tmforum knowledge

cloud migration: delivering a network for better customer experience

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contents

setting the scene

One of the biggest challenges communications service providers (CSPs) face today is transitioning from dedicated, hardware-based networks to virtualized, programmable networks that operate across multiple public clouds. There are tremendous benefits to be gained in cost, flexibility and customer experience (CX) by putting networks in public clouds. But from an operations perspective, doing so creates new complications.

Legacy networks traditionally have been regimented and static, comprised of purpose-built hardware and based on specifications that defined each element's role, functions and operations. They were predictable, and operations models could focus on making them even more predictable, stable, fault tolerant and repairable.

In the past decade, however, the ability to construct a software-based network with intelligent, elastic building blocks that can redefine functional roles in real time and communicate with each other – autonomously – has gone from the lab to real-world implementation. This is the era in which CSPs find themselves transitioning not only to virtualized networks, but also to cloud-native specifications like 5G standalone (5G SA).

which cloud is best?

This has raised a key strategic question for CSPs: On which type of cloud is it best to implement 5G networks? Options include private, public and hybrid clouds, with multiple public clouds as an option as well. According to a recent report by Dell'Oro Group, close to 30 service providers have deployed 5G networks in private or telco clouds (private clouds specifically for virtual network functions), with relatively few opting to implement their 5G networks in public clouds thus far. Dell'Oro predicts, however, that by 2026 CSPs' spending on public cloud 5G deployment will overtake spending on telco-operated clouds.

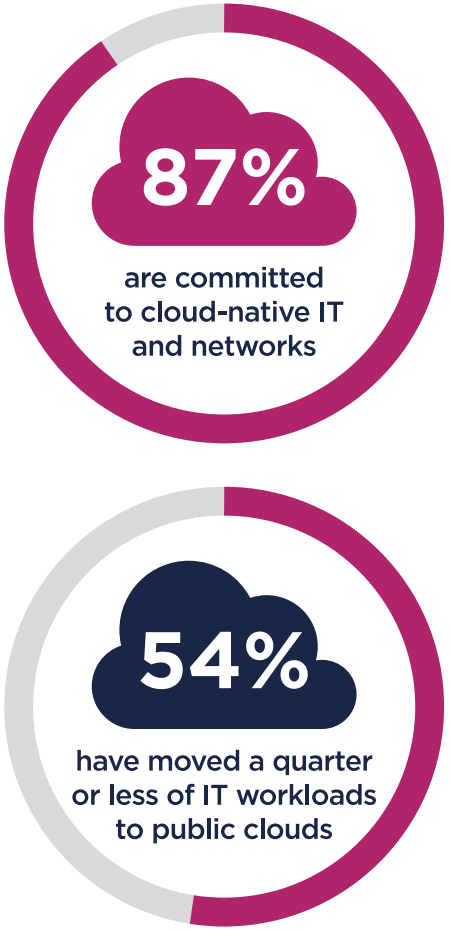
Dell'Oro Group predicts that by 2026 CSPs' spending on public cloud 5G deployment will overtake spending on telco-operated clouds

This prediction aligns with the findings from TM Forum's latest Digital Transformation Tracker, which show that while nearly 90% of CSPs are either partially or completely committed to cloud-native approaches to networks and IT, more than half have moved less than a quarter of their IT operations to public clouds (see graphic). In other words, it is still early in the game.

CSPs' deliberate approach – most early adopters are carefully deploying 5G solutions on clouds they control while learning how to operate the new systems – may be a sign of prudence rather than reluctance to use public clouds. The economic case for public clouds is so powerful that most CSPs will embrace them to decrease costs and improve CX, but they also want to understand the risks and adjust assumptions accordingly.

Public cloud providers like Amazon Web Services (AWS) have published open-source guides to implementing evolved packet core and 5G core networks in AWS cloud environments. AWS has also shared details on how customers like DISH are implementing end-to-end 5G networks on its public cloud services. These efforts are aimed at helping operators understand the distinct advantages cloud-native networks and services offer and how they offset business risks.

CSPs' commitment to cloud



TM Forum, 2022

benefits of public cloud

CSPs are looking to public clouds to deliver benefits such as:

Maximum network availability

Simpler and more elastic scalability

Greater and more flexible support for mission-critical enterprise applications

Realization of closed-loop automation, data-driven decisioning and real-time analytics

This e-book examines the path CSPs are taking from the early days of network management when fault, configuration, accounting, performance and security (FCAPS) was the norm to today's public-cloud paradigm. Specifically, we look at how DISH, Telefónica Colombia, Telenor and Sky Italia are running services in public clouds, the challenges they have faced and the benefits they're realizing. We also offer key steps for CSPs to take in deploying 5G functions in public clouds to create new experiences and service innovation through automation, autonomous networks (ANs) and enterprise-wide analytics.

CHAPTER 1

the path to public cloud

Transforming traditional telecom networks to become cloud native can be extremely complex. It is not a matter of transferring an iteration of software from one box to another and pressing "on". The shift is more fundamental, with potentially seismic impacts on CSPs' businesses.

For decades, a network element was a purpose-built device that effectively provided its own definition of what it was and how to operate it. In the public cloud, however, microservices – or collections of them – replace network elements and only become elements of the network when they are running. There are potentially no fixed or static resources in the network, except the physical elements. In a traditional network, there is no category for this kind of on-demand, elastic model, hence legacy solutions can rarely accommodate the new, cloud-native networking paradigm.

operations revolution

As networks and services have evolved, so have operations. Today, operations are fundamentally changing to support the new cloud-native network paradigm. The path from the traditional FCAPS operations management model to mapping operations functions against the requirements of intent-based, autonomous networks is well underway (see graphic on page 7). "Intents" comprise a user's requirements, goals and constraints in a simplified manner that is abstracted from the underlying infrastructure. Put more simply, intents are the "what" not the "how" – meaning, you can tell the system what it should do without having to tell it how to do it.

Today, operations are fundamentally changing to support the new cloud-native network paradigm

from FCAPS to ODA

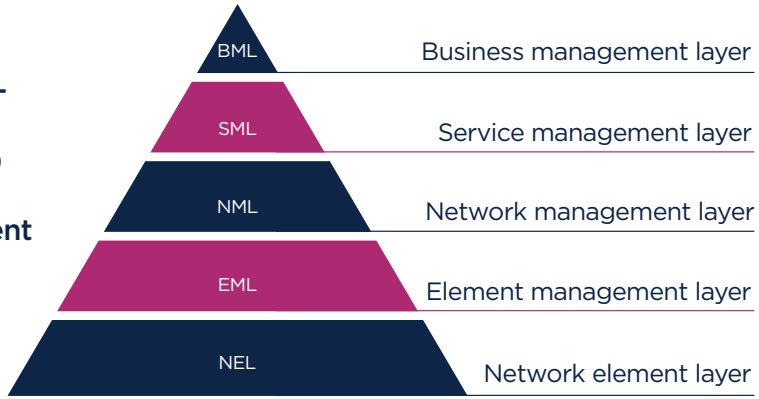
1

Original FCAPS model describes operations management functions

- Fault Management (F)
- Configuration Management (C)
- Accounting Management (A)
- Performance Management (P)
- Security Management (S)

2

ITU TMN (Telecommunications Management Network) model expands to include management layers



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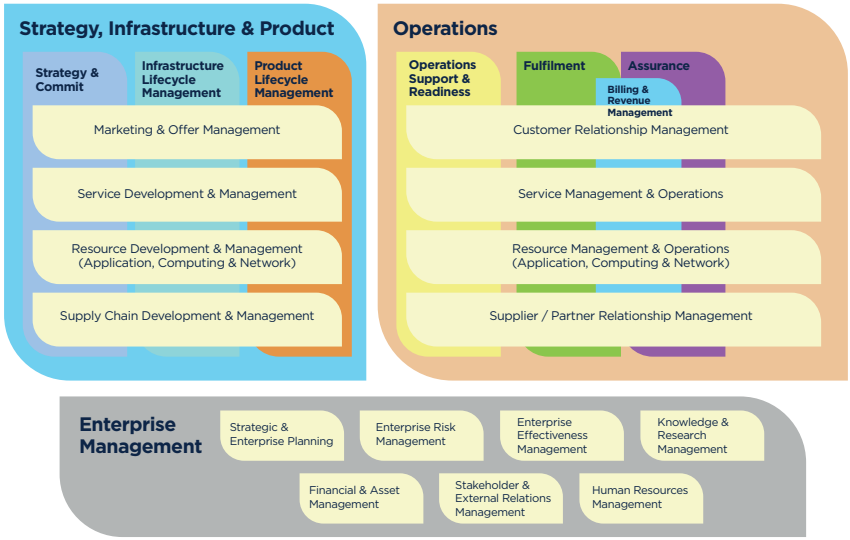
TM Forum standardizes the Business Process Framework (eTOM)



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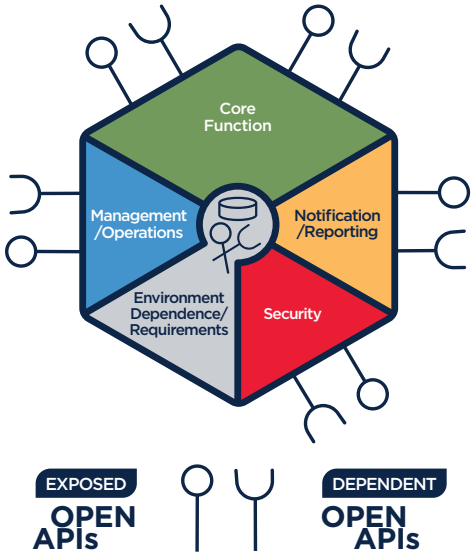
TM Forum writes the cloud-native operations handbook with the Open Digital Architecture (ODA)



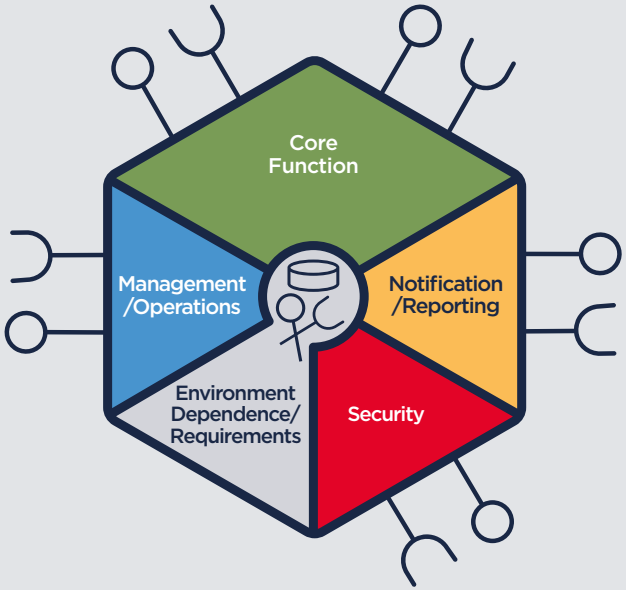
At each step in the evolution of CSPs' operations, TM Forum has played an important role in defining the models, specifications and Open APIs that operators can use to evolve their networks and businesses (see panel on page 8). A major challenge that results from re-imagining network architecture is sorting out how to operate cloud-native networks with the same predictability and reliability as traditional networks.

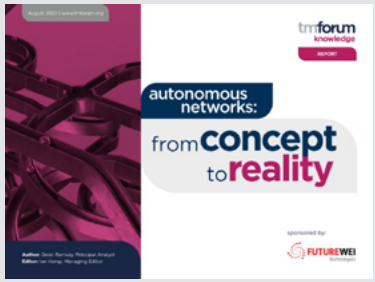
moving toward autonomous networks

TM Forum members are collaborating to help CSPs transition their networks to the cloud and embrace platform-based operations. The TM Forum Open Digital Architecture (ODA), for example, is a component-based approach that enables operators to evolve to a fully automated, cloud-native operations environment that relies on analytics and AI to deliver zero-touch services.

The goal is to create a software marketplace where CSPs can easily procure Lego-like IT components that can be plugged into their operations environments and managed autonomously. ODA components are independently deployable pieces of software, typically built out of one or more microservices. They have an "envelope" that provides metadata to describe its core function – for example, rating, pricing or invoice production, which are all parts of a billing system – and specify which Open APIs it exposes or depends upon. The envelope also specifies complementary functions relating to how the component is deployed on the ODA Canvas, an execution environment for ODA components.

To learn more about the ODA and how it can help CSPs move toward cloud-native ANs, read these reports and TM Forum's latest AN white paper:





automation and analytics

As the model changes, operations shift from labor-intensive, network-centric processes to automated approaches that focus on determining customers' needs and sentiments and delivering the best possible CX based on those needs. Given the change in focus, it makes sense that CSPs would regard a loss of control over their infrastructure cautiously, at least until they can observe, predict, remedy and explain any service degradations or failures as well as they can in traditional networks.

This sense of caution may contribute to CSPs being perceived as slow to adopt public clouds, particularly for 5G deployments. To become more comfortable with running services over public clouds, operators are advancing their data analytics skills and capabilities.

The ability to exploit increasingly large datasets for network, service and operations improvements has evolved alongside cloud-native networking and IT. Rather than siloed data servers that connect to analytics engines to provide query-based reports, CSPs are turning to solutions like serverless data lakes to achieve enterprise-wide data analysis which can feed live processes and automate data-driven decisioning.

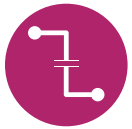
A serverless data lake can enable a CSP to pull data from every microservice to answer business- and service-related questions. The data and analysis can also be used to predict how network configuration changes will impact customers at various times of day under different traffic conditions. In turn, the data lake can provide the basis for a feedback loop that informs continuous improvement processes and automated DevOps pipelines across network and service operations, customer experience and any other business functions.

It makes sense that CSPs would regard a loss of control over their infrastructure cautiously, at least until they can observe, predict, remedy and explain any service degradations or failures

Such capabilities take network operations far beyond the FCAPS model. Without making this fundamental shift in their approaches to network operations, CSPs are likely to experience:

Limited ability to perform service-impact analyses in cloud-native networks

Slow reactions to customer-affecting service issues



Gaps in efficiency, security and capacity management while running dynamic networks

Trouble optimizing service delivery and resource consumption

Inability to deploy and improve new services rapidly

TM Forum members are making progress on the ODA concepts that enable cloud-native network operations. "We now have examples of the ODA Canvas running on both AWS and Alibaba clouds as tenants," says Hugo Vaughan of Crowd Frame Consulting, a key contributor to the ODA specifications. "With this in place we can demonstrate ODA-compliant 5G core components' plug-and-play movement between those two worlds. We hope to convince all the hyperscalers to enable their 5G core offerings with the FCAPS Open APIs we are extending."

In the next chapter we look at how cloud-native networks and operations are evolving side by side, and where they're headed.

CHAPTER 2

evolving to autonomous networks

The evolution of networks, operations and services to private and public clouds requires adoption of intent-based networking, zero-touch automation and closed-loop operations processes.

CSPs need to use enterprise-wide data to enable automation that is based on analytics. Indeed, automation is required in cloud-native 5G standalone specifications in the core and at the edge.

Now that operators have access to standardized interfaces, scalable cloud infrastructure and ready-made, higher-order services – like managed databases and serverless compute environments that can scale elastically – they can focus on using these new capabilities to achieve live views of networks, services and CX.

predictability and observability

In a public cloud setting, open and standardized resources like the ODA and Open APIs enable operations and operational improvements at cloud scale. They are designed for an environment where cloud infrastructure underpins not only the network, but also all the services and experiences traversing the network.

Sustaining observability of those relationships as they are instantiated in networks is critical. CSPs need live visibility, the ability to predict and remedy trouble in real time anywhere in the service lifecycle, and an unambiguous, explainable record of events after the fact.

Through cloud-native standardization and alignment with the ODA, operational processes can be automated and continuously improved. This includes automating the classic FCAPS functions like fault remediation, network configuration, usage accounting, performance management, and network and operations security. But it also expands these concepts to take advantage of the capabilities inherent to clouds, particularly public clouds.

CSPs need live visibility, the ability to predict and remedy trouble in real time anywhere in the service lifecycle, and an unambiguous, explainable record of events after the fact

For example, predictive fault detection and remediation goes hand in hand with automated network and service configuration. If the network responds automatically to trouble, reconfiguration will likely be a key aspect of its response. Such changes impact resource allocation and capacity management, which in turn flexes the cloud-based network's ability to scale infrastructure usage on-demand.

This responsive concept is the aim of autonomous, closed-loop operations, where humans are responsible only for governing the automated system rather than trying to keep up with and process needed adjustments, which occur on-demand.

revamped CX

With scale, automation, observability and real-time capabilities, CSPs are able to expand the concept of CX for customers ranging from large enterprises to consumers.

For enterprise customers, CSPs can:

Deploy next-generation capabilities fast, such as private 5G campus networks

Flex capacity via automation

Offer managed service level agreements (SLAs), even in a public cloud setting

Deliver enterprise-grade support, aided by automation, observability and zero-touch, self-service processes

For consumers, experiences are bolstered thanks to higher availability, which can result in a greater perception of speed and quality; continuously improved automation features, like self-service functions and personalized notifications; and new experiences across gaming, entertainment and commerce.

In the next chapter, we look at how leading CSPs are bringing these concepts to market.

CHAPTER 3

real-world examples of public cloud 5G networks

While many CSPs are approaching public cloud 5G deployments cautiously, some pioneers are already benefitting from deploying network elements and high-touch customer experiences in public clouds. The results are improvements in predictive capacity management, customer engagement and big data management as the examples in this chapter illustrate.

DISH Wireless goes live with cloud-native 5G

DISH Wireless is building in the AWS cloud what has been deemed the first standalone, cloud-native, autonomous 5G SA network. To date it has launched 5G services in more than 100 markets across the US. As a greenfield operator, the company is developing an open, cloud-native architecture that relies on automation from the outset.

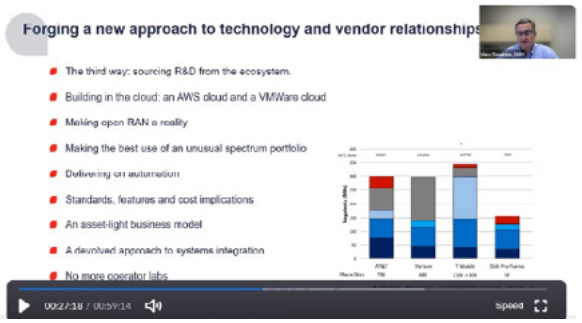
DISH and AWS have been open about their approach, publishing this article, for example, which explains in detail how the companies are collaborating. DISH Wireless Chief Network Officer Marc Rouanne also has spoken at length with TM Forum about the company's approach (see links, right).

Key goals from the start have been to implement automation and make full use of cloud infrastructure and services, plus support a combination of APIs and telecom protocols. DISH and AWS also have pledged to use as much automation native to AWS as possible in lieu of creating new, custom automation.

Ultimately, the architecture will combine AWS cloud automation and distributed 5G cloud-native network functions to optimize performance based on latency, throughput and processing requirements. For network automation, the team is using infrastructure as code (IaC) to formalize auditing of all infrastructure deployments and changes, and to accelerate, simplify and eliminate errors in infrastructure deployment with repeatable templates. The result will be simplified operations.

Read the report:

Watch the webinar:



Telefónica Colombia eliminates IT capacity incidents

Telefónica Colombia serves more than 15 million customers with an IT infrastructure that comprises more than 1,500 servers and 140 applications running across a hybrid, multi-cloud environment. The CSP's network engineers and IT teams wanted to gain visibility into resource and capacity utilization to perform predictive operations and resource optimization. Each was becoming more challenging as the company transitioned its networks and IT to public clouds. Without the ability to predict specific IT capacity needs across domains, CX could be impacted because operations potentially could not respond to customers' needs fast enough or with sufficient resources to fulfill service requests or solve problems.

Telefónica Colombia partnered with its cloud provider to use analytical insights derived from network data to model its resource needs and then to forecast resource and capacity allocations, which was difficult previously. This helped overcome the lack of control over resources with a combination of observability, predictability and automation. In production, Telefónica experienced no capacity-related incidents and realized improvements in budgeting and planning, lower costs, higher service quality and more agility to make infrastructure changes as needed.

Telenor combines 5G core and edge

Telenor recently co-invested with AWS to deploy 5G core and edge services on the AWS public cloud. This collaborative proof of concept includes a prototype dubbed "network on wheels", or NOW, which is currently used by two Norwegian government ministries and dtac, Telenor's mobile unit in Thailand. The dtac prototype lets enterprise customers instantiate private, autonomous 5G networks and edge computing resources on-demand.

Telenor stated at the time of the announcement that it aims to develop new 5G and edge enterprise services on the AWS cloud and to use the "most advanced and secure" technology AWS could make available. Bringing 5G cloud-native core and edge components together into an end-to-end solution is necessary to power the vertical-specific services Telenor wants to deliver in manufacturing, logistics and automotive sectors, and this large-scale proof of concept is demonstrating that it can be done.

Sky Italia enhances CX

Sky Italia is distinguishing itself from its competitors through competition. The CSP created a portfolio of contests for subscribers that relate to popular TV shows and are accessible via mobile app. They have become so significant that Sky Italia considers them central to generating revenue and sustaining brand equity.

Sky Italia faced several challenges, however: determining how customers engage with and vote in the contests; managing mobile app data; and addressing legal compliance. These challenges impacted customers because they had to wait days to learn who had won a popular contest.

Sky Italia partnered with BMC in the cloud to manage the data flows between the service provider, multiple partners and diverse data inputs, so that winner selection was trimmed to two hours or less. This in turn let Sky Italia triple the number of contests it runs each week. Compliance errors were nearly eliminated and compliance with SLAs improved along with customers' service quality. In this case, rather than building a 5G network, the operator is using the expansiveness of public cloud resources to solve a modern problem relating to application-layer services. The result is a positive impact on CX that drives clear, strategic value for the company.

diving into the serverless data lake

In legacy environments, data flows are like plumbing: discrete bits connected by pipes flow into a centralized management system. By contrast, a cloud-native environment includes a massive lake of data that feeds various processes continuously or on demand. Data is often considered the lifeblood of an organization because it is necessary for real-time, predictive, on-demand and decision-driven automation. Data and the use of it to improve continuously are inherent to cloud-native and intent-based networks. A serverless data lake is the ultimate expression of an infinitely scalable enterprise data source.

Data and the use of it to improve continuously are inherent to cloud-native and intent-based networks

A recently published article on TM Forum Inform outlines how to build a serverless data lake in the AWS public cloud. Much of the tooling needed to create and replicate a data lake has been proven. For example, AWS provides autonomous maintenance and uses IaC to accelerate build and replication processes.

The article highlights a service provider in Latin America that estimates it was able to build a data lake with AWS 40% faster than with traditional methods. The company also claimed it spent 60% less time on machine learning integration and cut costs by moving the solution off premises and to the public cloud.

Each of the examples in this chapter shows how CSPs are collaborating with public cloud partners to address the complexities of shifting telecom networks from purpose-built devices to fully cloud-native networks running in public clouds. In the next section, we offer some suggestions to help CSPs make the leap to public cloud.

CHAPTER 4

key steps to take

Although there is no single way for CSPs to transition their networks and operations to public clouds, the following checklist highlights steps most will need to take to achieve cloud-native autonomous networks.

adopt open, cloud-native infrastructure

At a basic level, the difference between a cloud-native network function and a purpose-built device may not be its function, but rather how functions are controlled. Software-based network elements should expose standard APIs, automate real-time data gathering and operations and enable two-way control via API-based commands. Functions should also scale up and down automatically, if not autonomously, because of cloud infrastructure. To learn more about how TM Forum's ODA and Open APIs can help CSPs transition to an open, cloud-native architecture, please contact Ian Turkington.

re-imagine plane architecture

Unlike legacy networks, both the control plane and user, or data, plane must be reimagined to support cloud-native deployments. A key concept is that network functions themselves must deliver the network analytics that in turn provide the intelligence for predictive, elastic and decision-driven automation. Simultaneously, the actions required of the deployment must be supported by the portfolio of available virtualized functions. This marriage of software capabilities, data flow and network requirements form the outline of the plane architecture.

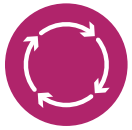
leverage a data lake

Data is the lifeblood of a cloud-native 5G network, which means it cannot remain siloed or isolated. Creating and using a data lake involves moving data from disparate sources into a centralized, serverless repository so that it can be consumed by many different microservices in real time. Data lakes should be easily accessible and replicable. The advantages of building a data lake in a public cloud are primarily faster deployment, substantial cost-savings and ready tooling.

automate data management

With data centralized for access, it needs to be made available for consumption by microservices fulfilling functions ranging from provisioning and orchestration to service assurance, capacity management and customer journey management. Data management automation can enable microservices to consume data as needed based on the service requesting the data. As a result, the data lake can fuel automated processes without developers needing to define specific or rigid data flows. To learn more about TM Forum's work on autonomous networks, AI and data analytics, please contact Aaron Boasman-Patel.

solve challenges with repeatable solutions



Repeatability is a key concept in automation and continuous improvement. For CSPs, the process of identifying business challenges and defining repeatable actions to address them is constant. In the new paradigm, this includes preventing negative service experiences to combat churn by creating repeatable fixes to known problems as well as automating repeatable private network and network slice creation for enterprise customers.

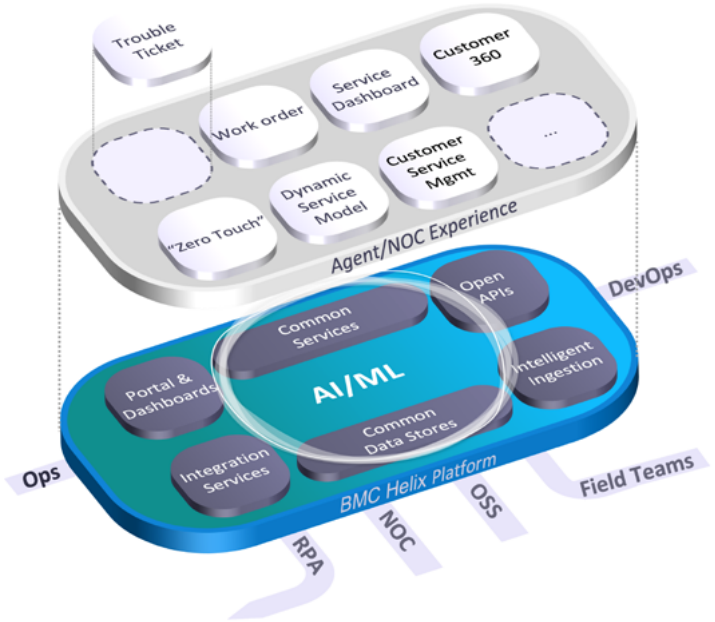
ADDITIONAL FEATURE

accelerate your cloud journey with integrated, cloud-native solutions

While CSPs have already realized or are in the process of evaluating the advantages of migrating their IT workloads and Network functions to the cloud, this is undoubtably a daunting proposition for many. Numerous dependencies can be hard to trace and map, and complexity can lead to over-scoping the size of the environment, potentially increasing costs unnecessarily.

This journey requires selecting the right partners with the appropriate tools and necessary competencies to address multiple facets of a successful migration plan.

BMC Helix Converged Platform Delivers End-to-End Service Assurance for CSPs



accurate, automated visibility into assets and relationships

New technologies and the need to innovate to maintain a competitive advantage are creating an increasingly complex environment. The lack of visibility into applications and dependencies can hinder cloud migration projects, impacting migration planning, capacity optimization, security, service availability, and integration with service management and service assurance tools.

The ability for CSPs to have instant, comprehensive visibility into hardware, software (including network functions), and service dependencies across their cloud environment is crucial for success. Discovery capabilities should be designed to handle the complexity of managing a wide spectrum of configurations, including mainframe, traditional and hyper-converged infrastructures, container management, and cloud services.

With fast, accurate, and agentless discovery of hardware, software, and service dependencies, CSPs can make informed decisions about IT service management, Network service assurance, asset management, and infrastructure/operations management.

This results in superior quality of service delivered to your customers and an improved employee experience—while keeping operational costs in check.

The lack of visibility into applications and dependencies can hinder cloud migration projects, impacting migration planning, capacity optimization, security, service availability, and integration with service management and service assurance tools

modernized service assurance to adapt and increase competitiveness

As more network functions become virtualized and migrate to the cloud, traditional service assurance tools become obsolete. Modernized tools provide the ability to move from reactive to proactive by automating processes and introducing the cognitive and predictive capabilities necessary to build customer-centric service assurance.

Today's providers need an end-to-end service assurance solution that is purpose built from the ground up for CSPs around network operations requirements and provides:

- Scalable, intelligent, and automated service assurance to quickly resolve disruptions and handle ticket volume peaks
- A secure, seamless service experience across multi-cloud environments
- 360-degree visibility of services, resources, and interdependencies, including physical and logical network topology through dynamic service modeling extended to include the SID model
- TM Forum API certifications to facilitate extensive integration across critical systems that are part of the CSP ecosystem
- Network-specific design to address network-specific requirements with the ability to configure and extend functionality enabled by low-code/no-code capabilities

Modernized tools provide the ability to move from reactive to proactive by automating processes and introducing the cognitive and predictive capabilities necessary to build customer-centric service assurance

Read the ebook:

simplified application and data pipeline orchestration to harness the power of data

Many CSPs rely on disparate manual processes along with siloed applications and data sources to run their business processes, preventing end-to-end control or visibility of their business application workflows. Manual processes take valuable time and create unnecessary risk for the business. At the same time, it is difficult to orchestrate siloed data pipelines and extract information that is valuable to the business.

CSPs require a solution that provides a single, unified view where they can orchestrate workflows, including file transfers, applications, data sources, and infrastructure, with a rich library of plug-ins. This also simplifies the creation, integration, and automation of data pipelines across on-premises and cloud technologies, allowing CSPs to ingest and process data from platforms including Hadoop, Spark, Amazon EMR, Snowflake, Amazon RedShift, and others to extract actionable insights, and, ultimately, to monetize the great amount of customer and network data that CSPs own.

CSPs require a solution that provides a single, unified view where they can orchestrate workflows

Watch the session:

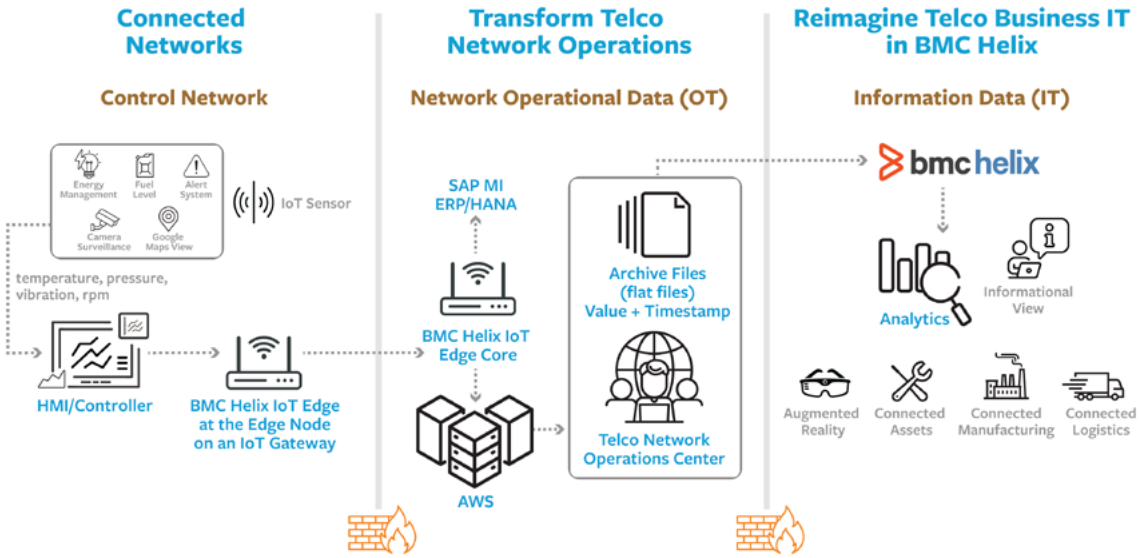
accelerate 5G ROI through IoT and MEC

The ability to collect data from remote devices, and the resulting business benefits, has been around for decades. More recently, with the advent of 5G and Network Slicing, this ability (aka Internet of Things, or IoT) has become mainstream and is now viewed as one of the capabilities that will help CSPs boost operational efficiencies, deliver new services, enhance revenue models, and extract better returns from capital-intensive 5G infrastructures.

With the high rate of adoption of IoT services, data volumes generated by both industrial and consumer IoT devices and solutions are surging. If this "data tsunami" is sent to a public cloud or a CSP's private cloud for further processing and analysis, the performance of the IoT services may suffer. It is therefore imperative to process data, at least the majority of IoT-generated data, directly at the edge of the network to improve customer experience, monetization, and operational efficiency.

In order to meet this requirement, CSPs will require solutions designed to manage the IoT and edge infrastructure by providing analytics and remediation capabilities to address problems such as performance issues, downtime, poor customer service, and asset inventory management.

CSP Network Optimization Using BMC Helix IoT Edge



It is imperative to process data, at least the majority of IoT-generated data, directly at the edge of the network to improve customer experience, monetization, and operational efficiency

Read the book:

Top-line growth, innovation, monetize 5G, Edge, and enterprise transformation are major priorities of all telecommunication providers. AWS is working closely with telecommunications providers, listening to their needs, working back from their problems, and innovating on their behalf to meet/exceed their needs. AWS believes that carriers should be able to choose the technologies, applications, and services to enable them in their transformation journeys.

Creating a cloud-native, flexible, and elastic 5G Core is the first step in monetizing 5G. Telcos need a carrier-grade cloud to host their core networks that provides flexible deployment options to emulate centralized/regional data centers and meets the near and far edge needs. AWS provides the most complete Telco cloud that meets the Core network's requirements and allows telcos to deploy CNFs where needed. By helping telcos cloudify the Core Network, we earn the customer's trust and develop strong partnerships that will evolve over time to the vRAN space.

AWS is partnering with the telco operators to enable new use cases that require ultra-low latencies, massive bandwidth, and high-speed connections to end user devices, such as real-time gaming, video streaming, augmented and virtual reality, autonomous vehicles, robotic manufacturing, and machine learning inference at the edge. AWS is working with telecom operators to accelerate the delivery of software-defined networks at a lower cost and increased elasticity, and introducing 5G standalone cloud-native platforms to improve automation and drive new revenues. This has helped software life cycle management and set in motion new use cases based on 5G access, such as drone control or remote maintenance management, among others.

AWS is supporting telecom operators on their journey to improve customer experience by infusing operations with AI and Machine Learning, and using data to predict and personalize outcomes for the benefit of their customers. AWS provides a comprehensive AI/ML partner ecosystem to deliver telco Data Lake capabilities, providing predictive insight for improving the customer experience. Telcos can leverage advanced AWS technologies to proactively predict network outages, network routing, and optimize network performance. Or they can use data analytics and AI to better understand customer information and usage for behavioral patterns so that they can better recommend services and added functionality to their customers.

about BMC

With decades of experience providing critical solutions for more than 180 Communications Service Providers (CSPs), BMC offers the modern, intelligent service and operations solutions that CSPs require to deliver the differentiated services vital to their customers and their business.

Leading providers such as Sky Italia, Telefónica Colombia, Telstra, Videotron, and Vodafone rely on BMC Helix for critical intelligent service assurance solutions that meet CSP-specific requirements today with the scalability and modularity to meet future goals.

The different solutions deliver:

- Service assurance with a zero-touch Network Operations Center (NOC), all from the BMC Helix platform that combines AIOps with intelligent automation in a single pane of glass. BMC Helix for CSP is TM Forum–certified and features extensive API certifications for essential ecosystem integrations.
- Orchestration of data pipelines and workloads with BMC Helix Control-M, making it easy to define, schedule, manage, and monitor application and data workflows, ensuring visibility, improving SLAs and reliability, and extracting valuable information from data.
- Management of IoT and edge infrastructure by providing analytics and remediation capabilities to address problems such as performance issues, downtime, poor customer service, and asset inventory management by collecting, aggregating, and analyzing data at the edge.

BMC and AWS have partnered together to help telcos streamline and accelerate their cloud migration journey. CSPs can simultaneously optimize their AWS cloud and enable data-driven business with integrated products and services for migration planning, dynamic service modeling, combined IT service and operations management, application workflow orchestration, and DevOps initiatives.

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For more information, visit
www.bmc.com/csp

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