Solution Brief

Multi-access Edge Computing

AEWIN Targets 5G Networks with High-Performance Edge Server

AEWIN SCB-1921 multi-access edge computing server, based on Intel® Xeon® processors and Intel® FPGA Programmable Acceleration Card N3000, is designed for low latency and local processing needed for 5G and other use cases

5G networks usher in some significant changes to network infrastructure to achieve higher throughput than existing 4G networks. One of the defining changes is the adoption of open and virtual radio access networks (RAN). Another change is the need for an increased number of small-cell base stations to support the higher radio frequencies (RF) needed by 5G networks to provide higher data rates. These higher RF bands result in shorter signal range. Both of these conditions require more compute processing power at the network edge. The multi-access edge computing (MEC) standard defines a new category of edge servers that balance the constraints of edge locations with the performance needed for 5G networks. Intel® Network Builders ecosystem partner AEWIN Technologies has developed a MEC server with the performance required to run open and virtual RANs for both large mobile operators and smaller 5G private networks in addition to other MEC applications.

Edge Computing Required for 5G

5G RAN includes antennas, radios, and baseband processing systems needed to transmit and receive radio signals from mobile devices and convert them into data packets. Open and virtual RAN solutions replace proprietary base stations with RAN software running on Intel® architecture-based commercial off-the-shelf (COTS) servers. Open architecture RAN software decomposes the baseband functionality into a real-time distributed unit (DU) that must be in the base station, and the centralized unit (CU), which is not real time and can be more centrally located.

The 5G standard specifies networks operating in frequency ranges of between 450 MHz and 6 GHz (frequency range 1 – FR1) or at millimeter wave frequencies between 24.25 GHz and 52.6 GHz (frequency range 2 – FR2). To get the hundreds of megabits to gigabits of bandwidth envisioned for 5G networks will require operating in the higher frequency ranges. Signal attenuation and reflection will reduce the range of a typical macrocell base station, so small-cell base stations will be needed. Analyst firm Analysys Mason estimates that three times[1] the number of base stations will be needed for 5G to attain the same coverage as 4G.

Multi-access edge computing (MEC), as defined by the European Telecommunications Standards Institute (ETSI), presents a solution by providing edge services directly on or near cellular base stations.

MEC extends traditional cloud infrastructure by placing additional nodes at the edge of the network where computation, storage, and data analytics can happen nearer to where data is consumed or generated.

In addition to processing power needed for open RAN software, and possibly other applications, MEC servers need to be compact for use in cramped small-cell base stations or wireless access points and must be environmentally hardened for the extreme temperatures that are possible in the remote locations.

Figure 1. Front and back views of the AEWIN SCB-1921 MEC server.

AEWIN High-Performance Edge Computing System

AEWIN's latest MEC product is the SCB-1921, a 2U rack-mount high-performance edge computing system, supporting dual 2nd generation Intel® Xeon® Scalable processors with an Intel® C624 chipset.

The 2nd generation Intel Xeon Scalable processors offer an architecture that scales and adapts with ease to handle the demands of emerging applications and the convergence of key workloads. The CPUs provide high performance with up to 28 cores, up to 3.8 GHz non-AVX base CPU frequency and multi-socket support for two, four, or eight CPUs. The processors feature up to three Ultra Path Interconnect (UPI) channels per CPU and six DDR4 channels per CPU supporting between 1 TB to 4.5 TB memory capacity per CPU. The processors also feature 48 lanes of PCIe 3.0 per CPU and support PCIe, USB, and SATA, and they connect to Ethernet, SSD, and FPGA peripherals.[2]

The Intel® C624 Chipset provides up to four 10 Gbps high-speed Ethernet ports for high data throughputs and low latency for near-real-time processing.

For additional compute performance, the SCB-1921 features an optional Intel® FPGA Programmable Acceleration Card N3000, providing acceleration to ensure high performance to 5G applications. The FPGA is a highly customizable SmartNIC platform for multi-workload networking infrastructure and application acceleration and enables high throughput, low latency, and low power per bit.

The high performance I/O elements of SCB-1921 include two management Ethernet ports (one for management, another for option IPMI function), a console port, and two USB 3.0 ports.

In addition, the SCB-1921 also supports two 2.5" SATA HDD/SSD with hot-plugging and an onboard CompactFlash, m-SATA, or M.2 slot for basic network storage applications.

One key advantage of the SCB-1921 for remote deployments is it features a front-access design that delivers excellent airflow, which can cool the GPU along with the Intel N3000 FPGA accelerator, allowing it to maintain optimal performance.

Use Cases

While the AEWIN SCB-1921 delivers the compute performance required for 5G vRAN use cases, it can be used for a range of MEC applications due to its scalable performance and compact size. Some applications where the SCB-1921 has already been deployed include the following:

Remote Work: As companies allow more employees to work from home, those employees must leverage cloud-based video chat services, remote database access, and other applications to complete their work. The accelerating move to this way of working has increased the number of devices accessing company networks remotely and requires significant performance, connectivity, and bandwidth to enable rich communication in real time. In this case, the AEWIN SCB-1921 high-performance edge computing system has been used to meet the low latency and bandwidth requirements of live video and chat applications at the home and remote office.

Content Streaming: Multiple screen options and a growing list of video streaming services has made low latency access to high definition 4K videos more important than ever. Delivering direct access to libraries' worth of movies and television shows without worries of congestion on transport networks or latency issues is a major concern for carriers. For this application, the AEWIN SCB-1921 has run content delivery network (CDN) software to locally serve popular videos, reducing the number of times the same video must be served from the origin server and providing a better viewing experience. The lower latency provided by the CDN can enable a range of new entertainment streaming applications, including high-performance gaming or real-time VR/AR services.

Smart City Traffic Management: Live video streams in major cities can produce useful data for advanced analytics of traffic patterns, license plate recognition, traffic conditions, crime prevention, and more. This information can be useful for city and traffic planning, as well as enabling the future of traffic management to allow live traffic rerouting around obstacles and accidents to improve overall traffic throughput and help reduce further risk of collateral damage. The AEWIN SCB-1921 has been used in security video applications to deliver edge video analytics, allowing monitoring of traffic scenarios. With edge analytics, security personnel can receive low resolution live feeds to reduce bandwidth, with a switch to high-resolution video when the analytics detects an issue that needs human intervention. By collecting this information in real-time, the city is able to complete fast, more cost-effective decision making for city safety and efficiency.
In a video analytics application for one customer, AEWIN achieved a 33 percent increase in video camera capacity due to the reduction in bandwidth. AEWIN was able to handle 24 full high-definition live streams, compared to the customer's previous system, which was only able to process 18 streams utilizing a similar setup.[3]

Conclusion

MEC servers are designed to meet the new edge computing pressures that come with growing 5G network infrastructure. The close proximity to where data is generated means ultra fast data processing and a significant reduction in transport network latency. In addition to 5G, there are a multitude of MEC use cases that require computing power at the edge to support new high-throughput internet use cases.

Working with Intel Xeon processor technology and FPGAs, AEWIN has developed a MEC server that offers flexible computing to be used in a wide range of MEC applications.

More Information

AEWIN home page

SCB-1921

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2nd generation Intel® Xeon® Scalable Processors

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[1] https://www.analysysmason.com/research/content/white-papers/5g-key-considerations-rma18/
[2] https://www.intel.com/content/www/us/en/products/docs/processors/xeon/2nd-gen-xeon-scalable-processors-brief.html
[3] Data provided by AEWIN, August 2020.

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