2020

elisa AUTOMATE

AUTOMATE THE NETWORK OPERATION CENTER

Contents

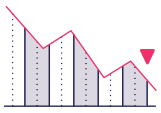
TRANSITION TO THE VIRTUAL NOC

The Network Operations Centre fulfils a crucial role for the operation and management of networks. But, it drives OPEX and consumes resources. Reducing these costs while protecting customer experience is essential – automation provides a path to achieve this.

The Network Operations Centre, or NOC, provides a centralised resource for the operational management of telecoms networks. It consolidates control and reporting interfaces for ease of access and visibility and enables appropriate activities to be performed and coordinated.

Running a NOC has traditionally been labour intensive – both in terms of on-site staff and for those who must provide field maintenance and repairs. Staff must respond to alarms reported from network solutions, monitor system health and ensure continuous service delivery, in a timely manner. This is costly, time consuming and requires considerable investment in resources, 24x7.

In the last decade, these costs have grown, alongside the complexity of networks. While some operators have outsourced their NOCs, operational costs (OPEX) have in many cases continued to rise. A new approach is required that leverages advances in technology to enable automation of key processes and actions that result from observed system behaviour and status indicators. Operators need to be able to:



Reduce OPEX

Improve network quality and customer experience

Predict and prevent future incidents

Improve Time to Repair (TTR) and fault resolution

Reduce human error

The desired end-goal is to deliver outstanding, consistent customer experience, cost-effectively. A fully automated NOC, that supports zero-touch and closed-loop processes, requiring minimal human intervention, with predictive maintenance capabilities, is a key step towards achieving this.

Such an environment would connect reporting and alarms – which may arise from different, disparate sources, such as equipment alarms, KPIs, customer complaints, weather forecasts, and more – to actions and responses. This would all be bolstered by new techniques, such as Machine Learning (ML), which would enable a pre-emptive, predictive approach and liberate resources for new revenue generation and growth opportunities.

This paper explores why NOC automation is essential, considers the benefits that can be obtained, and provides an illustration of this in practice. The introduction of NOC automation will deliver zero-touch capabilities and unlock new agility and efficiency. The paper further shows how Elisa, a leading mobile network operator, has adopted Virtual NOC, a fully automated NOC solution developed by Elisa Automate. Elisa is the first operator in the world to have achieved this. The Virtual NOC solution is now generally available for adoption by other operators seeking to achieve the same goals.

AUTOMATE NETWORK OPERATIONS

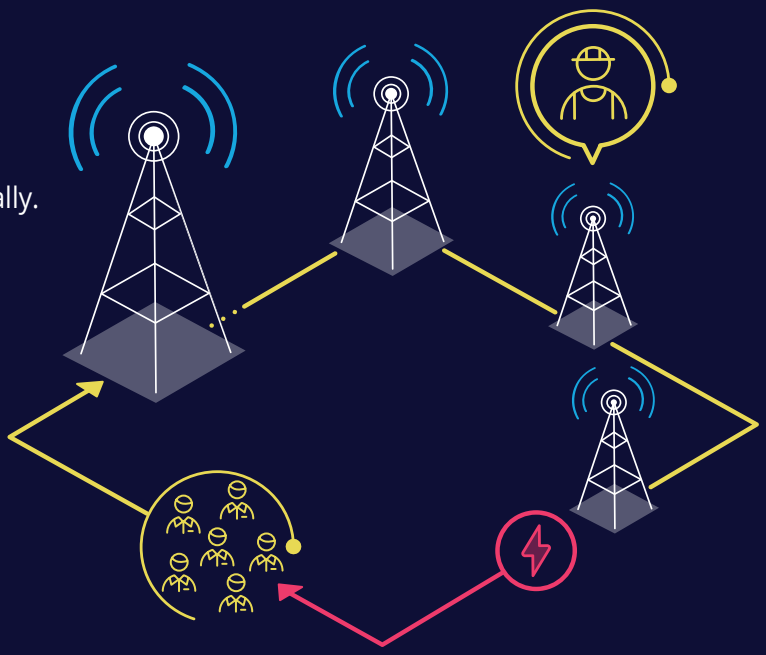
Network operations and performance management have high costs, making a significant contribution to overall OPEX and reducing profits that are already in decline. Different approaches to reducing the cost of network operations have been attempted and, because of imminent expenditure on 5G, the issue is more pressing than ever.

Operational costs (OPEX) are high in telecoms. There are many activities which contribute to OPEX. For example, time spent on routine or repetitive tasks or time spent reacting to network events. Similarly, customer complaints must be addressed, which creates further costs. It's also essential to try to reduce TTR for faults, as this further increases costs. If a problem requires a site visit, the costs are compounded. If service quality is affected, these costs can soon add up, as more users complain, and more effort must be invested in resolving the problem. Many of these tasks fall under the responsibility of the NOC, making it a significant contributor to OPEX.

Human costs also contribute to OPEX – in addition to direct costs associated with employment, there are also indirect opportunity costs. For example, manning the NOC with full-time staff consumes resources that could be deployed more profitably on other tasks, boosting the business instead of eating into margins.

FROM MANUAL

Network experts monitor alarms as they come in and solve them manually.



Manual operations approximately 1 hour per fault.

TO AUTOMATED

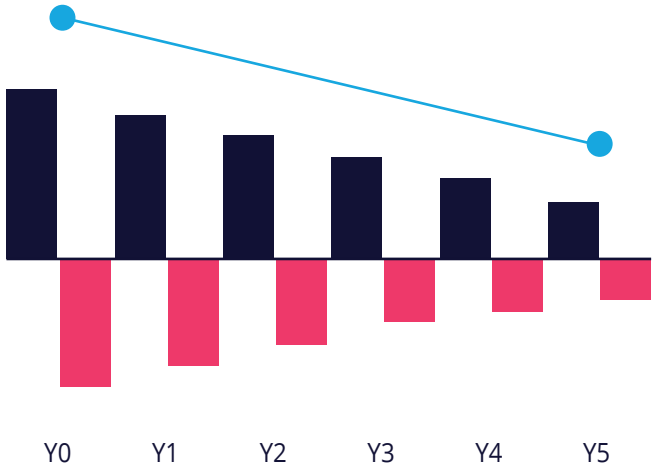
Alarms are being solved automatically and quickly.

Automated software can solve problems immediately.

Put simply, running a network to deliver telecoms services costs money. For telecoms operators, **aggregated OPEX costs can reach as much as 40% of total expenditure,** according to some reports – and this needs to be balanced against the need to invest in new solutions to extend and enhance the network.

This issue of rising OPEX has not gone unrecognised. As consulting firms such as Arthur D Little, PWC and Ernst and Young have noted, with margins growing ever tighter, there is a need to take action – by targeting operational cost reduction.

Of course, this is not new – back in 2010, Arthur D Little[1] predicted that margins could fall from historic levels of 35–45% to around 15% by 2021. This turned out to be accurate, as it has been reported that net profit margin reached 17% across the industry in 2018[2].



Illustrative EBITDA development

EBITDA %

Revenue -3% CAGR

OPEX +2% CAGR

Source: Arthur D. Little

This need is reinforced by the complexity of operators' networks, many of which have layered solutions, one on top of another, over time, creating a diverse array of legacy assets, each with its own processes and operational procedures. This adds to the cost burden.

There have been a number of efforts to reduce these costs. For example, some operators have adopted an outsourcing policy, transferring operational responsibility – including NOC management – to third-party service providers, integrators and vendors. This has shifted costs elsewhere, driving profit for such providers. Resuming responsibility for the NOC and optimising its costs creates an opportunity to recapture the profit taken by such operational service providers.

[1] "Cost reduction in the telecom industry", A D Little, 2010

[2] CSIMarket.com

Despite such approaches, a new consensus is forming. Arthur D Little, among others, has identified the potential of a new generation of technologies that can generate savings. These technologies can support new forms of automation for network operational processes, reducing human involvement and reducing costs – giving rise to the idea of the automated NOC, which runs with fewer or even no permanent staff, enabled by automation. An automated, zero-touch NOC is now seen as the optimal answer to these challenges.

At the same time, while there is a need to run the business more effectively to reduce operational costs, other factors need to be considered – for example, the quality of experience delivered to customers. With Net Promoter Scores (NPS) having become a differentiating factor in subscriber retention, service and network quality is of gro wing importance. Ensuring consistent quality through minimising faults both improves customer satisfaction (and hence NPS) and reduces the number of complaints – resul ting in lower cost levels. In addition, most operators are turning towards the introduction of 5G technology, which offers significantly enhanced performance.

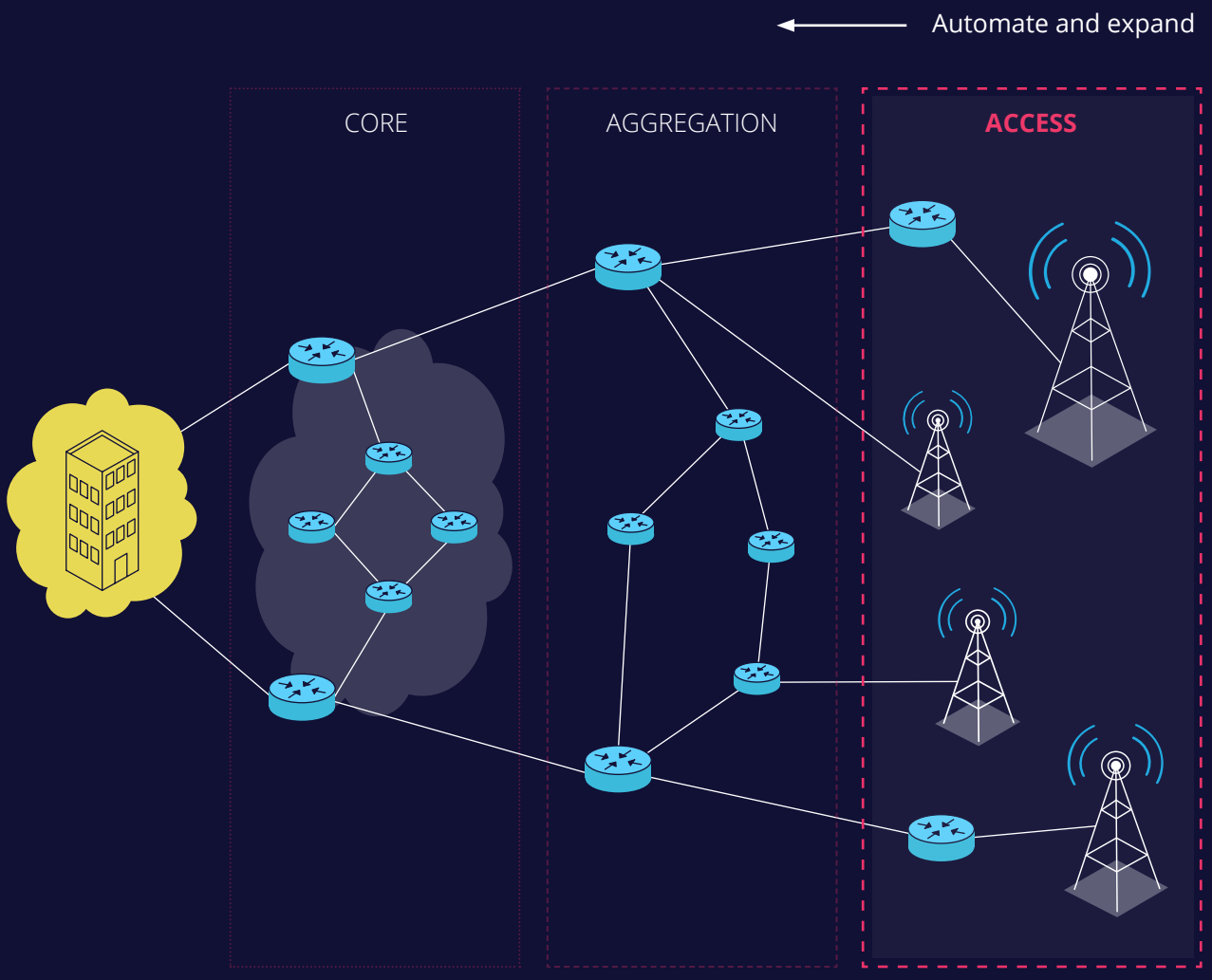
5G requires a massively increased footprint of cell sites, which increases the overall burden on network operations, adding to the pressure, and, since internet access has become indispensable to many, the impact of any service degradation is more pronounced than ever. Automating network operations and moving to an automated NOC can also help mitigate these costs, while reducing the cost of introducing new technology and solutions.

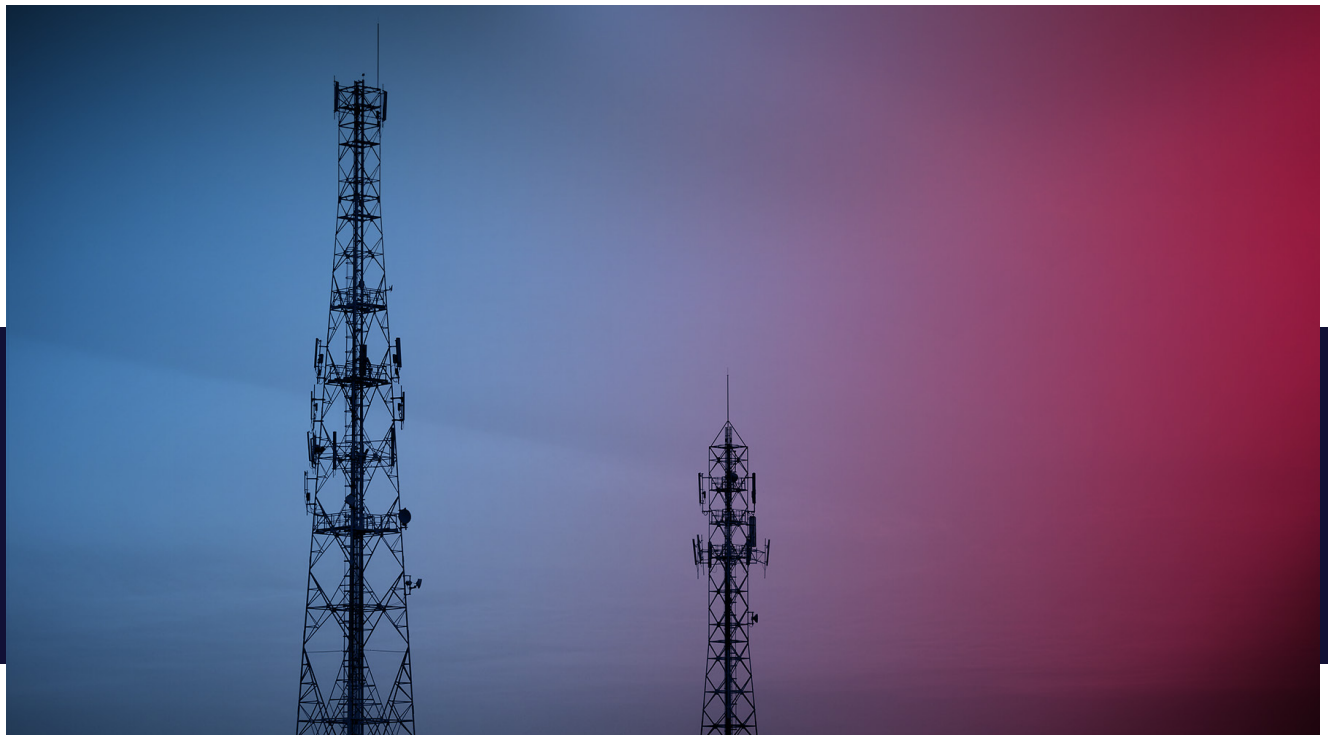
In addition, 5G is also designed to support more agile introduction of services but, in turn, this also depends on enhanced automation. Automation has thus become critical for more effectively managing existing infrastructure and assets.

In summary, an automated NOC, deployed in virtualised environments, will help operators to address existing OPEX and quality challenges, while also enabling them to meet new ones posed by 5G. In the next section, we will consider how this can be achieved by targeting a key source of operational costs that offers great promise for the introduction of automation and affords the potential for considerable cost savings as a result.

STARTING OUT WITH AUTOMATION

If automation in the NOC is the best answer for reducing operational costs, even while investing in new network technologies, where should efforts be applied to secure the most benefits? In most mobile networks, the largest single contributor to network operational costs is the RAN. Errors and their resolution cause costs to rise – and customers to complain.





To recap, there are many activities and resources that contribute to network operations OPEX in mobile networks. Examples include repairing faults, restoring faulty solutions to services, personnel that perform maintenance tasks, and power consumption. This creates multiple opportunities for the introduction of process automation – in which an event, rather than being handled with a manual intervention, instead automatically triggers one of a range of predefined responses, according to the nature of the event detected.

But, given the extent and complexity of overall network operations, operators need to be able to identify the best place to direct efforts to introduce NOC automation solutions. **For most mobile operators, the Radio Access Network (RAN), comprises the majority of the operational asset estate. Effectively managing RAN issues automatically from the NOC would drive down costs.**

The RAN consists of many thousands of distributed cell stations. These typically cover an entire country and are deployed in remote regions. They provide the key interface through which customers and devices access mobile voice, broadband and other services and, as such, are critical to service delivery.

Unfortunately, they are both costly to deploy and to maintain. The RAN has also traditionally required frequent manual intervention in the form of site visits and truck rolls, consuming both labour and increasing maintenance costs

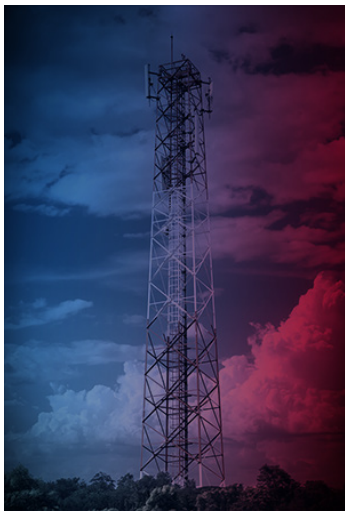
A mobile radio cell – the key element in the RAN – is typically composed of multiple elements, from antennas and connections to the backhaul and core network. The RAN must provide constant, continuous and consistent performance, but this is not always the case. Each cell element and

functional capability generates alarms, which must be continuously monitored so that when errors occur, they can be observed and corrected. Resolving these errors creates a stream of costs that can rapidly escalate. They may also lead to cascading customer complaints, causing both more costs and negative publicity.
In the worst case, for example, when a cell goes out of service, an alarm is generated, alerting a supervisor in the traditional NOC, who must take an appropriate action. There may be several possible actions, ranging from a simple remote reset, all the way to a visit from an engineer. In the event that a site visit is necessary, the cost can be significant.

To make matters more complex, faults may be ambiguous in their nature. For example, a number of alarms from different network elements and systems may be triggered at the same time. However, just one of these alarms may originate from the solution with the fault, while the others are triggered as the result of that single failure. Determining which alarm stems from the culprit can be time consuming.

Similarly, some alarms, known as “flapping alarms”, may appear for a brief period before disappearing in time. If the activity of this flapping alarm is missed, other, more serious alarms may result.

It is the task of the NOC team to determine which response is required and to initiate the appropriate actions. This needs to happen quickly, because customers in the affected domain or location will lose service and suffer as a result. Clearly, reducing the need for truck rolls, site visits or optimising the efficiency of such actions can have a significant positive impact on operational costs.



For other faults and irregularities, different actions can be taken – but again, decisions need to be taken about the appropriate response. Problem resolution may mean that engineers attempt several different procedures before identifying the correct solution. This takes time and may have a more significant impact on the business, not only increasing costs, but creating reputational damage.

In addition, while a diverse estate of legacy solutions (spanning multiple generations of network technology and products from different vendors) inherently increases costs, interconnecting disparate processes would go some way to alleviating this problem. If one process can trigger actions in another, then greater efficiencies can mitigate the costs of maintaining such legacy platforms.

Reducing this friction between alarm and action is the basis of zero-touch and closed-loop automation. It enables an alarm or event to trigger a corresponding action, removing or reducing the need for manual intervention and oversight. **Reducing TTR and enabling skilled – yet often scarce – human resources to be deployed on more profitable and productive tasks will boost not only network performance but unlock opportunities elsewhere.**

Finally, radio cells (and other solutions) also produce health status reports, with a predictable frequency, so a wide range of notifications can be collected. These notifications may not directly indicate errors, but they may provide indications of trends that, in turn, can lead to service problems in the future. Using these notifications to predict performance issues and thus to enable preventative action before costs are incurred would also be advantageous, as we shall see.

Taking action has become increasingly pressing – constraining and reducing OPEX is a strategic goal that has an important role in protecting and boosting margins, meeting key performance indicators (KPIs) and in transitioning to a new, agile network and service architecture. The question is, how and where to start the automation journey?

ELISA AUTOMATED THE NOC

Elisa, the leading mobile network operator in Finland, analysed common problems and their impacts, creating a prioritised approach to identify processes that could be automated to reduce costs and ensure effective error resolution.

Elisa, the leading Finnish mobile operator replaced its NOC with a Service Operation Center (SOC) as early as in 2011. The activity was originally triggered by the launch of a radical plan to unlock data consumption by pioneering unlimited mobile data plans. To achieve this, Elisa recognised that it had to constrain and manage OPEX, while investing in the extension and upgrade of its network to support surging data demand. The automation of key NOC processes was seen as critical to ensuring the success of these plans. This process was initiated in 2009 and is an early example of how such efforts should be realised.

At the outset, Elisa recognised that, while a fully virtual, zero-touch NOC was desirable, it had to take a step-by-step approach towards its implementation. As such, Elisa undertook an extensive review of operational costs, taking into account the customer impact of faults, the volume of issues that arise, and the cost of resolving them. Specifically, Elisa systematically undertook:

- **Identification of key processes;**
- **A review of legacy technology;**
- **Classification of workloads; and,**
- **Identification of the main**

This led Elisa to pinpoint transformation of the NOC to a virtual resource as a strategic priority, and also to identify the RAN as the key target area for process automation. Service degradation was found to be the single largest source of customer complaints. Resolving RAN errors automatically would both reduce costs, while enhancing customer experience and ensuring faster problem resolution.

The definition of processes proved to be critical. A network process is a series of steps that logically follow, one from another. A process might be initiated by an action and completed by a corresponding reaction. Removing manual steps in this series results in the desired enhanced automation.

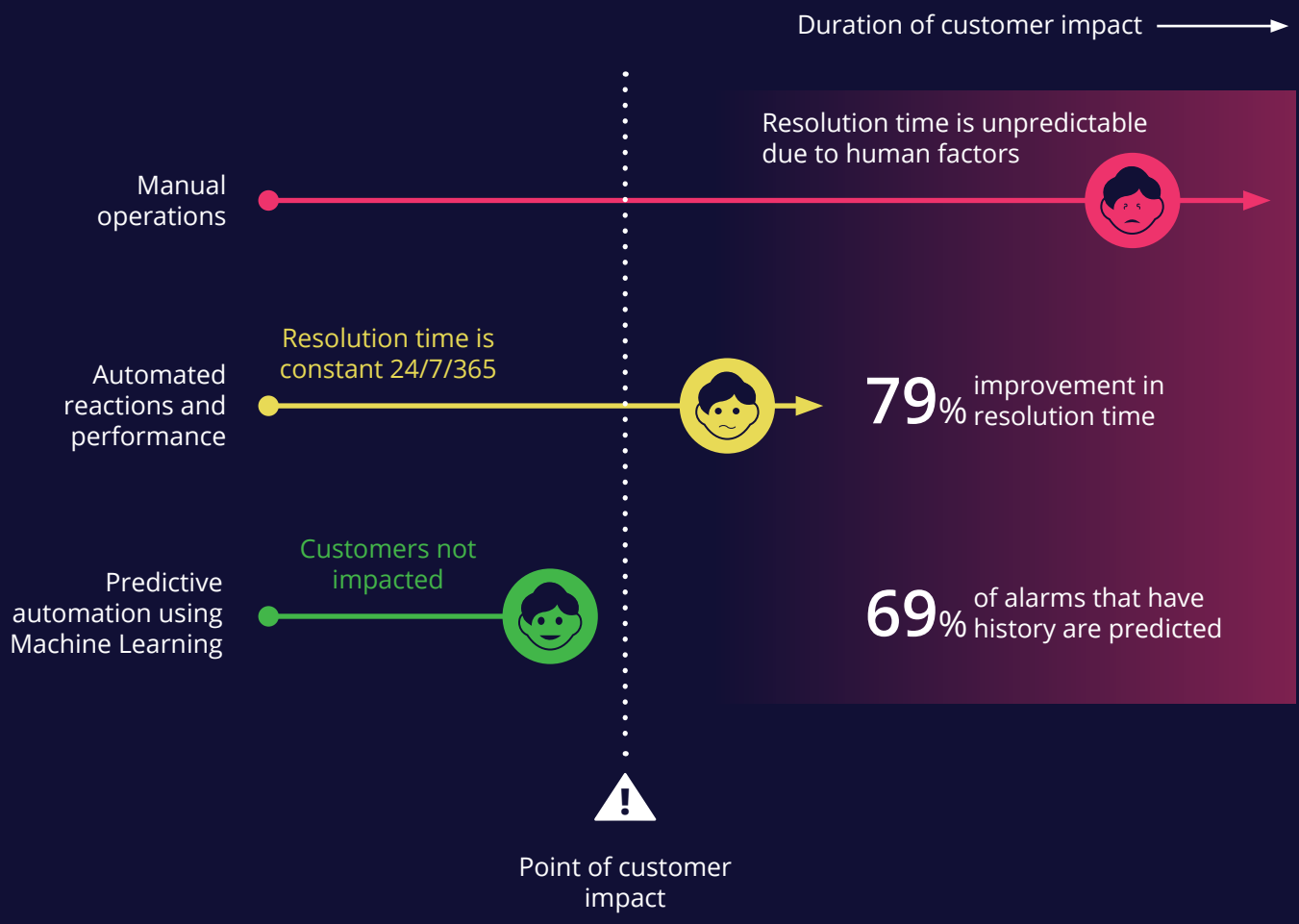
Elisa Automate's approach is to analyse and identify the candidate processes for automation; rank them in order of importance; build an appropriate algorithmic solution; and to verify the resulting performance. Elisa Automate designed a further methodology to target efforts effectively:

- What are the most frequent cell incidents?
- Which incidents have the biggest impact or create the biggest costs?
- Which demand the most resources?
- What are the different steps and actions that must be taken in order to resume normal operations?

This latter point is particularly important, because while some faults can be rectified easily in a single action, others may have a number of alternative remedies, which need to be applied in turn through escalation procedures. Cumulatively, the introduction of these automated processes led to the desired, fully automated NOC. Finally, in many cases, this automation can be further optimised through the application of machine learning processes.

THREE LEVELS OF AUTOMATION

Elisa Automate automated key alarms and removed friction points from NOC processes, allowing labour resources to be applied to other tasks. This enabled Elisa to handle the constant flow of alarms, to react to observed performance degradations, and to unlock proactive, predictive practices based on data processing by Machine Learning.



ALARMS - AUTOMATED REACTIONS

From the analysis, Elisa Automate quickly identified the incidents that would most benefit from automation – for example, an alarm that indicated a base station is out of service (OOS) would have critical implications. To accommodate this, an algorithm was created to analyse the current state of the base station and any associated alarms. This would then enable appropriate actions to be taken. In turn, the context of each Base Station can also be considered, because the location may have implications for the remedial activities. Some locations are more sensitive than others due to traffic volumes and the average number of daily users, or the remoteness of the site.

Appropriate actions can include full remote reset, as well as sending appropriate notifications to field maintenance teams or other relevant specialists. For notification of staff, new mechanisms can complement other channels. If the first action does not succeed, the next in the series can be taken automatically, culminating in the requisite step for worst-case scenarios.

Not all alarms relate directly to networks and services, however. There may be sensors to detect smoke or fire, as well as other environmental or physical factors (such as battery power, fuel supply, lighting, ambient temperature – vital for equipment that must be cooled – and so on). Alarms from such sensors must also be incorporated into the automation programme, to ensure that it is comprehensive.

As a result of deploying the Elisa Automate solution, new resolution paths were enabled, with fully closed loops and without recourse to human intervention: a zero-touch solution. Further examples of automation are provided in the next section.

PERFORMANCE AUTOMATION

Another focus for automation that can have a significant impact on customer quality experience is the automation of responses to routine alerts and alarms. This is because some alarm conditions provide indications of network performance issues that do not, yet, negatively impact service performance and customer experience. They may come to do so in time, so such indicators need to be incorporated into the automation framework. One common example is alarms that indicate faults in Base Stations or cells, but which do not mean that service has been disrupted.

By checking the nature of such alarms and what the corresponding remedies are, each can be triggered automatically. Responses can be generated in real-time, much more rapidly than by human decision-making. If these fail to resolve the problem, then escalation to engineering staff can also be generated. This ensures that performance is maintained according to KPIs, allowing new benchmarks to be established and the continual optimisation of performance, while reducing the need for manual intervention.

PREDICTIVE AUTOMATION USING MACHINE LEARNING

Reactive automation is one thing, but being able to predict when an incident might occur and taking preventative action is quite another. Elisa Automate has also been able to lead the way in this domain. How has this been accomplished?

Elisa Automate found that there are several key steps to enable preventive actions. The KPIs and error patterns collected from network data, as well as routine and regular health status reports – both historic and real-time – provide a rich source of information. The first step is to understand what these are and the impact they have.

This information can then be processed using ML algorithms, which identify and define the characteristics of normal versus anomalous indicators. ML is essential for this task, because it enables large volumes of data to be processed, patterns to be detected, and events and outcomes to be correlated with activity trends and signals.

Algorithms that include appropriate responses to such behaviours can then be created and deployed, allowing appropriate actions to be taken before an alarm is actually raised.

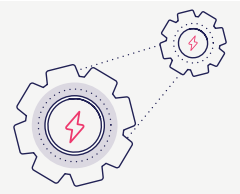
Finally, the effectiveness of the actions taken can be recognised and refined by the appropriate algorithm, allowing performance to be further optimised on a continual basis. Through time, Elisa Automate built an extensive library of such algorithms, enabling prediction of all service-affecting issues.

An example of this is the replacement of battery units in remote sites. While traditional techniques might be able to warn that a battery needs to be replaced, these are often inaccurate, leading to false positives and resulting in inefficiencies. In contrast, ML can estimate the actual level of power remaining in a battery, which, in turn, enables optimisation of the replacement schedule and, therefore, leads to cost reduction.

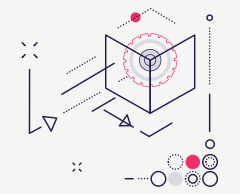
THE FULL IMPACT OF THE AUTOMATED NOC

Elisa Automate delivers a completely automated NOC that autonomously runs all processes for ensuring consistent service delivery in the RAN, in a fully virtual environment. Significant measurable benefits have been secured, together with the expected cost reductions.

Today, Elisa Finland runs a fully automated, zero-touch NOC, based on Elisa Automate's Virtual NOC solution. Key processes have been automated to ensure effective resolution and to enable predictive maintenance. The results have delivered significant cost savings and helped Elisa to meet operational targets. Cumulatively, for example, the following benefits have been achieved:



100% OF CUSTOMER-IMPACTING HAVE BEEN AUTOMATED

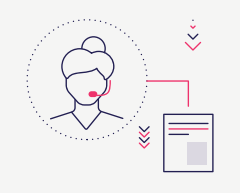


100% OF 1ST LINE WORK NOC AUTOMATED

93% OF ALARMS ARE PREDICTED AND PROACTIVELY MANAGED

79% IMPROVEMENT IN RESOLUTION TIME

71% REDUCTION IN NUMBER OF INCIDENTS



15% REDUCTION IN CUSTOMER COMPLAINTS

The deployment has also enabled more efficient deployment of human resources. The Virtual NOC runs without any full-time staff, but with resources available 'on-call' as required. This means that experts can be deployed on other tasks, enhancing efficiency.

This has had a profound positive impact on OPEX leading to significant cost reductions – which has a further positive impact on the bottom line. Zero-touch operations have been enabled, with closed loops that provide a solution to the challenges of OPEX cost management, in the automated NOC. In addition, solving problems earlier creates a better, more consistent customer experience – positively contributing to NPS. Elisa has also been able to introduce 5G, without negatively impacting OPEX. This is transformative and unique.

CONCLUSION

There is a clear need to control OPEX in the telecoms industry. Analysts have been making dire predictions about declining margins and the impact of OPEX on budgets for many years. One way to meet this challenge is the automation of network management and fault resolution processes, through the adoption of the Virtual NOC. Automation of RAN and other operational processes, in the Virtual NOC, delivers considerable, measurable benefits. A big-bang approach is not necessary, as even the automation of the first process delivers benefits, with incremental benefits accrued for each additional process as the scope is extended.

Some operators, such as Elisa Finland, have already embarked on this journey. Elisa, by working with Elisa Automate, has secured a completely virtual, zero-touch NOC, enabled by closed-loop automation and machine learning.

The Virtual NOC is not only essential for reducing current costs, it is also fundamental to future network evolution and service delivery. With the advent of 5G and the transformation it brings, an automated, zero-touch NOC will be essential. 5G demands higher performance and greater agility than any previous generation of network technology, but also comes with higher costs. As a result, expectations are higher, while costs must be constrained. Zero-touch automation is a prerequisite for this success.

Elisa Automate's Virtual NOC is a complete solution that enables operators to move to full NOC automation. The solution resolves complex issues and can scale to encompass the complete network infrastructure. It enables rapid reaction times, providing faster responses than those of humans. And, it enhances accuracy, avoiding inevitable human errors and benefitting from the continuous performance enhancement that ML provides.

The Virtual NOC is proven to deliver, in challenging networks. It reduces costs, improves customer experience and optimises network performance, while enabling more efficient resource allocation. It is the foundation of a completely automated NOC and effectively enables transition to 5G service-oriented networks, as well as the effective management of legacy infrastructure.

AUTOMATE

Are you curious and want to hear more about how Virtual NOC improve networks?

Get in touch with us for a noncommittal discussion.

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