RESEARCH

analysys mason

WHITE PAPER

EDGE COMPUTING: OPERATOR STRATEGIES, USE CASES AND IMPLEMENTATION

Gorkem Yigit

JUNE 2020

analysysmason.com

Contents

Published by Analysys Mason Limited
North West Wing, Bush House
Aldwych
London WC2B 4PJ
UK
Tel: +44 (0)20 7395 9000
london@analysysmason.com
www.analysysmason.com
Registered in England and Wales
No. 5177472

1 Executive summary

Edge computing refers to the architectural principle of moving the execution of digital services and applications to the edge of the network, closer to the human user or connected device. This enhances the user experience and enables the delivery of low-latency applications, while optimizing the economics of implementation. This new distributed cloud computing paradigm stands at the intersection of 5G, artificial intelligence (AI), digital transformation and industry 4.0 developments and is spawning new, complex value chains with a diverse set of players and ecosystems. Many operators are interested in pursuing emerging opportunities in the edge computing market, but to do so they must overcome the challenges and uncertainties surrounding use cases, technology choices and partnership decisions.

Analysys Mason conducted a survey in 1Q 2020 of 30 Tier-1 operators from 12 countries in 3 regions[1] to examine the following issues: operators' main drivers for building edge computing infrastructure and the challenges that they face, the types of use cases that they are planning to launch, the roles that they expect to play in edge value chain and the deployment and ecosystem strategies that they are adopting. This white paper presents the key findings of the survey, which are summarised as follows.

- **Edge computing is of high strategic importance to operators, and first-movers are forging ahead with early deployments.** 87% of the operators in our survey consider edge computing to be a top strategic priority in the short term. 30% of the operators have already started to implement edge computing infrastructure and the other 57% are planning to deploy an edge cloud in the next 12 months.

- **Operators' primary motivations and barriers vary significantly by geography.** For example, supporting 5G roll-outs and vRAN deployments is the main driver for most North American operators, while those in Western Europe plan to deploy edge computing in order to enable new enterprise, IoT and consumer edge services, though they simultaneously fear that these opportunities may not materialize soon. Our survey results indicate that operators' different starting points and approaches will converge in the long term.

- **Video and gaming use cases are the prime targets for edge** and many operators will address these use cases first, typically within the next 12 months. Mainstream deployments of most higher-value enterprise and IoT use cases have longer timescales. Blockchain, robotics and cryptography-as-a-service deployments are not expected to be realized until after 2022.

- **Operators want to play a broader role in the edge computing value chain beyond just being location or connectivity providers.** Most operators are hoping to become PaaS (70%), SaaS (63%) and/or IaaS (60%) providers.

- **Metro data centers will be the most common locations for initial edge deployments**. However, some operators in North America and Asia–Pacific are also considering deploying edge in cell sites in the next 12 months. Central offices are an average of 2 years away from becoming mainstream edge locations.

- **Security, operationalization capabilities, low deployment costs and a solid technology/operations partner to enable deployments** are the top critical requirements for operator edge cloud implementations.

- **Ideal edge vendor partners for operators are those that can bring industry knowledge, expertise and professional services** to help operators to tailor their edge clouds for specific industry requirements. Around a third of operators expressed their desire to have strategic partnerships with vendors to jointly pursue opportunities and share risks in their foray into edge computing.

- **Operators regard public cloud providers both as partners and potential threats.** Operators in North America and Asia–Pacific generally take a co-operative approach towards public cloud providers, but those in Western Europe tend to view public cloud providers as a threat.

- **The majority of operators will prioritize collaborating with other operators in order to foster an edge developer ecosystem.** However, a significant portion of first-mover operators prefer to create their own, differentiated developer ecosystem, rather than working with other service providers.

[1] Participants were from Australia, Canada, China, France, Germany, Italy, Japan, Norway, Singapore, South Korea, UK and USA. All respondents were executives with a focus on edge computing including CTO, CIO, Head of Innovation and Head of Planning and Technology

2 Key drivers and barriers in the edge computing market

2.1 Edge computing is a strategic priority for many Tier-1 operators, and deployments are underway in several regions

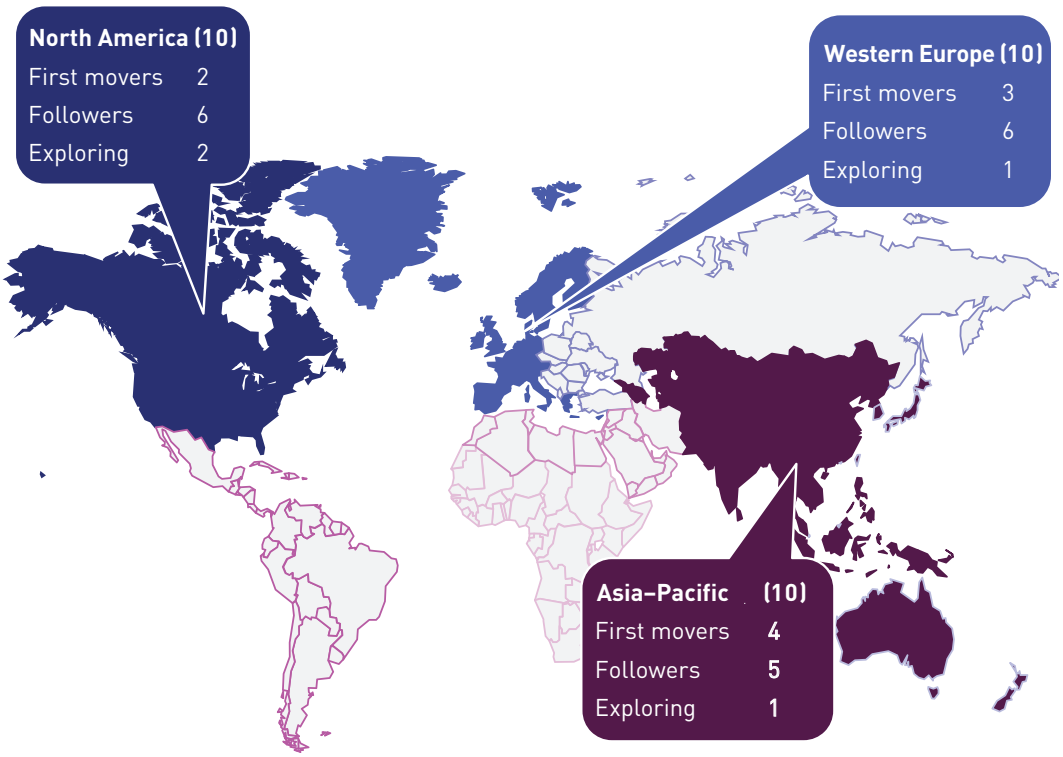
Analysys Mason's survey reveals that edge computing is a top strategic priority for many Tier-1 operators across North America (NA), Western Europe (WE) and Asia–Pacific (APAC) (87%). These operators are either at the planning or deployment phase of their edge cloud strategies. 30% of the operators surveyed are 'first movers' (that is, they are already in the process of deploying an edge cloud), and operators from Asia–Pacific lead this group. 57% of operators are currently outlining their plans for building edge computing infrastructure in the near term; we refer to them as 'followers' in this paper. A small portion of operators (13%) are still exploring the value and requirements of edge computing, and do not have immediate plans to deploy edge clouds.

2.2 5G roll-outs and enterprise and IoT service opportunities are driving edge investments, but strategic objectives and barriers vary by region

There are three main drivers of operators' edge computing strategies: their ambitions in the enterprise and IoT services markets, requirements for new edge locations to support 5G roll-outs and network cloudification and, to a lesser extent, new opportunities in the consumer market. However, there is a stark contrast in the primary motivations for deploying edge computing in different geographies (see Figure 2).

- Most operators in North America (70%) are driven by their plans for 5G and vRAN roll-outs and backhaul traffic management. These operators are mainly focused on supporting their 5G and network cloudification efforts by creating private edge computing nodes that will host network functions such as vRAN (CUs or DUs) or 5G packet core (for example, vUPF), which are increasingly transforming into disaggregated and distributed cloud-native architecture.

FIGURE 1: REGIONAL DISTRIBUTION OF SURVEY PARTICIPANTS AND THEIR EDGE COMPUTING DEPLOYMENT STATUS
[SOURCE: ANALYSYS MASON, 2020]



- The majority of Western European operators (70%) have a more service-driven motivation for deploying edge computing, based on enabling new enterprise, IoT and consumer edge services. For example, this could be in the form of a public edge cloud service that offers various 'as a service' business models (SaaS, PaaS and IaaS) for specific enterprise IT workloads and IoT applications at the edge. The roadmaps for 5G roll-outs in this region have so far been less ambitious than those in North America and Asia–Pacific, suggesting that operators in Western Europe may be placing a greater emphasis on the new service revenue benefits of edge in order to justify their early investments.
- Operators in Asia–Pacific have a more-balanced deployment strategy that is evenly split between the two types of drivers listed above.

However, operators' responses become much more homogenous across all regions when it comes to the broader motivations for deploying edge clouds, as shown in Figure 3. This indicates that operators' different starting points and approaches will coalesce and converge over time. For example, technology-driven operators are likely to co-locate new edge applications alongside their 5G network functions in their edge clouds in order to monetize their 5G investments with new or enhanced services, such as ultra-low-latency use cases. Conversely, service-driven operators may deploy some of the 5G network functions across their generic edge computing footprint to reduce the cost of their 5G deployments by utilizing existing edge infrastructure.

FIGURE 2: MAIN MOTIVATION FOR DEPLOYING EDGE CLOUDS, BY REGION, 2020
[SOURCE: ANALYSYS MASON, 2020]

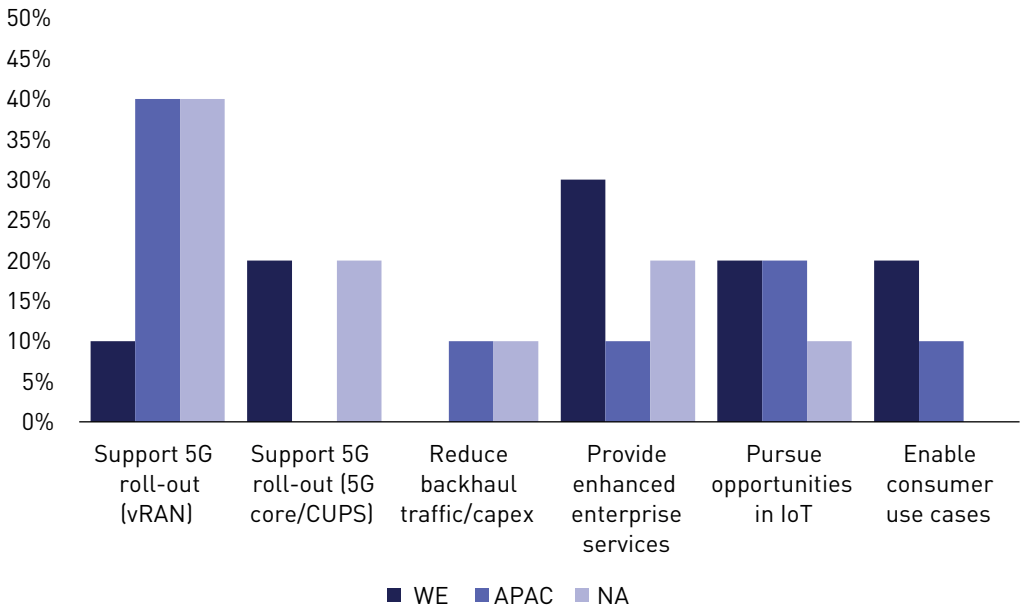
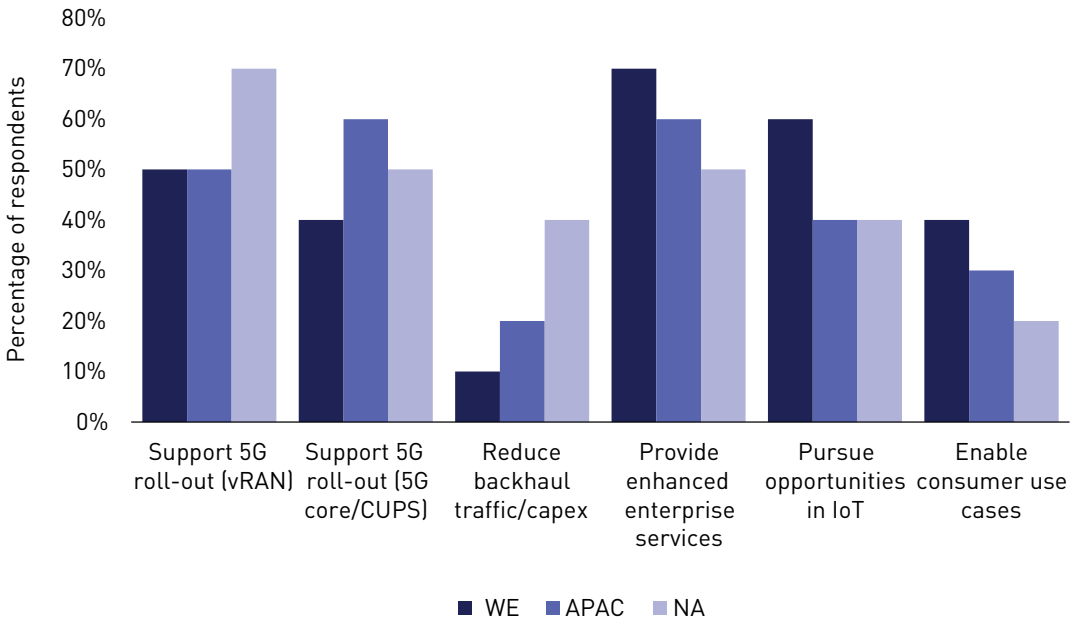
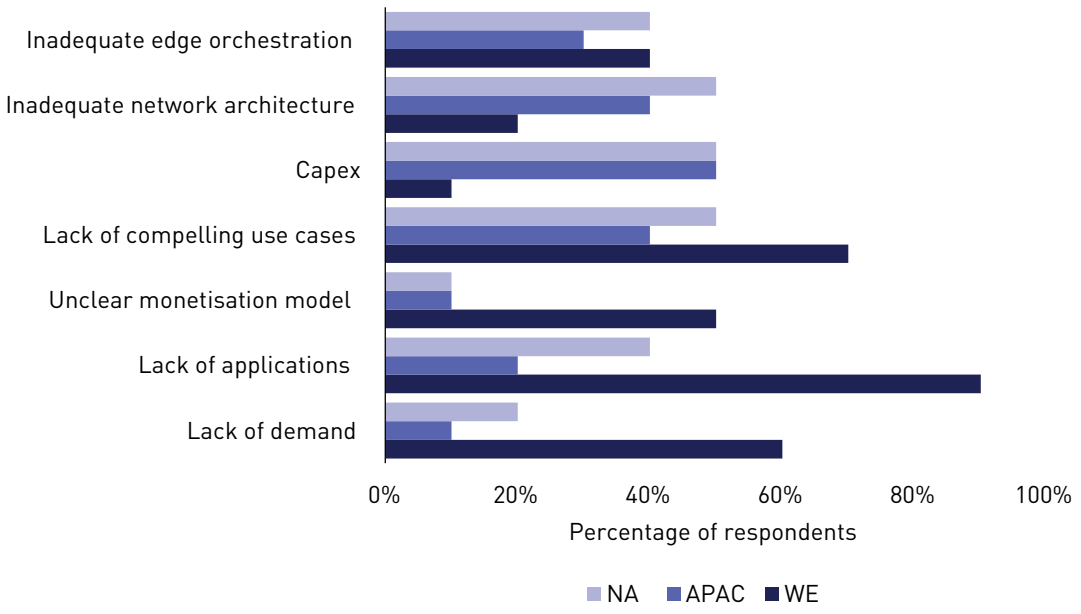


FIGURE 3: TOP THREE MOTIVATIONS FOR DEPLOYING EDGE CLOUDS, BY REGION, 2020 [SOURCE: ANALYSYS MASON, 2020]



The main barriers to edge computing deployments for operators in Western Europe are commercial and service-related, and include unclear monetization models and a lack of demand, compelling use cases and applications (Figure 4). Operators in this region fear that enterprise and IoT service opportunities may take time to materialize, despite their focus on such services as discussed above. This may mean that edge investments grow more slowly in Western Europe than elsewhere until the market matures. By contrast, the main concerns of operators in North America and Asia–Pacific are related to costs (for example, the number of dispersed locations required to house distributed vRAN functions) and inadequate network architecture. A significant portion of operators from all three regions agree that the lack of mature edge orchestration solutions and capabilities is an important barrier to edge deployments today. This is discussed in more detail in Section 4.2.

FIGURE 4: BARRIERS TO EDGE CLOUD DEPLOYMENT, BY REGION, 2020 [SOURCE: ANALYSYS MASON, 2020]



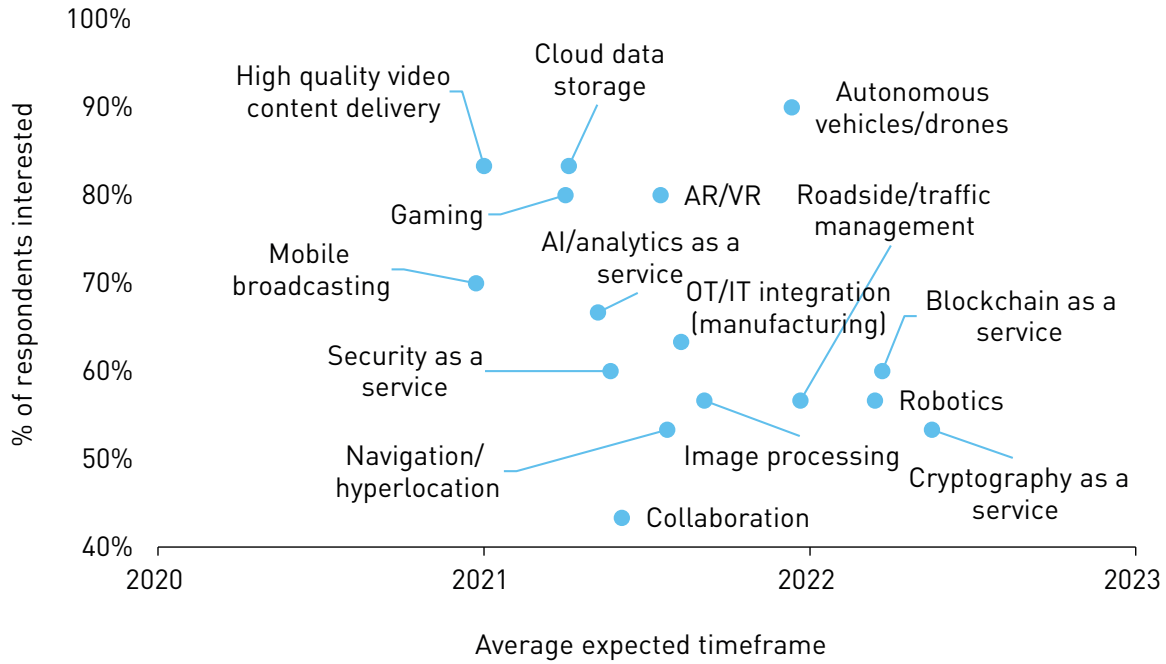
3 Key edge computing use cases and value chain roles for operators

3.1 Video and gaming will be the common early use cases for edge; the adoption of the higher-value enterprise and IoT use cases will take time

A wide range of potential edge computing use cases can be enabled or enhanced by bringing computing, data storage and processing and AI/analytics much closer to the end user (that is, a human or an IoT connected device). These use cases span many different vertical industries such as manufacturing, media and entertainment, healthcare, finance and transportation. It is important for operators to identify which edge computing use cases are aligned with their existing assets and capabilities and to have a sense of when these use cases are expected to emerge so that investments can be prioritized. Figure 5 illustrates the diverse set of use cases that operators are planning to deploy in the consumer and enterprise markets, along with their average expected deployment dates as cited by the surveyed operators.

First-mover and follower operators are deploying or planning to deploy consumer use cases first (especially those that are related to video content services), despite their higher strategic focus on enterprise and IoT services. The high-quality (UHD/HDR) video delivery use case is particularly popular among Western European operators, while the gaming and mobile video/broadcasting use cases are popular among operators in North America and Asia–Pacific, respectively. These use cases are well-understood; they have already been implemented in service provider clouds/data centers and operator networks and have existing customer bases, which make them prime targets for being used in the first edge deployments. Edge computing promises to enhance the delivery of these use cases by reducing the cost for video service providers and improving the quality of service (QoS; for example, by improving the latency) aspects. It also enables the delivery of new content services such as cloud gaming. Some operators (typically those that

FIGURE 5: PERCENTAGE OF OPERATORS INTERESTED IN EACH EDGE COMPUTING USE CASE AND THE AVERAGE EXPECTED DEPLOYMENT DATE [SOURCE: ANALYSYS MASON, 2020]



have already invested heavily in IP, cable and OTT TV/video services and content) are also interested in using edge computing to open up new revenue streams from dynamic advertising, two-sided CDN business models and in-venue services. AR/VR is also of great interest to operators, but its edge deployment is expected later than the aforementioned use cases due to its relative immaturity compared with other video services.

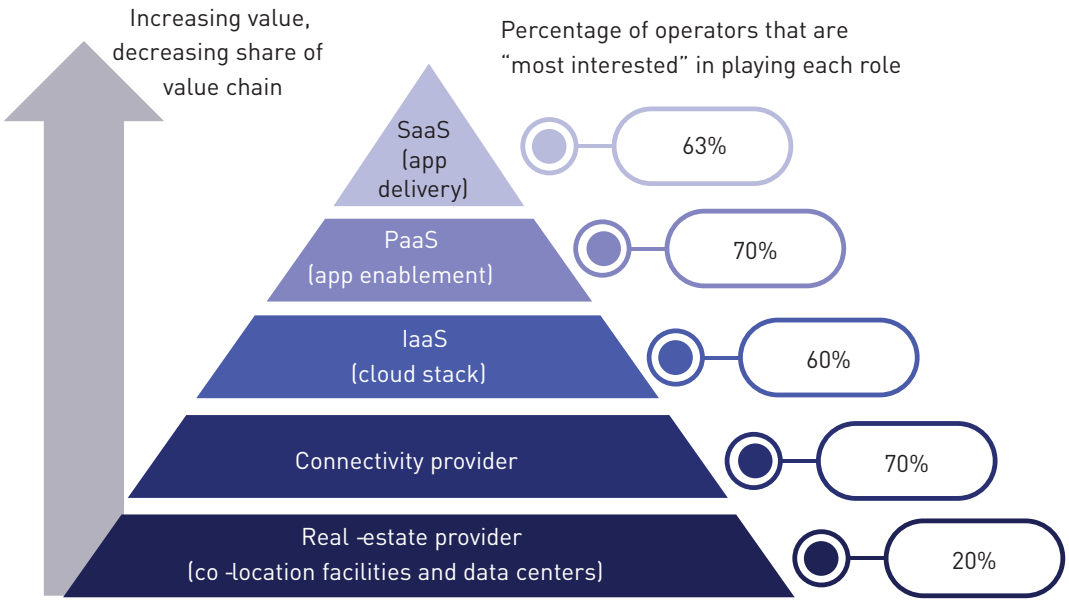
In contrast to the video-related use cases, the mainstream deployment of most enterprise- and IoT-focused use cases will take time. New and developing use cases such as image processing, security-as-a-service, AI-as-a-service, OT/IT manufacturing and navigation/hyperlocation are likely to be deployed during the next 2 years according to our survey, while blockchain- and cryptography-related services are longer-term targets. A significant amount of effort and expertise will be required for operators to assert themselves in the corresponding value chains for these use cases, though they represent a larger revenue opportunity than the consumer use cases. North American operators are likely to be the trailblazers for enterprise-related edge computing use cases (particularly for OT/IT manufacturing, blockchain, robotics, AI-as-a-service and autonomous vehicles and drones) as illustrated by their earlier expected deployment times than those given by operators in other regions.

3.2 Operators want to play a broader role in the edge computing value chain, beyond providing connectivity and location

Edge computing services are emerging with multi-layer value chains. These value chains will initially be highly fragmented, and a wide variety of players including operators, webscalers, CDN providers, industry specialists and start-up companies will be competing and partnering at various steps. Operators will need to assess which areas of the value chain they are best-placed to compete in and where they will need to form partnerships to monetize the edge use cases identified in Section 3.1.

Figure 6 illustrates the main layers of the edge computing value chain and the roles that are of the greatest interests to operators. Operators possess a natural competitive advantage at the foundational layers of the value chain thanks to their large, distributed and well-connected facilities footprint (as providers of real estate/co-location, connectivity and IaaS). However, it is clear from the survey results that operators want to play multiple roles and extend beyond these foundational layers. Indeed, most operators hope to become PaaS (70%) and SaaS (63%) providers in addition to holding IaaS (60%) and connectivity provider (70%) roles. Only a minority (20%) of operators consider providing real estate/co-location services to be their main focus area.

FIGURE 6: OPERATORS' INTEREST IN THE VARIOUS ROLES IN THE EDGE COMPUTING VALUE CHAIN
[SOURCE: ANALYSYS MASON, 2020]

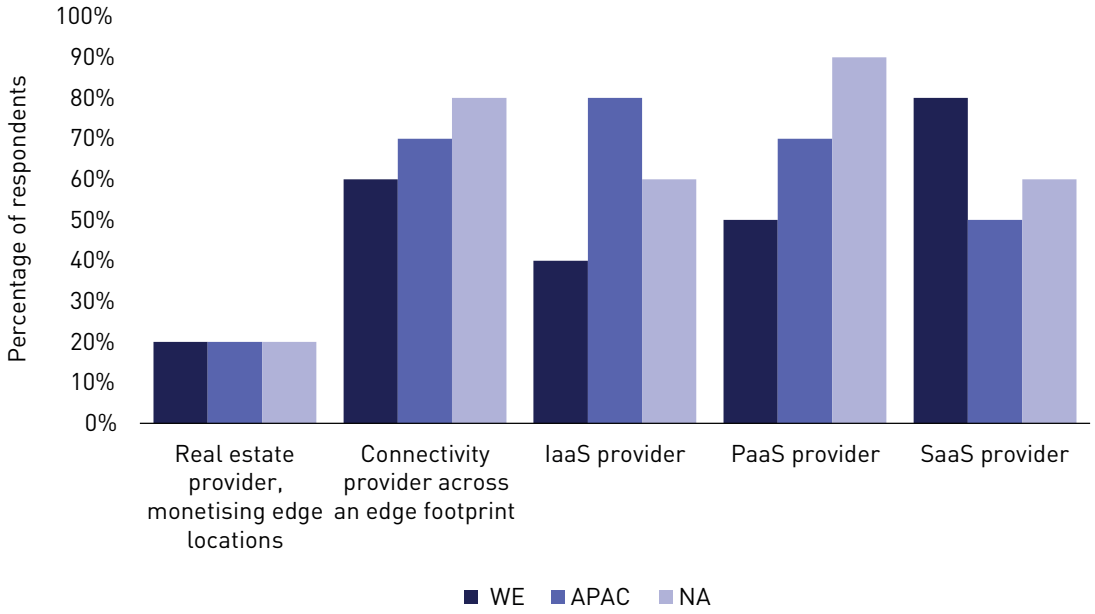


The PaaS and SaaS layers include platform services, tools and infrastructure exposure capabilities that are key to attracting developers and service partners that can enable edge use cases. These upper layers promise larger revenue opportunities but also a higher level of competition, and few operators are traditionally capable of addressing these layers by themselves. Operators will need to form industry-wide collaborations or rely on partners to build or bring edge platform services, supported by a critical mass of developers. This is discussed further in Section 4.3.

The survey results show that there is some variation between regions in terms of operators' interest in the value chain roles (Figure 7). Operators in Western Europe have a greater focus on becoming SaaS providers, while those in North America and Asia–Pacific are more interested in the PaaS and IaaS provider roles, respectively. This can be linked back to the varying edge deployment strategies discussed in Section 2. Western European operators' service-driven approach may spur them to invest in the SaaS layer and form partnerships for the direct monetization of specific edge applications. In contrast, technology-driven operators in North America and Asia–Pacific seem to be more interested in exposing and monetizing their edge computing capabilities by collaborating with enterprises and developers at the PaaS and IaaS layers, respectively.

There are also some variations in the expected value chain roles between first-mover operators and other operators: first-mover operators are prioritizing IaaS (89%) and connectivity provider (89%) roles. This may suggest that these operators are focusing on more-attainable opportunities in near term in order to justify the business case for early edge computing deployments before venturing into the higher-risk and more-competitive SaaS and PaaS layers.

FIGURE 7: PERCENTAGE OF OPERATORS INTERESTED IN EACH ROLE IN THE EDGE COMPUTING VALUE CHAIN, BY REGION, 2020
[SOURCE: ANALYSYS MASON, 2020]



4 Building the edge

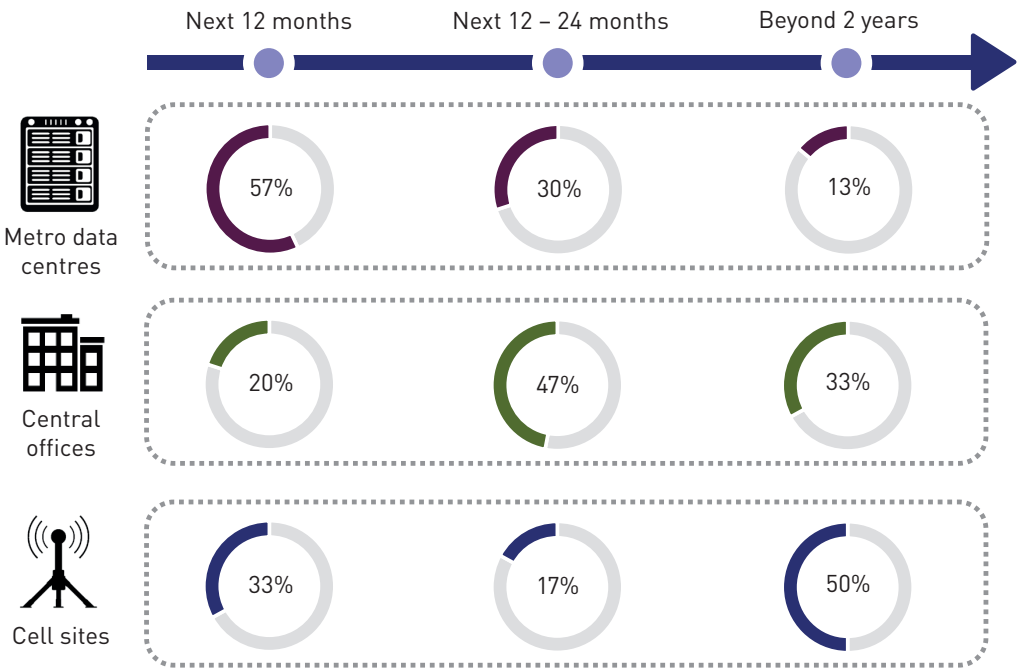
4.1 Where is the edge in operator networks?

There are a number of potential locations for edge cloud deployments, from just outside central data centers to very close to customer premises or devices. Operators' choice of edge computing locations and deployment timeframes will be largely dictated by cost, use case requirements (for example, latency and security) and 5G architectural choices. Operators' public and private edge clouds are expected to reside in three main locations within their networks: metro data centers, central offices and cell sites (as illustrated in Figure 8).

Metro data centers are the most popular locations for edge cloud deployments in the next 12 months among the operators surveyed. These locations are typically limited in number but can readily provide the required IT/data center environment for building edge clouds. This makes them highly suitable for initial deployments. Operators are generally considering using central offices and cell sites for their medium-to-long-term edge cloud implementations. These locations are large-scale and highly dispersed and it can be prohibitively expensive to deploy in a significant portion of them. Moreover, these locations are traditionally not conducive to cloud deployments and major modernizations/transformations are required to prepare them for edge computing. As such, operators will need to be selective when it comes to deploying their edge clouds in these locations to ensure economic viability. Typically only the technology-driven operators in North America and Asia–Pacific have plans to deploy edge clouds in cell sites (for example, to house vDUs with stringent bandwidth and latency requirements) in the next 12 months.

These findings are aligned with operators' use case deployment plans as detailed in Section 3.1. Video-related edge use cases, which are identified as being primary targets for deployment in the next 12 months, have latency requirements that are typically within the 20–100ms range, thereby making them suitable for deployments in metro data centers. Ultra-low-latency use cases (<10ms or <1ms) will require edge clouds in cell sites or central offices.

FIGURE 8: LOCATIONS FOR OPERATORS' EDGE CLOUD DEPLOYMENTS AND THEIR EXPECTED TIMELINE DEPLOYMENT TIMESCALES [SOURCE: ANALYSYS MASON, 2020]



4.2 Operators' key requirements for edge cloud deployments

There is strong consensus among operators that security is a top consideration when building edge computing infrastructure. Indeed, Figure 9 shows that 80% of the operators surveyed view security as the most critical factor for edge clouds. Security was also a major concern for traditional cloud computing in its early days, and a broad spectrum of technologies and tools have been developed to mitigate potential security risks. Edge computing is likely to benefit from the existing cloud computing and network security measures, but its distinct characteristics such as its distributed architecture with a high level of application mobility, massively data-intensive and sensitive workloads and the vulnerability of IoT devices will present new challenges for edge applications and data, both at rest and in transit.

The operationalization and management of edge clouds is another critical factor for operators. As network functions and applications are distributed out to the edge, manual operations become no longer feasible and existing orchestration and management solutions that are designed for centralized clouds may no longer meet the requirements. Moreover, edge infrastructure will be highly complex and composed of multi-clouds with hybrid cloud environments (virtual machines and containers) and heterogenous hardware resources (bare metal, white boxes, GPUs and FPGA). New capabilities for distributed workload placement and application and infrastructure lifecycle management of edge domains will be required, as well as those to enable end-to-end, cross-domain service and network orchestration and automation in an operator's entire network and cloud footprints. In addition, 73% of operators believe that it is important for deployments to be low-cost, which reflects the concerns about opex and automation, as well as those regarding capex as identified in Section 2.2.

The majority of operators surveyed (67%) acknowledge the importance of engaging with partners for both technology and operations for their edge deployments. There is a large ecosystem of edge vendors including infrastructure vendors, platform providers and system integrator companies, and it will be critical for operators to select the right vendor partners for their edge computing deployments.

FIGURE 9: CRITICAL' AND 'SOMEWHAT CRITICAL' REQUIREMENTS FOR OPERATORS' EDGE CLOUD DEPLOYMENTS, WORLDWIDE, 2020 [SOURCE: ANALYSYS MASON, 2020]

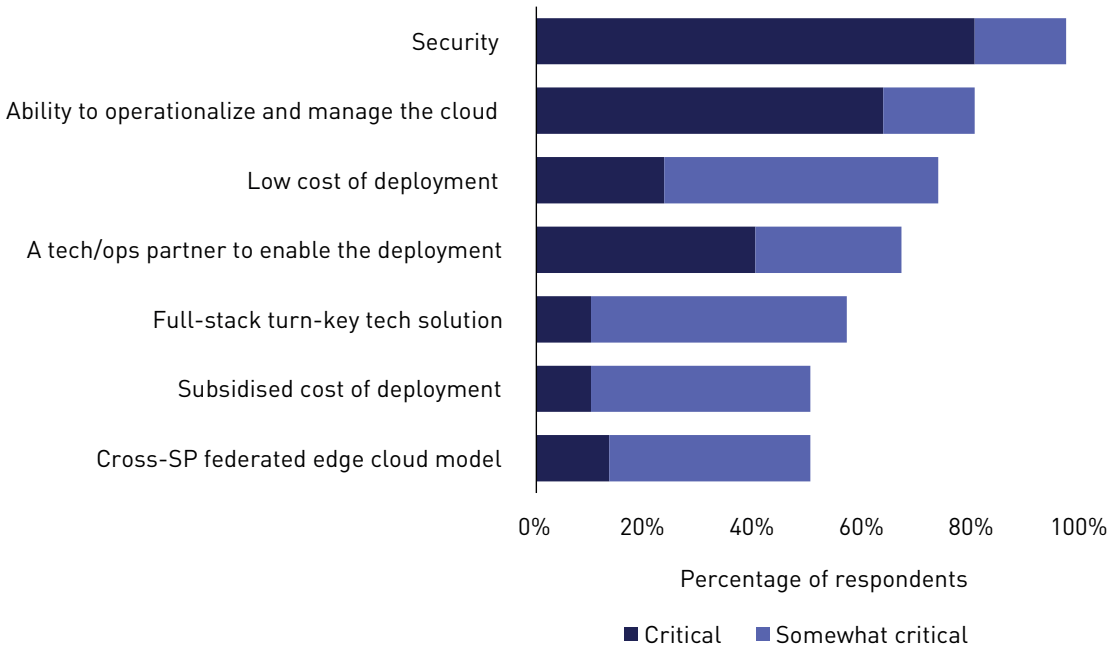


Figure 10 shows the key capabilities that operators look for in their edge vendor partners. Operators' top three requirements from their partners are customisation and system integration capabilities (57%), relevant technology and industry expertise and experience (50%) and the ability to provide support for various vertical industry standards and compliance requirements (40%). These results suggest that operators want to engage with vendor partners that have industry knowledge, expertise and professional services in order to help them to tailor their edge clouds for specific industry requirements so that they can realize the vertical market service ambitions discussed in Section 3.1.

4.3 Operators have contrasting views on public cloud provider partnerships and developer ecosystem strategies

As discussed in the previous sections, operators aspire to play an active role in a wide variety of edge use cases spanning many different verticals such as manufacturing, media and entertainment, finance and healthcare. However, most operators do not already possess the necessary technology, market expertise or channels to address the specific needs of these verticals nor to foster developer ecosystems. Moreover, large enterprises in these verticals typically operate around the globe and require edge locations across their entire footprint; a single operator may struggle to provide this. It will be critical for operators to collaborate with a diverse ecosystem of industry players including other operators, technology vendors, industry specialists, application vendors and public cloud providers if they wish to assert themselves in emerging edge value chains. Figure 11 shows how operators view these various players in the edge computing market.

The majority of operators acknowledge the importance of partnerships with application vendors (such as application developers, content providers and SaaS providers) and industry players (for example, manufacturers, healthcare providers and IoT players) that have industry-specific skills and in-depth knowledge. Operators have varying strategies as to how they will attract these players (for example, by building their own ecosystems or using existing ones) to their edge clouds.

Some operators expect that their relationships with their technology suppliers (that is, edge cloud vendors, system integrators and virtualization vendors) will go beyond just providing infrastructure. Around a third of operators surveyed expressed their plans to form strategic partnerships with these vendors in order to jointly pursue opportunities and share the risks in their forays into edge computing.

FIGURE 10: OPERATORS' MAIN REQUIREMENTS FROM AN EDGE CLOUD PARTNER, WORLDWIDE, 2020
[SOURCE: ANALYSYS MASON, 2020]

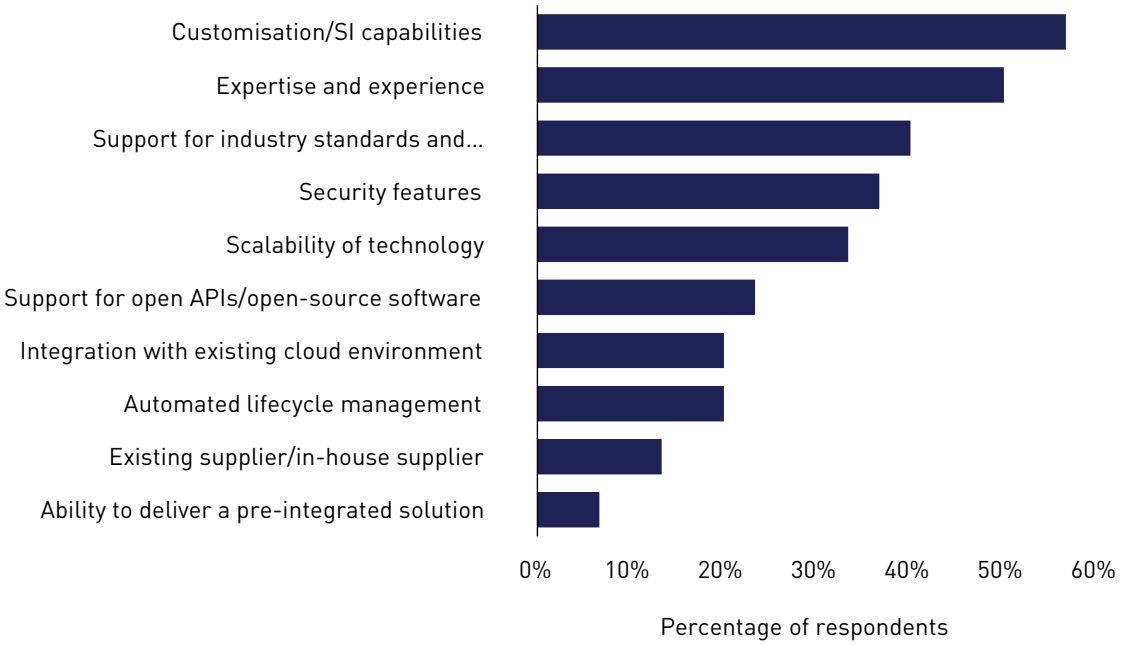
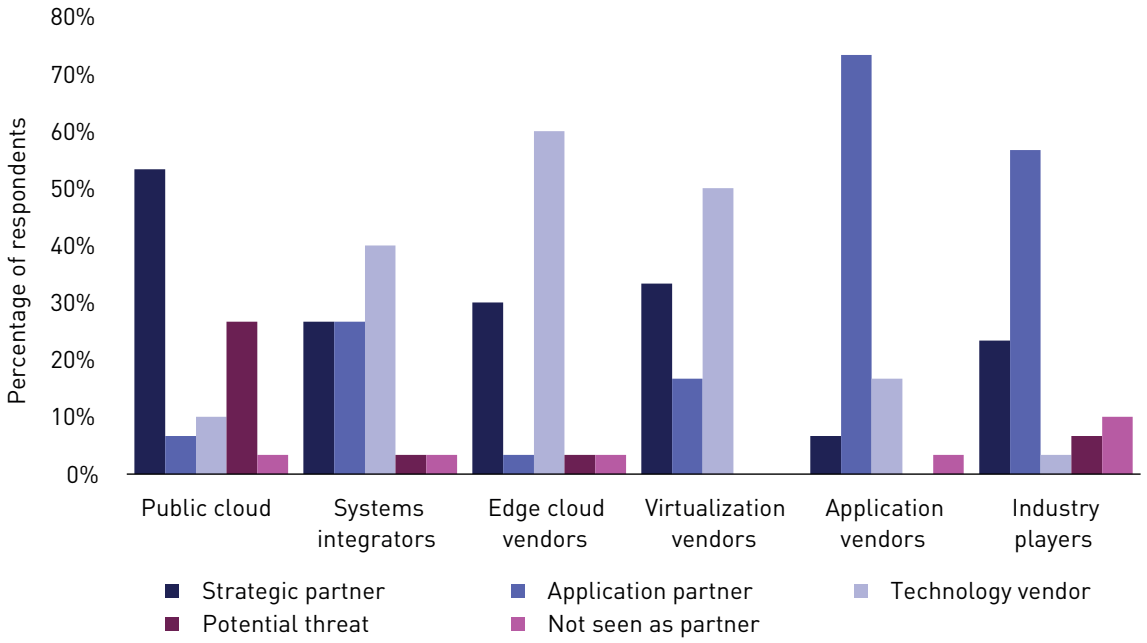


FIGURE 11: OPERATORS' VIEW OF OTHER PLAYERS IN THE EDGE COMPUTING MARKET, WORLDWIDE, 2020 [SOURCE: ANALYSYS MASON, 2020]



Operators are generally positive about collaborating with public cloud providers because they can benefit from these players' existing global presence, developer ecosystems and highly automated and efficient cloud platform technologies. In fact, a significant number of operators have already forged partnerships with public cloud providers (KDDI, SK Telecom, Verizon and Vodafone have partnered with AWS Wavelength and AT&T and seven other operators including Etisalat, NTT Comms, Rogers, Telstra and Vodafone have partnered with Microsoft Azure). However, a significant portion of operators (27%) consider these players to be potential threats to their edge computing business because public cloud providers are also potential competitors to operators in many layers of the value chain.

Figure 12 shows that there are significant regional variances in operators' attitudes towards public cloud providers. Most operators in North America (70%) view public cloud providers as strategic partners, and some consider forming technology (20%) and application partnerships (10%) with them. This is perhaps not surprising because many operators in North America have left the public cloud (IaaS and PaaS) market and are already in close co-operation with public cloud providers (AWS, Azure, GCP and IBM) to move their IT and enterprise workloads to public clouds. Edge provides an opportunity to extend these partnerships into new service areas. The majority of operators in Asia–Pacific (70%) take a similar stance to strategic partnerships with public cloud providers as those in North America. However, a significant number of operators in Western Europe (50%) and Asia–Pacific (30%) consider public cloud providers to be a threat. This may be because several large Tier-1 operators in these regions still provide public cloud services and maintain private clouds. Unlike their North American counterparts, they see themselves as competing with public cloud providers on some level and this may influence their edge computing decisions.

Follower operators in all regions take a more co-operative approach to public cloud providers than first movers. Indeed, around 76% of follower operators are planning to form strategic or technology partnerships with public cloud providers compared to 55% of first movers. The remaining first-mover operators (45%) regard public cloud providers as potential threats. This may indicate that the number of operator–public cloud provider collaborations for edge will grow as follower operators progress to the deployment phase.

FIGURE 12: OPERATORS' VIEW OF PUBLIC CLOUD PROVIDERS IN THE EDGE COMPUTING MARKET, BY REGION, 2020
[SOURCE: ANALYSYS MASON, 2020]

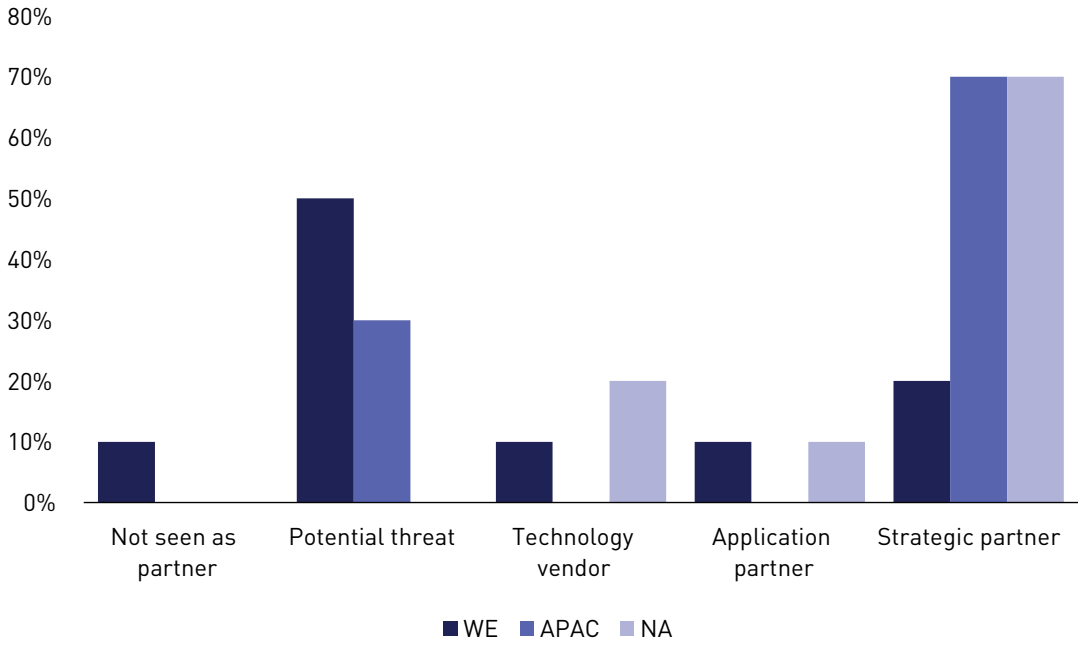


Figure 13 illustrates operators' primary strategies for building edge computing developer ecosystems. The majority of operators (43%) plan to prioritize working with other operators and service providers to foster an edge developer ecosystem. A growing number of industry initiatives (such as ETSI MEC, LF Edge Foundation and GSMA Telco Edge Cloud) are working on creating global developer frameworks and toolkits to attract developers to operator edge cloud platforms.

However, 23% of operators prefer to concentrate on creating their own, differentiated ecosystems, which is not an easy task due to the significant amount of time and resources required. It is mainly first-mover operators that plan to pursue such a strategy (Figure 14). We believe that this may be due to the following factors.

- Industry initiatives have not yet yielded unified, de-facto developer frameworks that these first-mover operators can readily adopt to foster large ecosystems.
- Public cloud providers or other existing developer ecosystems may not be attractive or mature enough for these operators.
- A high-level of competition between operators in certain markets (especially on 5G) may prevent fruitful collaborations.

FIGURE 13: OPERATORS' PRIMARY STRATEGIES FOR BUILDING DEVELOPER ECOSYSTEMS, WORLDWIDE, 2020 [SOURCE: ANALYSYS MASON, 2020]

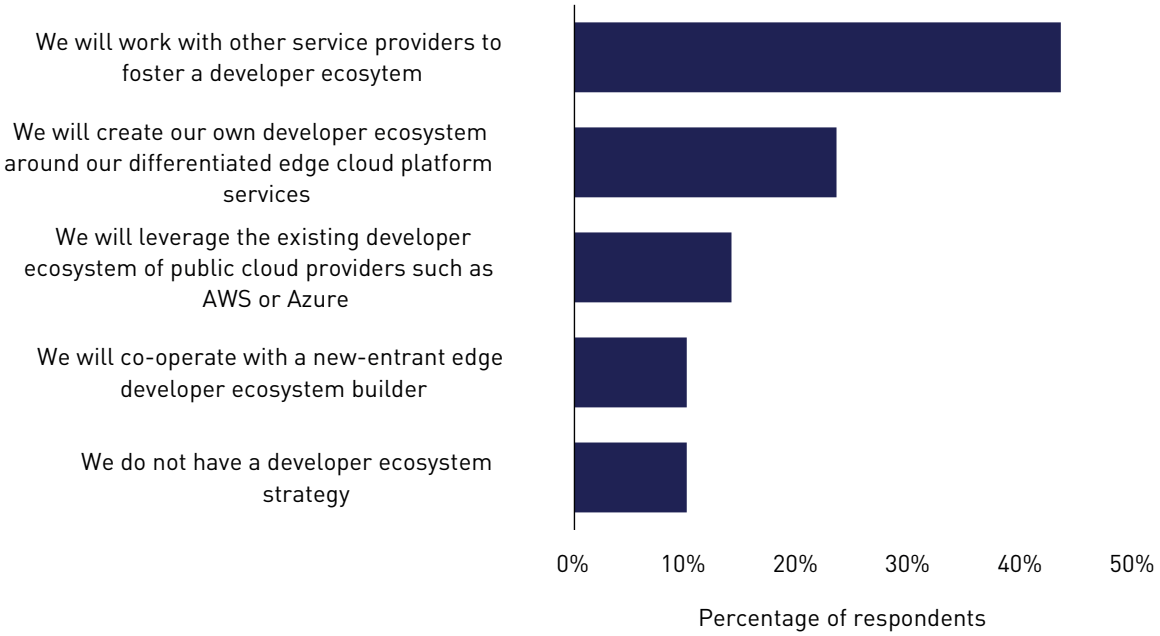
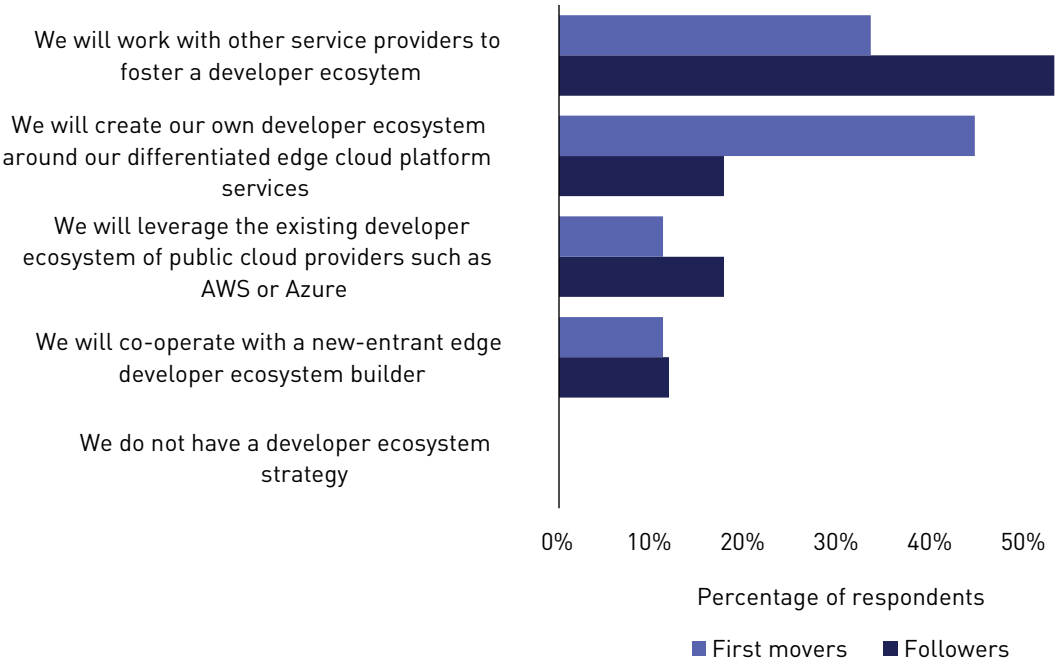


FIGURE 14: OPERATORS' PRIMARY STRATEGIES FOR BUILDING DEVELOPER ECOSYSTEMS BY OPERATOR TYPE (FIRST MOVERS AND FOLLOWERS ONLY), WORLDWIDE, 2020 [SOURCE: ANALYSYS MASON, 2020]



Only 14% of all operators surveyed are planning to rely mainly on the existing developer ecosystems, despite the strong interest in partnerships with public cloud providers. This may indicate that many of the operators that are looking to collaborate with public cloud providers want to cultivate larger ecosystems and maintain a degree of control over them. Similarly, only a small proportion of operators (10%) are considering co-operating with a new-entrant edge developer ecosystem builder (for example, Mobiledge X) as their primary strategy.

5 Conclusions and recommendations

Edge computing is quickly becoming a reality for operators; first-mover Tier-1 operators are leading the way with early deployments, and many others are firming up their strategies and plan to deploy soon. Operators are taking different paths towards building their edge infrastructure, and there are various primary business drivers, implementation strategies and partnership approaches. Several commercial and technological obstacles to fulfilling the potential of the edge computing opportunity have been discussed in this paper, but overall, operators have strong ambitions to join the edge computing market and expect to take significant roles in the emerging edge computing value chain. We provide the following recommendations to operators based on the survey results discussed in this paper.

- **Network technology-driven operators should avoid becoming locked in to vertically integrated, vendor-specific 5G and edge computing technology stacks and should instead aim to build open, horizontal edge platforms.** These operators' edge deployments will initially be dictated by their 5G/RAN architectural choices, but they must also have a plan to run new edge applications along with their network functions, for example in a MEC environment. Having common and disaggregated edge platform architecture with the ability to place and orchestrate any workload across multiple, distributed edge clouds with proper security measures in place will be critical to maximizing their service revenue opportunities and infrastructure utilization and exposure.

- **Operators should consider a multi-phase strategy whereby they prioritize the use cases that are most aligned with their current assets, locations, capabilities and customer bases to secure new revenue and cost savings immediately.** This applies even more to the operators that find it challenging to justify the business case for early edge investments because they cannot factor them into a 5G roll-out budget. They will need to investigate and trial many use cases, which requires them to adopt a fail-fast mindset and develop more organizational appetite for risk. They can then extend into a broader set of services, especially the higher-value enterprise/IoT services, as they mature, using partnerships with key vertical market players and later on, 5G networks.

- **Operators should consider a two-pronged ecosystem strategy in the early stages of their edge computing journey in order to minimize risk.** They should initially continue working with other operators to collectively build a global, unified application development framework and APIs to attract a critical mass of developers. A reduction in market fragmentation (through the consolidation of operator edge initiatives) will be required for this to be successful. Operators must simultaneously consider forging partnerships with public cloud providers. This option can help operators to achieve a quick time to market and benefit from public cloud providers' well-established developer ecosystems, but operators must assess how much control and value they are prepared to cede to their partners.

- **Operators should look for edge vendor partners that can not only provide the essential security, operationalization and orchestration capabilities, but also bring relevant industry knowledge, expertise and professional services.** This would help them to tailor their edge clouds for specific industry requirements so that they can realize their vertical market services ambitions.

6 About the author

Gorkem Yigit (Senior Analyst) is the lead analyst for the Digital Infrastructure Strategies and Video and Identity Platforms research programmes. His research focuses on the building blocks, architecture and adoption of the cloud-native, disaggregated and programmable digital infrastructure and networks that underpin the delivery of 5G, media and edge computing services. He also works with clients on a range of consulting projects such as market and competitive analysis, business case development and marketing support through thought leadership collateral. He holds a cum laude MSc degree in economics and management of innovation and technology from Bocconi University (Milan, Italy).

This whitepaper was commissioned by Cisco. Analysys Mason does not endorse any of the vendor's products or services.


mirror_mod.
mirror_mod.
mirror_mod.
elif _operation
mirror_mod.
mirror_mod.
mirror_mod.
#selection
mirror_ob.select=
modifier_ob.selec
bpy.context.scene
print("Selected"