

Supermicro Servers Power Celona's Turnkey 4G/5G Private Cellular Solution

Emerging enterprise use cases need cellular capabilities, including low latency and throughput. Celona delivers using Intel® processor-based Supermicro edge servers



Wi-Fi is the leading wireless networking technology for enterprise networks and will be for a long time. But many emerging use cases are pushing Wi-Fi to its technological and cost effectiveness limits. That's when it makes sense to consider private cellular wireless networks.



Wi-Fi radios are ubiquitous in laptops, tablets, smartphones and other connected devices ensuring that Wi-Fi technology will remain the foundation of enterprise wireless networks. The availability of Wi-Fi 7, which offers 320MHz channel bandwidths in order to deliver a peak rate of more than 40 Gbps, offers very high performance.



For applications on the manufacturing floor, in the warehouse, or other outdoor locations, Wi-Fi may not be cost effective and may not deliver the needed connectivity and mobility. Here are some of the challenges and requirements of these new applications and how each technology addresses them:

Challenge / Requirement	Wi-Fi	Private Cellular
Coverage Warehouses and outdoor areas have large areas that need connectivity.	Wi-Fi operates at low transmit power which restricts coverage to about 5,000 sq. ft. per access point. This translates into many more Wi-Fi APs needed for large spaces.	Private cellular networks have much higher transmission power with an access point having a coverage area of up to 50,000 sq. ft. indoors and up to 1 million sq. ft. outdoors.
Roaming Fast, dependable roaming is important for industrial robotics or other real time applications that can't tolerate signal handover delays.	In Wi-Fi, the handover of a device from one radio to another is determined by the device as it contends with other devices for access. This can lead to dropped connections and high latency.	Private cellular infrastructure determines how clients connect and roam. The network has knowledge of signal strength and roaming needs of other devices resulting in smarter and faster decisions.
Scalability Efficiency With tens or hundreds of roaming devices on the network, bandwidth allocation methodology is important for scalability.	Wi-Fi network access is based on contention which grants access to the device that makes its request at the right time while other devices get less bandwidth.	Private cellular is Subscriber Identity Module (SIM) -card based which provides the intelligence for each AP to see every device on the network which enables the network to divvy up bandwidth equally to all of the active devices.
Data in motion security Strong security is important because data on wireless networks can be sniffed from the air.	Provides over air encryption with username- and password-based authentication.	Also provides over the air encryption with access based on SIM cards that securely store an international mobile subscriber identity (IMSI) number and its authentication key. This is harder to hack than username and password.
Latency Many emerging use cases have near real time data dependencies and need very low latency network performance.	The Wi-Fi standard does not guarantee a latency level resulting in inconsistent latency of 500 milliseconds on average.	Low latency of less than 30 milliseconds (4G/LTE) or <25 ms (5G) are built into the standards.

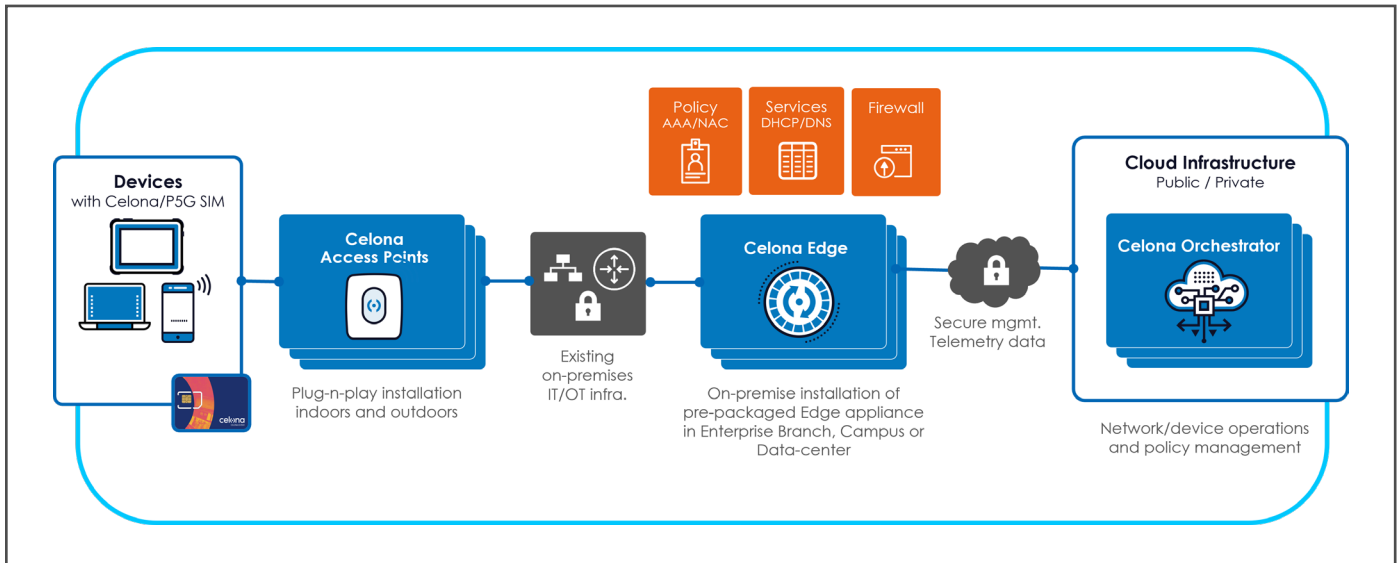


Figure 1. Block diagram of end-to-end Celona private cellular network.

Private cellular networks have become more feasible thanks to the virtualization of RAN architectures and the availability of Citizen's Broadband Radio Service (CBRS), which provides cost-effective cellular spectrum. All that is needed is a network system that makes cellular technology fit with IT skill sets. That's the mission of Celona, an Intel® Network Builders ecosystem member that is working with Supermicro, an Intel Network Builders Titanium level member, on Intel® architecture-powered servers for converged 4G/5G private cellular systems.

Celona Offers Turnkey 4G/5G Private Cellular Solution

Celona's private cellular product family is a turnkey solution that is engineered for the enterprise. The heart of the system is the Celona Edge OS, which is cloud native software that runs on pre-packaged COTS hardware, and provides a redundant, scalable, cloud-native network operating system with control and data plane services and spectrum management services for private wireless networks.

The Edge OS runs on Celona Edge Appliances, which are converged 4G/5G private cellular solutions that serve networks ranging from 40 access points (APs) to 300 APs. With a data plane that supports both 4G and 5G networks and a packet core that delivers standards-compliant 4G Evolved Packet Core (EPC) and 5G Standalone Core (5GC) services, the Celona Edge Appliances offer a flexible and future proof system.

The system supports 4G for the many applications where there are already a large number of 4G-compatible devices available. As these networks grow and need higher bandwidth or advanced 5G features, the Celona APs can be converted to 5G with a software upgrade, without the need to replace the hardware. Figure 1 is a block diagram of a configured Celona private cellular system.

In addition to SIM-based encryption support, the Celona Edge OS can be integrated with standard IT cybersecurity systems including firewalls and zero trust network access services.

Celona's access point family has models designed for indoor and outdoor applications in 4G, 5G and dual-network support. They are designed to support CBRS spectrum in US as well as global private wireless spectrums for 4G (b48) and 5G (n48, n78H, n77, n79). The APs are designed for enterprise applications with performance and signal range that is optimized for private cellular applications.

Celona Orchestrator

Network managers need visibility, the ability to set policies, the ability to initiate new features, as well as control over the network and data flows. The Celona Orchestrator is cloud-based network administrator that coordinates the configuration and optimization of network elements, subscriber management, and defining and automating the enforcement of QoS policies for individual applications and devices.

For integration into existing in-house or service partner management systems, the software is built using RESTful APIs, which ensures management flexibility.

MicroSlicing™ Improves QoS

Network slicing is one of the advanced quality of service (QoS) features of 5G standalone networks and Celona has made it more flexible and useful with its patented MicroSlicing feature, that also runs on Celona Edge.

Regular 5G network slicing creates an end-to-end logical network that enforces a specific set of QoS metrics based on specific data workload types. The slice is set up to transport data between two fixed locations.

Celona MicroSlicing has much more flexibility with the ability to enforce service quality on a per device and app basis. With precise filters, MicroSlicing offers service type definitions across multiple apps within an enterprise.

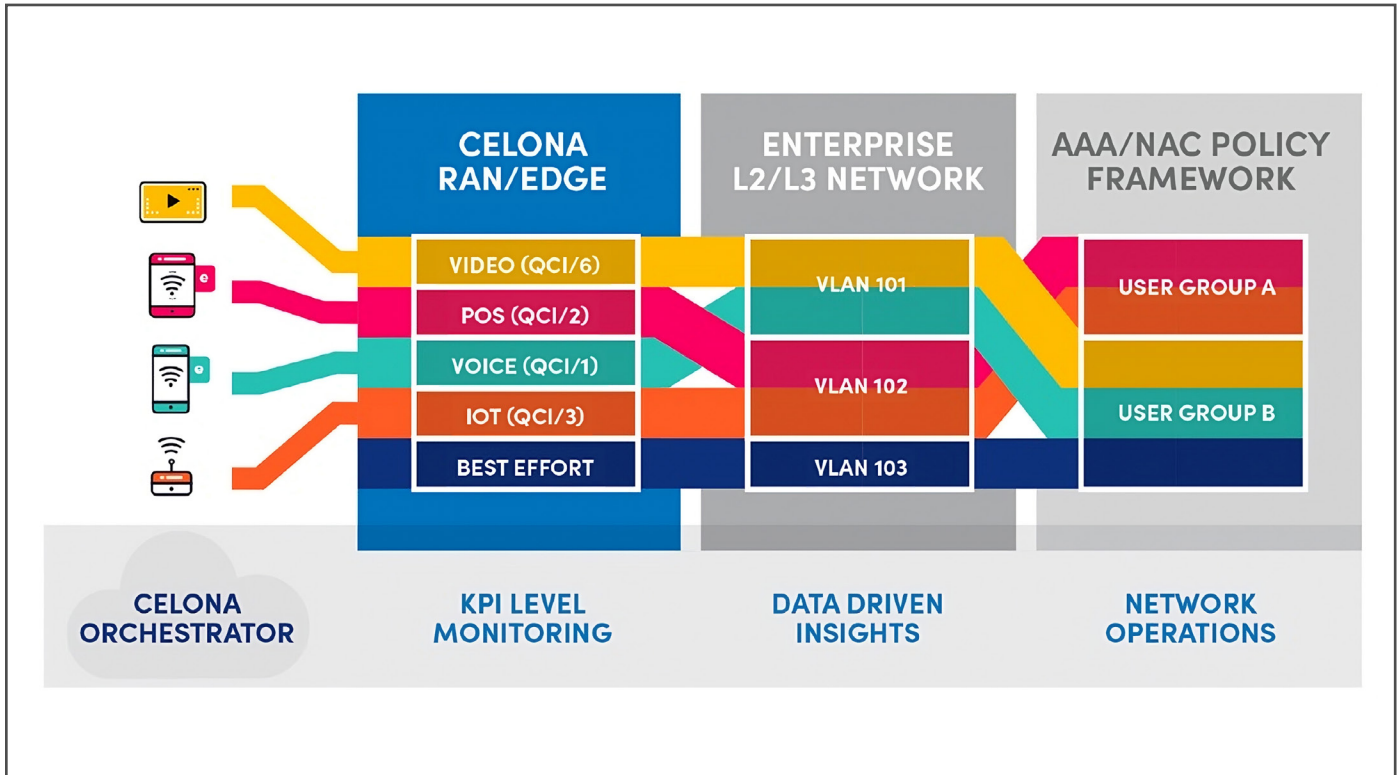


Figure 2. Flexible end-to-end QoS using Celona MicroSlicing.

As seen in Figure 2, Celona Edge OS senses a dataflow and assigns it to a MicroSlice, in this case video, point of sale systems, voice, IoT and a best effort channel. These MicroSlices map to virtual LANs in the enterprise transport network and can flexibly reach their user group destination based on authentication and network address control (NAC) policies. By providing customers full control on configuration updates to MicroSlicing policies, network administrators are able to change service levels across device groups and applications whenever required.

In addition to this resource allocation, Celona MicroSlicing also provides performance tracking of key performance indicators (KPIs). MicroSlicing also supports an open ecosystem of solutions from other technology providers to enterprise IT /OT teams.

Celona Edge Appliances based on Supermicro Compact Servers

Celona has chosen two Supermicro servers for its edge appliance family. Both servers are based on Intel® Xeon® D processors, which are designed to deliver workload-optimized performance in space- and power-constrained environments.

These innovative, system-on-chip processors support high-density, single-socket network, storage, and cloud edge computing solutions with a range of integrated security, network, and acceleration capabilities. For Celona's private 5G application, the CPU family provides an ideal balance between core count, processing performance, and cost effectiveness.

The Celona Edge Express Node (CN-EDGE-EXP) is based on the Supermicro SuperServer 5018D-FN8T and is Celona's solution for networks needing up to 40 APs. This network appliance is a single socket design using the six-core Intel® Xeon® processor D-1518.

The server features a compact design with 1x PCIe 3.0 x8 slot and a M.2 PCIe 3.0 slot. Network connectivity is provided by dual 10G SFP+ with six 1GbE LAN ports. With four DDR 4 DIMM sockets, the appliance can support up to 128GB. The RoHS compliant network appliance has a thermal design point (TDP) of just 200 Watts.

The Celona Edge Enterprise Node (CN-EDGE-ENT) is powered by the SuperServer 1019D-16C-FHN13TP, an edge server with RAN performance features. This server is a single-socket design based on the 16-core Intel® Xeon® D-2183IT Processor. The enterprise node is the company's solution for private wireless networks supporting up to 125 APs in a single server and up to 300 APs in a server cluster (CN-EDGE-ENTCLUSTER).

The 1RU-high server features two PCI-E 3.0 x16 full height, full length (FHFL) slots. For storage, the server can accommodate up to two 2.5" storage drives and two optional internal 2.5" SSD bays. For network connections, the server has dual built-in 10G RJ45 ports and supports two additional 10GbE ports via optional Intel® Ethernet Connection X557-AT2 modules. The server also supports Intel® Ethernet Server Adapter I350 providing up to eight 1GbE ports.

With four DDR 4 RDIMM sockets, the IoT SuperServer SYS-111E-FDWTR can support up to 512GB of memory.

Conclusion

Enterprise network managers are turning to private cellular networks to support emerging applications that demand low latency, high-bandwidth connections. Private cellular networks solve the technology challenges presented by these use cases but need to be delivered in an easy to use system that can be deployed by an IT team. Celona's Edge OS-based private cellular system does that with its turnkey system that uses cloud-native software, built-in APs and powerful Intel architecture-based server platforms from Supermicro.

Learn More

[Celona Edge Appliance-Datasheet](#)

[Private wireless and Celona 5G LAN Overview-Solutions Brief](#)

[Supermicro SuperServer 5018D-FN8T](#)

[SuperServer 1019D-16C-FHN13TP](#)

[Intel® Network Builders](#)

[Intel® Xeon® processor D-1518](#)

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