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Case Study

# SK TELECOM: THE ROAD TO THE WORLD'S FIRST 5G MEC PLATFORM

SK Telecom is a leading operator, having already launched 5G in April 2019. It is now one of the first service providers to begin the journey to make edge computing real and develop its own MEC platform – for both distributed MEC and on-site MEC. We explore how in this case study.

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# Preface

This document has been prepared by independent research firm STL Partners and commissioned by Dell Technologies and Intel. The document includes a case study developed with SK Telecom, a Dell customer. The findings in the case study are based on interviews with SK Telecom, Dell Technologies and the Bridge Alliance. It also leverages STL Partners' continuous research programme into edge computing and the future telecoms operator. Mentions or allusions to companies or products in this document are intended as illustrations of market evolution and are not intended as STL Partners endorsements or product/service recommendations.

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# Introducing MEC

Multi-access Edge Computing (MEC) is set to drive a range of commercial opportunities across many industries in the next 2-3 years, with its ability to deliver low latency and improved quality of experience (QoE) for end users. It is a form of edge computing that brings the capabilities of cloud computing into telecoms operators' points of presence (PoPs), as opposed to traditional cloud which occurs in remote data centres.

Having distributed MEC at sites such as base stations, central offices, and other aggregation points in the network enables customers to run low latency applications and cache or process data close to the data source, reducing backhaul traffic volumes and costs. On-site MEC[1] or edge, compute resources at customer premises, enable enterprises to retain sensitive data on-site whilst being able to run applications in cloud-like environments. For example, using flexible software platforms on standard, common-off-the-shelf hardware to ensure elasticity and enable enterprises to scale applications up or down on an as-needs basis.

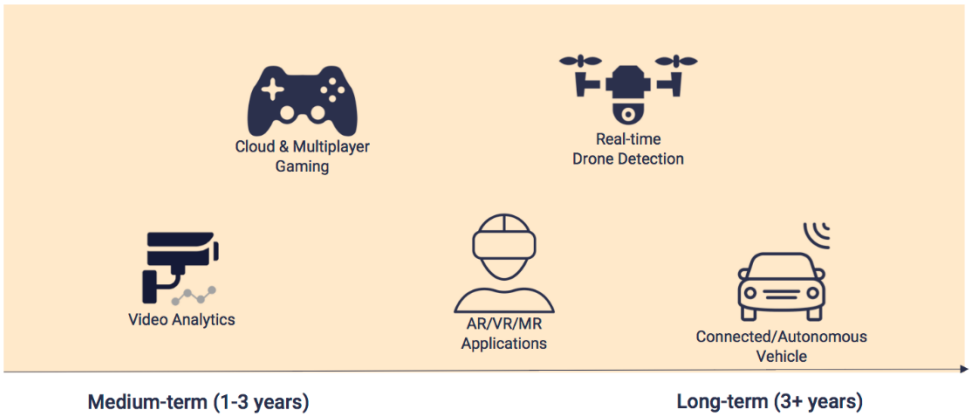
Both distributed MEC and on-site MEC will offer enterprises the ability to improve existing applications, such as content delivery or IoT solutions, and enable new applications, such as those that need 5G. These stretch across several industry verticals and have varying timelines for adoption. Examples of MEC use cases include:

- **Connected/autonomous vehicles**: MEC can enable access to crucial information on vehicle and road conditions and potential hazards to passengers/pedestrians/other road users to be shared directly to vehicles rather than interfacing with central cloud servers.
- **Enterprise AR/VR for maintenance and repair**: MEC can support remote workers using AR when conducting maintenance and repair tasks. For example, to aid the maintenance worker, information on the asset or the digital twin can be overlaid on the AR display while they are repairing the piece of machinery. MEC enables data to be processed off the device and keep the headset lightweight.
- **Real-time enterprise collaboration**: MEC can enable multi-user collaboration for design and engineering teams, allowing real-time rendering of models and interaction with those models to be processed in an edge cloud.
- **Cloud gaming**: MEC can move the rendering and processing required for rich video games from a dedicated console or data centre to the edge of the network, providing gamers with the same quality of game anywhere and on any device.

[1] For the purposes of this report, to align with SK Telecom's terminology, the term MEC refers to edge computing either at customer premises or the network edge.

- **Real-time drone detection**: Sensors can be used to detect when a drone has breached a security perimeter (e.g. an airport, prison or hospital). As this needs to be detected in real-time and acted on immediately, MEC can be used to reduce latency.
- **Video analytics**: MEC can enable filtering of raw data to reduce the need to route heavy video traffic to a central server for analysis. This reduces the cost, volume and time it takes to draw insight from raw footage.

**Figure 1: MEC adoption timeline for certain use cases**




Source: STL Partners

Telecoms operators are looking to MEC as a source of new revenue through a variety of business models. These range from co-location of telco edge datacentres, to platform plays and offering end applications.

Telcos are still at an early stage in evaluating the MEC opportunity. However, this is what makes SK Telecom such an interesting case study – it is the first service provider (SP) to launch a 5G MEC platform.

# SK Telecom's MEC journey

## MEC is core to SK Telecom's 5G strategy

SK Telecom is a world leader in 5G technology. Having launched 5G services in April 2019, the operator accumulated over 1 million 5G subscribers within 140 days after launch.

The current strategy is to continue growth of 5G services in B2B(2X)[2], as well as the consumer business. MEC is essential to this. The lower latency and enhanced higher security benefits, combined with the technological advantages of 5G, will help to uncover new solutions across different industries. Generally, even with 5G, users or applications need to go through the public cloud and the final service round trip time (RTT) becomes 30 to over 100 milliseconds whereas, with MEC, users can benefit from a significant reduction of the latency and an improved user experience. SK Telecom sees the latency reduction to below 10 milliseconds theoretically.

MEC supports the operator's growth strategy in multiple ways:

- By providing both the computing environment and end-solutions, SK Telecom moves up the value chain and helps users access new services at reduced time to market e.g. smart factories, smart cities
- Reducing 5G backhaul traffic and core network load results in lower costs e.g. video CDN, caching
- Optimising QoE due to ultra-low latency and ultra-high proximity and reliability, as well as facilitating a market for more lightweight devices e.g. AR/VR glasses, gaming
- By partnering with vendors, SPs and public cloud providers, the process of building an ecosystem is accelerated and allows SK Telecom to build strategic relationships with its enterprise customers

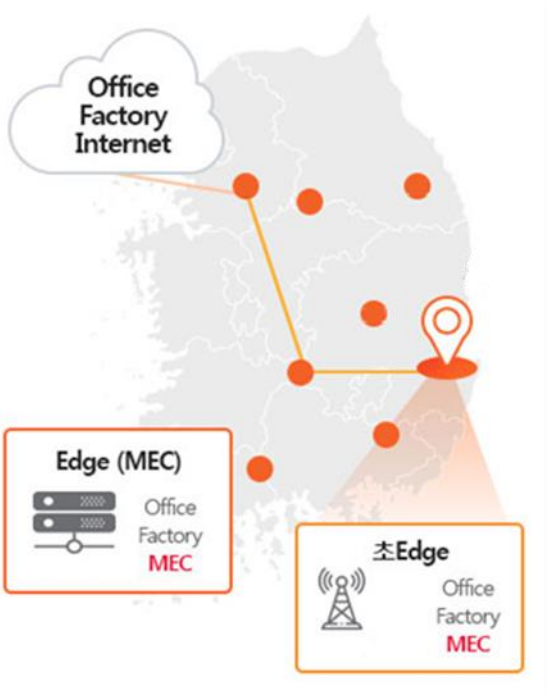
SK Telecom's MEC strategy encompasses two main types of MEC:

1. **Distributed MEC** – edge computing sites on SK Telecom's 5G network
2. **On-site MEC** – edge nodes at customer sites (campuses, factories, hospitals, offices, etc.)

For distributed MEC, SK Telecom intends to target urban centres across the country, building more MEC sites in South Korea this year to broaden countrywide coverage and add to the sites built in 2019. These will host MEC platforms - both those developed by SK Telecom in-house and by third parties.

[2] B2B2X refers to business models where the telecoms operator provides services for businesses to enable them to provide better solutions to their end customers (the "X") who may be businesses or consumers. For example, B2B2C services include hosting services for a cloud gaming company to offer cloud games to consumer, or IoT connectivity to a manufacturer that provides connected machines to its business customers.

**Figure 2: SK Telecom's MEC sites deployment (example)**




Source: SK Telecom

On-site MEC is targeted at customers with low latency, security sensitive requirements, e.g. smart factories, where manufacturers may choose to use MEC to run mission critical operational processes. With on-site MEC, each enterprise will have its own specific requirements, so the architecture is more flexible to match these needs. In the distributed MEC model, SK Telecom seeks to provide relatively standardised edge compute infrastructure and services.

SK Telecom has developed services and capabilities to enhance its strategy and to improve edge application performance and usability. The operator believes that the services would add more values to SK Telecom's MEC platform compared to MEC platforms from public cloud providers or other vendors. The services and capabilities include:

- AI service offloading using an advanced neural processing unit developed by SK Telecom for high performance, low latency AI services
- Quantum Communication: quantum cryptography for highly sensitive data
- Cloud Robot Service: OpenDevs platform cloud robot
- Telco API (Value Added API): using SK Telecom's network assets

## The big question: which use cases will leverage MEC?

SK Telecom has identified multiple B2B(2X) and B2C use cases for 5G and MEC, some of which are at proof-of-concept (PoC) stage, others are more advanced and being commercial deployed.

Generally, MEC use cases that require the wide area network for 5G customers, e.g. cloud gaming and (automotive) traffic management, are using the distributed MEC. Industrial use cases, such as smart factory, will likely use an on-site MEC to start with.

One of SK Telecom's use cases comes from the recently launched joint venture with Sinclair Broadcast Group, Cast.era, which is the first instance of a global roll-out of MEC technology. They are aiming to deliver ultra-low latency, over-the-top broadcasting, combining SK Telecom's cloud infrastructure with Sinclair's broadcasting infrastructure.

Another relatively mature use case is in cloud gaming, where the SP believes lower latency and higher QoS will greatly increase the experience provided for gamers. SK Telecom also see that the next generation gaming experience would be one of killer use cases of MEC, for example Watch & Play. SK Telecom developed Watch & Play to reduce lag problem for cloud gaming through MEC technologies. It is a real-time, interactive gaming platform that combines gaming and broadcasting. Users can not only choose between game-watching and game-playing modes, but can also jump right into playing the game they are watching for a more engaging experience.

In on-site MEC, SK Telecom has been looking for use cases in the area of hospitals, banks and distribution industries, and has been running PoCs with a few major companies. For example, in hospitals, patient rooms can be equipped with AI; a mobile AR app can help visitors and patients to navigate the hospital; and facial recognition will enable contactless entry and exit to reduce the spread of disease.

**Figure 3: Examples of SK Telecom's MEC use cases**

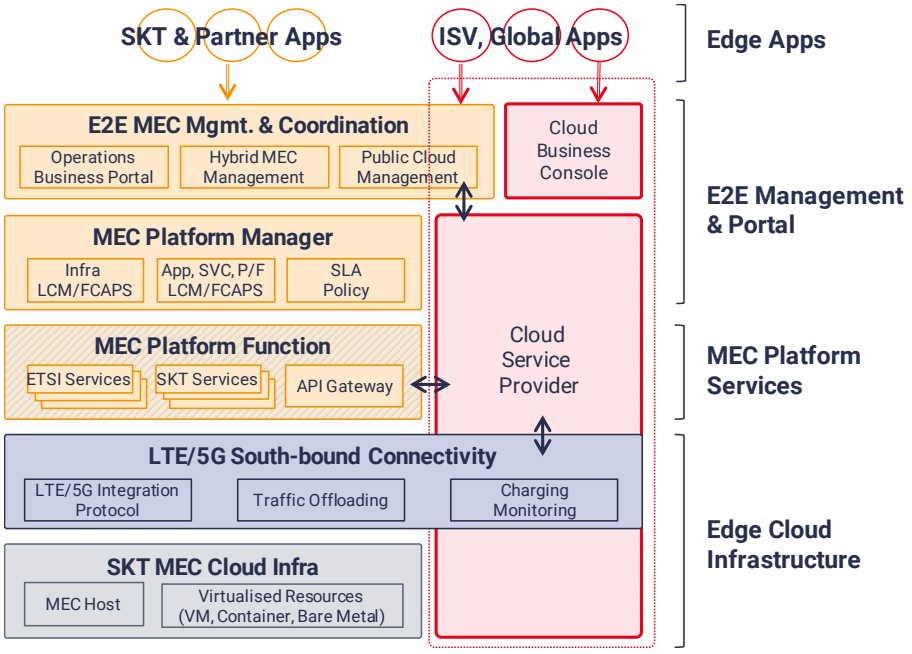

Source: SK Telecom, STL Partners

Another example in the smart factory uses autonomous smart robots, AR smart glasses and AI to identify faults quickly and mitigate disruptions to the production process. A partnership with MobiledgeX has helped the operator's exposure to innovative developers, such as 1000 Realities, who are exploring ways to render AR/VR content from a MEC server, instead of the device itself. This is estimated to improve display quality 100-fold.

# Building the distributed MEC platform: partners are essential

In providing distributed MEC platform services, SK Telecom has worked with partners to build its own platform, as well as open up facilities to third party platforms, who will be able to offer their own edge cloud services from an SK Telecom MEC site.

**Figure 4: SK Telecom's MEC architecture**




Source: SK Telecom, STL Partners

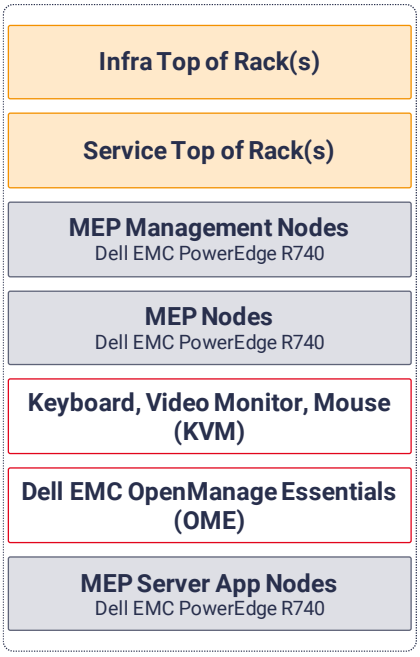
For example, in November 2019, AWS and SK Telecom announced they would partner to launch AWS Wavelength. The business model is similar to AWS' cloud services (e.g. EC2); providing (edge) cloud computing with an "as-a-Service" model from the MEC sites. It is likely that collaboration with edge cloud and public cloud would be required (or become more important) since MEC applications require many resources from the public cloud too. Plus, the hyperscalers already have an established and ever-growing customer base, therefore play an important role in seeding the market.

To build its own platform, SK Telecom has engaged many partners across hardware, software, middleware and applications. Dell Technologies has been a key hardware partner of SK Telecom's MEC infrastructure development, offering its suite of products. Dell Technologies hardware manages the traffic to and from the MEC nodes and run the MEC workloads on top. The partnership with SK Telecom ensures access to the whole family of servers, networking, hyper-converged infrastructure, storage and data protection products along with its world-class supply chain, customer support network and understanding of telco architectures and use cases. The detailed design diagram below shows where Dell EMC PowerEdge Servers are included in SK Telecom's MEC platform, highlighting the partnership between the companies.

One of the critical design factors for SK Telecom's MEP is flexibility, which has been enabled using network functions virtualization (NFV) infrastructure (NFVI). Being able to optimise the underlying

infrastructure is paramount to this, which is where both Dell Technologies and Intel's solutions play a role. Intel's Speed Select Technology - Base Frequency (Intel SST-BF)[4] - and Intel® Optane™ DC persistent memory provided the capability to optimise resources. The technology is designed to fill the capacity, cost, and performance gaps between traditional dynamic random access memory (DRAM) and solid state drives (SSDs).

**Figure 5: Dell EMC PowerEdge Servers & Management Software in SK Telecom's Mobile Edge Platform (MEP)**




Source: SK Telecom, Dell Technologies, STL Partners

Outside of the SK Telecom platform, looking beyond an SP's national borders can always be a challenge. However, this is a factor that SK Telecom has already considered as critical to success. Being able to create some standardisation across mobile operators' diverse MEC platforms will be necessary to provide MEC services to global enterprises. This is the basis of the partnership with Bridge Alliance, where major telecom providers in Asia have formed a Global MEC Taskforce looking to create a pan-Asia MEC ecosystem. Operators in the taskforce who have already launched their own 5G platform want to push for greater standardisation, so if there are monetisation opportunities in future it is easier for regional customers to plug in. The taskforce is currently evaluating multiple use cases at the conceptual stage and sharing know-how to drive the ecosystem forward.

Ong Geok Chwee, CEO of Bridge Alliance said, *"As the role of telecommunications companies is expanding beyond simply providing mobile connectivity to offering new values based on infrastructure, Bridge Alliance believes this cooperation will serve as a key driver for realising win-win business opportunities to all members"*.

[4] Intel solution available on select models of the 2nd generation Intel Xeon Scalable processors

# What are the implications of SK Telecom's approach for the telecoms industry?

SK Telecom's strategy for building its 5G MEC platform has two key learnings:

1. Telecoms operators cannot wait for the killer use case or create a traditional business case to justify initial MEC build-out

2. Working with hyperscalers is complementary and not mutually exclusive to developing a MEC platform in-house

There are many potential use cases for MEC but, as we discussed in our previous paper What edge developers want from telcos now, application developers are not going to start creating applications for the network edge until there is sufficient scalable infrastructure. Telecoms operators will need to accelerate roll-out to kickstart this virtuous cycle. However, this can be done in a modular way, as per SK Telecom, rather than building hundreds of fully fitted edge data centres from Day One.

The partnership with AWS again demonstrates demand for MEC and shows that working with cloud providers can be mutually beneficial. SK Telecom is adamant that it can serve certain customers with its own MEC platform, as well as the huge, established customer base that companies such as AWS.

This open, hybrid cloud approach means that there is room for MEC platforms from many different vendors: MNOs themselves, public cloud providers and edge specialists, such as MobiledgeX, ClearBlade, etc. More on which companies are in the MEC platform space can be found on our Edge Computing Ecosystem Tool.

As MEC evolves, we will continue looking to leading operators like SK Telecom for best practice. Similarly, key players such as Dell Technologies are well-positioned to bring different parties together and accelerate growth. Going forward, STL Partners will continue to share insights from our research and consulting services on our Edge Hub and address key questions on future challenges such as: MEC interoperability, new business models and security.

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