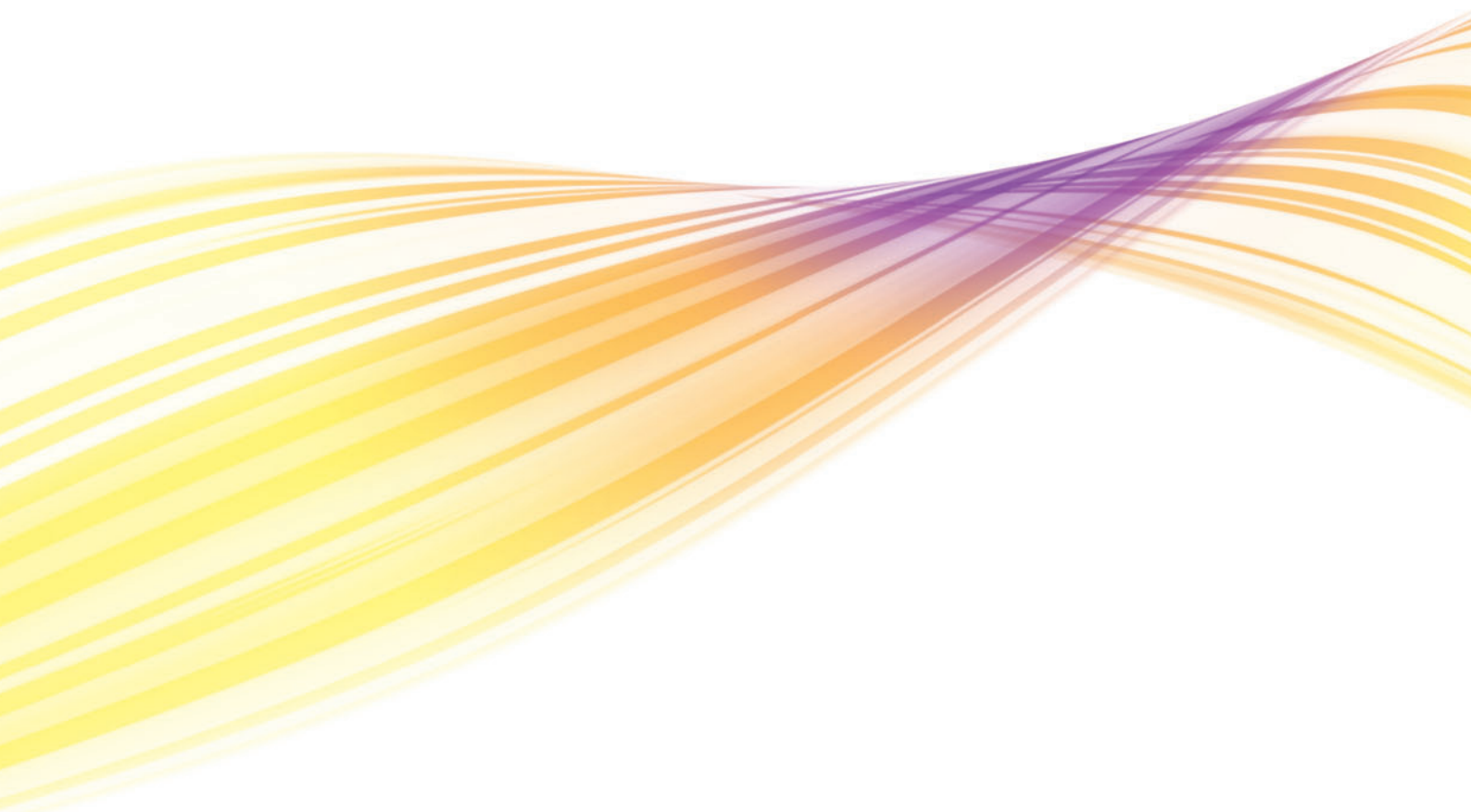


OSS architecture – the next generation

**Nokia Siemens
Networks**





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Introduction

Communications service providers (CSPs) are facing extreme cost pressures while fiercely competing for additional market share and revenue. In order to adapt rapidly to the changing business environment and to capitalize on the new business opportunities available in the market place, people, processes and support systems must all be highly agile.

New attractive services and business models are emerging, for example in mobile advertising, content brokering, IPTV, Web2.0 community business and mobile banking. All of these require investments.

The quest for economies of scale is also an option: analyzing acquisitions or renewing their infrastructure to take advantage of a company's national or multi-national scale to radically reduce costs and gain more **access to customers**. This also helps to free financial and other resources to tackle new opportunities.

Investors and shareholders look for new growth and increased profitability with attractive returns. In any business change and in particular when addressing new opportunities, additional concerns often emerge, from the business focus to the simplicity and manageability of the business. It is vital to be able to leverage existing investments more efficiently or free cash from old operations.

These challenges are frequently compounded by fragmented business environments in which organizations and processes are divided into silos supported by isolated management solutions. Such fragmentation usually leads to high costs and is often seen as a major barrier to change. A growing number of CSPs are running OSS transformation projects to manage business convergence and to overcome the obstacles posed by legacy systems. Many also rely on the promises of Service Oriented Architectures (SOA) to support optimized business processes.

Nokia Siemens Networks is addressing these challenges by further developing its OSS solution and product portfolio to provide topical solutions. Our vision of the next generation OSS is based on a consolidated and network-agnostic OSS solution, using harmonized

system platforms and a high level of automation. The next generation OSS should meet the following requirements:

- Reduced operational costs through increased automation and optimized business processes.
- Higher modularity and openness in application architecture, bringing the ability to adapt and allowing capitalization of new business opportunities.
- Complete view of services and efficient use of resources and assets enabled by consolidated OSS solutions.
- Simplified architecture with harmonized platforms, allowing OSS investments to be optimized while minimizing system integration, maintenance and operations costs.
- Fast and flexible adaptation of network elements to speed up time to market for new technologies or services.

Major CSP challenges across all segments and access types

- Managing customer experience and insights
- Streamlining OPEX structures and enhancing processes
- Technology transformation/ change management
- Finding additional revenues and coping with new business models

Business transformation calls for OSS transformation

The communications industry is in transition and business convergence is now a reality. This business transformation requires a fundamental change in OSS/BSS solutions.

Consumers and businesses around the world are enjoying superior value and greater innovation as the Internet merges with the world's communications networks. Likewise, telecom CSPs now have a superb opportunity to broaden their reach to create new sources of income.

User segments continue to fragment and customers will increasingly look for service packages tailored to their personal lifestyles. Being customer-focused, not product-focused, is vital. See Figure 1.

At the same time, business models are evolving, driven by the Internet and Web 2.0. Triple-play and multiplay are on the agenda, with integrated mobile, fixed, broadband and TV services. This calls for greater internal collaboration, as well as closer relationships with content and Internet providers. Government regulation can also impose sudden new rules on a well-established ecosystem, on top of the market disruptions introduced by competing CSPs or enterprises entering the market place from other industries.



Figure 1. Building esteemed end-user experience is essential for operators trying to differentiate – but it can also be a large cost factor.

We believe that the major challenge for CSPs today is providing higher value for end users while facing constant, intense cost pressures and operating in often complex value networks. The key to success lies in the ability to quickly and effectively respond to change while still making use of a low-cost base, a challenge which demands improved integration between people, processes and systems.

“We obtained 55% shorter time for setting up the required IT support for new telecom service products, 20% reduction in throughput time for customer projects, at a value of 1M€, 40,000 free network resources discovered which were previously marked as taken, and 14 databases and systems replaced by 1”.

EWE TEL – a leading German regional provider implementing our Inventory solution

Enterprise Architecture and OSS

As a consequence, many CSPs are looking to approach changes in a comprehensive way. When a CSP enters an entirely new value network, for example mobile advertising, changes are triggered in the various branches of its architecture:

- **Business architecture including processes**, for example, customer interfacing process, sales fulfillment, payment settlement with advertisers and verifying advertisement delivery
- **Information architecture:** How to make profiling and relevant data available to the business intelligence function, promoting understanding of customer preferences and the correct customer segmentation
- **Application Architecture:** Possible re-use of existing sales tools, CRM and billing system changes and any B2B integrations needed for advertisers
- **Technology Architecture:** Capacities needed for media coverage and the protocols required for use cases such as media and advertisement consumption.

This **Enterprise architecture** gives a framework to describe the elements of business strategy, business cases, business models, processes, supporting technologies, policies and infrastructures that make up an enterprise. It also gives a way to govern the enterprise and its information systems and planning changes to improve integrity and

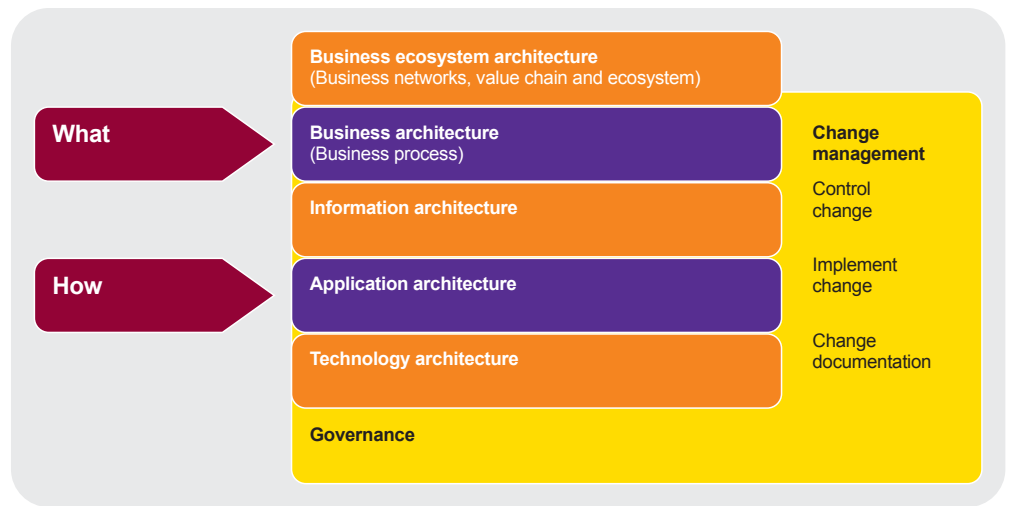


Figure 2. Enterprise Architecture gives a comprehensive framework that allows a structured understanding of the management of architectural changes in a structured manner.

flexibility. In other words, Enterprise Architecture crystallizes **what** the organization needs to do and **how** it does it, in order to be as efficient and productive as possible. See Figure 2.

From the literature, we can find several suggested enterprise architecture frameworks, such as TOGAF or Zachmann's model. Each has its own merits, varying somewhat in the order of the key layers. The common denominator is the more comprehensive approach to Enterprise change processes. This is regardless of whether one is considering necessary changes to financial management systems in the banking industry or a large scale next generation OSS renewal. Another viable benefit from common frameworks is that they also help to share the best industry practices.

Initial Enterprise Architecture can often be defined "as is" – a combination of the past strategies, decisions and regulatory requirements. Understanding the current environment and enterprise architecture as well as the new requirements allows a CSP to move towards the desired architecture. Equally important is to control changes through detailed planning and execution.

Enterprise “Stack”

Successful planning for architectural change will also reflect the changes to Enterprise Stack to understand linkages and relations. A simplified Enterprise Stack is illustrated in Figure 3.

Enterprise Stack also gives a framework with which to plan deployment of new technologies, such as BPM. It also aids later migration to SOA and use of Shared Information and Data models, for example in OSS renewals.

Important further considerations for OSS may include, but are not limited to:

- The implications for business processes and their efficiencies
- The process modeling options and how these help simulate future changes
- The information models available and how they link to existing information architecture
- The proposed integrations and interfaces and their consequences
- The time line that should be adopted to benefit Business Process Management and SOA the most

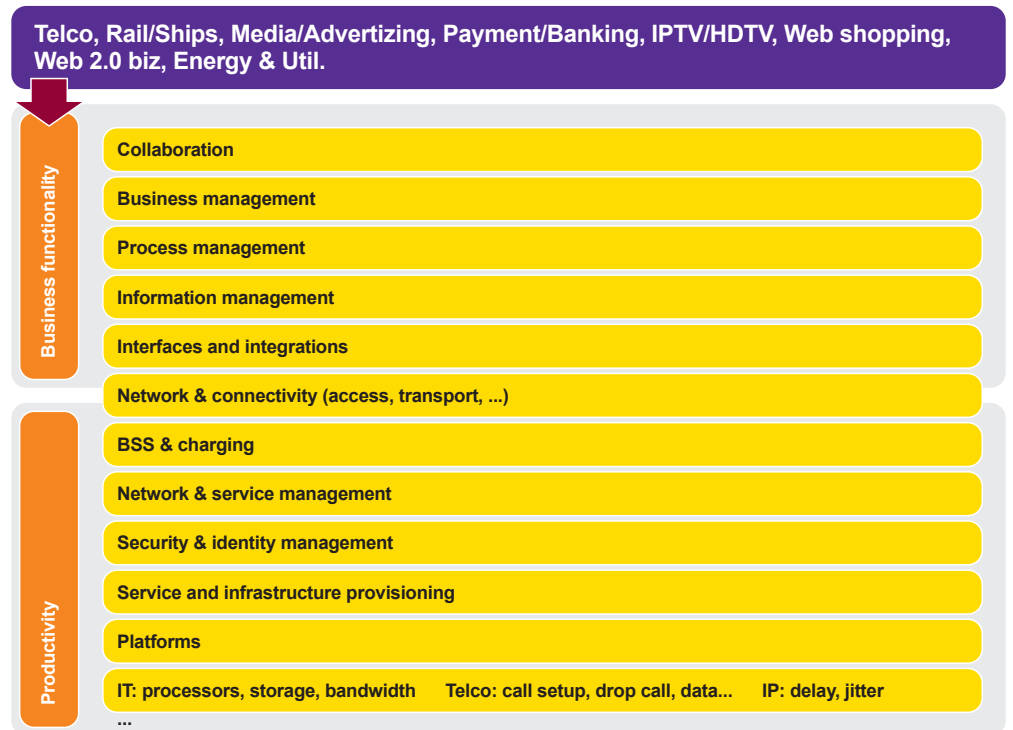


Figure 3. Simplified Enterprise Stack.

For example, should a CSP wish to increase efficiency in operation, TeleManagement Forum's eTOM is a commonly applied base framework. This needs to be augmented with ITIL, TMF's Shared Information Data Models and OSS Though Java Initiative (OSS/J) for completeness. To really deploy such an OSS transformation framework for a top down, need driven design, one must be able to:

- Manage the flow of data to gather information to analyze the current state
- Process gathered data through business and technology templates and models and link to data repositories
- Recapitalize output in business, technology and knowledge use cases

Modeling reveals the most time and resource consuming operations and where major gains would be achievable, often with quick returns. This top down approach to NGOSS would allow setting of the right priorities, but requires a deep understanding of both the processes and underlying technologies.

Fundamental changes needed in legacy OSS solutions

When converging services across different channels and access methods, CSPs are often faced with a fragmented business environment in which organizations and processes are divided into silos supported by separate “stovepipe” solutions – often a mixture of in-house development, customized and product-based point-solutions. These silos create significant obstacles and lead to many unwanted inefficiencies:

- Resource consuming operational processes with many overlapping functions
- Maintenance and system integration requiring a lot of additional manual work
- Increased risk of losing service quality or compromising customer experience
- Inflexibility and slow time-to-market when deploying new services
- Risk of operational instability
- In-ability to utilize fragmented data

It is estimated that more than 60% of OSS spending goes on maintaining legacy systems and building customized solutions for new services in-house (OSS Observer April 2007, OSS Forecast and Analysis Research Ltd.). Many of these operational processes can be redesigned to dismantle such cost structures by removing the silos that are difficult to manage and to improve overall cost-efficiency and profit margins.

Enable revenue growth and capitalize on new business opportunities

The telecom industry is undergoing further consolidation. Many CSPs and infrastructure vendors are actively looking for new ecosystem partners to build economies of scale, widen their access to global marketplaces and look for growth opportunities in developing markets. The resulting mergers and acquisitions, joint ventures or network sharing arrangements all have an impact on the legacy OSS/BSS solutions in place.

To enable future revenue growth, many CSPs are pursuing alternative or additional sources of revenue while trying to differentiate. The fight for market share has not only called for aggressive pricing strategies but also for an increased focus on managing customer experience. A major part of this is developing the ability to scale services up efficiently, requiring the development of new skills and new, more scalable platforms.

The creation of new services and service concepts, for example, will now need to happen in days and weeks, instead of the current norm of months, perhaps years. Consumers of telecom services are increasingly expecting very fast service introduction yet with the reliability of traditional telecom services. In order to meet these requirements CSPs will need to upgrade their current service creation, service deployment and service optimization solutions.

Following these trends, the shift from traditional network-centric operations to customer-centric processes is now clear, demanding improved end-to-end management capabilities across the various management layers and “stove-piped” silos of the legacy OSS and BSS systems.

Improve operational efficiency

Today’s intense competition for market share is forcing many CSPs to search for new ways to raise operational efficiency, reduce costs significantly and combat price erosion and static average revenue per user (ARPU). CSPs in developing countries must accomplish a very low cost base to balance the extremely low ARPU, while CSPs in mature markets have launched major development projects to keep their operating expenses in line with almost flat revenues.

Transforming OSS/BSS platforms and partially rebuilding with more modern and harmonized platform components leads to considerable savings in the long run: reductions in time, effort and costs spent on system integration, administration, maintenance and training. A highly adaptable and flexible OSS architecture is also the key enabler for more streamlined operations. This allows CSPs to re-design many of their operational processes and obtain high performance through increased automation and improved utilization of all assets.

To achieve the best possible improvement in operational efficiency, CSPs need a holistic view of their operations. This will help them optimize network capacity, invest at the right time, market their capacity in the best way, maximize the use subscribers make of services and minimize leaks in billing

The telecom industry Business Benchmarking study, carried out by TMForum and OSS Observer in 2007, shows that CSPs with the best performance ratios for service fulfillment and problem resolution were also among the best in reaching their goals and being the most reliable. The investment on processes has paid off: "process maturity and automation enable CSPs to exceed customer expectations at low cost".

"Based on the improvements made so far, the project is more than covering its cost, but more importantly we now have a clear picture of our system, giving us a strong foundation for implementing future improvements – this is the big benefit of the project for us."

– Mr Frederic Bertolino,
Director of Product Development,
Telefónica O2 Czech Republic

Optimize your connectivity

Network connectivity solutions will also pose various challenges in the near future. The expected massive growth in traffic volumes, induced by IP based and high-bandwidth demanding data services, will demand increased capacity. Smooth adoption of new access and backhaul technologies is needed to build the necessary bandwidth and indoor coverage, particularly in the home, at low cost.

While IP-based solutions and the adoption of flat network architecture help to simplify the actual physical network, operating complexity can increase. For example, new measurements and network monitoring techniques are needed to provide insights into IP-based services. In the world of mobile broadband, managing the network capacity and optimizing the utilization of network resources under fluctuating load can also be an additional challenge.

Re-distribute your OSS investment

Existing OSS systems have been built using a significant amount of tailored software and customer-specific systems integration work. Increasingly, these customer-specific solutions need to be replaced with software based solutions to lower recurring maintenance costs. This requires new thinking in how to adapt the network elements and understand the data requirements of the applications residing on top of the integration layer.

The maintenance investment freed-up from the lower layers of the OSS (element and network management) should then be invested in the upper layers of the OSS, where significant application development is needed to support new business models, operational concepts, value chains and operational procedures.

A vision of harmonized OSS architecture

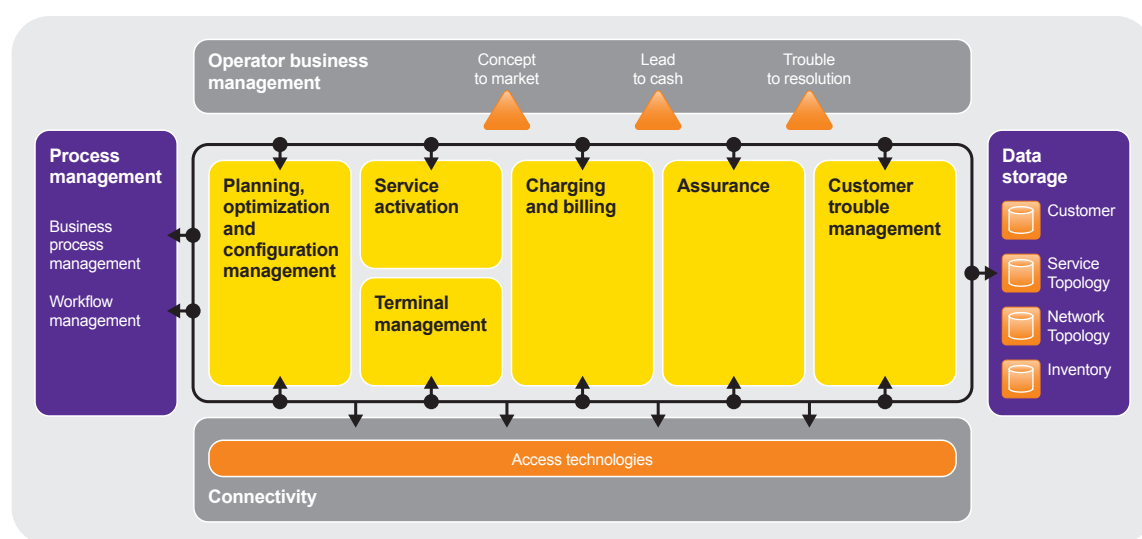


Figure 4. Modular software architecture and process automation to simplify operations

Our vision of harmonized OSS architecture is inspired by the TMF Lean Operator Initiative and based on four key areas:

1. **CSP's process architecture.** The CSPs' business processes can be supported by introducing modifiable operator process templates out-of-the-box and enabling a higher level of automation in their daily routines.
2. **Common information architecture** means stepping away from "stove piped" data and supporting shared information and data models. This enables OSS/BSS level application interoperability through Common Information Models.

3. **Modular application architecture** will bridge the gap between service and resource management applications. A high level of modularity allows flexible solution building: it enables easier maintenance, allows changes on one component without affecting others and allows new components to be added as required.

The application architecture itself is separated from the network element adaptation/mediation layer. Applications should therefore be built as multi-vendor and multi-technology capable. The architecture should also provide the openness that allows easy implementation of additional third party applications.

4. **Application integration architecture.** Interoperability and time to market is improved through compatible interfaces, common information models and through leveraging partner ecosystems and productized adaptation libraries. Using harmonized software and hardware assets when building these solutions reduces costs significantly. See Figure 4.



Shared data architecture – the way forward

Our vision on common data architecture addresses two key needs: 1) agreement on a shared data model and 2) ensuring data is available across all applications through standardized interfaces.

Regarding the Common Data Model, our intention is to seamlessly integrate the TMF SID and Network Resource Model (NRM) into one model, enabling effective management of network and services through cross-cutting use cases. The TMF SID approaches the topic from a business and services perspective, while the NRM viewpoint is that of telecom/datacom network domains and especially network resources. The common data model is a key cornerstone of application interoperability. The ultimate goal is a common data model that spans all applications and data sources.

Access to common and shared data means that anyone complying with the common data model can access any piece of data without having to know where it is physically stored. Such location transparent access enables a completely new level of efficiency in data utilization across an enterprise. It also makes it possible to create completely new kinds of value-added applications that make use of different sorts of data from various data sources. As an example, new and more advanced customer information and support systems can be built using data from several domains. Totally new revenue streams will also

become available from capitalizing customer and network data found, for example, in CRM, OSS and location based systems.

As an example, combining inventory data with customer data enables more focused marketing campaigns. For example, an ADSL user's distance to the DSLAM determines the maximum capacity it is possible to offer. This information can be used to offer higher capacity to customers who are still using a lower capacity connection.

A framework for building customer-centric operational processes

It is important not to simply introduce yet another process framework for the industry. When developing our OSS product portfolio, we have studied the different frameworks already well acknowledged by the telecom industry, especially the eTOM by TMF and the ITIL widely used by the IT world. In doing this we have come to the conclusion that by using the best of different process frames we can achieve both maximum customer value and process efficiency and use these as the basis for pre-integrated application sets and out-of-the-box solutions. For this reason, we have introduced a combined framework where eTOM and ITIL complement each other.

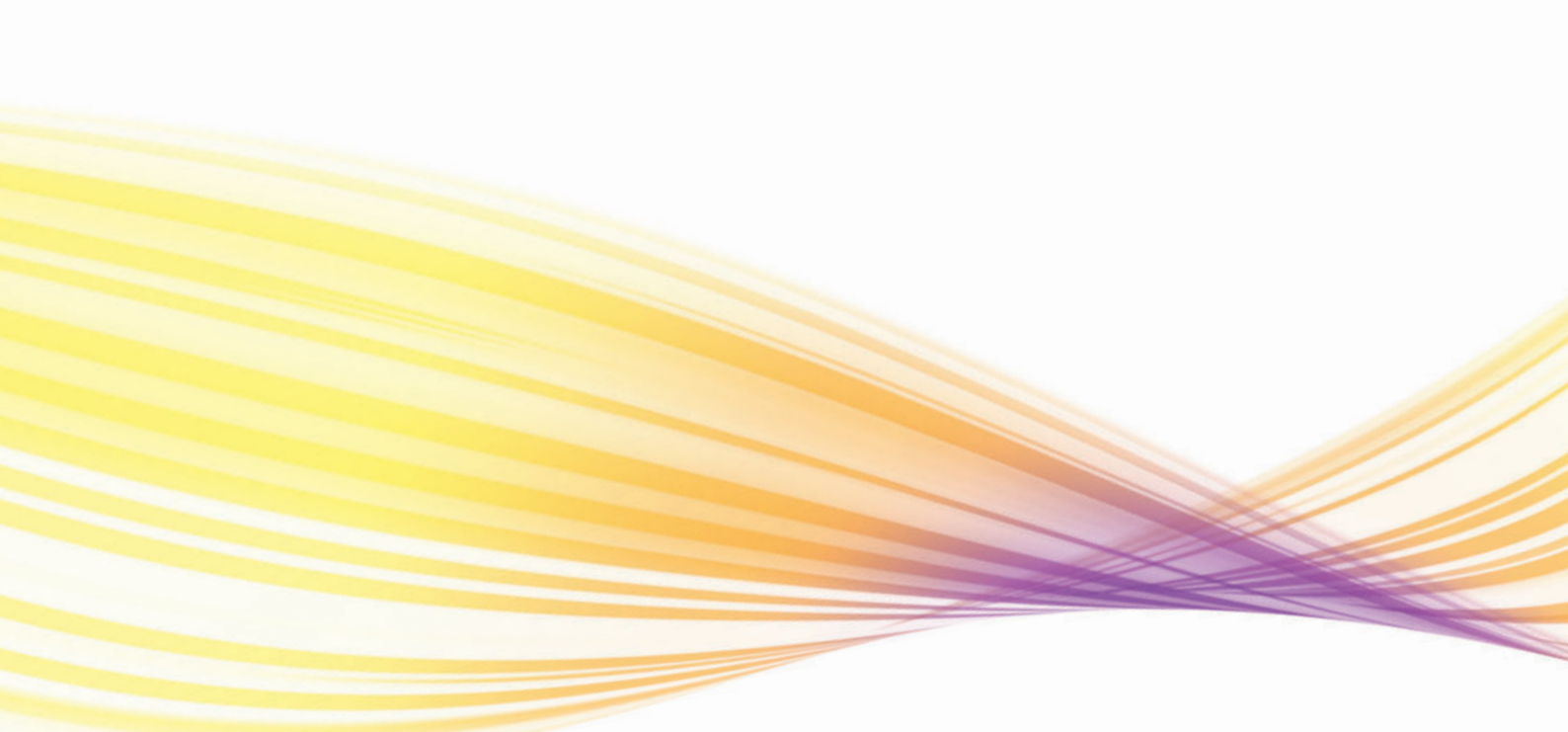
By using this logic, our consultation services and the business modeling tools available on the market, we can

build highly advanced solutions that can be adjusted to the needs of individual operators. Such solutions can range from managing isolated and small-scale operational workflows to large-scale development projects. In the latter, a number of synergies can be found, especially in handling horizontal change management activities – controlling, implementing and documenting changes.

OSS process automation

To help CSPs deliver competitive services rapidly and cost-effectively, our next generation OSS is based on operator use case driven functionality and is lead by workflow automation. With such a solution, the different applications needed for specific end-to-end telecom processes can be linked together through BPEL based SOA orchestration.

OSS process and workflow automation enables technology independent business processes. Should the business environment and market forces change, the solution can be modified to support the new business model. New workflow routines are easily added on top of a SOA architecture and the relevant process templates can be adapted to address the new challenges in the operational environment. Complementary application modules can be easily added on top of the existing platform, allowing the OSS solution to be built as needed.



We offer the following services and assets to allow the building of more efficient operating processes and highly automated solutions:

- Project and solution development: from consulting and development to kick-off, project management and the integration and implementation of solutions.
- Productized process templates: a set of modifiable process reference models for automated operations.
- Process automation tools: the necessary tools for enabling process automation (i.e. process execution engine).
- Our OSS/BSS products and applications: the new products in our portfolio built to support process automation.
- Adapters to integrate our legacy OSS and BSS products to SOA based processes.
- Third party products and applications as complementary process components.

OSS workflow automation is not only intended to deliver new services more quickly but also to cut operational costs by enabling end users to use self-care systems to solve their connection problems and activate new services. This allows service providers to charge these customers who call the care center rather than use the free self care system, as dealing with these calls entails an extra cost.

Enabling application interoperability and ease of integration

The fragmented OSS solutions and organizational silos we see today restrict the information flow between people, processes and systems. As a result, many of the service providers' assets are not managed efficiently and adequate data is not available as a basis for business decision making. At the same time, the telecom industry is full of different protocols and proprietary interfaces which usually lead to very expensive network renovations or upgrades.

By building a technology independent Element Abstraction Layer, CSPs can maximize the use of existing assets and so protect their investments while gradually planning and building the next generation OSS architecture. Our solution provides interfaces to existing OSS solutions as well as the ability to adapting to future technologies.

CSPs can improve the use of resources, have a complete view of services and minimize system integration, maintenance and operating costs by simplifying network management architecture and making the diverse OSSs work together. For this reason, the objective of our next generation OSS is to put into practice an efficient and scalable platform for technology independent network management. Our recipe for consolidated and harmonized OSS solutions includes the following:

- Technology independent applications are built as multi-vendor capable by nature.
- The applications provide services via Web service interfaces that can be easily integrated into an existing SOA infrastructure. Such a modular and scalable architecture allows CSPs to add functionality as needed.
- Open EMS Suite, a standard vendor neutral element management platform, provides flexible deployment of element, network and service management solutions on top of the same software platform.
- Interoperability of systems and applications is based on harmonized interfaces, data and information models.
- State-of-the-art integration capabilities use standard protocols. Pre-integrated solutions are readily available for a wide range of third party equipment, even with proprietary protocols. See Figure 5.

Nokia Siemens Networks, Open EMS Suite with Mediation Framework helps consolidate and harmonize OSS systems by providing open and standard interfaces. The Mediation Framework reduces the number of expensive customized, release-dependent network element integrations needed, while also enabling cost-efficient use of existing assets in the planning and implementation of next generation OSS solutions.

With Open EMS Suite an OSS vendor can cost-efficiently build element managers, interfaces and mediations in a multi-vendor multi-technology environment. The common framework and reusable assets such as mediation libraries enable plug-&-play integration and reduce the R&D cost required for an OSS vendor. For service providers this means product friendly integrations. Altogether it means removing the pain of customized integrations, hiding complex technology and enabling business driven management processes.

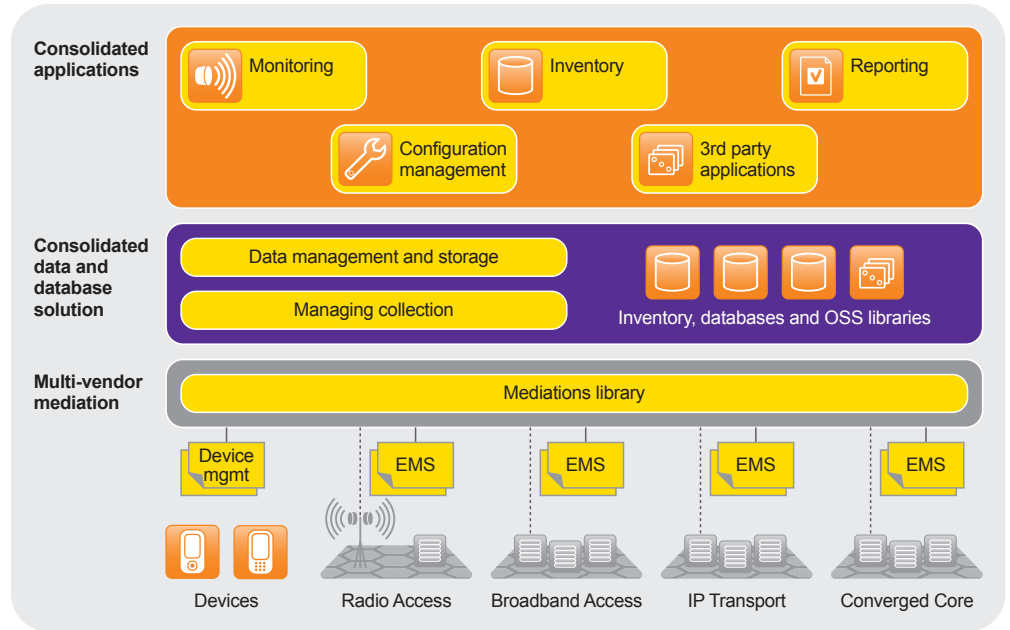


Figure 5. Consolidation and harmonization through layered OSS.

The OSS IT technology strategy

To allow the optimization of investments in OSS software and hardware, our vision of the next generation OSS is based on a harmonized system platform using market leading COTS components and Nokia Siemens Networks' Open EMS Suite (OES). The building blocks of our software and hardware platform strategy will be based on the following:

1. COTS HW: x86. The x86 instruction set based processors lead CPU innovation, provide the needed performance and enable efficient multi-vendor strategies.
2. COTS OS: Linux. Linux is a reliable and future-proof operating system with the flexibility to run on top of many alternative hardware options from different vendors. Open IT platforms, like Linux, can provide lower cost-of-ownership.
3. COTS IT MW: SQL, J2EE, LDAP, WS, BPEL. Our portfolio includes both open source and commercial off the shelf IT middleware to enable vendor agnostic solutions. This both cuts costs and gives greater security as they have been tested across the industry.
4. DOMAIN MW: OES, other RT components. We have developed these enablers in order to provide interoperability and common functions like single-sign-on out of the box. OSS middleware, OES, is also available to other vendors, allowing the sourcing of applications from multiple vendors.
5. Business processes and solution suites: our solution suites provide pre-integrated application sets as out-of-the-box solutions for various business processes. This enables rapid deployment and helps reduce system integration costs.

Solution examples based on next generation OSS

In the following sections, we introduce some use case examples showing improved efficiency through increased automation and reduced human interaction in selected operational processes. In addition to apparent cost savings, such process automation also minimizes potential human errors and reduces time to market when introducing new services – resulting in better customer service and improved customer experience.

VoIP auto-provisioning

Our Integrated Provisioning Solution can help improve productivity and cost-efficiency in service deployment and activation through automating many of the routine tasks involved. CSPs can introduce services faster and achieve a versatile and fresh service portfolio. Automating the provisioning of end-user devices and ensuring service settings are correct also frees the help desk from a mass of individual end-user contacts, resulting in more efficient customer service operations. See Figure 6.

In addition to the actual savings, the automation of provisioning can bring about revenue increases in two ways:

- Many users who face some sort of failure in provisioning don't bother to contact customer service (10–20% of cases) and will never use the service. By ensuring correct provisioning in the first phase, these latent users are turned into active ones.
- Quick and correct provisioning improves user experience and decreases churn.

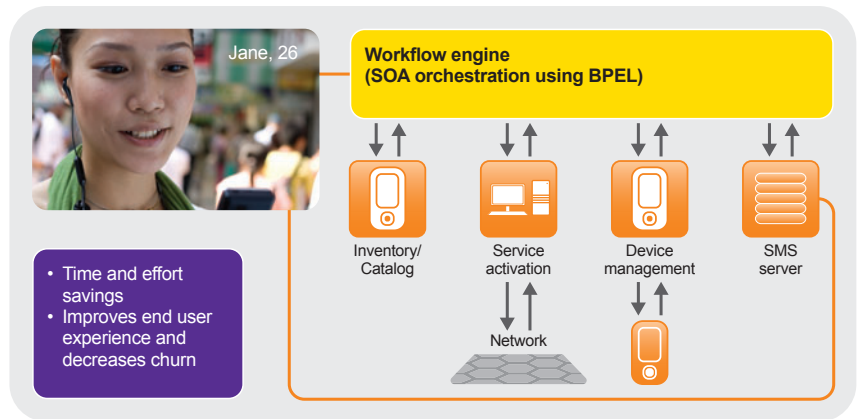


Figure 6. Automated provisioning of VoIP services to both the network and end-user devices.

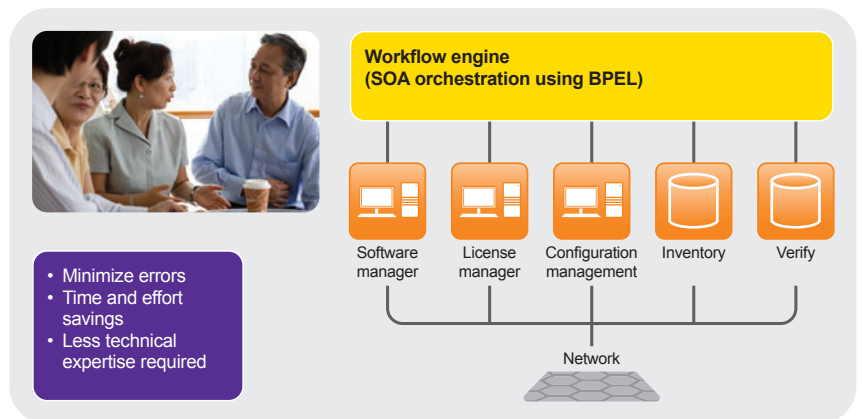


Figure 7. Introduction of a new network service – an example of HSUPA rollout.

Automated HSUPA rollout

The rollout of a new network service is a typical network management process which includes tasks that need to be done in a certain order.

With the help of process automation, a CSP can bring more structure to the process, shorten the time needed for the rollout and decrease operational costs by replacing manual tasks with automated ones. See Figure 7.

Transition to the next generation OSS

Self care portal

The self care solution allows users to access service via an interactive self-service portal, over a number of different access channels that include web and IVR. Problem resolution is driven by a knowledge base, with a page flow engine instructing the user what to do next. Different knowledge bases are available for different domains and the process can be modified without retraining by changing the engine flow rules.

Test probes can be automated and the selection of the next step can also be performed automatically. Error resolution can also be automated as PEL scripts, while adding new scripts can be done quickly via a GUI, with no coding needed. The solution can bring significant OPEX savings over the call center alternative. There is the option of making calls to the call center chargeable, turning it from a cost center into a profit center.

Our objective is to provide you with solutions that allow you to capitalize on new business opportunities while reducing operational costs, optimizing the use of assets and achieving greater flexibility. To help you accomplish this, our next generation OSS is designed to be highly adaptable, flexible and scalable.

We don't feel the transformation to the next generation OSS is a revolution, nor is it fixed to a particular date or year. As current OSS systems are crucial for the operation of a network they cannot be replaced overnight. The transformation and migration will need to happen gradually, making the challenge even greater – old systems cannot be turned off before new systems are in place.

By introducing NetAct Traffica for Customer Care, the leading Finnish 3G service provider Elisa's Network Management and Customer Care management teams brought tangible benefits to their financial, marketing, product management, and human resources colleagues by:

- Serving the same number of customers with 20% less staff
- Solving 98% of customer calls on the first level
- Decreasing field maintenance visits by 15%
- Improving customer satisfaction by shortening resolution time and making proactive customer contacts
- Creating better aligned customer operations with the brand promise of service leadership
- Improving the product design process by addressing feedback on product performance
- Increasing employee motivation in call centers

“Mobile service user experience, while being a relatively new concept for the China market is critical in bringing user friendly experience and improving operators’ service quality. We have introduced user experience into product design and optimization and will provide more user-friendly products and services.”

– Zhao Peng, Deputy General Manager
of CMBJ’s Data Service Center

To mitigate these risks, future needs must be anticipated in advance and OSS architecture must be designed to fit with future requirements from the start. OPEX for the legacy OSS needs to be reduced to make room for new investments and replacement of the old functionality. OPEX reduction takes many forms, including:

- removal of old, redundant OSS applications and systems
- streamlining of functionality in legacy OSS
- replacement of bespoke/customized systems integration work with standards-based software and off-the shelf mediations
- selective freezing of legacy OSS applications and systems
- encapsulation of functionality and making it “service aware” with SOA
- effective use of key OSS systems, moving functionality to these and taking other systems off-line

All of this will result in the reduction of the number of applications and systems to be maintained, thereby reducing the overall complexity and lowering the risks of migration.

Our intention is to further develop our products, services and solutions – and to release new ones – in close collaboration with our customers. Future solutions will encompass multi-vendor and multi-technology configuration management solution as well as comprehensive next generation service assurance.

The configuration management solution is a standard, vendor neutral element management platform. It also includes the Mediation Framework that helps service providers consolidate and harmonize OSS systems by providing open and standard interfaces. Together with other tools, it helps CSPs plan, implement, optimize and configure networks.

The solution’s mediation library contains off-the-shelf mediations and interfaces for a large number of different telecom protocols made by Nokia Siemens Networks and selected partner companies as well as development tools for building new mediations and interfaces standardized way. This enables significantly shorter integration time than with traditional integration methods.

As well as planning and implementing networks, our solutions include a business process modeling tool and a process automation engine for designing, executing, monitoring and managing business processes.

The service assurance solution will implement both Network Operation Center and Service Operation Center functionalities. It is designed to trigger automated actions when it receives data related to service status customer behavior, or customer management. Functions could include detecting traffic status and switching to an appropriate power saving mode or a customer care solution that can provide information to customers about major outages.

Nokia Siemens Networks Corporation
P.O. Box 1
FI-02022 NOKIA SIEMENS NETWORKS
Finland

Visiting address:
Karaportti 3, ESPOO, Finland

Switchboard +358 71 400 4000

Product code C401-00340-WP-200812-1-EN
Individual/Libris

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