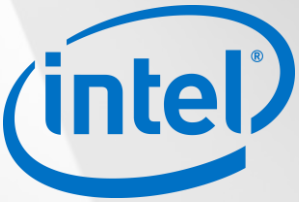
Independent market research and competitive analysis of next-generation business and technology solutions for service providers and vendors

HEAVY READING WHITE PAPER

Transforming the Edge: The Rise of MEC

A Heavy Reading white paper produced for Intel



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INTRODUCTION

There is little debate that the telephony services delivery model has undergone a formative change in the past two decades. Driven by the initial shift to IP-fueled data services, this was inevitable. While the precise evolution phases are hard to definitively establish, benchmarks can be defined and even tied to how we refer to service providers.

For example, along the way we have seen traditional naming conventions, such as telco, service provider and network operator, supplanted by more progressive names, such as communications service provider (CoSP) or even digital service provider (DSP). This change is largely driven by a new virtualized cloud-based service model that is reshaping the industry on every level.

While this innovative communications model is still being defined, the cadence of change continues to escalate. But even in this change-driven realm, it's clear that the future of communications will rely heavily on edge computing.

While, conceptually, edge computing is not a new approach, what is new are technologies like network functions virtualization (NFV) and related distributed cloud radio access network (RAN) architectures, such as 5G, which are enabling delivery of low-latency services on a level not even considered feasible five years ago.

Given these synergies, the formal concept of edge computing emerged initially in a mobile context. The focus here was to apply virtualization to the RAN, to reduce costs, support elastic scale and to "open-up" the RAN. Hence the initial *mobile* edge computing (MEC) moniker when standardization commenced in 2014. However, since then the focus has shifted to leverage highly-scalable edge computing in the enterprise and fixed networks, which drove a redefinition of MEC to *multi-access* edge computing.

Adoption of this broader definition has also enabled MEC to achieve strategic imperative status among progressive CoSPs. Still, given the number of competing technologies, understanding MEC from a driver, timeline and even implementation challenges perspective is important for assessing long-term adoption and sustainability.

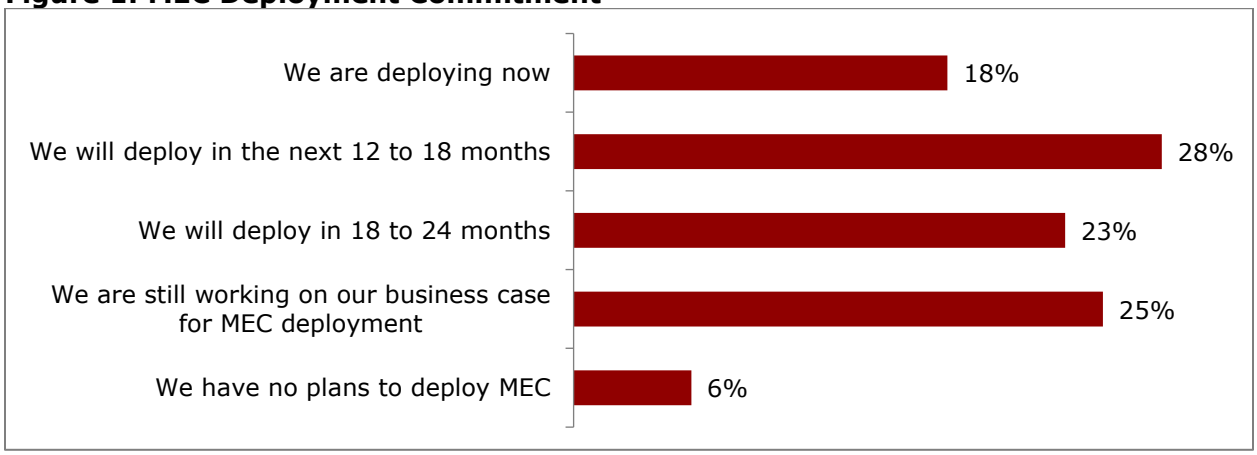
Therefore, in the fourth quarter of 2017, Heavy Reading, in conjunction with Intel, undertook the creation and execution of a global survey designed to assess CoSP perceptions and commitment to MEC. The key findings from the survey are documented in this white paper.

THE RISE OF MEC

While MEC promises to usher in an era of scalable and open-programmability at the edge, as with any technology, the true test of longevity beyond the "hype cycle" is the commitment to implement. This was the starting point for our research.

In this regard, as depicted in **Figure 1**, there is a very strong level of commitment to implement MEC. In fact, 18% of CoSPs are currently deploying MEC, with 28% planning to deploy in the next 12 to 18 months, followed by 23% that plan to deploy in an 18- to 24-month window. This translates into a 69% deployment rate within 24 months. Another strong endorsement is that only 6% of respondents have no plans to deploy MEC.

Figure 1: MEC Deployment Commitment

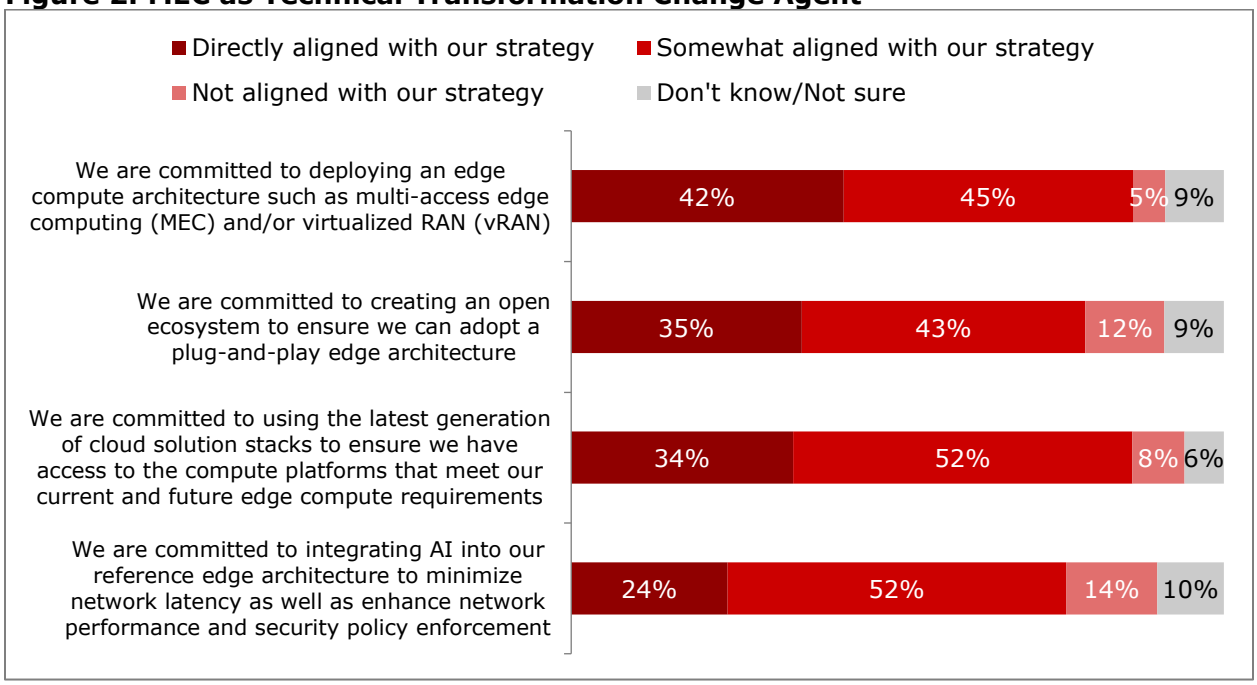


Question: When does your company plan to start deploying MEC? (N=107)
Source: Heavy Reading: Intel Custom Survey Q417

One reason we believe there is such a strong level of deployment support is that MEC is technically transformational since it is aligned with and embodies the programmable and distributed spirit of the cloud. Thus, CoSPs must also accept that openness is a key transformational tenet of an effective implementation strategy. By so doing, CoSPs can create a template that can be reused with other complementary edge use cases.

Of these, as depicted in **Figure 2**, MEC is complementary to use cases such as virtualized RAN (vRAN), which is leading the way.

Figure 2: MEC as Technical Transformation Change Agent



Question: To what extent do each of the following statements align with your company's network transformation strategy? (N=105-107)
Source: Heavy Reading: Intel Custom Survey Q417

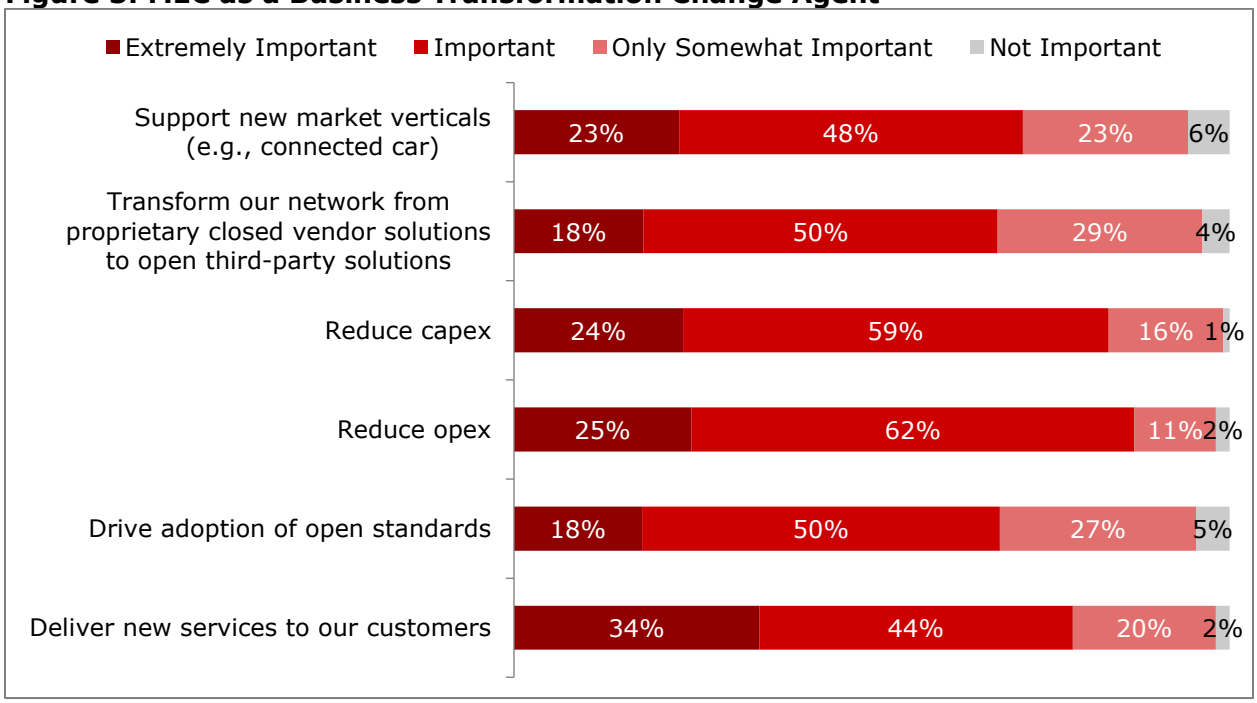
While 42% of respondents view vRAN as directly aligned with a transformation strategy, in this emerging edge intertwined world, other use cases and edge capabilities represent key network transformation components, as well. For example, as illustrated, open ecosystem (35%) and access to most current platforms (34%) are also *directly aligned*, which reinforces the universal and holistic value proposition of openness at the edge.

It's also important to note that support of artificial intelligence (AI) integration achieved solid support. As captured in the figure above, 24% of the survey respondents assessed AI as directly aligned with their network transformation strategies. This is significant in that it confirms that many CoSPs have made the connection between AI and edge computing and are focusing on leveraging AI to enhance automated processes and analytics data interpretation necessary to support ultra-low latency application delivery and to alleviate network congestion in core data centers.

In addition to driving technical transformation, MEC is also a business transformation change agent. This relationship is captured in **Figure 3**, based on the percentage of CoSPs that view MEC as *extremely important* on several business levels. Of these, two of the four highest-ranked business factors are service-focused (34% for new service delivery and 23% for supporting new market verticals). The others in the top four are the opportunity to leverage MEC to reduce opex (25%) and capex (24%).

Closely behind are the opportunity to utilize MEC to foster adoption of open standards and open third-party vendor integration (both 18%). Based on this input, it's clear that attributes, such as openness, will play a major role in the execution of both business and technical edge transformation strategies.

Figure 3: MEC as a Business Transformation Change Agent



Question: Please rate the importance of the following business factors in driving your company's multi-access edge computing (MEC) deployment strategy. (N=102)
Source: Heavy Reading: Intel Custom Survey Q417

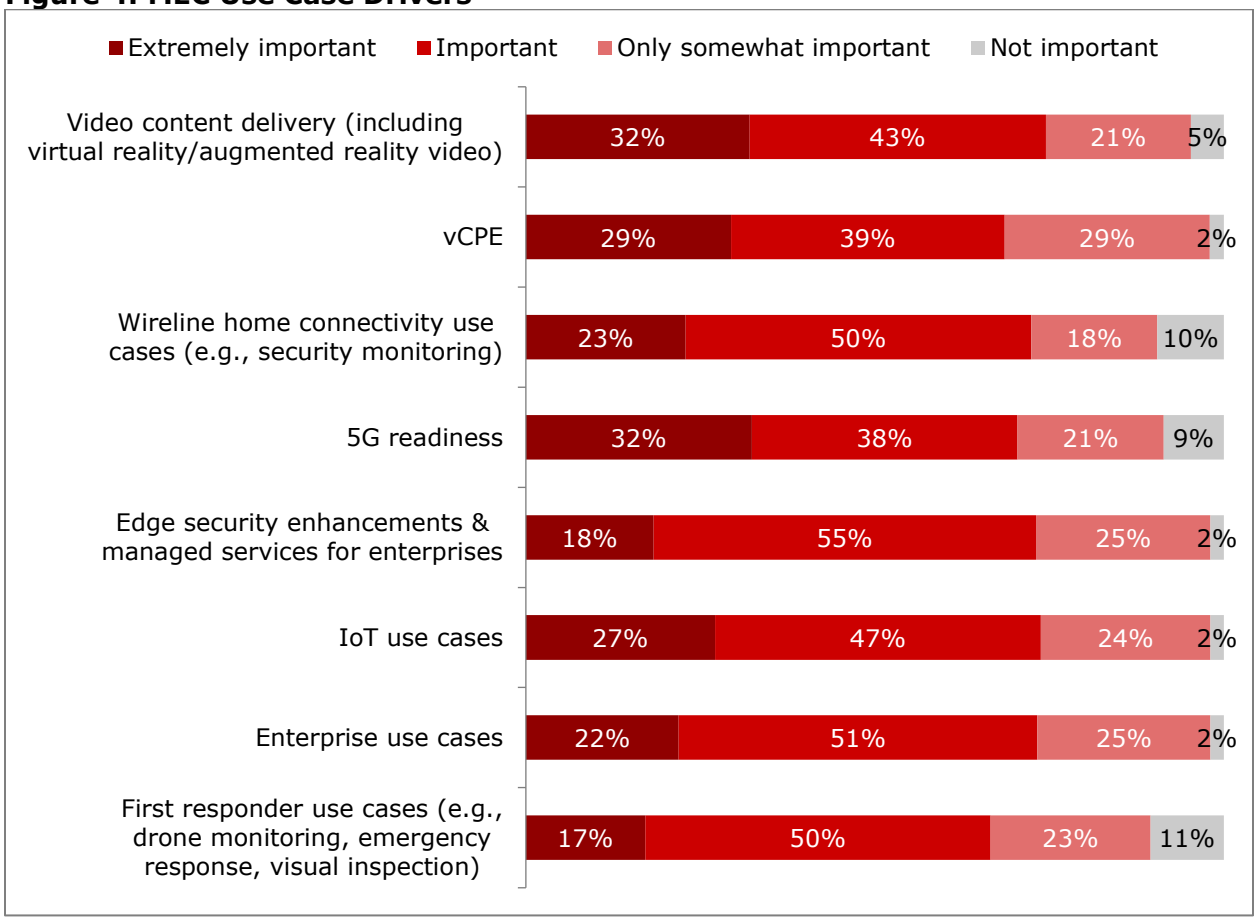
DEPLOYMENT DRIVERS & USE CASES

As noted, MEC's scope has been extended to include *multi-access* use cases, in effect becoming technology-agnostic. In order to gauge importance beyond the mobile realm, we requested the survey respondents to weigh fixed, mobile and enterprise use cases.

The input depicted in **Figure 4** reinforces that the momentum of MEC now extends well beyond mobile in part because MEC's low latency application model is crucial for baseline service capabilities, such as video delivery, which is germane to mobile, fixed and enterprise markets.

For instance, as illustrated, the close grouping of *extremely important* response levels confirms that CoSPs see a broad range of both fixed and mobile high-value use cases. Of these, the top six are 5G readiness and video content delivery (both 32%), then virtual customer premises equipment (vCPE) (29%), Internet of Things (IoT) use cases (27%), wireline home connectivity (23%) and enterprise use cases (22%).

Figure 4: MEC Use Case Drivers



Question: Please rate the importance of the following use cases in driving your company's MEC deployment strategy. (N=102-107)
Source: Heavy Reading: Intel Custom Survey Q417

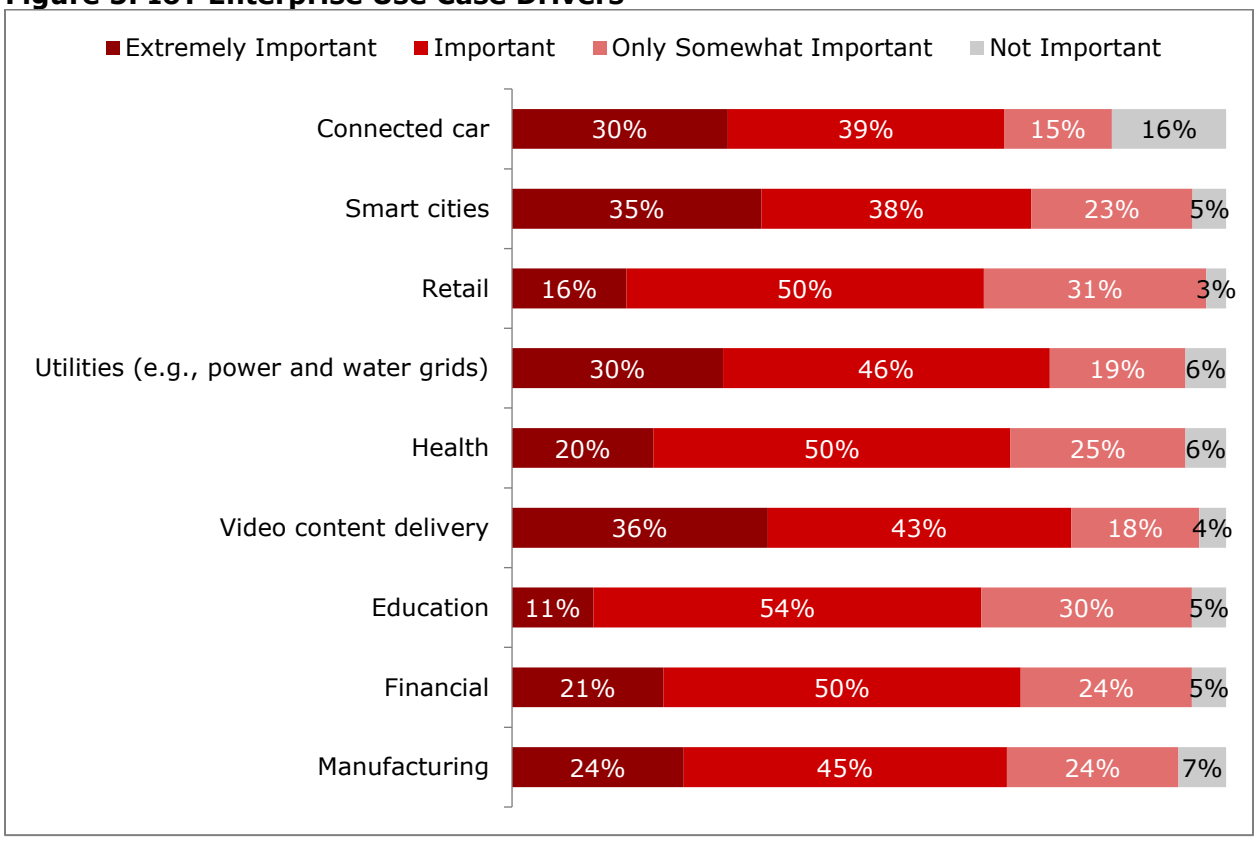
This impact of MEC on enterprise use cases must also be noted since the enterprise itself is undergoing a profound transformation predicated on programmability and third-party

application integration, driven in large part by the IoT opportunity. Thus, enterprise applications like the cloud will not be able to thrive, scale and gain the market reach necessary if they continue to be based on proprietary implementations.

As depicted in **Figure 5**, in terms of specific IoT use cases driving MEC, the top four highest-value use cases based on *extremely important* response levels are video content delivery (36%), smart cities (35%) and utilities and connected car (both 30%).

These rankings are significant since these use cases represent massive business opportunities for CoSPs and are very well suited to support via an MEC deployment. The relationship between these use cases and MEC also provides further insight into MEC attaining such a high level of implementation commitment (see **Figure 1**).

Figure 5: IoT Enterprise Use Case Drivers



Question: Please rate the importance of the following enterprise IoT use cases in driving your company's MEC deployment strategy (N=104-106)
Source: Heavy Reading: Intel Custom Survey Q417

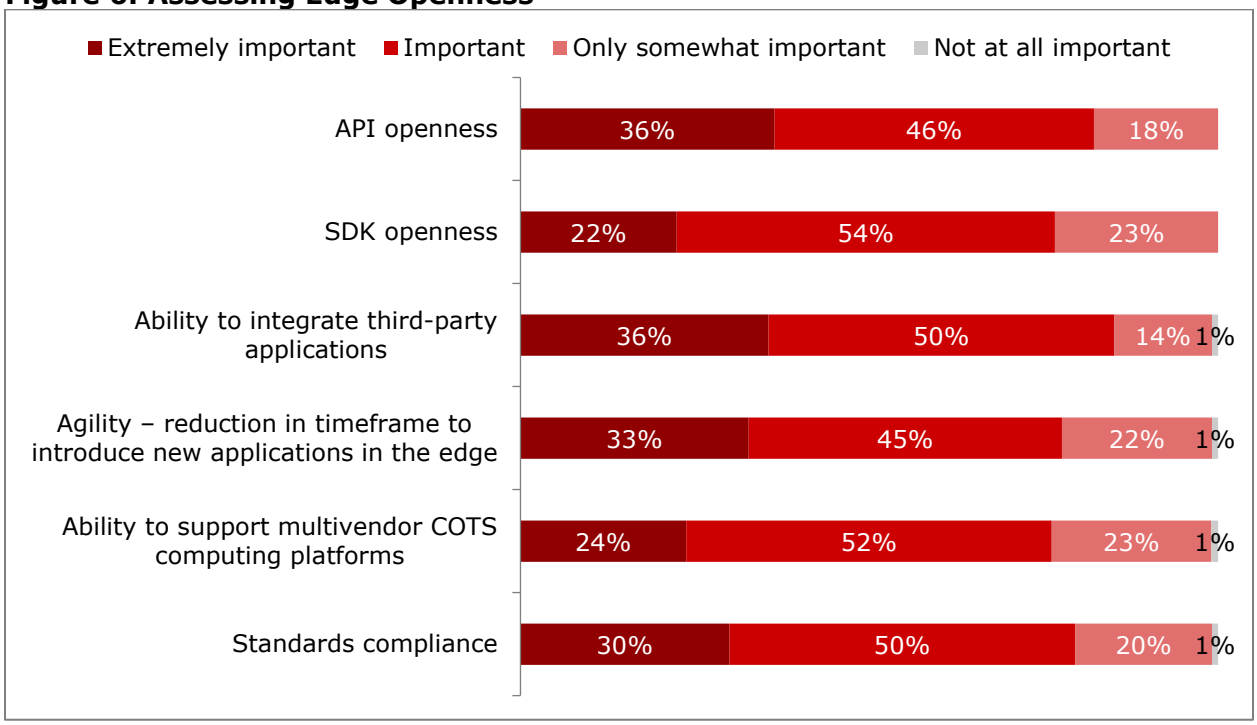
ASSESSING OPENNESS

Unquestionably, one of the greatest value propositions of MEC is its openness. However, assessing openness can be a complex undertaking. Accordingly, we asked the CoSP survey respondents to gauge a broad range of openness indicators encompassing application programming interfaces (API) to integration timeframes.

As depicted in **Figure 6**, not surprisingly, CoSPs consider multiple factors almost equally when assessing edge network openness. The top four rankings based on *extremely important* responses are API openness and ability to integrate third-party applications (both 36%), followed by application agility (33%) and standards compliance (30%). This is significant because we believe that these attributes when aggregated into a transformation strategy deliver multiple ways to truly assess openness, which will be key since each edge deployment will be unique.

Interestingly, the ability to support multivendor commercial-off-the-shelf (COTS) computing platforms also scored highly, based on *extremely important* (24%) and *important* (52%) responses, which reinforce that open hardware COTS platforms are also a central consideration in assessing openness. On an aggregate level, the only logical conclusion that can be reached from this input is that openness equally applies to both software-based APIs and the platforms they run upon.

Figure 6: Assessing Edge Openness



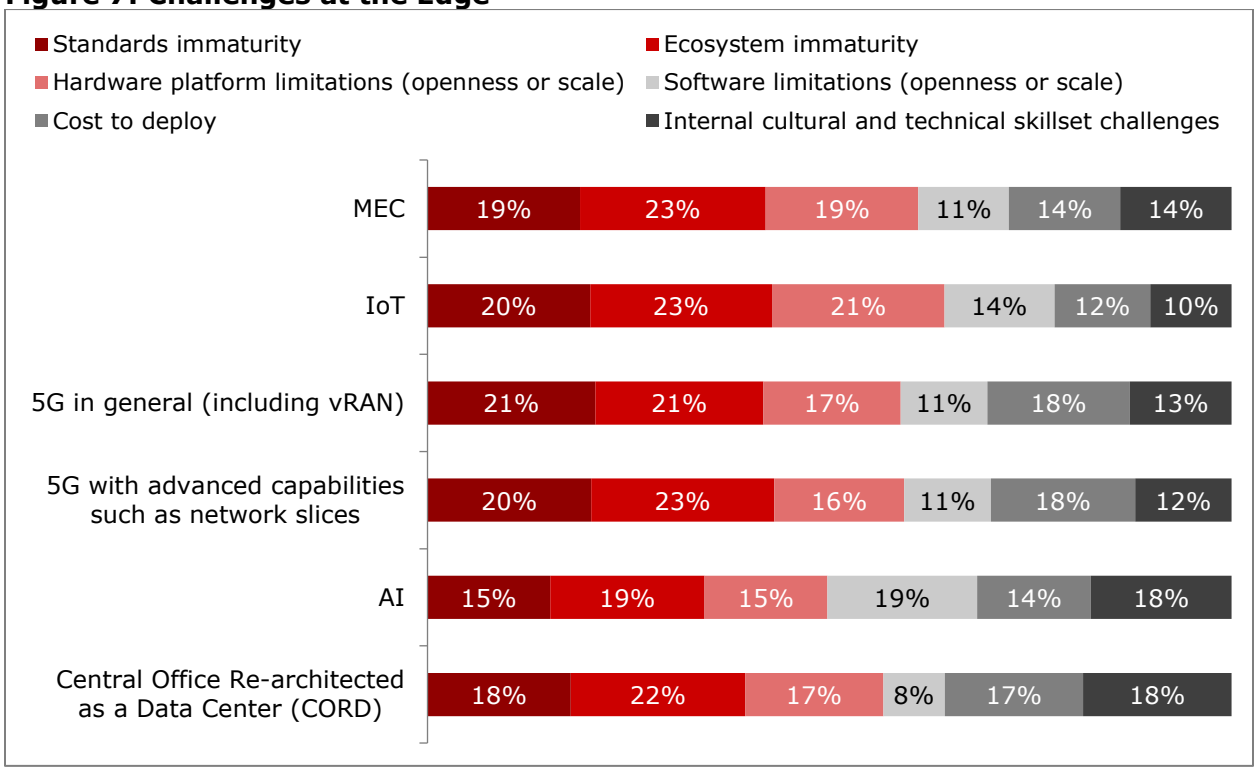
Question: Please rate the importance of the following attributes in assessing the openness of your edge network. (N=105-107)
Source: Heavy Reading: Intel Custom Survey Q417

IMPLEMENTING EDGE TECHNOLOGIES: CHALLENGES & NEXT STEPS

While CoSPs are committed to deploying MEC and possess a well-balanced view of the steps for evaluating openness, realizing an open and scalable edge cloud requires that vendors and other ecosystem partners deliver products that comply to the requisite openness requirements.

These vendor dependencies apply not only to MEC, but to any edge-based technology. And CoSPs share a similar view: For instance, as depicted in **Figure 7**, technologies such as 5G, AI, IoT and Central Office Re-architected as a Data Center (CORD), which rely on edge computing foundationally, all share several common implementation challenges. The top three here are ecosystem immaturity (19%-23%), hardware platform limitations (openness or scale) (15%-21%) and standards immaturity (15%-21%).

Figure 7: Challenges at the Edge



Question: What are the biggest challenges your company faces in implementing the following technologies? (choose all that apply) (N=102)
Source: Heavy Reading: Intel Custom Survey Q417

In many respects, the data captured in this figure also closes the feedback loop. This is because the CoSPs' top implementation challenges have a strong level of alignment to the attributes that CoSPs will rely upon to measure openness (see **Figure 5**), which reinforces that openness at the edge is a foundational element for all the innovative emerging edge technologies.

Consequently, the message is clear: CoSPs expect open software, hardware and standards-compliant edge solutions from their partners and failure to deliver them will not only introduce formidable implementation challenges, it will also negatively impact their ability to truly transform the edge of their network.

In response, the vendor community is now bringing to market commercial products that are truly open and standards-compliant, with key specifications developed by ETSI, ONF, MEC and ONF. One such vendor is Intel, which is strongly focused on enabling successful MEC and edge deployments through the delivery of open software and hardware edge compute platforms that are fully standards-compliant.

CONCLUSION

CoSPs are in the throes of an edge-driven generational business and technology transformation. It's generational because the process, once completed, will indelibly alter service delivery models, cost structures and even vendor and ecosystem partner relationships.

And while some CoSPs may lament that the edge compute model disrupts traditional business models and is constrained by opaque boundaries, as we have documented in this report, many progressive CoSPs are embracing edge compute technologies, such as MEC, as representing new opportunities to effect real and transformative change.

Moreover, the research presented captures that many CoSPs have a well-balanced and realistic view of the drivers, use-case manifestations, and even the implementation challenges. And while edge implementation challenges should not be understated, the positive news is that many of the challenges can be mitigated by embracing basic principles grounded in the support of open and standards compliant hardware and software.

Since MEC embodies these attributes, CoSPs are cognizant that deploying MEC will play an invaluable role in grounding and driving openness in the implementation of other strategic and complementary technologies, such as IoT, CORD and even AI.

ABOUT INTEL

By transitioning to a new generation of open networks based on flexible and optimized industry-standard servers, today's networks can become cloud-optimized and more automated, meeting next-generation performance and functionality demands from the core to the edge. Intel is leading this network transformation with proven technology platforms that deliver the capabilities for high-performance, efficient, scalable and agile 5G-ready networks. Learn more at www.intel.com/network.

Additionally, Intel is championing broad ecosystem initiatives to address the requirements introduced by edge computing. To this end, Intel has established Intel® Network Builders, an ecosystem of independent software vendors (ISVs), operating system vendors (OSVs), original equipment manufacturers (OEMs), telecom equipment manufacturers (TEMs), system integrators and communications service providers designed to accelerate the adoption of network functions virtualization (NFV)- and software-defined networking (SDN)-based solutions in telecommunications networks and public, private enterprise and hybrid clouds. https://networkbuilders.intel.com