



5G Standalone Deployed in the Cloud

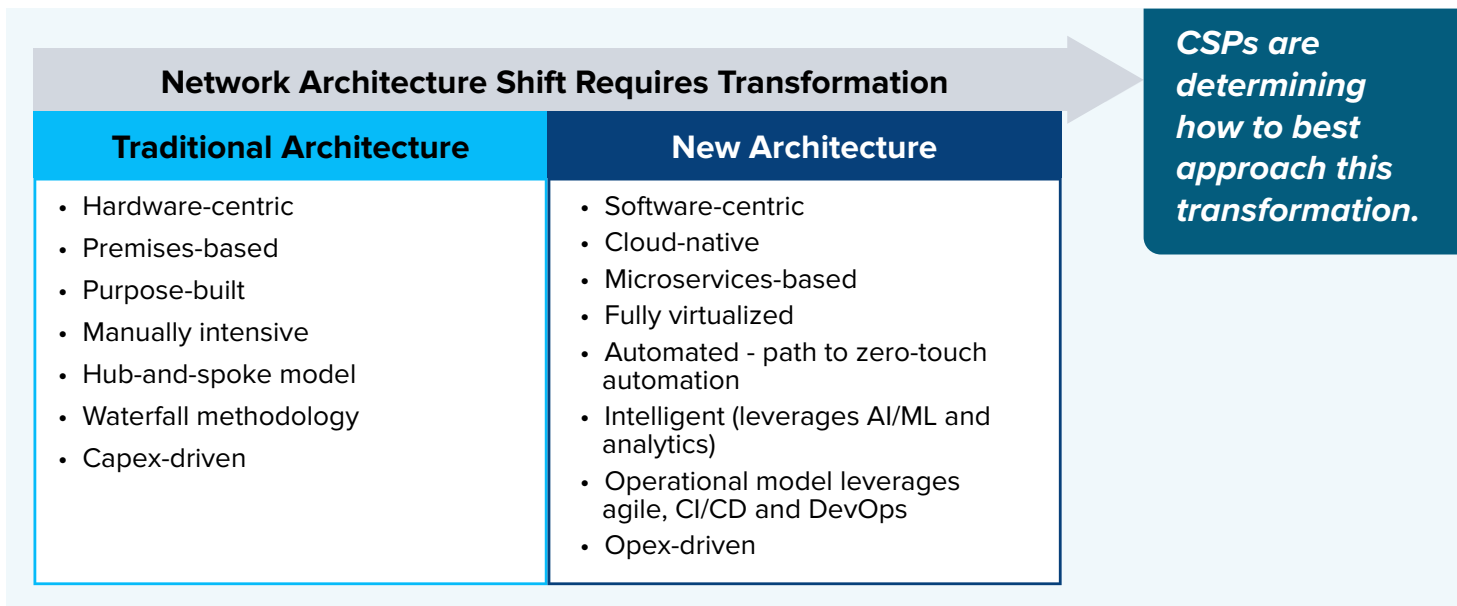


CASE STUDY

Introduction

Communication service providers (CSPs) are evolving into digital service providers (DSPs). As part of this evolution, CSPs must transform their networks to a fundamentally new architecture.

The new network architecture leverages next-generation technologies and processes to obtain cloud benefits, such as agility, scalability, flexibility and cost efficiency. Key characteristics of the new network are:



Cloud-centricity is a foundational component of the new network architecture. Putting the network in the cloud yields key benefits, such as cost optimization through better resource utilization, as well as greater scalability and flexibility.

Hyperscalers have emerged as leading players to help CSPs navigate the new network architecture requirements and transform into DSPs. Hyperscalers offer cloud infrastructure as well as numerous other benefits such as opportunity co-creation and a vibrant developer community that CSPs can leverage.



Hyperscalers offer CSPs many benefits:



ECOSYSTEM

CSP can tap into vibrant developer and partner communities to source its needs and participate in value creation



ECONOMIES OF SCALE

Unlimited compute and storage capacity nearly worldwide at lower cost



TIME-TO-MARKET ACCELERATION

Faster service creation and deployment to flexibly respond to market demands



CAPABILITIES

Provide low-code/no-code, artificial intelligence (AI), machine learning (ML) and big data analytics tools and capabilities to CSPs that leverage hyperscalers' clouds



BUSINESS OPPORTUNITIES

Hyperscalers bridge enterprise digital transformation with their partner communities and inside their marketplaces, exposing CSPs to B2B opportunities. There is also co-creation of new business models between CSPs and hyperscalers.



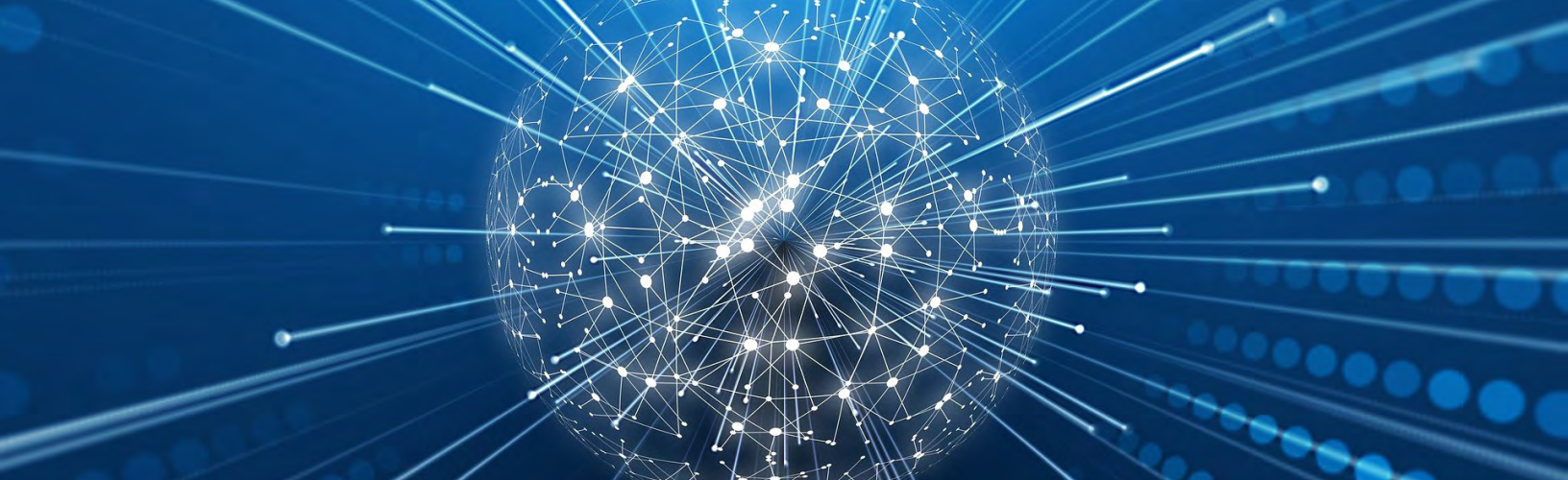
EDGE COMPUTING EXPOSURE

Enables CSPs to participate in edge computing use cases, leveraging hyperscalers' distributed computing platforms



ENVIRONMENTAL, SOCIAL & GOVERNANCE (ESG) INITIATIVES/ SUSTAINABILITY

Leveraging the cloud and hyperscaler innovations (e.g., energy - and workload-optimized custom silicon and renewable energy sources) helps CSPs meet ESG goals.



One key area CSPs are considering as part of their network transformation journey is which cloud approach to pursue. Private cloud has traditionally been used by CSPs, especially for core network and IT domains, but thanks to significant investments by hyperscalers, the public cloud now presents a compelling option.

The mobile core is one of the first domains of the network that CSPs migrated into the cloud, with the evolved packet core (EPC) typically residing in the CSPs' private cloud during the LTE era. Moving forward, CSPs are looking to migrate from EPC to a 5G core in the public cloud.

Benefits of the cloud:

- Cloud economics — lower total cost of ownership (capex and opex) versus on premises
- Limitless scalability
- Easier to scale supranationally
- Geographic redundancy
- Elasticity
- CI/CD for rapid deployment and automation
- AI/ML to automate operations
- Alleviation of technical complexity from the CSP to the cloud provider and systems integrator
- Agility to support customer needs
- Most compelling option for on-demand network slicing

In this case study, TBR will examine why the cloud is a compelling option for a network, specifically built with a 5G core. This study will focus on DISH Wireless, a pioneering CSP that is building the world's first 5G standalone network entirely in the cloud.

TBR leveraged a mix of primary and secondary research, which included in-depth interviews with key, executive-level representatives from DISH Network, Amazon Web Services (AWS) and Nokia as part of its due diligence for this case study.

Partners

DISH Wireless' greenfield, standalone 5G network will be fully cloud native and architected in the cloud. DISH has contracted with a variety of partners to provide the different aspects of the network, all with the overarching characteristic of openness.

Nokia is the mobile core vendor to DISH, supplying the cloud-native [5G core solution](#). Nokia is also a key systems integrator for DISH's network, stitching together the different aspects of the mobile core (e.g., control plane, user plane, policy, subscriber data management, cloud infrastructure management and orchestration, assurance, IP Multimedia Subsystem) and integrating the mobile core stack with the open radio access (Open RAN) layer.

AWS is providing the cloud infrastructure platform as well as a robust tool set of AI, ML, analytics and other capabilities that will enable DISH to build an automated, dynamic and intelligent network.

Nokia is embedding its cloud-native 5G core software inside AWS's cloud, which is where DISH's network software stack will reside.

Nokia and AWS are providing the following aspects of DISH Wireless' network:



- Mobile core and IMS — providing DISH with a container-based, cloud-native, standalone 5G core solution
- Mobile device management solution
- Network security solution (NetGuard) and security-related professional services
- Systems integration services for the mobile core



- Cloud infrastructure
- AI, ML, analytics and other tools and capabilities to enable intelligent connectivity
- Development of automated life cycle management (LCM) using CI/CD

Architecture

The disaggregated nature of a cloud-native 5G core, represented by its control-plane, user-plane separation (CUPS) architecture, is hosted in AWS's distributed computing (cloud) platform to optimize the performance of the mobile core. Specifically, the control plane is hosted in AWS Availability Zones (cluster of central cloud data center sites within an AWS Region), while the user plane is distributed across AWS Local Zones (typically metro or city-level sites) and AWS Outposts sites across the network footprint. The distributed computing characteristics of AWS's cloud fully supports the CUPS architecture, enabling DISH to support dynamic, on-demand compute and network resourcing to flexibly meet customer needs.

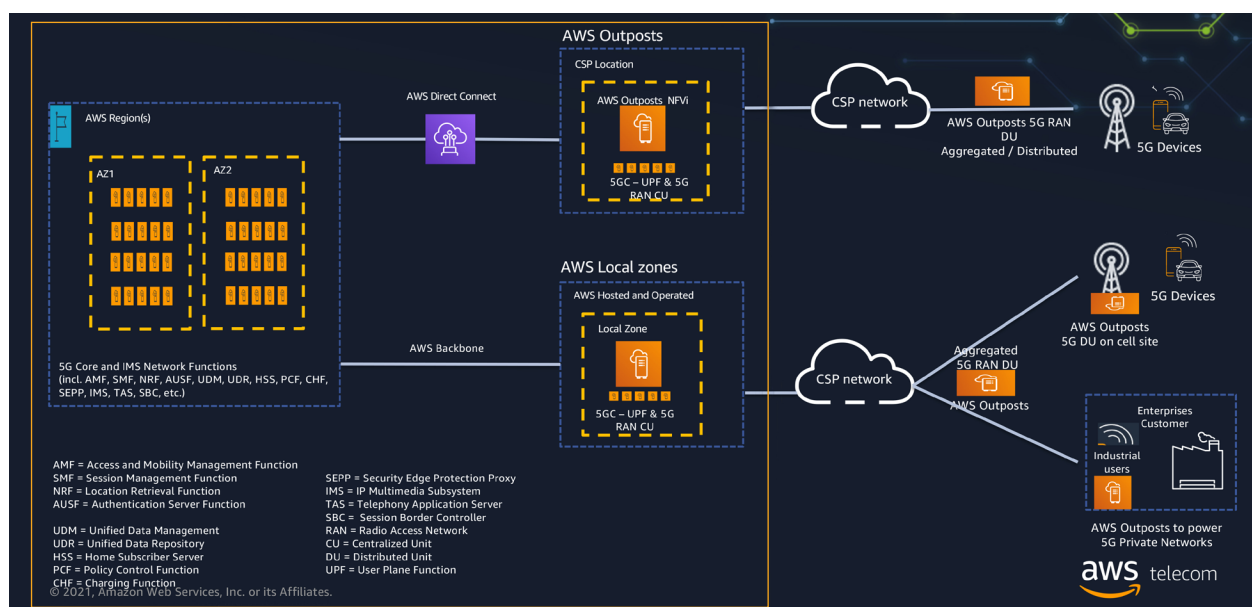


AWS is also providing DISH access to its silicon innovations, such as its currently available Graviton2 processor and upcoming Graviton3 processor, which will be leveraged across a portion of cloud infrastructure DISH will utilize to run its network. Graviton2 is AWS's Arm-based custom silicon, which is being leveraged in AWS's next-generation cloud servers. Graviton2 is optimized to provide 40% price-performance improvement and up to two-thirds lower energy usage versus x86-based silicon that is traditionally used in servers. These performance improvements enhance the competitive advantage DISH will obtain by leveraging AWS's cloud.

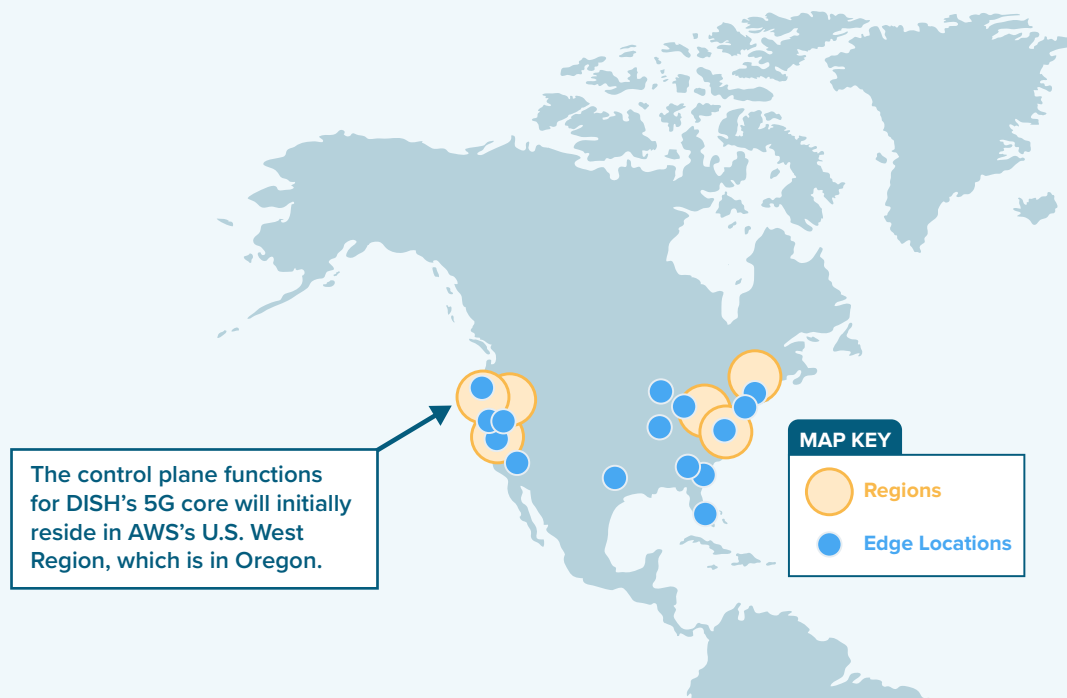
DISH will launch its network in three phases. Las Vegas is the initial build market where the pilot and beta testing are taking place before moving to commercialization and scaling out the network across the U.S. Once the network is commercially launched in Las Vegas, DISH will scale out commercial availability in markets nationally with the goal to cover 20% of the U.S. population by June 2022 and 70% of the U.S. population by June 2023.

DISH's 5G core will initially reside in AWS's U.S. West region. Specifically, the control plane, user plane and IMS functions will be housed in the AWS Region, which is located in Oregon, with the user plane functions further residing in the Las Vegas Local Zone. As DISH builds out its network across the U.S., additional AWS sites will be spun up to support the network, including additional AWS Regions for scale and geographic redundancy. This can be completed in a rapid manner once the core software stack is commercialized and ready to scale. With the U.S. blanketed with interconnected AWS sites (a combination of regions with their Availability Zones and Local Zones), AWS can support DISH's nationwide network deployment in a timely manner and at a lower cost. In addition, AWS Outposts can be leveraged to extend DISH's network to far edge sites, such as network aggregation hubs, cell sites and on customer premises, enabling DISH to participate in new revenue opportunities, especially those that require ultra-low latency.

AWS's Network Topology

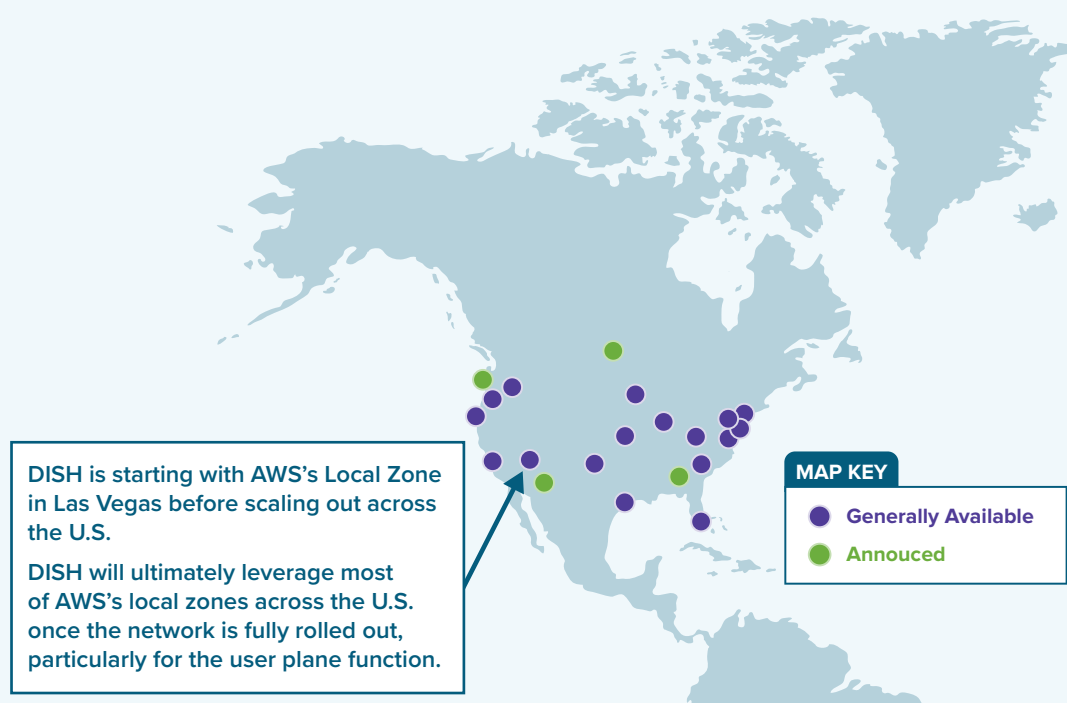


AWS Regional and Edge Locations in North America

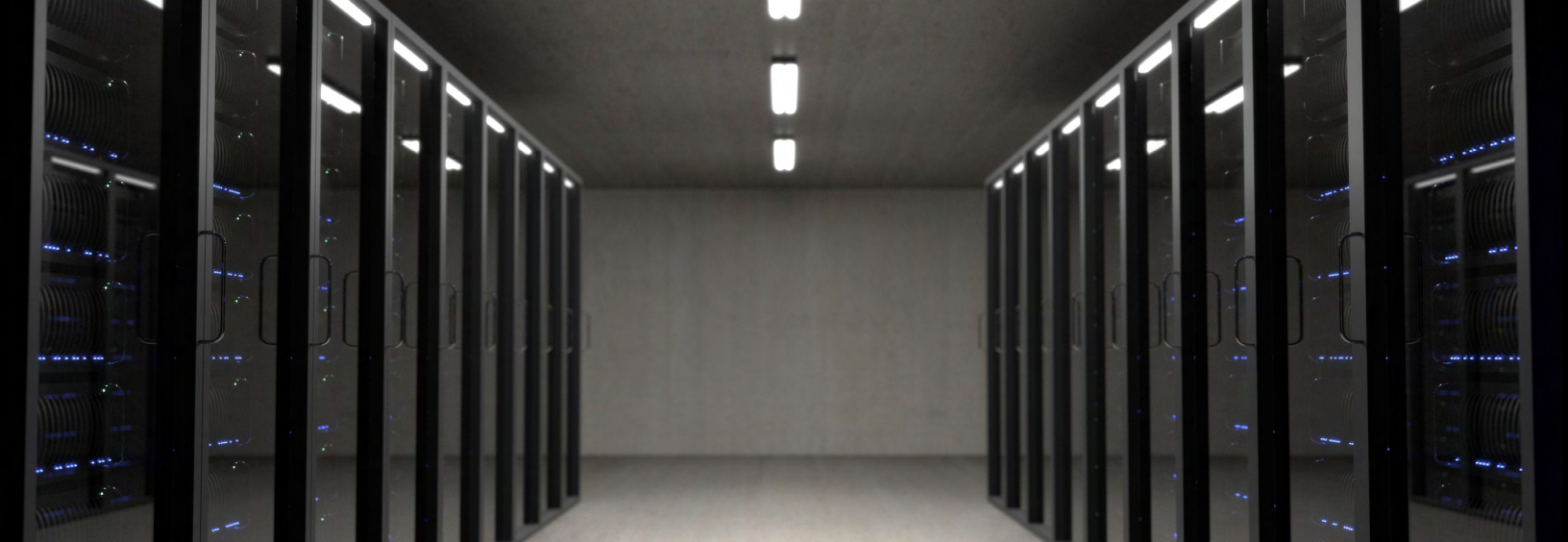


SOURCE: https://aws.amazon.com/about-aws/global-infrastructure/regions_az/

AWS Local Zones Locations



SOURCE: <https://aws.amazon.com/about-aws/global-infrastructure/localzones/locations/?nc=sn&loc=3>



Benefits:

This greenfield, cloud-native approach to the network will give DISH a competitive advantage over incumbent CSPs, which are tethered to the traditional (legacy) architecture. For example, DISH's customers will be able to consume 5G services from the start, whereas incumbent CSPs will have to transition their customers from legacy technologies (e.g., 2G, 3G, 4G, 5G NSA) to a modern, standalone 5G platform over time.

DISH is also likely to realize a significant cost and time-to-market advantage versus incumbent CSPs because hosting a cloud-native 5G core in the cloud has a lower total cost of ownership versus other 5G core deployment models and enables more seamless on-demand network slicing to dynamically meet customer needs.

Conclusion

CSPs are transforming their networks to a cloud-centric, cloud-native architecture. The cloud has become a viable option for CSPs to run their critical network workloads such as the 5G core. DISH Wireless is embarking on the most comprehensive commercial network deployment in the cloud and is working with best-in-class partners AWS and Nokia. The 5G core is one of the critical workloads DISH intends to run in AWS's cloud, which promises to provide significant benefits ranging from service agility to cost optimization to dynamic on-demand network slices. These benefits will enable DISH to be flexible and equipped to capitalize on market opportunities.



DISH Wireless is reimagining connectivity. Our vision is to change the way the world communicates, and our mission is to connect people and things.

<https://www.dishwireless.com/>



Amazon Web Services (AWS) is the world's most comprehensive and broadly adopted cloud platform, offering over 200 fully featured services from data centers globally. Millions of customers—including the fastest-growing startups, largest enterprises, and leading government agencies—are using AWS to lower costs, become more agile, and innovate faster.

<https://aws.amazon.com/>



At Nokia, we create technology that helps the world act together. As a trusted partner for critical networks, we are committed to innovation and technology leadership across mobile, fixed and cloud networks. We create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Adhering to the highest standards of integrity and security, we help build the capabilities needed for a more productive, sustainable and inclusive world.

<https://www.nokia.com/>



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