

Celona Solution Overview

Powered by the only integrated solution for private mobile networks, with a laser focus on enterprise environments.

Designed to accelerate the adoption of digital automation and to make predictable enterprise wireless a reality.



Contents

Introduction	3
Technology Benefits	3
Wireless with service levels	3
Performance at range	4
Hitless mobility and handovers	4
Private, secure and clean spectrum	4
IoT ready coverage	5
Getting Started	5
Celona Solution	6
Integrated architecture	6
Enterprise network integration	7
KPI-driven operational model	9
Conclusion	10

Introduction

Private mobile networks are here to stay. With the arrival of CBRS spectrum in the United States, 4G LTE cellular wireless technology can be made accessible to enterprise IT organizations and enable accelerated adoption of business-critical mobile devices on an express lane of wireless communication.

Private mobile networks powered by CBRS based LTE will open the doors to new set of apps that optimize the way people work – in addition to improving the quality of experience for existing set of critical app infrastructure.

What's now needed is an end-to-end networking solution – one that can easily integrate with an existing enterprise network and drastically simplify cellular wireless operations.

Technology Benefits

New digitization efforts in business – where stakes are higher than ever – will have high expectations from private mobile networks in order to justify investment. Given limited resources, time and budget, enterprise IT organizations need clarity on what CBRS based cellular wireless is for and why.

The need to deploy additional infrastructure have to be associated with tangible technology benefit statements that are applicable to most critical enterprise owned devices and sensitive / critical applications that they support. There are three key technology benefits that come with CBRS based private LTE networks and would be reasons for innovation as part of an enterprise IT infrastructure.

Wireless with service levels

CBRS based private mobile networks offer service level objective (SLO) metrics for minimum throughput, maximum latency and jitter and/or maximum packet error rate – per standard. Instead of random access to wireless medium by each connected device, CBRS based LTE access points instruct and schedule such devices on when they can get access to wireless medium and for how long. These two key technology principles translate to increased reliability and availability of the network resources when supporting mobile apps and devices. The level of predictability that has been available to devices that sit on the wired Ethernet or fiber networks, can now be enabled over enterprise wireless.

Performance at range

Large area coverage capability for CBRS LTE access points is a result of the high-power levels – 1W (30dBm) indoors and 50W (47dBm) outdoors – but also dependent on the hearing abilities of the radio and the mobile devices that are connecting to the network. Comparatively, while Wi-Fi provides reliable network connectivity to mobile devices when the signal strength of the packet transmissions is down to at least -90dBm, LTE wireless in the CBRS spectrum can maintain connections at -120 dBm. Increased coverage area per radio means less cabling and switching infrastructure, contributing to the overall return on investment for capital and operational expenses by enterprise IT teams.

Hitless mobility and handovers

Same cellular wireless modem that allows a mobile device to stay connected when it is traveling 65mph on the highway – is the same modem that allows it to connect to a CBRS based private mobile network within an enterprise environment. LTE enables this by coordinating handoff of the clients between the radios in the infrastructure – instead of leaving the decision to roam to the devices themselves. By taking into account the coverage and capacity resources available across the entire network footprint, a CBRS based LTE network is empowered to make a better roaming decision for the device, than the device itself. Business critical apps that demand real-time response time from the network and a predictable service levels will surely enjoy that wireless network's ability to fast roam with an unnoticeable delay to the end users and the applications they rely on.

Private, secure and clean spectrum

Use of CBRS spectrum by enterprises will be coordinated via certified Spectrum Access Systems (SAS) certified by FCC in the United States. This coordination translates to clean and undisrupted utilization of the spectrum away from Wi-Fi infrastructure – ideal for any confidential / sensitive information transfers. Given the fact that LTE wireless is always encrypted with private keys installed on the SIM identity and take advantage of centralized encryption within the mobile core installed on-prem, security perimeter of the solution is also reduced significantly.

IoT ready coverage

Many IoT devices, and business apps that private mobile networks support, come with relatively low bandwidth requirements when connected to an enterprise network. While the Wi-Fi based enterprise wireless networks maintain connectivity down to 1Mbps (2.4 GHz Wi-Fi) or 6Mbps (5GHz Wi-Fi) for a mobile device, CBRS based network extend that minimum performance requirements down to 50-100Kbps, delivering “cell edge performance”. This flexibility allows for an LTE access point to provide greater coverage area for an IoT infrastructure – reducing the need to deploy extra access points and improving capital expense metrics across the board.

Getting Started

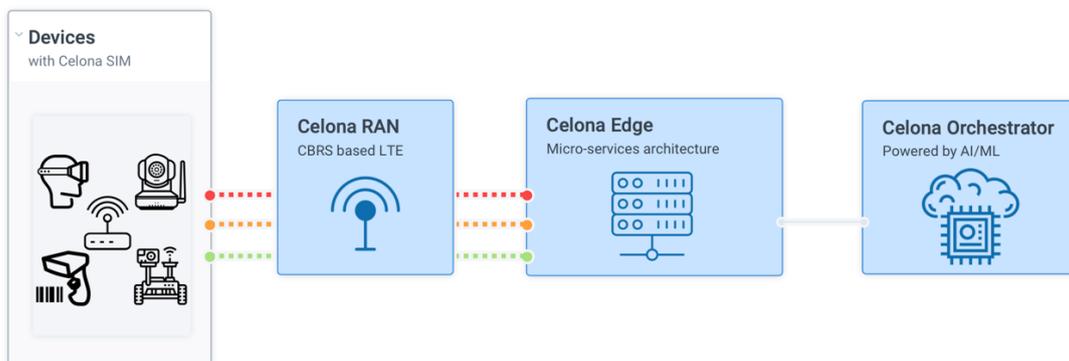
For any enterprise IT team, here are few questions to answer as they are embarking on evaluating CBRS based LTE wireless solutions:

- Are there any apps/devices in your environment that are still on the wired network today since they demand low latency or an SLA guarantee?
- Do you have large outdoor areas that require mobile connectivity for your staff devices or wireless backhaul for mission critical use cases?
- How about internal devices/users that demand fast/seamless handover between radios of the wireless infrastructure for uninterrupted service?
- Have you thought about keeping internal sensitive communications in their own private wireless spectrum away from Wi-Fi?
- Do you envision investing in a large farm of IoT devices indoors/outdoors to enable smart environments – if yes, what are the apps/devices?
- And to close: have you tried to solve any of these technology requirements in the past with Wi-Fi or public LTE – and what was the outcome?

Celona Solution

Celona is the first in the industry to offer the entire hardware and software stack required to deploy and operate private LTE networks in a highly automated manner – without compromising the powerful features of the cellular wireless technology. Celona solution offers three areas of unique differentiation in the market:

- First integrated end-to-end private mobile network architecture,
- Only solution that truly integrates with an existing enterprise network, and
- KPI-driven operational model that focuses on app experiences beyond infrastructure.



Integrated architecture

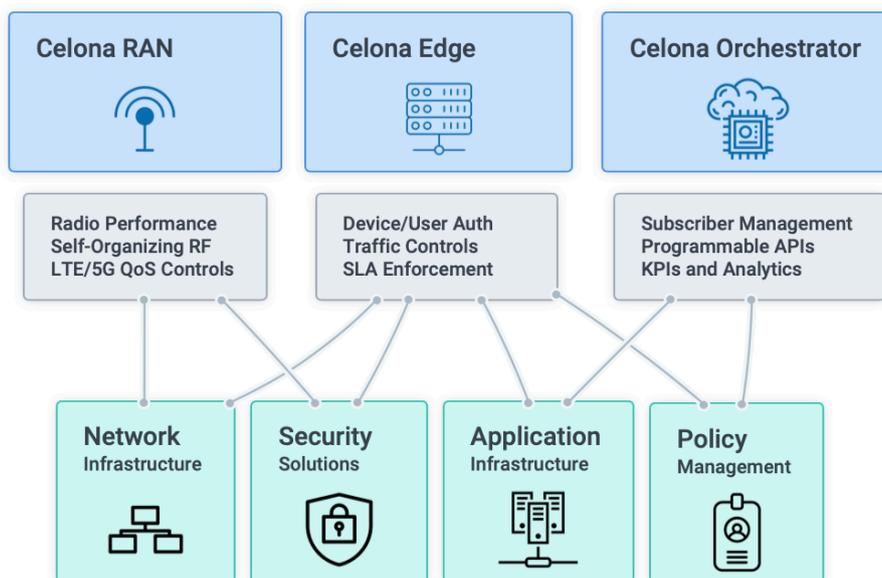
Celona's solution architecture provides all components required to bring a private mobile network to life: SIM cards on the connected devices, indoor and outdoor CBRS LTE access points making up the Celona Radio Access Network (RAN), edge compute services on-site including the Evolved Packet Core (EPC) functions as defined in the 4G LTE standard, cloud orchestration for network operations and subscriber management, and integration with the SAS infrastructure.

There is no longer the need to purchase different components separately from different product vendors and spend valuable cycles for system integration. All components of the solution are supported by cloud software. Celona access points and Celona Edge (where the wireless traffic is tunneled to and encrypted/decrypted) are zero-touch deployed within the enterprise environment. Their configurations are maintained via cloud-hosted Celona Orchestrator where the repetitive but critical network operations – for instance, the radio frequency selection on the Celona radios with its Self-Organizing Network (SON) function – are automated via machine learning.

Celona's SON functions will directly integrate with Shared Access Service (SAS) solutions offered by Federated Wireless or Google to ensure that the use of the frequency channels in the specific geo-location of the radios are coordinated per CBRS dynamic spectrum sharing specifications. For enterprise IT departments, there is no need to separately acquire licenses to integrate with these SAS solution providers – as this is handled automatically by Celona software. Within an enterprise cellular network, it is up to the Celona network to coordinate and automatically make the necessary frequency assignments to its access point radios.

Enterprise network integration

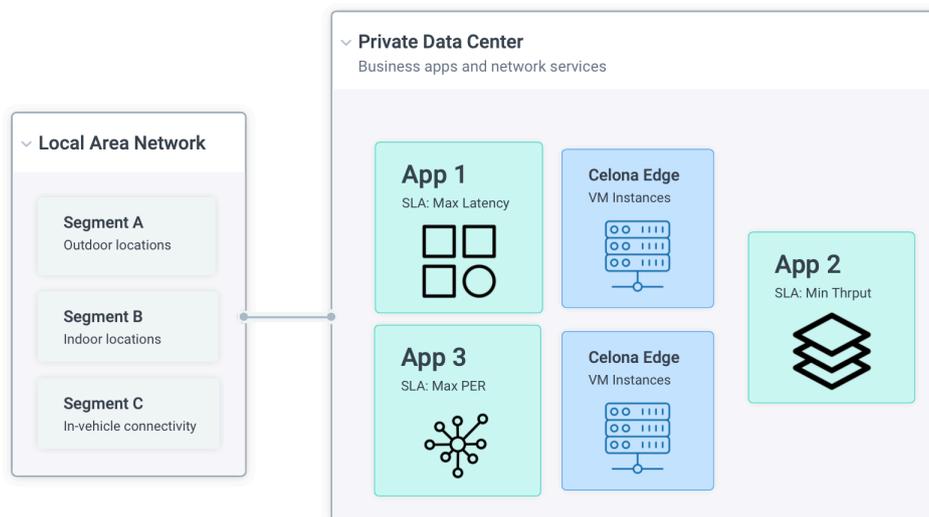
The Celona solution offers a new approach to deploying and managing mobile networks by allowing cellular wireless to be deployed as an overlay to take advantage of the existing enterprise IT infrastructure. No longer a separate dedicated infrastructure, owned and managed by a mobile network operator, is required to take advantage of LTE wireless capabilities in the enterprise.



Enterprises can retain data ownership and seamlessly integrate the solution with existing IT assets to leverage prior investments and existing operational models. This provides cost efficiencies and the ability to extend enterprise policy controls to private mobile networks. The Celona solution can integrate with many enterprise IT infrastructure systems, including security solutions, application infrastructure and policy management solutions.

Integration includes leveraging existing cable plant, switches, routers, and network architecture reducing expense, and integrating with existing network architecture for IP address management, traffic routing, and quality of service. Local breakout of applications and traffic can occur where Celona Edge resides for optimal traffic routing and performance, especially for latency sensitive applications that are hosted on-premises at remote sites.

Datapath performance within Celona Edge can elastically scale as cloud software, eliminating the need to manage capacity one server at a time as number of CBRS LTE access points increase in count and/or as the number of connected devices scale. Celona Edge – drastically simplifying integration with existing enterprise IT environment – can be deployed on-premise, in the private data center or in the cloud.

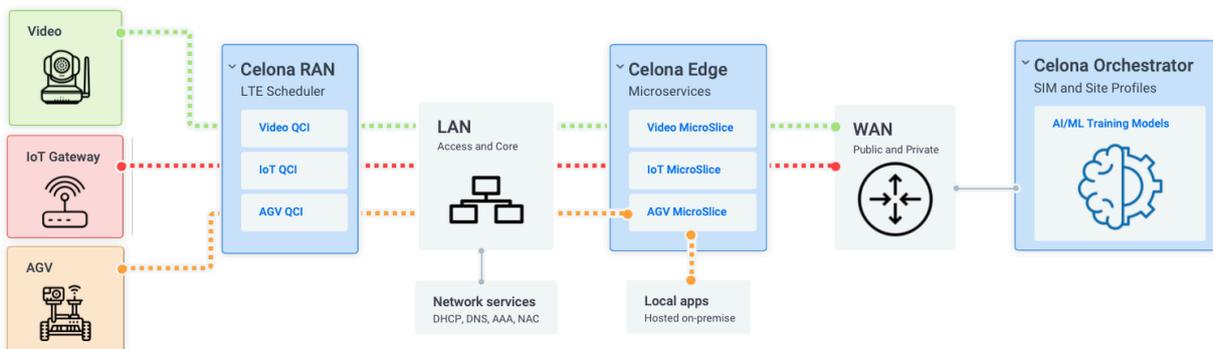


Existing security solutions deployed on the corporate network can be leveraged to segment mobile users and applications into different virtual networks, inspect and firewall traffic flows, provide intrusion detection and prevention, integrate with web filtering and anti-malware platforms, and ease regulatory and audit compliance initiatives by leveraging mature security systems and processes already deployed within the environment.

Integration with policy management solutions can provide an additional level of visibility and authorization of mobile users on the network by tying their mobile device subscriber information to an existing identity management platform and directory services.

KPI-driven operational model

Celona MicroSlicing™ is a unique and innovative approach to providing granular quality of service (QoS) for devices and applications on a private mobile network. Through this patent-pending capability, a Celona network enforces and keeps track of specific SLOs for different applications across one or more devices. Whereas most cellular networks only provide basic QoS controls to prioritize voice services over all other data services, Celona networks provide the ability for enterprise IT admins to easily define and prioritize many applications and services that are mission-critical in their environments.



A Celona MicroSlice is a set of network functions starting from Celona RAN to Celona Edge that are instantiated in real-time to meet the requirements of an application or a group of applications. MicroSlices enforce network access across multiple dimensions including throughput, packet error rate, session latency and policy enforcement. An augmented reality app on a device with a real-time video feed to an edge computing service deserves different levels of enforcement compared to ongoing software updates on that same device.

More importantly, the network operations are no longer performed at the port/radio level with Celona MicroSlicing – but rather by monitoring the availability of a specific app/service on the network against the SLO metrics promised. This focus on key performance indicators (KPI) allow enterprise IT teams to easily monitor what's most important: quality of experience for business-critical apps for which the private mobile network was implemented for in the first place.

In addition, MicroSlice policy controls can include network routing information for traffic through the corporate network (for example via VRF, VLAN, VxLAN) for the purpose of ensuring those QoS specifications. MicroSlice policies can be mapped to corporate network QoS controls such as IP DSCP markings for proper handling by enterprise network infrastructure such as switches, routers, and firewalls.

Administrators have the ability to define MicroSlicing policies within the Celona Orchestrator for any application running on their network, including in-house developed applications that are not publicly available. This provides an additional level of granular policy control with the ability to prioritize applications differently based on the device or user using the application.

Conclusion

It is clear from past history that application architectures have always been cause for innovation within the enterprise networks, especially at the edge where devices, apps and network connectivity meet. Ethernet and IP based networking solutions in the enterprise have tremendously benefited from the arrival of client-server architecture for digital applications. Move to the cloud powered mobile apps for enterprise users have inspired innovation for enterprise Wi-Fi.

We see a similar pattern emerging with enterprise apps that require real-time decision making at the edge demand AI-based learning models in the cloud. Such apps automate traditionally manual tasks at work and enable workers and employees to immediately get access to useful insights. They run on enterprise owned and staff operated devices that can either be mobile or be deployed as part of the IoT infrastructure. They provide the most critical business data to control systems such as the ones we see for video surveillance, patient monitoring, critical communications and more. These apps and devices eliminate the need for manual data entry, review of countless reports, hours of delay in making a decision critical to business operations.

We believe that these new generation of apps need to be supported by an enterprise wireless technology with the highest levels of reliability, availability and quality. We also believe that such a technology should be made accessible to the enterprise IT departments without breaking the bank for capital and operational expense.

At Celona, we are bringing to market a private mobile network solution that accelerates the adoption of business-critical apps, automates deployment of cellular wireless and drastically simplifies its adoption by enterprise IT organizations. We are looking forward to working with enterprise organizations across different industries as we take enterprise wireless to where it has not yet been.