Becoming a digital service provider: Profiting from 5G, IoT and virtualization with service-oriented operations

White paper

Abstract

Rising mobile traffic, resilient cloud-oriented architecture, new services blends, and customers' expectations are making service assurance more vital than ever. New technologies such as 5G, internet of things (IoT) and network function virtualization (NFV), are creating opportunities for new service revenues and cost optimization. These trends require operations, IT, care, and other groups to move to a real service-oriented way of managing quality and users' experience. Establishing service-oriented processes and groups such as a Service Operations Center (SOC) are effective strategies to scale, automate, and discern proactively. This paper will argue that developing a SOC not only has a strong business proposition, but is also essential as services and technology infrastructure is modernized.

Arguably, the move to a service-oriented approach is already well underway in the industry. However, several parallel trends are making this even more urgent. The capabilities of software-defined networking (SDN) and NFV will have a profound impact on service management and customer care. The orchestration capabilities of virtual networks will open up the possibility for a much more central role from the SOC using its analytical capabilities to automate many network supervisory operations. In this paper we argue that an evolved SOC is the next and necessary step to meet the opportunities of SDN/NFV and meet the challenges and opportunities that IoT and ultrabroadband networks, including 5G, will present. We argue that Communication Service Providers (CSPs) are on the cusp of a dramatic change to becoming Digital Service Providers (DSPs) and an evolved SOC will play a central role in their transformation.

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Introduction

To evolve from today's 4G to tomorrow's 5G, and successfully make the move to massive IoT and comprehensive SDN/NFV, CSPs must leverage different strategies to improve margins. With the cost of computing, storage and networking continuing to drop, there are natural CAPEX cost savings to expect in terms of IT modernization through NFV/SDN. Nevertheless, current service assurance and customer experience systems must adapt to help prepare, manage and profit from these extensive changes. While 5G, IoT and other new technologies and business models may boost some revenues, overall ARPU has been declining in most markets.

CSPs have multiple challenges that include growing competition, demands for higher service quality, increasing network and cloud complexity, stagnant revenue streams from legacy services and rising operations and care costs. Meanwhile, their systems are often still grouped into technology silos, and departments rarely exchange information automatically.

One compelling way to prepare for operations management challenges and be ready for new technologies and services is to establish a service-oriented operations approach in the form of a service operations group or center. As noted by Analysys Mason:

> Communications services providers (CSPs) are becoming convinced that a service operations centre (SOC) can deliver substantial business value. Cost savings and customer satisfaction are still the biggest drivers for a SOC, but some CSPs are also using it to generate new revenue.[1]

This paper will argue that a SOC not only generates solid business value but will also be required as services and technology infrastructure is modernized. It will be a journey requiring a series of steps culminating in a dynamic system for service assurance linking analytics and automation with what we refer to as an evolved SOC.

Virtualization: an opportunity for customer care

While the overwhelming shift in the CSP industry is the movement toward virtualization, there are other important trends that are necessary to make the shift effective. Virtualization will make network resources tremendously flexible, scalable, programmable and capable of automation. But in order to have its full effect on the customer experience, there has to be a corresponding shift to service-oriented operations.

Understanding customer pain and operating profitably

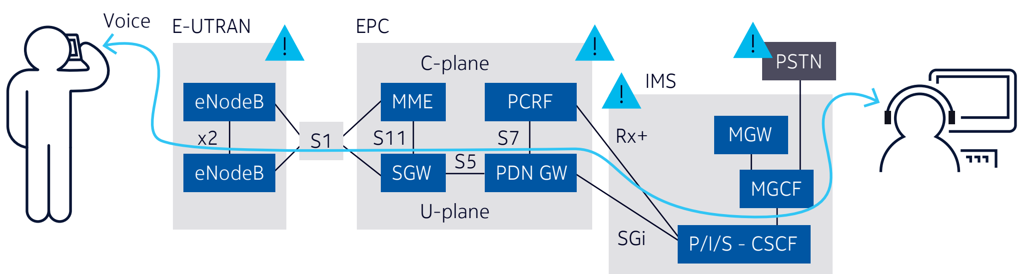
In the past, CSPs managed quality of service reactively and by technological domain. Now they face challenges that are forcing them to review their operations and care processes, including network and service management capabilities. These challenges include demands for higher service quality, the distributed and dynamic nature of new networks, and stagnant revenue streams from legacy services and rising costs, especially in terms of operations and customer retention.

1 2016. Implementing a service operations center. Analysys Mason Limited.

Nokia's annual customer acquisition and retention studies over the last few years demonstrate that Customer Care and a CSP's portfolio of services make up an increasing proportion of retention criteria.[2] Critically, the latest study found that 42 percent of customers dissatisfied with network quality are more likely to churn. These "silent churners" are one of the biggest challenges faced by CSPs, as they typically do not contact the call centers, thus giving the CSP no chance to retain them.

Let's imagine that an operator offers a Voice over IP service, such as VoLTE or VoWiFi, to its subscribers. It is vital that the operator knows whether the service is performing well for all subscribers. What if the voice quality is poor for some subscribers? The operator needs to identify the exact source of the problem relating to the service performance degradation. Does it reside in the LTE radio, Wi-Fi, or other access points? Is it in the short haul or back haul, the IP Multimedia Subsystem (IMS) or other domains? Poor voice call quality at a key location must be fixed rapidly or the operator risks disappointing a large number of potentially influential customers.

Figure 1. VoLTE service delivery chain



With the traditional reactive and network-centric management approach the operator will notice service performance degradations when customers are already affected, meaning that they suffer from lower service performance before the CSP is even aware that a problem exists. With the domain-specific assurance process, it is time-consuming to identify the degradations in service performance. Also, ownership for troubleshooting the issue may be unclear.

Given the impact that network quality has on customer retention, reacting to the problem after it occurs is simply not good enough. CSPs need a proactive, service-centric approach that detects service performance degradations before they affect subscribers. Ideally, service assurance is dynamic, with analytics and automation working in a closed-loop to ensure that faults are remedied and network resources provisioned end-to-end to ensure no interruptions in the service.

There are many performance and quality goals to meet when delivering services. Some services may require peak-data rates to perform, while others may need low latency, or a combination of various KPIs. Customer satisfaction may be influenced by a long list of factors including device configuration, service usage, service patterns and customer plans. Managing customer retention and operating efficiently are required as networks and service packages get more complex.

New revenue, new service paradigms

Along with the changes to optimize operations and customer care, CSPs are looking for new service constructs to generate revenue. While 4G is nearly rolled out in many places, there are many new evolutions on the horizon that represent potential top line growth based on technologies such as 5G, Wi-Fi and IoT, faster fixed consumer and business access and cloud applications.

2 2014-2016. Nokia Acquisition and Retention studies.

For instance, according to McKinsey, the IoT market space is anticipated to grow to between $3 and $11 Billion by 2025.[3] Categories cited for the most likely IoT applications include vehicles, home security and chores, office energy and security, factories, retail, workforce, health and fitness, outside logistics and cities. Interoperability of various IoT and IT systems will be a large portion of the business. Some of the revenue potential will be available to CSPs. As well, enterprises and government institutions, including hospitals, energy firms, and large businesses, are looking for cloud and virtualization services in the form of scalable and secure computing, storage and applications.

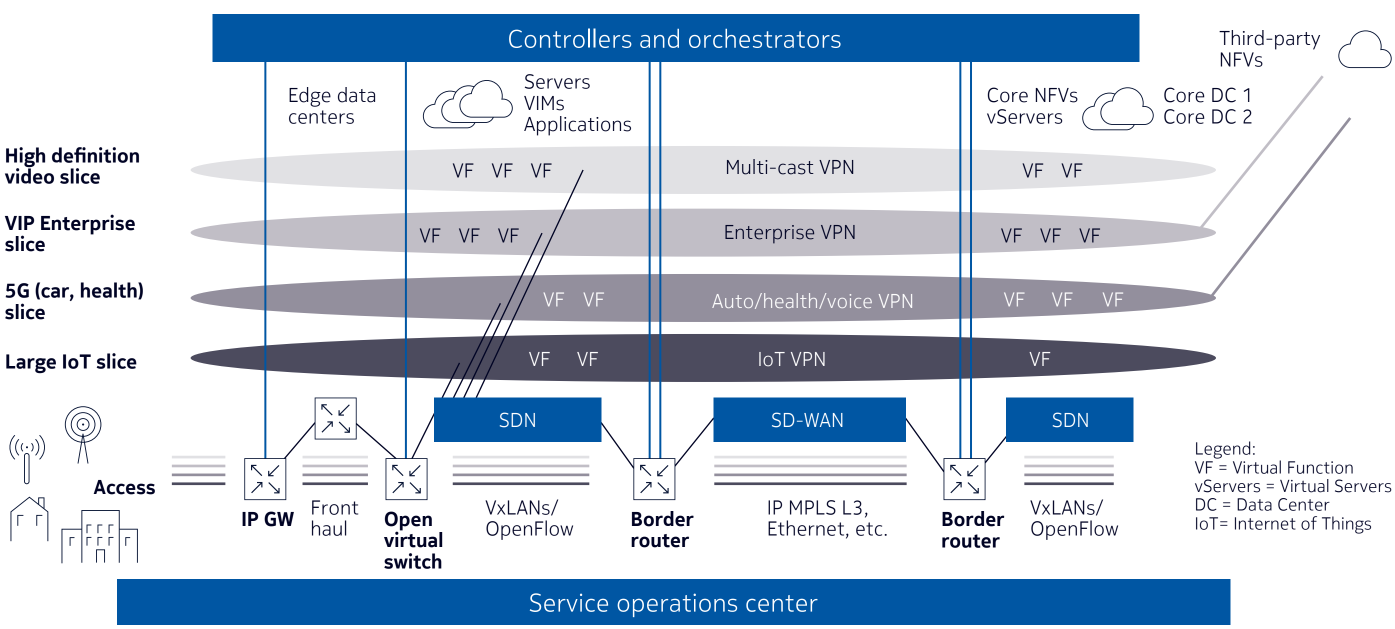
In general, providers are moving from being CSPs to being Digital Service Providers (DSPs). The term digital is used to represent the types of new services and the means by which services can be altered. They must leverage multiple service offerings and operate in an extended ecosystem to deliver digital business transformation and avoid disruptions to their own revenue streams.[4] To become a DSP, a CSP has to have automated and digitized a large portion of their activities and customers should be able to purchase or modify parts or all of services components or attributes immediately via web, phone or directly through an app using APIs.

These new dynamic service constructs present revenue opportunities but will also challenge operations and IT to consolidate silos and improve intergroup communications.

Virtualization

According to some sources, CSPs will have virtualized nearly all aspects of their infrastructure by 2025. There are many aspects of delivering network services that will change including how services are introduced and the customer's expectation of service quality. Most profoundly, services will be abstracted from the underlying network hardware and will be managed end to end, rather than by domains. This will inevitably move CSPs toward service-oriented management. This service-oriented view corresponds to a trend towards a sliced view of network services, which virtualization will make possible. Figure 2 has a high-level view of this.

Figure 2. Sliced view of a network



3 2016. McKinsey Global Institute. The Internet of Things: Map the value beyond the hype.
4 May 24, 2016, Gartner. Digital Disrupts Service Opportunities in Vertical Industries. Webinar.

Digital service delivery of slices and features via multiple channels opens the door to new revenue opportunities. However, managing operations and care of these slices, or sets of services, will also be critical to meeting customer expectations. Virtualization and software-based routing will be multi-tenant, and owners or groups of services will be treated distinctly from one another based on service type, traffic profile or ownership. An end-to-end, customer-centric view of service quality is, therefore, essential. It is critical that various groups within the CSP/DSP can discuss service components with the same language in a delineated way, for either virtualized or physical resources, covering orchestration, assurance and care.

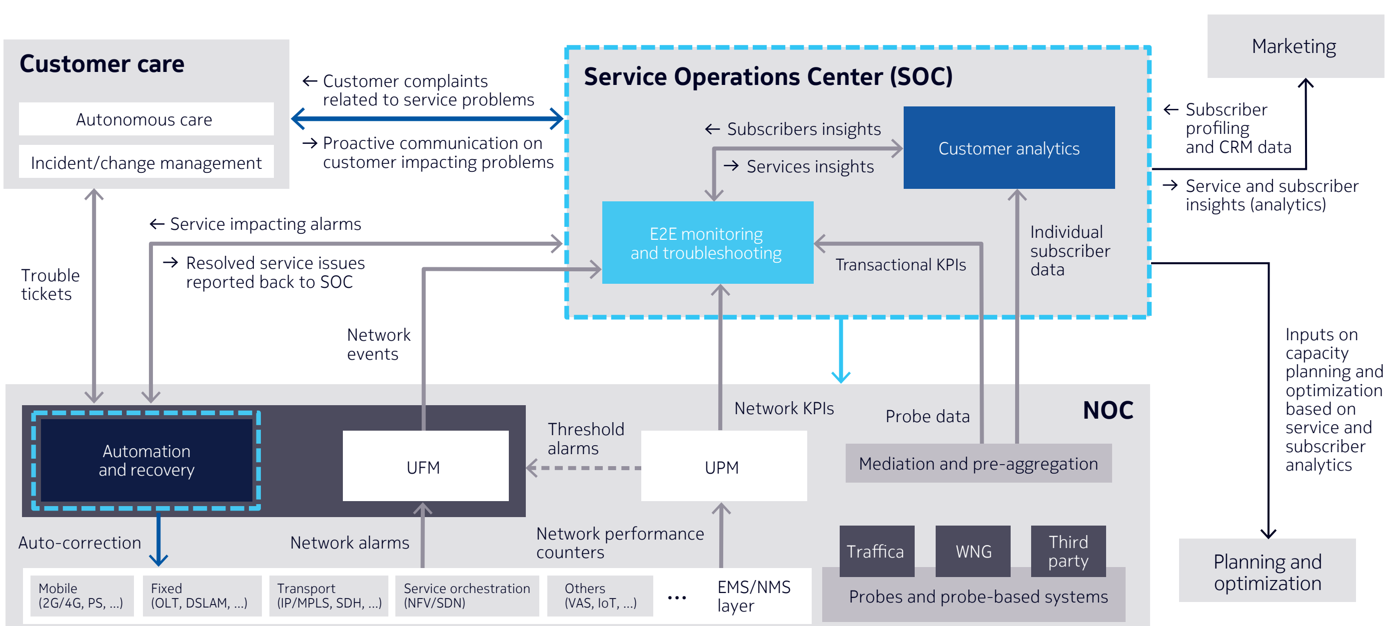
By working together with others in the industry, such as AT&T, China Mobile and industry groups, we are confident initiatives such as ONAP, aligned with the ETSI work, will move the industry towards more automated network operations on a faster time scale than any one organization could by itself.

Transforming to service-oriented operations

As we have seen, the evolution to NFV/SDN will shift the way network services are managed and delivered. With ever-increasing customer expectations as well as competitive pressures, CSPs must move toward a service-oriented operations and IT paradigm. A service operations center (SOC) is a key piece of this transformation, enabling them to prioritize the resolution of customer-affecting service issues based on an end-to-end service view.

The primary SOC components are shown in figure 3, highlighted in light blue. The diagram shows the various business groups that interface with the SOC.

Figure 3. SOC modules



From a process viewpoint, a SOC changes the way CSPs do operations and customer care management. It is a facilitator that improves communication and processes between different organizations. According to Analysys Mason, "A SOC provides the capability to monitor services in an end-to-end context, enabling CSPs to take actions based on their impact on services and the customer experience. A SOC plays the role of an intermediary between the customer-facing departments, such as customer care and marketing, and network-focused and back-end teams such as network operations and network engineering, planning and optimization."[5]

A SOC can be implemented as a small stand-alone unit, eventually be merged with a Network Operations Center (NOC) or to federate several NOCs. A CSP SOC also delivers valuable inputs to other business functions like customer care, marketing, network planning, network optimization and the NOC.

A SOC specifically adds value to the following functional areas:

1. Proactive problem avoidance and automated or managed investigation especially toward the NOC. Operations and IT managers can manage the fault and performance problems by service and customer impact
2. Capacity planning and optimization of sites, locations, servers, virtualization resources, etc. often toward the planning and engineering groups
3. Analysis of services and subscribers for marketing and sales groups to improve or suggest new product design and promotions
4. Proactive communication on customer impacting problems toward customer care.

A SOC does not aim to resolve network and application resource problems by itself. It relies on planning and IT groups, which provide the tools, staff and expertise to fix a network or application incident. Service Operations delegates the service problem resolution to Network Operations and IT teams. The coordination provided by the SOC results in reduced service downtime and better service quality as the influence of each network resource becomes clear and dependencies between different domains are discovered. Responsible entities for service degradations are identified, including network domains, solution partners and content providers. It also helps assess how the different entities have contributed to troubleshooting.

CSPs are also interested in understanding the impact of service quality degradations on subscribers and revenue, for example, who are the affected customers and what is the impact on the service usage. The combined solution allows operational tasks to be prioritized according to business impact and customer experience. This service-oriented approach results in more service availability, continuity and customer retention.

Solution: people, processes and technology

Implementing a SOC is more than simply purchasing a tool or creating a small team. The cornerstones of a successful SOC introduction are people, processes and technology. Failure to involve all three aspects can result in negative impacts such as alienation, turnover, under-utilized systems, automated chaos, poor customer service and frustration. All three areas need to be addressed to ensure that the CSP, and its partners and customers, are getting the full benefit of the solutions. Thus moving to a SOC and service-oriented management development is a major initiative that typically requires a strategic framework, executive buy-in and supporting implementation and governance plan.

5 2016. Analysys Mason. SOC evolves from a cost centre to a revenue centre for some communication service providers (CSPs)

Recommended deployment scenarios

Based on business and operational priorities, the CSP may come out with a list of operational use cases, which involve data and insights from the Service Quality Management (SQM) and Customer Experience Management (CEM) domains, automated assurance, or other solutions to take respective corrective actions.

The scope of what needs to be demarcated and measured can vary by technology, end-user service, segments or attributes. Some use cases examples can be found in table 1.

Table 1. Example use cases

Use case	Service domain	Segment
Service Quality Monitoring	4G, 5G	VIP users
Automated Assurance – Reset	Fixed access, IPTV	All broadband
Trouble ticket minimizing	Mobile access 2-5G, MPLS	Heavy users
Customer and device planning	Energy IOT, Android 8	East side
Service Level Improvement	Data Center, VxLAN	Corporate customers

It is all-important that the staff has a positive attitude towards the introduction of the SOC. When people understand the benefit for their daily work, they will also be more motivated. Through open and proactive communication, operators can support their people who tend to worry about changes in their work. Setting targets for staff during the introduction phase will be a key success factor.

Define the scope of the SOC to activity-specific business processes to address relevant services. Select which modules to start with and what to target (for example quality management for 5G, public Wi-Fi, or VoLTE, or automation for fixed access), in order to enable rapid returns. This will give a flexible and fast delivery in multi-vendor and multi-technology environments.

As the SOC proves its value with these “low-hanging fruit”, there will be tighter integration into the existing system landscape such as trouble ticketing and CEM. Many operators who embrace this way of thinking have found a way to continuously improve business agility and maintain a competitive advantage.

Service modeling and KPIs

Critical to the operation and eventual automation of the SOC are well-constructed service models. Built on data points from users’ service experiences, they capture how different service types and segments are being affected by service conditions, whether good, bad or acceptable. Service models need to be dynamic, capable of being updated with new service conditions or service segments.

An operations and IT management environment provides a large and constant flow of data. The challenge is to identify the “right data” that provides the key insights to the service quality delivered to customers. This is the role of service models, which need to be based on a deep understanding of communications technology and real know-how about its various effects on customer experience.

A SOC focuses on the quality of the service while it is being used and how customers are being affected. In considering how to model the customer and service behavior, the service usage phase can be divided into:

1. The mobile or fixed communication means is available for use by customers or end devices such as a sensor. For instance, is there wireless network coverage available to the customer or narrowband for a sensor? Are the complete front and backend of the network infrastructure available, including any cloud components to materialize the service?

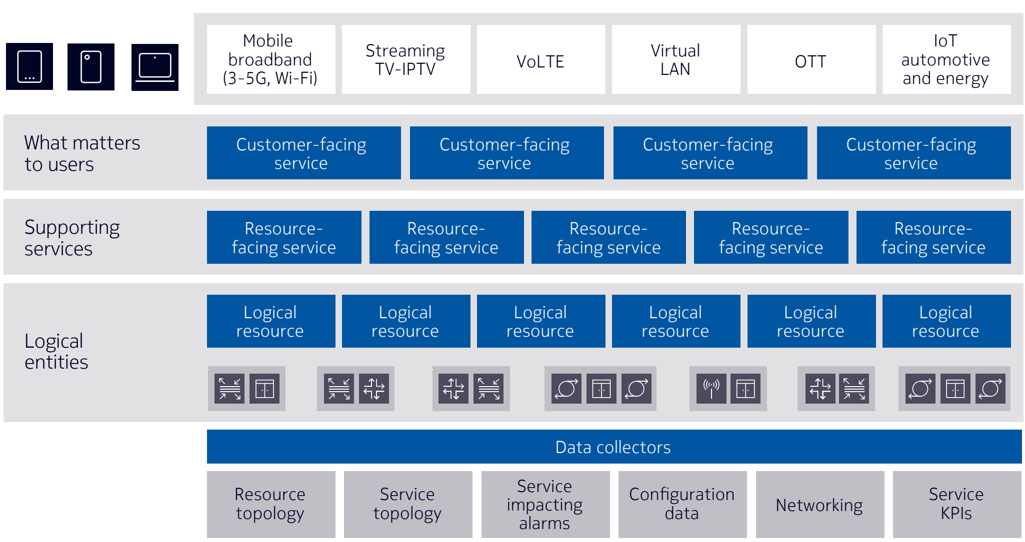
2. The customers' or systems' device can register on the network. This is the fundamental step, at which point the service can be authenticated and registered for the network services.
3. The client (consumer, enterprise or set of sensors) can use the service by starting an application on the device that translates the user's desire into a series of requests or transactions.
4. Services are in use. Network and service infrastructure, physical or virtual, delivers the requests and corresponding responses between the device and the respective sources or peers.
5. Service usage is terminated, either intentionally by the customer or is interrupted for other reasons.

These steps reflect different aspects of service quality and form the Key Quality Indicators (KQI) as described in ETSI 102 250-1: network availability, network accessibility, service accessibility, service integrity and service retainability. Additional KQIs like service availability and mobility further support modeling of the service quality.

Services in communications networks are no longer just voice, mobile data and short messages. Applications and over-the-top (OTT) services, such as Instant Messaging, Google and Facebook, imply different service characteristics and require different service models, as do cloud and software-defined services. The service model structure is based on the understanding of the service and resource hierarchy, starting with what the customer is receiving or deliverables from the operator to its customers. Also called customer-facing services (CFS), they include web access, voice calls and short messaging services (SMS).

The CFS is delivered to customers by resource-facing services (RFS), which are based in the underlying network resources. The relationship between the CFS and corresponding RFS is the foundation for service model development. This is illustrated in figure 4.

Figure 4. Service model hierarchy



The service model provides service quality assessment for a specific CFS. It is also used for root cause analysis as it bridges the service quality to the underlying network resources.

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Analytics

Using analytics, CSPs can understand all the relevant customer-experience touchpoints and improve them over time. When applying analytics, it is critical to have a comprehensive understanding of how a service is deployed in a CSP's network. In this way, they can improve brand value, increase revenue, provide competitive differentiation by spotting recurring problems, avoiding disruption of new device or service roll-outs, and increase satisfaction by anticipating situations proactively. Analytics helps the CSP to better understand what is relevant to forming the end-customer experience and can use this to improve it.

Analytics are critical to service-oriented management because they allow the CSP to know which problems are affecting the most users and which users are affected (e.g. VIP business users). The SOC uses analytical tools to prioritize the most important issues and direct proactive customer care. Well-designed, real-time analytics cannot only identify service-affecting issues, but even identify how happy a given customer is. Big data analytics enable the CSP to understand the context of the problems people are facing based on inputs from billing, care, configuration, network, server, signaling, device, application or externalities such as regional events or weather. Big data-based trends can be applied to fix and anticipate issues.

Purpose-built and off-the-shelf algorithms coupled with the flexibility and scale of big data stacks allow operators to get deep insights and recommendations on their customers and services. The big data stacks should enable integration from multiple data sources (e.g. OSS, BSS and transactional data) in order to unlock insights from combining multiple domains. The big data stacks should support insights provided in both real-time and historically through batch processing. In addition, the stack should provide the flexibility for multiple different departments within the CSP to view the insights in a manner that makes sense to them. Hence, the big data stack should have appropriate APIs to enable intragroup collaboration.

Applying machine learning and additional data sources can further reduce the number of issues and the time required to resolve them through automation, moving traditional alarm-oriented operations into a more dynamic ticket-oriented, service-focused operations environment.

Automating operations: the evolved SOC

CSPs are faced with growing competitive pressure to keep their customers loyal and to operate more efficiently. The market already requires that their operations, IT, customer care, and other groups move to a service-oriented way of managing quality and the user experience. Establishing service-oriented processes and groups, such as a SOC, are the first steps along this road. However, as networks become virtual and software-defined, it becomes possible to harness the newfound speed, flexibility and scalability of the underlying network resources to enable a further evolution of the service-oriented model using automation.

Research strongly points to the negative effects of bandwidth stress on customer loyalty. However, as we progress to 5G, issues of network coverage and capacity will become less important, whereas service availability and assurance will become paramount. With billions of IoT-connected devices automating much of our lives, issues of securely managing those devices will put unbearable strain on current operational models and demand far greater automation. This is the critical watershed that CSPs will need to cross in their quest to become full Digital Service Providers (DSPs).

Current Analysis suggests that the market requirements for managing and optimizing network and services be real-time, with predictive optimization, precise customer experience measurement, increased granularity for IOT, video, indoor services, special events coverage and 3D geospatial modeling. With IoT and SDN, the amount of subscriber and session data will multiply by orders of magnitude. Applying artificial and cultivated intelligence in an automated way will be operationally necessary. It will dramatically reduce quality issues, reduce operational costs and improve monetization. The improved QoE will have a significant customer retention impact reducing the churn rate and stimulating the adoption of new services and options.

Cultivated intelligence and automation

Automation should start with low-touch software features that eliminate much of the tedious work to identify and avoid problems. Software-powered pattern recognition can filter incoming faults and performance information based on human logic. This is where service models can be especially important as they aid in service impact assessment and identify the root and most significant causes. Auto-diagnostics can enable the operator to take corrective actions faster in either a manual or automated way depending on the circumstances. Proactive auto-repair should be attempted wherever possible to eliminate errors before customers call or experience problems.

Using closed-loop assurance principles, the service-oriented operational systems can communicate directly with the underlying software-defined network resources to automatically fix network issues, such as adjusting routing or switching settings, restarting servers or energy sources. In many cases, although kept in the loop, an evolved SOC should be able to by-pass the NOC entirely, enabling NOC personnel to focus on more critical tasks.

Implementation use cases

We will look at just three use cases out of dozens for implementing a SOC. The first two examples are more conventional and illustrate the value of a conventional SOC. The last example illustrates how SOCs will evolve through the use of analytics and automation.

Example 1: Service monitoring

Before the beginning of a big service-affecting event, the SOC team detects some service quality degradations in and around the event location. The SOC teams uses alerts, profiles, trends or expert recommendations to detect them. SOC managers then qualify the problem as subscriber-impacting service degradation.

1. The SOC team validates the problem and informs the Care and NOC teams
2. Care is informed about the subscriber impact proactively and in real-time
3. The NOC, IT and/or engineering teams resolve the associated network or application identifying the root cause explained in detail by the SOC in downstream systems
4. The Care or CEM team provides details of potential subscribers impacted, including volumes and customer segments such as high value customers
5. Service quality is restored to a normal state.

SOC personnel check that service quality is restored to normal condition (SQM) and customer care proactively informs relevant subscribers of the service resolution.

Example 2: Customer impact and satisfaction

In this case, the SOC team uses customer experience indexes (CEI) studies on roaming behavior and learns from segmentation. Through real-time insights it can prioritize by impact level the service problems to address.

The SOC measures the performance of various services, service slices and other service component demarcations on a GIS map. From there, operators and IT personnel should be able to drill down to the resource-facing services and resource components via the map. This would enable them to quickly verify service performance network-wide down to individual network resources or paths.

Taking it a step further, the SOC should be able to direct other teams to fix service problems where the impact is highest and create trouble tickets for operations when needed. This should result in better return on effort to fix service problems. The geographical mapping of service and customer impacting status can help to quickly identify problem zones. Multi-dimensional analysis of services and customer indicators is possible by gathering input from performance thresholds, faults from any type of system, software or more costly hardware probes, end-user application usage response times and other measures.

The SOC can improve customer experience by analyzing characteristics of users and services combined with how they are performing or perceived to be performing. For instance:

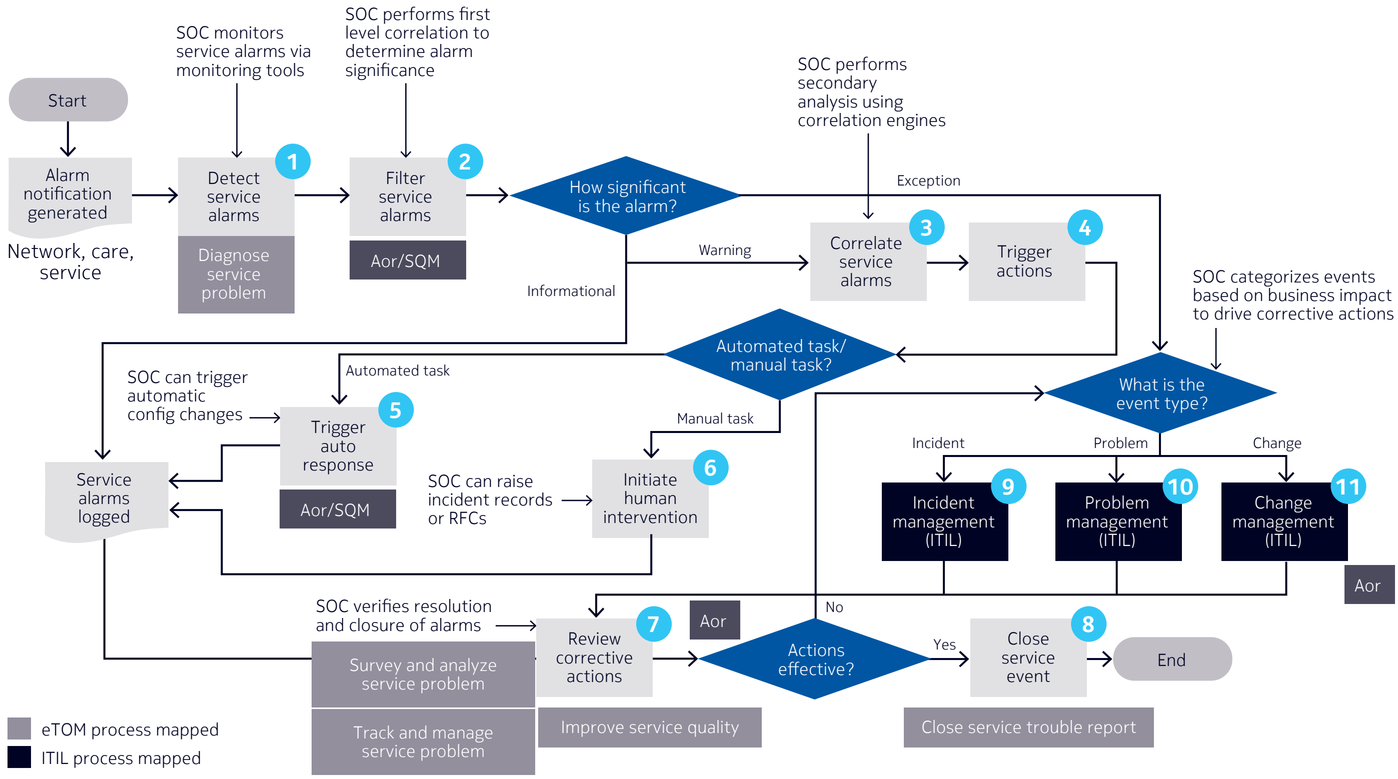
- Identify malfunctioning devices that adversely impact the network such as devices which generate high amounts of signaling, homes that generate massive amounts of video traffic or IOT devices experiencing high latency (this can be periodic or real-time reporting)
- Characterize one generation location with significant amounts on next generation (e.g. 4G and 5G respectively), or wrongly provisioned devices
- Indicate lack of subscription or payment for a service feature.

Example 3: Closed-loop automated resolution

In the third example, we look at how an evolved SOC would operate. If we look back at the first two examples from the perspective of an evolved SOC, in the first example, the SOC might have used data and appropriate service models to identify certain types of recurring service-affecting problems and taken automatic corrective actions to restore services. In the second example, it might have profiled key service quality indicators against past patterns, and then visualized values over time against typical behavior based on time slot or learned behavior. Then, it could have proactively raised service problems based on dynamic thresholds, and fixed them before they were experienced by end customers, e.g. by creating a trouble ticket automatically or dynamically allocating software-defined virtual network resources as needed.

The third case illustrates the interplay between quality management and automated operations in an evolved SOC. Figure 5 depicts a process flow for various alerts coming into the SOC. Alarms or events can be from network, energy, car or service sources.

Figure 5. Process flow for closed-loop automation



A large percentage of the service, network and other problems are detected proactively by the SOC as shown in step one and two of this process diagram. In step two, filters and other rules are applied automatically to determine if the alarm should be processed or dropped. There is also verification of received alarms and whether they are still active, already documented or false positives.

Next, the SOC determines how significant the alarm is. If it is only informational, it can be logged. If it is an exception, it is processed according to ITIL standards based on business impact: incident, problem and change management. If it is a serious warning, actions can be triggered. Manual or automated tasks would be invoked as a result. The automated action decision in step four is based on bounding information (e.g. consider the diagnostic, manage the problem and then proceed to step five).

In step five, the SOC triggers an automatic response. Some examples of automatic responses are restoration commands, status changes, reloading a known configuration, rebooting equipment, board, service or virtual machine.

Step six covers cases where automation is not possible. For instance, an engineer may need to fix a server, virtual machine, or pull a card in a router to fix something. In step seven, the SOC initiates an automated trouble ticket lifecycle verification based on service alarms, which includes communicating the service problems to care when necessary. Care is then aware of the service problems before customers report them.

About the Nokia evolved SOC solution

At Nokia, where we have been industry leaders in promoting service operations, we also fully embrace the need to evolve the traditional SOC for all the reasons set forth above. We refer to this as an eSOC. It is an innovative software and service solution that leverages automation to enable CSP/DSPs to accelerate their transformation to service and customer-centric operations. It combines service quality management, customer/subscriber-centric analytics and cultivated and machine intelligence.

The Nokia eSOC is a powerful software solution that includes consulting and integration services. A specialized SOC Office powered by Analytics, OSS, and Bell Labs consultants helps guide CSPs in their transformation journey. This second-generation "evolved" SOC adds an important emphasis on automation and intelligence including automated problem detection and ticketing as well as automated recovery through intelligent agents and machine learning. Nokia's eSOC solution follows industry standards including ITU, ETSI, and TMForum. By following standard terms and means of measuring customer experience and services end-to-end, Nokia's eSOC solution is closely aligned with user perception and the customer's true experience.

The eSOC enables CSP/DSPs to proactively detect network and subscriber performance degradation including anomalies and congestion over physical and virtual network and services resources, including applications, IoT and devices. It can detect locations exhibiting large amounts of handover or performance trends impacting 2G, 3G, 4G, Wi-Fi and 5G networks. It can, for instance, monitor:

- Voice quality and performance as operators introduce VoLTE services
- The impact of a new device or application prior to launch
- Roaming volume generated by each roaming partner.

Based on extensive experience with customer networks, the eSOC also provides service and customer experience modeling with multiple off-the-shelf service models available. There are editors for creating or modifying models for services, subscribers, networks, data centers, devices, locations and segments. It includes service monitoring dashboards and reports with the ability to drill down to root-cause management systems, such as OSS, to take and recommend actions.

Other features of the eSOC include:

- Multiple means of KPI event collection, filtering, normalization, and prioritization including packet inspection, signaling, virtual machine and ancillary big data
- Service problem detection, anticipation and impact analysis with root cause awareness
- Service quality usage trends and insights with threshold-based segmentation and profiling
- Enhanced service-aware customer care, which answers how customers feel about their service experience around the clock.

With the implementation of an eSOC, CSP/DSPs can realize significant operational and business benefits, including faster margin improvements and new revenue opportunities. They can improve the service quality for customers and lower OPEX. This level of automation typically results in up to 20 percent machine-automated resolution of issues.

Many of the operational savings occur in the NOC. For example, we have seen between 25 and 60 percent reduction of NOC operating costs. A second-line NOC has clear priorities over which service-affecting alarms need to be fixed, thus smoothing the workload and saving operations resources in peak hours. Trouble tickets are created with root causes for affected services, which avoids the usual bouncing between network domain teams. This results in much faster service outage impact handling and an increase in service and network availability with fewer critical alarms, congested links or volatile apps. The knock-on benefits of this reduction in operations resources include the ability to reallocate employees with significant network knowledge from mundane troubleshooting tasks to more innovative activities.

The following are some benefits achieved by operators after moving from network to service-centric operations.

- Shorter duration of service-affecting failures
- Approximately two percent of “raw alarms” received will result in trouble tickets
- Immediate prioritization of corrective actions based on service impact, avoiding unnecessary site visits or rescheduling of non-urgent site visits
- Noticeable increases in service usage
- A 50 percent reduction in the number of service-related complaints and 50 percent faster service restoration
- Up to a 90 percent reduction in operations alarm monitoring and surveillance activities
- Up to a 30 percent reduction in average MTTR intervals
- Up to a 40 percent reduction in ticket-processing activities
- A 20 percent reduction in site visits.

Flexible capacity management yields lower CAPEX spending with better use of physical and virtual network resources. It also results in faster realization of NFV/SDN OPEX/CAPEX savings. In terms of marketing and sales, service-centric operations have saved operators millions of dollars through better device and roaming contracts. They have also experienced stronger care and marketing ROI, including better upsell ratios. In many cases, new service roll-outs are 100 percent more profitable through incremental revenue and OPEX reduction generated by customer care. All of these benefits help improve the bottom line and permit faster adoption of new technologies and services.

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Product code: SR1703009227EN (September)