CASE STUDY

Global Tier 1 Mobile Network Operator Selects Ciena's xHaul Routers to Support Its 5G Rollout

The customer

Providing wireline and wireless communications to consumers, businesses, and government agencies, this leading Mobile Network Operator (MNO) has been investing heavily in 5G coverage and performance. With more than 100,000 employees, over $100 billion in annual revenues, and more than 100 million cellular connections in service, they led on major technical and business fronts throughout the 4G era. From higher network availability and wireless access speeds to higher revenue per user and minimal customer churn, this MNO set the market benchmark. Honoring their history of quality and innovation, they are increasing their focus on adding capacity and density to their 4G network, while also building out their new 5G network and associated services.

They are adding capacity to address increasing mobile video consumption and the growing demand for IoT products and services on their 4G and 5G networks. At the end of 2021, they were offering high-throughput 5G services in over 80 cities. Their broader 5G coverage leverages low-band spectrum with Dynamic Spectrum Sharing (DSS) technology, as well as mid-band and millimeter-wave spectrum.

New challenges in 5G

With 5G, their continued leadership is being challenged. Leading in 5G requires agility to deploy new coverage and increase throughput while continuing to support and grow 4G. On top of that, the MNO must carefully optimize every variable to make the 5G business case profitable. The complexity associated with the adoption and integration of numerous new technologies, coupled with standards still under development, results in additional uncertainty in the business. It is not a straightforward task by any means, but the MNO is committed to maintaining their existing leadership into the 5G era.

Competition remains intense in the wireless market with increased network investment by their main competitors, the development and deployment of new technologies, the introduction of new products and services, increased levels of promotions and service plan discounts, new market entrants, and the availability of additional licensed and unlicensed spectrum. These challenging competitive dynamics build additional pressure on the operator to differentiate from other networks quickly and continuously.

They have been deploying new sites and fiber facilities for their macro and small cells to support cell densification and increased throughput. They have also made massive investments in spectrum by acquiring large chunks of mid-band spectrum, in addition to their existing spectrum holdings, to increase capacity for mobile and fixed wireless services in areas of high demand.

This operator is carrying one of the largest network builds of our time, with tens of thousands of cell sites that must be upgraded to leverage new spectrum, implement new radios and architectures, and deliver new services and improved performance.

To be agile and stay ahead of the market, to bet on the right technologies to support their network evolution, and to optimize profitability by minimizing the total cost of ownership and enabling new services, they needed the right partners and maximum flexibility in every segment of their network—from Radio Access Network (RAN) to transport to core. A strategic piece of this puzzle was the converged mobile transport solution, particularly the Cell-Site Router (CSR).

The importance of the CSR

The CSR connects each cell site to the rest of the 4G and 5G networks and core. It has existed since the 3G days, was upgraded for 4G, and must be substantially upgraded and modernized for 5G. It must support the immediate requirements of initial 5G deployments while offering a broad set of capabilities to support the continued densification and evolution of the network, addressing future requirements to enable new use cases, services, and technologies.

A limited CSR may hinder future network and services evolution, while a flexible and feature-rich one is an enabler of continued network evolution. However, the challenging 5G business case requires MNOs to minimize investments at each step of their journey, and the CSR selection must add such flexibility without compromising cost efficiency.

Key requirements for CSRs

This MNO's expectations for their CSR were ambitious and comprehensive. Not only did they want to make sure they met their present and future needs with maximum flexibility at minimum cost, but they had to address several regional peculiarities of their network. Therefore, besides matching the feature set of the two existing IP equipment vendors in place, the new CSRs also must meet a multitude of routing underlays and overlays specific to each region of the MNO's network.

The vast set of requirements can be roughly summarized and grouped into five categories.

1. Capacity and port density

Throughout its continued 5G evolution, as the MNO rolls out additional wireless spectrum across its regions, new Radio Units (RUs) must be deployed at cell sites. In many areas, macro cell sites must aggregate neighboring small cells as part of densification efforts to deliver the required coverage with high throughput. All these new RAN elements need to be connected to the broader network, requiring new access ports on the CSR. Given 5G enhanced Mobile Broadband (eMBB) speeds, a high density of 10/25GbE interfaces was targeted.

2. Advanced timing and synchronization support

Timing and synchronization are critical variables in mobile networks, and particularly demanding for 5G. The MNO wanted the CSR to offer broad timing and sync capabilities, supporting different scenarios and technologies in diverse markets and regions. In some regions, it acts as an 8275.1 telecom grandmaster, while in other markets it must act as an 8275.1 telecom boundary clock, among several more advanced timing requirements such as support for assisted partial timing support.

3. Routing sophistication

This operator's routing architecture uses VPNv6 as the overlay, leveraging IS-IS with SR-MPLS, in a sophisticated design requiring advanced routing capabilities. The CSRs must connect diverse equipment at the cell sites to remote hubs, but also connect network elements that are part of the same macro tower—RUs, virtualized Distributed Units (vDUs), and so on—requiring integrated routing and bridging functionality, with local switching and routing.

4. Proven interoperability through open interfaces

This MNO leverages specialized software and systems to execute and coordinate different aspects of the network. From alarm collection to provisioning, polling-based telemetry, latency, and frequency and phase synchronization, the CSR needs to robustly integrate with these diverse software platforms. It is achieved through solid and flexible northbound interfaces supporting standards such as gRPC/gNMI, NETCONF/YANG, SNMPv3, Y.1731, TWAMP, G.8275 / IEEE 1588v2, and others. An open-by-design concept is also desired to support a broader multi-vendor network environment, with best-in-breed hardware and software platforms.

5. Comprehensive QoS and network slicing support
Quality of Service (QoS) is a critical aspect of 5G. The MNO required their CSRs to support advanced upstream-facing QoS, well beyond classifying and remarking transit and host-generated traffic. Even though end-to-end network slicing was not initially planned, broad support for slicing capabilities was required from CSRs to future-proof the network with the ability to use centralized path computation engines for traffic engineering.

Ciena offers a compelling path forward

For over a decade, multiple traditional routing vendors had been incumbent IP equipment suppliers in this operator's network. However, cognizant of the need for a fresh network approach to enable 5G evolution, the MNO was open to exploring the best alternative in the market. Having been a longstanding strategic resource to this operator in the long-haul, metro, and wireless backhaul networks, Ciena was well positioned to bring its modern IP solution to the evaluation, and challenge the routing incumbents.

Ciena had the opportunity to introduce its open, scalable, and automated 5G transport solutions, and progressively demonstrate its comprehensive capabilities and value to all stakeholders involved. From preliminary conceptual discussions to lab trials, and eventually a detailed proof of concept in the operator's architecture lab, the solution was meticulously tested and validated, meeting all their CSR requirements. Ciena's 5164 Router was selected as CSR for their network evolution, given its comprehensive capabilities, feature set, and flexibility to support complex and diverse cell-site scenarios.

Ciena's xHaul router portfolio offers unparalleled flexibility and scalability to effectively future-proof investments through higher 10/25GbE port density, up to 800 Gb/s switching fabric, and 4x 100/200GbE ports. Its versatility is further complemented by a compact, hardened form-factor with multiple mounting and installation options capable of supporting any combination of fronthaul, midhaul, and backhaul transport traffic in the most diverse RAN architectures.

Ciena's open-by-design approach maximizes interoperability, not only supporting all required initial integrations but laying the foundation for continued and unrestrained innovation.

The advanced timing and sync capabilities of these routers, and their comprehensive soft and hard network slicing support, provide peace of mind that the most stringent 5G requirements—both present and future—will be addressed to effectively enable new architectures and use cases.

This iconic win at one of the leading global MNOs further solidifies Ciena's strength in the 5G IP and routing space. Ciena 5G Network Solutions—built on the principles of openness, scalability, and automation—are uniquely positioned to maximize MNO's flexibility as they adapt to meet the challenges of the 5G era.