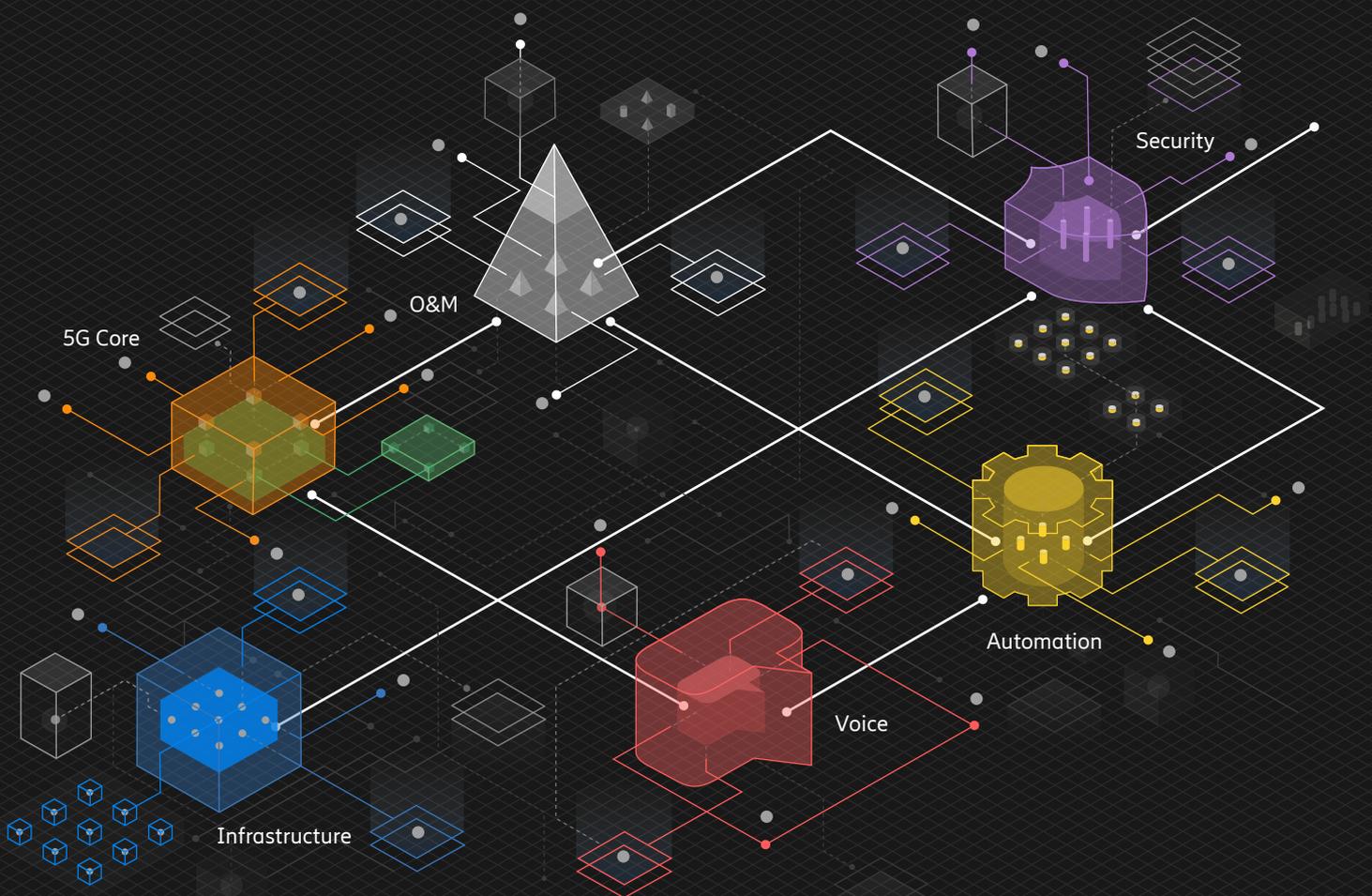




# Your guide to building a cloud native 5G Core



# Preface

## Contents

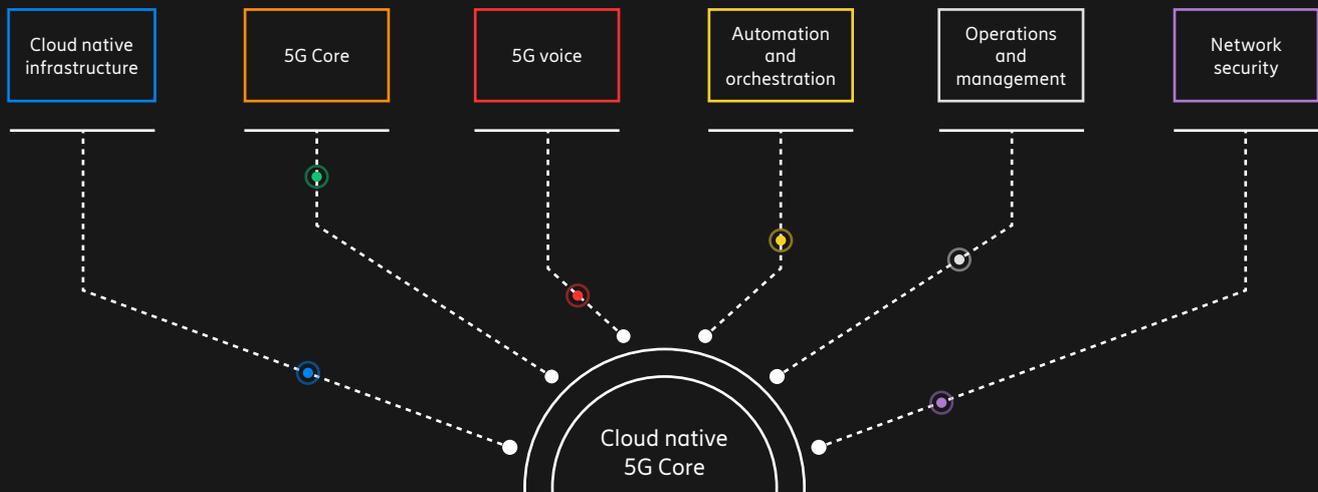
- 03 Introduction
- 04 Cloud native infrastructure for 5G Core
- 05 5G Core
- 06 5G voice
- 07 Automation and orchestration
- 08 Transforming operations and management
- 10 Security
- 11 Summary

We can safely say that during 2020, the 5G train left the station.

A key part of any 5G project is the introduction and journey to 5G Core (5GC) or a 5G system. In order to share our views and learnings around this essential topic and support communications service providers (CSPs), we have developed a series of papers which together offer a comprehensive guide, covering key topics for your 5G projects.

This top-level paper offers an introduction to the guide series, while each guide paper digs deeper into the important topic areas to consider when it comes to building a 5G core network.

# Introduction



## A new business landscape

The introduction of 5G signals the start of a new era for CSPs, where both networks and businesses are evolving and expanding. A new business landscape is arising, where growing numbers of capabilities are added to the network that can improve current services as well as address new business needs. Thus, 5G offers up a real opportunity for CSPs to grow revenues and capture more value.

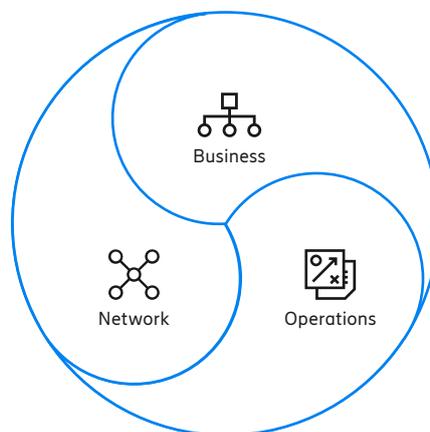
5G represents a paradigm shift, where the telecom industry is now taking substantial steps towards using the same building blocks as the IT industry. The 5GC standalone (SA) has a new Service-Based Architecture (SBA), which is based on IT principles and designed for cloud native implementation. We also see that other parts of the network, like Radio Access Network (RAN), are being standardized along the same lines. A cloud native 5GC is necessary to meet market demands in the form of new and distributed capabilities, and deliver faster time to market, but also to achieve improved total cost of ownership (TCO).

Though the journey towards a fully cloud native network will take considerable time to achieve, it does represent a clear target architecture for the transformation journey at hand. The introduction of new technologies plays an important role in achieving new benefits and capturing opportunities. However, it is not the only thing that needs to be transformed.

The new business landscape is one where traditional ways of working need to be challenged and existing “silos” have to be replaced with continuous collaboration across the organization and ecosystems of business partners.

For all CSPs around the world, there are three key steering plans to manage the organization – these being the business, network and operational plans. To address new challenges and opportunities going forward, these plans must be much more interlinked than they might have been in the past.

**Figure 1: The link between business, network and operational plans for CSPs to address**



In this new business landscape, it is important for CSPs to formulate a clear strategy and make careful choices on which opportunities to pursue and what role to aim for in the value chain. Based on these strategic choices, an iterative process can begin to formulate the different plans, where key business needs are reflected in the way that both the network and operations are developed.

A business plan articulates the reason “to be” for any company. 5G represents a tremendous opportunity for CSPs, as the

network has the potential to become a platform for differentiated services. New services will, to a large extent, be based on collaboration and co-creation, where capabilities of the network are exposed to enable this differentiation.

The opportunities for growth exist both in the traditional consumer segment as well as in enterprise and industries. In this series of papers which offers “Your guide to building a cloud native 5G Core”, we will focus on the network and operational aspects, digging deeper into these key topic areas.

More information around business opportunities in 5G for Consumers<sup>1</sup> and 5G for Business<sup>2</sup> is available on [ericsson.com](https://www.ericsson.com).

Many areas, topics and network domains must be considered by CSPs during the journey to a cloud native 5GC. We have chosen six topic areas that we think are relevant to explore in more detail, though it is not in any way an exhaustive list. The chosen areas are virtualized infrastructure, the 5GC itself, voice in 5G, automation and orchestration, evolution of operations and security.

<sup>1</sup> <https://www.ericsson.com/en/5g/5g-for-consumers>

<sup>2</sup> <https://www.ericsson.com/en/5g/5g-for-business>

# Cloud native infrastructure for 5G Core

No journey to a 5G Core will look the same – a key parameter will be the starting point of this journey. This combined with the chosen strategy will influence the path taken.

Some CSPs have come quite far on their virtualization journey, while others have not yet begun. As the introduction of 5G Core opens up new business opportunities, the core network now needs to support cloud native network functions and container-based software. This is done by introducing a Cloud Native Computing Foundation (CNCF) certified container as a service (CaaS) platform based on Kubernetes.

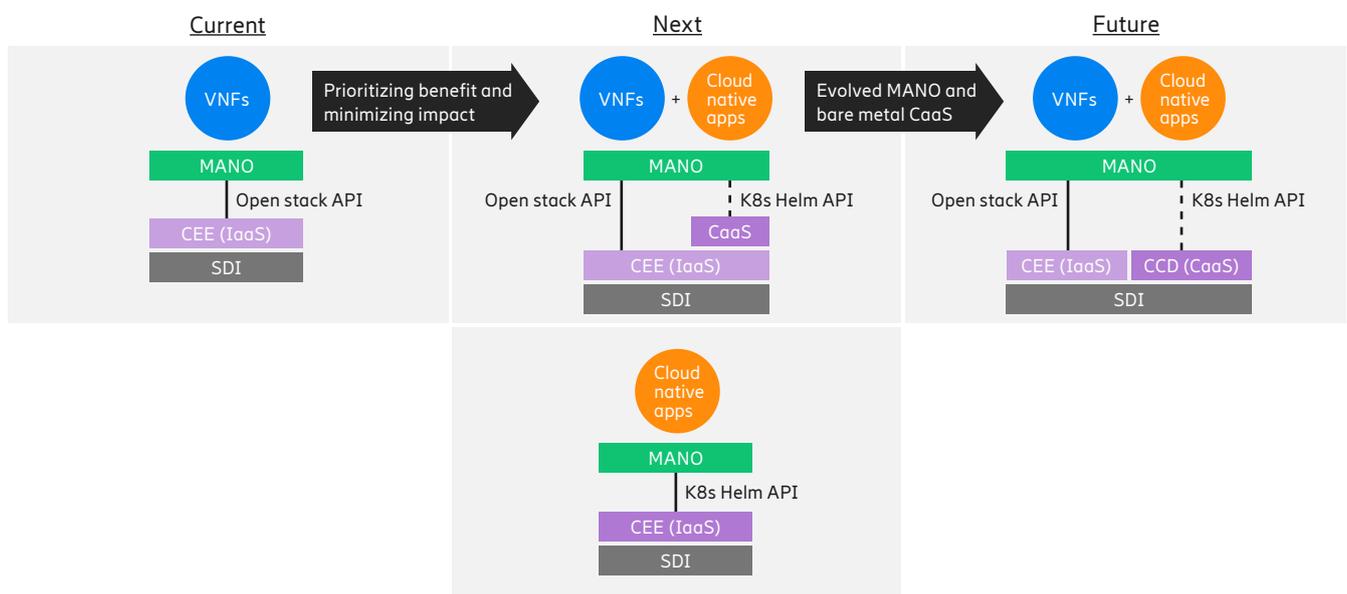
Key characteristics of using this platform include efficient automation of continuous integration/continuous delivery (CI/CD) loops, automated life cycle management (LCM) and operations of containerized network functions (CNFs) over a managed software defined infrastructure (SDI).

We see two alternatives for the evolution of the cloud infrastructure:

- The existing network function virtualization (NFVI) is complemented with a CaaS platform. This allows for the possibility to run virtual machine-based applications in parallel. This will be beneficial if the current NFVI is a stable multi-VNF telco cloud. We believe this will be the next step for the majority of CSPs.
- A new bare metal infrastructure without a virtualization layer is introduced alongside the current virtualization platform or platforms. This solution will have a simpler stack and make better use of the underlying hardware. It enables more efficient CI/CD capabilities. This will be the long-term type of architecture for the telco cloud, and will start to be introduced during 2021 by some CSP networks around the world.

To read more around the topic of cloud infrastructure and cloud native design, we recommend the “Building a cloud native infrastructure”<sup>3</sup> and “The cloud native transformation”<sup>4</sup> guides in the series.

Figure 2: Cloud native transformation journey and deployment options



<sup>3</sup> <https://foryou.ericsson.com/cloud-native-infrastructure-report.html>

<sup>4</sup> <https://foryou.ericsson.com/5g-core-guide-cloud-native-design.html>

# 5G Core

Dual-mode 5G Core brings together EPC and 5GC under one operations and management network to offer a flexible journey and enable new opportunities.

5G is not only about introducing 5G new radio (NR). To fully enjoy and implement the full capabilities of 5G, as defined by 3GPP, the new 5GC SA is a prerequisite. Going forward this will only be more accentuated, as 5GC will be the platform for innovation and standardization going forward. Very limited efforts will be directed towards the EPC.

The new 5GC represents a paradigm shift. A new SBA is introduced, which is designed for cloud native implementation, and represents new opportunities and challenges.

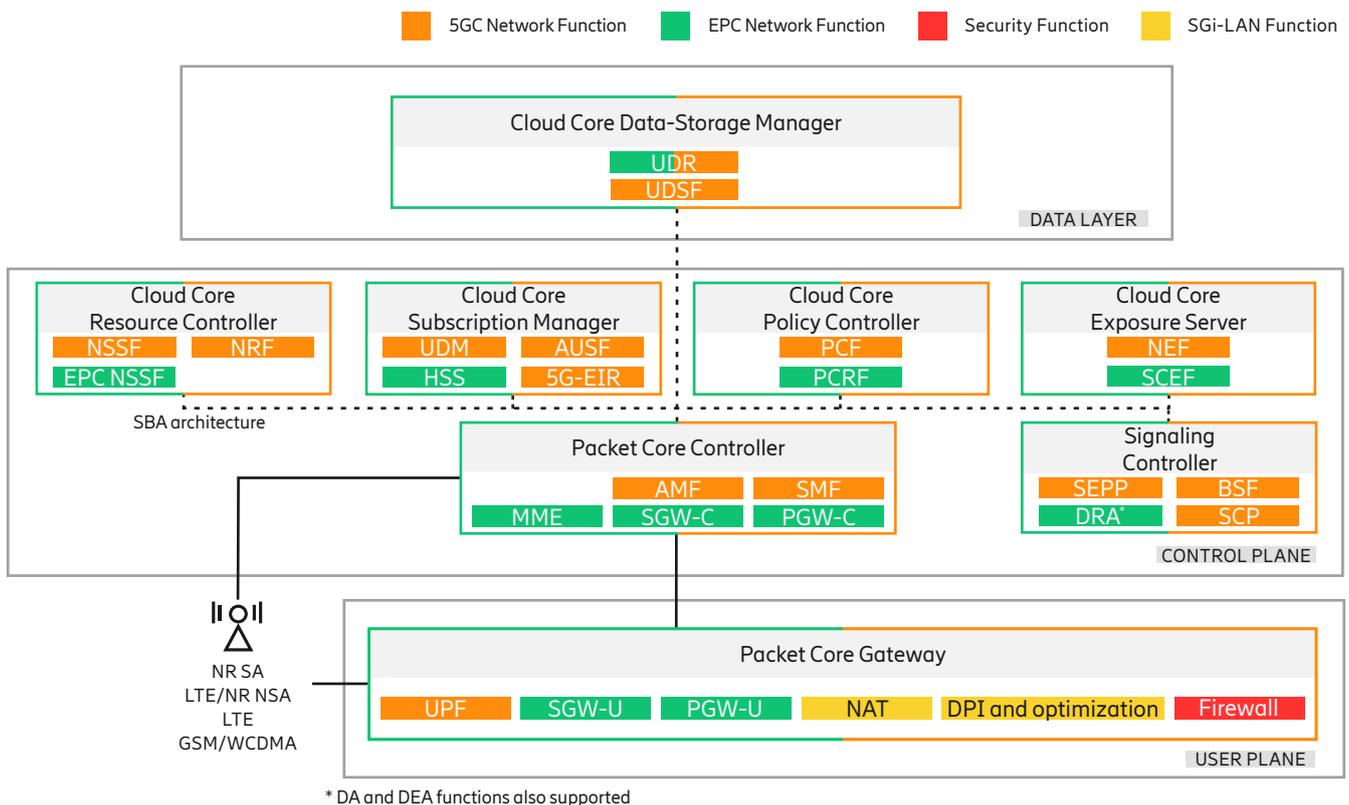
Based on the reality that different technologies will have to live together for a long time, we have developed a solution that we call dual-mode 5G Core. This brings together EPC and 5GC network functions into a common cloud native software platform for efficient TCO and smooth migration to 5G. It also means that we have designed and redesigned all network functions to cloud native and based on microservices.

The main driver behind this has been to support our customers with both a flexible and cost-efficient journey towards the 5GC, independent of starting point and local market conditions.

To read more on how we can support you in your journey to a cloud native 5GC in more depth, we recommend these documents in the guide series:

- Building a new world<sup>5</sup>
- One core – the best of two worlds<sup>6</sup>
- Dual-mode 5G Core: TCO benefits<sup>7</sup>

Figure 3: Inside Ericsson's dual-mode 5G Core portfolio



<sup>5</sup> <https://foryou.ericsson.com/core-evolution-to-5g.html>

<sup>6</sup> <https://foryou.ericsson.com/one-core-the-best-of-two-worlds.html>

<sup>7</sup> <https://foryou.ericsson.com/tco-for-dual-mode-cloud-core-5g.html>

# 5G voice

All service providers deploying 5G networks must consider how to deploy mobile voice services in their networks. 5G advances will bring new business opportunities when it comes to new real-time communication services.

Voice is one of our most powerful communication tools and so making voice calls available in 5G networks is a fundamental service. Today, CSPs can already build on their existing mobile voice service in 4G – voice over LTE (VoLTE) – and add new valuable voice and communication services for consumers, small businesses, industries and enterprises. With 5G, there are new opportunities to develop even more advanced voice and communication services, including interactive calling, combinations with AR and VR, and other future real-time communication services.

All CSPs that are deploying 5G networks must consider how to deploy mobile voice services. The introduction of 5G voice will happen in different technology evolution phases, depending on the speed at which nationwide 5G coverage is being built out and device capabilities. The IP Multimedia Subsystem

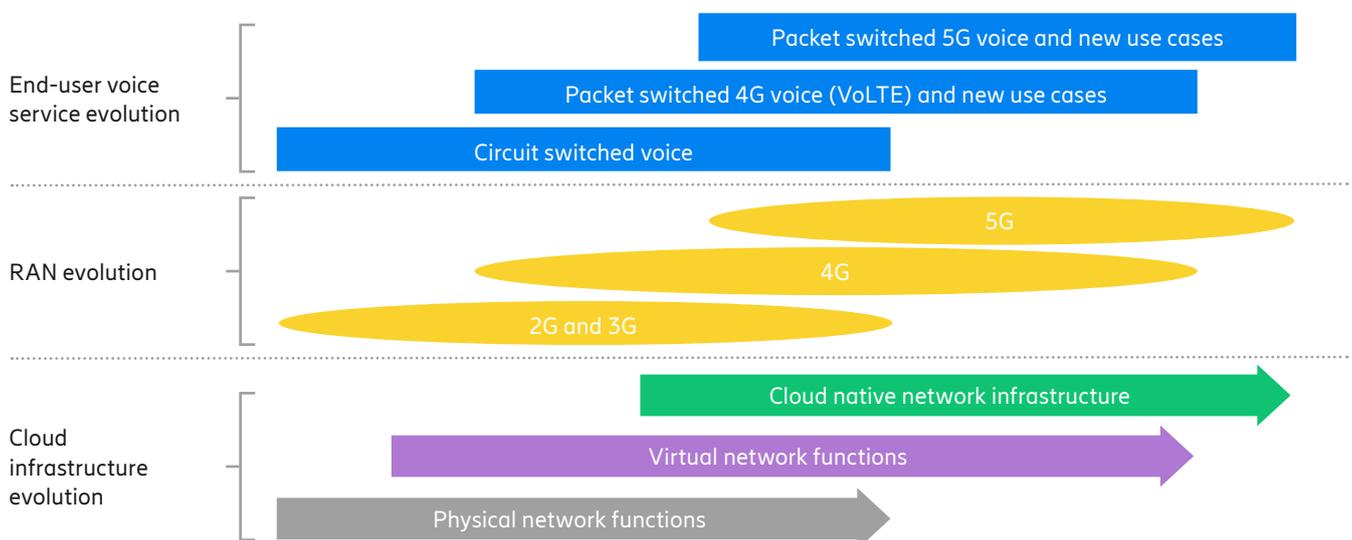
(IMS) handles all telephony services in a 5G network, as in a 4G VoLTE-enabled network. Therefore, VoLTE is a fundamental building block and starting point in the 5G voice network evolution.

There are several evolutions happening simultaneously in the telecoms industry, all of which affect how mobile voice services are enabled and enhanced in a mobile network. These are end-user voice service evolution, RAN evolution and cloud infrastructure evolution.

Our complete voice portfolio, which includes core and radio network functionality, supports CSPs as they introduce 5G voice. The main component is the IMS, required for VoLTE in 4G networks today, and for supporting efficient 5G voice deployment. A CSP's 5G voice journey can begin today with our cloud automated IMS, before evolving to our cloud native IMS with improved TCO and fast time to market.

To learn more about 5G voice and our role in supporting CSPs, we recommend the "5G voice network evolution"<sup>8</sup> guide in the series.

Figure 4: Industry evolutions affecting how mobile voice services are evolved and deployed in mobile networks



<sup>8</sup> <https://foryou.ericsson.com/5g-core-guide-5g-voice.html>

# Automation and orchestration

5G enables a range of new applications and higher-value revenue opportunities. But how can these be captured to make the most out of a 5G network?

Capturing high-value revenues will require that a CSP's network meets customer expectations on short time to market for new services, and provide the ability to compose real-time and seamless services. Here, automation and orchestration play a key role in reducing time and removing manual intervention, as well as ensuring the service performance.

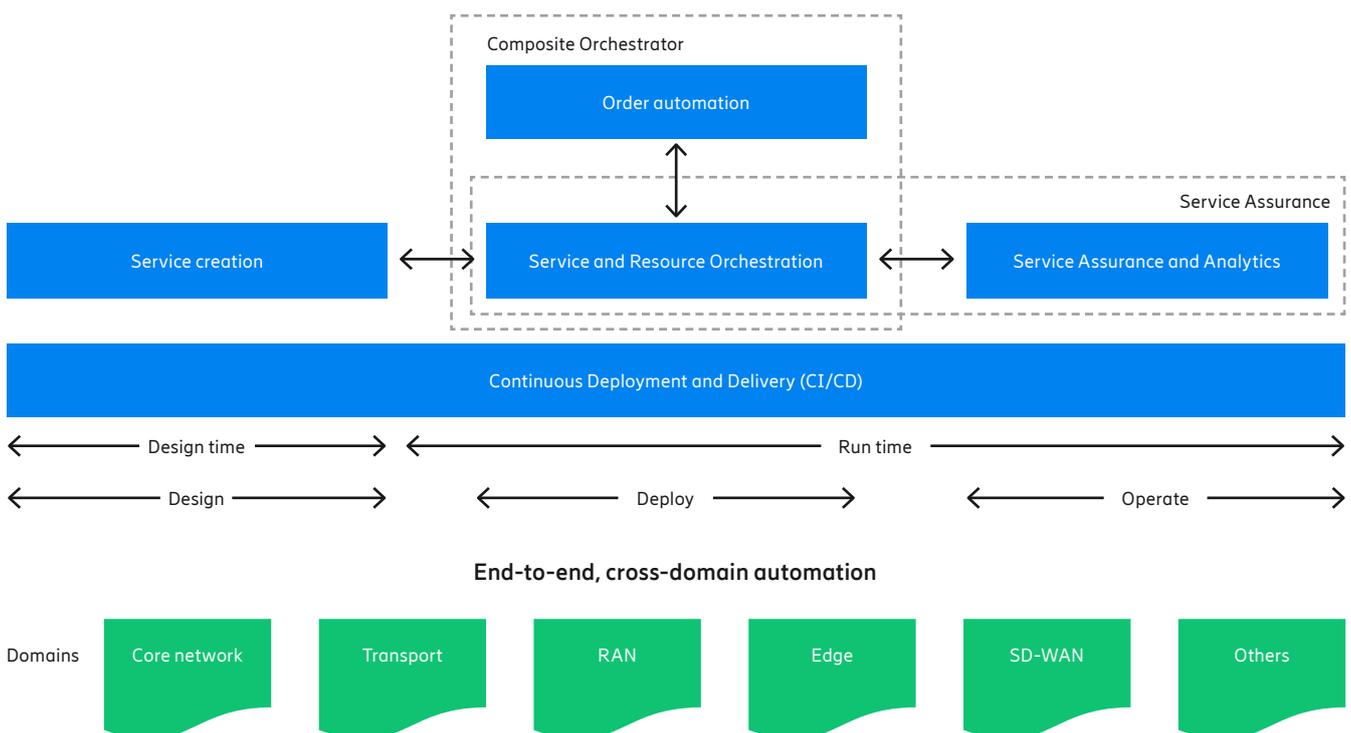
Our cloud native dual-mode 5G Core is designed for automation and supports CI/CD, where software will be released more frequently in an order of magnitude. Managing the more frequent software releases with increased levels of automation is a prerequisite, as current procedures for testing and verification would become unmanageable.

The new business landscape will challenge how CSPs have traditionally been organized and operated. Traditional "silos" will have to be replaced with a more horizontal service-based approach, where cross-domain end-to-end (E2E) orchestration will become a business need.

We offer a full suite of solutions and services to support this – we define the steps of the automation and orchestration evolution journey and what the necessary capabilities are. Wherever you are in your automation and orchestration evolution journey today, we can guide you through the implementation – Ericsson Dynamic Orchestration allows CSPs to build for today while planning for future needs.

For further depth, we recommend the "Network automation: the journey to zero-touch networks"<sup>9</sup> and the "Ericsson Dynamic Orchestration solution brief"<sup>10</sup> guides in this series.

Figure 5: Ericsson Dynamic Orchestration automation flow



<sup>9</sup> <https://foryou.ericsson.com/5g-core-guide-network-automation.html>

<sup>10</sup> <https://foryou.ericsson.com/5g-core-guide-dynamic-orchestration.html>

# Transforming operations and management

The deployment of 5GC will introduce cloud native technology to the core of the mobile networks, requiring transformation to meet new operational and management challenges.

The deployment of 5GC marks the first time the cloud native technology will be introduced into the core of the mobile networks, which will bring benefits such as software decomposition and improved life cycle, higher agnosticity between applications and underlying infrastructure, higher levels of application resilience and increased degrees of automation and orchestration. However, its adoption will impose new challenges on CSPs in the area of network orchestration and management, requiring an operational transformation of a nature not seen before.

Beyond the cloud native adoption, the new 5GC SBA architecture based on IT principles is also something that has not yet been incorporated in previous generations of mobile core networks, and will impose new challenges to CSPs.

The virtualization of the infrastructure journey that many CSPs started some years ago will now continue to evolve to a truly multi-domain cloud infrastructure that will require a new operational model and procedures.

5G networks will also require a faster software LCM to allow for deploying new and updated software and products on demand. For this, the adoption of DevOps principles such as CI/CD is a must and will involve significant changes in tools, culture and ways of working.

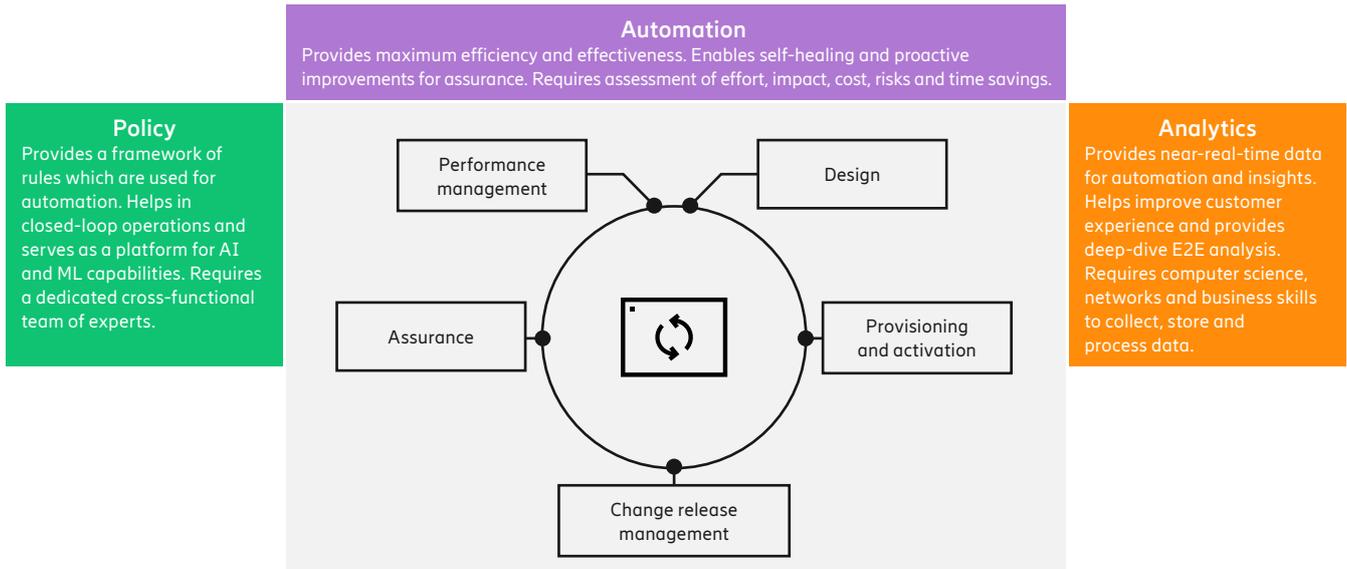
Finally, this new network will need to coexist with the legacy one for many years, requiring CSPs to find the sweet spot to leverage the best of both worlds with high levels of operational efficiency. Some of the operational challenges CSPs will need to deal with are:

- leveraging the already-started virtualization journey (if this is the case)
- cloudifying the core architecture
- managing the coexistence of the new architecture and legacy systems with high levels of operational efficiency
- implementing and managing a partner ecosystem for business innovation
- adopting DevOps principles for efficient software delivery
- implementing network slicing and edge computing capabilities in the network
- automating the network



We are ready to guide and partner with CSPs on the journey

Figure 6: Guiding principles to operational process transformation



### The need for operational transformation

Our experience of working with leading CSPs has found that they often continue with their existing approach to operations when they move to a cloud environment, meaning critical pain points are carried into this new environment. Manual, time-consuming and inconsistent processes, as well as a lack of seamlessly integrated operating models, increase the complexity of managing the network.

Without the necessary changes to the operating model, the evolution to 5GC will only increase the overall cost and complexity of managing the network along with an increase in time to market for new services, going in the opposite direction of what is expected with 5G.

### Transforming for efficiency

A good transformation strategy supported by the C-level, that aligns business and technology needs with the organization's current maturity level, is imperative to address the opportunities and challenges of cloud native adoption. This strategy should tackle:

1. Processes: managing, automating and orchestrating the hybrid core network in a cost-efficient way will require a suite of new E2E operational processes that move away from siloed stacks to a service-oriented approach. When it comes to process transformation in particular, this should be enabled by three guiding principles – policy, analytics and automation (see Figure 6).
2. Organization: CSPs need to transform to a cross-domain model. This will require new competences and skills to be developed and organizational borders to be reviewed to match the needs of the new processes.
3. Technology: some key capabilities need to be embraced to achieve the high operational efficiency expected from 5G networks, such as:
  - multi-domain orchestration and network slicing
  - automation of testing and LCM of VNFs and CNFs with CI/CD
  - machine learning and artificial intelligence
  - common network management solutions for the hybrid network
  - closed-loop automation

In summary, CSPs need to look at revamping modern solutions to address the operational challenges while also scoping an architecture with legacy and virtualized components at the core. This means investing in technology that can move them closer to a zero-touch network, for quick creation and delivery of innovative services that also leverage edge computing and network slicing.

To read more about our experiences and learn how we can support with operational transformation, we recommend the "Transforming operations on the way to 5G"<sup>11</sup> guide in the series.

<sup>11</sup> <https://foryou.ericsson.com/5g-core-guide-operations-and-management.html>

# Security

5G’s new deployment scenarios and use cases create new business opportunities for CSPs but can also increase the threat surface and risks. Therefore, a new approach to security is required.

### The need for operational transformation

The need to securely protect the business models that will emerge as 5G and IoT gather momentum presents both challenges and opportunities for CSPs.

We believe this is actually an opportunity to convert security from a cost center into a revenue center. But, let us start at the beginning.

Building secure and trustworthy networks and services depends on the following layers, which are all equally essential:

- mobile network standardization
- implementation of secure products
- deployment
- operation of the network

As indicated above, security in a 5G system implies much more than specific products inserted at different places – it requires the capability to overlook and manage security across the entire network architecture. A vast number of multi-vendor solutions should also be considered. Due to the dynamicity anticipated in 5G, threat detection and mitigation must be done very quickly.

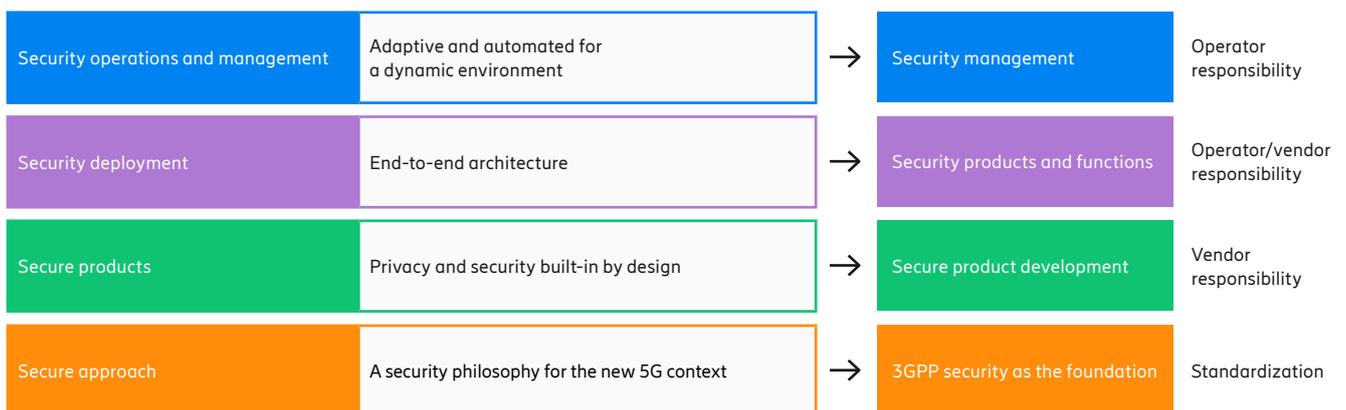
CSPs today have varying maturity in their security operations, and many have static manual processes in their telco network security operations. We have defined a three-step approach to reach a high level of intelligent security management.

Security automation plays a critical role in network deployments and operations by ensuring continuous security compliance, threat detection and efficient response. Security automation offers the capability to scale up security management across the entire network easily, stay on top of the security status and swiftly react to new security risks. It will enable CSPs to constantly stay protected by adapting their security posture to the evolving security risk landscape. This also opens various business opportunities in security.

To help CSPs, we have been working for many years to develop a management solution for the entire telecom network across all layers and network domains including multi-vendor products. As part of dual-mode 5G Core, we recently launched a user plane embedded firewall to both simplify the architecture and maintain 5G latency as well as decrease TCO.

To learn more about the need to build secure and trustworthy networks and services, we recommend reading the “Mastering complete 5G network security”<sup>12</sup> paper – part of the full guide series.

Figure 7: Four areas for building trust in mobile networks



<sup>12</sup><https://foryou.ericsson.com/5g-core-guide-network-security.html>

# Summary

The complexities of your 5G project cannot and should not be underestimated. The introduction of new technology plays an important role, but equally – if not more – important to consider are the new ways of working, skill sets and processes needed to capture the new opportunities in the evolving 5G business landscape.

In this guide series to building a cloud native 5GC, we have tried to cover some of the most important areas of your 5G project in depth. However, the real driver behind all of this is the opportunity to grow businesses and find ways of positioning networks and their new capabilities at the center of future value creation and innovation.

We hope you find this series useful as input for your journey. Please reach out to your local Ericsson contact for further information or support.

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans Networks, Digital Services, Managed Services, and Emerging Business and is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. The Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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