New real world impact on network management priorities

Managing your network to meet the challenges of today's economy

New—and more realistic—world & new rules require new reflections & new reactions

Exploring the value of an effective network management strategy, this white paper:

- Examines how recent market shifts can ripple through to network management strategy
- Proposes solutions to some of the emerging network management challenges
- Offers techniques to minimize the cost of managing your networks
- Suggests how to find additional revenue sources through skillful management of your networks

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Abstract

As the telecommunications industry grapples with the sobering experiences of the recent past, service providers are carefully reexamining the way they do business. With the bursting of the build-out bubble, service providers are searching for ways to minimize capital expenditures and eke out more proceeds from current assets. Network management has taken on a more critical role in this time of drought, offering the possibility of containing costs and generating incremental revenue. This white paper demonstrates how a judicious network management strategy can help service providers meet business goals, control costs and gain added revenue.

Introduction

Tremendous changes in the telecommunications industry over the past couple of years have profoundly impacted service providers, precipitating significant policy and cultural changes. In North America the growth bubble burst and rippled through to Europe and Asia. Plans for 3G mobile telephone services slowed as providers re-examined their business cases. In the meantime, governments worldwide, convinced that pervasive communications and computing capability is essential to participate in the world economy, continued to liberalize their telecommunications policies.

Turmoil in the telecom industry, indeed the economy as a whole, impacts how service providers conduct their business activities. The "new economy" is dead—long live the old economy. Certain familiar principles of economics have reappeared—cost containment is mandatory; profitability is important; solid business plans are essential. With this return to fundamentals, what are the implications for network management in the service provider environment?

Transition to new real world is painful

The late 1990s saw rapid expansion of the telecom market in North America and Europe, followed by swift liberalization of markets in Asia-Pacific. For example, in North America the philosophy was "build it and they shall come." Although many CLECs were established with the idea of eventually selling out to the incumbents, their plans backfired when the incumbents stepped up to the competitive threat with expansions of their own. With new entrants and incumbents both vying for market share, very rapidly networks were overbuilt. Eventually, CLECs burned through their cash infusions and, one by one, have headed towards bankruptcy.

Meanwhile, Europe was engaged in a bidding hysteria for mobile licenses, forcing prices up to levels that would require them to generate 10 times the revenue per user from their existing client base just to break even. However, in a highly competitive environment, they were forced to lower their prices, employing technologies with data rates insufficient to sustain revenue-generating application services. Even some large carriers stumbled.

"A critical success factor in Competitive Operator survival has been commitment to OSS strategy and implementation…"

Stratecast Partners

When the bubble burst in the west, Asia-Pacific—despite more conservative plans—lurched as the fallout in the West created waves through their export economies.

With this new adjustment of telecommunications priorities, it's an extremely difficult time for many service providers. Survivors will be carriers with the resources to continue operations in spite of sagging revenues. However, when demand once again catches up with supply, successful carriers must be lean and efficient in the face of increased competition.

Recently analysts noted that IT—particularly Operational Support Systems (OSS)—was a key component in service provider survival.[1] Although analysts didn't agree on all points, a common theme emerged on the role of IT: *Those providers with an intelligent IT strategy* ***that reflected the critical success factors for their companies*** *had an advantage over providers with technology-driven strategies.*

Critical success factors in today's environment

With the exception of a few places in Asia and Eastern Europe where the markets are in the process of liberalization, the strategy for providers has shifted from *obtain* to *retain and sustain*.

Obtain – work to gain new subscribers

When markets are in the initial launch and expansion phase, you strive to obtain new subscribers. The *obtain* phase—characterized by market expansion, network build-out and service diversification to gain additional revenue—was the dominant phase for many carriers in the 1990s. In this environment, the network management keys to success are time to market, effective provisioning of basic service and the ability to bill for that service.

However, now that the industry has overbuilt and finds itself in a struggle for survival, priorities have shifted from *obtain* to *retain and sustain* until networks are ready to expand again.

Retain – work to keep clients in the face of comparable competition

Because you and your competitors offer similar services, you must differentiate yourself by offering superior quality of service. Since subscribers perceive what you are providing as a mature service, you must provision more quickly—and more accurately. Once you identify a profitable service mix and profitable subscribers, you maintain customer satisfaction by assuring greater network service reliability and availability, and providing rapid fault resolution.

Sustain – established service supports emerging services

In the North American idiom, this is known as the "cash cow" phase, i.e., the established service whose profitable milk feeds other infant services in the company. You enter this phase when the market has saturated. Priorities during the sustain phase are: lowering operational costs, maximizing use of existing network resources and revenues and providing just enough refinements in your service offering to keep existing subscribers interested in continuing service with you.

[1] Stratecast to Telcos: Don't Cut OSS Spending. (MS-Word), April 27, 2001, *Stratecast Partners*

In the retain and sustain phases of the market, you manage risks by simplifying network management, maximizing network utilization and minimizing fraudulent use. In order to keep customers satisfied during this service maturation period, you must shorten service provisioning intervals and reduce provisioning errors.

Key market drivers

In order to develop an effective network management strategy, your NOC management and operations planners must have the knowledge and skills to plan your resource requirements and infrastructure support to meet the needs of your business. They must manage and merge requirements from three different aspects, each with its own set of critical success factors:

1. **Business aspect.** In North America, after the recent build-out, the focus for now is on lowering capital expenditures until cash reserves can be built up. In Europe, carriers are focused on increasing average revenue per user (ARPU) in order to recover costs expended in mobile licenses and network equipment. In Asia-Pacific, the focus remains on the obtain phase with special emphasis on maximizing wireless penetration, moderated by observations of failures in North America and Europe. In all regions, there is pressure to control and— wherever possible— reduce operational expenditures.
2. **Industry aspect.** Service providers must contain costs for existing networks, leverage the existing IT infrastructure, increase revenue per subscriber or business, and maximize revenue subscriber growth for new networks. Although IT revolutions such as next generation operations support systems (NGOSS) work well on paper, economic realities suggest following the path of evolution instead of revolution.
3. **Architectural aspect.** Architectural priorities should be driven by the business and industry considerations. Service providers must seek ways to improve operational efficiency while sustaining a high degree of interoperability with the existing infrastructure. Moreover, it is increasingly necessary to integrate with other parties in the overall supply chain, extending select operations to subscribers, trading partners and value-added resellers. Countering competition by delivering provisioning for a broad service portfolio at the same rate as the more concentrated CLEC contenders presents a particular challenge to incumbent service providers.

Success in addressing these key market drivers requires people with proven business and networking expertise that can map your business and marketing objectives to required technology solutions. These networking experts must be able to analyze the cost implications of such solutions and define the operational design needed to support your business and network infrastructure.

New real world network management strategy

Today service providers are responding to these market impacts with a variety of initiatives, ranging from flow-through and self-provisioning to platform consolidations to data warehousing with online analysis processing. Behind all these initiatives, however, are two strategic principles: *cost containment* and *revenue enhancement*.

Cost containment

Cost containment principally arises either from the near-term need to improve cash flow under tough economic conditions, or as a prudent preparatory step prior to a major network expansion. An effective network management policy can support cost containment policies in several ways.

One common way is to conduct an audit of current systems and processes, seeking ways to reduce operational expenditures by simplifying and automating key processes. Also, implementing self-provisioning and electronic billing can help lower the cost of subscriber interfaces.

Another cost containment method focuses on using network management to squeeze more value out of an existing network. Incorporating inventory management (IM) and enterprise resource planning (ERP) systems can help ensure efficient use of network resources—which may help recover "lost" or misused assets such as dark fiber or idle line interfaces. Proper tuning of network usage—using the excellent systems available today for network monitoring, analysis and optimization—can be a powerful tool for improving the carrying capacity of your network.

Revenue enhancement

The other strategic principle we want to consider is *revenue enhancement*. Although just a few years ago network management was not viewed as a means of improving the revenue stream, this perception is starting to change. This is especially so in the mobility arena, as applications create new challenges for network management—particularly in the areas of data record mediation and service creation.

Let's turn now to investigate in more detail how changes in your network management environment can achieve the desired principles of cost containment and revenue enhancement. Because of its vital importance to survival in today's risk-averse environment, we'll look first at cost containment.

Cost containment is crucial to survival

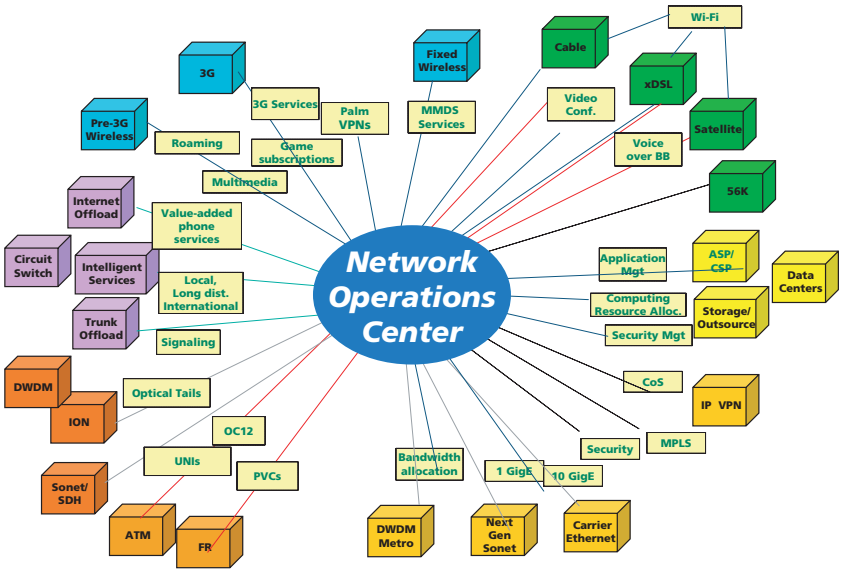

Figure 1: NOC

The illustration depicted in Figure 1 indicates the complexity of the challenge your network management people face in designing and managing your NOC. Since a major issue is the need to manage a broad portfolio of technologies and services, you must employ or contract experienced internetworking engineers to help guide you through the technology maze of multiple platforms and services. This effort requires thorough knowledge of IT infrastructure engineering, combined with an in-depth understanding of current and emerging technologies.

NOC operations can be a headache for two reasons: officially you must manage the *network*; unofficially you are also expected to make *services* function well. If services corresponded to specific sub-networks, this expectation would be a lesser problem; but services typically employ multiple technologies and sub-networks.

All too often when another network build-out occurs, the CFO looks for the best buy, the network planning people focus on the network, and suddenly you're faced with another vendor-specific enterprise management system (EMS) or network management system (NMS) to incorporate into your NOC. Unfortunately, this does not simplify your operations or provide insight into service problems—quite the opposite, the complexity of operations grows as your people manage yet another fragmentary technology.

Convergent systems are key to platform reduction.

Four ways to contain costs

Taking a broad view of your overall network, there are four main ways you can begin to rein in costs: consolidate platforms; separate data and process, allowing centralized inventory management; use the network more efficiently; integrate platforms. In the following paragraphs we will look in detail at each of these four areas.

1. Platform consolidation simplifies operations

There's little argument that multiple platforms present a variety of expensive problems: fulfillment delays/errors; difficulties in rolling out new services; impeded fault isolation; SLAs are hard to achieve; OA&M costs are high. Moreover, in the confusion, typically 20-30% of infrastructure is "lost" or invisible and therefore inacessible. Simplifying operations in order to contain the cost of managing a complex, multi-service network usually requires consolidating information from multiple platforms—or even better, consolidating the platforms themselves.

An ideal solution is a *single system supporting multiple vendors and multiple technologies* that presents a holistic and comprehensible view of the network. Once all the disparate sub-network systems are integrated under a single converged system, operations become much simpler and more cost-effective:

- Administration and maintenance tasks are easier
- Fulfillment is more straightforward and quicker
- Users are trained on only one system
- Facilitation of inventory management helps find "lost" assets
- Network monitoring and fault isolation are simplified
- Maintenance and warranty costs decrease

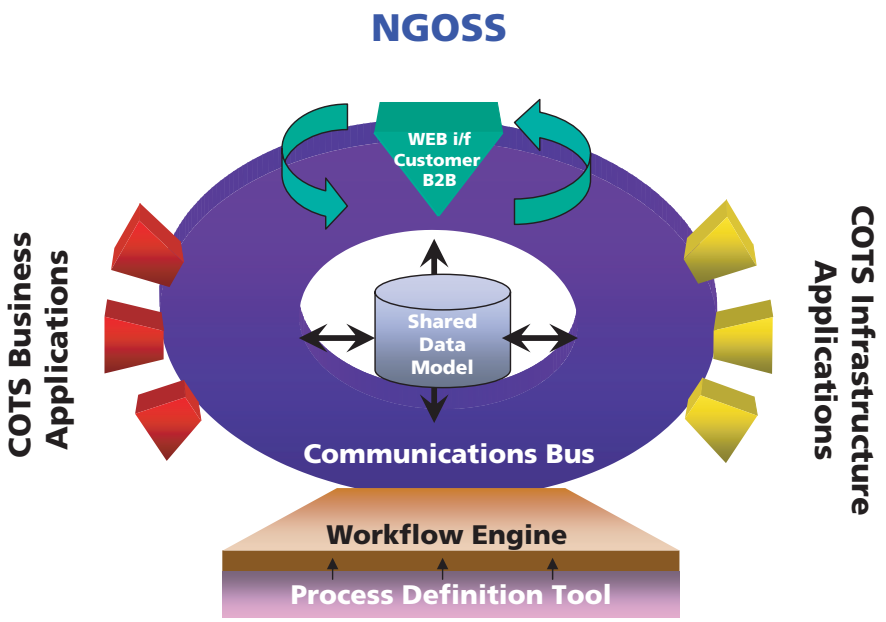

Figure 2: NGOSS

2. Maximize asset utilization—first separate data and process, then centralize inventory

The Next Generation Operations Support Systems (NGOSS) initiative of the Telecommunications Management Forum (TMF) is a hot topic these days. One of the four NGOSS tenets is the enhanced Telecommunications Operations Map (eTOM). Providing an alternative view to the International Telecommunications Union's Telecommunications Network Management model (which focuses on management functions required by a network), eTOM instead concentrates on operational processes required from a service provider perspective. (For more information on this topic see: http://www.tmforum.org).

eTOM provides an interesting vision towards the near future, where service providers are majority owners of content-based value chains. Some TOM concepts are still nascent; others are nearer to being ready for the marketplace. However, significant strides are being made in one particular TOM concept, that of *separating process from data*.

If you're a typical large service provider, you probably store resource information in at least eight different databases—some of it legacy databases, others in surprisingly unsophisticated file systems. Basic engineering and configuration activities can be a nightmare. If your databases are not synchronized, every time a client orders service you can spend an inordinate amount of time searching for viable resources and connections.

Separating the process from data, and then consolidating the data, provides you with both immediate benefits and long-term gains. Immediate benefits of data consolidation are threefold:

1. Improved utilization of existing network—in the process of cleansing data prior to consolidation, "lost" and inaccessible infrastructure is recovered (typically 20-30%).
2. Less labor-intensive maintenance of consolidated data.
3. Reduced need for data synchronization among disparate databases.

In the longer term, separating data from process and then consolidating data avoids duplicated data or near-duplicated data with similar meanings, making future integration of systems easier. If you consolidate IM information into a sophisticated network resource management product, you gain an error-proof way of assigning assets, opening the door for automated flow-thorough provisioning, automatic asset identification (flow-back) and automatic updates to fault management network topologies.

Reining in costs by recovering "lost assets"

Problem:
Suppose a customer's network size is 40,000 equivalent network elements and 350 DSCs, with each DS1 taking up four equipment ports. Further suppose that capacity under-utilization is 15% due to data discrepancies and inaccuracies.

Solution:
Database compare services (such as those provided by Lucent Worldwide Services) can resolve discrepancies between multiple out-of-sync databases to reveal capacity not being fully utilized. Improved utilization of existing assets can also help to bring costs under control.

Benefits:
Detecting and recovering lost equipment provides potential savings of up to $12 million in equipment purchase costs and recovers facilities with the potential of generating an annual incremental income of $110 million.

North American service provider recovers revenue from call failures

- International gateway provider
- Call volume in two switches for 3 days = 4,964,795 calls
- 520,684 call failure messages => 63 million per year
- Call duration approximately 3 minutes
- Cost: $0.50 per call
- Revenue savings per year = $3.15 million (based on 10% of failed call count recovered)
- Increased staff efficiency not included in savings estimate

Service provider recovers revenue from stranded switch capacity

Problem:
Large USA service provider was experiencing switch capacity problems (shortage of ports plus out-of-sync condition between switches, circuit provisioning and billing databases were causing lost revenues). Service provider wanted to avoid capital expenditures for additional switch ports.

Solution:
Lucent Worldwide Services performed database compare services and identified stranded switch capacity—hardware not being used largely due to disconnects not being worked on lines and PRI (primary rate interface trunks). Resolving out-of-sync conditions allowed service provider to recover revenue-generating switch resources.

Benefit:
Identifying stranded switch capacity enabled Service provider to recover $11.8 million revenue per year. Moreover, service provider was able to defer over a half million dollars in capital investment in one office.

3. Effective use of network minimizes lost revenue

The third way to contain costs is to use your network more effectively. Studies have shown that call failures do indeed result in lost revenue. The amount lost depends on retrial probability, number of additional attempts, and Ultimate Call Success Probability (UCSP).

UCSP usually is in the range of 67% – 84%. A figure of 75% has been used in several RBOC and international NTP economic studies (i.e., 25% of the actual call failures will result in lost revenue), a number believed to be quite conservative.

Utilizing a network trouble-patterning product offers great potential for cost savings by identifying the source of call irregularities so they can be eliminated. Improving call carrying capacity of a network from 15-25% has obvious economic advantages in mature service areas, enabling you to get more milk from your "cash cows," which can be used to fund next generation networks and services.

Unfortunately, this facet of cost containment can be a hard sell, because it involves convincing one group to increase capital expenditures in the short term in order to reduce the capital expenditures of another group in the long term. If your company takes the broader—and wiser—view, this strategy can produce remarkable savings in a short payback period.

Another way to use your network more effectively in order to contain costs is to model your network environment so you can better plan capacity to control capital expenditures. Network engineers must have broad experience in multivendor, multiprotocol environments to address this challenge successfully.

4. Platform Integration

A fourth technique that can help you reduce operational expenses even further is to automate processes by integrating platforms. Some hot button items driving integration today include: flow-through provisioning, cross-provider service orders, SLA violation notification, self-provisioning, and flow-through trouble ticketing.

Well-integrated network management solutions offer substantial advantages:

- Operational expenditure reductions
- Faster fulfillment/increased revenue
- More revenue from value-added services
- Higher quality of service
- Increased customer satisfaction

Of course, if cross platform integration were easy, everyone would have done it by now. Two obstacles stand in the way: lack of interoperability and data integrity.

Interoperability issues. In the 1990s, many carriers bought best-of-breed systems, which optimize operations locally, but present obstacles when broader optimizations are attempted. Another issue is a potential hiccup in interoperability when a new version of one OSS element is introduced—software upgrades from other vendors may be required for all the OSS pieces to integrate.

Data definition issues. A lack of common data definitions between the various OSS is the other big obstacle to cross platform integration. Incomplete, inconsistent, and unrecognizable data creates major obstacles for both north/south integration (between layers of BSS/OSS systems within a service provider to automate operational flows; e.g., an order management system that communicates with multiple network management system to automate service ordering) and east/west integration (between peer-level BSS/OSS systems, especially to provide service products composed of service elements owned by multiple business entities; e.g., sending a service order from a CLEC to an ILEC to wire up the last mile to a house).

Carriers are shifting away from best-of-breed systems and toward best-of-suite solutions precisely because they address these integration and data integrity issues.

Now that we have investigated in detail the first strategic principle of cost containment, let's turn now to the second strategic principle of revenue enhancement and explore ways to leverage better-managed networks to attain increased revenue.

Enhance revenue – challenges and opportunities

Two basic approaches can enhance revenues: obtain additional subscribers; generate demand for additional service by existing subscribers. Competing for subscribers in a saturated market can be counterproductive, leading to price wars that drag down average revenue per subscriber. So the only viable alternative to generate additional revenue in a saturated market is to stimulate demand for additional value-added services.

"Old economy" approaches for enhancing revenues are re-emerging—with some "twists." Telecommunications marketing and sales people are laying aside the ubiquitous "killer application" idea in favor of a portfolio of variant and evolving services targeted towards specific client groups. That's a return to old economy thinking, but the twist is: the underpinning service delivery model is rapidly changing.

Fully-integrated OSS solution helps service provider reach for global market

Problem:
Major service provider supplies a global telecommunications network linking the US with major cities in Europe, Asia, and Latin America. Service provider wanted to offer a wide range of voice and broadband packet services globally, and needed LWS to architect, plan, customize and implement a complete OSS solution for network service provisioning and network service assurance.

Solution:
LWS delivered a large OSS solution (composed of Lucent and third party systems) covering service management, network management, inventory management, and element management. Integrated, tested, end-to-end solution allows service provider to generate revenue more quickly.

Benefits:
Service provider generated $29.2 million in services revenues ($17.6M in 2001; $11.6M in 2002). Outsourcing the lab testing to LWS allowed service provider to save an initial investment of $22 million plus recurring annual operating costs of over $15 million.

Until recently, service providers created service "products" constructed primarily from internal company assets. Now service products often incorporate access to content outside of the service provider's domain, and rely upon a combination of in-house and off-net network facilities. This shift towards services constructed from multiple suppliers presents numerous challenges for network managers, especially the need to achieve:

- Value-chain-based billing and payments
- Self-provisioning
- End-to-end performance management

Value-chain-based billing and payments

As Telecommunications, Information Technology, and Media verticals merge from a service delivery standpoint, Telecommunications is evolving into "*Teleinformation*." This is especially true for wireless, where subscribers use their handsets not only to talk, but also to send text messages, look up directions to theaters and restaurants, obtain informational alerts, etc. While you need not provide content directly, you do need to account and bill for content-based services, as well as provide payments to the content providers (current jargon in the industry for these functions is *value-based billing* or *dynamic transaction management*).

Moreover, you must avoid applying the "fixed-price, unlimited-access" paradigm to content-based services—unless you like engaging in price wars with competitors that result in rapidly decreasing ARPUs. So purchasing or upgrading systems to support *variable-rate pricing* is essential.

When content-based services are projected to be 10% or more of your company's revenue stream—or you are moving to a technology such as 2.5G wireless with potential to derive significant revenue from data-based applications—you will need to start seriously upgrading or replacing your billing system. Whether you upgrade or replace depends on your existing business support systems (BSS) and your expectations for return on investment.

As of 4Q02, several emerging billing systems now support dynamic transaction management suitable for Tier 2 and Tier 3 carriers. Similar functions are expected within 1-2 years from mainstream billing providers that serve tier 1 providers. Another option is to upgrade only the rating engine.

Before you initiate content-based billing, you need a data mediation system that supports usage-based data collection, coupled with an authentication device (e.g., RADIUS or DHCP server) that maps IP addresses to users. A number of suppliers in the market support usage-based billing. For high volume-services, you also will require flow-through service provisioning, which entails a robust order manager coupled to a network-level provisioning system.

Acquisition and integration of the prerequisite systems for content-based services can be a daunting task and may produce short-term negative ROI. However, with vision and persistence, you can hit the market window for offering value-added, revenue-enhancing services and avoid loss of subscribers to competition. If you are unsure how to approach integration of business processes, the TMF's eTOM model can provide a framework for understanding what processes must be supported and the subsequent requirements this places on systems for purchase. Alternatively, you may seek a solution from a competent solutions integrator familiar with the eTOM model.

Self-provisioning

A common train of thought says, "If provisioning of services is made simple and near-instantaneous, subscribers will sign up for additional services upon impulse—and be less likely to unsubscribe according to impulse." In order to provide the instantaneous gratification associated with impulse purchases, near-real time provisioning is necessary. Since many wireless services can be provided without dispatching personnel to perform physical installation, wireless is more amenable to this sort of provisioning than fixed line services.

Self-provisioning typically is performed via the Internet using a web-portal interface or, for wireless, a handset. Self-provisioning can be as simple as placing an order via a web portal, which is then processed by a customer service representative using a traditional operation manager—or it can be as sophisticated as an end-to-end, self-provisioning system that automatically provisions network components, turns-up service and initiates billing. Although relatively simple to implement, the former lacks the near-instantaneous aspect. The latter is more difficult, requiring a custom solution.

If you want to limit self-provisioning to service add-ons, relatively inexpensive implementations can be devised that require provisioning of only one network element, such as a home location register (HLR). More sophisticated implementations are possible if you are willing to invest in a middleware solution with business process management capability.

Self-provisioning (the near-real time version) offers a means for retaining subscribers. If you are planning to launch a series of content-based services, you should seriously consider self-provisioning, as it is especially attractive to the early adopters who will form the subscriber base for critical-mass services such as Instantaneous Messaging.

End-to-end performance management

Once a premium offered only to key business customers, SLAs are rapidly becoming an essential tool for retaining major customers. Customer expectations for SLAs have been evolving rapidly. A few years ago, it was sufficient to extract availability data from the network, massage it into a spreadsheet, and then send out the subsequent report to the customer periodically. Today major customers are demanding much more in terms of SLA data availability and data abstraction.

Especially where data equipment is shared, network-level views of data showing equipment availability levels and MTTR are no longer adequate—every customer wants views of data that are specific to the service purchased. And because they want it in real time, there's a very strong trend to providing data on demand in a web-accessible venue.

For most service providers the point of pain is where the customer wants end-to-end SLAs. At some point, facilities go off net, rendering SLAs ineffective from the standpoint of a multi-national corporation (MNC). Also, MNCs want SLAs to encompass applications performance as well as network performance.

With excellent tools available today that offer performance management solutions spanning both the network and applications, the challenge of providing end-to-end SLAs can be met. If the "last mile" provider also utilizes these types of tools, complete end-to-end performance management is possible, enabling Service Providers to offer managed services.

Sitting at the top of the value chain, managed services can turn a network management cost center into a profit center. The key to success lies in convincing all parties along the value chain—service provider, enterprise client and last mile provider—to allow a common performance management tool to monitor their network and to abide by the same SLA measurements.

Conclusion

The glamour and irrational growth of the 1990s diverted attention from the inherent value of providing solid, robust network support to subscribers. Now that the bubble has burst, perhaps it's time to move network management back to being a critical success factor.

Particularly in the mobile and IP areas, there's a lot of talk about finding the revenue-generating killer application to achieve the ROI for recent network build-outs. However, maybe it's not the killer *application*, but the killer *attributes* of the carrier that guarantee payback and long-term survival. If you can provision more efficiently, offer a wider variety of billing schemes for products, demonstrate better quality of service, and achieve superior utilization of your network, you are more likely to retain and sustain in the current market.

Successful network management requires people with extensive expertise in business/technology planning who can take a holistic approach to assessing all the issues. Leveraging broad-based skills and experience, they must manage all the interdependent elements of a complex multi-vendor, multi-service network to ensure the network is meeting today's service objectives—and supporting the vital goals of cost containment and revenue enhancement.

Some carriers have strong in-house development capabilities and have launched programs to tighten control over their networks and integrate their OSS. Other carriers struggle with the network management challenge. If your company needs outside assistance, Lucent Worldwide Services is available to help. Focused on Tier 1 carriers, our services provide solutions incorporating multiple vendors and pre-existing OSS systems.

About the author

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Lucent Worldwide Services Advantage

Lucent Worldwide Services has more than 14,000 experienced and highly skilled technical professionals dedicated to developing, deploying, operating and maintaining global networks. Our proven track record of successful networks is powered by Bell Labs innovations and our end-to-end, comprehensive portfolio of professional, deployment and operations and maintenance services. Our unsurpassed suite of solutions can help reduce operating expense, leverage capital expense and grow revenue — helping you make your network more profitable throughout its lifecycle.

To learn more about our comprehensive portfolio, please contact your Lucent Technologies Sales Representative or visit our web site at www.lucent.com,

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