5G Open vRAN and MEC

The telecommunications landscape is undergoing a transformative shift with the advent of 5G technology and the proliferation of edge computing. This white paper explores the dynamic synergy between Multi-Access Edge Computing (MEC) and 5G Open vRAN (virtualized Radio Access Network) and their collective potential to reshape the telecommunications industry.

OVERVIEW

As the demand for ultra-low latency, high-speed connectivity, and real-time data processing intensifies, MEC and 5G Open vRAN emerge as critical enablers. This white paper provides a detailed analysis of the benefits, challenges, and real-world use cases, underscoring the imperative for stakeholders to embrace the paradigm shift presented by MEC and 5G Open vRAN in a rapidly evolving digital landscape.

Understanding MEC

MEC units process data near its source, eliminating delays and improving efficiency. In a traditional setup, most data is sent for processing at a data center, incurring heavy bandwidth demands on the backhaul. The MEC system is a more powerful computer capable of analyzing real-time data from IoT devices. The computer can perform near-real-time decision-making without incurring the overhead of the roundtrip to the remote server and back.

Unveiling 5G Open vRAN Technology

5G brings high-speed wireless communications technology into the picture. This technology revolutionizes real-time communication and data exchange by extending the reach of edge connections beyond the limits of Wi-Fi and with lower latency than 4G LTE. Open vRAN disaggregates hardware and software through virtualization, bringing network slicing features to create virtual networks for specific tasks, ensuring reliable, low-latency communication.

Convergence of MEC and 5G Open vRAN

The combination of MEC and 5G Open vRAN facilitates real-time decision-making for critical tasks, making it an integral tool for optimizing operations and delivering innovative services. It delivers the latest edge processing capabilities wirelessly to remote devices and sensors in the field. Many telcos and enterprises have held back from full-scale adoption because of the unproven potential of these new technologies beyond simple speed increases. However, with accelerated interest, the landscape is changing fast.

The Significance for Telcos and Enterprise

Telcos are capitalizing on the potential of MEC and 5G Open vRAN to reshape their roles and extend their service offerings. Telcos can partner with smart city initiatives, deploying new MECs for real-time data analysis from diverse IoT devices spread across the city, with 5G ensuring seamless communication between these devices and edge servers. Traffic monitoring and autonomous driving can benefit from this infrastructure in a similar manner. For enterprises, these capabilities can extend their networks to previously inaccessible or remote locations. Rolling out these new technologies poses many challenges, not least of which is hardware capable of delivering the new levels of performance required for these new applications.

Hardware Considerations

The integration of MEC and 5G technology offers tremendous potential, and the IBASE INA8505 1U Edge Server for 5G Open vRAN & MEC has the capabilities to meet complex edge workloads.

Processing power is delivered through a combination of multi-threaded processing for varied workloads and parallel processing prowess for loads often handled by GPUs. The latest generations of Intel® server-grade processors are tailored to the demands of real-time data processing. The INA8505 sports an Intel® Xeon® D (formerly Ice Lake D) processor with 10 to 20 cores, a max TDP of 126W, and memory support for up to four DDR4 2133/2666 DIMMs with max capacity of 128GB.

Storage capacity and speed are essential for storing and retrieving data at the edge. A combination of suitable storage solutions, such as solid-state drives (SSDs) or network-attached storage (NAS), is critical to avoid data bottlenecks. The INA8505 has flexible storage options that include 2x SATA/NVMe 2.5” HDD/SSD, 2x M.2 SATA/NVMe storage, and 1x 16GB/32GB/64GB eMMC to improve scalability and efficiency.

High-speed networking interfaces are vital for MEC and 5G convergence. Gigabit Ethernet, 10GbE, and emerging technologies like 25GbE facilitate seamless data transfer between edge nodes and core networks. The INA8505 has advanced networking capabilities with 4x 25GbE SFP28 ports and a modular design for flexibility.

PCIe expansion is required to add GPUs that bring the real-scale parallel processing and analysis of high-definition images and video to fruition. The availability of ample PCIe slots is crucial for flexibility and scalability. The INA8505 has a wide range of PCIe expansion options, including 1x FHFL PCIe Gen 4* 16 (Supports 75W), 1x FHFL PCIe Gen4 *8 (Supports 75W), and an optional combination with DW FHFL PCIe Gen4 *16 (Supporting 120W) to serve a variety of applications for versatile solutions and higher performance.

Multiple I/O options are a key consideration in making essential connections with a wide range of external devices and sensors. The INA8505 comes with the full spread of I/O, including BMC Aspeed 2600, PMI 2.0 support, VGA port from BMC, 2x USB2.0 Type-A ports, 1x RJ45 console port, 2x RS242 ports, and TPM 2.0.

Front access and short depth make access for installation and maintenance in tight places simpler by putting essential connections on the front and keeping the size compact. This is

especially important for the space-constrained edge environments. The INA8505 fits well in those tight spaces and is convenient to operate, maintain, and integrate.

Precision clock synchronization is crucial for increased data throughput in networks. The INA8505 has built-in support for IEEE 1588v2 and SyncE, utilizing a GPS reference time source for the most accurate synchronization for time-sensitive applications such as telecommunications and industrial automation.

Features:

- Intel® Xeon® D-2700 (Ice Lake-D) processor
- 4x DDR4 DIMMs, Max. 256GB RDIMM or Max. 512GB LRDIMM
- 1x GbE RJ45 & 4x 25GbE SFP28 ports on board
- 2x 2.5” SATA/NVMe hot Swappable HDD/SSD
- Optional for one card: 1x PCI-E (x16) Gen4 single-slot for double FHFL interfaces passive cooling, up to 120W
- For two cards: 1x PCI-E (x16) Gen4 single-slot +1x PCI-E (x8) Gen4 FHFL interfaces Passive cooling, up to 75W each
- Optional IPMI 2.0 module
- GPS time synchronization
- Supports SyncE and PTP IEEE 1588

Case Studies: MEC and 5G in Action

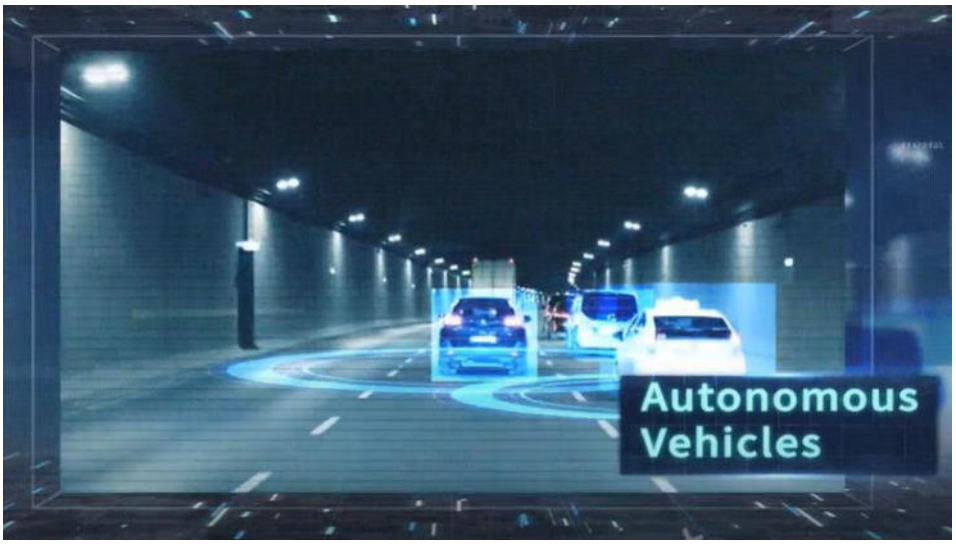
Real-Time Data Analytics: Optimizing Supply Chains

Logistics companies can leverage MEC and 5G to transform their supply chain management. MEC units in distribution centers enable real-time analysis of data from RFID tags on inventory items. Swift decisions for inventory management become possible. 5G's high-speed communication between centers ensures real-time sharing of analyzed data. 5G can

also extend the range of communication with devices such as AMRs. This optimizes inventory tracking, demand forecasting, and overall supply chain efficiency.

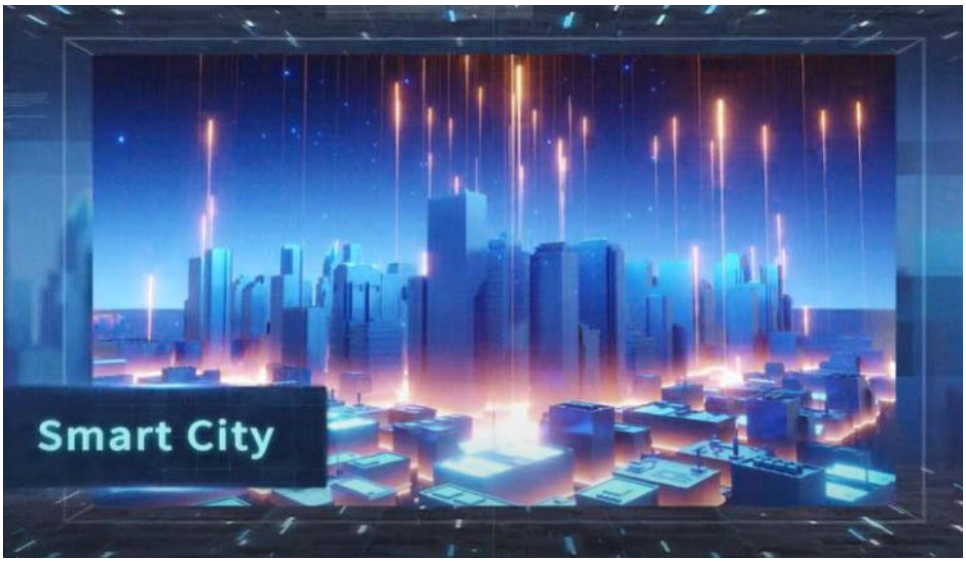
Autonomous Vehicles: Enhancing Road Safety

MEC and 5G come together to revolutionize the safety and functionality of autonomous vehicles. MEC units along roadways process sensor data, enabling real-time decision-making for autonomous vehicles. Tasks like object recognition and collision avoidance are offloaded to the edge. Low-latency 5G facilitates quick communication between autonomous vehicles and nearby MEC units. This enhances the responsiveness and safety of self-driving systems.



Smart Cities: Urban Efficiency and Sustainability

The synergy between MEC and 5G drives the evolution of smart cities towards enhanced efficiency and sustainability. MEC units process data from diverse sources, like traffic cameras and environmental sensors, in real time. Insights into traffic, air quality, and energy consumption empower dynamic urban management. 5G's continuous connectivity ensures swift communication between data sources and MEC nodes. This dynamic exchange enables efficient traffic management, energy optimization, and rapid emergency responses.



Seize the 5G Open vRAN & MEC Opportunity

The combination of MEC and 5G Open vRAN tech will revolutionize the telecom industry, unlocking countless possibilities for innovation and efficiency across multiple sectors. The combination of MEC's localized processing and 5G's high-speed connectivity will redefine the role of telcos, creating new revenue streams and remaining competitive through transformative business models and enhanced customer engagement. Manufacturing, autonomous vehicles, smart cities, and even healthcare will benefit greatly. Telcos must integrate MEC and 5G to remain competitive, create new revenue streams, and drive us toward a faster, smarter, and more connected world.

About IBASE

IBASE Technology (TPEx: 8050) specializes in the design and manufacture of robust industrial PC products, delivering high-quality products and excellent service since its establishment in 2000. We carry out manufacturing and quality control at our own facilities

in Taiwan that are ISO 9001, ISO 13485, and ISO 14001 certified. We also provide ODM/JDM services, tailoring products to customers' requirements. Current product offerings comprise x86- and RISC-based industrial motherboards, embedded systems, panel PCs, digital signage players, and network appliances for applications in the AIoT, automation, smart retail, transportation, networking, and medical sectors. For more information, please visit www.ibase.com.tw.

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