5G and the IT Edge: What's the Fit?

The IT edge will play an important role in what 5G becomes and how it is optimized, but ownership of that edge remains an open question. The answer could be transformative for telcos and data center operators alike.

By Scott Armul / *Vertiv*

The first commercial 5G network appeared sometime in 2018, or maybe 2019, in Qatar, South Korea or the United States. The relevant parties have debated which country was first for the better part of two years, an exercise that is far less interesting than what happened in the interim – a still-unfolding race to bring 5G capabilities to the masses.

Much of the attention around 5G focuses on the more extreme applications these networks will enable. Autonomous vehicles, artificial intelligence, virtual reality and other capabilities related to the internet of things (IoT) grab all the headlines, but the reality in the early days is likely to reflect more incremental improvements.

Early 5G networks will deliver more bandwidth, which today means faster network speeds and better performance for more common tasks, such as high-definition video streaming, gaming and telemedicine. And, with the pandemic forcing millions of people worldwide to work from home and businesses to adjust their operational practices accordingly, managing that disruption pushes more advanced applications to the back burner. Driverless cars, for now, are stuck in park.

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FIBER'S PROMINENT ROLE

Before we go any further, an important reminder: 5G is more than wireless. Fiber will underpin next-generation networks, from submarine and terrestrial cables, through countless data centers and the IT edge, all the way to the transmission lines running to wireless transmitters and into buildings – and maybe even into homes, making fiber to the home (FTTH) more than the niche offering it is today in North America and Europe. In fact, the global FTTH market was valued at about $10.4 billion in 2018 and is projected to grow at a rate of more than 15 percent through 2026.

And don't forget the backhaul connections these networks require. Proximity to users is critical for several reasons, most notably the fact that 5G frequencies have unavoidable transmission losses over longer distances. Operators are solving this problem with increased densification of the network through deployment of many small microcells, with antennas creeping closer and closer to users. All those cells require backhaul connections to the network, and the bandwidth demands of 5G will exceed the physical limits of copper cable, forcing a transition from copper to fiber.

Verizon is counting on its extensive fiber network and fiber backhaul to support a partnership with Amazon Web Services to deploy mobile edge computing resources for its

5G networks. Even Facebook is getting into the fiber business, at least in part with 5G possibilities in mind. The social media giant is deploying high-capacity fiber optic routes and offering to sell unused capacity between its data centers to third parties. It's called middle-mile infrastructure, and it's not a stretch to imagine telcos jumping in as a way to add existing fiber support to their 5G networks – especially in rural areas their own fiber networks do not reach.

All of this is happening faster than you might think. Vertiv commissioned a study with 451 Research last year, looking at 5G progress and expectations, and the results suggest the groundwork being laid today presages a 5G groundswell in fairly short order. Just 12 percent of telecom operators said they would roll out 5G services in 2019, but a stunning 86 percent expect to deliver 5G services by 2021. Why the rush? According to IHS Markit, 5G is expected to generate some $12.3 trillion in annual revenue by 2035. With that much at stake, the race to get there first is very much *on*.

5G AND THE IT EDGE: PARTNERS OF CONVENIENCE?

While all of this is happening on the telecom front, the IT edge is expanding out into the same spaces to accomplish largely the same objective – bringing computing and applications closer to users – and delivers many of the same benefits, starting with low latency. Until now, these activities have happened largely independent of each other, but natural connections are forming. Unsurprisingly, telcos are showing interest in leveraging existing edge computing resources to support their 5G needs, and many organizations with edge computing see considerable benefit to enabling 5G at their sites.

Still, despite the obvious connections, the opportunities for telecom operators at the edge remain unclear. Real questions remain, not the least of which are: who will pay for the edge infrastructure supporting 5G networks, and who stands to derive the greatest benefit from such an investment? Telcos aren't the only interested parties. Cloud providers, software-as-a-service vendors and content developers all are eyeing the edge as a potential source of revenue.

We can say this much with confidence: Telcos do not have the computing resources to enable full 5G functionality, they aren't going to be able to deploy those resources fast enough to meet demand and these challenges cannot be overcome through brute force. The local processing, caching, spectrum sharing and pooling needed for 5G all require IT resources in the access network that telcos aren't equipped to provide on their own. They're going to rely on existing IT resources or IT partners.

To be clear, we're not talking about the extreme-use cases of 5G. Even the near-term applications we discussed earlier – high-definition video, gaming and telemedicine – and others rooted

EDGE ARCHETYPES DEFINED

To better define the edge of the network, Vertiv studied more than 100 edge use cases and focused on those considered to have the greatest impact on businesses and end users. Evaluating these based on multiple factors, including workload requirements and criticality, as well as the importance of latency, availability, scalability and security, Vertiv experts ultimately identified four edge archetypes:

- **Data Intensive:** This includes use cases in which the amount of data makes transfer over the network directly to the cloud or from the cloud to point of use impractical because of data volume, cost or bandwidth issues. Examples include smart cities, smart factories, smart homes/buildings, high-definition content distribution, high-performance computing, restricted connectivity, virtual reality and oil and gas digitization. The most cited example is high-definition content delivery. Major content providers (e.g., Amazon and Netflix) actively partner with co-location providers to expand delivery networks and bring data-intensive streaming video closer to users to reduce costs and latency.
- **Human-Latency Sensitive:** This archetype includes use cases in which services are optimized for human consumption, and it is all about speed. Delayed data delivery negatively impacts users' technology experiences, potentially reducing retailers' sales and profitability. Use cases include smart retail, augmented reality, website optimization and natural language processing.
- **Machine-to-Machine Latency Sensitive:** Speed also is the defining characteristic of this archetype, which includes the arbitrage market, smart grids, smart security, real-time analytics, low-latency content distribution and defense force simulation. Because machines can process data much faster than humans, the consequences for slow delivery are higher than in the Human-Latency Sensitive archetype. Delays in commodities and stock trading, in which prices fluctuate within fractions of a second, may turn potential gains into losses.
- **Life Critical:** This archetype encompasses use cases that directly impact human health and safety. Consequently, speed and reliability are vital. Use cases include smart transportation, digital health, connected/autonomous cars, autonomous robots, and drones. Autonomous vehicles, for example, must have updated data to operate safely, as is the case with drones that may be used for e-commerce and package delivery.

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in increased network speed will depend on IT resources telcos do not currently possess. That brings us back to the edge.

TELCOS INCHING TOWARD IT

If you've been in a telco central office in the last three years, you know the adoption of IT architectures in the telecom space is well underway. Central offices once full of switch gear now look more like data centers, with servers manipulating increasingly software-enabled, cloud-based network architectures. Network function virtualization (NFV) is turning traditional, static telecom networks into dynamic, agile, evolved versions of themselves, often leveraging cloud and co-location providers and regional data centers to make it happen.

5G is another driver of this evolution, allowing providers to introduce new network features. Edge computing can accelerate the transformation by providing a readily available, cost-effective platform capable of supporting a growing number of use cases. This is creating a new, hybrid architecture at 5G cell sites. The fundamentals are consistent with traditional telco sites, including a reliance on DC power, but the introduction of AC-powered IT equipment adds new complexity. Beyond the significant difference in power architectures, IT electronics typically require more robust thermal management. The 5G cell sites look very much like the IT edge deployments that have proliferated over the last five years.

CAN TELCOS MONETIZE 5G – AND THE EDGE?

5G is, of course, the fifth-generation cellular network. You might quibble and point out some five evolutions in there, but this is, more or less, the fifth swing at wireless for telecom operators. The revenue model remains largely subscription-based in a world where market penetration for mobile devices is maxed out, but many companies and tremendous value can be traced to the long-term evolution (LTE) technology wireless operators enable.

Now, even as they roll out early 5G networks, operators continue to explore opportunities for monetization. With previous generations, application providers such as Facebook, Google, Amazon and many others monetized the technology, much to the chagrin of the operators who made the initial investment and did the hard work of technology development and deployment. Billions of nonhuman IoT connections will deliver new revenue, but that alone won't be enough. To avoid another missed opportunity, operators must maintain some ownership of all the services 5G enables. The edge is central to that.

Telecom operators can't justify a $25 million capital investment to expand broadband speeds without some way to generate a return on that investment. If they don't do it, someone else will – in this case, probably some cloud or co-location providers who build a bunch of edge data centers to support their applications or those of their customers. If nothing else, edge investment for telcos is a defensive play.

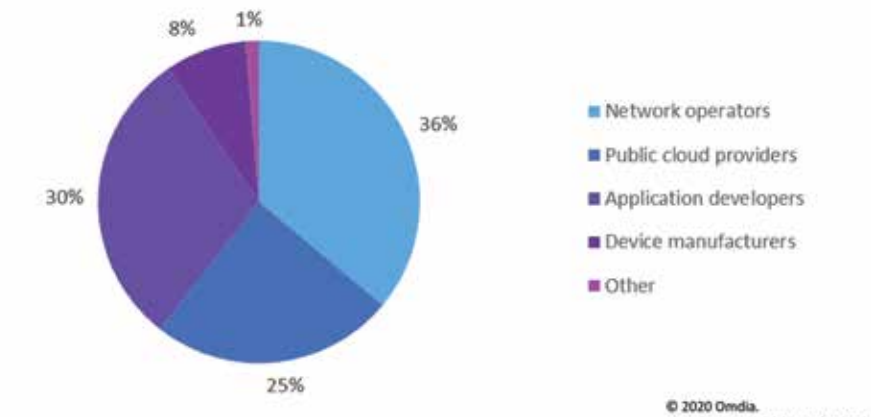
MONETIZING 5G

So, how do telcos make it happen with 5G when they couldn't with past generations? Let's start with the three things they need to successfully monetize 5G:

- A subscriber base, which they have
- An engine and conduit, which they're working on
- An application or use case

That last one is where it gets tricky. Without the application, they're in the same place they were with 3G and 4G. It's perceived that the top of the value chain is the end-user service – in this case, the application. Wireless operators used to see revenue from end-user services they once controlled, such as SMS, but those days are gone. In more recent years, telcos have largely become a utility, providing the conduit

Figure 1: Which ecosystem segment will be most important in the creation of new revenue services from the edge?



Source: Omdia survey of 147 operators

the services run through and defining a business model based on volume of traffic. It works, but there are limits to how lucrative it can be.

THREE NEW OPTIONS

Telecom operators do maintain some leverage. They have built up a considerable real-estate base over the years, and that has value. Looking at the edge from an application developer's or a cloud provider's point of view, the telcos have what they need – the delivery network and the real estate. Understanding that, there are three ways this situation can play out:

- **Develop their own applications:** Even with the platform and the subscriber base, it's unlikely that telcos could develop and launch several applications rapidly, knowing that there is likely to be a high failure rate.
- **Co-location model:** Leverage their real estate base for co-location, either as bare metal space for cloud providers or platform-as-a-service for application developers. This ignores any potential that a subscriber base would offer.
- **Cloud providers collaboration:** With cloud providers using tools that developers are already familiar with and telcos offering services to their existing subscriber bases, potentially everyone gets what they want quickly.

Operators are well aware of their limited capability in creating broader arrays of services and applications, so making the infrastructure more intelligent is a more sensible approach to enhancing the value proposition of the underlying platform. Again, the edge is important on that front. 5G/edge integration bolsters the value of all involved.

Of course, there's a very real chance telecom operators will end up renting the edge rather than building it. Traditional telcos are deploying 5G on towers city by city, and working with specific clients on applications, but it's certainly possible – and maybe even likely – a cloud or co-location provider sweeps in and builds out 5G-friendly edge IT hubs en masse to get there first.

You may feel as though you've been hearing about 5G for years, but much of the chatter was too-early marketing hype. Real rollouts are only just starting, and there is still much that's unknown about 5G. The IT edge almost certainly will play an important role in what 5G becomes and how it is optimized, but ownership of that edge remains an open question. The answer has the potential to be transformative for telcos and data center operators alike. ❖

Scott Armul is the vice president and general manager of Global DC Power and Outside Plant for Vertiv.