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Brochure

Transforming Networks to Leverage 5G Performance

Edge Server MECS Series

MEC Gives 5G Computing at the Edge

The intersection of 5G's arrival and the rise of edge computing is pulling markets across the board into its gravitational field. There is a compelling attraction to bandwidth exceeding that of the pre-5G era: to ultra-low latency, to real-time access to 5G radio networks. Reacting in time to the demands of these markets is crucial. The risk of being shut out of myriad opportunities is real.

Introduction

From augmented reality-assisted surgery to smart parking to factories embracing AI as they go for top efficiency, many markets find 5G a welcome arrival. But it's possible – and necessary – to go further. When guests feel truly welcome, they are at home in their host's home. Truly welcoming 5G to our world requires giving 5G applications the kind of freedom and power enjoyed by guests in homes fully equipped to welcome them.

This is where the Multi-access Edge Computing (MEC) architecture comes in. An Industry Specification Group (ISG) within the European Telecommunications Standards Institute (ETSI), MEC has been designed to change the world of computing at the network's edge into one ready to welcome 5G to the fullest extent. In so doing MEC not only opens the door wide to this newcomer, but also to untold opportunities for telcos, mobile network operators, and content and service providers.

Edge computing provides real-time decision-making that is valued across multiple sectors. So is capitalizing on data in context—a context not found in data centers, but exclusively at the end points. In addition, security vulnerabilities that are exposed during data transfer are avoided.

These opportunities stem from MEC's rich set of features. With solutions based on the MEC architecture, dynamic allocation of data processing is possible. The radio access network becomes a welcoming place for innovative applications. Computational power flows to IoT devices. Data analysis happens at the edge—an edge that MEC can transform into one where all the benefits of an IT service environment are present. Applications from vendors, service providers, and third parties meld into a seamless whole.

And with the opportunities that solutions based on the MEC architecture can bring to life, application developers and content providers are able to reap the rewards of satisfying markets eager for ultra-low latency, high bandwidth, and extreme user proximity.

However, pressure as well as opportunity are present. Currently, applications can win over and retain users as latency becomes negligible. Operators are ready to relieve congestion on mobile networks by caching content on servers and to gain savings on network backbone costs. And right now over a third of companies, according to recent research, are using edge computing, and that percentage is expected to increase. Acting now to win in this limited time frame makes success not just possible but predictable.

Use Cases

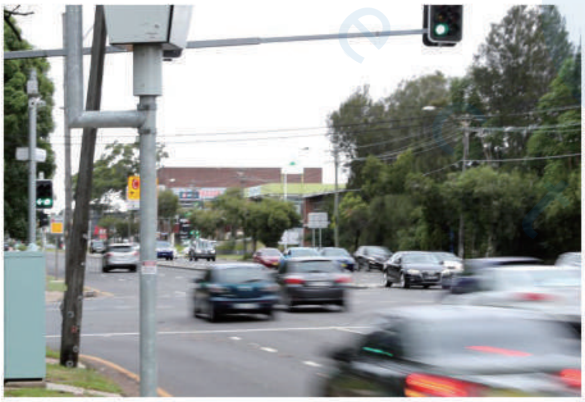
As we enter the 5G era, platforms deploying the Multi-access Edge Computing (MEC) architecture are making higher connection speeds, slashed latency, stronger security, improved quality of service (QoS), and use cases such as the following achievable.

MEC Network Node Integration for Lower Latency

MEC platforms are integrated in each network node, extending the capabilities of mobile network operators serving millions of customers. Positioning server-like devices at the network edge lowers latency for fintech, digital content, communications and other applications to near-insignificant levels, assures rich media content, and increases transfer speeds to the 10 to 20 Gbps range. Services relying on low latency—from connected cars to online gaming—benefit as do the basic functions of the mobile network infrastructure.

Figure 1: Ultra-low latency services rely on MEC network node integration.

Data Organized to Bring Users More Services



Orchestrating the massive amount of data generated by connected and autonomous vehicles, as well as roadside units (RSUs), becomes feasible through dynamically allocating CPU and acceleration resources in relation to the varied needs of computer vision, video streaming, data aggregation, and other services. Network slicing and data analysis at the edge—made possible by the MEC architecture—enables such allocation by adjusting network connectivity and capabilities for various services.

Figure 2: A MEC server enables transfer of real-time video streaming, allowing a platoon lead vehicle to share road condition images, for instance of an oncoming car in the passing lane, with the rest of the platoon.

Safety at New Levels with V2X and MEC-supported Positioning Accuracy

With MEC supported Vehicle-to-Everything (V2X), bicyclists, vehicles, and pedestrians, although connected through different mobile networks, can share information. Distance calculations are made on a MEC server to support positioning information accuracy.

Figure 3: Traffic safety is improved when mobile networks used by vulnerable road users (VRUs), i.e., pedestrians, cyclists, runners, can share location and other information.

Data Processing at the Edge for Stronger Predictability

Investment and other banking services improve customer experience when network latency is reduced as a result of MEC architecture deployment. Such deployment also harnesses 5G capabilities, AI-powered advanced analytics, and machine learning to process data at the edge for more accurate and timely market behavior predictions.

Figure 4: Pairing 5G with edge computing is enabling financial institutions to make mobility a key strategic element.

More Power for Wearables

By offloading computation tasks from the data centers to MEC servers, a network operator increases the computational power available for small IoT devices on the network, so decision-making can happen at the edge. For instance, patients with wearable IoT medical devices can be diagnosed rapidly and effectively onsite. By communicating with a MEC server, these portable devices can gather, analyze and store medical data efficiently with no need to be constantly connecting with central network infrastructure.

Figure 5: Acting as gateway nodes, MEC servers aggregate and process the small data packets IoT applications create before the packets arrive at the core network.

Low-Latency Orchestration of Multiple Video Streams Supports AR Success

Low latency and real-time response made possible by the availability of MEC architecture to exploit 5G speed and bandwidth strengths are key to a memorable AR experience for fans at a sport stadium.

Figure 6: During a stadium AR experience edge computing handles low-latency orchestration of multiple video streams and enables overlaying information onto video streamed to end user devices.

MEC Servers: Welcoming a New Era of Innovation

With access to the 5G radio network will come fresh ideas for services that can be provided to end users. For example, first responders to a disaster can benefit from receiving video in real time. Lives can potentially be saved if the information that an officer has drawn his or her weapon reaches a police dispatcher within a split second.

The transforming power of capabilities such as these cannot come just from cloud computing and storage migrating to the network edge. What's vital is that this migration take place in an environment characterized by reliability, security, and the ability to evolve as needed. MEC servers make this possible with the following features.

Built for the 5G Edge

The proximity of edge servers to users cuts latency and shortens response time, freeing applications from the limitations imposed when data processing happens at great distances from where it's needed. Conventional servers operating in large data centers have specific cooling and spatial requirements. Edge servers must operate in edge server rooms or in outdoor small cells, environments with restricted space and limited available cooling, meaning they must be specifically designed to meet these limitations.

Edge Server Room Deployment

In edge server rooms, server hardware must fit racks with a typical depth of 600mm, which is too shallow for conventional servers. On top of that, installations in office or commercial buildings, where space is at a premium, makes servers with high-density scalable architecture a must. Harsh and unstable temperature environments must also be anticipated. So, edge servers' thermal characteristics should be such that reliable operation can be maintained at ambient temperatures up to +55 ºC

Small Cell Deployment

In small cell outdoor deployments, edge servers must accommodate not only temperature extremes but also dust shock and vibration. Servers which operate reliably in harsh environments make it possible to co-locate powerful computing resources with low-latency 5G radios.

Pairing NFV and SDN for Novel Applications and Deployment Flexibility

Pairing NFV and SDN technologies excises the guesswork from network resource distribution, making MEC servers even more agile as data flow manageability becomes easier. NFV and SDN teamwork also brings fine tuning to QoS control, benefitting users while improving efficiency.

With the dynamic resource allocation that NFV technology makes possible, traditional base stations are upgraded in functionality to virtualized computing platforms, opening the door to novel wireless applications. At the same time, it becomes faster and easier to deploy network functions and to use computing and storage more efficiently, on demand.

Doing More while Using Less Energy

To minimize power costs and maximize efficiency when achieving the benefits of 5G networks, whether for autonomous vehicles, location services, the industrial IoT or anything else, the processors used by MEC servers need to be highly efficient and able to scale in sync with real-time computing loads. By supporting service hot-migration, MEC servers centralize the computing load. Idle computing nodes are powered down, cutting down on power consumption.

Quick Response to Market Demands

5G's arrival is sparking developers' imaginations, requiring fast response to the demands springing from new ideas. To allow smooth and speedy development, the MEC standards Is fully compliant with the Open Telecom IT Infrastructure (OTII) defined by the Open Data Center Committee (ODCC) and is a high-density scalable architecture able to meet a wide range of expansion and configuration demands. This is where the features of MEC servers built for the 5G era come into play.

Compact Design
1/2U & 420/430mm depth to be adapted in existing equipment room

Powerful Computing
Intel® Xeon® Scalable & Xeon-D to support powerful & flexible computing

Wide Temperature
-5°C - +55°C for operating in critical environment

Expandable Add-on Modules for Accelerators
Support 2x PCIe x16 (dual slot, FHFL) or 2x PCIe x16 (single slot, FHFL) for FPGA, GPU accelerators

2U and 1U Edge Servers Powered by Intel® Xeon® Processors

ADLINK's MECS-7210 and MECS-6110 are 19" rackmount, 420/430mm depth edge computing servers designed to meet edge server room space constraints. 2U and 1U height respectively, the MECS-7210 and MECS-6110 meet the edge computing requirements of ultra-low latency, high bandwidth, and high-efficiency computing power. Whether the markets that will drive your success exist within cybersecurity, machine learning, sustainable cities, or autonomous driving, these servers will enable you to pursue, capture, and retain opportunities.

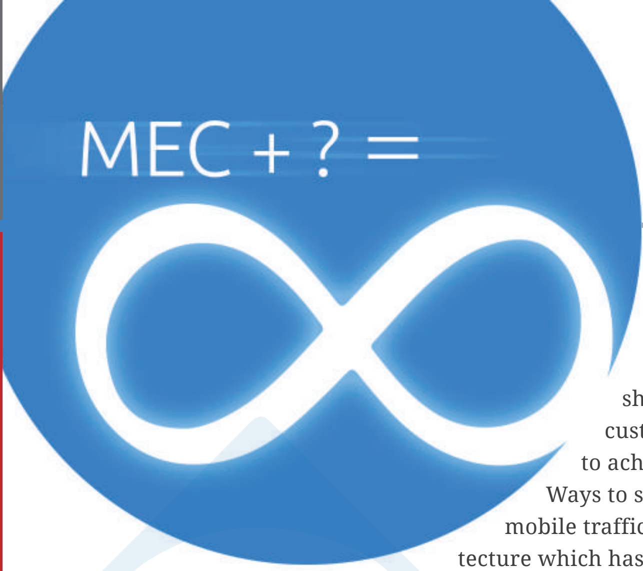
Intel® Xeon® Scalable Silver/Gold processors power the MECS-7210 server's high performance. To assure your readiness to take on tomorrow's opportunities, not just today's, the MECS-7210, as well as the Intel® Xeon® D processor-fueled MECS-6110, are COTS flexible platforms that offer access to FGPA/GPU acceleration hardware and I/O expansion cards with dual full-height full-length (FHFL) PCIe expansion slots.

Taking on compute-intensive operations can be done with confidence, as both servers include Intel® Quick Assist Technology (QAT) support (processor dependent). Enhanced integrated QAT takes performance to the next level across a range of tasks, including storage, networking, cloud, and big data.

Capable of fully capitalizing upon 5G's genius at taking on an exponentially growing number of connected devices, both these edge computing servers have a strong set of network interface types, with up to eight Ethernet ports on the front panel, including 1/10 GbE copper and 10GbE optical.

Network edge data processing, storage, analytics, and communication can happen where it needs to happen, and that includes harsh and extreme temperature environments. Supported operating temperature range is -5 °C to +55 °C, I/O access is entirely in the front, and they are built to withstand dust, shock and vibration.

Model Name		MECS-7210	MECS-6110
Form Factor		2U 19" rackmount 438mm x 88mm x 420mm (WxHxD)	1U 19" rackmount 438mm x 44mm x 430mm (WxHxD)
Processor		Dual Intel® Xeon® Scalable Silver/Gold Processors	Single Intel® Xeon® D-2100 Series
Chipset		Intel C620 Series (support QAT embedded by chipset)	Intel® Xeon® D-2100 SoC
Memory		16x DDR4 memory socket, ECC, registered, up to 512GB	4x DDR4 memory socket, ECC, registered, up to 256GB
Storage	On-board	1x M.2 SATA	1x M.2 SATA 2280
	Drive bay	3x 2.5" SATA drive bay, front access, hot-swappable	2x 2.5" SATA drive bay, front access, hot-swappable
PCIe Expansion		2x dual-slot FHFL PCIe 3.0 x16 with external panel Or 2x dual-slot FHFL PCIe 3.0 x16 slots, internal	1x single-slot FHFL PCIe 3.0 x16 and 1x single-slot FHFL PCIe 3.0 x8
IO	Ethernet	4x 10G SFP+ front access 2x 10/100/1000M RJ-45 front access	4x RJ-45 10/100/1000BASE-T Ethernet ports 2x 10G SFP+ Ethernet ports 2x 10GBASE-T Ethernet ports
	Console Port	1x RJ45 front access	1x RJ45 front access
	USB3.0	2x front access, 2x internal	2x front access
	Power/Reset	1x Power button, 1x Reset button front access	1x Power button, 1x Reset button front access
Operating temperature		-5°C~+55°C	-5°C~+55°C



MEC + ? = Infinite Possibilities

The era of infinite possibilities powered by 5G Edge Computing is yours to shape. As you do, you will be transforming the Internet and empowering your customers, bringing them ways to analyze data at the edge without delay. Ways to achieve high reliability, low latency, and precision with dedicated 5G networks. Ways to strengthen indoor signal coverage and orchestrate growing multimedia mobile traffic. The list goes on, but all these possibilities depend on two factors: an archi tecture which has the power to increase development ease, speed, versatility, and security; and a solution which integrates that architecture and is able to evolve with it.

Answering this challenge, ADLINK's MECS edge servers include dedicated PCIe slots to access FPGA and GPU acceleration hardware, IO expansion cards, and QAT cards to improve both platform and application performance while expanding options for meeting varying market needs. Accelerating graphics processing, stretching bandwidth to carry more network traffic, data encryption and loss-less data compression can all be realized.

Add to these benefits the choice to deploy in edge server rooms that are standalone or part of cloud data centers or new-builds. The platform's operating temperature range of -5°C to +55°C and its compact form factor allow operators to take full advantage of 5G and edge computing, yet without the time and expense of having to expand beyond existing facilities.

As the application stories presented below illustrate, opportunities for telcos, mobile network operators, and content and service providers are moving from possibility to reality.

Reliable Signal Coverage Indoors

Problem: Reliable indoor signal coverage is crucial to maximizing the benefits of 5G. A leading supplier of digital communications products in China understood this and wanted to solve this problem for its telecommunications customers. Hurdles to overcome included narrower signal coverage than that of 4G networks; inadequate diffraction; and poor signal reception. The exponentially increasing amount of multimedia mobile traffic and growing indoor mobile use made solving these issues especially pressing.

Solution: A Distributed Antenna System (DAS) is the conventional approach to strengthening indoor signaling coverage. But DAS has its own problems, including difficulties with failure analysis and with detecting, locating, and monitoring faults. So the digital communications supplier decided instead on a 5G digital pico remote radio unit (picoRRU), using the ADLINK MECS-7210 edge server as a foundation. The solution consisted of the baseband unit (BBU), picoHUB, and RRU. To simplify construction, lower costs, and speed deployment, the solution employed Ethernet networking and Power-over-Ethernet. A human-machine interface (HMI), which enabled visual management of the system, greatly reduced maintenance costs and difficulties.

Once complete, the MECS-7210 based solution offered a highly cost-effective 5G mesh and indoor distribution/coverage solution that supports the splitting and merging of cells on demand for phased roll-outs. Positioning and CDN buffering for Industrial IoT, cloud desktop, VR, and other edge computing based applications can also be uploaded for different scenarios as necessary.

Mobile Devices for Patient Care

Problem: By obtaining a user's local data, either through a mobile network or via external geographic positioning, a location-based service (LBS) lowers latency and supports high throughput to service search, notification, and other local event applications. A provider of solutions to the medical sector wanted to give a hospital's staff and patients access to these and additional benefits through LBS and a bio-image processing system.

However, the provider knew that the amount of data that mobile networks can handle has been limited. Traditionally, the response has been to offload the most intensive computing to the data center. But this offloading, followed by sending the computing results back to the user, made for unacceptably high latency and would hampered the effectiveness of an LBS.

Solution: To overcome problems the obstacles of successful LBS deployment, the provider based its LBS and bio-image processing system for hospital use on ADLINK's MECS-7210 edge server. The LBS serves hospital patients, equipment, and drugs, helping nurses care for patients with greater consistency. In addition, graphics acceleration provided by the MECS-7210 support for PCIe add-on cards allows physicians to perform real-time analysis of medical images. Another benefit of the hospital's new LBS is that data can be uploaded to the patient's mobile device. This way, any medical practitioner treating a referred patient has the information required to understand the patient's needs.

Increased Productivity at a Smart Factory

Problem: Inspecting goods as they proceed through a factory's production lines is necessary to prevent defective goods from reaching customers. The problem is that long downtimes to adjust production equipment and lines in order to prevent more defects occurring increase costs and lower productivity.

Solution: The availability of 5G services to businesses is offering factories the option to become smart without having to install a Wi-Fi network to support AI. Tasks such as inspection to discover product defects in real-time can be performed more efficiently by AI, supported by a lower-cost 5G mobile network.

For example, the ADLINK MECS-7210 edge server was recently selected for a next-generation smart factory and tasked with processing the data collected by sensors from all terminal equipment in real-time. The sensors were part of a low-latency dedicated wireless 5G network, eliminating the need for physical cables. In addition to offering low latency, a 5G network also offers high reliability, precision, and immediacy. Accelerated image processing – supported by the server's PCIe expansion slots for GPU cards – enabled the factory's AI to check rapidly for defective products. Flexibility and efficiency shot up as product line adjustment time went from days to hours.

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