

How to Accelerate the Adoption of Cloud-native, Open Standards-based 5G Networks

6 Key Criteria CSPs Must Have to Enable Agile, Sustainable, and Scalable 5G Network Environments

By **Bob Laliberte** | Principal Analyst

ENTERPRISE STRATEGY GROUP

DECEMBER 2023

KEY FINDINGS

CLICK TO FOLLOW



The Evolution to 5G Represents an Opportunity to Transform

PAGE 3



Challenges of Modernizing and Transforming CSP Networks

PAGE 6



Accelerate 5G Network Adoption for CSPs

PAGE 10



Google Telecom Solutions Enable CSP 5G Environments

PAGE 13



The Time to Transform Is Now

PAGE 18



About Google Cloud and Intel

PAGE 19

The Evolution to 5G Represents an Opportunity to Transform



The Evolution to 5G Represents an Opportunity to Transform

Communication service providers (CSPs) are undergoing significant transformation as they deploy 5G environments globally. While the shift to new technology is eagerly awaited by users, it also presents a significant opportunity for CSPs to adopt modern architectures—ones that will enable CSPs to have greater agility and scale, while also being environmentally responsible. Building out a new generation of technology is resource-intensive and expensive, so it is imperative it's done correctly. With CSP networks responsible for about 2-3% of the world's global energy demand¹ while using legacy solutions, this transition is a chance to dramatically change how networks are designed, built, and operated to be more sustainable. However, CSPs also need to ensure their new environments are also highly reliable and performant, as delivering positive experiences to ensure a successful 5G rollout.

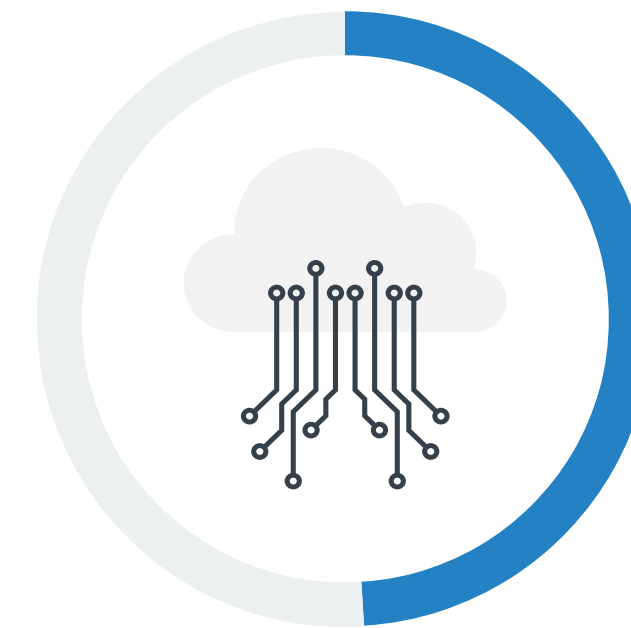
One of the key technology innovations now available to CSPs is the ability to leverage cloud-native technologies and modern application architectures that will enable CSPs to achieve both sustainability and performance goals. Embracing cloud-native architectures will provide the agility required to monetize 5G networks with demanding enterprise customers. The demand is there, and enterprises are anticipating the 5G rollout, as TechTarget's Enterprise Strategy Group research shows that 59% of organizations plan to use 5G connectivity to connect to edge computing locations, and almost half (49%) report the desire to leverage CSPs for wireless connectivity to remote sites,² where fixed lines either don't exist or the cost to connect is prohibitive. Furthermore, the majority of respondents believe that 5G will have a significant impact on their edge computing strategies, with almost three quarters (71%) of respondents stating that 5G will have a significant or critical impact on edge computing environments.³

Planned Usage of 5G Connectivity for Edge



59%

Plan to use 5G to connect edge computing locations.



49%

Want to use CSPs for wireless connectivity to edge locations.

1. Source: Business Wire, ["Guidehouse Insights Report Finds Telecom Networks Are Expected to Install 122 GW of New Distributed Generation and Distributed Energy Storage Capacity from 2021-2030"](#) February 2021.

2. Source: Enterprise Strategy Group Research Report, ["The State of Digital Ecosystems at the Edge"](#), September 2022.

3. Ibid.

“ This is important because these enterprises **already have years of experience using cloud services and cloud-native offerings** and will have high expectations for their 5G services.”

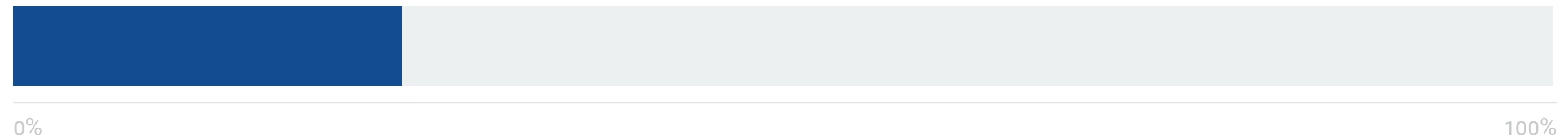
By Bob Laliberte, Principal Analyst
ENTERPRISE STRATEGY GROUP

These expectations will include the ability to rapidly scale services where and when needed. CSPs need to ensure that the transformation to 5G includes a shift to modern, cloud-native architectures that provide the agility, scale, and sustainability required. However, this is much easier said than done, as there are numerous challenges to achieving these goals.

Impact of 5G Networks on Enterprise Edge Environments

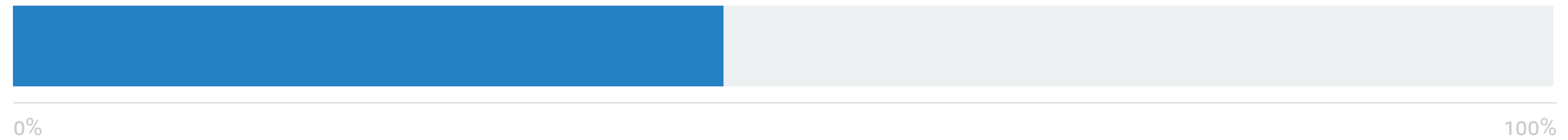
25%

Critical – we are waiting to deploy new apps until 5G is in place



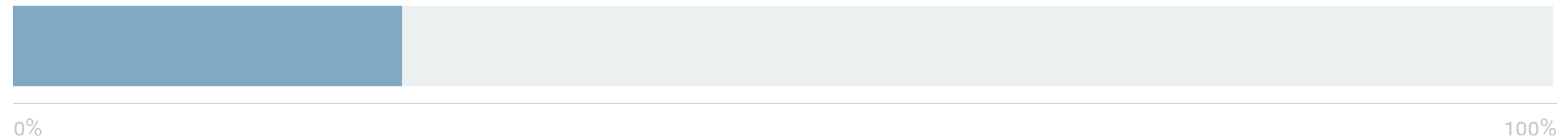
46%

Significant impact – we have many sites that require cellular or have fleet vehicles that need to be connected



25%

Some impact – we have some sites that require high-bandwidth cellular connections (i.e., beyond what 4G can offer)



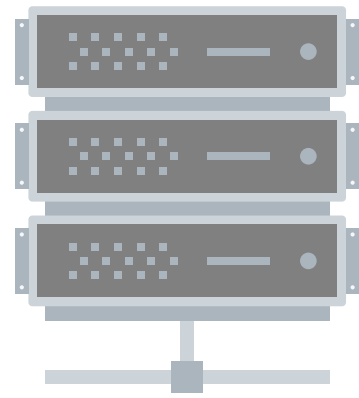
An additional 3% said, “No impact – we will continue to use wired connections to all edge locations.”



Challenges of Modernizing and Transforming CSP Networks

Challenges of Modernizing and Transforming CSP Networks

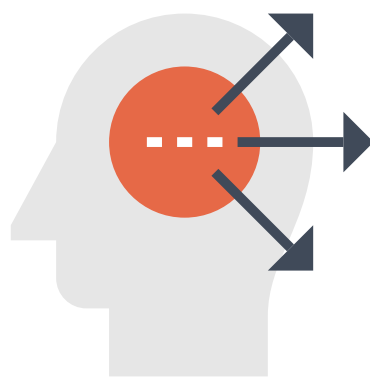
Each new generation of cellular technology requires CSPs to make significant investments in time, resources, and capital to fully deploy and manage these new environments. While each transition provides opportunities to modernize with the latest technologies, it also creates several challenges as well. Specifically, CSPs face a number of challenges that could impact their ability to have a successful 5G rollout, including:



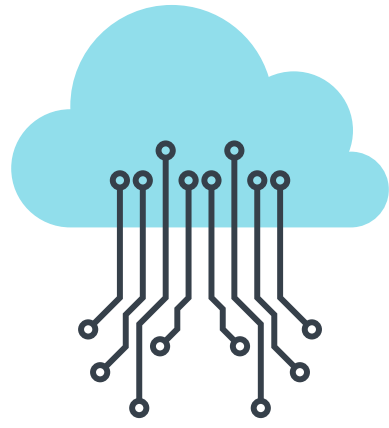
Existing architectures based on legacy black boxes or appliances. Tying a service or function to a specific piece of hardware inhibits scale and agility. It is also very inefficient from a sustainability perspective, as each device requires power and cooling. CSPs are forced to scale using step functions based on the proprietary box or appliance capacity, which typically requires skilled resources to be deployed to install and configure the device. Plus, this appliance-based model creates potential vendor lock-in situations.



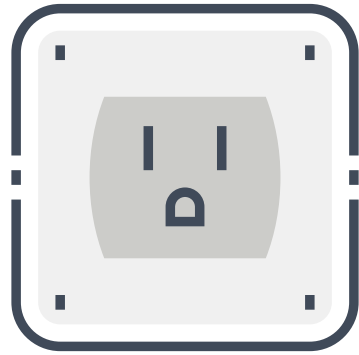
Inefficient data management and use. Prior architectures were built with data confined to silos. This makes it very difficult to manage the architectures effectively and extract value from the data in real time. Not only is the network data often siloed, but it is also from adjacent IT domains that house CRM or other applications critical to the business. Legacy data pipelines will not be able to meet the needs of highly dynamic 5G environments. The inability to blend data from different vendors (with different formats), the lack of automation, and the lack of scalable data and AI capabilities will hold CSPs back. These silos result duplicated data and manual time-intensive processes to collect, reformat, and store the data. Plus, there are numerous data sovereignty, governance, and privacy issues that need to be addressed.



Lack of knowledge and skill sets. Transitioning to a new technology and architecture can be problematic, as, typically, there will be very few internal resources that have extensive knowledge or the required skills to deploy new technologies. While this can be the case when simply switching between vendors of the same technology, it is amplified when transitioning to brand new technologies and architectures. Such is the case for CSPs as they look to deploy 5G with cloud-native technologies and modern application architectures that leverage microservices and Kubernetes containers. And it is not just the underlying network platforms; this will also apply to organizations that are starting to deploy artificial intelligence and automation or orchestration solutions.



Making the shift to a cloud-native architecture. CSPs virtualizing their environments was a good start, but with 5G, they need to go further. The speed of modern business requires greater agility and scale. CSPs have found virtualization solutions difficult to scale and automate in carrier environments. Plus, most solutions were proprietary and expensive to deploy throughout the CSP environment. This shift requires an ecosystem of partners that need to act as one.



Static environments. Currently, most CSP networks are built to accommodate peak traffic. While building out the network to accommodate peak traffic ensures greater user satisfaction levels and experiences, it is highly inefficient, as the infrastructure is consuming energy even when not fully utilized. This both wastes energy and negatively impacts a CSP's budget.

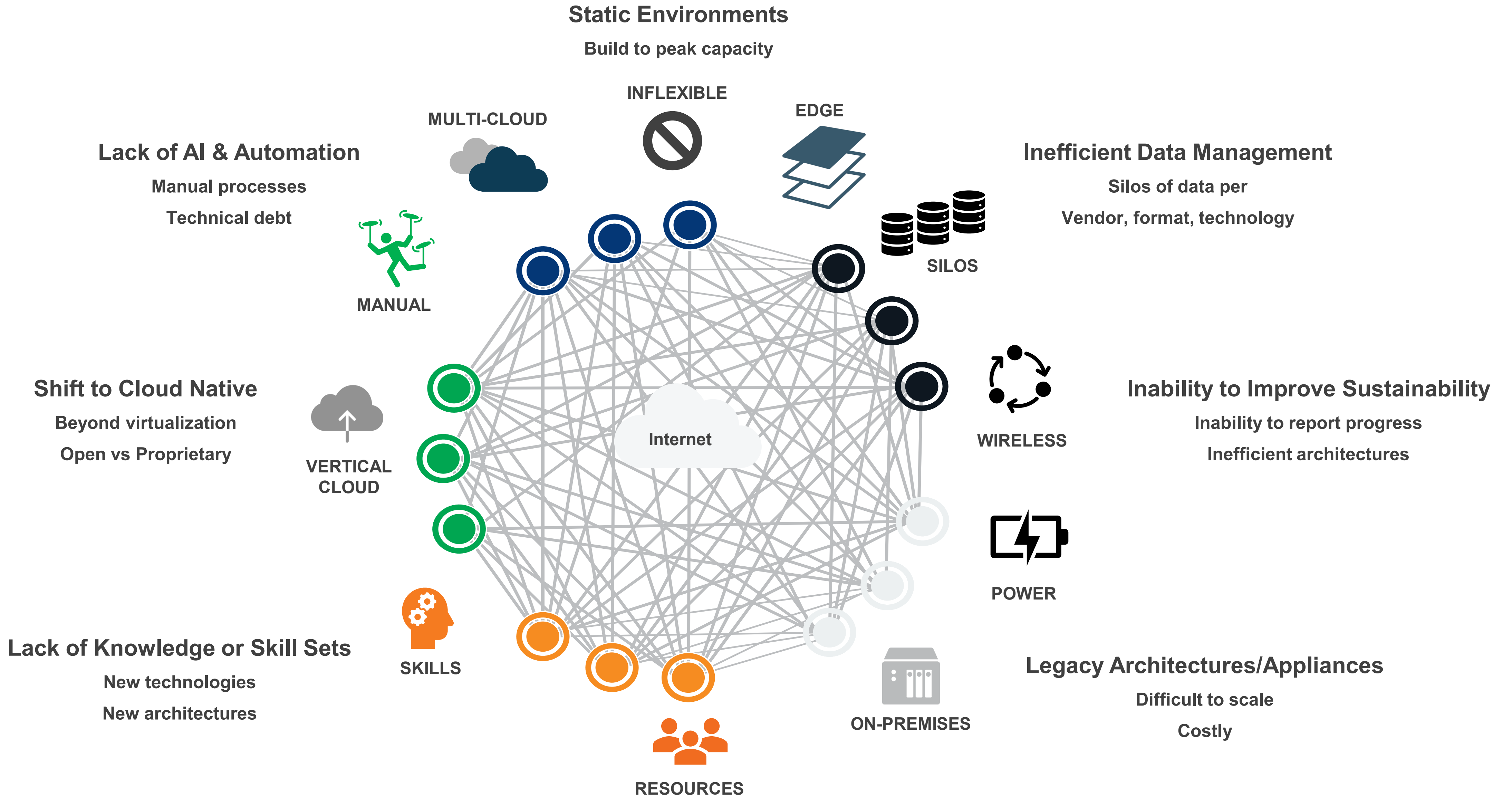


Inability to demonstrate sustainability. With global concerns about power consumption and energy efficiency, enterprises are focused on sustainability as well, with 30% having mature ESG programs that affect their purchasing and operational decision-making.⁴ CSPs will need to demonstrate and potentially document how they are reducing their energy consumption.



Lack of automation and AI/ML technology. As networks increase in size and scale, the amount of telemetry data collected is also increasing far beyond the scope of human capacity. Manual efforts to collect data from multiple different sources, correlate it, and provide actionable information is simply not feasible in modern environments. Without the addition of artificial intelligence or machine learning and some type of automation, CSPs will find themselves disadvantaged when trying to deliver real-time actionable insights and ensure optimal customer experiences. CSPs can't continue to rely on swivel chair management (i.e., looking at multiple different screens and manually correlating issues) and troubleshooting for 5G environments.

Network Modernization Challenges



Accelerate 5G Network Adoption for CSPs

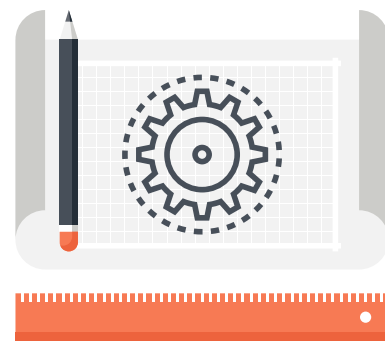


Accelerate 5G Network Adoption for CSPs

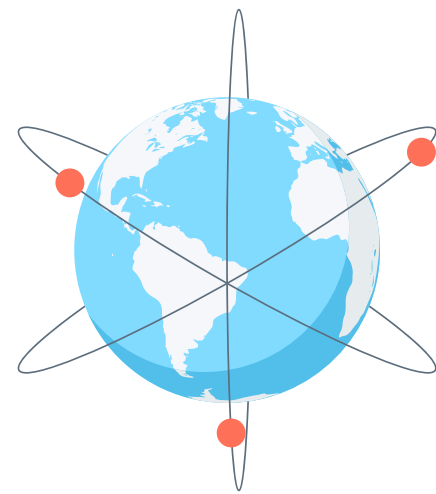
Given these challenges, what should CSPs keep top of mind when building out new 5G network environments? There are 6 key criteria that will enable CSPs to overcome the challenges associated with prior architectures and position themselves to become more agile and scalable. Those criteria include:



1. Cloud-native architectures. CSPs need to embrace cloud-native container technologies like Kubernetes to drive greater agility and support the use of modern microservices-based application architectures. Kubernetes is a trusted and well-documented technology that hyperscalers have used for years and that enterprises have also adopted to modernize their on-premises data centers. As a result, support for these environments is robust, and issues such as interoperability, validation, onboarding, and lifecycle management (LCM) of network functions have all been resolved. Additionally, because these technologies were built for distributed cloud-based environments, they have been designed with security and operations teams in mind.



2. Open source. CSPs need to shift from proprietary solutions to open source-based solutions. Moving to a cloud-native environment provides the opportunity to leverage open solutions and helps to eliminate vendor lock-in, even when using the environment to support a multivendor ecosystem. Along with leveraging open source standards and technology, CSPs need to ensure solutions utilize open APIs to provide access to information across the environment. CSPs can benefit from open source technology, with its community of developers to drive innovation at an accelerated pace. An example of an open source solution for the CSP environment is Nephio, which is hosted by the Linux Foundation and currently has over 75 members contributing to the development of its Network Automation capabilities.



3. Consistency and scale. Existing telecommunication networks are already highly distributed, and 5G environments will take that to a new level. Not only will 5G RAN infrastructure be highly distributed, but certain compute functions will be extracted from the core and will also be distributed (separation of control and user plane). The RAN environment will have potentially tens of thousands of geographically dispersed locations. Plus, with growing interest in multi-access edge computing, CSPs will have another reason to distribute compute infrastructure to the edge. As a result, it will be important to leverage common hardware, application stack, and management platforms across centralized and distributed locations to drive operational efficiencies with regard to lifecycle management, support, spare parts, and upgrades. This approach mimics hyperscalers' approach to having a consistent operating model and hardware across all locations.



4. Sustainable and efficient solutions. CSPs need to ensure they are deploying the most energy-efficient solutions possible to reduce their costs and overall energy consumption. A big part of this will be when deploying new hardware solutions that take advantage of the latest CPU technologies with improved power-to-energy consumption ratios. Also, the ability for these solutions to scale both up and down enable CSPs to spin down resources when not needed for peak usage hours. Solutions should include the ability to optimize the radio-frequency parameters to be more energy efficient as well. Being more energy efficient will be advantageous when selling to enterprise customers that are passing on sustainability requirements to their suppliers. In fact, Enterprise Strategy Group research highlights that 93% of enterprises state that a supplier's environmental, social, and governance (ESG) program will have either a significant (45%) or modest (48%) influence on purchasing decisions and that the top area of both corporate and personal concern with regard to an ESG program is the environmental impact (46% and 57%, respectively).⁵



5. AI and automation at scale. Data is a valuable currency in modern business, and after years of digital transformations, there is more data being generated now than ever before. This is also true for CSP network environments, as they have increasing amounts of telemetry data being generated. The distributed nature and sheer volume of information collected makes it impossible to manually collect, correlate, and infer any real-time insights. Because of this, CSPs must embrace AI and ML technologies combined with network automation to proactively respond to issues and continuously optimize performance. AI will be essential to providing critical-to-deliver, real-time actionable insights and recommendations. Once operations teams have validated these AI recommendations, organizations need to allow AI to trigger the automation to remediate or correct an issue. It will be important to leverage a closed control loop to fully verify that the automated actions yielded the appropriate results. And it's not just for operations, CSPs need to connect network data with location services, real-time offer management, and much more. This means that CSPs need a consistent, multivendor DataOps platform with highly scalable and repeatable AI/ML models.



6. A strategic partner with experience and expertise. CSPs pride themselves on building out the infrastructure and each generation of network technology themselves. However, to accelerate the time to value for 5G leveraging cloud-native technologies, it will be imperative for them to pick a strategic partner for this transformation. Given that most CSPs are spending all their time delivering current services, it will be difficult for them to dedicate the time required to learn and become proficient in new technologies. Leveraging a strategic partner with deep experience building out highly scalable, cloud-native, sustainable, and open network environments will be very important to ensure both short- and long-term success. Additionally, being able to leverage managed services enables CSPs to match expenses with revenue.

“**93% of enterprises** state that a supplier's environmental, social, and governance (ESG) program will have either a significant (45%) or modest (48%) influence on purchasing decisions.”

Google Telecom Solutions Enable CSP 5G Environments



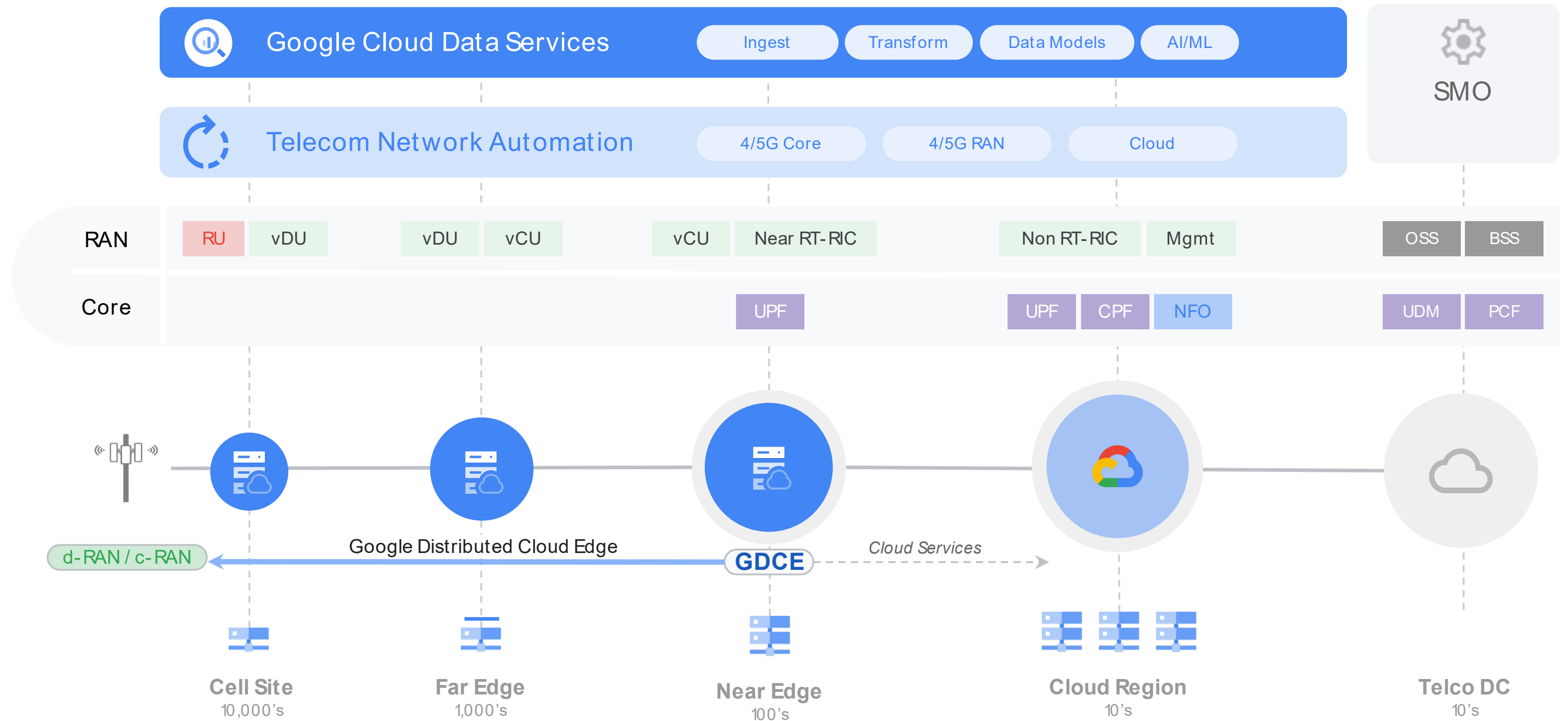
Google Telecom Solutions Enable CSP 5G Environments

Google is well known for its global Cloud Platform and innovative technology solutions. While most think of Google providing cloud computing services, according to Google, it also handles 30%-40% of global internet traffic over their network. This data traverses over 177 geographically dispersed data centers and points of presence. To accomplish this feat, Google has spent a considerable amount of time, effort, and expertise figuring out how to design, build, and cost-effectively manage a highly scalable, distributed, sustainable, agile, cloud-native, and open autonomous network environment. Google was able to do this by leveraging the Google Cloud Platform to host functions suited for regional data centers.

As a result of these experiences, Google is in an advantageous position to enable CSPs that want to leverage cloud-native, open, and proven technology to empower its highly distributed 5G core and RAN network environments. To make it easier and faster to adopt 5G solutions, Google has created offerings specifically designed for CSP networks. These offerings include Google Distributed Cloud Edge (GDC Edge), Telecom Network Automation, and Google Cloud Data and AI services.

“ While most think of Google providing cloud computing services, according to Google, it also handles **30%-40% of global internet traffic over their network.**”

Google Telecom Solutions for 5G, Google Distributed Cloud Edge, Telecom Network Automation, and Google Cloud Data and AI Services



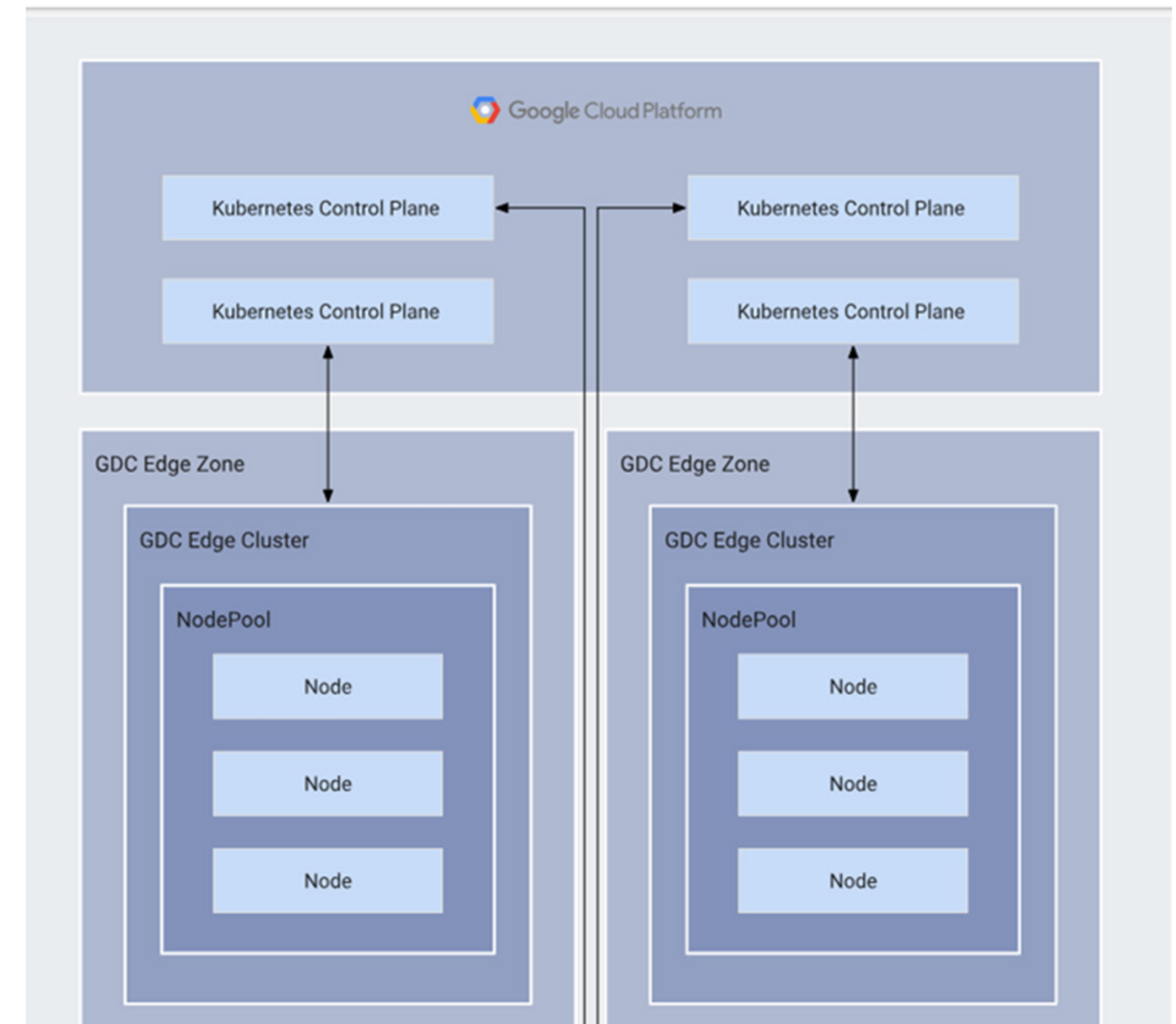
Google Distributed Cloud Edge (GDC Edge)

This cloud-native product enables CSPs to deploy uniform and scalable hardware, application stack, and management software across all on-premises locations. The software is consistent with Google's public cloud platform and offers consistent operational capabilities from its core to edge products.

This solution:

- Delivers an Intel-powered single or multi-server rack. CSPs have access to the latest Intel technology, which delivers powerful, energy-efficient compute power. According to Intel, these chips provide more scale, with two times the virtual RAN (vRAN) capacity while also delivering up to 20% compute power savings.⁶
- Leverages Kubernetes. CSPs can take advantage of purpose-built cloud-native Kubernetes environments right out of the box for highly distributed CSP environments and includes the ability to run network functions virtualization (NFVs) and vRAN.
- Offers a scalable footprint to meet different requirements based on deployment model, including distributed and centralized RAN and fully disaggregated O-RAN. GDC Edge can be located at cell sites, far edge, or near edge.
- Provides centralized control with distributed enforcement. CSPs can take advantage of a centralized cloud-based control plane that enables the enforcement of policies at all the distributed locations where GDC Edge is deployed.
- Reduces Capex spending. GDC Edge is consumed as a service by CSPs, which enables them to align spending with revenue and eliminates the "field of dreams" scenario (i.e., spending upfront in the hopes customers will come).

Google Distributed Cloud Edge



Telecom Network Automation

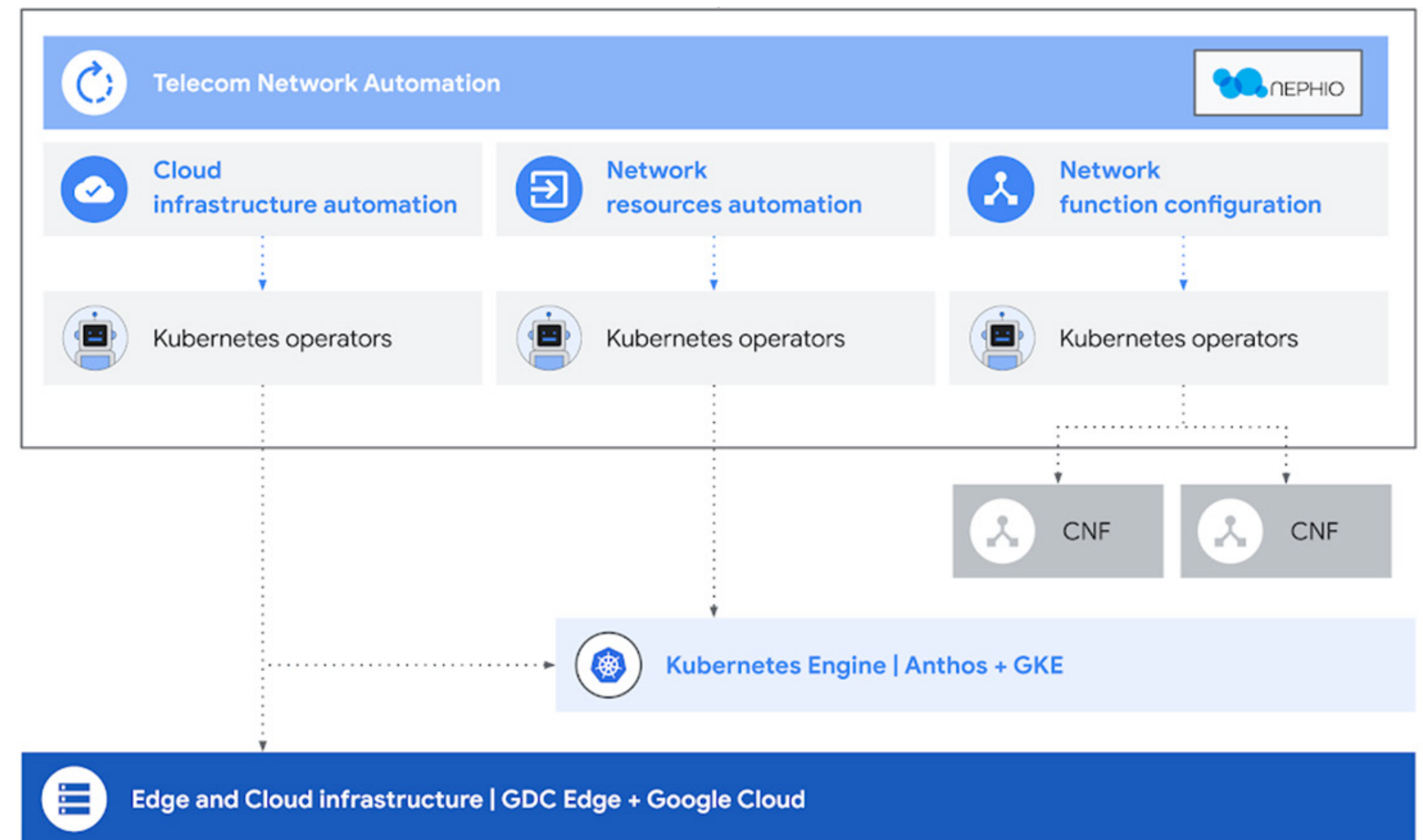
This Google Cloud product is focused on simplifying the deployment and management of multivendor cloud infrastructure and network functions across highly distributed environments based on an open source project hosted by the Linux Foundation. While Google Cloud provided the seed code to the open source project Nephio, it continues to contribute code and innovate along with numerous other members.

According to the Nephio,⁷ the project’s “goal is to provide a carrier-grade, open, and simple Kubernetes-based cloud-native intent automation and common automation templates that greatly simplify the deployment and management of multi-vendor cloud infrastructure and network functions across large scale deployments. This includes faster onboarding of network functions to production, including provisioning of underlying cloud infrastructure with a true cloud-native approach and reduces costs of cloud and network infrastructure adoption.”

Google Cloud’s Telecom Network Automation delivers:

- Greater agility by embodying the ability to shift left and support continuous innovation and continuous delivery and continuous deployment.
- Predefined templates, which help to automate deployment and management of 5G cloud infrastructure and NFVs and are tightly integrated with Telecom Data Fabric and GDC Edge.
- A closed control loop with declarative, intent-based capabilities to ensure organizations have visibility into changes and can verify their success quickly and easily.
- A managed service that enables CSPs to match network services with customer demand and revenue.
- The ability to deploy and manage highly distributed 5G networks using a single pane glass, enabling CSPs to scale a network without scaling operations resources, which drives operational efficiency and enhanced experiences for users.

Google Cloud Telecom Network Automation



CSPs can leverage Google Cloud's extensive cloud and network experience and expertise to accelerate 5G deployments, improve day-to-day operations and experiences, and drive more energy efficiency.

Google Cloud remains committed to open source, as it demonstrated by donating the seed code for Nephio, which the Linux foundation is now further advancing to enable cloud-native networks for everyone. Plus, Google Cloud has a growing ecosystem of technology partners such as Ericsson, Nokia, and Mavenir. These partnerships ensure operational excellence across heterogeneous environments. It also has proven technology deployments with a number of CSPs that have strategically partnered with Google Cloud, including Telenet, Deutsche Telekom, Bell Canada, and Telefonica. The ability to provide reference customers will be important for customers looking to deploy new and innovative solutions, as it demonstrates that the solutions provide value, and having some completed deployments enables organizations to work out any issue, ensuring a faster and problem-free delivery.



The Time to Transform Is Now

CSPs are actively deploying 5G networks, with both enterprises and consumers anticipating the benefits of a 5G wireless network. To ensure CSPs can meet the scale and agility required to extract all the benefits of 5G, it will be imperative for CSPs to transform how these 5G networks are deployed and managed. These new networks must be more agile, sustainable, and cost-effective. Fortunately, CSPs don't have to reinvent the wheel to deploy platforms capable of supporting carrier-grade environments or resort to utilizing legacy architectures. By learning from and leveraging hyperscaler solutions, CSPs can create modern, energy-efficient, cloud-native 5G environments.

“ **It will be critical for CSPs to make this transformation** to ensure service delivery, rapidly scale the 5G environment without scaling operations teams, and provide positive experiences.”

To accomplish this transformation, there are six key capabilities that are required, including being cloud-native, utilizing open source standards, deploying common hardware and software platforms across distributed locations, improving sustainability, taking advantage of AI/ML and automation or orchestration, and working with trusted, strategic partners. It will be critical for CSPs to make this transformation to ensure service delivery, rapidly scale the 5G environment without scaling operations teams, and provide positive experiences.

Google Cloud is enabling CSPs to accelerate the transformation to highly distributed modern, cloud-native 5G environments with a trio of solutions based on their extensive experience with public cloud environments, working with technology leaders like Intel and running a significant portion of internet traffic. Those solutions include the GDC Edge powered by Intel, the Telecom Network Automation, and Google Cloud Data and AI services. This trio of offerings is delivered as a managed service and provides a comprehensive solution that meets all the key criteria outlined to significantly speed up the deployment of more sustainable distributed 5G environments. Additionally, CSPs will gain real-time insights to ensure agility and optimize day-2 operations and experiences. The time to transform is now, and CSPs should understand the benefits of strategically partnering with Google. By embracing Google's cloud-native solutions, CSPs will be able to roll out 5G services faster, as well as provide differentiated services and experiences to their customers—both consumer and enterprise.

Learn how Google Cloud helps the telecommunication industry digitally transform with AI and cloud-native networks to improve your business outcomes.

[Explore more](#)



We create world-changing technology that improves the life of every person on the planet. Intel put the silicon in Silicon Valley. For more than 50 years, Intel and our people have had a profound influence on the world, driving business and society forward by creating radical innovation that revolutionizes the way we live. Today we are applying our reach, scale, and resources to enable our customers to capitalize more fully on the power of digital technology. Inspired by Moore's Law, we continuously work to advance the design and manufacturing of semiconductors to help address our customers' greatest challenges. Intel® Xeon® Scalable processors, are just one of the ways Intel helps address customer challenges. They feature built-in accelerators for more performance-per-core and unmatched AI performance, with advanced security technologies for the most in-demand workload requirements—all while offering the greatest cloud choice and application portability.

[Explore more](#)



ABOUT ENTERPRISE STRATEGY GROUP

TechTarget's Enterprise Strategy Group is an integrated technology analysis, research, and strategy firm providing market intelligence, actionable insight, and go-to-market content services to the global technology community.



All product names, logos, brands, and trademarks are the property of their respective owners. Information contained in this publication has been obtained by sources TechTarget, Inc. considers to be reliable but is not warranted by TechTarget, Inc. This publication may contain opinions of TechTarget, Inc., which are subject to change. This publication may include forecasts, projections, and other predictive statements that represent TechTarget, Inc.'s assumptions and expectations in light of currently available information. These forecasts are based on industry trends and involve variables and uncertainties. Consequently, TechTarget, Inc. makes no warranty as to the accuracy of specific forecasts, projections or predictive statements contained herein.

This publication is copyrighted by TechTarget, Inc. Any reproduction or redistribution of this publication, in whole or in part, whether in hard-copy format, electronically, or otherwise to persons not authorized to receive it, without the express consent of TechTarget, Inc., is in violation of U.S. copyright law and will be subject to an action for civil damages and, if applicable, criminal prosecution. Should you have any questions, please contact Client Relations at cr@esg-global.com.



Enterprise Strategy Group is an integrated technology analysis, research, and strategy firm providing market intelligence, actionable insight, and go-to-market content services to the global technology community.

© 2023 TechTarget, Inc. All Rights Reserved.