Solution Brief

ISV Operator Configurators, Solution Architects
RAN, oRAN, xRAN, Private LTE Networks

Kontron and Intel Deliver Advanced Services at Network Edge

Multi-access edge computing improves network performance, new revenue opportunities, and cost reduction for mobile operators. Kontron ME1310 servers, powered by Intel® Xeon® D-2700 processors, enable complex apps at the edge

The vision and promise of 5G mobile network architecture includes multi-access edge computing (MEC), placing computing power and capacity at the network edge, thereby enabling next-generation applications and attracting new revenue opportunities for mobile network operators (MNOs). Most critically, MEC deployments are being driven by virtualization of the radio access networks (vRAN) which enables the disaggregation of RAN components into more flexible virtual network functions (VNFs) running on Intel architecture-based commercial-off-the-shelf (COTS) servers that improve network performance while lowering capital expenditures (CAPEX) and operation expenditures (OPEX). Kontron, working with Intel® Xeon® D systems on chip (SoC), have developed a MEC server that balances the performance requirements with space and power limitations.

The promise of 5G Edge Computing

The architecture of 5G ushered in a transformative paradigm shift driving the need for robust computing power at the network edge. MEC is a distributed network model where a server is located on the customer premises or in remote telecom cabinets to process local data without having to transmit that data to a data center or cloud. Moving computing to the edge has a profound impact on transport latency and performance. Data no longer must make the round trip to data centers or the cloud but can be analyzed and processed very close to or by the user equipment (UE). This also alleviates network traffic and bandwidth costs for MNOs.

Moving computing power to the network edge delivers several key benefits:

Improved Performance from Ultra-Reliable Ultra-Low Latency (URLLC)

- By processing data functionally or nearly adjacent to UE without long roundtrips, sub-millisecond latency with 99.999% ultra-high network reliability is possible due to a lack of transport latency.[1]

Reliability

- Since computing is distributed to the edge, UE can continue to operate even if communication channels are slow or offline. For remote applications, such as oil rig monitoring via AI and IoT sensors, operations can continue offline, and analytic data can be stored and sent once connectivity is restored. Without relying on a single connection to a centralized server, there is no single point of failure.

Enhanced Security

- Data, such as confidential customer information, can be processed, analyzed, and stored locally and thereby reduce the risk of security breaches during transmission to data centers.

Scalability

- As use cases and users expand, edge devices can scale locally. Likewise processing power can be applied and shifted to UE as needed.

Reduced Costs

- With the explosive use of data, costs to transmit data now surpass the cost of storing data. Edge computing reduces the amount of data being transported to data centers or the cloud, lessening the burden on networks and the costs to MNOs. And since edge UE is predominantly less expensive than data center hardware, it can be more cost-effective to scale at the network edge than data centers.[2]

In the 2022 Heavy Reading 5G Networks Strategies Operator Survey[3], operators said their top motivators for moving workloads to the edge are reduced bandwidth use/cost, better support for vertical industry applications, the ability to offer differentiated services, and improve overall application performance.

A new generation of use cases and innovative applications that depend upon ultra-low latency and reliable connectivity are now possible with MEC. In manufacturing, connectivity of large numbers of Internet of Things (IoT) sensors can be effectively deployed and managed, at larger scale and with lower latency than previously possible. With 5G, one million devices per 1 square kilometer is supported (compared to 10,000 devices/1 sq km with 4G)[4]. Artificial intelligence (AI), machine learning (ML), augmented reality (AR)/virtual reality (VR), are made possible with URLLC provided by MEC. These create new revenue opportunities for MNOs in verticals such as manufacturing, transportation, and healthcare; in enterprise markets with private 5G offerings; and differentiated services such as video and gaming.

Kontron, an Intel® Network Builders ecosystem member, is leveraging its market experience in IoT and embedded computing technology to create a family of MEC servers based on Intel Xeon D 2700 SoCs to meet the growing demand for edge network processing.

Kontron ME1310 Flexible Edge Servers

The Kontron high-performance ME1310 multi-access edge server is a rugged, long-life, power-efficient, and multi-purpose system designed to decrease network congestion and improve the performance of applications by getting task processing closer to the user.[5] The ME1310 enables applications such as vRAN, AI, data caching, and other ultra-low latency and high-bandwidth edge applications.

With support for wide temperature range, the ME1310 (Figure 1) solves restricted space and power challenges by condensing multiple functions and devices into one rack unit (RU), saving space, cabling, and costs:

- Embedded switch with network timing and synchronization
- Switching capabilities up to 200GbE
- Daisy chain configuration connects multiple distributed units (DUs) together
- Compliant with any major vRAN software
- Three embedded functions in one RU:
- Single socket CPU server
- 16 ports 200GbE switch (12x front and 4x to CPU)
- Embedded GNSS receiver with high-precision timing solution (switch)
- 2x PCIe expansion slots for hardware acceleration
- Rackmount and IP65 outdoor form factors available
- Extreme operating temperature range, -40 to +65 degrees
- 10+ years lifespan

The ME1310 is configurable with multiple Intel® Xeon® D processor options, among the most popular are the following:

- Intel® Xeon® D-2796NT 20C/2.0GHz 120W
- Intel® Xeon® D-2776NT 16C/2.1GHz 117W
- Intel® Xeon® D-2766NT 14C/2.0GHz 97W

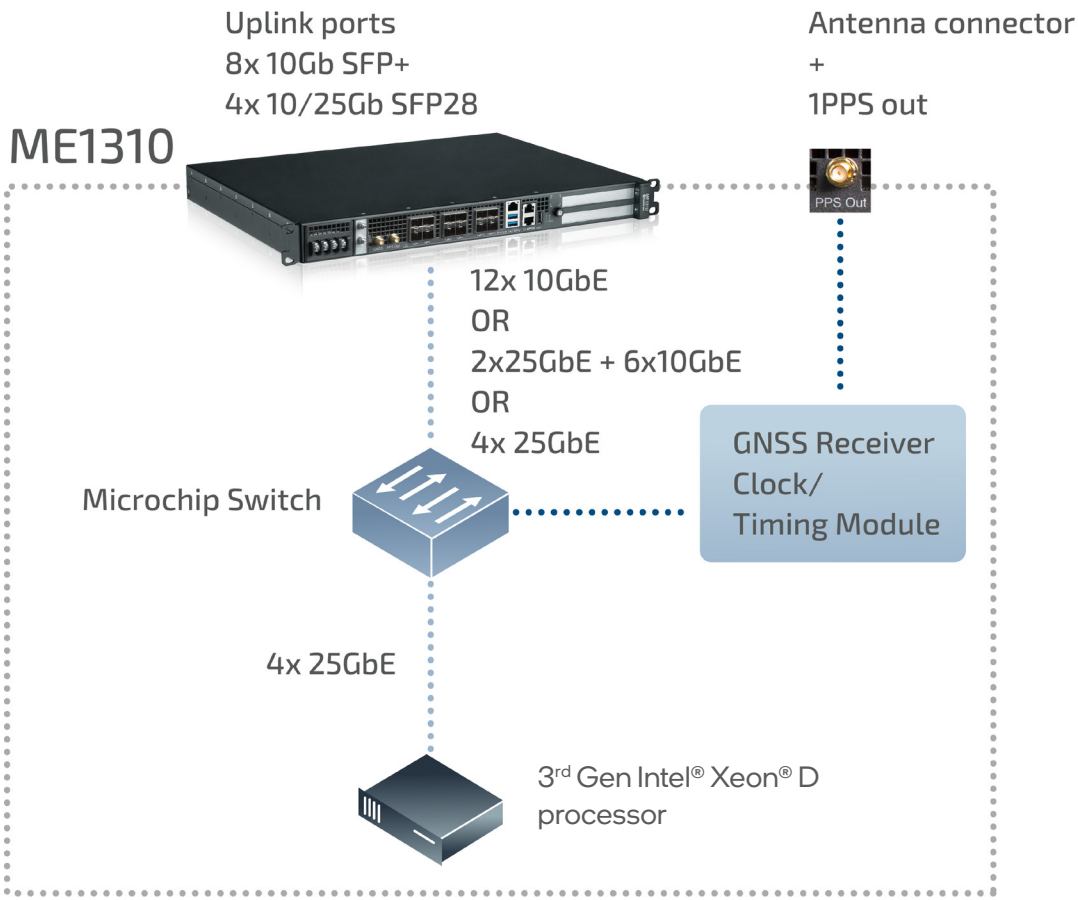

Figure 1. Kontron ME1310 Multi-Access Edge Computing Solution Architecture.

Performance Optimized for the Edge

Kontron selected the Intel Xeon D-2700 processor family because it delivers breakthrough, density-optimized performance, scalability, and value for edge and 5G networks. The ongoing drive to process workloads closer to the point of data origin creates requirements for compute at the edge.

Delivering performance and enhanced security while meeting power and space constraints is key to taking full advantage of network edge usage models for benefits such as low latency and reduced costs for backhaul bandwidth. Advanced systems architectures that are optimized for edge computing and other distributed environments are enabling the push of data center resources outward, for implementations and use cases such as:

- **Networking,** including gateways and routers, security appliances, and storage
- **5G topologies,** including C-RAN and D-RAN architectures
- **Security,** including secure access service edge (SASE)
- **IoT,** including smart operations

Intel Xeon D-2700 processors are designed for provisioning dense compute at the edge that balances high computational throughput with low thermal design power (TDP). High per-core performance, advanced security features, and built-in hardware acceleration for crypto, AI, and compression support the requirements of demanding workloads within a density-optimized platform. The highly integrated design is packaged as a system-on-chip (SoC) based on a ball grid array (BGA) package for ease of design-in and power efficiency.

The highly integrated design is well suited to the development of compact solutions, such as the Kontron ME1310 Multi-Edge Platform, for deployments targeting indoor, outdoor, and ruggedized environments, complemented by a newly extended range of operating temperatures. The SoC is also fully compatible with software and APIs across previous generations of Intel® Xeon® processors, as well as other Intel architecture and solutions. The resulting ease of design, development, and integration into existing Intel solutions enables low total cost of ownership and fast time to market for updated product offerings[6].

Edge Computing Use Cases

The following use cases[7] benefit from the ultra-low latency, and high density, bandwidth, and capacity available with 5G multi-access edge computing:

- Transportation/Autonomous Vehicles (AV): AVs can communicate with each other about accidents, real-time weather conditions, traffic and detours.
- Oil & Gas/Remote Monitoring: Real-time analytics monitor conditions in remote, rugged locations without needed high-bandwidth connectivity to the cloud.
- Smart Grid: Municipalities, campuses, factories, and enterprises can better manage and analyze energy consumption during peak and off-peak times and utilize AI for system management.
- Manufacturing/Predictive Maintenance: IoT sensors can monitor machine health, perform real-time analytics, giving manufacturers the ability to analyze and detect changes before failures occur.
- Healthcare/Patient Monitoring: Wearable healthcare devices and monitors can quickly alert caregivers and dispense medications, and surgical robotics can analyze data and respond in real-time.
- Traffic Management: Optimizing bus scheduling, dynamic highway lane opens/closures, and optimizing traffic signaling.

Conclusion

The goal of multi-access edge computing is to enable complex applications closer to the network edge, which improves application performance by getting task processing closer to the user. New use cases and next generation applications such as IoT, AI, and AR/VR, become viable. The result is significant potential for MNOs to save CAPEX and OPEX by virtualization and reducing network load and attract new revenue opportunities through vertical and enterprise customers, as well as gain competitive advantage through differentiated services. The Kontron ME1310 multi-edge platform running on Intel Xeon D-2700 processors deliver the MEC promise with more cores, more memory, and increased density.

Learn More

Kontron ME1310 High Performance Multi-Edge Platform

Kontron

Intel® Xeon® D-2700 Processor

Intel® Network Builders

Notices & Disclaimers

[1] https://ieeexplore.ieee.org/document/8705373

[2] https://www.techtarget.com/iotagenda/tip/Top-5-benefits-of-edge-computing-for-businesses#:~:text=Additionally%2C%20endpoint%20hardware%20and%20edge,to%20scale%20at%20the%20edge.

[3] https://www.lightreading.com/webinar.asp?webinar_id=2052

[4] https://ieeexplore.ieee.org/document/9665730

[5] https://www.kontron.com/en/products/me1310-high-performance-multi-edge-platform/p171703

[6] https://www.intel.com/content/www/us/en/products/docs/processors/xeon-d/network-segments-product-brief.html

[7] https://stlpartners.com/articles/edge-computing/10-edge-computing-use-case-examples/

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