Case Study

K-12 Education, Hospitality, Health Care, Higher Education

InfiniG's Private Cellular Network Brings Coverage to K-12 Schools

InfiniG's Mobile Coverage as a Service, powered by the Intel® Xeon® E-2300 processor for servers, delivers a private cellular network with five bars of mobile service and AI applications to Parkside Elementary

Smartphones, laptops, and other devices that connect to cellular networks in schools are dependent on reliable signals. Historically, K-12 school buildings have had poor cellular coverage. Many school buildings were built well before smartphones were invented and are not designed or constructed in ways that allow for strong connectivity to cellular towers. Typically, mobile network operators only fund coverage improvements for the largest and busiest 20% of buildings, leaving most to find their own solutions.

Private cellular networks offer numerous benefits to K-12 schools. A more capable and reliable network means fewer broken audio or video connections and faster download speeds. It helps bridge the educational divide by democratizing access to cutting edge educational resources. And it offers the bandwidth for more personalized and AI-enabled learning experiences.[1] Adequate coverage is also crucial to ensure that those with access to mobile phones in the school building can reach 911 in case of an emergency.

Parkside Elementary is a K-6 public school serving about 600 students, teachers, and staff in Murray, Utah, a largely underprivileged, lower income area outside of Salt Lake City. More than 200 of its students are English-language learners. Inside Parkside Elementary's school building, five bars of cellular network coverage were spotty or non-existent. The school is situated in a valley that makes connectivity to cellular towers uniquely difficult, and the aluminum foil in the building's roof blocked signals.

The Murray City School District has been at the forefront of advancing new technologies. For example, during the COVID-19 pandemic, students had to learn remotely, but very few of them had internet service at home. The district pioneered a solution to share schools' broadband connections up to a mile away using the Citizens Broadband Radio Service (CBRS) shared spectrum.

InfiniG's Mobile Coverage as a Service for a private cellular network

In the spring of 2024, InfiniG, an Intel® Partner Alliance member and Intel® Industry Solution Builders' Network Builders Community member, deployed a Mobile Coverage as a Service (MCaaS) solution powered by the Intel Xeon E-2300 Processor at Parkside Elementary.

[1] https://blogs.worldbank.org/en/digital-development/how-can-5g-make-difference-education

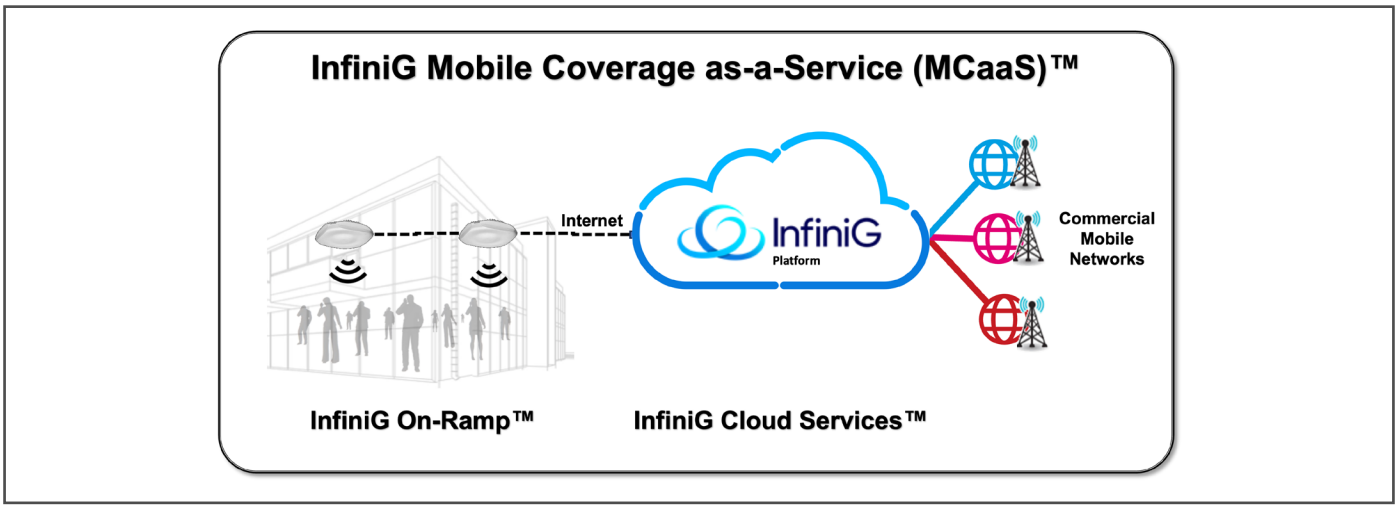

Figure 1. InfiniG's MCaaS solution.

InfiniG's private cellular network solution uses small radio nodes that share CBRS airwaves, LAN infrastructure, and the building's existing broadband service to connect each mobile user to their own mobile network service provider. InfiniG's MCaaS solution is illustrated in Figure 1.

Cellular signals are not simply repeated from the outside. Instead, they are generated throughout the building like tiny radio towers the size of Wi-Fi access points. The result is a high-quality, high-capacity, highly cost-effective network that provides excellent coverage, mobility, and all the services that mobile device users expect. And because it is a private network owned by the school, it has built-in support for private cellular applications.

InfiniG's MCaaS solution has been deployed in more than 40 buildings with over 10 million square feet of indoor space. It is simpler and costs less than alternatives, making it ideal for budget-constrained K-12 schools. Furthermore, instead of looking to mobile network service providers for solutions, CBRS has opened the door for organizations to solve their coverage problems themselves.

Now, there are five bars of mobile service throughout the school building at Parkside Elementary. This enhances teacher productivity, bridges the divide for student learning, and allows for anyone to call 911 in case of an emergency. And this private cellular network allows for the school to implement its own applications that leverage AI and edge computing.

Private cellular networks offer a better option

Private cellular networks provide several technical advantages over Wi-Fi. These include seamless mobility, end-to-end security, consistent latency, and farther signal reach. In addition, private networks give enterprises control over the cellular network. They can determine where to put coverage, who has access, how data is routed and controlled, and which security policies apply.

On a public cellular network operated by a mobile network operator (MNO), each mobile user's SIM card contains a cryptographic chip. This chip authenticates the user and establishes a secure end-to-end connection with the MNO's network and their Enhanced Packet Core (EPC). The EPC controls access into the network and out to other network resources such as the internet. When a mobile subscriber signs up for service, the MNO creates a record in the EPC with cryptographic credentials that match their SIM card.

When an enterprise deploys InfiniG's MCaaS solution with cellular radios within their building, the relationship remains the same as with a public cellular network. A mobile user with an AT&T SIM in their phone is simply routed over the wired internet to the AT&T EPC for authentication and establishing a secure connection. Other than seeing the data flowing through their LAN, the enterprise has no visibility of who is on their network and what data they are sending.

However, enterprises can also add their own SIM cards and EPC to essentially become their own MNO, with full control of who and how users or devices access their network and network resources. This can be particularly useful for IoT devices.

When a cellular device has a private SIM card, it will advertise itself to the radio network using a public land mobile network ID (PLMNID) that identifies it as a private user. When the InfiniG network sees this PLMNID, it routes the request to the enterprise's private EPC instead of the EPC of the MNO. The private EPC then checks that the cryptographic credentials of the SIM match its own, and, if so, applies rules to allow the SIM into the network and onto various network resources.

Powered by Intel® Xeon® E-2300 Processors for Servers

InfiniG's MCaaS solution at Parkland Elementary is powered by Intel Xeon E-2300 Processors for Servers.

For server applications and workloads that do not require enterprise scalability and other advanced capabilities, Intel® Xeon® E processors for servers offer a compelling CPU solution designed for single-processor server platforms. These power-efficient and cost-effective processors feature the essential server features and capabilities needed for entry-level hardware solutions.

The Intel Xeon E-2300 processors for servers feature essential performance and I/O expandability options for entry-level servers. They offer business-ready reliability to support critical services and customer data needs.

The before-and-after scenarios in Figure 2 below highlight how InfiniG utilizes devices with Intel® architecture to enable the private network capabilities built into InfiniG's MCaaS solution, as noted by the green items. The private EPC is powered by the Intel Xeon E-2300 processor for servers, authenticates SIM cards, and handles the radio access network's resources, mobility, and security.

InfiniG's MCaaS solution also supports IoT devices with private SIM cards. For Parkside Elementary, a language learning AI camera was installed on the private cellular network to aid English-language learners (see use case).

An AI camera with a private SIM: An IoT use case for Parkside Elementary

At Parkside Elementary, classrooms are using a language learning AI camera powered by the Intel® Movidius™ Myriad™ X Vision Processing Unit to provide real-time translating capabilities for English-language learners. Classrooms can put a television with a camera alongside the teacher and it will translate what the teacher is saying into the students' native language.

AI tools and internet connectivity can help students bridge the language gap in a way that that schools hadn't been able to previously. Once they have fast and reliable connectivity, schools can start driving innovation, creating their own new use cases.

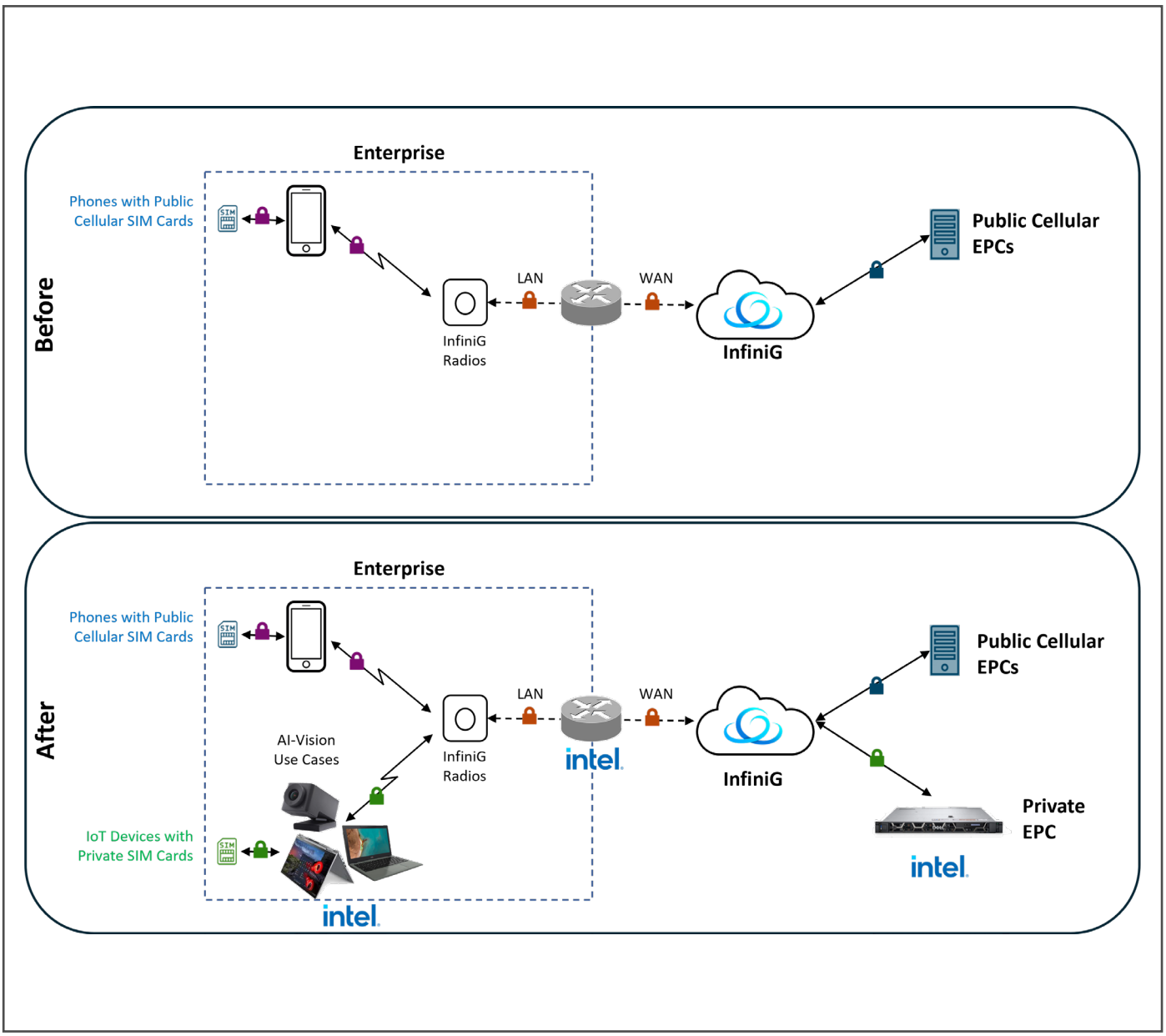

Figure 2. A before-and-after illustration highlights how InfiniG uses Intel® technology in its MCaaS solution, as noted by the green items.

Conclusion

Many K-12 school buildings have poor cellular coverage. At Parkside Elementary in Murray, Utah, InfiniG deployed a Mobile Coverage as a Service solution powered by the Intel Xeon E-2300 Processor. InfiniG's private cellular network solution uses small radio nodes that share CBRS airwaves, LAN infrastructure, and existing broadband service to connect users to their own mobile network service provider. Private cellular networks offer several advantages over Wi-Fi, including lower latency, farther reach, and control over the cellular network. Now, Parkside Elementary has five bars of mobile service and a language learning AI camera tool powered by the Intel Movidius Myriad X VPU to aid its English-language learners. With fast and reliable connectivity, schools can drive innovation and create their own use cases that leverage AI and edge computing.

Learn More

InfiniG Mobile Coverage as a Service (MCaaS)

Parkside Elementary School

Intel® Xeon® E-2300 Processors for Servers

Intel® Movidius™ Myriad™ X VPU

Intel Business: Private Networks Enable Connectivity and Second Language Learning in Schools

Intel Corporate Social Responsibility

Intel RISE Strategy and Goals

Intel® Industry Solution Builders

Intel RISE Technology Initiative

The Parkside School project is part of Intel's RISE strategy. Through RISE, Intel is working to harness the power of technology to solve the increasingly complex and interconnected challenges the world faces.

Intel's environmental, social, and governance (ESG) efforts are integrated throughout our business through our unified "One Intel" ESG framework, RISE. We aim to create a more **responsible**, **inclusive**, and **sustainable** world, **enabled** by technology and the expertise and passion of our employees.

As an innovation leader, Intel is well-positioned to share its technology expertise and solutions with communities, customers, governments, non-governmental organizations, and educators to help them reach their own goals and effect broader change. The entire Intel team aspires to drive collective impact through the Intel RISE Technology Initiative (IRTI) by deploying Intel® technology and employees' talent, while collaborating with customers and the industry.

Through the IRTI, Intel has invested cumulatively in 370 technology projects across 42 countries since 2020, addressing health and life sciences, education, economic recovery, social equity and human rights, accessibility, and sustainability.

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