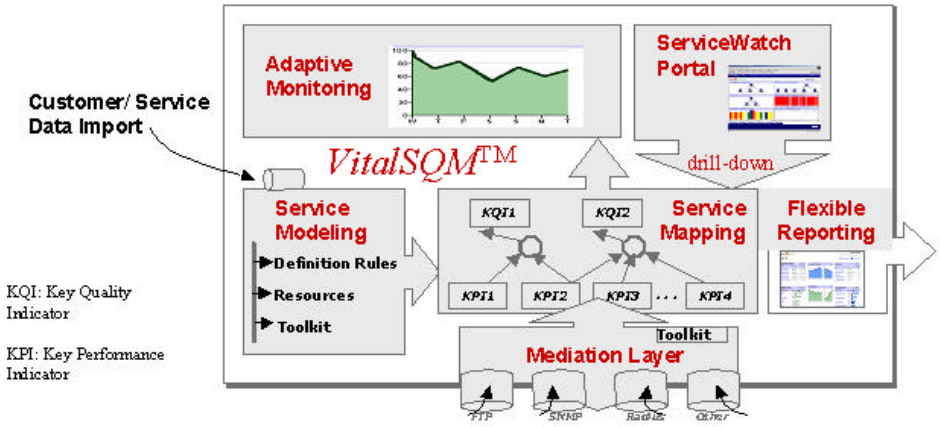

Figure 1: Lucent Service Quality Management Solution

The following sections highlight the key capabilities of VitalSQM™.

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Flexible service modeling with customer-centric views

VitalSQM™ provides a customer-centric, tiered service view by capturing the logical relationships between network elements, services at different layers, and customers associated with these services. Figure 2 shows an example of a tiered service model.

With VitalSQM™'s modeling approach and service views that reflect the quality as perceived by end users, service providers can easily define a new service, set quality objectives from a customer perspective, and associate these objectives with measurements of parameters of all the service components that construct the service.

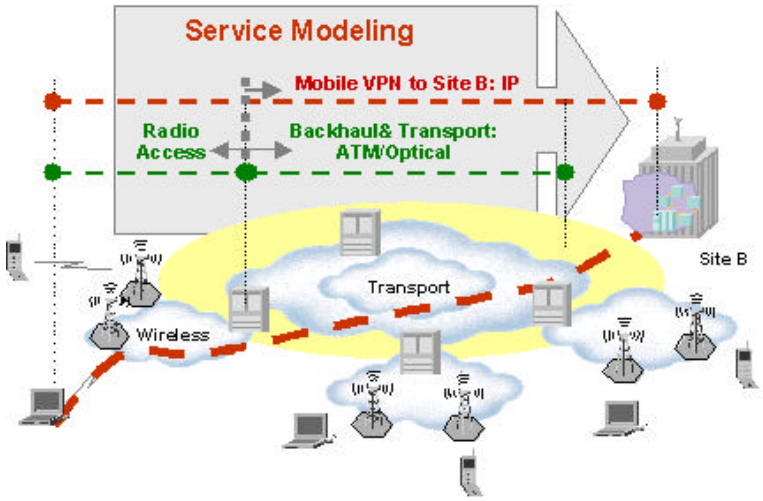

Figure 2: Service Modeling

VitalSQM™ uses standards-based definitions of KPIs and KQIs developed by the TeleManamagement Forum[2]. By using VitalSQM™ to define tiered services, the hierarchical relationships between them, and associated KPIs and KQIs of these services, service providers can identify the root cause of out-of-range KQIs in near real-time, and take actions before they cause major degradations in service quality.

Open and extensible Mediation Layer providing a real-time in-service view of the network

VitalSQM™ provides a flexible mediation layer that enables operators to rapidly incorporate support for new services and technologies. The Mediation Layer provides a rich set of adaptors/mediators that interface to a wide range of data sources and support transport protocols such as FTP (file-based), SNMP, streamed data, etc. These adaptors/mediators can be used to peer with NEs, EMS/NMSs, and OSSs to collect periodic data counts, CDRs/Call-logs, data from probe managers, and operational metrics from other OSSs such as trouble-ticketing systems. In addition, the Mediation Layer discovers network topology and presents a real-time in-service view of the network using a unified, standards-based model.

Real-Time processing with scalable Service Mapping Engine

VitalSQM™'s real-time Service Mapping Engine creates service quality records for services and service instances by consuming and processing the large amounts of data produced by large carrier networks. With VitalSQM™, the stream of KPIs are mapped into service instances and KQIs are computed using a powerful computation engine – all in real-time to represent true service quality at any given instant in time. The VitalSQM™ service-mapping engine is extremely flexible and scalable and allows for real-time processing of thousands of records per second.

[2] TMF GB923, Nov 2002

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Trend-based Thresholding for intelligent identification of potential trouble spots

As VitalSQM™ creates service quality records, the quality indicators are aggregated and compared against pre-defined Service Level Objectives (SLOs) that could be either contractual commitments or operational benchmarks. VitalSQM™ then uses these aggregates to compute the expected trends for the various KQIs.

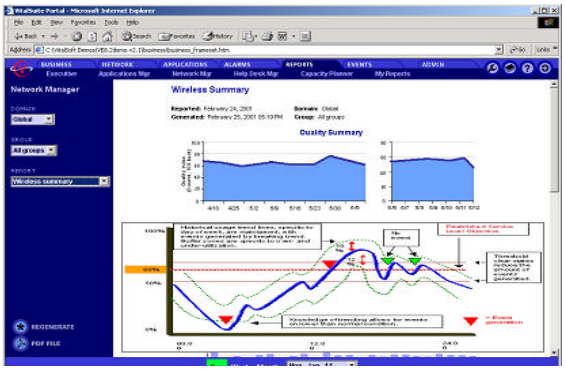

Figure 3: Adaptive Thresholding

The adaptive threshold mechanism brings many advantages over traditional static threshold monitoring by generating alerts only if there are significant deviations from expected service quality. These adaptive thresholds are derived from a historical understanding of traffic and usage patterns, therefore reducing the amount of network events while meeting customer expectations of service quality.

In addition to adaptive thresholds, VitalSQM™ also monitors SLA parameters that represent guarantees in an SLA contract, and uses them as static thresholds to generate SLA violation alerts.

Easy to use operational GUI with "At-A-Glance" view of service quality, and the right information delivered to the decision makers

Once a potential degradation is detected, operators can drill down to individual KPIs and identify network elements or domains contributing to QoS problems via a Graphical User Interface (GUI). Coupled with a tiered view of services, the flexible user-friendly web-based GUI provides a logical representation of services by customer and by region and delivers the information that decision-makers (Figure 4) need right to their desktops, making the monitoring and management of service quality easier and more effective.

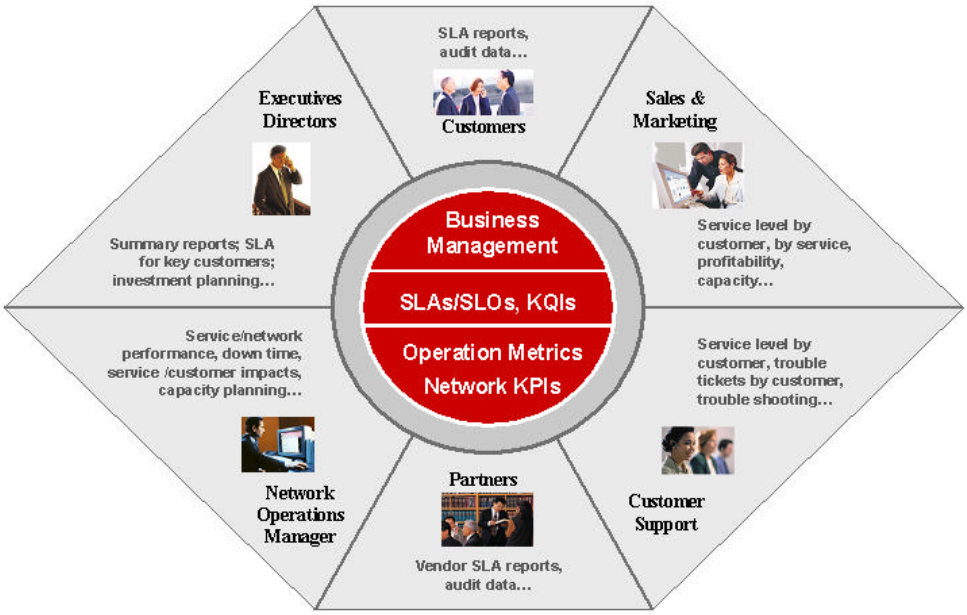

Figure 4: Decision-makers and Information They Need

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VitalSQM™ provides an action list that allows network operators to configure tasks to be executed on detection of a violation. The action list supports standard actions such as forwarding of service alarms to alert management systems and notification of operator groups via email, or other communications. In addition, it allows for the execution of scripts created and customized by operators to meet specific operations' needs.

An SQM Example — Achieving Quality Objectives for Mobile VPNs

Figure 5 illustrates an example of Mobile IP VPN management using VitalSQM™. In this case an out of range KQI is detected—for instance Packet Loss deviates significantly from the customer's service quality expectation pre-set as an adaptive threshold. Operators can use VitalSQM™'s workflows to quickly drill down and isolate the root cause using the topology view, and then take corrective actions before this out of range KQI causes major SLA violations.

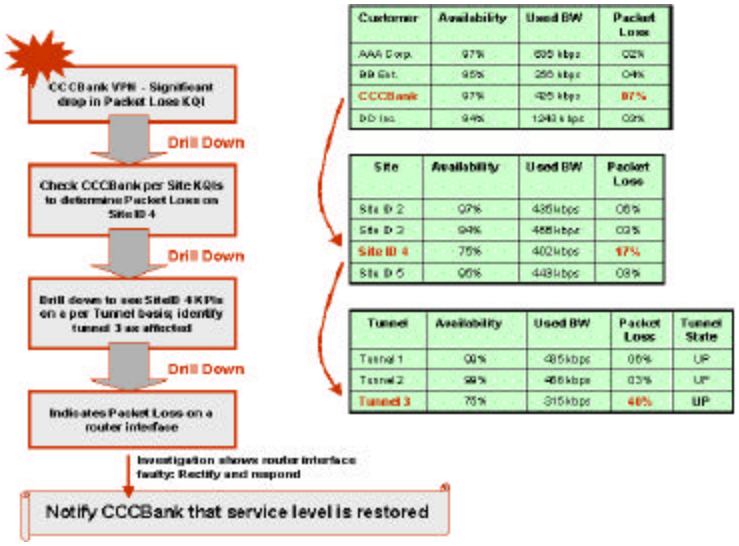

Figure 5: Drill Down to the Root Cause of Quality Problems

Achieve Rapid ROI through Quantifiable Business Benefits

VitalSQM™ delivers quantifiable business benefits that generate rapid Return-on-Investment (ROI). Potential financial benefits can be derived from reduction in customer churn, cost savings—both operational and in customer re-acquisition, avoidance of SLA violations and creation of new revenue streams (see Figure 6).

It is estimated that through a combination of cost savings and incremental revenues, VitalSQM™ provides rapid ROI by yielding ~$15 million annually on a base of 500K subscribers for one or two identified services. Such estimates are based on conservative assumptions and the amount could be much greater depending on scope of deployment.

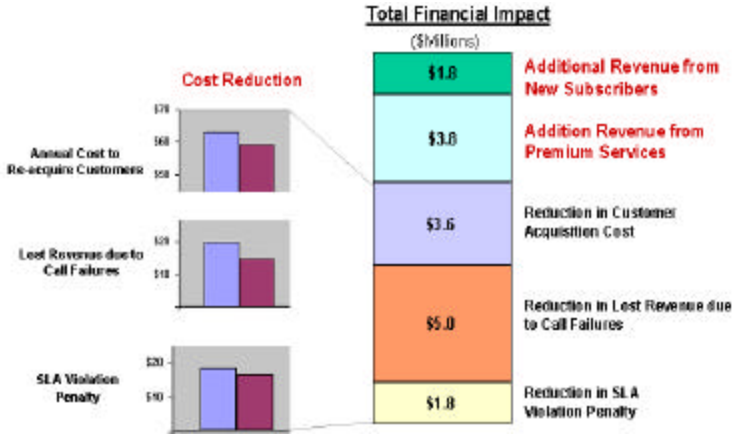

Figure 6: Annual Return on Investment with SQM Solution[3]

[3] ***Key assumptions for the assessment include:***

- IP VPN customer base: 500,000 subscribers, addition of new data subscribers: 0.5% of customer base
- Reduction in customer churn rate with SQM: 3.5% to 3.3% monthly
- Reduction in call failure rate with SQM: 2% to 1.5%
- Reduction in SLA violation penalties with SQM: 10%
- Additional revenue from premium pricing: 5% of revenue

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VitalSQM™ enables service providers to improve management of service level objectives and commitments made to customers for a wide range of mobile services (including voice, high-speed data, SMS and MMS, and other services). It allows network and service managers to monitor QoS in real-time from end-user perspectives. It also allows providers to take preventive action before any service degradation causes SLA violations, thus ensuring that customers, especially high-value customers, always have confidence in the quality of service they receive.

VitalSQM™ Key Functionality

- Model and present a customer-centric view of the network, operational, and business processes.
- Map KPIs to services and compute KQIs.
- Define *Service Level Agreements* to include relevant KPIs, KQIs, and Service Level Objectives.
- Calculate trends to generate expected service quality levels of the KQIs.
- Proactively monitor for deviation from either expected range or user-defined/SLA contracted thresholds.
- View real-time service quality snapshots in addition to providing a logical view of the service hierarchy through a user-friendly operational GUI.
- Advanced reporting and customized reports.
- Drill-down to identify possible source of trouble and isolate the root-cause
- Interface to different applications that currently exist in the service provider environment as data sources.

Lucent Technologies *Navis*® iOperations Software Solutions

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The award winning Lucent *Navis*® iOperations portfolio supports the breadth of Network Management Operations, including Service Provisioning, Service Assurance, Element Management and more. *Navis*® iOperations solutions enable the delivery of advanced services across current and next generation networks -- while improving efficiencies, significantly reducing operating expenses and delivering the Quality of Service that customers demand.

Navis® iOperations Software solutions are supported by Lucent Worldwide Services (LWS), Systems Integrators, and Service Provider partners who provide a comprehensive suite of world-class planning, deployment, operations and maintenance services. For more information, contact your Lucent Technologies sales representative or visit the Lucent Technologies web site at www.lucent.com/oss

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