# 5G Service Assurance: The Case for AIOps

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# EXECUTIVE SUMMARY

Communication Service Providers (CSPs) are rapidly deploying 5G networks, creating new services and revenue which were not possible using 4G and earlier mobile technologies. 5G networks have much higher bandwidth and lower latency, and new services based on 5G hold the promise to accelerate digital transformation for many enterprises. Examples of these exciting new use cases include network slicing, IoT, Private 5G, business AR/VR, smart factories, fleet and inventory management, connected vehicles, cloud gaming, drones, and connected robots.

As CSPs move to 5G, infrastructure, operations, and services are undergoing a massive paradigm shift. Legacy networks consist of multiple silos, for example, the RAN is typically a closed system supported by a single vendor. The same is true for the packet core. However, 5G networks are moving to a cloud-native architecture that is heterogeneous, highly distributed and has fuzzier boundaries. Many vendors provide software and hardware in shared environments, resulting in horizontal architectures and virtual network functions running across hybrid clouds. At the same time the new 5G enabled services raise the bar on quick delivery, rapid iteration, and a high level of service assurance.

This transition creates new challenges for CSPs:

- Managing the transition from mostly hardware elements to a more complex mix of hardware, virtual and cloud native network elements
- Market pressure to move faster in creating, delivering and iterating on new services
- The Customer Experience bar for new services is high, with low tolerance for disruptions or slow response times.
- CSPs must tackle all of the above while improving operational efficiency, to lower cost and reduce the dependence on hard-to-find skills

CSPs need a modern monitoring and automation platform that is best suited to tackle the complexity and challenges of the new 5G environments. This drives the need for a service-centric AIOps approach to 5G operations, which eases complexity, enables agile service delivery and innovation, while elevating customer experience and lowering operational expense. Some of the key characteristics of a service centric AIOps platform are:

- A highly extensible data platform that seamlessly spans the full gamut of physical, virtual and cloud native building blocks
- Deep insights leveraging correlation across data sources, as well as mapping low level building blocks to customer facing business services
- AI/ML that enables predictive monitoring and automated RCA, enabling a great Customer Experience
- A high degree of automation for agile service delivery and low Opex

This paper discusses the challenges posed to CSPs in migrating to cloud-native 5G infrastructure and the benefits of adopting an AIOps platform for hybrid cloud network management and service assurance.

## Evolution to 5G – The Blurring Of Boundaries

The transition from 4G to 5G is a major paradigm shift in three dimensions, each of which blur previously clear boundaries in these areas:

- Infrastructure
- Operations
- Services

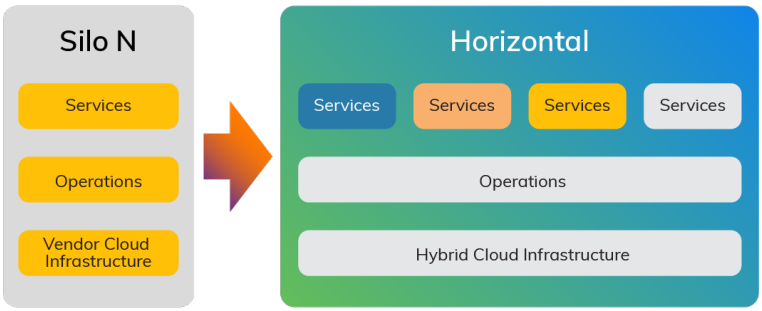



**Figure 1**

## 5G Infrastructure Paradigm Shift

Figure 2 illustrates the shift as 5G infrastructure is moving from physical network elements running in traditional central offices to virtual network elements in hybrid cloud environments. Today, telco networks consist of vertically integrated systems supplied and maintained by a limited group of telecom vendors. By comparison, 5G infrastructure consists of a complex mix of physical, virtual and cloud-native network elements running in a highly distributed modern multi-cloud architecture.

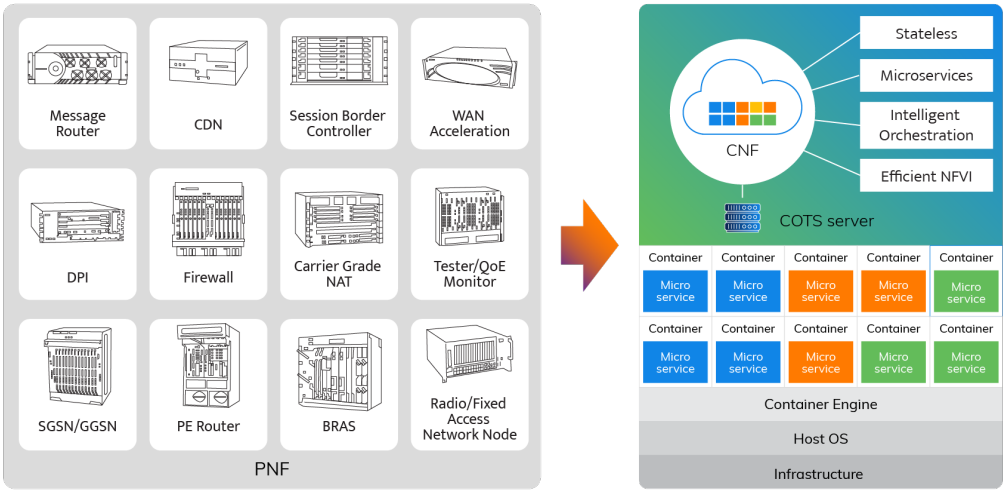



**Figure 2. Transition from Physical Network Elements to Virtual Network Elements**

Software can be provided by many vendors and can include open source and cloud native components. In the physical telco network CSPs could rely on a small group of vendors to help operate and maintain network infrastructure. In a horizontal 5G architecture CSPs must take responsibility for systems integration and life-cycle management, which is more challenging. Further, components of this architecture will be rapidly changing, and life cycles will be shorter, adding to challenges.

Additionally, network functions are moving to the edge of the network. The packet core forwarding plane is moving from regional data centers to

distributed edge data centers. Open Radio Access Networks (O-RAN) components are running in far edge cell sites and near edge data centers. And Multi-Access Edge Computing (MEC) nodes are providing new services and applications at the network edge, such as public safety, fleet and inventory management, smart energy grid, connected vehicles, and IoT solutions.

The diversity of a modern, distributed 5G telco cloud is depicted in Figure 3. Some of the key challenges are:

- Thousands of highly distributed regional, edge, far edge cloud data centers
- Complexity associated with many vendors, software, cloud and open source.
- Large amounts of data and high data throughput
- Large number of devices (IoT)

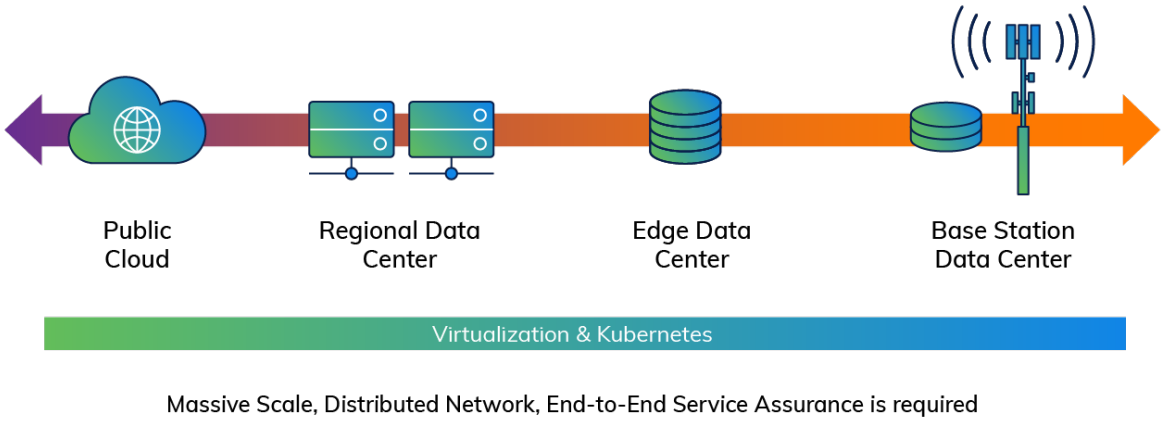



**Figure 3. A Modern, Distributed Telco Cloud Architecture**

## 5G Operations Paradigm Shift

Network operations impact cost, efficiency, agility and quality of 5G services, making them critical differentiators. Legacy network operations are usually organized in vertical silos because the technology is provided by distinct vendors who provide significant operations support to CSPs.

CSPs had to organize around silos to maintain the specialization required to operate these network components. Examples of operations silos are illustrated in Figure 4. For example, in legacy networks it is common to have one or more packet cores that are supported by a single vendor and supported by a single organization.

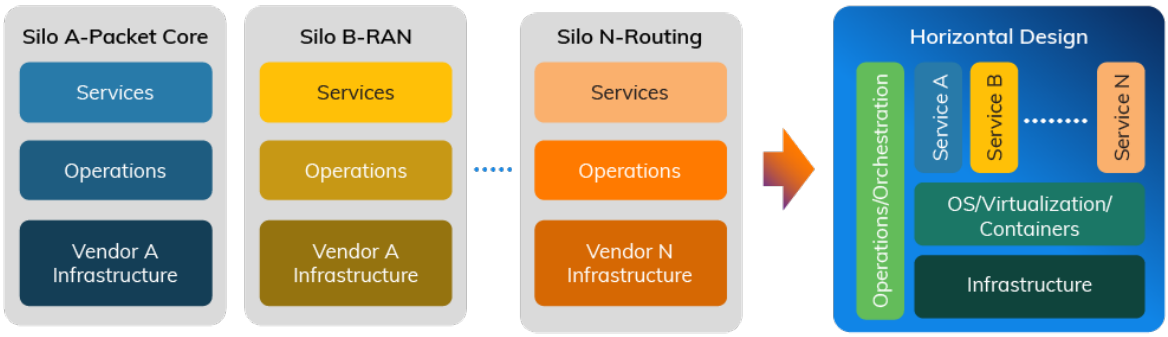



**Figure 4. Operations Silos in Legacy Networks**

In the new 5G network infrastructure, operations and services exist in a horizontal architecture with virtual network functions running on virtual machines or containers running on a hybrid cloud infrastructure. The old, siloed operations model does not work well anymore. CSPs are no longer managing single vendor solutions; network functions can be provided by multiple vendors or with open source, across multiple data centers and geographies. To effectively deliver targeted 5G service levels, the CSP must have visibility across the interconnected and interdependent end-to-end 5G service environment.

This means operations must also move from a silo to a horizontal architecture to support 5G services, while integrating modern cloud tools and AIOps into operations.

Additionally, skill sets need to change. Traditional skill sets were heavily network-centric, based on vendors' technologies, solutions, and tools. 5G networks require both network-centric skills and modern cloud native operations skills. These hybrid skill sets may be tougher to find; organizations instead should seek tools (like AIOps) and processes that simplify complexity and consequently lower the bar for skills required.

### 5G Services Paradigm Shift

New services are key to 5G business success to grow revenue and profitability. CSPs cannot maximize return on their 5G infrastructure investments with traditional smartphone services alone. There is great potential in new services such as:

- Enterprise services: Network slicing, IoT, Private 5G, Business AR/VR, smart factories, fleet and inventory management, etc.
- Edge services: Connected vehicles, cloud gaming, IoT, drones, robots, etc.

To introduce new, profitable services quickly and successfully, CSPs must have both:

- Service agility: Ability to rapidly deploy new services based on end-users' intent and requirements, iterate based on market feedback and implement fast fail for services that are not successful.
- Service assurance: Ensure that all services provide end-users with high availability and predictable performance.

## 5G Pain Points for CSPs

As CSPs roll out 5G, this shift from vertical siloes to a blurrier horizontal architecture creates some new pain points that need to be addressed.

### Pain Point #1: Complexity created by Transition from Hardware Network Elements to Virtual Network Elements

Network elements, including the packet core and RAN, are moving to cloud-native architectures. Today, CSPs rely on a few vendors and systems integrators for network maintenance (and in some cases outsourced operations). As everything shifts to cloud-native architectures there are multiple problems that need to be solved:

- Telco networks always involved massive scale (tens or hundreds of thousands of mini data centers), but 5G networks have a more complex mix of vendors, open-source software, white-box solutions, cloud native components and new orchestration tools (like Kubernetes).
- CSPs must also support multi-cloud environments, including private clouds, public clouds, and private/public edge clouds.
- All of this is a scalability, management, and operations challenge. The CSP needs to take responsibility of systems integration and life-cycle management of this complex, distributed environment. This transition forces the need for new skills, tools and processes.

These factors lead to increased network complexity. Some of the questions that need to be answered are:

- How do I monitor this environment, and track how the pieces impact customer facing services?
- How do I do service assurance, catch problems early and fix them quickly?

### Pain Point #2: Raising the bar on Agility with Service Creation and Delivery

The attractive new 5G use cases create a need to deploy and evolve services faster to serve new enterprise and edge use cases. This, plus the paradigm shift from a hardware-centric telco network to a distributed cloud-native network means that service delivery processes and procedures will need to change to a more DevOps like model.

The key problems that need to be addressed are:

- How can services be rapidly and efficiently deployed?
- Building and deploying services at rapid scale and rapid frequency requires a mature DevOps model. How do CSPs implement and maintain such a DevOps model?
- How to support applications developers and third-party service providers with a modern DevOps model?
- What software tools are required to accomplish these goals?

### Pain point #3: How to maintain a good Customer Experience

The new 5G use cases have novel requirements and a high bar for service quality. Bad news travels fast so it is essential to minimize service problems, especially

with large enterprise customers because service performance problems and outages can adversely affect future business. The key problems that need to be addressed are:

- How to speed incident response, reduce MTTR, and maintain SLAs?
- How to automatically diagnose problems before they impact customers?
- How to automatically remediate problems as they are occurring?
- How to create a self-healing network?

### Pain point #4: How to Achieve Operational Efficiency through Automation

All of the above challenges (agility, complexity, CX) must be met while maintaining operational efficiency and low cost. The key problems that need to be addressed are:

- How to reduce manual tasks and workloads?
- How to minimize the need for highly specialized skills to support these new environments?
- How to leverage AI/ML for complex tasks (like troubleshooting a mix of cloud native and physical components)?
- How to automate tasks by linking them to insights delivered by AI/ML tools?

CSP pain points for 5G rollouts are summarized below in Figure 5.

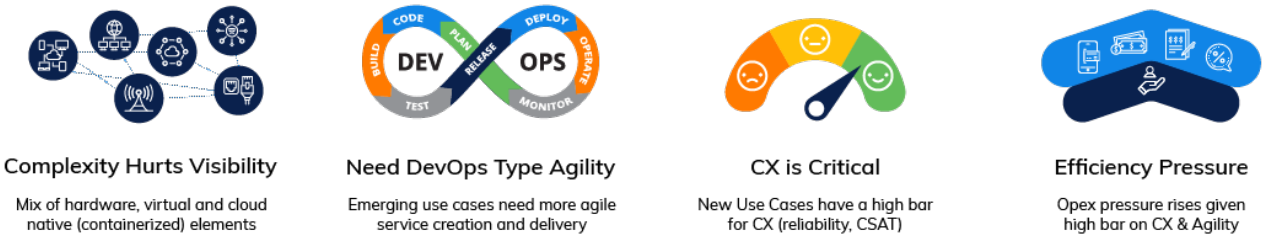



**Figure 5. CSP Pain Points with 5G Rollouts**

Lack of 5G service infrastructure visibility and falling back on traditional manual (brute force) techniques are two common threads that run across the pain points listed above. Tackling them will require an intelligent AIops approach that can quickly adapt to changes within a dynamic 5G environment, uncover insights without painstaking effort, and automate every known task easily.

# AIOps Solutions for 5G Pain Points

Since these pain points cannot be solved with brute force, AI and automation are critical success factors, and AIOps platforms can offer the capabilities needed to meet these challenges.

## AIOps Attributes

AIOps is the term for platforms that can aggregate large volumes of monitoring data, extract insights about operational problems using AI/ML techniques, and help speed up remediation based on these insights. A modern AIOps platform has several attributes that are well suited to tackling the pain points associated with 5G rollout:

- Versatile and extensible monitoring and data collection capabilities – including physical, virtual and cloud native components.
- The capability to map building blocks to user facing business services, enabling quick insights into service health and sources of potential problems.
- AI/ML that quickly adapt to new services and uncovers potential problems autonomously.
- Accurate ML generated Root Cause reports to drastically shorten MTTR without relying on a large pool of skilled engineers.
- No-code automation tools to easily replace manual workflows.

Here are more details on these capabilities:

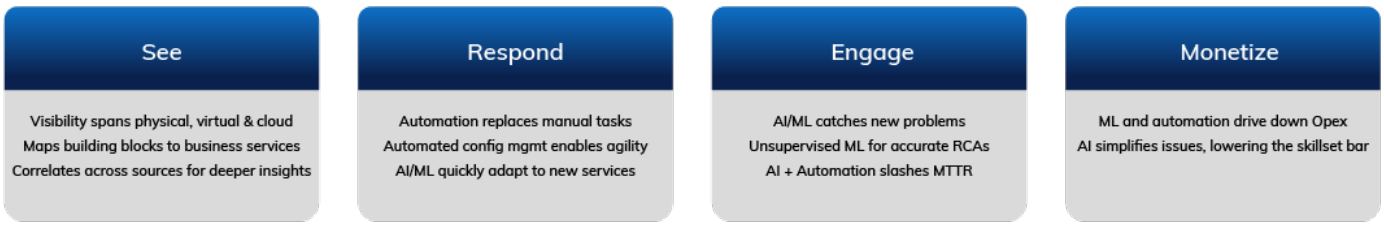


**Figure 6. AIOps Platform Capabilities**

## SEE: Versatile & Extensible Monitoring and Data Collection

The first problem that needs to be addressed is to get visibility across a large, distributed heterogeneous network. The first step is to be able to collect and normalize data from all 5G components – whether virtual or physical, multi-vendor or open source, data center or multi-cloud. In order to accomplish this a common platform is needed to ingest, normalize and aggregate data from many sources into a real time operational data lake with a common data model. The real-time data lake enables users and AI/ML tools to extract insights about environment health and usage, including alerts, queries, custom reports and unified dashboards.

CSPs should be able to quickly and easily create service views of the network using the data lake to visualize health, availability, and risk of outages for individual network services. Service assurance and fault management automation must be based on services not individual network devices, VMs or containers.

## RESPOND: Agility Through ML and Workflow Automation

Given a service view of the network and a real-time data lake it is possible to apply a rich set of analytical techniques and machine learning to detect anomalous service behavior. This allows CSPs to plan based on trends, predict service degrading events before they occur, and rapidly detect service impacting issues.

Low-code/no-code automation tools lower the bar on converting manual operations to automated ones, whether proactive or in response to problems. Automation allows CSPs to keep their configuration management database up-to-date and accurate, automating tasks like backup, recovery and compliance checks. Automation also manages creation and routing of trouble tickets to manage IT workflows. Finally, automation can enable “self-healing networks”, by linking root cause reports that were generated by AI/ML, to remediation actions, such as a config rollback or a device reboot.

## ENGAGE: Leverage AI/ML to Deliver a Great Customer Experience

In 5G networks it is essential to deliver new services to the market and

iterate quickly as customers refine their use cases. At the same time, the expectations for service quality, reliability and low MTTR are quite high given the nature of these new services. Failure to meet these expectations can result in customer churn and bad word of mouth regarding their experience. The traditional approach of throwing people at the problem gets much harder given operational expense constraints and the tight market for highly skilled engineers.

AI/ML can play a critical role here. Unsupervised ML is now capable of detecting new problems, AND extremely quick and accurate root cause analysis (as good as a skilled engineer). This makes AI/ML a key tool to help meet the CX expectations of 5G customers.

### MONETIZE: Automation plus AI/ML Enable Simplicity, Efficiency and Opex Savings

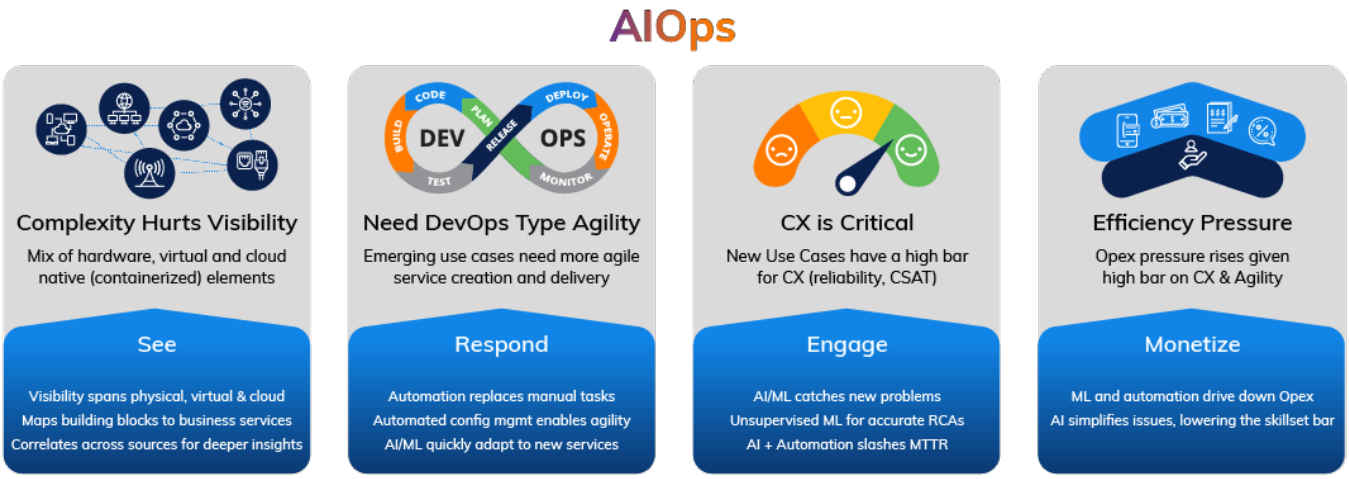
New 5G use cases offer rich revenue generating opportunities, as long as the services can be delivered efficiently and profitably. AIOps can play a key role here. AI/ML features simplify and speed up time consuming tasks, such as problem detection, triage and root cause. No-code automation building blocks enable repetitive tasks to be quickly automated, and linked to AI/ML generated insights.

Finally AI/ML leverage Natural Language Processing techniques like keyword extraction and GPT based summarization simplify problems in ways that relatively less experienced engineers can understand. This lowers the skillset bar required to staff operations, further lowering opex.

## Solution Benefits

A modern AIOps service assurance solution enables a CSP to manage the complexity of a 5G network, deliver a better customer experience, and lower operational expense by using AI/ML and automation to replace manual tasks. This enables faster market response and service rollout, higher customer satisfaction, and lower cost of service delivery. In short, AIOps is a

critical tool to help CSPs address the challenges associated with rolling out new 5G services.




## Conclusion

Even as 5G opens up exciting new applications and use cases, it is driving a migration from a physical technology and organizational silos to a horizontal cloud- native network. This transition represents a paradigm shift in network infrastructure, operations, and services. The only viable approach to rapidly deliver new services while maintaining good customer experience, low opex and managing the complexity of the new environments is to implement an AIOps architecture.

AIOps allows CSPs to quickly design and deliver new services, maintain a high bar for service assurance while reducing the requirements for highly skilled staff to manage increasingly complex network operations. This allows CSPs to satisfy customers, introduce highly competitive services quickly, and grow revenue and profitability. AIOps is a critical tool for CSPs that want to stay ahead of the curve in an increasingly competitive 5G market.

## About the Sponsor, ScienceLogic

ScienceLogic enables companies to digitally transform themselves by removing the difficulty of managing complex, distributed IT services.

Our IT infrastructure monitoring and AIOps platform (SL1) provides modern IT operations with actionable insights to predict and resolve problems faster in a digital, ephemeral world. The SL1 platform sees everything across cloud and distributed architectures, contextualizes data through relationship mapping, and acts on this insight through integration and automation. SL1 solves the challenges and complexities of today and provides the flexibility to face the IT monitoring and management needs of tomorrow.

Trusted by thousands of organizations, ScienceLogic's technology was designed for the rigorous security requirements of United States Department of Defense, proven for scale by the world's largest service providers, and optimized for the needs of large enterprises.

For more information: www.sciencelogic.com

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