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Competing for the Edge
Analysis of Competitive Dynamics Between
Cloud Providers and Telcos

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Edge computing stands at the intersection between cloud providers and telcos, each seeking to carve a role in servicing the enterprise. This raises questions on who will be better able to generate revenue from edge cloud services, and the nature of the competitive landscape between telcos and cloud providers.

To answer these questions, we reviewed the approach of the cloud providers and telcos towards the edge. The cloud providers leverage data centers designed for scalability and efficiency but are physically far from the end user. Migration towards the edge helps them reduce latency and save on the cost of transport to centralized data centers. On the other hand, telcos are in the process of launching 5G networks with the promise of low latency and high bandwidth that can only be realized with edge computing.

The evolution of the edge cloud is a complex topic. Here, we describe an important aspect of this evolution which is governed by many deployment scenarios and applications. Our approach is to segment the market to project the prospects of the cloud providers and telcos. In one dimension, we have the type of cloud: public and/or private cloud. In the other dimension we have on- and off-premise edge computing. We believe these segments cover the most important deployment scenarios required to assess competitive dynamics.

Evolution of the Public Cloud Edge

AWS, Microsoft (Azure) and Google have close to 60% of the public cloud market revenue. They are rapidly developing edge services to cater to their enterprise clients. The first edge solutions focused on device-side applications that benefited from local processing in low bandwidth availability and reliability. Recently, within the past year, AWS and Microsoft released new edge solutions which placed instances of their public cloud infrastructure on enterprise premise (a single or few racks of servers) or at the telco.

The AWS services include Wavelength which hosts infrastructure at the telco central office and Outpost which hosts infrastructure on enterprise premises. Similar services by Azure include Azure Edge Zone with Carrier and Azure Edge Zone for enterprises hosting on premise.

Cloud providers view the edge cloud as an extension of the public cloud. The same tools for automation, deployment and security controls are used in both cases, as are the service application programming interfaces (APIs). Both edge and cloud services run on the same infrastructure and have the same operational consistency for functions such as upgrades, patches and versions. In both cases, applications can scale up or down and are billed based on resource utilization.

AWS announced partnerships with Verizon, Vodafone (UK, Germany), SK Telecom, KDDI. Microsoft announced AT&T, CenturyLink, Etisalat, NTT Communications, Proximus, Rogers, SK Telecom, Telefónica, Telstra, and Vodafone. These are non-exclusive agreements, so operators could sign with different cloud providers, just as cloud providers could sign with different operators. The telcos provide their central offices as hosting locations. The computing infrastructure is tested with the network and optimized to minimize latency.

Evolution of the Private Cloud Edge

Analysts estimate that only 20% of enterprise workloads run on public clouds, leaving the remainder 80% to run on private infrastructure. Private cloud providers are seeking to capitalize on this market by enabling enterprises to implement a hybrid-cloud model where workloads run on the most suitable platform for the desired task, including the edge cloud. This means solutions to meet the different requirements for workload deployments in public cloud, private cloud, virtualized or bare metal; and to allow enterprises to automate provisioning, manage and orchestrate functions across multiple locations.

There are many players in this sector including both established companies and startups typically addressing public-private hybrid clouds. Key players include VMWare, RedHat which is part of IBM, Ubuntu, Volterra and many other players. From a telco perspective, MobiledgeX is notable for being a spin-out from Deutsche Telekom with a business plan to provide edge cloud PaaS services operating from locations leased from telcos.

Comparative Strengths and Weaknesses of the Cloud Providers

The cloud providers already possess a number of key strengths in the evolution towards the edge which are the following:

1. **Technology and infrastructure:** The infrastructure that forms the cloud – the data centers, software stacks and backbone connectivity - provides a scalable global platform to host enterprise services. The edge is considered an extension to the cloud to allow enterprises run workloads in the most suitable location, and to change that location at any time depending on desired performance and cost. Edge applications can be managed and controlled from the Cloud. The smooth migration from centralized public cloud into the distributed edge is a key advantage of cloud providers. Telcos can provide information about the performance of different locations, such as latency and QoS. But ultimately, the cloud provider owns the platform; and enterprises make their purchasing decisions based on which platform best meets their requirements.

2. **Enterprise client-base:** Cloud providers have an established client base of enterprises for their wide range of services (SaaS, PaaS, etc.). These enterprises could benefit from edge services either to improve the performance of existing applications or to develop new applications. The technology developed by cloud providers took years and billions of dollars to develop. In the meantime, cloud providers perfected their operation and delivery model. In contrast, telcos provide connectivity but few applications and services above that. While there is much room to grow in the enterprise cloud market as many enterprises still rely on private clouds, the telcos are at a competitive disadvantage in winning that business.

3. **Developers:** The cloud providers have a large number of developers building applications on the cloud platforms. Developers can use the same development and management environment for both the edge and cloud services. There is no equivalent ecosystem of developers for telcos, which would be difficult to replicate especially due to the fragmented nature of telcos. Since applications drive revenue, this is one of the most critical aspects. Telcos actually recognize this shortcoming as evident in telco-led ETSI MEC industry group identifying the application ecosystem as a challenge, and the creation of a developer group in the Telecom Infra Project (TIP).

4. **Ecosystem:** Complementing the developer community is the ecosystem that exists around cloud services. Many applications and services are available to accelerate development of new services on public clouds. Telcos would have to replicate that which would again prove challenging given the fragmentation of the telco community.

Despite these strengths, the cloud providers suffer from a major weakness: lack of physical presence at the edge of the network. Cloud providers leverage hyperscaler data centers for scale and cost efficiency. They have also partnered with other data center operators to get closer to users. Yet, they remain far from being integrated into the connectivity network which is necessary to achieve the ultra-low latency and jitter performance.

Comparative Strengths and Weaknesses of Telcos

The key telcos strengths related to the edge are as follow:

1. **Location and physical assets:** Telcos have hundreds, even thousands, of central offices in cities across their service areas. The evolution of central office technology has left many of these locations vacant or with unused space. Some telcos even proceeded to sell some central offices and aggregate operations into a fewer number (e.g. Deutsche Telekom and NTT Docomo). We exclude towers and cell sites because service providers would not be able to capitalize on such assets because: a. Many telcos sold their tower sites to infrastructure companies; b. There is limited space at tower sites for edge computing hardware; and c. The architecture of the mobile network doesn't lend itself to pacing edge computing infrastructure at the tower, at least for the time being.

2. **Access to subscribers:** Mobile network operators sell connectivity services to over three billion subscribers. That makes them an ideal channel for cloud providers and over-the-top application providers (OTTs) in B2C model where the end-customer is a subscriber or an IoT device, including drones and future autonomous vehicles.

3. **Access to enterprise:** This is an arguable strength. Telcos with strong fixed access business typically have better access to enterprises than pure mobile

network operators to whom the enterprise is a group of individual subscribers. Some service providers still maintain and operate data centers, especially in markets such as Europe, Japan, the Middle East and other regions.

On the other hand, telcos suffer from a number of weaknesses, such as:

1. Fragmentation and lack of global scale.

2. Lack of understanding in building software and applications at scale.

3. Edge cloud technologies, which are software-based, are not fundamental to telcos' core expertise.

4. Edge cloud services require operational practices that many telcos failed at providing in the past.

In summary, the strengths of the telcos are the weaknesses of the cloud providers and vice versa. This makes a good argument for a synergetic relationship.

The Competitive Landscape

The edge cloud includes different deployment models, such as on- or off- the enterprise premise. On-premise edge implies physically locating the computing, storage and networking infrastructure at the enterprise. Off-premise edge implies locating the edge infrastructure elsewhere, close to the enterprise, but not physically on enterprise premises. To understand the opportunity and dynamics between cloud providers and telcos in the edge cloud, we summarize the analysis in the two tables below first by approaching the edge from a public cloud direction, followed by approaching the edge from a private cloud direction.

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Table 1. Edge dynamics from a public cloud approach.

Enterprise On-Premise Edge	Enterprise Off-Premise Edge
• An emerging area primarily complementing cloud services and mitigating its shortcomings. • The cloud providers are beginning to offer new edge cloud services as extensions of cloud platforms: e.g. AWS Outpost and Azure Edge Zone. • The cloud providers reduce barriers to adoption by providing the same development, management and operational environment. • Telcos don't have a public cloud play and would be limited to providing connectivity services[1]. • Telcos remain limited to providing connectivity services. • Collaboration between telcos and cloud providers benefits both parties.	• Cloud providers dominate public cloud services while telcos don't have such a play. • Cloud providers co-locate instances of their cloud infrastructure in telco central offices transforming them into edge data centers. • Cloud providers leverage the edge as an extension of the cloud while telcos leverage their physical assets and proximity to end-users. • Collaboration between public cloud providers and telcos enables low-latency applications and reduce data transport expenses. • Services such as AWS Wavelength and Azure Edge Zones with Carrier address this market segment. • Close integration with the telco cloud brings further value to cloud providers' services. • The role of telco is primarily providing real estate facilities for the edge data centers. • While telcos could opt to block the cloud providers[2], telcos would not be able to provide a competing offering.

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1   There are exceptions such as NTT Docomo in Japan.

2   As is the case with Alibaba and the service providers in China.

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Table 2. Edge dynamics from a private cloud approach.

Enterprise On-Premise Edge	Enterprise Off-Premise Edge
• The status quo for the enterprise which owns the edge hardware & software running on its private cloud. • Where the enterprise benefits from 5G for its own use (enterprise network), the enterprise has the choice to own and operate the 5G network, or lease it from a third party that manages the network. • Telcos could provide private wireless networks with a user plane function (UPF) on enterprise premises and play a similar role to a mobile virtual network enabler (MVNE). • Telcos don't yet have such a strategy today (except for trials in Europe). However, such business models would need to consider hybrid cloud models to improve the value proposition for the enterprise. • A cloud provider, such as Microsoft, could provide a hosted core network service. This relegates the role of the telco to a pure connectivity provider. • Hybrid private-public cloud models are evolving to address this market with solutions from the likes of Google and RedHat. This approach could be complementary to telco services.	• A potential opportunity for telcos is to provide hosted edge services in their central office data centers offering enterprises tight integration with the telco network for maximum performance. • Telcos could choose from a few available platforms such as MobiledgeX, OpenStack or VMWare[3]. • A telco-hosted public cloud service - e.g. AWS Wavelength and Azure Edge Zones with Carrier - competes with this model, potentially pitting a company like MobiledgeX or the telco itself against the public cloud providers.

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3   *System integrators such as WiPro and Infosys are among such players in addition to many cloud
providers of the type of RedHat and VMWare.*

Summarizing the competitive landscape from, we arrive at the following simplified matrix to describe the interaction between cloud providers and telcos.

Table 3. Competitive landscape between telcos and cloud providers.

	Enterprise On-Premise Edge	Enterprise Off-Premise Edge
Public Cloud	• A domain for the cloud players where telcos' role is providing connectivity services.	• A cooperative partnership between cloud providers who supply the technology and service platforms and telcos who host the cloud providers' infrastructure in telco central offices.
Private Cloud	• A new market where cloud providers leverage software solutions and telcos leverage connectivity services. • Enterprises can opt for hybrid cloud models that play in favor of cloud providers from monetization perspective.	• Potential competitive segment between telcos and cloud providers. • Telcos could block cloud providers but will need to address telcos' inherent weakness in providing cloud services.

Synergies Between the Cloud Providers and Telcos

Telcos have met successive failures in cloud services, first as public cloud providers then in building their own cloud for their own services. Today, telcos rely on public cloud providers for these services.

While some would position the edge as another opportunity for the telcos to develop a cloud play, our analysis points towards complementary dynamics between telcos and cloud providers. This is particularly the case in relation to consumer services over wireless networks. On the other hand, the enterprise segment could see competitive behavior although both cloud providers and telcos will have to co-exist. We illustrate with two examples:

1. **Complementary coexistence:** AWS Wavelength, Microsoft Azure Edge Zones with Carrier are examples of how telcos and cloud providers could collaborate: Telcos are resellers of cloud services and technology. This helps drive new business to both parties. Telcos leverage their proximity to end-users while cloud providers develop complementary services to their cloud offering.

2. **Competitive coexistence:** Microsoft's acquisition of Affirmed Networks allows it to host a virtual packet core and provide it as a service to connect enterprise radio

nodes in unlicensed (NR-U), shared (CBRS) or enterprise licensed-spectrum. Such a managed service relegates the role of telco to connectivity provider. The telcos would lose a new revenue opportunity for managing the enterprise private wireless network. This has parallels with OTTs services where telcos cannot monetize services beyond connectivity.

Conclusion

The public cloud providers have an advantage over telcos in capitalizing on edge cloud services. This is due to technology, ecosystem and business models. Nevertheless, there are opportunities for telcos because the edge cloud is heterogeneous and the promise of many emerging technologies is yet to materialize. The cloud providers have a head start in technology and operations which creates an uneven playing field tilted to their advantage. The edge cloud is diverse and provides many areas where both cloud providers and telcos could collaborate.

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