Roadmap to the Cloud Native Telco

Architecture for Hyper-scale CSPs

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Roadmap to the Cloud Native Telco: Architecture for Hyper-scale CSPs

Welcome to the world of the Cloud Native Telco, where innovation meets efficiency and scalability.

In this book, we will explore the compelling reasons why the telecommunications industry should embrace the trend of cloud-native architecture.

From enhanced agility to cost savings, the benefits and opportunities that await are truly remarkable.

The Netflix Era of Cloud IT

Like every enterprise sector telecommunications is seeking to harness the evolution of IT pioneered by Netflix, building hyper-scale systems using containers and a microservices architecture.

Netflix ushered in a new era of 'web scale IT', a technology architecture that naturally leverages the global, elastic capacity of the Cloud and enables a high velocity rate of digital service innovation.

The enterprise sector has been quick to understand how this approach can be applied to their existing IT estate and a vendor ecosystem has organized around fulfilling that potential. Smart CSPs will be next to build upon that learning further and leverage that momentum to replicate it to achieve the same for Telco services.

For CSPs this has a number of dimensions.

The telecommunications industry is undergoing a transformation like never before. The traditional telco infrastructure is being replaced by cloud-native solutions that offer unparalleled flexibility and scalability. But what exactly is a Cloud Native Telco?

Roadmap to the Cloud Native Telco: Architecture for Hyper-scale CSPs

A Cloud Native Telco is an architecture that leverages cloud computing technologies to deliver telecommunications services. It is built on the principles of microservices, containerization, and orchestration, allowing for rapid development, deployment, and scaling of applications. By decoupling services from the underlying infrastructure, telcos can achieve greater agility and efficiency.

Benefits of Cloud Native Telco

The shift towards a Cloud Native Telco brings numerous benefits to the telecommunications industry. One of the key advantages is enhanced agility. With cloud-native architecture, telcos can quickly adapt to changing market demands and launch new services at a fraction of the time it would take with traditional infrastructure.

Cost savings are another compelling reason to embrace the trend. By leveraging cloud resources, telcos can reduce capital expenditures on hardware and infrastructure. Additionally, the pay-as-you-go model allows for better cost control and optimization.

Scalability is also a significant advantage of cloud-native solutions. Telcos can easily scale their services up or down based on demand, ensuring optimal performance and customer satisfaction. This flexibility is crucial in an industry where traffic patterns can vary significantly.

Embracing the Cloud Native Telco trend requires a shift in mindset and a willingness to adopt new technologies and practices. Telcos need to invest in building a cloud-native infrastructure, including containerization platforms and orchestration tools.

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Furthermore, a cultural transformation is necessary to foster collaboration and agility within the organization. Telcos must encourage cross-functional teams and embrace DevOps practices to enable continuous integration and deployment.

The great potential for telcos is that industry experts commonly agree on what this journey involves, notably the 'Cloudification' of telco networks through:

- **Virtualizing network functions.** Since the advent of the Cloud era telcos have been undertaking to virtualize networking functions (NFVs) previously executed via dedicated hardware solutions. 'CNFs' represent the next iteration of this evolution – Cloud Native Network Functions.
- **Utilize Kubernetes for containers.** Telcos are prioritizing Kubernetes for containerizing and managing these network functions, tailoring it for their industry and adopting it for key use cases such as an Edge platform.
- **Employing a microservices architecture.** The next step in this evolution is to decompose monolithic applications into modular microservice components.

The purpose of our Roadmap is to provide a single framework for synthesizing these innovations into a vendor neutral blueprint, for Telcos to plan their Cloud Native journey, aggregating expert insights from across the entire industry.

Why Telecoms Needs a Cloud Native Manifesto

The imperative for Cloud Native engineering in the Telecomms sector is headlined by the clarion call from Orange for an industry manifesto.

Following the publication of the Cloud Native Manifesto by the Next Generation Mobile Networks Alliance (NGMN), Laurent Leboucher, group CTO and SVP of Orange, joins TelecomTV to explain what the manifesto is, why it is needed and the impact it could have on the telecom sector.

The Cloud Native Manifesto, developed by the Next Generation Mobile Networks Alliance (NGMN), outlines the principles and guidelines for building cloud-native architectures in the context of telco networks.

This manifesto aims to provide a framework for leveraging cloud computing technologies to enable scalable, flexible, and efficient mobile network infrastructure. It recognizes the need for agility, scalability, and automation in the face of increasing demands on telco networks.

Orange Leadership

As the TMF writes in this interview with Laurent, they are seeking to apply a Cloud Native approach to their core network infrastructure. In 2020 CIO Thierry Souche set the scene, saying that the Only Way is Cloud Native.

Laurent is extending the work he began for the IT systems of Orange, where he applied a Cloud DevOps model to transform their business systems and is now leveraging that learning to similarly modernize their core network.

Why Telecoms Needs a Cloud Native Manifesto

Orange is testing how its vision will work in practice on Pikeo, an experimental, fully cloudified 5G standalone network, where they are developing network functions as microservices deployed in cloud infrastructure in containers orchestrated by Kubernetes, with the access network based on Open RAN principles and technologies.

In his TelecomTV interview Laurent describes the type of product innovations that a software-driven network is enabling for Orange, such as 'Standalone 5G', where "network slicing" prioritizes certain slices to cover critical uses or specific needs and offer different levels of quality and security.

He says they will also leverage their Cloud Native capability and AI to better automate their network operations, using CI/CD DevOps practices.

At 3m:15s he is asked about network disaggregation and he says this is a key path to utilizing Cloud Native applications, allowing them to introduce more innovation as different network building blocks are split so that new industry players can provide these services. They have already begun to disaggregate some functions like L2 switches and IP routers, and are deploying Cloud Native 5G networking and are starting with OpenRAN.

From 7m:18s Laurent describes what he believes the keynote strategic goal for the Telco cloud industry should be.

While the industry is on the journey to adopt Cloud Native they are still doing so in silos – Vendors bring them virtualized network functions but each requires a slightly different flavour of Cloud infrastructure, meaning they would end up with multiple islands of small Cloud platforms to implement them.

Why Telecoms Needs a Cloud Native Manifesto

Instead what is needed is an end-to-end homogeneous Telco cloud offering, one that is commoditized across the entire industry not just designed for single operators like Orange.

Orange has been an early adopter and innovator in this area, and in this Telecom TV interview Philippe Ensarguet, VP of software engineering, explains how they went about the process, what tools and partners they selected, and what lessons they learned along the way.

Conclusion

The Cloud Native Manifesto by the NGMN sets the stage for the adoption of cloud-native architectures in the mobile network domain. By following the principles and guidelines outlined in the manifesto, mobile network operators can leverage cloud computing technologies to build scalable, flexible, and efficient infrastructure that meets the demands of the digital era.

What Does It Really Mean to Become a Cloud Native Telco?

Cloud-native solutions refer to software applications, platforms, or systems specifically designed and built to operate in cloud computing environments, leveraging the inherent advantages of the cloud such as scalability, flexibility, and resilience.

Unlike traditional software that might be adapted to run in the cloud, cloud-native solutions are architected from the ground up to exploit cloud principles and technologies, enabling organizations to maximize efficiency, agility, and innovation.

Cloud-native solutions are built to thrive in dynamic, distributed cloud environments—whether public, private, or hybrid—rather than relying on static, on-premises infrastructure.

The Cloud Native Computing Foundation (CNCF), a leading authority in this space, defines cloud-native technologies as those that "empower organizations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds." This involves a combination of architectural patterns, development practices, and operational methodologies optimized for the cloud.

Cloud-native solutions are distinguished by several core traits:

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- **Microservices Architecture:** Instead of a monolithic, single-unit application, cloud-native solutions are broken into smaller, independent services (microservices). Each microservice focuses on a specific function (e.g., billing, authentication) and communicates with others via APIs. This modularity allows teams to develop, deploy, and scale individual components independently, improving agility and resilience.
- **Containerization:** Cloud-native applications are packaged into containers—lightweight, portable units that include the application code, dependencies, and runtime environment (e.g., using Docker or Kubernetes). Containers ensure consistency across development, testing, and production environments, and they can be easily moved or scaled across cloud infrastructure.
- **Dynamic Orchestration:** Tools like Kubernetes manage (or "orchestrate") containers, automating deployment, scaling, and maintenance based on demand or failure. This enables self-healing systems that automatically recover from crashes and scale resources up or down as needed.
- **DevOps and Continuous Delivery:** Cloud-native solutions embrace DevOps practices, where development and operations teams collaborate closely, and CI/CD (Continuous Integration/Continuous Deployment) pipelines automate software updates. Frequent, low-risk updates reduce time-to-market and improve responsiveness to customer needs.

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- **Scalability and Elasticity:** These solutions are designed to scale horizontally (adding more instances) rather than vertically (upgrading hardware), leveraging the cloud's ability to provision resources on demand. Applications handle traffic spikes efficiently without over-provisioning resources during low-demand periods.
- **Resilience and Fault Tolerance:** Built with failure in mind, cloud-native systems use distributed architectures to ensure no single point of failure disrupts the entire application. Benefit: Downtime is minimized, and services remain available even if parts of the system fail.
- **Cloud-Agnostic Design:** While optimized for the cloud, many cloud-native solutions avoid tight coupling to a single provider (e.g., AWS, Azure), using open standards and APIs. This portability prevents vendor lock-in and supports hybrid or multi-cloud strategies.

Traditional (legacy) solutions, often monolithic and server-dependent, require manual scaling, have longer release cycles, and struggle with the flexibility of modern demands. Cloud-native solutions, by contrast, are purpose-built for the cloud's distributed, on-demand nature, making them ideal for the AI era where speed, scalability, and data-driven insights are critical.

Cloud-native solutions represent a paradigm shift in software design, harnessing microservices, containers, orchestration, and DevOps to fully exploit cloud environments. They empower organizations—like the carriers partnering with Alianza—to modernize, innovate, and monetize their infrastructure efficiently, meeting the demands of an increasingly digital and AI-driven world.

Cloud Native Telco: Industry Standards Programs

With a goal to apply the principles and practices of Cloud Native Computing to the telco world industry standards programs are central to this process.

Industry initiatives to define the relationship between Cloud Native principles and Telco Operational Support Systems (OSS) and Business Support Systems (BSS) focus on aligning modern software development practices with the specific needs of the telecommunications sector.

These efforts aim to clarify how Cloud Native approaches—characterized by scalable, resilient, and modular architectures—can be applied to OSS/BSS, which traditionally manage network operations, service provisioning, billing, and customer interactions for communication service providers (CSPs).

Several industry bodies, such as the Cloud Native Computing Foundation (CNCF), TM Forum, and ETSI (European Telecommunications Standards Institute), are working to establish a shared understanding of Cloud Native principles—such as microservices, containerization, DevOps, and continuous integration/continuous deployment (CI/CD)—and how they relate to OSS/BSS.

Standardization Programs

These groups explore whether Cloud Native means simply hosting legacy systems on cloud infrastructure or fully redesigning OSS/BSS as distributed, containerized applications optimized for dynamic scaling and automation.

Cloud Native Telco: Industry Standards Programs

- **TM Forum:** Through initiatives like the Open Digital Architecture (ODA), TM Forum is defining frameworks that integrate Cloud Native principles into OSS/BSS. ODA promotes modular, API-driven designs that allow CSPs to replace monolithic systems with interoperable components, aligning with Cloud Native's emphasis on flexibility and openness.
- **ETSI and NFV:** The Network Functions Virtualization (NFV) framework, led by ETSI, examines how Cloud Native approaches can enhance virtualized network functions (VNFs) and their management via OSS. This includes exploring container-based deployments alongside traditional virtual machines.
- **CNCF Telco Working Group:** The CNCF has a telco-specific working group to explore how Kubernetes can support OSS/BSS workloads, focusing on orchestration, scalability, and resilience in telecom environments, building on the NFV work to define 'CNFs' (Cloud Native Network Functions).

CNCF establishes and promotes the principles of Cloud Native—microservices, containerization, dynamic orchestration, and declarative APIs—through its community-driven efforts. It maintains a "Cloud Native Definition" and a maturity model (graduated, incubating, and sandbox projects) to guide organizations, including telecom providers, in adopting these practices. This standardization helps clarify how Cloud Native can be applied to OSS/BSS, such as enabling modular billing systems or network management platforms.

Cloud Native Telco: Industry Standards Programs

Lessons We Learned from Deploying Cloud-Native Telco Cloud – Vodafone

In this CNCF Youtube video, Riccardo Gasparetto Stori and Tom Kivlin share their insights and lessons learned from deploying a cloud-native telco cloud. Vodafone is aggressively deploying Kubernetes-based telco cloud across its markets to support 5G Core and other containerised network functions, and recently went live with 5G SA Core CNFs in the UK, with other markets following.

They share their experiences both from the point of view of the Kubernetes-based telco cloud builders' perspective and the CNF operator's perspective – what are the main gotchas when building carrier-grade telco cloud, such as using Multus and Whereabouts for providing multi-homed networking, and what are their expectations as a Network Operator that needs to provide Telco Services to its customers using cloud-native technologies, for example the journey to Cloud Native EMS (Element Management Systems).

Cloud Native Telco: Industry Standards Programs

- **Key Challenges:** This section explores the main challenges faced when deploying a cloud-native telco cloud. It discusses issues such as scalability, reliability, security, and interoperability. The speakers provide insights into how these challenges can be addressed effectively.
- **Best Practices:** Here, the speakers share best practices for implementing a cloud-native telco cloud. They discuss topics like containerization, microservices architecture, automation, and monitoring. These best practices help ensure a successful deployment and operation of a cloud-native telco cloud.
- **Lessons Learned:** This section highlights the key lessons learned from the speakers' experience in deploying a cloud-native telco cloud. They discuss the importance of collaboration, continuous improvement, and the need for a strong DevOps culture. The lessons learned provide valuable insights for organizations embarking on a similar journey.

Industry initiatives are systematically exploring how Cloud Native principles can reshape Telco OSS/BSS, balancing innovation with the sector's unique operational and regulatory demands. Through standardization, collaboration, and practical testing, these efforts aim to provide CSPs with clear pathways to modernize their systems while maintaining service reliability and enabling future growth.