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## Crack the Code of Tomorrow's Network

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Communications service providers (CSPs) keep being told to think of their networks in new ways, as everything from cloudified infrastructure to ecosystem platforms to value-creation engines. Valid as these are, they don't take the deconstruction (and reconstruction) of the network all the way to the finish line. To fully realize the potential of the 5G opportunity, it's time to see the network as code.



The new use cases enabled by 5G range from richly personalized consumer services to radically customizable network slices tuned to the needs of specific industry verticals. All of these require highly automated, service-oriented, and cloud-native networks that are a far cry from monolithic legacy physical architectures.

Transforming the network for 5G basically involves deconstructing it into ever-smaller, more configurable, and reusable components, right down to the level of code. It can then be built back up into distributed chains of multiple linked services that are created with third-party partners and delivered over a single network connection or slice.

Hyperscalers and cloud players already host mature, open software marketplaces for agile new services to be created and consumed in their ecosystems. These marketplaces are foundational to 5G value creation and CSPs are well-positioned to build their own — not necessarily as competitors with hyperscale and cloud companies but as partners.

## Software reigns supreme

The role of software in seizing the 5G opportunity can't be overstated. The network itself has to be software-centric. The core needs to be software-based to function in a scalable, decentralized, any-cloud environment. Business and service operations require software so they can be intent-driven and provide orchestration, assurance and management in multi-vendor, multi-access and multi-cloud settings. Insights and analytics need to be gathered and used in fixed, mobile and software-based networks, enabled by artificial intelligence and machine learning (AI/ML).

Service and network delivery are already shifting to be software-led with the rise of software-as-a-service (SaaS) and network-as-a-service (NaaS) offerings.

Analysts tend to agree that these shifts are essential. "CSPs must transform themselves... and the switch to SaaS delivery models is a critical component of their digital transformation strategies," according to [Analysys Mason Research Director Caroline Chappell](#).

Based on all of this, five distinct technological prerequisites stand out as critical for any 5G-era network.

### ***Software-defined cloud-native network functions***

Deployable on public clouds and integrated into an automation fabric, these functions make it possible to expose the network on demand as a service, with secure orchestration, operation and management to drive the creation of value-adding service chains. Abstraction and application programming interfaces (APIs) will be the new currency, as exposing network capabilities through service chains opens the door to NaaS offerings, which IDC expects could amount to a [\\$15 billion market](#) by 2025.

### ***Scalability and multi-cloud adaptability***

These modify workloads for various cloud platforms using best-practice deployment "recipes" that respect the pre-defined, validated blueprints of the underlying cloud platforms. These recipes are collections of container and platform services that can be used by a specific subclass of applications, such as control planes or data planes, to create a consumable service from the platform. They also make it possible to develop software once and deploy it efficiently on multiple platforms in various cloud and hyperscaler environments.

### ***Zero-touch automation***

Zero-touch automation should be part of every aspect of service lifecycle automation from deployment and configuration to upgrades and removal. This is foundational for any dynamic, agile network, and especially for slice automation, as the whole slice lifecycle must be automated to enable as-a-service offerings. Over time, AI/ML will permeate each network function, making

the network predictive instead of reactive, with the ability to scale to meet market demand. Automation and AI/ML will handle routine actions, while cognitive automation will transform and simplify processes.

**DevOps/DelOps and test automation**

DevOps and test automation ensure highly automated test cycles at the application and service level so new services can be launched using software test frameworks. DevOps, which is used widely in IT and webscale networks, needs to be adapted to the complexity of delivering software to multiple domain environments, third-party software, and the hybrid cloud environments typical of telecoms networks. This adaptation, with a many-to-many delivery and operations process, is called DelOps. Open- and closed-loop assurance drive automation and predictability for network operations and management. Digital twins will come to play a growing role in creating these building blocks.

**Security, privacy and trust**

Because cloud-native, open-source software development and public cloud environments are often comprised of shared multi-cloud platforms, proactive security, privacy, and trust are key to enabling any new business model. Security-by-design principles and special attention to cloud-native security are imperative. Using the latest software tools for vulnerability and malware detection, including region/country-specific security requirements, is and will continue to be in every CSP’s interest.

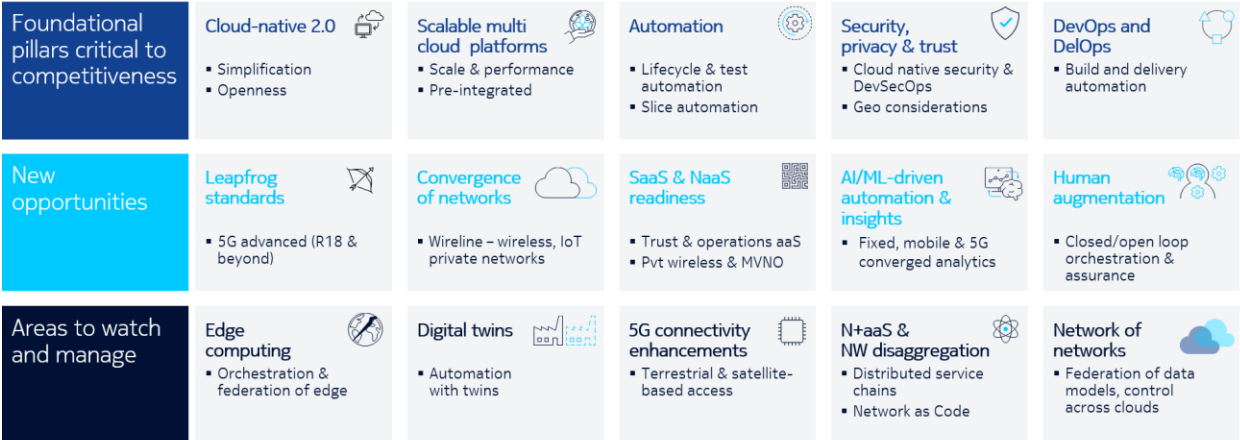


Figure 1. Foundational technologies and emerging opportunities [click to enlarge](#)

**Ecosystems emerge from the network as code**

Developers creating service chains today are already looking for simplified access to different components of the network — whether infrastructure or insights — that they can easily plug into

their own applications. Giving them a view of the network as an open, abstracted, and horizontal platform driven by APIs and software development kits (SDKs) makes component-ized consumption possible.

To put it another way, they already relate to the network as code — and their use of network components is what will produce the kind of service-creation ecosystems CSPs have been hearing about for years now as being at the heart of the 5G opportunity.

“The ecosystem archetype may appeal to traditional operators eager to lean into self-disruption because of the great revenue pressures they face,” according to McKinsey & Company’s [A blueprint for telecom’s critical reinvention](#).

Standards bodies are actively working to enable open, ecosystem-ready networking. The 3GPP 5G Advanced working group, for example, is preparing its release 18 for issue sometime in 2023. That update will create new opportunities for wireless, wired and Internet of Things (IoT) networks to be orchestrated, operated, managed, and exposed for service creation.

The evolution of edge computing will also make a difference for CSPs in terms of how service chains are orchestrated, levels of edge performance, and the technical ability to integrate and utilize edge potential.

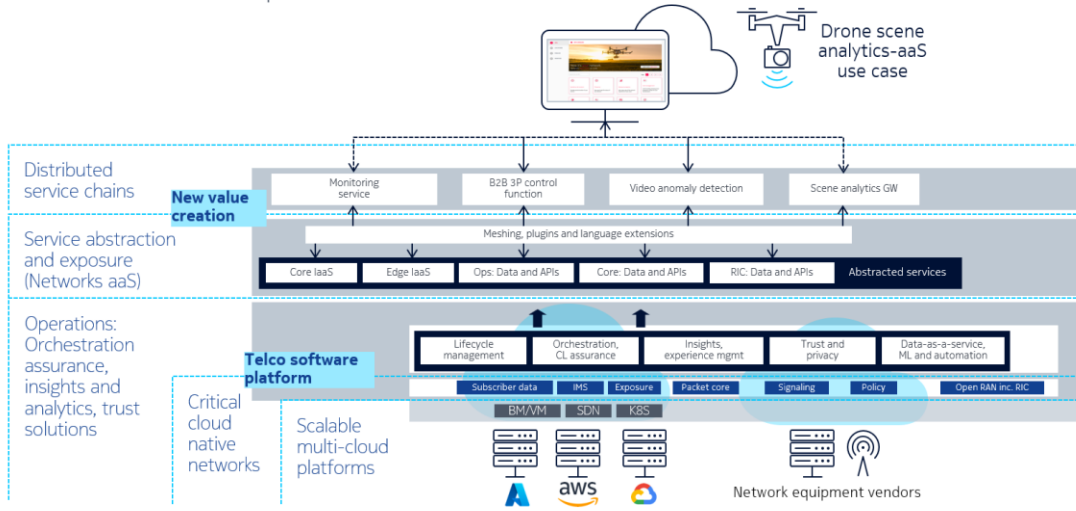
## Realizing the “digital transformation promise” of 5G

The call for scalable, software-centric, intent-driven networks goes back to the early days when 5G was just being conceived. Only now are the capabilities really available for CSPs to realize that vision and become the digital service providers (DSPs) their transformation journey has been driving toward. (See Figure 2)

In the short- to medium-term (for example, within the next 48 months), “execution-oriented adoption” of critical technology enablers such as cloud-native solutions and zero-touch automation will lay the foundation for future value creation. APIs and abstraction at each level — whether infrastructure, network operations or the data fabric — will be a critical bridge to value creation. This will allow CSPs to build their telco software platforms in the cloud(s), treating the network as code so it can be used and consumed in an infinite variety of ways.

Ultimately, doing so will lead to federated data models and the ability to manage entire “networks of networks” in the cloud. These will combine access (terrestrial and non-terrestrial networks), transport, global cloud platforms and, ultimately, network and operations in well-orchestrated service chains.

# Enablement of horizontal platforms and distributed service chains For a B2B/B2C marketplace of 5G era services



**Figure 2: Creating the network of the future**  
[click to enlarge](#)

If it all sounds exciting but slightly daunting, CSPs shouldn't worry. They don't have to do this alone; in fact, they can't. The network as code concept requires CSPs and software vendors to work together and collaborate seamlessly with cloud players.

There also need to be new collaborative arrangements inside the CSP organizations themselves, among chief technology officers (CTOs), chief marketing officers (CMOs) and chief information officers (CIOs), to build the right software platform in the right way — as the only path to value creation in the next decade.