HEAVY READING

Introduction

Achieving greater efficiencies in the processes that link service design with provisioning has become essential to achieving quality and performance in service development and deployment. In this highly competitive and complex telecom environment the only way carriers will gain a long-term market position is by creating service delivery environments that enable them to federate a wide variety of services and distribute these services efficiently across their networks.

Carriers must establish business models, deploy associated technologies and develop service distribution strategies to capitalize on the business models that arise from displaced control. Carriers must either optimize their business models for wholesale network operations or, alternatively, create an efficient way to federate Internet and other dedicated third-party (off-net) services and applications while they drive cost down and add advanced functionality to their offerings.

As the appetite for bandwidth-intensive services grows, IP's ability to provide cost-effective service has found favor with operators as they serve consumers, as well as their enterprise customers. Hence, the pivotal reason driving network transformation projects within operators to move toward IP next-generation network (NGN) is driven by cost efficiency because the same transport and technology elements can be used to provide enterprises with voice, video and data over a common network infrastructure.

A fresh approach that utilizes greater levels of automation and integration becomes critical to manage this increased complexity and improve the fulfillment process, from accurate design to assurance. Complex enterprise IP services are cloaked with complex and veiled challenges, because accurate design and delivery are often difficult to achieve. Applying automation and adopting an integrated approach to all aspects of IP service lifecycle management, from design to assurance, can help communications service providers (CSPs) achieve greater accuracy and efficiency in their end-to-end service management.

The key enabler for delivering this change is the operations support system (OSS). Carriers must invest and streamline their OSS strategy around service fulfillment and service assurance. Carriers must realize the importance of an integrated, stream-lined OSS strategy and how it can act as a competitive differentiator in today's market. This report aims to better understand the challenges CSPs face on the OSS front around deployment of IP NGN services. It highlights OSS challenges for IP NGN service delivery and OSS solution requirements for IP NGN-based services delivery. The report also looks at a range of issues, including challenges related to siloed OSS systems, perceived gaps in existing OSS platforms and how challenges around OSS can act as bottleneck to IP NGN service deployment.

Key Drivers Accelerating Growth of Enterprise IP Market

As demands from enterprise customers for IP services tend to become complex and customized, the success of CSPs will depend on their ability to efficiently design, deploy and assure IP NGN-based services within a short timeframe.

Some of the key business drivers accelerating the demand for IP-based enterprise services are listed below:

Better, Cheaper Networking: There is tremendous growth in demand for the IP Multiprotocol Label Switching (MPLS) market, which forces CSPs to invest in and optimize their IP VPN and IP MPLS infrastructure. The biggest advantage for using IP MPLS stems from the fact that CSPs can cost effectively use the same transport and technology to provide enterprises with voice, video and data over a common network.

Proliferation of Cloud Services: Cloud computing represents a new force in the new IP era that has sparked innovation and creativity in the IT world. Ranging from IT veterans such as Sun, HP, IBM and SAP, network-centric operators such as AT&T, Verizon Business and Savvis, to a new breed of Web application providers such as Saleforce.com, Amazon Web Services and Google, providers are charting their game plans with great enthusiasm.

Managed Services: Enterprise IP services have become more complex as enterprises demand more customized services tailored for their individual needs. Design, delivery and maintenance of those services have become more complex and time consuming. Pushed by competitive pressures, companies across a wide array of vertical industries are pursuing the use of third parties to provide a range of information and communications technology (ICT) services. By outsourcing planning and operations of communications networks and service delivery businesses in mature, competitive industries, enterprises can streamline business processes and allow for more agile execution of core operations.

Homegrown OSS solutions will not be able to keep up with this increased complexity and provide the agility and responsiveness carriers need to remain competitive. Automated zero-touch service provisioning solutions, coupled with integrated service assurance, will help lower network and operations cost and increase provisioning accuracy, which will improve customer satisfaction and help increase customer stickiness. CSPs realize that service quality from the customer's perspective is a critical yardstick for service quality assessment. The eternal challenge, however, always remains as to how to make this a reality by streamlining the underlying OSS systems.
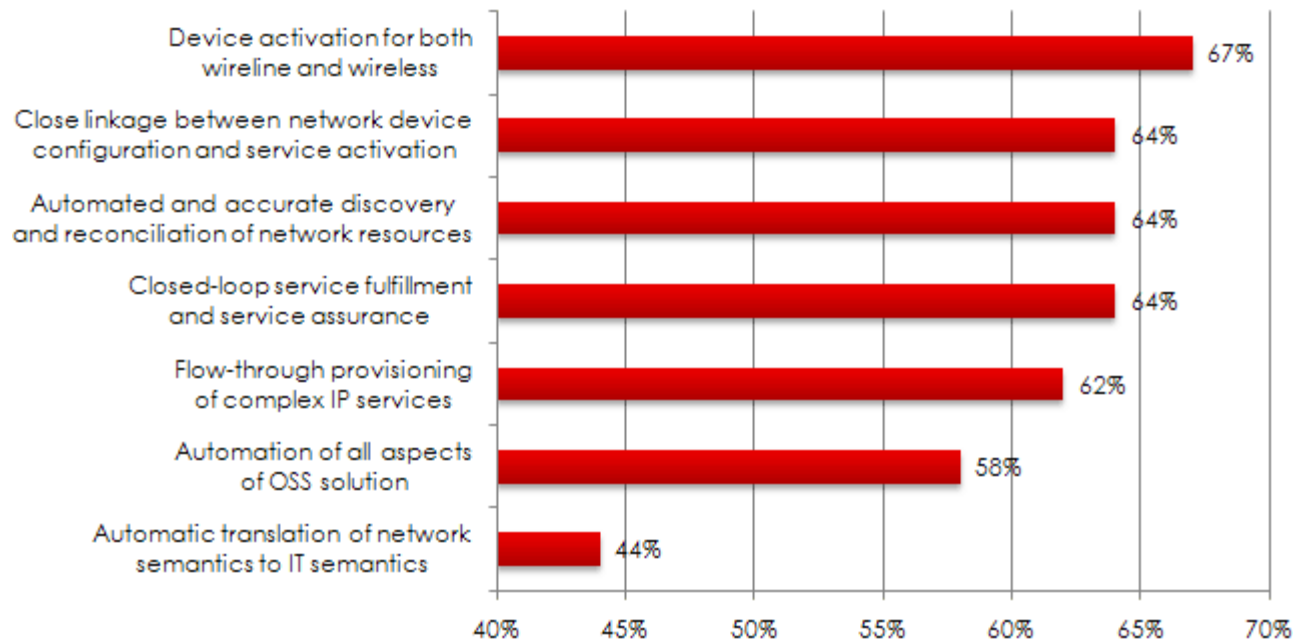
OSS Challenges for IP NGN Service Delivery

OSS requirements for IP NGN-based services are complex. Some of the key problems that CSPs must focus on for efficient delivery of services that can be attributed to OSS systems are listed below:

- **End-to-end integration:** Siloed systems – which result in a lack of integration in core back-office systems, primarily between order management, customer care, fulfillment, monitoring and fault and service management systems – will result in inefficient delivery of services. Lack of automation and end-to-end view of subscribers, their requested services and resources will delay delivery of services and result in service management issues as provisioned services may fail because of resource constriction, etc. For streamlined delivery of IP NGN services, CSPs must invest in integrated end-to-end fulfillment systems, as a piecemeal approach will result in higher support cost and customer dissatisfaction.

- **Flow-through provisioning:** Most CSPs cannot implement flow-through provisioning of IP virtual private network (VPN) services and must have manual intervention at certain stages of the fulfillment lifecycle. The current emphasis on best of breed also leads to multivendor network environments, creating difficulties in implementing end-to-end capability and enforcing horizontal policy-based device configuration. It is critical for OSS systems and CSP business processes to be aligned in such a way that flow-through provisioning becomes possible and ensures rapid delivery, cost leadership and service differentiation.

- **Consistent interfaces and systems:** CSPs must focus on the homogenization of systems interfaces that can be achieved by following standards and focusing on service-oriented architecture (SOA) to provide Web-based interfaces and standards-based application programming interfaces (APIs) for easy integration and minimizing inconsistencies. Inconsistency adds customization and integration cost to CSPs and prevents them from presenting a unified image to the customer.

- **Scalability for configuration and provisioning systems:** Many incumbent CSPs rely on homegrown OSS systems or a disparate element management system (EMS) to manage a multi-vendor network infrastructure. These systems do not have an end-to-end service view and, hence, cause customer experience issues. For IP service delivery, it is critical to configure network devices with high consistency and accuracy, especially as carriers aim to get away from homegrown scripts and vendor EMSs that are not scalable and will have difficulty accommodating growth in IP NGN-related services.

- **Embedded real-time discovery & reconciliation:** Stranded or unutilized assets can result in major capex issues for CSPs. All operators are striving for efficiency and resource optimization. Without embedded real-time discovery and reconciliation (D&R) system operators run the risk of losing millions of dollars in stranded and underutilized assets.

Figure 1 illustrates survey results of about 90 global CSPs who rate the key wish list activities they want from their OSS infrastructure that they cannot obtain at present.

Figure 1: Key Wish-List Activities That CSPs Want From Their OSS Infrastructure but Cannot Obtain at Present

Activity	Percentage
Device activation for both wireline and wireless	67%
Close linkage between network device configuration and service activation	64%
Automated and accurate discovery and reconciliation of network resources	64%
Closed-loop service fulfillment and service assurance	64%
Flow-through provisioning of complex IP services	62%
Automation of all aspects of OSS solution	58%
Automatic translation of network semantics to IT semantics	44%

Source: Heavy Reading, 2012

OSS Solution Requirements for IP NGN-Based Service Delivery

With rapid introduction of IP-based services and customer stickiness directly related to quality of service (QoS) and service continuity expectation across any network and any device, a closed-loop approach to service fulfillment process is the need of the hour. Deploying NGN architectures and setting up new content and services partnerships will enable operators to create or source innovative blended service offerings. Operators do not sell individual services, but rather offer complex and bundled products. Agility and customer centricity are the cornerstones of success for CSPs in today's competitive environment.

Customer centricity is not customer relationship management (CRM) functionality, as merely capturing customer orders does not create a satisfied customer; fulfilling orders seamlessly, so that customers get their desired service with expected QoS, will. It is thus natural that correct visibility and understanding of network capability, the ability to change network device configuration in real time without affecting underlying services, and managing order dependencies and process dependencies with minimal latency will enable CSPs to serve their customers better.

Hence, customer centricity is a direct function of a Customer Fulfillment Lifecycle Management (CFLM) strategy, and vendors must provide solutions directly addressing these carrier requirements. At *Heavy Reading*, we define CLFM as an end-to-end service fulfillment process in which products, packages, etc. available to the customer are based on network capabilities in order to eliminate or minimize service provisioning errors. This process will manage service and resource catalog handle order orchestration, process orchestration and hence be able to manage end-to-end orchestration of fulfillment lifecycle.

Let's look at some of the key OSS requirements for next-generation service delivery:

Efficient service design process critical for increased accuracy and personalized service delivery: For CSPs, an efficient bid design process relies on a combination of lower-cost yet accurate design processes, efficient use of existing network capacities and the ability to present the customer with a greater level of detail in a shorter time frame and with a high degree of accuracy. CSPs that can efficiently link the iterative design process to the provisioning process will clearly be able to meet their customers' demands more efficiently. Therefore, adoption of end-to-end automation in service design and provisioning is central to the success of CSPs aiming to increase their profitability in enterprise IP services. It is also vital for CSPs to model various forecast scenarios and predict congestion points based on historical network performance data. Therefore, an efficient design solutions must transcend business and IT boundaries by providing the needed support to financial, IT and network departments responsible for build cost and asset utilization.

Faster, more accurate provisioning because of end-to-end order management: Most CSPs have struggled to provide an increased level of Web-based automation and interface in their order entry processes for IP NGN services. The prime reason for the lack of automation is the complexity of the service offering, which typically requires a significant amount of product and sales staff involvement in the service performance criteria selection, and the inability of order management solutions to handle these complex situations. Aligning a centralized product and service catalog with end-to-end order management systems will also help speed provisioning and time to market for IP-based services.

Enhancing customer experience with unified OSS: A single and central view of subscribers, their provisioned services and their interactions with network resources will gain acceptance as a better way to provide a customer-centric view of products and services. Driven in part by next-generation OSS/business support system (BSS) technologies, customer interactions will be viewed as more than just a billing or call center relationships. It's important to consider that the customer interaction starts from the moment a new service order is initiated, provisioned and activated. It also continues at the network level every time a customer consumes a service. We expect Tier 1 carriers to lay more emphasis on establishing a unified view of customers. Unified OSS solutions can help carriers in this endeavor as it will to take advantage of single data source all the way from network elements to network facing OSSs.

End-to-end service lifecycle management critical for IP NGN success: IP Multimedia Subsystem (IMS) and other NGN architectures will introduce major complexities for operators. In today's dynamic communications environment, it will be impossible for operators to keep pace with the consistent change and dynamism introduced by converged services unless their fulfillment and assurance systems are closely aligned. A single and central view of subscribers, their provisioned services and their interactions with network resources will be the better way to provide a customer-centric view of products and services. It is critical to close the gap between service fulfillment and assurance, which will enable providers to reuse interfaces and process fragments that can subsequently be triggered in either the service fulfillment or assurance context. Service assurance solutions will also need to have an important service management component. Service management provides an understanding of where service quality for different services stands, what combinations of different service quality scenarios are possible and which service quality scenarios deliver the greatest value to CSPs.

Network resource management for economic service delivery: On-demand bandwidth-intensive service requires dynamic, real-time allocation of network resources across the end-to-end network infrastructure. Accurate, realistic and proactive capacity planning and trending capabilities are a key requirement for OSS (network inventory) solutions. Planning will not only enable correct sizing of the future network but also help CSPs reduce capacity shortfalls, minimize order fallout and increase efficiency by identifying underutilized network resources.

Increasing operational efficiency with unified activation and configuration management system: For IP service delivery, it is critical to configure network devices with high consistency and accuracy, especially as carriers aim to get away from homegrown scripts and vendor EMS systems. A centralized device management or configuration management solution is directed toward greater utilization of network resources, accurate configuration and reduction of manual processes and errors, and it directly impacts operational efficiency and capex spend on devices. When a device supports multiple network services, each service requires some portion of the shared resource of the device in order to build and maintain each network service. Typically, rollout of a new service or even a change in the network requires multiple changes to multiple devices. Configuration management is predominantly a horizontal capability that handles design, management and specification changes across all devices on the network. Service-aware configuration management will become critical for the success of CSPs. This is because when a configuration management system changes a device configuration, it ensures that the change is performed in a manner that will not disrupt other services, since it has a network-wide view of the impact of such changes. The primary benefits are:

- Ensuring configuration and management of the entire network

- Automating changes, ensuring the configuration meets policy and service obligations without disrupting the network

- Creating and managing an audit trail for all configuration changes

- Eliminating maximum possible configuration and configuration change errors

Closed-loop service fulfillment via unified catalog: Centralized product management and catalog federation must become critical components of next-generation OSS offerings. BSS/OSS vendors must focus on providing process automation encompassing workflow, task and order management that will reduce time and cost and enable customer self-provisioning capability. OSS vendors must provide linkages between commercially offered products with technical products, services and resources in a common repository to enable a closed-loop provisioning process from order generation to order fulfillment.

Minimizing stranded assets with automated, integrated real-time D&R: Many CSPs employ multiple inventory systems with varying levels of accuracy, and conduct audit and accounting exercises to reconcile differences between network configuration and network elements. CSPs source, collect and cleanse data that contains information about location, configuration, deployment and the use of network equipment so that the CSP can activate and efficiently provision services. Despite this, a typical Tier 1 CSP operates with up to 25 percent of its network assets and components stranded, either lost or deployed erroneously. Stranded assets are one of the more pervasive problems in this industry. There are two kinds of stranded assets: lost assets and underutilized assets. Lost assets are fully-functioning assets that cannot be found, or assets of which the company is unaware. Underutilized assets can be deployed, but are underused or recorded incorrectly. This is a glaring example of operational inefficiency, which has forced CSPs to seek D&R solutions to solve data accuracy problems. D&R finds stranded assets – both physical and logical – and matches them with existing databases of record, identifying discrepancies and reconciling them. D&R has a multiplier effect across a range of OSS. Network use increases, capex and opex are reduced, the provisioning process becomes more efficient, planning is better and overall asset management improves. Best practice of minimizing this mismatch is by using automated D&R and having it closely aligned with service fulfillment solution.

Conclusions

The promise of next-generation architecture is to provide any service on any device with the expected QoS. This makes the job of service fulfillment vendors more complex, because they must support not only different network elements but also different end devices. Fueled by intense market pressure, service convergence will continue. This will introduce complexity in the service fulfillment process and enable a gradual reduction of fragmented approaches to service fulfillment.

Most CSPs have struggled to provide an increased level of Web-based automation and interface in their order entry processes for IP NGN services. The prime reason for the lack of automation is the complexity of the service offering, which typically requires a significant amount of product and sales staff involvement in the service performance criteria selection, and the inability of order management solutions to handle these complex situations. Aligning a centralized product and service catalog with end-to-end order management systems will also help speed provisioning and time to market for IP-based services.

Successful OSS offerings will have to enable flow-through provisioning, auto-discovery, end-to-end monitoring, real-time capacity management, self-care, service-level reporting and pre-emptive service management. Carriers that have the foresight to invest in OSS today for tomorrow's growth will be best positioned to dominate the market. There must be a close linkage of service fulfillment and service assurance for end-to-end lifecycle management of IP services.

Recommendations for Operators

CSPs evaluating OSS solutions should pay special attention to real-time network capacity planning. For CSPs, an efficient bid design process relies on a combination of lower-cost designs, efficient use of existing network capacity and the ability to present the customer with a greater level of detail in a short time frame. It is critical for OSS solutions to be able to support CSPs' various modeling scenarios, predict congestion points based on historical network performance data, and provide accurate build costs in a very short time frame.

End-to-end integrated OSS is just what the CSPs need. In today's dynamic communications environment, it will be impossible for carriers and CSPs to keep pace with the consistent change and dynamism introduced by converged services unless their fulfillment and assurance systems are closely aligned. Service assurance and fulfillment vendors must work strategically together to build out a unified OSS platform, specifically for IP services, which will enable CSPs to reuse interfaces and process fragments that can subsequently be triggered in either the service fulfillment or assurance context.

CSPs must think strategically about D&R implementation. Discrepancy management is sometimes the most underappreciated aspect of CSPs' services However, it is central to understanding the nature of a stranded asset. An ideal discrepancy management solution should be real-time and should constantly update and track sets of discrepancies between various data sources in the OSS. It should be flexible enough to allow matching and consistency rules, so the CSP can configure systems and identify matching parameters, and can implement consistency rules as appropriate for the network.

Vendor Analysis – Cisco

Cisco provides a modular suite of network management applications for CSPs designed to accelerate the time-to-value of Cisco and third-party network equipment and technologies by driving efficiencies through all phases of the service lifecycle including design, fulfill, assure and analyze. A key component of this modular suite is **Cisco Prime Fulfillment**, an end-to-end service assembly and fulfillment solution based on four key capabilities that help meet address CSP's challenges outlined in this report. The four capabilities are as follows:

Cisco Prime Active Catalog provides the unique capability of allowing product managers to create services without an intimate understanding of the complex underlying network technologies, inventory resources and associated processes by abstracting service design from the engineering layer. With Active Catalog, the network, service and other resource capabilities can be modeled as reusable service components that can be quickly and easily aggregated into publishable services and products. Service and product specifications are used as orchestration templates for specific product fulfillment. Cisco Prime Active Catalog is built around the TeleManagement Forum (TMF)-endorsed Product and Service Assembly (PSA)-standard, a framework that allows CSPs to build their operations around a model that helps create, assemble and launch new products and services much more quickly and efficiently. Benefits include an efficient service design process, accelerated time to market and quick, personalized service delivery.

Cisco Prime Order Management monitors and controls detailed order processes involved in fulfilling a customer's order, keeping track of all details and progress – from initial order to fulfillment of that service. It manages complex task interdependencies and exception processes, and enables rapid creation and introduction of new service order types. The detailed visibility into the entire order process helps CSPs effectively and successfully manage customer expectations. Benefits include consistent and accurate delivery of services and customer satisfaction.

Cisco Prime Service Inventory manages all the resources required for successful service delivery and network operations, from customer end devices such as handsets to network equipment such as access and core network devices. Not only does Cisco Prime Service Inventory have the unique capability of modeling all required physical and logical resources, but it also applies comprehensive business processes to the usage of those resources. Additionally, built-in utilities allow network elements to be quickly and easily identified and compared to the record maintained in the database and reconciled for alignment of the inventory record and the actual situation. Benefits include increased business and operational efficiencies, optimized network resource utilization and management for lower costs, and rapid D&R for timely delivery of accurate, high-quality services.

Cisco Prime Provisioning performs all the communications required to activate services, from the configuration of individual network elements to the activation of entire technological domains. Pre-configured provisioning workflows automate activation functions for Cisco and third-party network devices. Benefits include quick and predictable service activation and rapid deployment of services.

Ultimately, through these extensive capabilities, **Cisco Prime Fulfillment** enables CSPs a solid foundation for continuous improvements in both product and business operations while enabling business agility to stay ahead of the constantly and rapidly evolving marketplace.