Our Vision for the Edgeless Enterprise

MAY 2021

celona

CONTENTS

Executive Summary

Enterprise technologies are growing increasingly scalable, flexible and easy to manage. However, a foundational component of enterprise IT that's lagging resides within the local area network (LAN). While Celona currently provides LTE/5G solutions that can be integrated into any existing enterprise network, our ultimate vision is to modernize the broader set of network services that make up the corporate LAN. This will be accomplished with modern cloud-native software-defined network microservices inherent in 5G architectures.

The reason a new network model is needed is simple: users and things are getting connected over a variety of different networks. From the corporate LAN to enterprise Wi-Fi, private LTE/5G to broadband Wi-Fi hotspots or public LTE 5G networks, the application layer is increasingly dispersed. Instead of the traditional on-premises or public cloud options there is now a continuum of compute locations including:

- public clouds such as Amazon Web Services, Microsoft Azure, Google's Cloud Platform,

- multi-tenant edge clouds such as AWS Outposts and Azure Edge Zones,

- on-prem extensions of public cloud such as AWS Snowcone and Azure Stack Edge and

- centralized and distributed private clouds such as white box, bare metal or VMware based.

Today's conventional enterprise network and security architectures have simply not been designed and built for such a dynamic and diverse set of compute infrastructure options. Significant changes to applications and data flows has resulted in a patchwork of solutions that are as different as the various combinations of network access and compute locations. Ultimately, these legacy architectures lead to overly complex infrastructure foundations that are unable to keep pace with the rapid change driven by digital transformation efforts within the enterprise.

These are the same problems that the new cloud-native 5G core architecture solves for the public cellular networks in their migration to 5G. Introducing private 5G into the enterprise does not just bring the benefits of the most reliable wireless technology, but also sets businesses on the path to realizing the Edgeless Enterprise. When the edge of your enterprise extends everywhere where your critical applications rely on for compute requirements, traditional definition of "Edge" no longer applies.

Consequently, a new enterprise architectural approach is needed. This model, which we call the Edgeless Enterprise, embraces established 5G networking and cloud native software principles to unify the policy framework across any underlying existing network infrastructure - while enabling network automation to support new generation of digital initiatives in the enterprise, from the ground up.

Celona's Edgeless Enterprise approach provides an all-in-one, cloud-native network service overlay that delivers policy-based routing, QoS and security segmentation functions for a consistent application experience. This is an architecture that's truly as agile as the new generation of enterprise applications themselves.

These vital networking services can be deployed at one or more edge locations including on-premises, metro edge clouds, or public clouds. Celona's network services can also be service chained with other third-party cybersecurity and SD-WAN services to create unified service edge. Celona's edgeless architecture is predicated on a highly agile and scalable compute platform can automatically shift the delivery route of applications and services based on performance, security requirements and the real-time health of network paths. As a result, Celona's Edgeless Enterprise architecture delivers a wide arrange of business benefits that include:

Gaining and maintaining a competitive edge by rolling out new automation and digital transformation services faster than ever before,

- Accelerating the adoption of transformative 5G technology with wire-like experience on a wireless network,

- Enable enterprise app developers to automate app and network level actions based on application-level key performance indicators (KPIs),

- Removing operational friction by making network and security service provisioning for new apps as agile as cloud compute and storage,

- Reducing operational cost inefficiencies in scaling network resources to meet new application needs by leveraging AI-Ops, and

- Decreasing security exposure by unifying the policy framework independent of network access and compute location options.

CELONA'S CORE EXPERTISE IN PRIVATE LTE/5G NETWORKS

At Celona, we are currently focused on helping businesses build and deploy private LTE/5G mobile networks using the CBRS (LTE/5G Band 48) spectrum recently made available in the United States - and similar private spectrum options now available abroad.

Our integrated private mobile network platform includes all the essential elements, such as base stations, 4G/5G core network software and cloud-based orchestration tools specifically designed and developed for enterprise environments. As opposed to traditional solutions, it allows for enterprises to have full data ownership and eliminate metered "per user" cost structure as they consume cellular wireless.

Celona's private mobile network platform can be fully managed by in-house IT administrators or outsourced to a third-party managed service provider (MSP). Customers can be matched either with integration specialists or MSP's through Celona's partner program.

Widespread enterprise interest in the use of private spectrum is growing fast as IT leaders are quickly learning how the technology can be applied to solve existing wireless shortcomings within their organization. Today's 4G LTE wireless technology on the private spectrum is solving some of the toughest wireless connectivity challenges in the enterprise. And the market will continue its accelerated growth with the addition of 5G wireless connectivity option, as 5G chipset support becomes prevalent within wireless endpoints.

Today, the drivers behind the interest from information and operational technology teams (IT & OT) are categorical. Renewed focus on business services and new mobility use-cases are causing enterprise to consider private mobile networks for:

- Complete autonomy of business operations (eg. supply chain automation),
- Deterministic connectivity for latency-sensitive applications and devices,
- Scaling network capacity with additional spectrum, and
- Privacy and confidentiality of network data.

When compared to Wi-Fi alternatives, private mobile networks deliver a range of technical benefits such as reduced wireless interference, uninterrupted mobility of wireless clients as they move between wireless access points and predictable performance with the ability to enforce specific latency and throughput service levels. Celona assists customers throughout the radio access network (RAN) design and implementation process starting from the frequency planning state all the way to a successful integration to an existing corporate LAN.

EXPANDING 5G TECHNOLOGY INTO ENTERPRISE NETWORKS

Although the Celona Radio Access Network (RAN) uses industry-leading LTE/5G technologies including cloud-native microservices, software-defined networking (SDN) and patent pending Celona MicroSlicing™ technology, the entire Celona network can be seamlessly integrated into existing enterprise infrastructure that do not have these modern capabilities.

These functions push application intelligence and automated network operations to a whole new level on private LTE/5G. We believe this new operational model will be integrated into other parts of a corporate wired and wireless infrastructure. Below is a breakdown of what these technologies offer for LTE/5G deployments today as well as for expansion into enterprise networks of the future.

Cloud-native Microservices Architecture

Software innovation continues to be an essential and strategic component to support business critical applications. Consequently, IT leaders are looking for ways to make rapid and automated changes to their underlying on-premises and cloud networks in a similar fashion to how software-centric applications, compute and storage resources are delivered and managed. Traditional monolithic network architectures are simply on a collision course with the needs of today's applications and services that rely on the network for efficient transport and data security.

Addressing this deficiency, Celona brings a cloud-native network operating system (OS) at the enterprise edge built on a microservices architecture. This provides the same level of agility and machine learning intelligence that businesses currently enjoy in other aspects of enterprise IT.

As the number of latency-sensitive business applications rises, the need for a flexible corporate network that dynamically shifts and scales network and application resources where they are needed at any given time will be in high demand. This includes the dynamic migration of network, cybersecurity and application microservices between private data centers, public clouds and the metro edge.

Because the Celona Edge – 4G/5G mobile core as an extension of the Celona platform – is built on a clustered microservices architecture, AI can be used to automate the dynamic movement of workloads in and out of the different application edge locations. With each individual network function deployed as a microservice, enabling new capabilities to existing network functions or rolling out new ones do not require time consuming and disruptive network outage: just like the deployment of a new and improved application does not require the outage of the service when served from the cloud.

Software-defined Networking (SDN)

The use of SDN within the Celona platform allows for a separation of the network control plane from the data plane. This provides centralized management in the cloud while being able to dictate routing, QoS and security policy at a logical level. While the control plane governs higher-level management functions such as private spectrum access, mobility management, authentication and network resource allocation, the data plane performs tunnel encryption, network switching and dynamic policy-based routing across different device groups and applications.

With its cloud-native deployment model, Celona Edge can be placed either on-premises or in the cloud. This allows for highly flexible deployments based on demands dictated by the rollout of critical business applications, also setting the stage for networks to be fully managed and operated in public or private cloud environments. This in turn translates to network resources being as programmable as the enterprise apps themselves; wherever they are deployed in the new "edgeless" world, your network resources to support them can be instantiated as quickly as required.
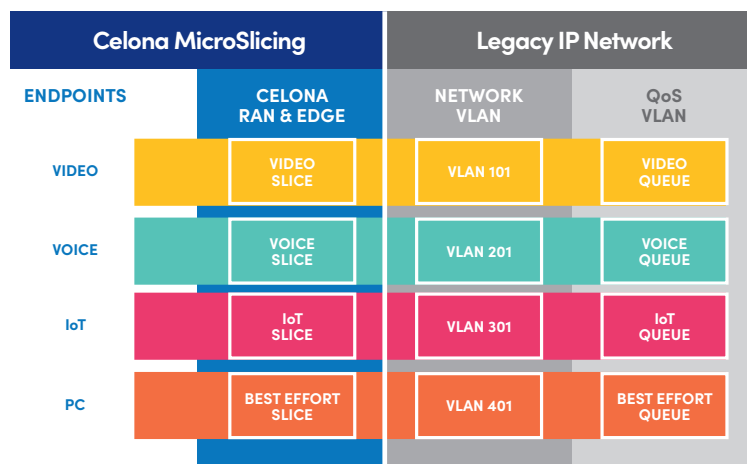
Celona MicroSlicing

Celona MicroSlicing is the unique process of separating traffic flows by type and assigning them to logical slices that strictly define QoS, network performance, routing paths and security policy.

Each MicroSlicing policy provides for the execution of precise network service level agreement (SLA) parameters including guaranteed / mean throughput, maximum latency / jitter and maximum packet error rate (PER) assignments. These QoS parameters are defined, tracked and enforced for any and all applications no matter where they are located.

Today, policy parameters are faithfully enforced throughout the Celona radio access network (RAN). But, once traffic leaves the RAN and enters a traditional enterprise network, existing network architectures hold no concept of MicroSlicing. To overcome this challenge, Celona Edge automatically maps and offloads each MicroSlicing policy onto individual virtual LANs (VLANs) as defined within the existing enterprise L2/L3 network.

Administrators can then apply similar quality of service (QoS) network performance parameters that mimic such policies. Through a combination of Celona MicroSlicing and legacy network QoS policy mappings, application performance can be effectively automated and maintained throughout the entire corporate network as shown here:

Celona MicroSlicing		Legacy IP Network	
ENDPOINTS	**CELONA RAN & EDGE**	**NETWORK VLAN**	**QoS VLAN**
VIDEO	VIDEO SLICE	VLAN 101	VIDEO QUEUE
VOICE	VOICE SLICE	VLAN 201	VOICE QUEUE
IoT	IoT SLICE	VLAN 301	IoT QUEUE
PC	BEST EFFORT SLICE	VLAN 401	BEST EFFORT QUEUE

While the manual tasks required to translate the Celona MicroSlicing policies into legacy QoS configurations that traditional network components understand works, extending the superior MicroSlicing capabilities further into the corporate network is a far better approach.

EXPLORING THE FUTURE OF 5G IN THE ENTERPIRSE

Leveraging existing expertise in 5G technologies, Celona's solution is opening room for disruption within enterprise campus and branch networks. The same technologies that help defined the foundation of Celona's private mobile networking architecture can be efficiently overlayed across any traditional wired and/or Wi-Fi-enabled wireless network.

Instead of customers having to manage both an enterprise LAN/WLAN and a separate RAN using disparate technologies that require the translation of 4G/5G traffic flow into legacy QoS policy, Celona's Edgeless Enterprise framework can be leveraged throughout the entire enterprise infrastructure.

Rather than creating complex performance and security policies using legacy LAN technologies, the network itself can be made as smart as the enterprise apps in its ability to automate the identification of traffic flows. It's ability to enforce performance, routing and security policies can be each be defined "per slice", based on business intent. Each slice can terminate at the application edge instance to provide the best possible network performance.

The entire network can then be centrally controlled via a single platform that natively rely on cutting-edge traffic flow management techniques stemming from LTE/5G RAN architectures. The result is an end-to-end enterprise network that for the first time ever is cloud-native and highly adaptable to changes in business technology operations.
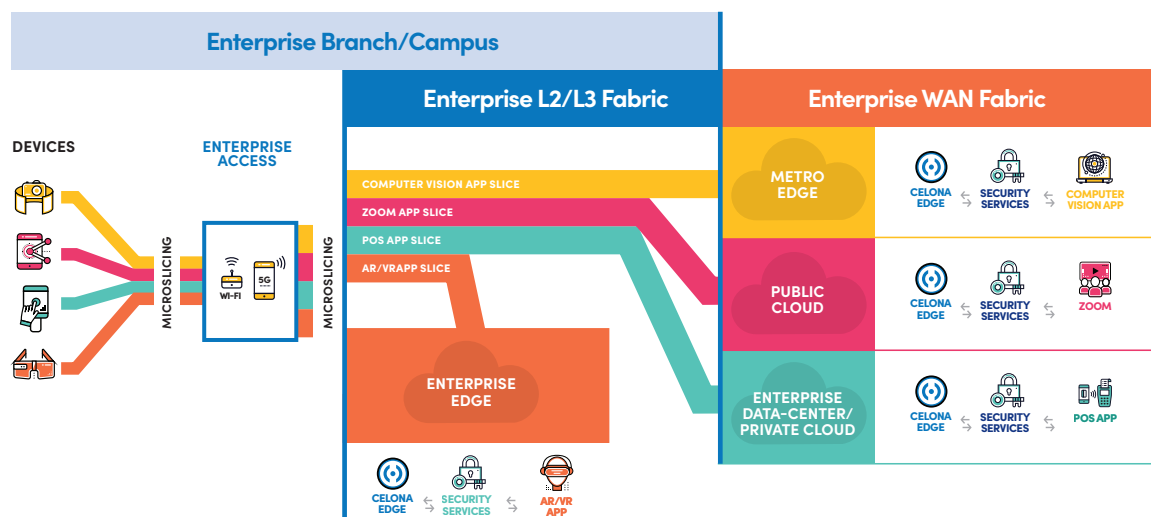
CELONA'S EDGELESS ENTERPRISE ARCHITECTURE

Within Celona's vision of an edgeless enterprise network, network and policy automation are fully controlled to intelligently automate the optimization of traffic flows across multiple wireless mediums, the wired LAN/WAN and connectivity into cloud/metro edge services.

End-to-end visibility, control, the use of microservices and SDN overlay technologies greatly simplify network setup and can automate ongoing operations when shifts in business directives dictate changes to the network.
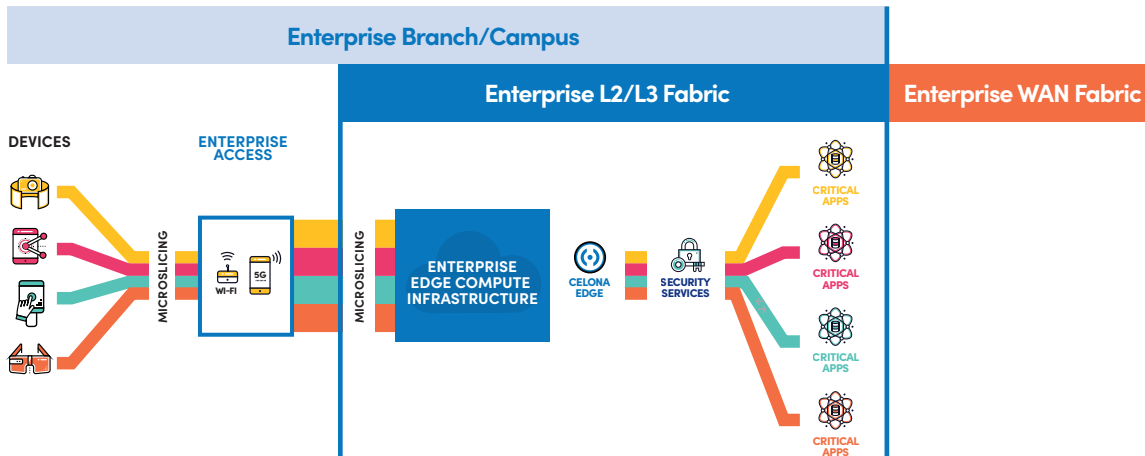
Data plane tasks required to create QoS, routing and security policy can be manually managed by an infrastructure administrator -- or automated through use of AI to identify application traffic and apply network/security policy based on derived business intent.

In turn, the physical location of the cloud-native Celona Network OS is wherever it makes the most sense from a traffic optimization perspective and the needs of digital initiatives. Determining the ideal deployment location of the Celona platform then depends on where latency/jitter-sensitive services reside, where traffic should be routed for optimal performance and what security services should be applied, per each MicroSlicing policy.
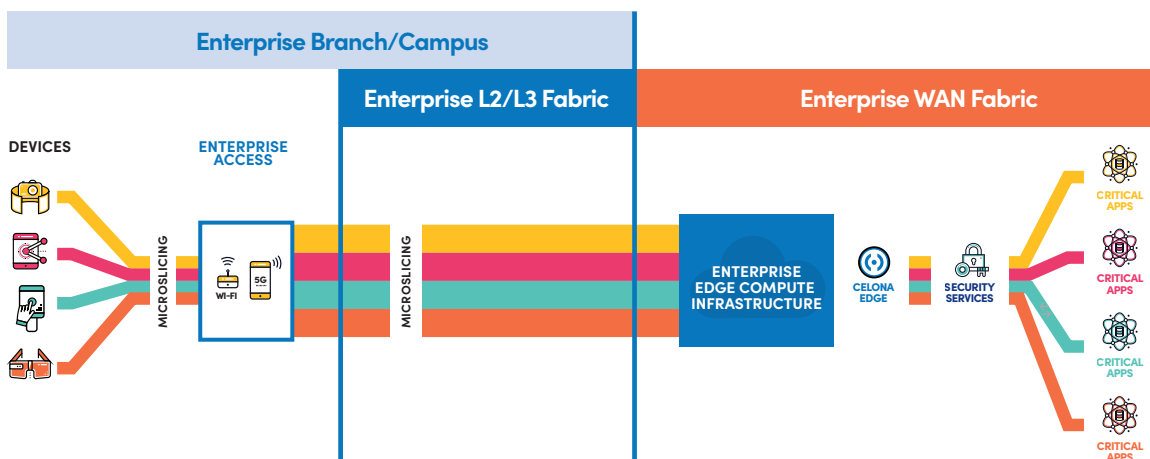
For example, complex organizations that manage apps and services on-premises, in the cloud and at the metro edge, Celona services could be deployed at all three physical locations and dynamically shift workloads based on performance need and the health of the network at each site. This model adds a necessary network component that existing telecom and hyperscale edge compute architectures currently lack:
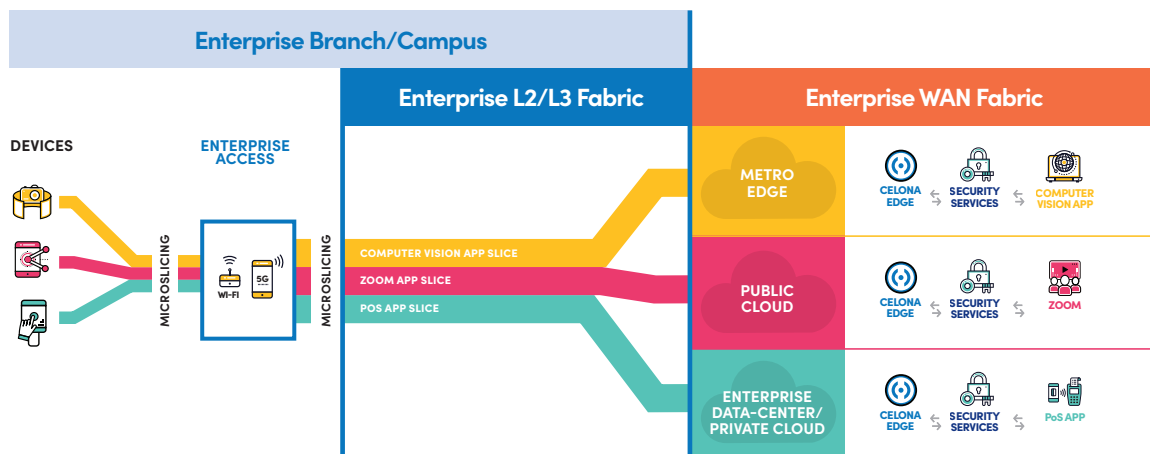
Alternatively, for businesses that manage mission-critical applications in a traditional hybrid cloud environment consisting of an on-premises data center and public cloud, they could deploy Celona's services on-premises within the corporate LAN as shown below:

For organizations moving toward a cloud-first strategy, where the vast majority of applications, data and services reside in one or more public clouds, Celona services can be deployed and managed inside the public cloud as shown here:

Finally, organizations choosing to migrate latency-sensitive services to a metropolitan edge can opt to place the Celona network intelligence at the metro edge as well. This diagram depicts a hybrid cloud where apps/data/services can reside at the metro edge and in a traditional cloud infrastructure:

MOVING TODAY'S ENTERPRISE ARCHITECTURES FORWARD

LTE and 5G-based private RANs only scratch the surface in helping enterprises power their campus networks with a cloud-native operating system, with limitless elasticity. In many cases, those challenges will be within the enterprise networking purview.

With the Celona Edgeless architecture, enterprises can rapidly deploy critical applications wherever they find enough computing resources and take network management from status monitoring to KPI based intelligence about the health of virtualized network resources. From an implementation perspective, customers are not forced to perform large-scale forklift upgrades to realize the benefits of a Celona-powered network.

In most cases, customers will likely first partner with Celona to help implement a private mobile network. As organizations truly realize the potential of the 5G's underlying principles, they will be more receptive to taking advantage of virtualized network overlays to support new applications, or fully replace other parts of their network that are due for a refresh.

Over time, edge computing technologies and supplemental network overlays powered by Celona will natively integrate SASE-delivered network security and SD-WAN services. It will be possible to unify end-to-end network, security, identity access management and endpoint protections under a single software as a service (SaaS) delivery model. This will be appealing to both information and operational technology professionals within businesses and service providers who are seeking to lower CAPEX and OPEX as they support new generation of business digital initiatives.

SEE THE CELONA TECHNOLOGY IN ACTION

Request a free trial and custom product demonstrations by visiting us at celona.io/journey.

hello@celona.io | celona.io

celona