WHITE PAPER | PRIVATE WIRELESS, EDGE NETWORKS, AND INDUSTRIAL INFRASTRUCTURE

Industrial Private 5G and Edge Computing

Protecting the outdoor electronics, controls, and network equipment behind modern industrial wireless infrastructure.

PRIVATE 5G	EDGE	DATA	POWER	CABINETS
Local wireless control	Compute close to equipment	Cameras, Sensors, Robots	UPS, Surge, Backup	Protected field electronics

The network is wireless

The infrastructure still needs radios, routers, switches, edge servers, power, grounding, cabling, antennas, and service access.

Industrial sites are demanding

Factories, utilities, mines, ports, warehouses, and outdoor yards expose network equipment to heat, dust, moisture, vibration, and security risk.

Private 5G is a network design. Edge computing is a site design challenge.

Industrial wireless and edge projects only perform as well as the field hardware that powers, connects, protects, and maintains them.

Executive Overview: Industrial Networks Are Moving to the Edge

Industrial private 5G and edge computing are becoming important planning topics for facilities that need reliable wireless connectivity near production, automation, safety, logistics, and field operations. The goal is not just faster connectivity. The goal is to move data, control, and compute closer to the equipment that generates operational value.

Private wireless networks can support mobile robots, automated guided vehicles, cameras, sensors, handhelds, yard systems, remote monitoring, and operational technology systems that may not fit neatly into traditional Wi-Fi or public cellular models. Edge computing adds local processing so video, sensor, and automation data can be handled closer to the source instead of always being sent to a distant data center.

In the United States, CBRS has provided an important spectrum path for private LTE and 5G, while NIST has treated industrial 5G testbeds as a research area for networked automation systems and smart manufacturing. For project teams, the field infrastructure issue is clear: radios, routers, switches, edge compute, power, backup, and cabling need protected, serviceable locations.

The network is wireless. The installation is not invisible.

Private 5G and edge systems still depend on physical cabinets, cable entry, antennas, grounding, power, backup, thermal planning, and serviceable layouts.

Layer	Field equipment	Enclosure consideration
Radio access	Small cells, radios, antennas, timing support	Mounting, antenna path, cable entry, power, and service access.
Network core and routing	Routers, switches, firewalls, gateways, backhaul	Racking, labeling, grounding, surge protection, and maintenance space.
Edge computing	Industrial PCs, edge servers, storage, AI/video appliances	Thermal load, dust control, access, and lifecycle service planning.
Power and backup	UPS, batteries, AC/DC power, disconnects, load centers	Electrical review, separation, cooling, cable paths, and expandability.

Why Industrial Wireless Is Moving Closer to Equipment

Industrial facilities increasingly need connectivity in places where wired infrastructure is expensive to change, public cellular may not provide the right control model, and Wi-Fi may not match every coverage, mobility, or traffic-management requirement. Private 5G gives teams another tool for connecting equipment across production floors, yards, campuses, remote assets, and mobile operations.

Automation	Vision	Safety	Yards	Utilities
Robots, AMRs, AGVs, Machine control support	Cameras, Inspection systems, Video analytics	Wearables, Alarms, Worker location, Monitoring	Forklifts, Gates, Trailers, Perimeter systems	Substations, Water sites, Terminals, Remote pads

Edge computing changes the cabinet conversation. When compute moves out of a server room and closer to machines, cameras, sensors, or remote assets, the field enclosure may need to house equipment that is more sensitive to heat, dust, power quality, and service interruptions.

Industrial use case	Why private 5G/edge is considered	Field infrastructure need
Factories and warehouses	Mobile automation, handheld devices, dense sensors, and operational visibility.	Indoor/outdoor edge cabinets, small cells, switches, routers, and backup power.
Mines and aggregate sites	Large outdoor areas, dust, moving equipment, and remote monitoring.	Weather-ready enclosures, elevated equipment, cable entry, power, and field service access.
Ports and logistics terminals	High traffic, cameras, autonomous equipment, gates, and yard management.	Distributed network nodes, edge processing, and rugged equipment protection.
Utilities and critical infrastructure	Remote assets, telemetry, controls, inspection, and resiliency needs.	Cabinet planning for communications, power, routing, monitoring, and security.

What a Private 5G and Edge Site Includes

A private wireless deployment is not a single device. It is a stack of radios, antennas, network services, backhaul, power, monitoring, and support equipment. Some of that equipment may sit in indoor IT spaces, but industrial projects often push hardware into outdoor yards, process areas, rooftops, utility pads, warehouses, and remote equipment locations.

1. **Radio**
   Small cell, Antenna, Cable path
2. **Backhaul**
   Fiber, Ethernet, Router, Switch
3. **Edge**
   Compute, Storage, Analytics
4. **Power**
   UPS, Surge, Grounding, Cabinet

Component	Purpose	Cabinet planning issue
Small cell or radio	Provides local wireless coverage for devices and equipment.	Needs power, antenna path, weather consideration, grounding, and service reach.
Router, switch, or gateway	Moves traffic between radio access, edge systems, cloud, or OT networks.	Needs racking, labels, cable management, thermal planning, and physical security.
Edge compute or storage	Processes video, sensor, analytics, or automation data near the source.	Needs heat-load review, dust control, stable power, and future upgrade space.
Power and protection	Supports uptime and protects equipment from electrical events.	Needs disconnects, surge protection, grounding, UPS space, and safe access.
Monitoring and alarms	Tracks site status, cabinet conditions, door access, and network health.	Needs organized low-voltage wiring and serviceable terminations.

The cabinet becomes part of the network architecture.

If the enclosure is undersized or hard to service, the network can become harder to maintain even when the radio design is strong.

Industrial Site Conditions Are the Real Test

Industrial private 5G and edge equipment may be deployed near metal structures, moving vehicles, outdoor process areas, harsh weather, washdown zones, heavy dust, high heat, vibration, electrical noise, and limited-access locations. The field environment should drive enclosure planning as much as the network design does.

Planning pressure points for industrial private wireless

Site pressure	Risk to network equipment	Enclosure planning response
Dust, fibers, and airborne material	Contamination can affect fans, electronics, connectors, and filters.	Review NEMA configuration, filtration, sealed layout, and maintenance intervals.
Heat and solar exposure	Edge compute and radios can add heat inside outdoor cabinets.	Use thermal review, equipment spacing, ventilation, or climate control where required.
Water, washdown, and corrosion	Moisture intrusion can damage electronics and create service problems.	Evaluate NEMA 4/4X needs, cable entry, gasketing, and corrosion exposure.
Security and access	Network equipment can support critical operations and may need restricted access.	Plan locks, alarms, placement, labeling, and technician work clearances.
Growth and upgrade cycles	Network loads and device counts can change after deployment.	Leave practical room for expansion, spare ports, additional power, and future devices.

Planning Variables Before the Cabinet Is Ordered

The enclosure decision should come early enough to influence the network bill of material, site layout, cable paths, power design, and maintenance plan. Waiting until the radio or edge equipment has already been selected can force project teams into cramped layouts or service compromises.

Planning question	Why it matters	Information to confirm
Where will radios and antennas be placed?	Placement affects cable length, line of sight, coverage, weather exposure, and service access.	Mounting surface, cable route, antenna plan, grounding, and service reach.
What belongs inside the cabinet?	Routers, switches, edge compute, power, and batteries create different space and heat needs.	Equipment dimensions, power draw, heat load, rack needs, and spare capacity.
What level of environmental protection is needed?	Industrial sites vary widely in dust, water, corrosion, and temperature exposure.	NEMA target, climate control need, filters, seals, and cabinet material.
How will the site be maintained?	Remote or restricted sites can make truck rolls expensive and slow.	Door orientation, access clearances, labels, service loops, and monitoring.
How will the network grow?	Private wireless deployments often expand as new devices and use cases are added.	Extra rack space, ports, power, cable entry, and expansion room.

Private 5G planning should include the physical layer outside the radio design.

Spectrum, core architecture, and device strategy matter, but the field cabinet determines where electronics live, how power enters, how cables are routed, and how technicians keep the system working.

Where DDB Enclosures Fit

DDB Unlimited supports industrial private wireless and edge projects by helping teams match equipment packages to outdoor enclosure platforms that support protection, serviceability, cable entry, power routing, and long-term maintainability. The right starting point depends on the equipment stack, site exposure, mounting method, and future expansion needs.

5G-LTE Micro

Field-ready communications enclosure

A compact LTE/5G-oriented enclosure direction for communications backhaul, routing, power support, and weather-ready network deployments.

51"H x 30"W x 30"D

View Product

SOD-302420

Racking small box

Useful for compact racked electronics, remote monitoring hardware, routers, switches, and localized power support around distributed sites.

32"H x 24"W x 24"D

View Product

OD-62DXC

Tall OD Series enclosure

A strong racked-enclosure direction for private wireless, edge electronics, power support, cable entry, and future service capacity.

63"H x 28"W x 30"D (33 RU)

View Product

Ready to plan an industrial private wireless enclosure package?

DDB can help review radio, routing, edge compute, power, cable-entry, grounding, and service-access requirements for private 5G and edge deployments.

Request a Quote | View 5G-LTE Micro | View SOD-302420

Call 800-753-8459 | Contact DDB

Conclusion

Industrial private 5G and edge computing are not only IT projects. They are field infrastructure projects that connect wireless design, operational technology, power, edge processing, and equipment protection into one deployment plan.

A strong network architecture can still struggle if the supporting equipment is placed in an undersized, poorly ventilated, hard-to-service, or poorly protected cabinet. Site teams should review equipment dimensions, heat load, cable entry, grounding, antenna routing, backup power, security, and future expansion before the project moves into installation.

DDB Unlimited's outdoor enclosure platforms give integrators, industrial operators, utilities, manufacturers, and project teams practical starting points for protecting the electronics that support private wireless and edge computing at the field level.

Key takeaway

The network may be wireless, but reliable operation still depends on protected radios, routers, edge devices, power equipment, cabling, grounding, and service access.

Planning takeaway	Field impact
Start with the application.	Robots, cameras, sensors, yards, utilities, and safety systems create different network and enclosure requirements.
Treat edge compute as field equipment.	Local compute may need stable power, thermal management, dust protection, and accessible service space.
Plan cable entry and grounding early.	Poor penetrations and bonding can create avoidable maintenance problems after deployment.
Leave room for growth.	Industrial wireless systems often expand as additional assets, users, devices, and analytics are added.

Research Notes

Source references used for current context include the FCC 3.5 GHz Band and Citizens Broadband Radio Service overview, NIST Industrial Wireless 5G Testbed resources, NIST Industrial Private 5G Testbed publication materials, and DDB Unlimited product pages for 5G-LTE Micro, SOD Series, and OD Series enclosures. Project-specific spectrum, network, and compliance details should be refreshed before publication or final design use.