ADLINK
Leading EDGE COMPUTING

Solution Brief

ADLINK Edge Servers Enable Rapid 5G Open RAN Deployment

ADLINK MECS Series Edge Servers

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Why 5G Open RAN?

The transition from 4G/LTE to 5G has revealed limitations in legacy network design. The industry-proposed solution is a 5G Open Radio Access Network (RAN), which brings open architecture to the fronthaul of the network by embracing 3GPP 5G designs, splitting the 4G/LTE baseband unit (BBU) into a centralized unit (CU) connected through the midhaul to one or more distributed units (DU). This split allows for increased flexibility in delivering new network use cases, notably emerging, non-traditional applications like the Internet of Things (IoT) and artificial intelligence (AI), because of the near zero-latency provided by the DU's proximity to the edge. Depending on application and deployment requirements, in some cases, CU and DU are co-located or even integrated into a single server at cell sites. .

The software-defined Open RAN network architecture makes the disaggregation of software and hardware possible, ensuring a fully interoperable future-proof network while avoiding vendor lock-in, and allowing flexible scalability and automated network management. The innovation and promise of this new technology, as stated in a GMSA study, delivers a possible 25%-40% overall savings for total cost of ownership (TCO). The figure is further confirmed by Rakuten Mobile's recent estimate about sizable savings through reduced capital investment and cheaper operation, with capital expenditure (CapEx) and operating expenditure (OpEx) down 30% and 40%, respectively.

White box edge servers are foundational to 5G Open RAN. The major Open RAN consortia, such as OpenRAN Project Group of the Telecom Infra Project (TIP), the O-RAN Alliance and the Open RAN Policy Coalition, provide specifications for commercial-off-the-shelf (COTS) based networking equipment that supports software-based networking, virtualization, network splitting, and resource pooling. Inspired by data center white boxes and adapted for edge DU applications, they provide expansion options for extended processing power, tolerate a wider temperature range, and use a smaller form factor suitable for compact edge installation locations.

5G Open RAN is rapidly gaining traction with adoption and rollouts accelerating, and major players worldwide already capitalizing on its advantages. Rakuten Mobile, an upstart newcomer in Japan's mobile sector, has rolled out 5G service built with an Open RAN architecture for its 1 million mobile customers. In the US, Dish Networks acquired Boost Mobile from T-Mobile US and is implementing a fully-compliant Open RAN infrastructure to support its network of 9 million customers.

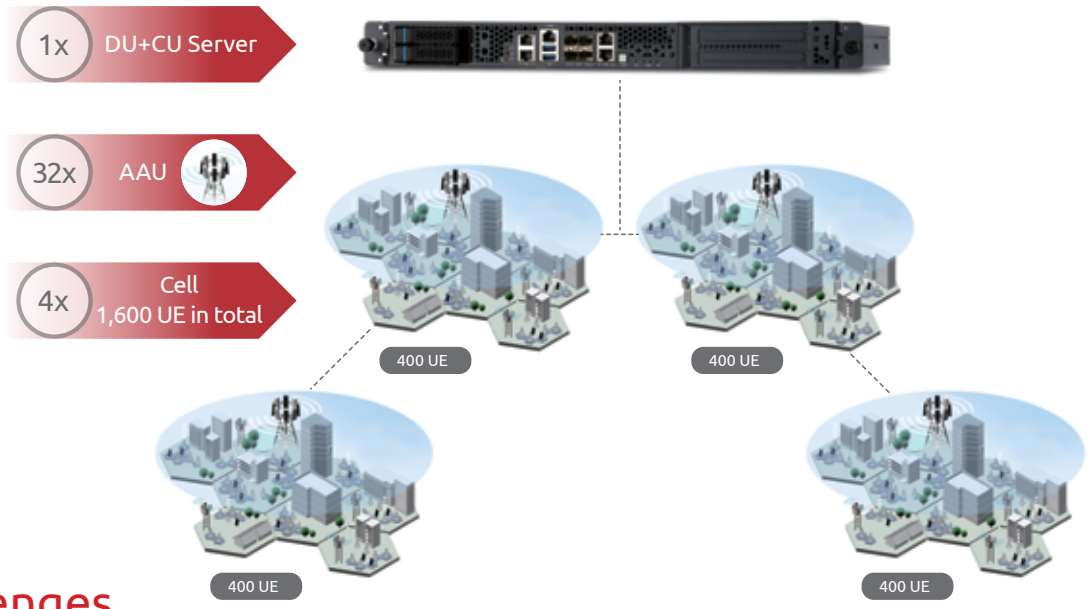
ADLINK's partner Ruijie Networks set up a test location to calculate the real-world costs and evaluate the potential applications.

Customer Application

Ruijie Networks, a leading network solution supplier in China, and a member of the O-RAN Alliance, recently undertook a 5G Open RAN pilot project in a metropolitan area in China to implement an optimized RAN architecture to provide 5G cellular services and evaluate network performance and customer experience for multiple predefined use cases.

In this project, Ruijie tested technological aspects of implementing multiple key technologies, including network disaggregation, virtualization, slicing, equipment pooling, and resource sharing, to assess these emerging technologies' impact on network densification and quality of service (QoS). In addition, Ruijie also calculated the economic impact of the implementation, creating benchmarks to analyze CapEx and OpEx in order to facilitate the commercialization of the optimized RAN architecture and associated use cases.

At the network's core were a group of DUs installed in server racks of an existing small equipment room annexed to a nearby office building. In this case, the CU function can also be incorporated in the DU servers. Each DU connected to 32 active antenna units (AAU) evenly distributed in four cells. With each cell serving 400 mobile phones, IoT devices, and other user equipment (UE) on the cellular network, each DU in this deployment could serve up to 1,600 UE for mixed users in both consumer and commercial segments.



Challenges

Network solution providers like Ruijie face several challenges with networking equipment for DU applications, including space limitations, reliability, flexibility, and interoperability.

Harsh Edge Environment with Limited Space

DUs installed close to the network edge can reduce the data roundtrip for low-latency applications. Installation is usually in an edge server room with limited air-conditioning and less-than-optimal airflow, so networking hardware must tolerate a wider temperature range because of these cooling constraints. Size is also an issue, since unlike data centers with 19" racks supporting servers over 1,000 mm deep, an edge server room typically has a two-post 19" rack supporting a maximum depth of only 450 mm.

Stringent Reliability Requirements

Telecom equipment must operate 24/7 to meet stringent service-level agreements (SLA). Constant stress on all components means they must individually meet higher reliability standards with mean time between failures (MTBF) beyond typical parameters. Redundant hardware is crucial to prevent server downtime. Networking, power supplies, cooling fans, storage, and memory must all be fault-tolerant with fallback in case of hardware malfunction. Failure of a DU at a remote or hard-to-access location could take hours or days to repair, which is unacceptable in today's always-on world.

Diverse Application Needs

5G Open RAN offers flexibility for future applications that demand diverse network functionality. Traditionally, mobile networks have focused on high-bandwidth for high-definition streaming video, augmented reality (AR), virtual reality (VR), and various cloud services. Now, new opportunities like smart grids, autonomous driving, and remote surgery are less focused on bandwidth, but require the intensive computation power of GPUs and FPGAs and the no-latency network response (<1ms) enabled by higher network throughput and shorter data roundtrips.

Open Standards for Global Deployment

Most major network solution providers use proprietary designs that make interoperability between vendors difficult or impossible. Aside from the price premium of branded offerings, their proprietary hardware means longer lead times for network implementation. This closed development ecosystem presents a competitive barrier when trying to gain the "first-mover advantage" that is critical for new technology rollout. Open standard compliance ensures interoperability between hardware and software from different vendors. COTS networking hardware comprises components readily available in the supply chain, like CPU, memory, expansion cards, and other parts.

World-class Global Support

Better pricing and design flexibility may tip the scales in favor of open offerings. Still, limited or subpar vendor support is often enough to justify the choice of big-name brands. Traditional vendors provide comprehensive maintenance and SLAs that ensure service quality that smaller OEM and ODM vendors often fail to deliver. Vendors must offer leading hardware quality, competitive pricing, global presence, and local support to help customers with their deployment and network scaling.

Remote Monitoring, Control, and Configuration

Due to the difficult-to-reach location of DUs, they must support easy troubleshooting and monitoring, with preventative notifications of failing modules so that potential issues can be fixed before they negatively impact service delivery. Baseboard management in data centers provides remote management to troubleshoot and remote reset in case of hardware difficulties, and edge servers must also provide these functions. Advanced capabilities for edge servers must include remote provisioning and configuration over wide area networks through modern protocols like Redfish®.

ADLINK's Solution

ADLINK's MECS series edge servers are designed from the ground up to meet the challenges of implementing 5G open architecture and Multi-access Edge Computing (MEC), providing the processing power, reliability, expansion capabilities, and ongoing support to open the doors to international markets. Ruijie chose the ADLINK MECS-6110 for this project.

Server-Grade 5G Networking Hardware in a Rugged Package

ADLINK's MECS-6110 is a 1U edge server optimized to be deployed as a 5G Open RAN DU+CU server. Its short 420 mm depth complies with the specification limits for Open RAN, providing Ruijie the deployment flexibility to effectively utilize any existing infrastructure. System fans are strategically placed to provide ample air flow through the system and over the internal components, facilitating a wide operating temperature of -5°C to +55°C (-40°C to +70°C storage) and ensuring reliability in unpredictable environments. Finally, front panel I/O provides easy access to commonly used connections.

High MTBF and Multiple Redundant Components

As a carrier-grade and server-class platform, the ADLINK MECS-6110 is designed with an industry leading MTBF. Even in the event of component failure, hot-swappable, redundant components keep the system online. There are dual hot-swappable 2.5'' SATA 6Gb/s hard drives, dual hot-swappable power supplies to keep power running even if one power supply fails, multiple system fans that provide sufficient airflow in the event of fan failure, and M.2 2242 and M.2 2280 slots to support industrial SSDs typically rated at over 2-million-hour MTBF.

Intel® Xeon® Processor and Multiple Expansion Options for Future Applications

An Intel® Xeon® D-2100 processor with Intel® Advanced Vector Extension 512 (Intel® AVX-512) and enhanced Intel® QuickAssist Technology (Intel® QAT) enables faster data transfer, faster encryption, and cryptography processing. The CPU handles general processing and two PCIe expansion slots provide flexible configuration and expandability that enables powerful edge server functions through GPUs, FPGAs or additional I/O. GPUs (and FPGAs) provide more calculation power with a smaller footprint, precisely what is needed for driving AI algorithms, IoT applications, and other mathematically intensive operations.

Remote Monitoring, Control, and Configuration

ADLINK's MECS-6110 supports the open Redfish® industry standard. Redfish provides simple, modern, and secure management of scalable platform hardware. By using modern technologies like a RESTful interface over HTTPS, JSON, and OData, Redfish can easily integrate into existing tool chains. Administrators can also use Intelligent Platform Management Interface (IPMI) with iKVM and Serial over LAN (SoL) to manage and monitor the edge server remotely via a web browser.

World-class White box Solution Supplier with Global Presence

By leveraging more than 25 years of expertise in developing highly reliable and available embedded computing systems, ADLINK is a global supplier of cost-effective COTS, white box solutions with a strategic footprint in design, manufacturing, and service worldwide. In addition, ADLINK ensures best practices in product obsolescence and lifecycle management, and maintains supply longevity by leveraging its strategic partnerships with key technology vendors such as Intel and NVIDIA.

OTII-Compliant for Worldwide Deployment

The Open RAN consortia all share the aim of ensuring interoperability and compatibility for open networking. The consortia embrace the 3GPP 5G design specifications and fill in the gaps to create fully interoperable networks. One part of their charge is to set the specifications for white box network servers to ensure hardware compatibility. ADLINK is a member of China's Open Data Center Committee (ODCC), and the MECS-6110 meets their Open Telecom IT Infrastructure (OTII) requirements, which is necessary for rollouts like Ruijie Networks' in China.

Conclusion

ADLINK delivers competitive service with network solutions that conform to the Open RAN consortia's design specifications. In this 5G Open RAN pilot project, ADLINK's edge servers provided Ruijie Networks a complete package for distributed units (DU) at the network edge, with the processing power needed for high-speed networking, reliability for industry-leading QoS, hot-swappable parts to ensure uninterrupted operation, and upgrade flexibility to support future applications. And all backed up with a world-class global supply and support network. As an ODM powerhouse with a flexible and agile organization, ADLINK can also effectively and efficiently address customization and rebranding to accommodate Ruijie's unique needs and help them accelerate the commercialization of their 5G RAN solutions at a fast pace and on a large scale.

Learn more about ADLINK Edge Server MECS-6110

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