ADLINK
Leading EDGE COMPUTING

# *Unlock 5G Value with Open Standards-based COTS Edge Servers*

## *ADLINK MECS Series Edge Servers*




Validated for NGC-Ready and AWS IoT Greengrass, ADLINK's OTII-compliant edge servers provide a versatile, cost-effective and scalable white-box solution to facilitate deployment of 5G RAN and private networks, and enable a wide range of 5G MEC use cases.

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# Emerging 5G Open RAN Drives Interoperability and Innovation

Since the introduction of 4G/LTE, providers of innovative technologies like the Internet of Things (IoT), machine-to-machine (M2M) communications, cloud services, social media, and video streaming have rushed to capitalize on wireless capabilities and the flexibility they deliver. Increasingly, though, this rush strains 4G technology beyond it limits, both in throughput and demands for real-time responsiveness. The ongoing 5G rollout addresses these pressures.

5G delivers higher throughput, lower latency, and the potential for greater device density than 4G. The benefits 5G brings to both consumer and enterprise cellular communication is difficult to overstate, especially with the recent industry adoption of 5G Release 16 (Phase 2) specifications. However, adopting 5G requires changes in how telecom radio access networks (RAN) are designed and intercommunicate.

In a conventional 4G RAN, a baseband unit (BBU) is positioned between the evolved packet core (EPC, the heart of an LTE network's architecture) in the provider's network and the remote radio unit (RRU) located at the cell site. A dedicated backhaul network transports data between the EPC and the BBU while a fronthaul network connects the BBU to the RRU. These network components tend to be proprietary and costly. Fortunately, the functions of these network elements can now be abstracted and recreated as software, independent and disaggregated from underlying hardware.

With today's software-defined networking (SDN) and network function virtualization (NFV), disaggregation between the networking data, control, and management planes, as well as networking software and hardware, becomes possible. Telecoms can now split the BBU into two separate units: a central unit (CU) and a distributed unit (DU). In this split configuration, the CU handles all high-layered functions of the network protocol stack while the DU manages lower baseband processing layers. 5G RANs use an additional channel of communication, a midhaul, to connect the CU to the DU. These architectural elements can form a virtualized RAN (vRAN) that operates on commercial off-the-shelf (COTS) x86-based hardware.

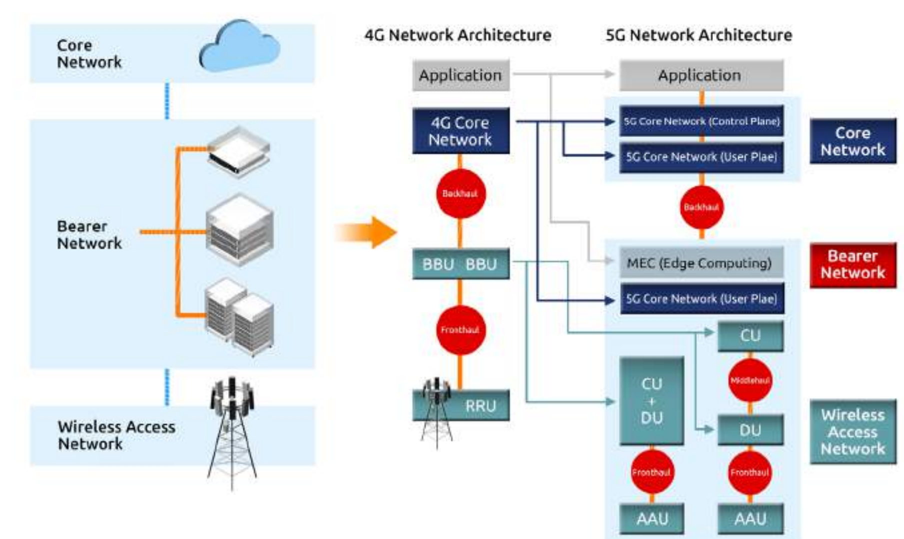
Enterprise migration to 5G often involves substantial network architecture transformation, and part of this transformation may entail "network slicing," in which different market segments (smart cars, public safety, high bandwidth users, for example) use the same single cellular network. Network slicing lets operators virtually split a single physical 5G network into multiple end-to-end networks to fulfill the specific requirements of one segment without impacting others. By network slicing the 5G network and dedicating resources to each slice, the resulting multiplexed connectivity allows for each isolated service to be differentiated and optimized, and therefore meet varying quality of service (QoS) requirements.

This updated infrastructure requires a suitable software and management framework. Again, proprietary options abound, but companies increasingly turn to open source options, such as Telecom Infra Project (TIP)'s OpenRAN 5G NR. Such platforms are fully programmable, software-defined RAN solutions for operating networks across a broad range of deployment scales and complexities.

OpenRAN (which is, somewhat confusingly, a specific project within the "Open RAN" movement) focuses on disaggregation to eliminate proprietary bottlenecks and lets providers run their networks on COTS hardware. This is especially true with the CU and DU components of new 5G networks, as providers can now jointly manage the CU in the data center and the DU sitting at the network's edge. The DU's location in the 5G infrastructure will impact network speed, latency, and reliability. Having a compact COTS DU solution that consumes less power than proprietary alternatives will provide greater flexibility in hardware placement.

With the backing of consortiums like the O-RAN Alliance and the Open RAN Policy Coalition, SDN- and NFV-based 5G deployments continue to evolve and gain global acceptance. Ultimately, the market will decide which of today's competing open approaches will prevail, but the trend seems clear and the participants trust that Open RAN will avoid vendor lock-in, promote multi-vendor interoperability, and drive technology innovation. No wonder operators like Rakuten Mobile (Japan), Dish Network (U.S.), Vodafone (U.K.), Telefónica (Spain), Deutsche Telekom (Germany), and Orange (France) are already involved in Open RAN. According to Rethink Technology Research's Open RAN adoption patterns and forecast 2020-2026 report, the technology will operate at 65 percent of all radio access network sites by 2026. ABI Research extends that figure to 75 percent by 2030, noting that "Open RAN can also be beneficial for industrial enterprise verticals to build private cellular networks. These features include infrastructure reconfigurability, network sustainability, time to innovations, and deployment cost." When Rakuten based its new 5G network on Open RAN, the financial benefits were striking. According to Rakuten's CTO, capital expenditure (CapEx) and operating expenditure (OpEx) were 30 and 40 percent lower respectively, compared to traditional mobile networks.

### 5G Network Transformation




## First Words

On October 19, 2020, a collaboration between VodafoneZiggo, NEC Europe, and Altiostar yielded the first-ever voice call made over an Open RAN. The solution used NEC's 5G radio products as well as third-party COTS hardware. According to NEC's release, the advance will enable "VodafoneZiggo to transform its network to a software-based one suiting multiple deployment scenarios." Vodafone also announced that it would be deploying Open RAN technology at 2,600 cell sites across U.K. by 2027

# Private 5G Networks Facilitate Enterprise Digital Transformation

Many industries, especially manufacturing, are now adapting their processes and operations around 5G to modernize and better leverage wireless technology benefits. Some organizations, especially smaller firms with limited CapEx budgets, will wish to leverage existing public resources offered by large mobile network operators (MNO). Alternatively, private 5G deployments based on COTS hardware and newer platforms can provide adopters with superior reliability, greater speeds, lower latencies, and improved connectivity. Both models can run Open RAN platforms, and both have their advantages. Users can even mingle public and private models, much as enterprises do when adopting hybrid data infrastructures that blend public and private cloud architectures. By deploying these networks, manufacturing firms can better address the specific forces driving their move to 5G solutions.

Enterprises that adopt private 5G give themselves a competitive advantage. They can move toward digitalization at a faster rate, especially during the age of Industry 4.0. As more device categories (such as IoT and M2M) and technologies (including cloud, Citizens Broadband Radio Service (CBRS), and SDN) are deployed and populate today's networks, manufacturers will need a connecting technology more flexible than Ethernet and faster than Wi-Fi in both throughput and latency. Robotics, surveillance, information security, artificial intelligence (AI), and similar data-laden applications generates vast amounts of data. A capable, well-deployed 5G network will ensure that this data flows at required speeds and can be used by the business in a rapid, potentially even real-time manner.

Evolving technologies continue to push companies into private 5G adoption. For example, time-sensitive networking (TSN) is key in deploying virtual appliances, but successfully employing TSN across wireless nodes requires the responsiveness of a properly configured private 5G network. Additionally, companies can manage their own 5G networks, eliminating middle-man service providers and their related problems, such as working through slow technical support or dealing with both planned and unplanned outages. Lastly, when companies use their own private 5G, data stays within their internal network, and is not transmitted through a third-party provider. This allows the company to be fully accountable for their network and data. Enterprises able to build out their own private 5G networks achieve greater customizability, scalability, and performance than the ready-made solutions offered by public 5G providers.

Private 5G networks may vary in size, scope, and spectrum. Companies can opt to deploy their larger 5G private networks on the licensed wireless spectrum, which is immediately available but may face limitations due to conflicts with existing radio, TV, and other cellular traffic. 5G deployments may use multiple bands as conditions and application needs dictate to improve data throughput, decrease latency, and extend serviceable reception ranges, especially in challenging environments.

Other 5G deployments will be based on the LTE small cell system, which can provide much of the functionality delivered in larger 5G installations by proprietary EPC solutions. LTE small cell systems can supply these EPC services, but the features supported by these systems can vary widely. They can serve as a stand-alone DU or as both a DU and a CU, which serves the role played by a traditional BBU.

The advantage of an LTE small cell system like those from Gemtek is that they are powerful yet compact and highly configurable to an operator's specific needs. Such solutions, especially when built on the solid foundations of an ADLINK MECS series edge platform, are ideal for meeting the growing needs of small/medium-scale 5G EPC deployments.

Regardless of the deployment specifics, global companies are clearly opting for private 5G networks to transform their operations. In Japan, Toyota Production Engineering worked with Nokia to implement private 5G to support IoT devices, equipment digitization, and visualization technologies. In Sweden, Volvo CE partnered with Ericsson to deploy 5G at its research and development facility, largely with the aim to create "more efficient production, logistics, greater flexibility, and safer work." This adoption trend shows every sign of broadening and accelerating.

# Multi-access Edge Computing (MEC) Delivers on 5G Promises

With improved wireless speeds, lower latency, and improved quality of service, 5G is changing the way people live and conduct business. However, 5G delivers these benefits largely by benefiting from edge computing. Edge compute systems sit on the extremities of a carrier's network, where endpoints like laptops, IoT devices, cellular phones, and smart cars are close to the network and can receive a strong 5G cellular signal.

Multi-access Edge Computing (MEC) is the platform of choice when working with 5G edge services. Powered by high- performance CPUs, memory, and PCI Express-based GPU/FPGA hardware acceleration, MEC servers are COTS-based systems that replace traditional provider-supplied base stations and are designed to cut latency and shorten response times. Ultimately, it is the MEC system's mission to help remove range and compute limitations by processing data at the network edge rather than back at the main data center. Paired with virtualization technologies such as NFV and SDN, MEC servers eliminate the need to use proprietary solution platforms, allowing compute and storage services to be dynamically allocated on demand, while also improving the network's data flow management.

MEC-driven 5G solutions are often better able to deliver real-time performance for high-bandwidth applications. In fact, virtualization allows for the abstraction and distribution of the data center itself; MEC servers can share the workloads typically pushed back into the network core. This approach can boost solution performance and bolster network resilience while still preserving a high level of performance. Additional MEC infrastructure benefits can include reduced cloud data transport costs, reduced network resource contention, greater ability to achieve real-time analytics, and the opening of new edge-based services to monetize IT investments and expand company revenue.

MEC servers physically differ from their data center-bound counterparts in both size and ruggedness. Since edge server rooms are smaller and much more compact than the average on-premises data center, MEC architecture is designed around a space-saving concept that facilitates a server's installation in spaces unsuited to standard-sized servers. These rack-mountable MEC servers are available in 1U and 2U configurations, each with depth measurements of either 420 or 430 mm—an appropriate size for locations lacking in server space. Aside from their compact physical dimensions, ADLINK's MEC servers are designed and built to withstand rugged environmental conditions including dust, shock, and vibration while also supporting an operating temperature range from -5°C to +55°C.

MEC-based edge computing use cases abound across all industries and markets. In July 2020, Dell'Oro Group published its Advanced Research Report on Multi-Access Edge Computing, which forecast a 169 percent compound annual growth rate (CAGR) in the MEC market from 2019 to 2024—a doubling of the January 2020 forecast—driven largely by 5G service providers. However, the characteristics driving MEC adoption for 5G carry through into related markets as well. For example, in August 2020, ABI Research projected that edge AI chipset sales would surpass those of cloud AI chipset sales for the first time in 2025, signaling changing market and application demands "driven by the need for privacy, cybersecurity, and low latency." MEC-based solutions provide a level of control and performance that cloud-based platforms cannot match.

Following are some of the most promising 5G MEC use scenarios that small and medium-sized operators can target in the short term and coming years.

# Promising MEC Use Cases Deliver Performance and Efficiency

## Cellular Vehicle-to-Everything (C-V2X)

As an automobile moves through traffic, opportunities abound to connect the vehicle with other devices that can add value to the driving experience. Examples could include other vehicles (collision avoidance), navigation and road condition information, telematics service providers (engine diagnostics and vehicle activity, like a Fitbit for one's car), the road itself (autonomous driving), and content providers (infotainment). The more this data can be retained and processed at the edge, the more stable and reliable the end-user's experience will be.

## Visual Inspection

A manufacturer's defect rate can make or break a product line's profitability. Visual parts inspection has been a staple of assembly lines for well over a century, but human inspection is both costly and fallible, as people are easily distracted and bored by repetitive tasks. 5G allows manufacturers to easily deploy a range of sensors and camera systems along an assembly line. By performing AI-based image analysis at the edge, defects can be spotted more quickly than by streaming the same data to the cloud. Faster acceptance/rejection, in turn, allows for faster inspection and end-to-end production.

## Augmented/Virtual Reality (AR/VR)

Between Google Glass and the Oculus Rift, the allure and potential of augmented and virtual reality solutions are now widely known. However, both technologies face a use experience (UX) barrier. The UX is significantly enhanced by having wireless head-mounted displays, but, prior to 5G, wireless technologies could not provide the throughput and low latency required for convincing AR and VR. At least one study from 2019 claims that a 4K, 60 fps VR experience requires up to 40 Mbps of sustained bandwidth with latency of under 50 ms. (Some sensitive users may require even lower latencies.) With 5G Phase 2 (Release 16), these requirements can easily meet. AR/VR applications can be implemented everywhere, from assembly lines to molecular research to consumer entertainment.

## Wearables

Wearable smart devices have been constrained in range and functionality, in part because of limited bandwidth and application models that required most of the data processing to be done in the cloud, which hampered performance. Changing to a local processing model backed by a capable MEC server platform can help realize the true potential of wearables. An improved 5G network can quickly shift workloads to edge processing for personal navigation services, medical monitoring, job site safety, athletic performance, and customer data access. A Salesforce survey found that 76 percent of wearable adopters reported improved business performance from wearable use, and 86 percent of adopters planned to increase wearable technology spending over the coming 12 months. Going forward, 5G integration into a wearable strategy can provide an even higher ROI for wearables.

## Distributed Antenna System (DAS)

Indoor environments, especially large areas with concrete and metal obstacles, can be particularly difficult for wireless signal reception. A DAS can improve indoor signal coverage and performance, but this technology requires significant processing when detecting, monitoring, and dynamically adjusting for detected signal faults. A high-performance edge server, such as an ADLINK MECS series solution, can handle the complex data loads necessary for an effective DAS implementation.

## Analytics

Operational support systems (OSS) and business support systems (BSS) applications rely on data streams from throughout an organization. Historically, these potentially large streams were routed to the data center for analysis, but doing so increases latency and utilizes bandwidth—two factors that can be detrimental to the performance of applications such as closed-loop automation, which may require corrective action within milliseconds. It can be more cost effective to run analytics at the edge and send small batches of pre-processed information to the core. Analytics activities include event correlation, big data applications, IoT data processing, video analytics, and machine learning.

# 5G Edge Server Requirements

As 5G grows in popularity and performance demands scale upwards, especially at the edge, attention must increasingly focus on platform and component quality. Slow speeds, high latency, and unreliable network connections can sour 5G endpoint experiences. Fortunately, most, if not all, such issues can be mitigated by improving 5G network edge processing.

Building the fronthaul portion of the network will be critical as devices like 5G small cells will need sufficient bandwidth coming from the DU to properly serve its audience. Similarly, the DU platform will need hardware with the right characteristics to survive harsh conditions, address reliability considerations, and overcome speed-related performance issues.

## Durability

Edge devices, including servers, may need to withstand harsh environments likely to damage components over time. Such rugged servers must tolerate fluctuating high and low temperature conditions. They should also be resistant to environmental vibration, such as the constant running of nearby motors or the passing of low-flying aircraft. Additional considerations may need to be made for factors including dust and humidity. Edge application uptime is often critical, and attention to durability may be essential to an effective 5G architecture.

## Performance

Edge servers on a 5G network need to be built with components able to handle the high I/O going passing between edge and RRU devices, including server-class CPUs, memory, network adapters, and storage. For certain tasks, dedicated hardware acceleration products, particularly GPUs and FPGAs, can help boost processing performance. Data offload to such accelerators leaves more compute resources available for other applications. This is particularly important with virtualized resources, as resource utilization in virtualized platforms tends to be higher. An edge server should accommodate such task-specific expandability.

## SWaP

Unlike data center deployments, edge servers can be placed in the most unlikely locations, including roadside enclosures, atop radio towers, and even in vehicles. For this reason, size, weight, and power (SWaP) considerations may be crucial in a 5G edge server. There are always compromises to be made between performance and SWaP constraints, but the object is to obtain the best performance with the lowest possible physical limitations. No organization wants to consume 10U of rack space when 1U or 2U can provide the same performance at lower power and less cost.

## Scalable

The ability to upgrade CPUs and memory, or add GPU and FPGA acceleration, are examples of scaling up. An edge platform should also be able to scale out to additional systems across various high-performance network fabrics and add resources wherever needed. This is especially true for 5G networks, for which exponentially increasing device counts and escalating feature support (for example, 5G Release 17 expected in 2021 or 2022) are likely to be ongoing trends.

## Business Requirements

Many elements of a successful edge server deployment will depend on factors beyond conventional technical considerations. Wide geocoverage by the supplier will be needed by clients who are deploying systems across multiple global regions. This is necessary to lower post-sale costs as well as reduce service turn-around times. Service requirements may be reduced if edge server platforms are certified by key organizations and vendors that carry pertinent value for the client's needs. Easy, comprehensive manageability will also help keep IT expenses in check while improving user experience, as will streamlined provisioning processes and integrated security throughout the solution stack. In addition to the features supported, the edge platform's form factors, from component dimensions to rack space consumed, should be considered, as clients will need to adapt solutions to their environment's and application's demands. And in the same vein, 5G edge server platform manufacturers should be able to customize the system to a client's unique needs, perhaps omitting unnecessary board-level component costs or adding components that will add specific value to the solution.

# ADLINK MEC Servers: Built for 5G and Beyond

ADLINK's MECS series consists of two COTS systems: the MECS-6110 and MECS-7210. Each system targets different sets of requirements at the 5G edge. The 1U MECS-6110 uses a single Intel® Xeon® D-2100 Series processor with support for up to 256GB of memory, while the larger 2U MECS-7210, designed for heavy workloads and intensive processing, is powered by dual Intel® Xeon® Scalable Silver/Gold Processors with a maximum 512GB memory capacity. Additionally, the MECS-7210 includes redundant, hot-swappable storage and redundant power supplies for higher uptime assurance and easier maintenance. Both systems fully comply with the Open Telecom IT Infrastructure (OTII) as defined by the Open Data Center Committee (ODCC), a collaborative industry effort helmed by Intel and others to achieve an industry standard for COTS-based, 5G network and edge server solutions.

| Model Name | | MECS-7210 | MECS-6110 / 6111 |
|---|---|---|---|
| Form Factor (WxHxD) | | 2U 19'' rackmount 438mm x 88mm x 420mm | 1U 19'' rackmount 438mm x 44mm x 430mm |
| Processor | | Dual 1st or 2nd Gen Intel® Xeon® Scalable Processors | Single Intel® Xeon® D-2100 family processor |
| Chipset | | Intel® C624/C627 Chipset | Integrated on Intel® Xeon® D SoC |
| Memory | | 16x DDR4-2666 DIMM sockets, ECC, registered, up to 512GB | 4x DDR4-2666 1DPC RDIMM sockets, ECC, REG, up to 256GB |
| Storage | On-board | 1x M.2 2242 M key SATA 6 Gb/s<br>2x M.2 2242/2280 NVMe | 2x M.2 NVME socket, 2242/2280 M Key |
| | Drive bay | 2x 2.5" hot-swappable SATA 6 Gb/s | 2x 2.5" hot-swappable SATA 6Gb/s<br>(Only for MECS-6110) |
| PCIe Expansion | | 2x PCIe x16 Gen3 single/dual-slot FHFL interfaces | 2x PCIe x16 Gen3 single-slot FHFL interfaces |
| IO | Ethernet | 4x10G SFP+ front access<br>2x 10/100/1000M RJ-45 front access | 4x RJ-45 10/100/1000BASE-T Ethernet ports<br>2x 10G SFP+ Ethernet ports<br>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 |

ADLINK MECS series systems fulfill general edge server requirements in the following ways:

### Ruggedly Built to Endure

Designed for harsh environments, the MECS-6110 and MECS-7210 are built to withstand rugged environmental conditions and can operate from -5°C to +55°C, with a storage tolerance down to -40°C. Additionally, the platforms can withstand repeated shocks of 2G (half-sine, 11ms pulse, 100 pulses in each direction) thanks to ADLINK's years experience in rugged embedded design and use of only the highest-quality mechanical parts. ADLINK edge servers feature a high mean time between failures (MTBF), extended support options, and secure remote configuration and monitoring.

### Ready to Perform

To handle demanding and ever-increasing 5G workloads, ADLINK MECS series servers utilize Intel® Xeon® Scalable and Xeon®-D processors, DDR4 ECC memory, and a combination of M.2 and 2.5" SATA drives. Each model also includes PCIe expansion slots to support add-on components to meet specific application requirements, including FGPA, GPU, and I/O expansion cards. For networking, each edge server includes both 1 GbE and 10 GbE ports, which is critical for passing large amounts of data through Open RAN virtual environments without fabric bottlenecks.

### Satisfying SWaP

Both MEC servers have standard rack-mountable dimensions but are only 1U or 2U in height, occupying much less physical space and allowing them to be easily installed in remote and/or constrained locations. Smaller systems with efficient processors mean less power consumed and reduced cooling demands, which becomes doubly important when installed in environments lacking data center-like cooling and ventilation.

### Easy Manageability

ADLINK's MECS series servers support the open Redfish® industry standard. Redfish provides simple, modern, and secure management of scalable platform hardware. Administrators can also use the Intelligent Platform Management Interface (IPMI) with iKVM and Serial over LAN (SoL) to manage and monitor the edge server remotely via a web browser.

### Penalty-Free Scalability

Too often, proprietary edge solutions limit users' ability to grow and meet new workloads or platform enhancements. ADLINK MECS series provide two full-height, full-length (FHFL) PCI Express slots for quick, affordable performance expansion, such as with GPU or FPGA add-on cards. Ample network bandwidth can accommodate large IoT device sets and workloads including high-resolution video, as well as lateral scaling of compute resources within edge and broader RAN deployments.

### Built for Business

ADLINK maintains branch offices around the world to ensure that it can provide faster, more pertinent, regionally tailored support for all its product families, including MEC servers. ADLINK further backs its edge servers with comprehensive platform certifications, including OTII compliance, NVIDIA NGC-Ready, and AWS validation (see below). Systems include a wealth of security features, from board- and chip-level trusted platform enhancements to application-level management tools designed to enforce IT policies and block unwanted activity. ADLINK offers a line of off-the-shelf MEC servers, but the company's vertical integration and exceptional ODM engineering abilities allow clients to fine-tune these systems to specific needs or even build novel MEC designs from the ground up with whatever components, functionality, or form factors are required to meet specific needs of the customer's deployment.

# Validated for NVIDIA NGC-Ready, Amazon AWS Device and Intel® Select Solution for uCPE

ADLINK's MECS-7210 system, when configured with two NVIDIA T4 Tensor Core GPUs, is validated by NVIDIA as an NGC-Ready Computing Platform for on-premises, cloud, and edge deployments, allowing customers to leverage NVIDIA's extensive range of GPU-accelerated AI frameworks for real-time intelligent decision making, and migrate workflows between hybrid and multi-cloud environments. This hardware-optimized MEC/GPU supercomputing combination makes the MECS-7210 ideal for processing AI workloads in machine learning and deep learning applications. As a form of hardware acceleration, the NVIDIA GPUs' parallel processing capabilities enhance the MECS-7210's inherent processing power and allow offloading of processes from CPU to the GPU to optimize workloads while the server runs at the network edge. The NGC-Ready validation also gives MECS-7210 customers access to NVIDIA's enterprise-grade support while also letting these customers benefit from the continuously optimized NVIDIA framework and its latest features.

aws qualified device

Additionally, the MECS-7210 has completed validation with Amazon's AWS Device Qualification Program. This means that the system will arrive pre-qualified to run Amazon edge platforms such as AWS IoT Greengrass, AWS IoT Core, and Amazon Kinesis Video Streams. Whether customers target low-end IoT stream storage or high-demand, high-performance video analysis, using solutions validated for some of the world's largest and most advanced IoT frameworks can improve user results, increase ROI, and speed time-to-market.

intel select solution

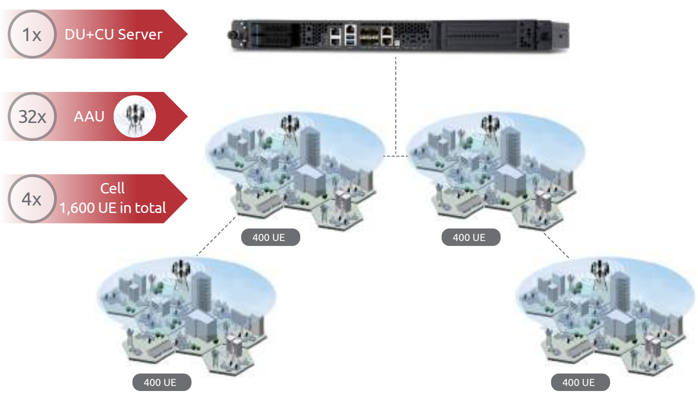
ADLINK's MECS-6110 is a verified Intel® Select Solution for universal customer premises equipment (uCPE) for CentOS. uCPE is an emerging category of NVF-based edge computing and service provisioning systems that enable service agility for communications service providers (CSPs). The Intel Select Solution for uCPE provides a foundation for the development of uCPE products with a solution reference design that combines the powerful Intel® Xeon® D processor with an optimized software stack. With the verification, the MECS-6110 is a differentiated platform with validated software from an ecosystem of a large number of tested and optimized virtual network functions (VNFs). This helps CSPs get to market quickly and deliver new services to enterprises and small businesses.


# MECS at Work: Private 5G Networks Accelerate Smart Manufacturing

With 5G deployments expanding in Taiwan, Gemtek Technology, a leading wireless communication solution providers, wanted to pair its advanced small cell system with a robust edge computing platform for the manufacturing industry. This would enable dedicated, reliable, cost-effective, and secure private 5G networks and edge analytics platforms. Gemtek needed the right edge computing solution to be the hardware foundation for its solution to deploy to Open RAN sites and partnered with ADLINK, selecting the MECS-7210 server for its 5G infrastructure solution. The MECS-7210 brings compute power closer to RRUs located at the cell sites, increases overall performance, and lowers latency, while also improving network reliability.

The MECS-7210 is able to bring these benefits to Gemtek's 5G solution, thanks in part to dual Intel® Xeon® Scalable processors that integrate Intel® QuickAssist Technology (QAT), which helps accelerate several functions critical to software-defined solutions. The server also supports up to 512GB of DDR4 memory, supplying broad networking pipelines to avoid load congestion, and provides the compute power needed to handle intense computational workloads derived from a dense 5G environment. Early manufacturing deployments of the Gemtek solution in Taiwan allowed users to increase production capacity through more successful deployment of AI and robotics, which led to savings in human resource deployment and more intelligent analytics for failure prediction.

# MECS at Work: COTS Edge Servers Facilitate 5G Open RAN Deployment




Despite the countless advantages of 5G technology over 4G and other wireless alternatives, there can be costs to pay in capital and operational expenditures as well as increased energy consumption. A paper by the GSM Association details these costs and how open standards can help mitigate them. The 5G Open RAN is one such effort, but deployments are still so new that little industry data on actual savings exists. To put matters to a real test, ADLINK teamed with solution provider Ruijie Networks to perform benchmarking on a real 5G deployment of DUs connected to 32 active antenna units (AAU), evenly distributed in four cells servicing 1,600 user equipment (UE), including 5G mobile phones and IoT devices.

Ruijie Networks built its solution on the ADLINK MECS-6110, a 1U edge server compliant with all Open RAN specifications. With low power consumption to allow operation in a ventilation-constrained server closet combined with high processing performance and expandability, the MECS-6110 proved more than capable for the customer's application. Ruijie Networks' solution maintained reliable 5G service for the entire 1,600-client network on a prolonged basis, meeting all throughput, latency, and reliability requirements. The test platform showed that ADLINK systems are quite capable of fulfilling the Open RAN vision and providing a more cost-effective path for providers and clients seeking to deploy 5G solutions.


# Collaborative Ecosystem Speeds Time-to-Market

While organizations around the world are moving to deploy 5G Open RAN solutions to enable new wireless capabilities, several implementation challenges remain. A new collaboration between ADLINK and integrated wireless solutions provider SageRAN addresses many of these challenges and now offers a unique, high-value option for organizations needing 5G small cell coverage for edge networks, especially in difficult environments.

Externally, SageRAN's new 5G small cell solution looks much like a piece of wheeled carry-on luggage, complete with an extending handle and top lid secured by four latches. Within the enclosure lies a miniature 19-inch rack system with three installed 1U/2U components: a 5G Core (5GC), application server, and BBU. Collectively, the system functions as a compact, mobile, high-performance 5G base station when connected to an RRU. This 5G small cell solution is optimized for cutting-edge 5G applications, including vehicle-to-everything (V2X) communication and the industrial internet of things (IIoT).

The BBU of SageRAN's solution is based on ADLINK's MECS-6110/MECS-7210 edge server series, which provides COTS affordability combined with scalability, OTII compliance, and validated NGC-ready hardware. SageRAN adds its own 5G BBU protocol stack to the solution, enabling broad wireless functionality with market-tested compatibility and performance.

Additionally, ADLINK and SageRAN have extended their collaboration by founding a joint laboratory for developing integrated 5G edge solutions for public and private networks. Projects will support open architectures and strive to balance innovation with interoperability and ongoing cost reduction.

# Why ADLINK?

By leveraging more than two decades of expertise in developing highly reliable and available embedded computing systems, ADLINK is a premier supplier to worldwide leading telecommunications equipment manufacturers (TEMs) and networking solution providers. ADLINK's carrier-grade, open standards-based COTS and ODM/custom solutions enable customers to speed time-to-market by focusing on differentiating their next-generation applications at the edge of both cloud and mobile networks. ADLINK is committed to helping solution providers facilitate the transformation to 5G network infrastructure, open up enormous opportunities of new services, fend off increasingly challenging cyberattacks, and deliver uninterrupted enterprise network services.

### Technology Leadership

As a long-standing pioneer in embedded technologies, ADLINK demonstrates strong thought leadership in prominent industry consortia, including Open Data Center Committee (ODCC) and Telecom Infra Project (TIP). The company also drives standards establishment and technology advancements to enable state-of-the-art edge computing and GPGPU solutions for information and communications technology (ICT) infrastructure transformation.

### Extensive Portfolio

ADLINK is dedicated to continued development of its extensive, highly cost-effective, standards-compliant COTS product portfolio. ADLINK's complementary product lines promote multi-vendor interoperability; enable customers to effectively drive low TCO with great flexibility in solution selection; and leverage edge computing, IoT, AI, and machine learning technologies to enable a wide range of new applications and services in the era of 5G.

### Strategic Partnership

As a Premier member of the Intel® Internet of Things Solutions Alliance and an NVIDIA Quadro Embedded Partner, OEM Preferred Partner and Jetson Elite Partner, ADLINK leverages unrivalled access to advanced processing technologies, driving innovative, open standards-based heterogeneous computing solutions for data-intensive use cases.

### Quality and Integrity

With world-class in-house manufacturing facilities, established quality management systems, and supply chain management (ISO-9000 and TL9000 certified), ADLINK ensures uncompromised carrier-grade quality. Equally important, ADLINK fully controls product integrity and security, and thus remains immune to any outside tampering.

### Supply Longevity

ADLINK ensures best practices in product obsolescence and lifecycle management. We leverage strategic partnerships with key component and software vendors, delivering supply longevity to support long lifecycle customer programs.

### Business Flexibility

As a flexible and agile organization with best-in-class ODM capabilities, ADLINK can effectively and efficiently address rebranding, customization, joint development, and hardware prototyping smoothly and promptly. ADLINK makes ease of doing business one of our top priorities and focuses on helping customers speed time-to-market for long-term mutual success.

### Global Support

As a global enterprise with a strategic footprint in design, manufacturing, and service worldwide, ADLINK leverages customer proximity to effectively deliver products to regional market specifications and requirements. This high-touch business model, which hinges on local technical and business services, is key to most networking and communications projects.

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