Best practices for achieving service assurance excellence

Climbing the operational maturity ladder

This paper covers the most effective way to turn your network-focused assurance operations into a successful service assurance operation. To achieve this operational transformation, Communication Service Providers (CSPs) need to climb the operations maturity ladder. By moving from a technology or network focus to a service-oriented delivery model, they can gain operational efficiencies while improving the customer experience. Both result in improvements to their competitive position, return on investment and revenue.

Moving up the maturity ladder is a challenging and complex endeavour. That’s why CSPs are turning to standards-based frameworks for guidance to climb this ladder.

Nokia Bell Labs Consulting’s Capability Reference Operating Model (CROM) defines an end-to-end framework for telecoms operations, including a comprehensive map of operational functions and capabilities. The outcome is an operations map of best practices that provides the fastest, most cost-efficient route up the maturity ladder.

This paper provides an abridged version of the operations map with selected best practices. Illustrations of outcomes and deliverables are also provided.
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Introduction

Ever since the liberalization of the telecommunications market, Communication Service Providers (CSPs) have evolved towards business models where customer centricity is paramount. In parallel, as technology rapidly evolved and has become widely available, communications services have become increasingly sophisticated and customer experience and innovation are now the main differentiators. Service management is a CSP operation that centers on services provided to the customers, not the resources that constitute the service.

The emergence of cloud and virtualization technologies has also shifted the focus of CSPs from infrastructure to services, while many CSPs are now implementing platform\(^1\) business models. As a result, these CSPs can better differentiate their offers.

CSPs have been able to move into service management in operational areas, such as fulfilment/service activation and billing. However, service-level assurance has traditionally been elusive for many CSPs who have remained at the resource/technology level. As illustrated in Figure 1, these CSPs have not progressed from the Ad Hoc and Reactive levels to the Proactive, Service or Value levels of the service management maturity model. This is particularly the case in areas such as fault management.

Recently, operational capabilities such as Service Level Management (SLM) and Service Operation Centers (SOCs) have been established by pioneering CSPs. Meanwhile, others remain infrastructure focused at the Ad Hoc and Reactive levels.

Figure 1. Service Management Maturity Model drivers

\(^1\)Platform is a business model that create value primarily by enabling direct interactions between two (or more) distinct types of affiliated customer groups, who value each other’s participation, generally tapping on a network effect.\(^2\) Our detailed analysis of processing effort (time spent on event management and ticket opening) per fault type shows that it can be approximated by a Pareto distribution. This is due mostly to frequency of occurrence and the distribution of effort per fault type.
Moving up to the Service level of the Service Management Maturity Model is challenging. It has to be done on the fly without disrupting ongoing operations. Adding to the challenge of this transformation is the identification and application of the right operational best practices in these four domains: people, processes, platforms and metrics.

Climbing the operational maturity ladder

The operational maturity ladder establishes a series of levels that define the status of an organization’s operational performance in terms of productivity and customer experience. Figure 2 depicts the levels on this ladder. Fully-fledged service management sits at level 3. At this level, operations are focused on end-to-end services, which are enabled by end-to-end integrated processes supported by defined service models.

CSPs need to fully complete the prior level before climbing to the next one. For example, this means that a CSP must achieve effective resource management (i.e., resource inventory, resource provisioning and mediation) before rising to the Service level. Similarly, CSPs should have mastered the key components of the Reactive level before stepping up to the Proactive level.

Figure 2. The operations maturity ladder

The key difference between level 3 and the levels below it is that processes are based on instances of services as opposed to instances of resources. Additionally, climbing the maturity ladder requires specific investment at each level. Each level incrementally improves operational efficiency, which has a direct impact on OPEX. Because maturity investments follow the law of diminishing marginal returns, it is important to focus on areas that yield the most significant maturity improvements.
Best practices for achieving service assurance excellence

As noted, moving up the maturity ladder is achieved through specific best practices covering four operational domains: people, processes, platforms and metrics. Nokia Bell Labs Consulting has helped CSPs worldwide to develop their service management operations. This is in addition to the vast experience of our Managed Services team who have implemented service management as part of our operating model.

One critical success factor is being able to analyse CSP operations and determine high-yield focus areas. At Nokia Bell Labs Consulting, our proven Capability Reference Operating Model (CROM) defines an end-to-end framework for telecoms operations. As illustrated in Figure 3, the CROM provides a comprehensive and consistent map of operational capabilities.

The CROM operating model is a standards-based framework. It blends the ITIL and eTOM frameworks with Nokia Bell Labs Consulting know how. This know-how has been drawn from our extensive experience providing consultancy and managed services to operators worldwide. As a result, the CROM has both a strong theoretical foundation as well as a practical one. It applies at both the strategic level and at the day-to-day tactical level in the management of outsourced networks. The higher levels of the CROM (levels 0 and 1) are depicted in Figure 3.

To systematically identify high-yield focus areas, we apply the CROM framework to real-world situations. For each customer, we go one by one through the comprehensive set of assurance capabilities in CROM, and select the areas of operational transformation relevant to the service assurance goals. Once these areas are selected, the set of best practices that provides the highest maturity improvement yield is identified within each area. This analysis is isolated from the contextual and idiosyncratic circumstances of the individual operators. The outcome is an operations map of best practices that provides the fastest, most cost-efficient route up the maturity ladder.
The CROM has been used to provide consulting services to many operators worldwide including: a major fixed line operator in Italy; mobile operators in France and India; the incumbent operator in New Zealand; and an MSO in the United States. Using the CROM, our experience in service assurance consulting and our Managed Services team, we have identified the following focus areas illustrated in Figure 4:

1. Event Engineering
2. Policy Design and Maintenance
3. Change Management
4. Data Integrity
5. Service Management
6. Incident Management
7. Problem Management
8. Event Management
9. Performance/SLA Management
10. Proactive Fault Management

Figure 4. Focus areas mapped to the CROM operating model

Within these areas, we have identified more than forty best practices, some of which have been placed in the operational map shown in Figure 5.

In the rest of this paper, we discuss an abridged version of the operations map of best practices. We present a diverse best-practices selection and provide details on each. We also describe how Nokia Bell Labs Consulting has assisted CSPs to implement them. Our best practice selection includes:

1. Resource management excellence
2. Service Operations Center (SOC)
3. Manage incidents at ticket level
4. Inventory management and reconciliation
5. Problem management
6. SLA-driven metrics framework
7. Proactive KPI dashboard
8. Event management RACI and role interaction
9. Service modelling
Key service assurance best practices

1. **Resource management excellence**

   In practice, resource management excellence is an essential condition of service management excellence. The following examples show that this is not a mere theoretical consideration, but a practical imperative:

   • Incident management is best handled at ticket level rather than alarm level. Automated ticket creation is required to effectively perform incident management at ticket level.

   • Automatic ticket creation relies on sound alarm correlation at resource level to open tickets on a consolidated, single root cause alarm.

   • Alarm correlation relies on an accurate resource inventory that reflects the network topology.

   • The service impact assessment relies on a service inventory that accurately associates each service with its underpinning resources (i.e., implements a service topology).

   • An accurate service inventory with a service topology relies on an accurate resource inventory.

2. **Service Operations Center (SOC)**

   The concept of an SOC has recently become popular with more mature CSPs. An SOC is a function that sits between the infrastructure and resource assurance operational functions (i.e., NOCs, SMCs and data centres) and the customer operations and the governance functions. The SOC provides value-added service management (see Figure 6). It also acts as a service-centric operational hub for network operations, customer operations, business managers and partners.

   Nokia Bell Labs Consulting has been contracted by an incumbent Western European CSP to implement its SOC, which oversees different outsourced technology operations, including access, core and transmission networks. Among other contracts, we have provided SOC-related consulting services to a new 4G operator in India and to a Western European multi-national CSP in many of its local affiliates.
The SOC operates on service instances as distinct from resource instances, such as network elements, which are the basis of NOC operations.

The SOC performs the following activities:

- Proactive end-to-end service management
- Coordination of regional NOCs
- Management of SLAs, QoE, QoS monitoring and analytics
- Empowerment of partners
- Delivery of new service types and roll-out acceptance
- Management of incident service impacts

3. Manage incidents at ticket level

Our extensive consulting and managed services experience has shown that incident management is best performed at the ticket level instead of at alarm level. Managing incidents at ticket level requires:

- Full automation of event management (i.e., suppression, correlation, enrichment)
- Automation of service impact assessment of root cause alarms
- Automated ticket creation
This means that all human interaction within the “trouble-to-resolve flow” takes place within an incident ticket update.

When automating event management and ticket creation, the law of diminishing marginal returns is taken into account. The benefits of ticketing automation show a Pareto distribution. Therefore, automation should concentrate on the faults that have the greatest impact. It should stop when the cost of automating an additional marginal ticket does not warrant the benefit.

Our Managed Services team has successfully implemented such systems for several customers. We have reduced the CSP workload about 20 percent through elimination of time consuming alarm monitoring and ticket opening.

4. Inventory management and reconciliation

Effective alarm correlation and enrichment relies heavily on the accuracy of the network topology resource inventory. Inaccurate inventory data renders correlation impossible. Consequently, automated ticket creation and other dependent service management functions fall short.

Data inaccuracy often originates from mishaps in the fulfilment process, such as commissioning and provisioning. Other inaccuracies can arise from uncontrolled changes during the operational lifecycle of resources. Even with sound fulfilment data as well as change management discipline and control, there may be exceptional failures in the processes. In addition, inaccuracies may result in incident management situations when service restoration draws attention away from maintaining up-to-date inventory after changes and workarounds.

Data reconciliation between the network and inventory is a best practice that addresses these operational problems. It improves resource inventory accuracy by detecting and resolving discrepancies with the network configuration at regular intervals. Information is collected by the reconciliation engine and compared with that contained in the inventory.

Any discrepancies are flagged to the NOC/Engineering team. If service-related, discrepancies are relayed to the SOC team instead. Each team decides which information source (i.e., inventory or network configuration) is correct and which one should be amended. In this respect, inventory reconciliation is not just a technical OSS capability but is also a process capability. This ensures all discrepancies are handled with due diligence.

Furthermore, inventory reconciliation is not a replacement of enforced or automated data capture at commissioning/provisioning or during incident management data updates. Rather, inventory reconciliation is an additional safeguard to prevent inconsistencies.

2. Our detailed analysis of processing effort (time spent on event management and ticket opening) per fault type shows that it can be approximated by a Pareto distribution. This is due mostly to frequency of occurrence and the distribution of effort per fault type.
An additional best practice in data reconciliation is using an operational data store. The data store is a replicated slave inventory. To prevent performance issues, it offloads the main inventory from non-real time data processing. Figure 7 illustrates all the reconciliation functions described herein and their relationship with the rest of the processes and OSS platforms.

**Figure 7. Inventory Reconciliation Architecture**

5. **Problem management**

Formalized ITIL problem management enables the SOC to ascend the maturity ladder to the Proactive level. It does this by minimizing the impact of reoccurring incidents.

This best practice splits the trouble-to-resolve (T2R) end-to-end process into two cycles: a short cycle, which usually takes hours to restore service from incidents, as well as a long cycle, which may take days or even a few months to resolve the root causes. These might include fixing a design defect, installing a patch set or new version, or getting a fix from the vendor, using the standard change management/release management processes.

This dual-cycle process workflow includes the creation of a problem. A problem is a new entity in the operational data model, which is implemented as a problem ticket. The problem ticket is independent of the incident ticket, which has its own autonomous lifecycle. Typically, problem tickets are created after incident tickets and have a one-to-many relationship between the incident and the problem.

3. The Nokia Bell Labs Consulting white paper, Optimizing enterprise fulfillment through operations best practices, describes techniques to achieve data accuracy without compromising the flexibility and modularity of the product portfolio and its enabling processes.

4. In ITIL, a problem is an undesired and typically chronic issue associated with the root cause of one or more incidents. Problem management is the process responsible for managing the problem lifecycle.
Nokia has applied this concept internally to our Managed Services Operating Model (MSOM) and to our OSS software solutions, which are used by European CSPs and in vertical markets. This approach has significantly improved operational cost and performance by:

- Better handling the diversity between the short-cycle SLAs to restore service from incidents, and the long-cycle SLAs for vendors and engineering and technology organizations to investigate and resolve underlying defects that cause incidents;
- Moving from firefighting to prevention. Focusing more strategically on root causes instead of working backwards from consequential impacts, therefore reducing the amount of operational waste.
- Helping to focus the operational staff on the root cause instead of the service restoration through monitoring problem resolution performance.

Problem management also simplifies incident resolution with the Known Errors Database (KEDB). This database captures all recognized faults along with their resolutions and workarounds. The result is reduced time to diagnose and restore.

Despite these advantages, many CSPs lack a formalized problem management process. Some fear the costs of implementing this process. Others are too busy deploying new services or technologies to focus on problem management.
6. SLA-driven metrics framework

Enterprise customers’ stringent SLAs and the demand for quality are driving CSPs to better align processes with strategic requirements. As illustrated in Figure 9, these can include contract clauses, regulations, as well as marketing requirement sets. Meeting these demands is a matter of enforcing process compliance with the strategy and Key Business Objectives (KBO). This is done by assessing process outcomes and ensuring alignment with the SLAs that underpin the requirements. Achieving these outcomes also requires making the organizations that are in charge of the processes accountable.

To effectively assess compliance, process outcomes should be measured and mapped to the KBOs. This is achieved by creating a hierarchical measurement framework. The framework maps low-level operational outcomes to high-level SLAs—in addition to mapping SLAs to strategic requirements and KBOs.

Figure 9. Hierarchical metrics framework

However, the development of this hierarchy can be a time consuming and resource-intensive task.

The following set of principles can guide its development:

- **Top-down consistency**: The end-to-end hierarchical structure must consistently tie KBOs with low-level process measurements across all levels (e.g., SLA, KQIs, high-level KPIs, etc.)

- **Simplicity**: Consuming performance information can be onerous for senior management. The SLA set should be a small, easily maintained, comprehensive set of metrics that capture most of the KBO/strategic objectives. Re-using industry-standard metrics, wherever possible, is a best practice. For example, the TM Forum has created more than 100 metrics based on dozens of service provider inputs. These metrics can be found in the TM Forum’s BM1000 Business Performance Management System.
Nokia has incorporated these principles in our operations benchmarking framework. Using this framework, we have provided consulting services to several operators. These include a North American MSO and an Asia-Pacific wholesale provider.

7. Proactive KPI dashboard

The concept of a dashboard is akin to the Balanced Scorecard, a performance measure framework that adds strategic perspectives (e.g., customer, internal excellence and innovation) to traditional financial metrics for managers. This concept has been refined for individual industries, including telecommunications.

In the CSP service assurance context, the dashboard is the reporting/visual summary of the metrics framework. It helps all levels of management make better informed decisions. We have distilled the attributes of a best-practice service assurance dashboard:

- It has a small, clearly defined set of metrics that supports most of the service assurance operational decision-making.
- It offers an effective visual representation to provide service assurance operational performance data in an easy-to-analyse, at-a-glance format.
- It ensures metrics are aligned with relevant perspectives (e.g., cost, quality, time, and excellence) and has a hierarchical report/chart link that follows the defined metrics framework hierarchy.
- It is viewable from a top-down and cross-organizational perspective (i.e. is accessible to NOCs, third-level support organizations and field-line support teams) so that the entire organization is aligned.
- It is available across all the service assurance organizations. Only if all the relevant employees have appropriate visibility of the scorecard is the maximum benefit achieved. In addition, it sends the right message: operational management and the organizations they lead will be measured by the metrics and scorecard targets.

At Nokia Bell Labs Consulting, we have successfully delivered KPI dashboards in consultancy engagements for many customers, including a North American MSO and an Australian access wholesaler.

8. Event management RACI and role interaction

Organizational accountability and strategic alignment with KBOs is also achieved through the implementation of RACI matrices. RACI is an acronym for a project management practice in which stakeholder roles are defined in terms of Responsibilities, Accountabilities, as well as who needs to be Consulted and Informed. The RACI matrix associates key service assurance functions and roles with processes, activities and KPIs.

Nokia Bell Labs Consulting has employed RACI matrices to establish role and function accountability for a North American MSO. This project consisted of detailed top-down design, formalizing processes, defining outcomes and KPIs to measure compliance with KBOs. The outcomes were mapped to the organization using a RACI matrix.
Figure 11 illustrates a RACI matrix.6

<table>
<thead>
<tr>
<th>Functions</th>
<th>Ops Readiness</th>
<th>Operate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Order handling implementation</td>
<td>Order handling validation (SORF)</td>
</tr>
<tr>
<td>CC Customer Care</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>SFC Service Fulfillment Centre</td>
<td>C</td>
<td>R</td>
</tr>
<tr>
<td>FLS Field Line Support</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>OSS OSS engineering</td>
<td>AR</td>
<td>AR</td>
</tr>
<tr>
<td>Eng Network engineering/IT</td>
<td>AR</td>
<td>AR</td>
</tr>
<tr>
<td>HoF Head of Fulfillment</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

9. Service modelling

Service modelling is, in essence, a value-chain analysis of services provided by a CSP. This value-chain analysis identifies the contribution of each component to cost, value and delivered service quality. Components can include network elements/resources and operations—manual and OSS.

By performing service modelling, CSPs establish a sound analytical foundation to define:

- The hierarchy of KPI/KQIs to assess service performance covered by SLA management in all areas: operations excellence, customer experience and cost.
- The service topology in the service inventory that supports the service assurance impact assessment.
- The costs and benefits of each operational activity and resource component of the service, as well as their impact on the contribution margin of the service.

6. Details have been eliminated to comply with the Nokia customer information, non-disclosure policy.
Quantifiable results from client transformation engagements

Climbing the maturity ladder to the Service level leads to measurable improvements on cost and customer experience for the service assurance operator. This allows the operator to differentiate on cost and quality, giving it a competitive advantage and generating more revenue.

Using the Nokia Bell Labs Consulting approach of targeting high-yield focus areas minimizes the investment while assuring ROI. This is especially important for service operations, where capital rationing is tighter than for network-based operations. Figure 12 shows the benefits of implementing the Nokia Bell Labs approach. These outcomes are derived from the operators mentioned previously:

Figure 12. Outcomes of maturity improvement on Assurance

<table>
<thead>
<tr>
<th></th>
<th>REACTIVE</th>
<th>PROACTIVE</th>
<th>SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidents repeated more than once*</td>
<td>41.9%</td>
<td>10.7%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Problems dealt within SLA*</td>
<td>49%</td>
<td>65%</td>
<td>94.4%</td>
</tr>
<tr>
<td>Customer incident resolution time*</td>
<td>3942 min</td>
<td>973 min</td>
<td>444 min</td>
</tr>
</tbody>
</table>

The Nokia Bell Labs service assurance consulting value proposition

Nokia Bell Labs Consulting provides trusted guidance to take CSPs' assurance operations to a higher level of maturity with the adoption of industry best practices. Supported by our transformation methodology, we have helped CSPs identify the most effective way to build a quality, cost-effective service operation to achieve competitive advantage in a market that demands customer experience and relentless innovation.

Figure 13 illustrates our transformation methodology, as well as its stages and deliverables. Each stage provides carefully defined and agreed-upon deliverables to ensure all stakeholders remain aligned. Assessment and definition processes are used at each stage. This enables CSPs to clearly understand and identify objectives, quantify results and mitigate risks.
Our methodology consists of the following stages:

- Identification of operational transformation KBOs and definition of key transformational operations metrics
- Assessment of enterprise fulfilment operations at the customer, service and resource levels to identify the Present Mode of Operation (PMO)
- Definition of the best fitting Future Mode of Operation (FMO) to adopt the best practices that provide the highest improvement returns.
- Definition of the path, if necessary, from PMO to FMO, including the intermediate stages of the journey as the Interim Mode of Operation (IMO)
- Evaluation of the changes’ impacts on cost and customer experience, including business processes, metrics and the OSS/IT infrastructure
- Quantification of the transformation recommendations against the KBOs.

Figure 13. Nokia Bell Labs transformation consulting methodology

The operational planning work streams are managed simultaneously to ensure coordination, as well as the speed of decision making. The final deliverable provides customers with a financially sound and market-aligned approach for the staged transformation to the Service level. This deliverable is detailed so that it can be implemented immediately. The duration of each stage ranges from one to three weeks, depending on the complexity of the operation.
Conclusion

The achievement of service assurance excellence can be a daunting challenge. In this white paper, we have shared selected best practices that offer CSPs guidance on the way to reach Service level maturity. The Capability Reference Operating Model (CROM) is a critical framework for CSPs to reach this level. Nokia Bell Labs Consulting uses this model to provide CSPs with an operations map and supporting best practices that result in the fastest, most cost-efficient route up the maturity ladder.

About the authors

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The authors have written the white paper, Optimizing enterprise fulfillment through operations best practices. The paper describes the challenges faced by CSPs aiming to provide cost-effective quality fulfilment to the enterprise market. It also presents the best practices to overcome these challenges.

Abbreviations

CROM  Capability Reference Operating Model
CSP  Converged Service Provider or Converged Services Platform
eTOM  Enhanced Telecom Operations Map
FMO  Future Mode of Operations
IMO  Interim Mode of Operations
ITIL  Information Technology Infrastructure Library
KBO  Key Business Objectives
KEDB  Known Errors Database
KQI  Key Quality Indicator
MSO  Mobile Service Operator
MSOM Managed Services Operating Model
MTBF Mean Time Between Failures
MTBI Mean Time Between Interruptions
MTTR Mean Time To Repair
MTTRI Mean Time to Restore Incident
NOC  Network Operations Center
OSS  Operational Support Systems
OPEX Operating Expenses
PMO  Project Management Office
QoE  Quality of Experience
QoS  Quality of Service
RACI Responsible, Accountable, Consulted, Informed
SLA  Service Level Agreement
SLM  Service Level Management
SMC  Service Management Center
TCO  Total Cost of Ownership
T2R  Trouble-to-Resolve