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edge-computing

Edge deployment strategies for communications service providers

2023 edition

Contents

Introduction

Communications Service Providers (CSPs) are looking for new revenue sources to grow their business. In particular, the growing appetite of enterprises for IT and communication services promises new revenue streams. 5G and edge computing create opportunities for CSPs to bring processing power and storage closer to where the data is being generated and consumed.

The total edge computing addressable market will grow at a CAGR of 48 percent to USD 445 billion in 2030 [1]. With the ability to handle demanding requirements on scalability, security, availability, low latency and bandwidth, edge computing unlocks enormous new opportunities for CSPs in terms of optimal placement, quality of service, data protection and more.

Today, the top three edge markets for CSPs are manufacturing, gaming & entertainment, and healthcare [2]. The leading use cases across those markets are real-time analytics, autonomous and connected vehicles [3], and robotics.

Collaboration of players in the ecosystem will be crucial to stimulate infrastructure investment and unlock the value of edge computing. Several ecosystem partners are required to build small, demand-driven innovations on top of existing digital infrastructures. However, the ecosystem is fragmented and evolving fast. Many technical solutions such as interfaces, standards and business models are not yet fully set.

Opportunities for edge computing can be found at enterprise premises such as factory buildings, in homes and vehicles including trains, planes, and private cars. Many use cases require various applications to be deployed at different sites, and the innovation rate in this part of the ecosystem will be significant going forward.

Third-party applications from players with specific vertical industry knowledge are key to driving the edge application ecosystem. It is therefore critical that edge infrastructure is accessible to third-party application providers and developers to enable a multitude of applications each with specific characteristics and needs.

This paper describes edge computing from a CSP perspective, how the ecosystem looks, which go-to-market (GTM) models a CSP can choose, which key functions need to be considered, how standardization efforts are progressing and which strategy recommendations can be derived.

It is based on our insights gained through extensive collaboration with key players in the edge computing ecosystem and builds on the 2020-published paper "Edge computing and deployment strategies for communication service providers" [4].

The edge ecosystem

CSPs must take a holistic end-to-end view on the requirements and the ecosystem to determine who best to partner with for a specific use case.

The edge ecosystem is broad, highly fragmented and comprises a vast number of different players, including:

- CSPs, bringing robust and flexible connectivity with intelligent traffic routing from the mobile network to the optimal location of the application and having a significant number of distributed sites.
- Hyperscale cloud providers (HCPs) and data center providers (DCP), building and operating global and distributed cloud infrastructure to run enterprise workloads, as well as having established developer ecosystems and service marketplaces.
- Network vendors, providing connectivity infrastructure, software, and related services to CSPs.
- Systems integrators (SIs), providing professional services to the end customer (the enterprise), having in-depth knowledge on the existing IT and OT landscape of the enterprise and the ability to connect all involved pieces together.
- Operations technology (OT) vendors, developing specific industry-related platforms and applications and having strong enterprise relationships.
- Applications developers, creating the software that runs on edge computing infrastructure. Ideally, they can deploy and manage their applications in a flexible and scalable way.
- Device manufacturers, providing different types of devices to the enterprise, from wireless routers to automated guided vehicles.
- Enterprises, being the customer or user that benefits from the ecosystem and edge computing solution put in place.

The ecosystem orchestrator and the use case will determine which combination of ecosystem players will be the most optimal fit for purpose. The orchestrator is customer- or beneficiary-facing and requires both a meaningful contribution and the capability and interest to bring together all the required stakeholders.

SIs that have the trust of the enterprise and the in-depth knowledge of the enterprise's OT and IT systems will have a vital role to play in connecting different pieces from various players into a single solution.

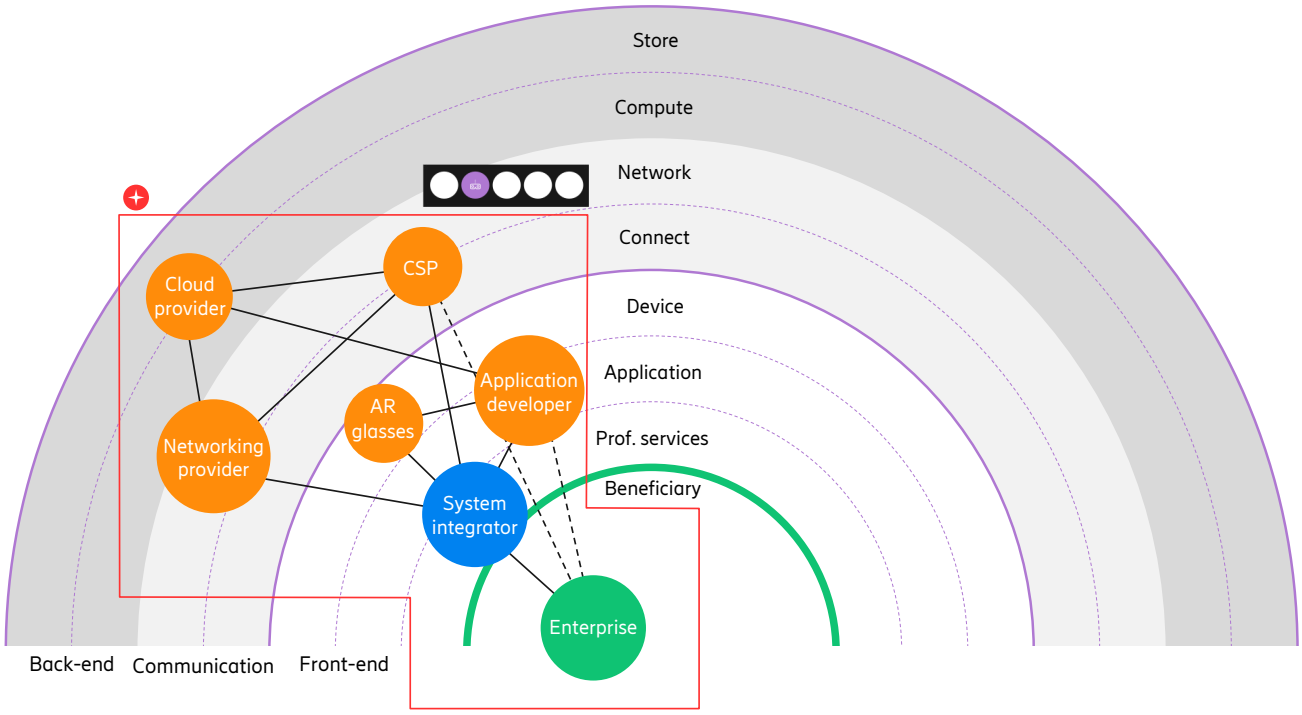
With a huge range of players who have invested in different areas, understanding the ecosystem is critical for CSPs to determine who best to partner with.

CSPs must take a holistic, end-to-end view of the requirements and the ecosystem. For example, if a combination of ecosystem players proves to be the best choice for a relatively centralized use case, an entirely different set of players might be required for a more distributed deployment.

Ecosystem example: Industrial application for Augmented Reality (AR)

The need for ecosystem agility can be illustrated through the example of an industrial AR application. In such a scenario it is likely that the CSP will only be responsible for certain elements such as network connectivity and distribution. However successful realization of the use case requires a combination of expertise across different domains. A device vendor for AR glasses, a range of software developers that provide applications, rendering, and content and a SI that can enable the applications to run on a certain infrastructure.

Today's lightweight AR glasses typically are tethered to a companion device like the smartphone where compute is offloaded. In the long term, we expect that AR glasses will be standalone connecting directly to the 5G network, offloading rendering to the edge of the network especially in wide area mobility scenarios.



Players and relationships
- Orchestrator
- Contributor
- Beneficiary
- Value exchange

Ecosystem maturity
- Pioneering
- Replicating
- Replicating at scale

5 lenses
1. Process
2. Thing
3. Place
4. Technology
5. Industry

Figure 1: Ecosystem map example for an industrial AR application; the systems integrator acts as a one-stop-shop to the enterprise. Analysis based on ecosystem evolution framework.

Edge locations

While HCPs expand the extended public edge, CSPs need to consider how to complement their infrastructure with HCPs to secure their role as an edge computing provider otherwise risk losing a share of the value chain.

Lower latency and data sovereignty are two of the key value propositions of edge compute. This can only be achieved when distributed compute and storage resources are tightly combined with connectivity.

CSPs have a significant number of distributed sites across regional and local edge locations, the expertise to deliver intelligent traffic routing from the mobile network to the optimal location of the enterprise application. They also have people on the ground and expert knowledge of network topology, network efficiency, device management, and more. With such inherent capabilities, CSPs are strongly positioned to play a leading role in the edge value chain.

To realize those opportunities, CSPs need to have a unifying way of exposing services, as well as orchestration that supports different deployment models. As CSPs deploy cloud RAN, they will also gain experience in managing one of the most distributed applications at the edge. From that perspective even cloud RAN is a telco edge application.

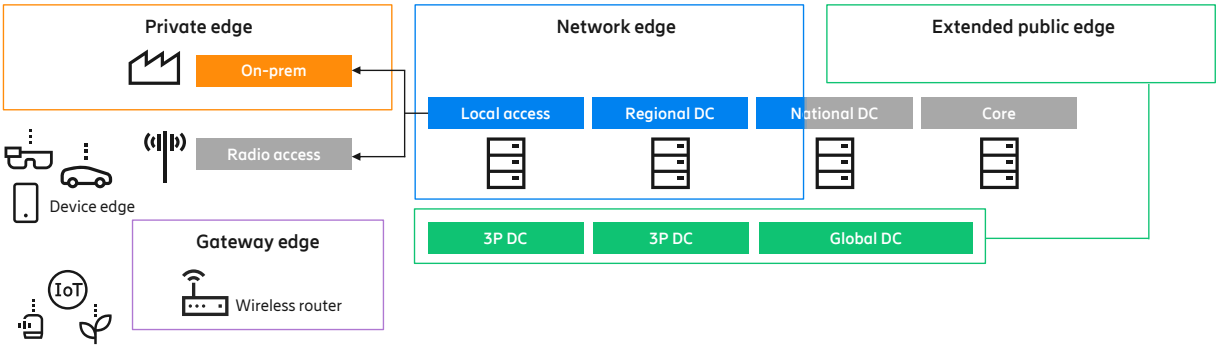


Figure 2: Four main locations to deploy edge computing physical infrastructure.

Gateway edge

Small computing and storage resources are deployed at an enterprise or consumer-facing premises, or within mobile physical objects, for example vehicles.

Private edge

Computing and storage resources are deployed at an enterprise or consumer-facing premises. Edge computing resources can be standalone or integrated with a private network and SD-WAN.

Network edge

Computing and storage resources are distributed across CSP's premises, between national- and local access sites. Edge resources can be standalone or integrated with the mobile cloud (running both telecommunication- and third-party workloads).

Edge compute can be seen as an extension of existing network capabilities – many of which CSPs already have. Cloud and compute services at the network edge leverage the benefits of distributed network architecture to enable CSPs to provide functions and services to edge applications.

The network edge enables enterprises and their ecosystem partners to develop, deploy and manage applications flexibly, enabled through an orchestration logic towards the landing-zone which accesses the distributed cloud and uses network services that are exposed through APIs.

Extended public edge

Computing and storage resources are distributed from central cloud sites located outside CSP premises, for example at a co-location site or HCP data center. Site and cloud infrastructure is owned by HCPs or third-party cloud providers and others, for example CDN/OT/IT players.

CSP go-to-market models

Frontrunner CSPs can pursue both CSP-led and HCP-led go-to-market models in parallel depending on their target segment and strategy.

Edge computing is part of the wider enterprise opportunity for CSPs and an enabler for use cases that can be scaled horizontally to other industries. For example, within IoT, and potentially can be bundled with other industry vertical offerings such as private networks.

CSPs' edge go-to-market (GTM) models are determined by their enterprise strategy. This strategy needs to consider the enterprise landscape in the region and the CSP's assets and offerings beyond connectivity that can be used by enterprises.

There are two main GTM models and both could apply depending on CSP enterprise strategy and segments targeted:

1. CSP-led model: CSP assumes the role of orchestrator and manage the cloud infrastructure themselves.
2. HCP-led model: HCP assumes the role of orchestrator and manages the enterprise relation.

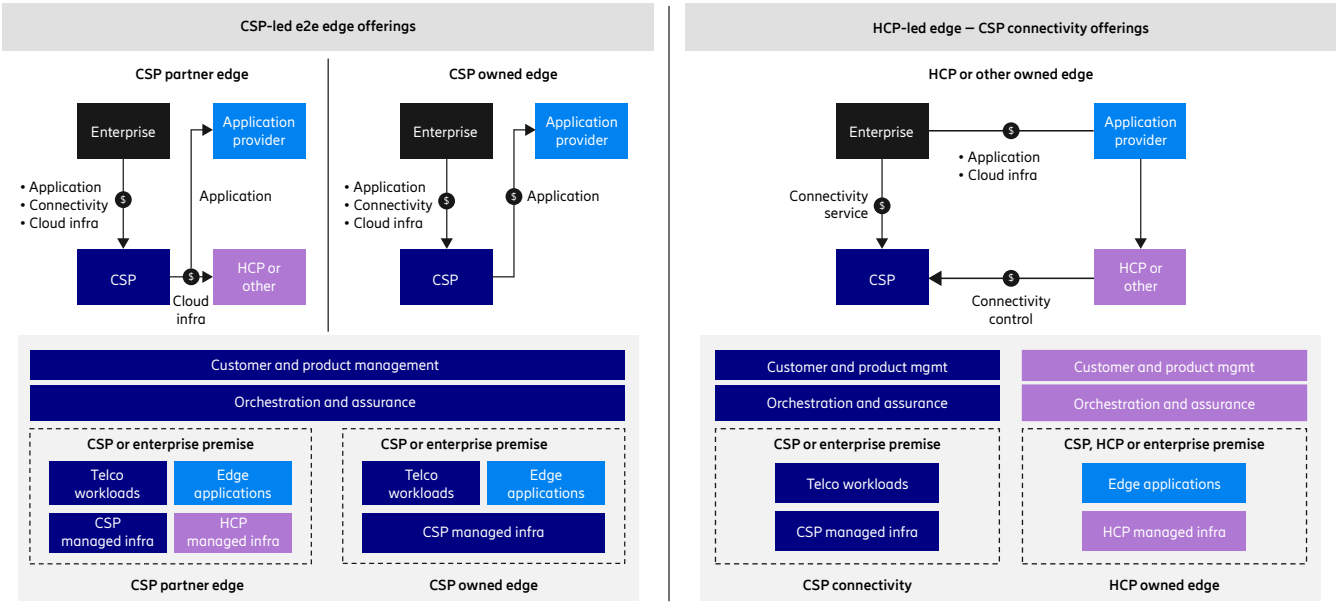


Figure 3: Comparison of CSP-led and HCP-led end-to-end edge models.

CSP-led edge model

In a CSP-led model, the CSP orchestrates the entire enterprise edge solution. In this model, the CSP can choose to partner with one or more HCPs and/or an industry-specific edge application platform provider, for example in gaming, to deliver all end-to-end (E2E) connectivity-based services, including cloud resources and edge capabilities.

Depending on CSP strategy, the telecommunications workloads can also run on HCP-managed infrastructure, through a partner edge solution or an owned edge solution whereby they can manage the cloud infrastructure themselves. Or CSPs could run telecommunications workloads like 5G Core functions on their own infrastructure and third party workloads on HCP infrastructure managed as hybrid cloud by CSP orchestration.

In this model, the CSP has a direct enterprise relation, manages the application lifecycle and delivers connectivity services according to a performance service level agreement (SLA), which can range from latency requirements to network availability.

HCP-led edge model

In an HCP-led model, the HCP orchestrates the entire enterprise edge solution. In this solution, the HCP can choose to partner with one or several CSPs, of which they can install and integrate their infrastructure across one or many CSP networks.

In this model, the CSP delivers the enterprise's connectivity solutions only. The HCP is responsible for sourcing site assets and connectivity services characteristics management, which it can purchase from the CSP directly, and the overall SLA.

Deployment examples

This chapter describes real examples from frontrunner CSPs and their different chosen deployment models for edge computing. The following examples are provided for illustration purposes only. Ericsson has also hybrid cloud engagements with CSPs in Europe and North America, where telecommunications and third party workloads can run together with Ericsson orchestration for non edge compute use cases.

CSP-led (Partner Edge, Private Edge), North America

Verizon has developed a volume-driven edge solution for logistics- and manufacturing enterprises based in the US market. The solution comprises an Ericsson private network and edge computing solution from HCP Microsoft Azure. Both solutions work in parallel to provide low latency or enhanced security and data sovereignty for industrial applications.

In another frontrunning use case, Verizon is partnering with HCP AWS Wavelength to provide edge cloud and compute services at the network edge to support multiple industrial enterprise applications across multiple locations in the US. In the same offering, Verizon is partnering with SaaS providers Couchbase and Confluent to expose innovation capabilities at the network edge for developers.

Sources: Verizon 5G Edge with Private MEC, Verizon and AWS news

CSP-led (Partner Edge, Private Edge), Asia-Pacific

Australian CSP Telstra developed the world's first edge use case for the financial services sector together with Ericsson and the Commonwealth Bank of Australia. The solution helps to reduce the enterprise's IT infrastructure costs at each branch location by offloading IT workloads to the network edge while delivering the required performance for the enterprise's application, including latency, bandwidth, security, and regulatory demands.

The solution has also been scaled horizontally into other industrial sectors, including a use case with construction enterprise Taylor. Here, Telstra deploys wireless routers from Cradlepoint to connect construction sites to Telstra's national 5G network. This is used to support innovative XR enterprise applications, such as a live XR walk-through of a replica model building enabled by application developer HoloLens.

Sources: Telstra CBA Ericsson news, Telstra Taylor case study

CSP-led (Partner Edge, Network Edge), Europe

In a proof of concept, a European tier 1 CSP has successfully delivered an integrated 5G edge solution with E2E network slicing capabilities for a retail enterprise. The solution enables on-demand low-latency E2E services, including faster cloud-based feature deployment and upgrades, and automated assurance of the service level to the enterprises in an easy way. Using the network edge solution also means that the enterprise's data stays local.

HCP-led (Network Edge), North America

Verizon partnered with AWS Wavelength to enable developers to build and deploy applications, as well as manage their workloads, on the CSP network edge. The enterprise relationship is with AWS and they leverage connectivity from Verizon in the US.

Source: Verizon and AWS news

Hybrid model, Europe

Gruppo TIM in Italy has developed a frontrunning hybrid edge use case comprising TIM's cloud infrastructure, Google's Cloud solutions and Ericsson's 5G Core network.

The 5G cloud network uses both HCP services, and TIM's own mobile cloud services. In 2021, Gruppo TIM acquired cloud specialist Noovle to enhance its offering in industrial cloud markets.

Source: TIM press archive

Hybrid model, Asia-Pacific

In Asia-Pacific markets, various CSPs such as SingTel and SKT have developed hybrid edge solutions towards enterprise customers, using their own cloud and compute resources together with connectivity and are also integrated with HCP services. With this set up, they can follow both GTM models CSP-led with partner and own.

Key functions of the edge

To define and deploy edge solutions on the network, CSPs need to consider infrastructure, orchestration, user plane & traffic routing, exposure and services.

Private edge deployments are optimal for enterprise use cases that require high data sovereignty and have limited mobility requirements. This requires relatively less network planning.

Network edge deployments, on the other hand, play a key role in enabling mobility-centric, low-latency use cases by combining compute and connectivity mechanisms. The value for edge computing on the CSP network emerges from the combination of differentiated networking across different technology solutions from HCPs and related infrastructure services.

To define and deploy edge computing solutions on the network, the following key interdependent areas need to be considered.

Infrastructure

A footprint-flexible, efficient, automated infrastructure provides high reliability. To achieve this, edge infrastructure needs to be deployed either on-premises at enterprises or in the CSP network. The latter requires both hosting of telecommunications workloads and third-party/over-the-top applications with limited local management. This can be done either on the same infrastructure or on integrated side-by-side infrastructures.

Infrastructure can be built by CSPs either using components of the stack from different vendors or relying on a single vendor to deliver an integrated infrastructure stack. The infrastructure can also be delivered by HCPs as-a-service, either on premises (from national sites to local access or enterprise sites) or as part of their public cloud offering (located primarily across national sites but extending to local access sites through local or edge zones).

For on-premises deployments there are different options:

a. Use a vendor-specific cloud with a full stack that is verified by the network vendor. Typically, they are limited to vendor applications meaning applications from other providers will have limited support.

b. Use a 'best-of-breed' approach comprising different providers across the stack layers. This is vendor application agnostic to a certain extent, however requires heavy integration effort.

c. Use HCP on-premises solutions, fully verified and managed by the HCP with a common, replicated blueprint across deployments.

To run diverse applications, the infrastructure needs to support multi- and hybrid-cloud. The orchestration layer needs to manage the deployment of workloads across the hybrid infrastructure.

Orchestration

Orchestration provides smart third-party/over-the-top workload placement and topology discovery, controlling which sites the third-party/over-the-top applications are deployed on, and how they are configured. As the edge is a resource-constrained environment, it is vital to map the topology, considering the capabilities of all different sites across the network, identifying the best location for an application to be placed, and continuously monitoring it for optimum usage.

'Smart Workload Placement' software uses AI to intelligently manage the allocation of capabilities where they are needed most. In other words, it finds that sweet spot where the cost of deploying an application in a multi-cloud infrastructure is matched by the benefits it provides. Dynamic allocation of resources, in other words ensuring that data flows and information are going to the right places, are crucial for the effective operation of applications at the edge – especially in a multi-cloud environment.

Edge connectivity and networking

While infrastructure and orchestration focus on application hosting and environment, edge connectivity and networking bring the information and awareness that sits within the network – the location of the user and what the user is trying to consume.

The user plane function in the core network is the gateway between the network and the application. It is the connection point where the network meets the Internet, and one of the key functions that needs to be distributed to the edge of the network.

If you are deploying the application at a certain location, you need to make sure that the gateway is close by and instruct the network to take the data for that application. CSPs need an agile user plane function, which is scalable to meet the demands of an application and that can be deployed at the site in a plug and play manner.

Enabling traffic termination at the edge site requires controlling traffic routing inside the network using 3GPP mechanisms.

Routing data to the nearest edge location where the application is hosted enables performance demands of the application to be met – delivering a better customer experience.

Exposure and services

Exposure at the edge makes network capabilities available for applications that reside at the edge. Capabilities can include location information, quality of service information or user equipment information. Exposing these capabilities at the edge means that, in low-latency dependent scenarios, application traffic is not required to go back to a central location to access those capabilities.

CSP-led GTM considerations for key functions

To succeed in CSP-led GTM, capabilities across different key functions need to be built that together form a complete end-to-end solution. This requires extensive engagement with the ecosystem.

For CSPs, it is important to engage with a partner that understands the E2E requirements, which can support them to build out the solution and capabilities across the different key functions of the network.

In a CSP-led model, the CSP offering to the enterprise can consist of three potential edge services. Each enterprise deployment could denote a different service bundle.

- Edge connectivity service: the CSP routes the edge traffic to the edge application.
- Edge cloud infrastructure service: the CSP hosts the enterprise applications on CSP-controlled infrastructure.
- Edge application service: the CSP provides right-to-use licenses including lifecycle management for relevant applications.

Infrastructure considerations

In a CSP-led model, the infrastructure for partner- or enterprise workloads is provided by the CSP. It could be owned by the CSP or owned and operated by HCPs but deployed within the CSP- or enterprise premises. In such a scenario, the available infrastructure will be used exclusively for workloads controlled by the CSP meaning that the CSP will decide which workloads will run where.

Orchestration considerations

From an orchestration perspective, such a scenario would constitute a multi-cloud environment. For instance, the CSP would provide a service comprising some applications running on CSP-controlled infrastructure, with other applications running on HCP-controlled infrastructure.

It is likely that CSP orchestration of both network functions and enterprise edge applications will only be applicable in CSP-led GTM models, and not in HCP-led models.

Exposure considerations

Service exposure is an important value enabler for CSPs and provides an opportunity to differentiate their offering. To accelerate innovation and simplify the application developers' interaction with the mobile network, the exposure solution needs to expose APIs both for and at the edge.

Services include discovery of optimal edge sites, hosting and registration of application servers and (re-)selection of application servers based on factors such as network conditions, user equipment location, edge application management etc.

CSPs should work on differentiating themselves across the services, capabilities and characteristics they offer through APIs. Not in the way the services are described or consumed, which is not on the APIs themselves. To make an impact in edge markets, it is in the interest of CSPs to align behind a common global way of interacting with the connectivity services.

Hybrid infrastructure considerations

In a CSP-led approach, we can face deployments where part of the cloud infrastructure is provided by the HCP and used to deploy both network functions and enterprise applications. In this case, we are referring to a hybrid cloud deployment, any combination of CSP and HCP private and public infrastructure environments for the deployment of applications. Hybrid cloud management is needed to efficiently control applications and infrastructure through orchestration, lifecycle management and operations.

In such hybrid cloud scenarios, the CSP service and resource orchestration provides the capabilities to manage and orchestrate the CSP integrated cloud and mobile network cloud stacks (both integrated and HCP-provided) in more central locations. The architecture supports management capabilities for network functions and edge applications if they are part of the CSP catalog. The management capabilities comprise orchestration, lifecycle management, monitoring, and integration with the HCP orchestration and monitoring to secure E2E service management. Hybrid infrastructure support is built in to the orchestration and management capabilities.

Standardizing the edge ecosystem

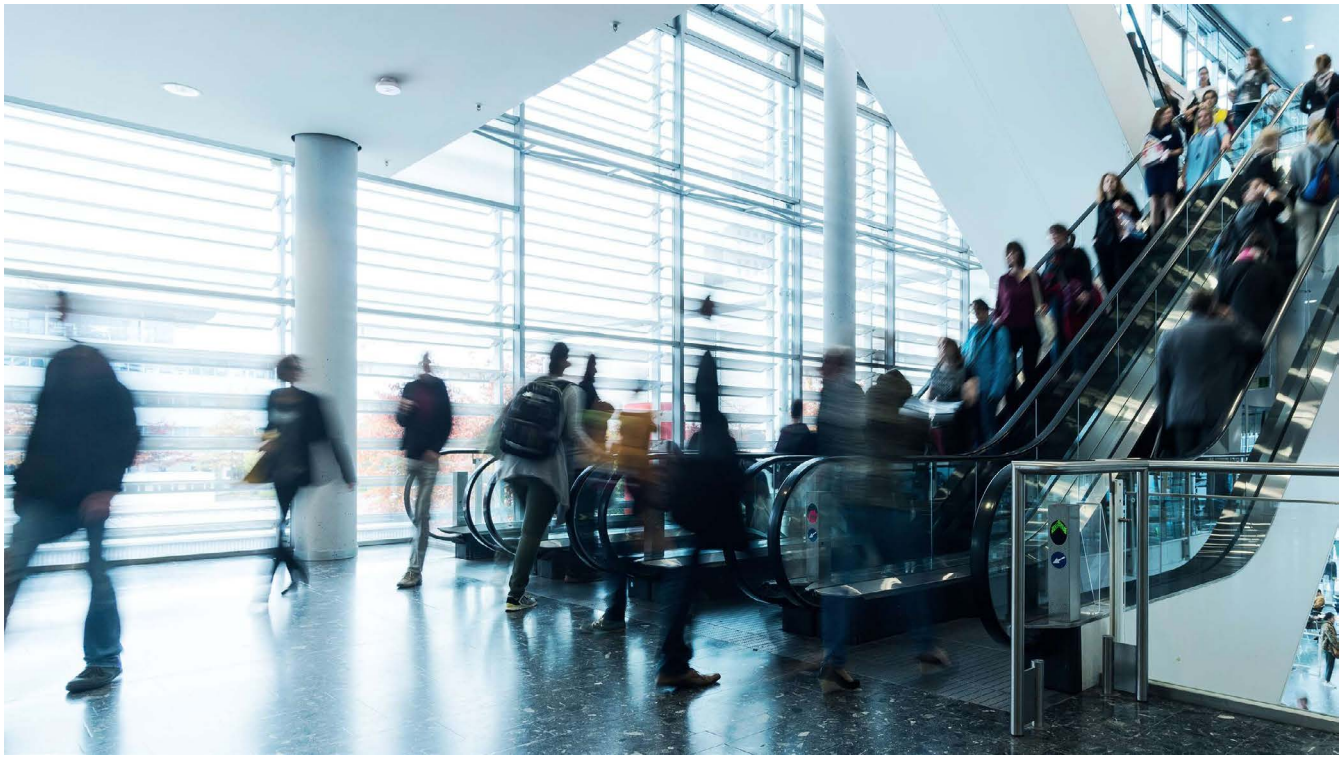
The telecommunications industry needs to avoid fragmentation in standards, technology, and interfaces, while also enabling differentiation and competition between CSPs. 3GPP is the main body influencing standardization in edge computing. CSPs should keep a close eye on HCP ecosystem developments.

Today, edge computing is still in an early phase, with many different initiatives from various organizations, industries and companies. In the open source area alone, there are several initiatives ongoing across different communities as of 2023. However, there is no industry standard agreed yet that covers all aspects of edge compute.

Edge compute is being specified across standards and open source fora, for example in 3GPP, which has accelerated its activities towards edge in ETSI, CNCF (Cloud Native Computing Foundation) and GSMA operator platform.

In addition, there are several industry alliances aligning on their own use cases. Two notable examples are AECC (Automotive Edge Computing Consortium) and 5G-ACIA (5G Alliance for Connected Industries and Automation). They take input from 3GPP, ETSI MEC, GSMA, and from industry verticals to formulate liaisons towards 3GPP mainly.

ETSI, GSMA and other standardization bodies are aligning heavily, often playing the role to define a new use case and liaisons to 3GPP. Whereas TM Forum specifies the management layer and aligns with 3GPP SA5, the technical specifications working group that oversees management, orchestration and charging of 3GPP systems.



Service API related initiatives for harmonization

- Open source projects aim to embrace the practices of the developers and HCPs communities.
- CAMARA is a broad industry cooperation mainly out of CSPs, ISVs, device manufacturers, and HCPs, for defining the service APIs for an open ecosystem through open-source implementations. CAMARA works on an abstraction API architecture and the harmonization of API capabilities, exposed from CSP networks to the developers, either directly or through aggregators. This is done in two steps:
  1. Definition of API families and specifications in the open source community.
  2. Creation of reference implementations that can be reused by members for faster adoption.

The telecommunications industry must avoid ecosystem fragmentation, while also enabling differentiation and competition between CSPs. The more organizations that contribute to the specifications of edge compute development, the higher the risk for fragmentation. This means that standards, technologies, interfaces and business models will not align, resulting in slower adoption of new services and the failure to achieve the required economies of scale.

Standardization will be key for low-level technical APIs. For applications and exposure on the business support systems (BSS) layer, that enable securitization and monetization of the APIs, high-level APIs will be needed.

High-level APIs will be defined as a de-facto standard initially as part of the implementation, not from standardization bodies. As a base for edge compute implementations, the industry can today use standards and specifications on the technical level.

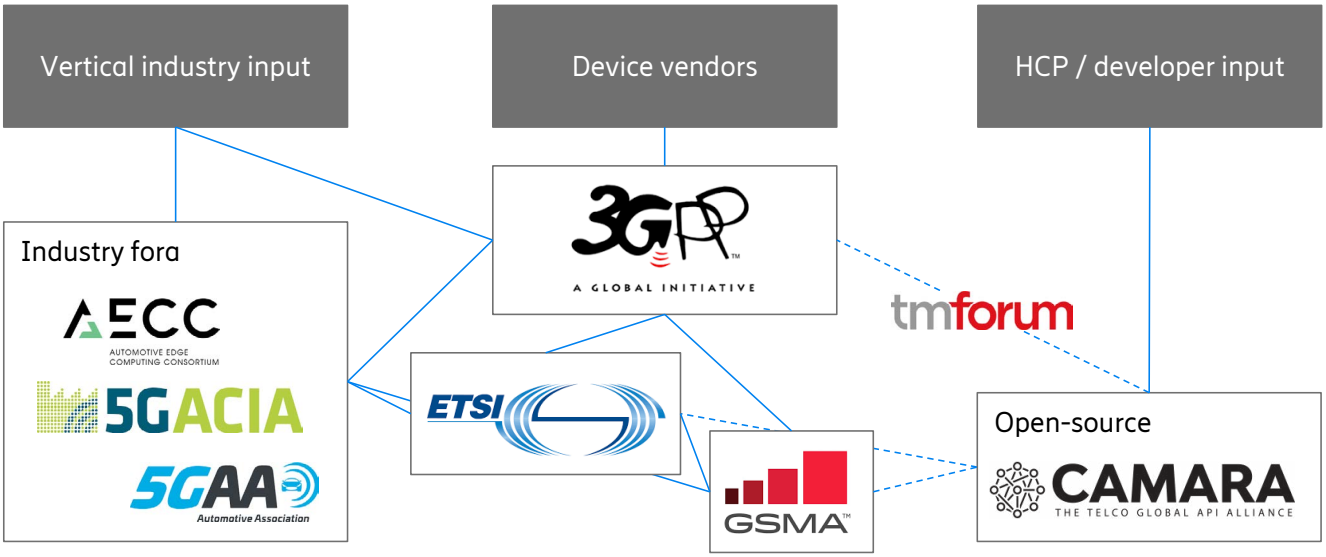


Figure 4: Overview of standardization bodies and industry alliances.

Strategy recommendations for edge markets

While edge may be an extension of existing capabilities, it will also require a transformative shift in the way CSPs approach it and their choices – in terms of business, technology and the ecosystem.

With increasing interest in new use cases such as real-time analytics, video optimization, AR, VR, or mobile cloud gaming, there are emerging opportunities for CSPs to monetize mobile cloud and compute. However, the edge is not a standalone product nor an offering, but rather an enabler for use cases requiring secure, resilient, and low-latency connectivity.

The edge computing ecosystem is vast and evolving rapidly. Many organizations and companies are involved in specifying technologies and defining solutions. Edge ecosystems can avoid fragmentation by ensuring that differentiation is performed on services, not on how they are consumed or exposed.

When defining a CSP's GTM strategy, the following factors need to be considered:

- Level of enterprise growth ambitions and willingness to invest
- Market size and position in that market
- Level of current enterprise relations and GTM capabilities
- Competence in enterprise verticals
- Capacity and competence to provide complex solutions

Business strategic decisions, such as vendor selection and procurement, need to be taken in a multi-vendor, multi-technology, multi-standard and multi-cloud environment. Therefore, CSPs will need to take a use case driven approach at a strategic level. CSPs need to take the lead to develop use cases that require connectivity, are latency sensitive or need data sovereignty. This means mapping out requirements for each use case and identifying the capabilities that need to be built or brought in by partners.

Building use cases from a demand perspective and gaining a deep market understanding that can lay a foundation for long-term impact will also require a strong partner ecosystem.

CSPs can aim for versatility in the edge partner ecosystem. From a single role or a combination of roles, each CSP's deployment track will depend on their ambition in the enterprise area beyond providing connectivity.

CSPs that choose a CSP-led GTM need multiple partnerships, consumption-based revenue models and control of the higher layers of the stack such as orchestration, enterprise portal and exposure. Their focus should be to build partnerships, select edge opportunities that allow them to innovate and co-create together with enterprises and other partners. Further they need to select verticals where they can offer competitive value.

Targeting early use cases that can scale horizontally to other vertical industries will also deliver impact. As part of this, CSPs need to focus on standardization of new APIs in these verticals to maximize value from connectivity. It is important to invest in an enterprise GTM strategy to avoid commoditization from HCPs. HCPs are important partners and CSPs need to consider whether it makes sense to invest in their own edge infrastructure or partner with HCPs.

CSPs with a HCP-led GTM, need to use multiple partners such as HCPs, content aggregators, and SI companies to rapidly gain scale. They should only invest in enterprise GTM opportunities, where they are able to develop strong relationships with local customers and vendors.

In the following areas, CSPs could offer compute and connectivity bundles:

- Private edge and private network
- Latency/data residency (network edge)
- Gateway edge with connectivity

In addition, they will offer edge discovery services to applications. This can be extended with other network services such as data analytics, device analytics and more.

Glossary

3GPP	Third Generation Partnership Project
3P DC	Third party data center
5GAA	5G Automotive Association
5G-ACIA	5G Alliance for Connected Industries
AECC	Automotive Edge Computing Consortium
AI	Artificial intelligence
APIs	Application programming interface
AR	Augmented reality
CAMARA	The Telecommunications Global API Alliance
CDN	Content delivery network
CNCF	Cloud Native Computing Foundation
CSP	Communication service provider
DC	Data center
DCP	Data center provider
E2E	End-to-end
ETSI	European Telecommunications Standards Institute
ETSI MEC	ETSI Multi-access Edge Computing
GSMA	GSM Association
GTM	Go-to-market
HCP	Hyperscale cloud provider
ISV	Independent software vendor
IT	Information technology
OT	Operational technology
RAN	Radio access network
SD-WAN	Software-defined wide area network
SI	System integrator
SLA	Service level agreement
TM Forum	Tele-Management Forum

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Ericsson enables communications service providers and enterprises to capture the full value of connectivity. The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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