Case study

How CBRS-based smart wireless connectivity is empowering Industry 4.0

Ericsson USA 5G Smart Factory

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OnGo alliance

How CBRS-based smart wireless connectivity is empowering Industry 4.0

The Ericsson USA 5G Smart Factory in Lewisville, Texas, produces 5G and Advanced Antenna System (AAS) radios to boost network capacity. LEED Gold certified and pursing LEED Zero Carbon certification, the 300,000-square-foot facility sets a precedent for how smart manufacturing can optimize processes for efficiency and increase production through automation. This space is not only a state-of-the-art production facility; it's an innovation center where Ericsson continuously innovates and expands on deployed use cases.

In the short time since it began operation, the 5G Smart Factory has already become a proving ground for numerous new technologies and use cases. Over the past year, Ericsson has explored an impressive 25 new uses. One outstanding example is the use of shared spectrum in the OnGo 3.5GHz Citizens Broadband Radio Service (CBRS) band, deployed over a telecom-grade wireless network, to provide fast and secure cellular connectivity for Industry 4.0.

This paper looks at some of the most promising use cases regarding building management that OnGo CBRS is enabling in the factory. These use cases can apply across a range of verticals outside of manufacturing including retail, healthcare, agriculture, buildings, energy and utility, and public safety.

Why wireless?

Industries are driving hard today to make factories smarter and more efficient, processes less wasteful, production lines more flexible and productivity higher. That means making the most of every opportunity to extend machine life through predictive maintenance, support rapid material handling, monitor every detail on the shop floor, and leverage the Industrial Internet of Things (IIoT). Smart, secure wireless connectivity is the red thread that enables the realization of Industry 4.0.

Why CBRS?

In the Ericsson USA 5G Smart Factory, we built our solution on Ericsson Industry Connect using CBRS. CBRS makes improved wireless accessible to most enterprises. It's inexpensive and simple to use. CBRS's simplified radio frequency (RF) guidelines mean that your own IT professionals can install and deploy it without the need for specialized expertise.

CBRS-based wireless connectivity provides unprecedented flexibility and agility, enabling you to:

- Add new use cases without having to run cables.
- Place sensors, cameras and other control devices anywhere, and move them easily as needed.
- Deploy a fully private network quickly, without need for provider involvement.
- Securely control all devices connected to the network, by burning your own SIMs (Subscriber Identity Module).
- Evolve to 5G when you're ready.

"Putting Ericsson's Industry Connect solution on OnGo shared spectrum has led our 5G smart factory operations to become even more efficient, reliable, environmentally friendly and cutting-edge. The factory is not only a manufacturing site but also a place of innovation where we are working to expand our OnGo shared spectrum use cases. These use cases show the power of wireless solutions to digitally transform factories and industries for the better."

—Erik Simonsson, Head of the Ericsson USA 5G Smart Factory

Use cases

Challenge
- Buildings, including factories, use 40 percent of our energy and 70 percent of our electricity.
- Lack of visibility into energy consumption at the device-level prevents optimization strategies.

Solution
- Enables monitoring of all energy appliances and ability to turn them on/off based on rules.
- Gathers data out of the building management systems (BMS) for tracking in the data lake and shows real-time energy consumption on big screen.

Estimated impact
- Cost: Five percent reduction in energy bill is from better monitoring and control of energy consumption.
- Visibility: Better visibility into actual power consumption leads to increased ability to negotiate power consumption unit price from energy providers.

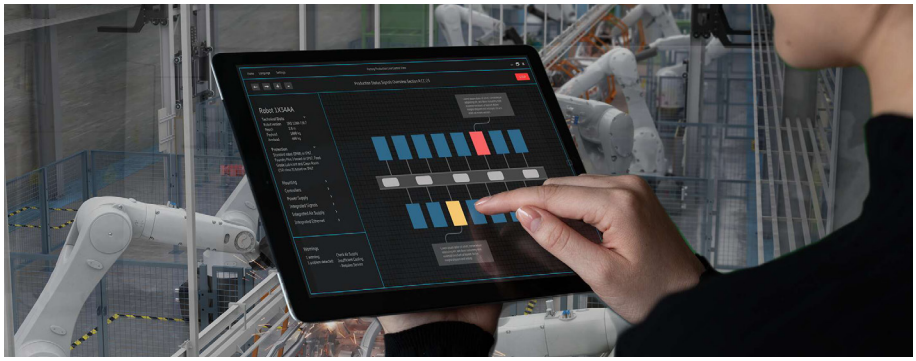
Potential applications
- manufacturing
- agriculture
- retail and smart buildings

1. Energy monitoring and management

Manufacturing operations are among the most energy-intensive in the U.S. Industrial energy use is responsible for almost 30 percent of all U.S. greenhouse gas emissions, which contribute to global climate change. Buildings, including factories, use 40 percent of our energy and 70 percent of our electricity. Gaining visibility into energy consumption at the device level enables factory operators to incorporate optimization strategies in factory management. In the Ericsson USA 5G Smart Factory, a 4G-connected energy monitoring and management solution gathers data of all energy appliances in the factory for tracking. Energy appliances in the factory—including the building systems (heating, ventilation, air-conditioning, solar panels, irrigation systems and air particulate monitoring)—are connected over the CBRS network. Schneider Electric, who provides the building controls and the equipment, is connected using MultiTech CBRS microcell devices.

Because the elements are connected wirelessly, there is no cost for pulling cable during deployment, a significant savings on system deployment. Because the network is wireless, it's easy to add elements and respond to unanticipated needs such as deploying additional particulate monitoring sensors during construction. Because the system collects real-time data on consumption, we can adjust continuously and deploy automation based of pre-set thresholds/rules and improve over time using machine learning.

We saved five percent of the building management systems budget by adopting CBRS, and increased flexibility to add new sensors in the future easily.



Challenge
- Environmental factors are impacting industry output; for instance, a day of with temperatures above 90 degrees can cost a manufacturing plant up to USD 10,000 in output and increased waste.
- It is difficult to understand exactly how the environment (e.g., humidity) impacts the production/working environment for employees.

Solution
- Collect environmental monitoring data, such as humidity and temperature, from across the factory floor and store it in the data lake for correlation purposes.

Estimated impact
- Quality: Five percent reduction in waste is due to out of production conditions, such as high temperatures and humidity.

Potential applications
- manufacturing
- energy and utilities
- agriculture
- retail and smart buildings

2. Environmental monitoring within the factory

Environmental factors impacting industry output can cost a manufacturing plant up to USD 10,000 in output and increased waste, not to mention their effect on the well-being of those working inside the factory. Temperature and humidity can also affect production and the working environment for employees. The 5G Smart Factory's environmental monitoring solution collects environmental factors, such as humidity and temperature, across the factory floor in a data lake for analysis purposes. These insights can lead to higher manufacturing quality and a five percent reduction in waste production conditions. CBRS makes expanding the system as easy as attaching more sensors, giving us the opportunity to connect other systems such as the rainwater harvesting, solar panel and lawn monitoring to the Schneider Electric platform.

Challenge
- With nearly 27 percent of U.S. manufacturing workers set to retire over the next ten years, it will be increasingly difficult to complete certain repairs due to lack of on-site expertise and specialized knowledge.
- The cost is high for maintenance labor maintained at each site. Flying the vendor out for repairs is also costly.

Solution
- Augmented reality headsets and smartphones used by maintenance teams to troubleshoot and repair equipment by:
- Connecting to globally distributed Ericsson support, or third-party vendor support teams.
- Getting step-by-step, system generated and knowledge-base-powered guidance in real-time.

Estimated impact
- Labor: 10 percent decrease in plant maintenance labor
- Downtime: Five percent decrease in equipment downtime because of more efficient troubleshooting
- Cost: 20-25 percent reduction in vendor service cost
- Travel cost: 40-50 percent reduction in travel cost

Potential applications
- manufacturing
- energy and utilities
- healthcare

3. AR For remote support

With a facility as advanced as the Ericsson USA 5G Smart Factory, maintenance can be complex and require a high level of expertise that it may not be practical or economical to keep available on-site. Flying in expertise or vendor support for repairs is expensive and time consuming.

In the Ericsson USA 5G Smart Factory, that challenge is solved through Augmented reality (AR). Connected to a private network—which could be CBRS or licensed spectrum or even Wi-Fi—provides freedom and mobility as well as data security. Wearing Microsoft's AR headset, the wearer can share high-resolution video, audio and annotations in real time with the global Ericsson team, a vendor or subject matter expert anywhere in the world. The wearer can view work instructions during a task hands- free and see process data while working—something not possible when you have to return to a desk to check a report.

Through the AR system, maintenance staff sees the analytics they need to do their job; managers can see the statistics that represent, for instance, finished goods-per-second reports and identify bottlenecks.

Over the past year, Ericsson conducted time studies and saw a 10 percent improvement in maintenance labor and five percent in downtime. Most dramatic of all, travel costs were cut 50 percent. In fact, during the pandemic, when bringing in a team of engineers was simply not feasible, AR enabled the teams to continue to function at all.

Augmented reality support will decrease labor, travel and vendor costs, as well as increasing equipment uptime with quicker response and improved maintenance.

Challenge
- Providers/material set-up assistant get no alert when there is an issue (e.g., material magazine is empty).
- Immediate action is not possible if a provider is not at the production line computer, leading to production loss.
- No guidance on immediate next step is available to provider.

Solution
- Smart devices can provide real-time alerts or critical alarms to provider and suggest immediate workflow actions.

Estimated impact
- Uptime: Five percent increase in machine uptime from faster provider response time

Potential applications
- manufacturing
- energy and utilities
- public safety
- healthcare

4. Mobile alerting and escalations

In a thriving factory, continuously checking all equipment in a facility is time-consuming; material magazines can be empty for a while before the shortage is detected and refilled by a factory worker. To reduce or avoid production loss, smart devices including mobile devices and wearables provide real-time alerts to factory personnel and suggest actions based on past experiences. Addressing critical alarms or material shortages more promptly increases machine uptime and reduces production losses. We also adopted a system to reduce personnel in the manufacturing area during autonomous operations, improving the safety of employees to improve productivity.

Conclusion

As the OnGo Alliance recognized, the Ericsson USA 5G Smart Factory demonstrates how shared spectrum in the 3.5GHz CBRS band can help drive Industry 4.0 and IIoT innovation. The use cases this paper explores show the power of wireless solutions to digitally transform factories and industries from manufacturing to energy and utilities; retail to healthcare and public safety. With an array of innovative and unique solutions inside and out, the Ericsson USA 5G Smart Factory is a major leap towards fulfilling Ericsson's commitment to supporting 5G deployments in North America and showcasing how superior connectivity leads to a new era of smart manufacturing.

About OnGo Allianace

The OnGo Alliance believes that 4G and 5G solutions, utilizing shared spectrum, can enable both in-building and outdoor coverage and capacity expansion at massive scale. In order to maximize the full potential of shared spectrum, the OnGo Alliance aims to enable a robust ecosystem towards making OnGo solutions available. The mission of the OnGo Alliance is to evangelize 4G and 5G OnGo technology, use cases and business opportunities while simultaneously driving technology developments necessary to fulfill the mission, including multi-operator capabilities. The Alliance also established an effective product certification program for OnGo equipment in the U.S. 3.5 GHz band ensuring multi-vendor interoperability. For more information, please visit www.ongoalliance.org and follow the OnGo Alliance on LinkedIn and Twitter.

About Ericsson

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans Networks, Digital Services, Managed Services, and Emerging Business and is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. The Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York. www.ericsson.com

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