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S&P Global Market Intelligence Black & White

# Network Cloudification, 5G and Edge Computing

**Strategic Perceptions and Practitioner Views** 

COMMISSIONED BY

kyndryl

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# About this paper

A Black & White paper is a study based on primary research survey data that assesses the market dynamics of a key enterprise technology segment through the lens of the "on the ground" experience and opinions of real practitioners — what they are doing, and why they are doing it.

# ABOUT THE AUTHORS



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# Introduction

As enterprises go through their dramatic transformations, adaptive network capabilities that are as versatile as their application platforms are critical to ensure their success. Next-generation 5G, virtual and edge networking technology offer functionality that can catapult organizations forward as they bring together expansive ecosystems and data resources. Today's businesses must be able to engage with customers wherever they are and offer experiences that will keep them loyal. That means that their application infrastructure needs to be dispersed and well connected, which are characteristics that edge computing environments and 5G access promise to deliver.

Service providers and network operators have a different perspective, but they are also looking to new networking technologies as the basis for enhanced services and new revenue streams.

The overarching question is how these two camps will bring the promise contained in these innovations to fruition. Kyndryl, formerly known as IBM Infrastructure Services approached 451 Research to conduct a study in mid-2020 to explore how both enterprises and network operators view one of the most promising new areas of networking technology – the arrival of 5G wireless technology and the impact that it can have on the expansion of edge computing.

# **Key Findings**

- Enterprise IT respondents indicated that key networking technologies will be critical to their digital transformation. They see 5G services (58%) as the most critical networking technology. Multicloud networking (48%) ran a close second as hybrid environments grow. Edge networking (46%) was also key, with organizations leveraging more edge resources.
- Respondents expect edge strategies to deliver a variety of benefits nearly equally: 38% expect to enable new core business functions, 35% want to improve monitoring and site reliability, and 34% want to improve customer experience.
- The benefit enterprise IT respondents least expect from their edge strategies (cited by 29%) is creating/expanding revenue opportunities. This suggests that IT recognizes its role as an enabling function.

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# Assessing the Enterprise View

The top three challenges enterprise IT executives foresee while executing their edge strategy are complexity of cloud-centric processes (45%), interoperability due to vendor lock-in (43%) and introducing unreliability into their network (41%). Currently, enterprise IT networking teams face a growing diversity of application environments that are composed of on-premises datacenters, one or more cloud services, and edge locations – each of which can simultaneously run applications on physical, virtual or containerized platforms. IT teams must ensure these compute environments are interconnected and provide consistent, reliable interconnectivity, but they face increasing complexity in network architectures that hinder their ability to reduce the time to provision and manage the network throughout its lifecycle. Enterprise IT teams have had a difficult time capitalizing on the promise of software-defined networking on their own. While there are exceptions, achieving the goal of dynamic networking while reducing complexity and operational overhead, and navigating the various technologies and internal hurdles without professional services support has been problematic.

Enterprise IT is looking for a number of benefits from edge, cloud and 5G networking to better support the business, improve monitoring and site reliability, and improve the customer experience with faster, more responsive networking – for the application and all the way to the end user. Enterprises are expecting to put service partners to work to accomplish goals that have been challenging to deliver by themselves.

Enterprises are fairly confident – perhaps overly optimistic – in their self-assessment on their readiness for edge and cloud networking (see Figure 1). A significant percentage of survey respondents indicated that they are extremely ready for use cases such as NFV/SDN, network cloud security and AI/ML, which are not technologies enterprises typically deploy themselves but, rather, consume as a service from an MSP or SaaS provider.

The most sought-after enterprise IT use cases related to 5G services are fixed wireless access to branches (47%), supporting massive IoT deployments (44%) and multicloud integration services (43%).

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#### Figure 1: Readiness for 5G and edge

Source: 451 Research and Kyndryl custom survey

Q: How would you rate your overall readiness today and in the next two years in the following areas related to 5G? (1=not ready at all, 7=extremely ready)

Base: (n=387)

■ not ready at all ■2 ■3 ■4 ■5 ■6 ■extremely ready							
NFV/SDN	<b>6%</b> 69	% 10% 8	% 2 <sup>,</sup>	1%	15%		33%
Network cloud security	12%	16%	12%	12%	9%	6%	32%
AI/ML expertise	12%	17%	13%	11%	7%	9%	30%
Container network functions	13%	18%	12%	11%	5% 1	1%	30%
Hybrid IT/multi/edge-cloud orchestration and management	10%	12%	15% 1	0%	16%	11%	26%
Using 5G for WAN connectivity	9%	8% 12%	9%	21%		18%	24%
Technical architecture for edge computing	11%	12%	19%	8%	19%	7%	24%
Cloud native/DevOps	10%	17%	14%	13%	11%	14%	21%
Operational processes for edge computing	10%	13%	17%	9%	20%	14	17%

Cloud consumption creates a virtuous cycle. As enterprise IT consumes services via the cloud, MSP and SaaS providers, the more confident IT becomes using those services, which leads to even greater usage. In fact, a large majority of respondents indicated that they work closely with strategic service partners to fill gaps in their capabilities. For edge technologies like private 5G, our data (see Figure 2) shows that a majority of enterprises will look to telecom service providers and systems integrators for fully or comanaged services. We'll look at the complexities that this expectation could create.

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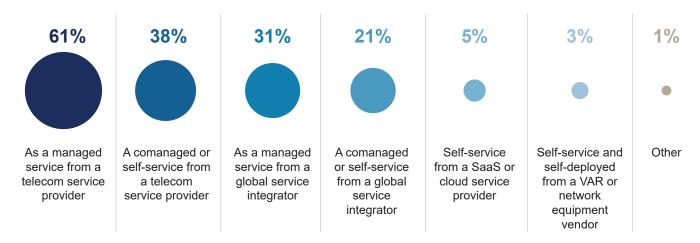
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#### Figure 2: Enterprise IT will look to service providers and integrators for help with private 5G.

Source: 451 Research and Kyndryl custom survey

Q: Which operational models are you likely to use for private 5G?

Base: Those who indicated they will deploy private 5G (n=143)



# Enterprise Expectations of the Edge

Enterprises are looking to edge computing and 5G as tools to accomplish business goals, but respondents have a diverse set of expectations. Enabling new core business functions (see Figure 3) topped the list (38%) of expectations, followed by improving monitoring (35%), improving customer experience (34%) and optimizing data collection (33%); creating new revenue-generation opportunities took the last position (29%). This highlights that organizations expect a number of benefits from their edge strategy rather than there being a common goal that's shared by all.

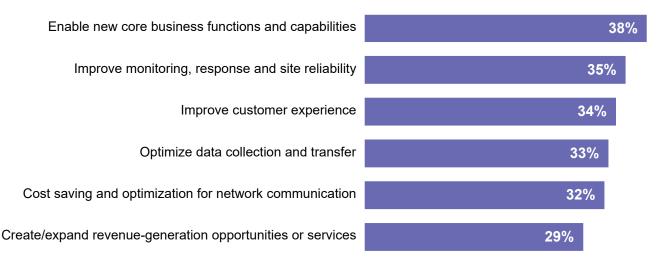
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#### Figure 3: Expected benefits from the edge

Source: 451 Research and Kyndryl custom survey

Q: What benefits does your organization expect to gain with its edge strategy? (n=387)



	EXPECTED BENEFITS FROM THE EDGE BY INDUSTRY VERTICAL					
	Consumer Goods	Automotive	Retail	Energy & Utilities	Healthcare & Pharma	Travel & Logistics
Sample Size	47	22	79	78	78	77
Enable new core business functions and capabilities	40.4%	45.5%	29.1%	44.9%	35.9%	36.4%
Improve monitoring, response and site reliability	31.9%	54.5%	26.6%	32.1%	35.9%	44.2%
Improve customer experience	31.9%	9.1%	30.4%	41.0%	38.5%	33.8%
Optimize data collection and transfer	23.4%	31.8%	35.4%	38.5%	29.5%	29.9%
Cost saving and optimization for network communication	34.0%	36.4%	39.2%	23.1%	33.3%	27.3%
Create/expand revenue-generation opportunities or services	38.3%	22.7%	39.2%	20.5%	26.9%	28.6%

The expected benefits from edge strategies varied by industry vertical. For example, in the automotive vertical, 55% of respondents indicated improving monitoring, response and site reliability as a top priority, and 46% in the automotive vertical said they expect their edge strategy to enable new core business functions. The emphasis in the automotive sector is on integrating the chain of design, testing and manufacturing processes where downtime quickly adds up. Not surprisingly, 39% of respondents in the retail vertical indicated that creating or expanding new revenue opportunities was a top priority for their edge strategy, and 39% said cost savings and optimization of networking. Both are important for retail businesses, which generally operate with thin margins as they compete with other retail brick-and-mortar and online stores.

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Survey data also showed that objectives by role are varied, with leading priorities changing for each. For example, 59% of CIOs polled said they want to enable new core business functions where IT can add value to the business. In contrast, 50% of CFOs indicated a preference for improved monitoring, response and site reliability as a top important benefit because downtime and service degradation lead to higher costs and potentially lost revenue. This speaks to the complexity that enterprises face as they try to balance potentially competing priorities, and it's an area where a specialist service provider partner could be useful in providing perspective and analysis of approaches that could benefit the enterprise as a whole.

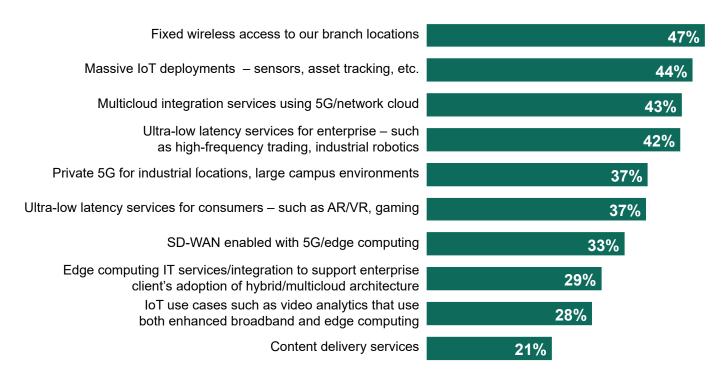
# Enterprise Priorities for Edge and 5G

Support of branch networking is at the top of enterprise respondents' list of priorities for edge and 5G. Across all respondents, 47% indicated that fixed wireless access was a top priority for 5G services (see Figure 4), likely as a replacement for fixed wired access such as business-class broadband or traditional WAN connections. In many parts of the world, wired access is not readily available, leaving wireless technologies such as cellular connections or satellite as the only option. Fixed wireless access over 5G, even in the lower-capacity bands, will improve reliability and performance over 3G and 4G. Surprisingly, only 33% indicated SD-WAN with 5G and edge as a priority, which could suggest that enterprises deploying SD-WAN often have multiple wired access methods available or view 5G as a backup access method due to higher operating costs. If pricing models for 5G fixed wireless access matched wired with predictable monthly rates, that would remove a hurdle to 5G adoption as a WAN access method.

#### Figure 4: Priorities for 5G deployments

Source: 451 Research and Kyndryl custom survey

Q: Which of the following use cases do you anticipate pursuing related to 5G services? (n=387)



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Breaking the data down by region, we found that respondents from North America (50%) and the European Union (48%) listed fixed wireless access to branches as a top priority, while SD-WAN was in the low-to-mid 30% range. Concerns about provisioning time for new services could be driving this interest. It's a concern that's been heightened by the changes in office and retail footprints in the last year. By vertical, 59% of respondents from the automotive vertical indicated that multicloud integration using 5G and network cloud was a top priority, and massive IoT deployments was the next highest at 54.5%. Vast vehicle, dealer and customer interconnection requirements could be driving this need.

One of the most hyped features of 5G – ultra-low latency – is often touted as a significant benefit derived from 5G, but the importance of ultra-low latency outside of very specific use cases such as high-frequency trading, industrial robotic control and real-time virtual reality is only a moderately important priority among enterprise respondents. For about 49% of respondents in the healthcare and pharmaceutical vertical, where wireless augmented and virtual reality (AR/VR) is being developed for remote diagnostics and imaging, ultra-low latency was the second-highest priority. AR and VR are still very much in the early stages of development, and there has been little uptake in hospitals and clinics, but as the technology improves, demand for the supporting infrastructure like 5G will grow. Ultra-low latency was also relatively important for the logistics, travel and transportation sectors, which is likely due to the need to track assets across buildings, campuses and larger geographic areas.

To gain an operator perspective to this study, we also surveyed executives at 77 telecommunications companies worldwide. They indicated that the most important business drivers toward cloudification are increasing the usability and openness of their networks (65%), reducing capex (57%), and increasing overall agility and ability to react to changing market and competitive conditions (53%). However, we found some significant gaps between telecom operators' perceptions about enterprise demand for services and what enterprise IT respondents said they want.

Indeed, there is significant disparity between enterprise and service provider responses to the same question about their perceived priorities. Fixed wireless access was rated a top priority for 47% enterprise respondents, but only 35% of service provider respondents ranked it a top priority, making it seventh in the list of 10 priorities. Some 53% of service providers indicated that edge computing IT services/integration to support their enterprise clients' adoption of hybrid/multicloud architectures is a top priority, whereas edge integration came in eighth (at 29%) in the list of priorities for enterprise respondents. We found other big disparities as well: 44% of enterprise respondents indicated that massive IoT deployments (sensors, asset tracking, etc.) are their top priority, whereas 31% of service providers saw massive IoT deployments as a priority. Some 28% of enterprises cited IoT use cases such as video analytics that use both enhanced-broadband and edge computing a top priority compared to 48% of service providers. For many of the use cases, there is a mismatch between what enterprise IT considers important and the 5G and edge capabilities that service providers are prioritizing.

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#### THESE PRIORITY DIFFERENCES POSE A QUESTION FOR ENTERPRISE LEADERS.

While the enterprises we polled expressed an interest in working with telecommunications service providers, the data indicates that telcos may not be well aligned with enterprise needs. This should be an indication to enterprises to proceed with caution or that they might want to engage with global service integrators that could be better focused on enterprise requirements and priorities.

Choosing to deploy emerging technologies like 5G, cloud and edge services will lead to some complex technology decisions that are shaped by business need. A service integrator can bring together the best platforms, applications and hardware, independent of source, in ways that are aligned with enterprise needs.

The cloud and network business priorities identified by enterprises emphasize the operational goals they want to achieve. Overall, 39% of respondents said they want to reduce the need for specialized networking skills. This holds true for most verticals, the notable exceptions being the consumer goods and logistics verticals, which both ranked reducing networking capex as a top priority at 43% and 44%, respectively, and the automotive vertical, which said that reducing network vendor lock-in is a top priority at 50% of respondents, a notable deviation from the other verticals. Looking at the respondents overall, there were only eight percentage points between the aforementioned most-picked priority and the least-picked, which was increasing staff productivity. Cloud and network priorities are nearly equally important, with some variation among verticals.

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# Journey Toward Cloudification of Network Assets

As we enter the 5G era of connectivity, telecom operators need to aggressively pursue digital transformation to ensure profitability. The business environment for telecom operators is generally one of high competition, flat/low revenue growth, rising network usage and increasing expectations for customer experience. The customer-experience bar is now set based on what is offered by cloud service providers, and churning is as easy as ever. A majority of telco leaders aspire to transition from their legacy position as communications service providers to a more nimble and relevant position as digital service providers, which means, in practice, they are seeking new opportunities to create value for customers and partners with far greater agility and fewer operational costs.

Digital initiatives in progress in the telecom sector include lifting and shifting back-end IT systems to the hybrid cloud, reimagining their digital channels of engagement to increase personalization and customer experience, and strategically implementing AI capabilities to bring business-critical insights and enablement to sales, marketing and business operations. However, the most important – and most difficult to achieve – pillar of digital transformation is the cloudification of their network systems.

As they transition, they will need to adopt cloud-native technologies for network services such as containers and microservices, as well as centralized container orchestration/automation and operating principals such as CI/CD, along with the generalized transition to more 'open' architectures. All of this translates to a more agile telco with far greater flexibility in how they deliver and scale network applications – including the use of hybrid, multicloud infrastructure. Telcos' destination is to deliver services in nearly the same way that cloud hyperscalers deliver theirs, with equivalency in release cadence, system automation and resource optimization.

Our research study revealed the most important business drivers of cloudification. As many as 65% of respondents indicated that increasing the usability and openness of their networks was a top driver, followed by 57% who indicated that reducing capex was a core driver, and 53% who indicated that increasing overall agility and ability to react to changing market and competitive conditions was key. Respondents expect to face challenges during their cloudification efforts; 45% of respondents indicated that cultural inertia is the greatest barrier to success while 36% rated security concerns as their biggest challenge; lack of ROI (32%) was the third-most-mentioned challenge.

That cultural inertia is the greatest obstacle is no surprise given the complexity and core structural changes implied by cloudification. So, who will assist the telcos on this journey? The majority believe that a hybrid approach of legacy network equipment manufacturers and IT/cloud partners, SIs and internal staff (32%), while 29% of respondents indicated a more pronounced change where cloud players take a lead role. The concept of cloud providers as change agents in the telecom segment is a new development born from necessity: if the path of travel is to be cloud-like, it's best to work with cloud providers directly.

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We wanted to get a feel for their own evaluation of readiness for cloudification. As Figure 5 shows, the respondents were split; 67% said they are feeling 'most ready' in the area of AI/ML expertise, while only 47% said they are ready to adopt DevOps at industrial scale.

#### Figure 5. Telecom decision-makers rate their readiness for cloudification

Source: 451 Research and Kyndryl custom survey

Q: How would you rate your overall readiness over the next two years in the following areas related to 5G edge network cloud? Base: All respondents (n=77)

■ Feel Ready (5+)	Less Ready (4 and below)	
DevOps	47%	53%
Operational processes for edge computing	52%	48%
Network cloud security	54%	46%
Cloud-native functions	55%	45%
Open network strategy	59%	41%
Hybrid/multicloud orchestration and management	60%	40%
NFV/SDN	62%	38%
Edge computing architecture	63%	37%
Monetization	64%	36%
AI/ML expertise	67%	33%

# New Business Opportunity with 5G and Intelligent Edge Networks

Interestingly, monetization of new services is an area where most respondents said they feel ready (64%), which is good news; clearly, generating revenue and profits from cloudification investment is mission-critical. Our survey validated this point. When we asked about topics and technologies most critical to profitability over the next five years, edge computing monetization and 5G monetization where the most popular choices. As Figure 6 shows, 31% indicated that edge computing monetization is mission-critical while a further 31% indicated it's very important to five-year profitability, while 49% indicated that 5G monetization will be 'very important.'

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#### Figure 6. Topic and technologies most critical to profitability over the next five years

Source: 451 Research and Kyndryl custom survey

Q: For each of the following topics/technologies, please indicate how important it is to your firm's profitability over the next five years.

Base: All respondents (n=77)

■Not important at all ■Somewhat important ■Moderately important ■Very important ■Mission-critical					
Evolving our ecosystems and go-to-market channels to match 5G capabilities to serve B2B and B2B2C	12%	40%	39%	9%	
VMware/vCenter	30%	16%	44%	10%	
Transitioning internal workloads to public cloud infrastructure	26%	29%	34%	12%	
Transitioning workloads to hybrid/multicloud infrastructures	22%	17%	48%	13%	
OpenStack	22%	39%	21%	18%	
AI/ML to support network, IT, and customer experience intelligence/automation	21%	21%	38%	21%	
Increasing internal teams' ability to bring new service innovation to serve B2B and B2B2C	13%	33%	34%	21%	
Cloud native: Adopting cloud-native technologies and development principals including containers and Kubernetes	20%	23%	34%	23%	
O-RAN: The use of open interfaces in radio access network to support multi-vendor and disaggregate hardware from software	5%	42%	27%	26%	
5G monetization	23%	4	9%	27%	
Edge computing monetization	20%	18%	31%	31%	

Double clicking on the topic of monetization, we sought to understand a high-level view of expectations on a variety of use cases enabled by 5G intelligent edge networks. As Figure 7 shows, there were some surprises. For example, only 16% of respondents indicated that they believe massive IoT deployments present a \$100m opportunity over the next five years. This is a sign that some of the early challenges in monetizing IoT will overhang the 5G era and a strong endorsement for the expected opportunity for edge computing in support of enterprise adoption of multicloud services (34% said it will be worth over \$100m in the next five years), and private 5G for industrial venues (33% indicated a worth of over \$100m in the next five years). There were significant regional differences (called out in the observations column) for each use case.

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#### Figure 7: 5G and edge network cloud revenue potential for use cases

Source: 451 Research and Kyndryl custom survey

*Q*: Please characterize your overall revenue/growth opportunity related to 5G/edge network cloud for the following use cases. Base: All respondents (n=77)

USE CASE	<b>LOW –</b> \$10M incremental over next five years	<b>MEDIUM –</b> \$10-\$100M over next five years	<b>HIGH –</b> \$100M+ over next five years	OBSERVATIONS
Edge computing IT services/integration to support enterprise clients' adoption of hybrid/multicloud architecture	30%	36%	34%	48% ranked 'high' in NA
Private 5G for industrial venues	27%	40%	33%	SA telcos ranked this highest (48%)
SD-WAN enabled with 5G/edge computing	39%	31%	30%	EU/NA ranked highest (~37%)
IoT use cases such as video analytics that use both enhanced broadband and edge computing	43%	30%	27%	Ranked highest in EU
Multicloud integration services using 5G/ network cloud	40%	34%	26%	Most popular for large telcos
Content delivery services	36%	39%	25%	Rated equally in NA and SA
Fixed wireless access	39%	39%	22%	Ranked highest in SA
Ultra-low latency services for consumers such as AR/VR, gaming	46%	34%	21%	Ranked highest in NA (24%)
Massive IoT deployments	42%	43%	16%	Generally graded as medium opportunity

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# Conclusions

Enterprises have a strong drive to put the next stage of networking innovations to work and increase utilization of edge computing capabilities. While they may not fully grasp the changes that will be required to raise their skill and process levels, they are expecting to benefit from strong collaborations with partners that can help them reach these goals.

At the same time, operators are anticipating enterprises' needs, identifying an expectation that they'll monetize the 5G and edge opportunity. They also understand that they have work to do to raise their technology expertise to the level required to offer these services. The fact that a significant number of operators are expecting to gain those skills from cloud providers is an interesting shift in a complex market. Operators know that they'll have to master new skills in the process of cloudifying their environments.

Both enterprises and operators understand that making their networking environments more agile and automated can have large benefits. They're aligned in their expectations of the improvements that these capabilities could provide, but their priorities for services don't appear to match. This may be an indication that enterprises will find a better fit with partners other than the typical operators they might encounter. Both operators and enterprises are also aligned in understanding that they'll need capable partners to get them to these higher levels of performance. That's a significant opportunity for those that can enable these transformations.

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