Top three principles to build futureproof OSS

A winning formula for telcos.

White paper
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Executive Summary

The last fifteen years have seen operators striving to automate their order-to-activation stacks in order to reduce costs, increase margin and enable web-based order capture. The pace of change has made this hard to achieve and in many cases a complex ‘patchwork quilt’ of systems has emerged, not by design, but in response to commercial pressures and the failure of large software vendors to provide cost effective, elegant solutions.

As a result of this, many operators today are considering whether their large, complex and inflexible fulfillment stacks are fit for purpose with the introduction of far more interactive self-provisioned and self-managed services which are increasingly hosted on virtual hardware driven by cloud based systems and app stores.

It is a tired cliché to talk about the increasing pace of change in telecoms. Yet it is a fact nonetheless that change is ever present. Change is a wake-up call to those companies who have failed to create flexible infrastructures that allow new services, multiple sales channels and new levels of service to thrive. At the same time, many large-scale transformations and the grand plans to create more dynamic systems terrains have failed – often spectacularly. A new, more pragmatic approach must be found.

This paper discusses the key changes that are occurring and being planned by many telecoms operators across the globe, why operators are pursuing change, and the advantages and challenges these changes are bringing.

This paper will outline how operators can take advantage of these changes without the dramatic, large scale transformations which have proven costly, time consuming and high risk in the past by deploying incrementally and at low cost a new approach to the Operations Support Systems (OSS) and Business Support Systems (BSS) IT architecture, which will in addition pave the way for new technologies such as Cloud and NFV / SDN.

Constantly changing face of telecoms

There are a number of trends in the industry which are driving change at present. They can be categorized as follows:

• The move from static to dynamic networks - The finalization of the move from statically configured network technologies such as ATM and SDH/SONET and early forms of IP/MPLS to fully self-configuring and dynamically managed technologies which are all IP. The introduction of virtualization technologies - notably NFV and SDN - completes this trend.

• Service orientation - The increasing commoditization of “moving bytes” – increasingly customers are demanding services such as content provision, self-provisioning and management and an “app store” approach to option and function selection. Simply moving data from place to place via a “bitpipe” without services on the top is becoming less lucrative to operators.

• Network access ubiquity - Ever increasing expectation of the ubiquity of network access, driven by such trends as the Internet of Things (IoT). These expectations are being driven by a variety of mechanisms and technologies such as LTE, 5G and Small Cells as well as Cloud-based infrastructures.
Move to dynamic networks

Twenty years ago, when many of the current commercial software applications such as inventory, CRM and billing systems were conceived, the telecoms world was a very different place.

Technologies such as SDH/SONET, ATM and Frame Relay were the norm, and IP traffic was just one of many forms of traffic carried over the networks of the time. Consumers, if they connected to the Internet at all, likely did so via a slow dial-up connection. Businesses, if they had data connections between offices, utilized technologies such as E1/T1 leased lines.

The one thing these technologies have in common is that they are deterministic. In other words, the capacity of the link was pre-determined - configured during provisioning - and once the available capacity was all in use, no more could be sold.

The job of the telecoms operator was therefore:

- Build an infrastructure to meet the anticipated needs of the addressable market
- Sell portions of that infrastructure, and groom the traffic, to ensure efficient utilization
- Keep track of what had been sold across the network and expand infrastructure as needed in advance of demand

In this environment, a good strategy is to have an integrated OSS inventory which manages the physical infrastructure plan and build process, plans and configures the logical infrastructure (for example SDH/SONET ring structures) and keeps track of what has been sold by designing the end-to-end service and mapping this onto the physical and logical infrastructure.

Once aspects of the infrastructure reach some pre-determined load factor, plans are initiated to build out new capacity.

An excellent architecture for building an OSS to meet such needs is termed “inventory-centric OSS”. In this model the inventory sits at the heart of the OSS, and coordinates the plan and build process, the fulfillment process and has an awareness of fault status. In this way, it has oversight of all activities involving the network, and is able to manage and allocate capacity according to need, and to track capacity requirements.
However, logical networks have become increasingly sophisticated, for example dynamically managing class of service, as well as the environment has expanded in scope, for example to include IT resources and infrastructure. Hence, the logical layering required to properly record and track how a customer’s delivered service relates to the underlying available resources has become almost impossible and is incredibly complex. The final challenge to this 'inventory-centric' approach is Network Function Virtualization (NFV), where the physical hardware's relationship to the virtual network which runs across it has become abstract and is constantly changing every few seconds.

Not only has it now become impossible for inventory-centric solutions to do their job but in practice there is no longer a sensible reason to do so. Networks and IT resources are now dynamic, self-managing and self-optimizing, at least up to a point, and the need to track the utilization of these complex logical infrastructures is therefore no longer necessary as other systems now have that responsibility.

In practice, very few operators have succeeded in truly creating an inventory-centric OSS. To create such an architecture requires that all network and service information that impinges on plan and build, fulfillment and fault enrichment is maintained in a single, integrated inventory database, and that this inventory has sight of - and ideally manages - all processes which alter that data. Given that a typical mid- to large-sized operator might have dozens of systems which retain such data it is a very tough job to transform all this data into the right format, to ensure data quality, to load it to the new system, and to transfer all the relevant business processes onto the new platform. Typically, such a transformation takes years and costs tens of millions of dollars, if not more.
The difficulty of such transformations is such that the industry is littered with the wreckage of failed or partially completed projects that aimed to do this. And even where such exercises have resulted in a partial or complete success, the introduction of a new technology is frequently needed in such a short time period to meet market demands, and the fear of the cost and delay associated with updating the central inventory is such that very often a small silo is built to undertake the necessary support, resulting in complex, non-centralized system terrains.

With the advent of NFV an inventory-centric approach which integrates physical and logical network and IT information into one place is no longer feasible or sensible. The virtualization of the network means that the relationship with physical hardware is tenuous at best, and can change rapidly – within seconds. The standards that are emerging in this space demand that the function and service inventories are decoupled from the plan and build physical infrastructure systems. In other words, planning and building physical hardware is undertaken in separate systems to the fulfillment of services. While these systems will require some level of communication, this is of a simple nature relating to key hardware platform information.

The logical infrastructure is maintained and managed entirely within the NFV systems, the physical entirely outside.

With respect to BSS, a similar story emerges. Through the 2000s and into the early 2010s, the primary aspiration of many operators was to create an integrated stack which offered an order capture portal, processed the order automatically using a data driving catalog, and provisioned the emerging services through a link to the underlying fulfillment systems within the OSS. And of course, bill these services at the appropriate point.

Most of these stacks missed two key features that are emerging as a necessity.

- The recognition that information flows are conversational between the end-user and network after the first order provisioning.
- The timeliness and granularity of orders is drastically different to that envisaged at the start of the century. No longer are consumers purchasing a service package for a year at a time. They are adding additional cost options, removing options, changing configurations (some of which may be chargeable) and generally wanting things finalized within seconds.
- In consequence of these trends, the size and complexity of orders may at times be reduced, but the volume and the number of systems and sales channels involved will go up. And most certainly, the process is a far more interactive, dynamic process than anything envisaged a decade ago.

Order portals, ordering systems and product catalogs which assume a “top down” flow of orders from the customer to the network, and assume that no configuration information is coming from the network, and that no revised facilities are emerging from the network to be on offer to customers will not suffice as we move forward. OSS now sits alongside ordering systems as a dynamic triplet with the network. Having a conversation with users during the sales process is an increasingly important part of the process and having access to information about what can be provided and how it can be provided aligning to the customer’s requirements – some of which they may not even realize – is paramount going forward. In short, everything we thought we knew about the ‘integrated BSS/OSS stack’ approach to servicing customer needs is no longer viable or effective.
Service Orientation

The last twenty years have seen customers obsessed mainly with speed of access to the Internet and all it can offer them. From dial-up services in the late 1990s, through increasingly fast DSL and broadband cable access services, we now see ‘fiber to the premise’ services which are now widely deployed in many areas offering speeds in excess of 70Mbps. As available speeds have become more than customers can typically utilize in the short term, prices and margins have dropped and focus has shifted to the nature of the services on offer. Many operators now offer or plan to offer:

- Integrated mobile and fixed broadband services.
- Triple or quad-play services containing also content services such as video on demand and TV or 3rd party applications from OTT players on top of the basic connectivity and own services.
- Internet of things embedded support, for example new cars are now typically shipped with an embedded SIM and free access package which allows certain services such as navigation data free of charge and entices the purchase of value add services via a dedicated car App store.

Figure 2: The move from legacy service delivery to selfservice, process automation and rich service offerings.

End-customers, whether consumers or businesses, are now accustomed to having services, applications and content delivered to them within seconds of their purchase. Operators need to be able to meet these needs, and indeed it is in their interests to do so. As technologies such as NFV deploy, the ability of operators to sell not only content, but bundles of services which include content and enhanced network related services, increases.
This can only be achieved if operators not only deploy NFV and the relevant content-related services, but also have the ability to sell them in such a way that the consumer gets the buying experience they expect – easy purchase, delivery within seconds (including any network re-configuration) and the ability to self-configure any parameters within the overall service that they wish to.

This requires a sophisticated approach to the customer sales portal, the BSS systems and billing environment, and the OSS which enables multi-channel sales, manages the network and underlying IT resources. And all of them must be seamlessly integrated, at least from the customer perspective.

Operators who fail to perceive this need and act to enable it will be relegated to commodity network providers with significantly reduced margins.

Network access ubiquity

Consumers and business are becoming increasingly reliant on technology, and it seems that most people under 30 years of age would have difficulty navigating using a paper map, or would know what to do if their car broke at the roadside without a phone in their pocket.

Continuous, high speed, network access is now assumed by most technologies, whether mobile or otherwise, and technologies such as LTE, 5G and small cells as well as in-premise femtocells are addressing these needs, and additionally allowing operators to monetize this desire in preference to public Wi-Fi.

This imposes further burdens on the operator BSS/OSS stack. In particular, there are increasingly blurred lines between what is infrastructure and what is part of the end-customer domain – for example, is a small cell deployment into a shopping center infrastructure or CPE? In one sense, this doesn’t matter so long as the fulfillment systems can manage the volume of deployments and integrate the facility into the network, and provided the BSS can properly bill the relevant parties, but it does potentially require increased flexibility and scalability within the relevant systems.

The advent of cloud services, whereby consumers - and increasingly businesses - operate more flexibly across a range of devices and physical locations, is increasingly driving the need for ubiquitous network access at all times. The ability to purchase, provision and re-configure services on all devices and at all times and locations is an important corollary of this trend, as witnessed by Google’s recent decision to penalize web sites which are not mobile friendly by pushing them down the search listings.

Top Three Tips for choosing the best approach

Anyone who has worked in this industry for more than a few years has the sense that things never stop changing. Just when you think you’ve got it all figured out, a paradigm shift occurs that calls into question the assumptions that we took for granted. As an industry, we need to build flexibility and responsiveness to change into the very heart of our OSS and BSS systems. We need to move away from ambitious, multi-year, costly transformations for the very simple reason that a high percentage fail, and even those that succeed are often verging on obsolescence within a short period of time.

If we’ve learned anything in the last 30 years, it is that there is no single “silver bullet” that will solve every problem, though the young and the naïve still expect this ‘any day now’. Instead, we see steady, incremental improvements in the way the industry works, with increasing flexibility and use of standards.
The introduction of cloud based services and NFV will be the number one cause of obsolescence in the OSS/BSS stack in the coming years, and this will particularly impact those operators who have successfully made the transition to an inventory-centric approach.

We can draw a number of rules of thumb to guide our way to increased flexibility and cost reduction in the coming years:

- **Pragmatic, incremental transformation** - Don’t undertake big, expensive transformations of the full OSS/BSS infrastructure because by the time they are completed, even if they succeed, they will be obsolete – the pace of change has become too rapid.
- **Separate logical and physical network systems** - Separate the plan and build process from the fulfillment process. There is no longer a need to couple these tightly together, indeed it is counterproductive in a modern network and its introduction is costly and fraught with risk.
- **Don’t assume a top-down order process** – The increasingly dynamic nature of customers’ services and the networks which serve them is leading to a requirement for more interactive communication up and down the stack. Orchestration of services from the ground to the cloud is essential in achieving customer satisfaction.
- **Build in flexibility, plan for change** – Architectures change. Instead of avoiding “silos”, plan for them as part of a flexible infrastructure with clear demarcation between layers and well-defined interfaces to allow multi-vendor, multi-technology and multi-channel business.

There are three key aspects of the solution approach we advocate:

- **A process centric approach**, which leads to incremental rather than ‘big bang’ transformations and significantly lowers cost and risk.
- **Consider moving BSS to the Cloud** – this can drastically reduce costs and risks, and create more dynamic, flexible BSS capabilities.
- **Don’t get locked into a single vendor** – Big players in the industry love to tell you that their “best of suite” approach will solve all of your problems. It won’t. But after the huge cost of transformation, moving away from them will be hard if not impossible.

### Process centric OSS

Rather than introducing a monolithic, centralized inventory to the OSS, adopting what we term a ‘process centric’ approach has significant advantages.

In this approach, a centralized process automation framework is deployed, which coordinates automated processes such as fulfillment and fault resolution, drawing upon the relevant existing or new data sources as necessary to accomplish its ends.

Where appropriate, the fulfillment approach can be driven by a technical service catalog, which introduces considerable flexibility into the overall architecture.

By adopting such an architecture for the OSS, the following advantages are gained:
- Existing systems and databases can be leveraged - if they are not broken, there is no need to replace them.
- Where existing systems do need to be replaced or upgraded, this can be done without significant disruption to other systems, i.e. incrementally rather than in a ‘big bang’ transformation.
- New systems can be added which are dedicated to innovative services without undue disruption to the overall framework and without the perception that this is somehow contrary to the broader architectural strategy.
- A single, integrated technical service catalog alongside an OSS capable process automation framework offers a single place to introduce, review or amend service capabilities and process definitions and publish them to multiple sales channels.
- Costs and time to deploy are significantly reduced, as are the risks of large scale, multi-year transformations. By leveraging existing systems, costs are further reduced.

Figure 3: Process centric OSS coordinates processes as part of the service delivery.
What components are required to deliver such a strategy?

In order to deliver such a process-centric strategy, the following components are a necessity:

• Process automation framework
  - An OSS-specific process automation framework is essential. OSS has certain needs such as being able to handle the high volumes of transactions associated with consumer wireless and wireline services, as well as the more business oriented needs such as tracking jeopardy and Service Level Agreements (SLAs). In addition, it will need to have a comprehensive and well-proven ability to handle rollbacks, device and system timeouts, and other such low-level matters when dealing with networks. It is important to note that typical general purpose workflow solutions or those designed to support BSS functions such as order handling, do not typically scale well to OSS transaction volumes, particularly for wireless consumer services, nor do they handle downstream failure gracefully, for example where a network element or downstream system is temporarily offline.

• Technical service catalog
  - In order to allow rapid change to available services, having a technical service catalog with a graphical user interface, integration with the process automation framework, and ability to define and manage order parameterization and dependencies is essential. Ideally, the catalog should be capable of uploading service information from the network, for example utilizing emerging NFV standards, so that rapid change and publication of revised services to multiple sales channels is possible.

• Lightweight federated inventory
  - For those services that require management of logical resources as they relate to physical, for example the tracking of assigned IP addresses, where VLANs run to, how VPNs are connected and available ports on devices, an inventory will remain necessary. At times, existing inventory systems can be utilized to meet this need. More commonly, a lightweight, relatively passive inventory which can synchronize information either from the network, or from other inventories sufficiently to support fulfillment may be necessary. Ideally this should be standards based to facilitate this federated approach, and it should align to NFV standards to avoid obsolescence in coming years.

• Separate plan and build systems from fulfillment
  - As logical networks become dynamic, and more complex, tracking logical infrastructure changes in nature. NFV is likely to require separate fulfillment inventories for service and function deployment which are part of the infrastructure and therefore separate from plan and build. Separating plan and build systems from fulfillment can be achieved by re-purposing existing inventories to become physical planning systems, and extracting and synchronising only the device level information required into the fulfillment inventory.
Working with the cloud

Operators will need to consider how and where they will implement and evolve their BSS capabilities.

A significant challenge will be the increasing demands for ever more sophisticated BSS functions, which tie into increasingly dynamic network environments. These offer consumer customers real-time options for purchase and reconfiguration, and offer business customers more rapid design, feasibility validation and pricing of their requirements.

Consumer and business customer’s expectations of instant access to new service options and personalized packages are driving change and require more responsive, interactive ordering, validation, feasibility and fulfillment systems.

Cloud and NFV technologies and platforms enable operators to respond to these expectations – but only with the right approach.

For very large operators, it may make sense to invest in BSS systems which track innovations in the space. By so doing, operators can gain competitive advantages over other players in the market. Increasingly, however, larger operators have invested in “best of suite” solutions from a small number of large, powerful vendors who are in themselves not especially innovative and have a vested interest in not enabling more flexible environments.

The other extreme are the smaller operators, for which the costs of maintaining and evolving such complex, flexible BSS systems are likely to prove prohibitive.

The objective for many operators – both large and small - is likely to involve moving some or even all BSS functions onto a cloud-based platform such as Salesforce.com, where an increasingly innovative ‘app store’ community is offering a range of solutions such as CPQ (configure, price, quote) and billing solutions. Provided this cloud-based approach can be linked effectively to the OSS solution, for example linking...
network feasibility and updated service availability into cloud-based ordering and catalog solutions, this offers significant potential for improved customer service and reduced cost and risk.

By combining the deployment of NFV and cloud-based BSS the operator is able to very rapidly introduce new services and innovations, as the flow of service class information can flow almost immediately from the NFV service catalog through to the ordering catalog within the cloud platform almost seamlessly. Without NFV, significant reductions in service introduction time can still be achieved with this approach.

In this context, investing today in significant transformation of BSS - in particular Enterprise Product Catalog (EPC) architectures which assume monolithic, non-cloud-based strategies, and are not populated “ground up” from the newly intelligent NFV network - is likely to be an expensive blind alley. Attention should be paid to whether cloud-based product catalogs and processes can meet needs of today, and if not, when they are likely to do so.

For those operators determined to invest in their own BSS, driven by an in-house EPC rather than cloud oriented approaches, attention should be paid to how this will operate in an environment where network abilities and functions are changing on a constant basis, requiring the BSS to receive information about functions from the network. Offers to market are likely to be more flexible and dynamic, personalized to the individual customer, combining marketing, pricing and network capability on a fast turnaround. This is in contrast to earlier more static approaches such as marketing teams determining what services would be of interest to a customer segment and hoping they got it right. Customers, and especially enterprise customers, expect more from their vendor.

Figure 5: Nokia enables accurate sales process via Salesforce: Apptus CPQ on Salesforce below.
Multi-vendor approach

Utilizing a pragmatic, process-centric architecture for the OSS environment and a cloud-based approach for the BSS results in a supremely flexible environment. Within the OSS, which inevitably is close to the network, a process-centric approach allows multiple systems to be integrated relatively easily into a coordinated process.

Nokia terms this ‘Orchestration from Ground to the Cloud’.

With a modular and vendor-agnostic OSS it is easy to introduce multiple vendors, leverage existing assets from several vendors or custom build in-house solutions, and to evolve systems in a lower risk, lower cost and more timely fashion due to them being smaller and more focused on specific needs. No longer are there “too big to fail” systems which are high risk and high cost to replace.

With respect to the BSS, the advent of cloud-based operations, with supporting “app stores” has created a vibrant, competitive, multi-vendor environment for such capabilities as CPQ, billing and many other aspects of the commercial support environment. This lowers costs and promotes innovation through competition, just as the equivalent service has done for Apple and for Android in a consumer context. This significantly reduces cost and risk to the operator and promotes and enables innovation. However, the same OSS must be able to simultaneously support legacy BSS systems and allow their migration when justified. This enables business continuity and gradual transformation based on business need.

The following diagram illustrates how a new fulfilment environment can look, working with multiple vendors and hosted on a cloud-based platform.

Figure 6: A multivendor cloud environment for fulfilling services interactively.
While pre-integration has been heavily used as a sales argument for full OSS/BSS stack with a promise of lowers risks, cost and time for integration, it has many times failed and turned out in practice to be “integration on-demand”. Today integration is no longer the risky prospect it was in the past. Current technologies and standards-based interfaces combined together with good experience and capability makes this straightforward and low risk, leading to significant changes in what is the optimal architecture for an operator. No longer do we need to be tied to a single vendor because we are scared of the risks of integration.

How can Nokia Help?

Nokia offers a number of solutions and products which can help operators take advantage of the approaches mentioned. FlowOne solutions are created to address the business and operational challenges at the very heart of the communications service provider. In most cases fulfillment and orchestration challenges can be linked with effective use of infrastructure to deliver services; improving time-to-market for new products; enriching the ordering process and customer experience; increasing automation and operational effectiveness. FlowOne and its eco-system of industry-leading partners is relevant to the discussions in this whitepaper and includes:

- **Asset-to-Service** - A service and resource inventory designed from the group up to support inventor federation, and reconciliation from the network. This implements the TMF SID standard.

- **Concept-to-Market** - A technical service catalog which links to our process automation framework, and enables service decomposition to be defined, as well as the flow of order parameters and service dependencies. We are tracking the emerging NFV standards, and are able to offer automated on-boarding of NFV service definitions right now.

- **Lead-to-Order** – An Enterprise Sales Transformation approach – which allows sales automation platforms (incl. Salesforce) and certain partner (Cloudsense) CPQ and Billing apps to leverage information made available by the OSS process automation and federated inventory. This is not, needless to say, a “top down” approach – the flow is into Salesforce, as well as out of, in a full dynamic two-way process.

- **Order-to-Activate and Trouble-to-Resolve** - A mature process automation framework which has evolved over two decades to support operators. This is OSS specific, and offers a graphical user interface for process definition as well as a web based monitoring capability suitable for example for Network Operations Center (NOC) support. This handles rollbacks, timeouts and orchestration across multiple systems and devices, and operates at very high volumes and transaction speeds, as one would expect given its history. It handles jeopardy and SLA management.

- **Strategic partnerships with an eco-system of cloud vendors.** Nokia has relationships with a number of cloud-hosted vendors, which together offer diversity and choice for our customers, as well as pre-integration, all hosted within the cloud.

FlowOne solutions are created using Fulfillment SoftBlades. The SoftBlades are individual pre-integrated and proven capabilities of the Fulfillment suite that can be deployed in virtual, physical and hybrid IT environments. Any combination of these SoftBlades can be deployed to build a flexible array of solutions for network and IT transformation.
As one might expect from the above discussion, all of these systems can be deployed standalone, and can leverage external solutions instead of, or in addition to the Nokia equivalent.

Nokia understands the importance of being partner-friendly and advocates openness. Thanks to this, operators can choose the partners and system integrators they prefer as well as decide the level of development they take in-house in a longer term.