SPARRO™

Private Cellular Networks: The Next Evolution in Enterprise Connectivity

Enterprise connectivity is getting a significant upgrade. While traditional network solutions have their place, savvy organizations are incorporating private cellular networks (PCNs) into their connectivity toolkit to address critical operational challenges.

The numbers tell the story. The global PCN market will reach $12.2 billion by 2028 – a staggering 114% growth from 2025, according to recent analysis by Juniper Research. The healthcare, logistics, and utilities sectors exhibit particularly robust growth in PCN adoption. STL Partners anticipates that the growth of this technology will reach $21 billion by 2030. Organizations across industries are recognizing that reliable connectivity has become as critical to their operations as electricity or water.

What Are Private Cellular Networks?

Think of a private cellular network as your own personal cell tower system. PCNs function similarly to public cellular networks but operate within a defined area exclusively for your organization. Unlike public cellular, which shares bandwidth among thousands of users, a PCN gives you dedicated, enterprise-grade coverage and security.

In the US, these networks typically use Citizens Broadband Radio Service (CBRS) spectrum, a slice of the airwaves in the 3.5 GHz radio frequency band that the FCC has made available for private use. Several other countries have also allocated spectrum specifically for cellular communication.

Devices connect just like they would to any cellular network; they are enrolled with eSIMs to allow access to the network. The difference is that the infrastructure belongs to you and is dedicated for use by your organization.

The Business Case: How PCNs Complement and Enhance Your Network Strategy

PCNs and Wi-Fi: Better Together

Smart enterprises don't choose between PCNs and Wi-Fi; they use both strategically. Most enterprises already have Wi-Fi networks established to enable connectivity. Analysts say that companies are increasingly requesting that these networks connect with newer PCN networks to improve business intelligence and data results.

Wi-Fi excels for guest access, conference rooms, and general office connectivity. PCNs shine for mission-critical operations, mobile workers, and environments where Wi-Fi struggles. The most effective deployments combine both technologies. Use Wi-Fi for everyday computing needs and guest access, and let PCNs handle operations that require guaranteed performance, broader coverage, or enhanced security.

Where PCNs Provide Critical Improvements

Some specific applications for which PCNs improve performance compared to Wi-Fi include:

- **Extended coverage areas –** While Wi-Fi works well in offices, PCNs excel in warehouses, manufacturing floors, sprawling outdoor facilities, and other challenging environments. PCNs provide consistent coverage across large areas with significantly fewer access points. A single CBRS access point can cover an area approximately ten times that of a Wi-Fi access point.

- **Improved security –** Public Wi-Fi presents security challenges, and even enterprise Wi-Fi can be vulnerable to various attack vectors. PCNs offer enterprise-grade security by design, with dedicated spectrum and controlled access that ensures only authorized devices can connect. For industries handling sensitive data such as healthcare records, financial transactions, or logistics information, this additional layer of security is invaluable.

- **Performance when it matters –** Public cellular networks prioritize voice over data. During peak usage (think shift changes, emergency situations, or high-traffic events), data speeds plummet. PCNs carry data without this degradation, maintaining consistent performance when your operations depend on it.

- **Mobile workforce support –** Unlike Wi-Fi, which can require users to connect to different networks and APs as they move, PCNs provide seamless connectivity as workers move throughout large facilities – just like a public cellular network.

- **Interference resistance –** Wi-Fi operates in crowded spectrum bands shared with everything from microwaves to baby monitors. PCNs use dedicated CBRS spectrum, eliminating interference issues that can plague Wi-Fi deployments.

- **Reduced infrastructure complexity –** Traditional Wi-Fi deployments require extensive cabling and numerous access points. PCNs require fewer hardware components while providing broader coverage, reducing both installation complexity and ongoing maintenance compared to equivalent Wi-Fi coverage.

Examples: Real-World Impact Across Industries

According to Technology Business Research, Inc., when paired with other technologies such as AI, machine learning, blockchain, IoT, edge computing, and cloud computing, 5G is poised to revolutionize entire industries. Here are some examples of PCN uses in various industries.

Manufacturing: Unleashing Performance and Reducing Risk

Manufacturing is a key driver of private cellular adoption. Manufacturers use PCNs to connect IoT sensors, automated guided vehicles, and robotic systems that require ultra-reliable, low-latency connectivity.

Consider an automotive assembly line where a connectivity failure could halt production, resulting in thousands of dollars in lost revenue per minute. PCNs eliminate this risk by providing guaranteed bandwidth and eliminating interference from consumer devices.

Healthcare: Life-Critical Connectivity

Healthcare facilities can't afford network failures. PCNs enable secure, reliable connections for medical devices, patient monitoring systems, and electronic health records. Unlike public networks that might be compromised or overloaded, PCNs ensure healthcare applications always have the connectivity and security they need.

Logistics and Warehousing: Moving at Scale

Modern logistics operations depend on real-time data from warehouse management systems, inventory tracking, and vehicle coordination. PCNs provide the coverage needed across vast warehouse spaces and outdoor yards where Wi-Fi often struggles and public cellular is unreliable.

Waste Management: Operations That Never Stop

Waste management companies operate in challenging environments, such as expansive landfills and processing facilities. PCNs enable reliable communication for fleet tracking, route optimization, and safety monitoring across diverse locations. When drivers or facility operators require instant communication during critical operations, PCNs ensure connectivity works regardless of location or network congestion.

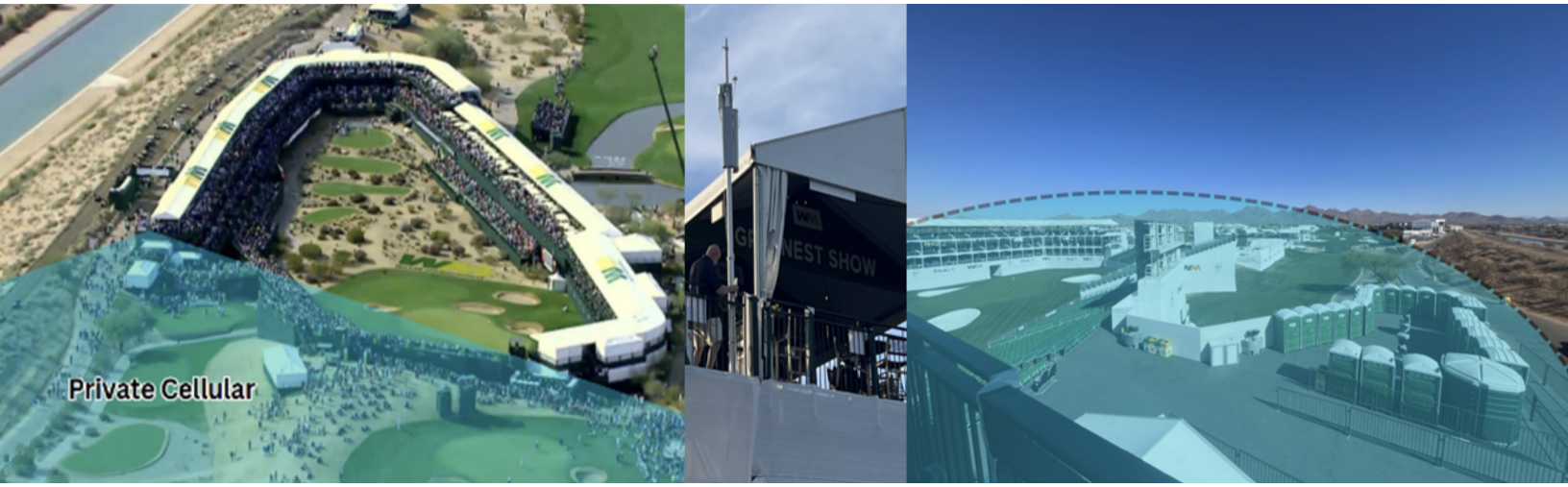
Retail: Seamless Customer Experience

Retail chains use PCNs to support POS systems, inventory management, and customer experience applications. When Black Friday arrives and thousands of customers flood your store, PCNs ensure your operations continue to run smoothly while public networks buckle under the strain of consumer demand.

Understanding PCN Deployment Options

Not all private cellular networks are created equal. Organizations can choose from several deployment models based on their specific needs:

- **Indoor PCNs** work well for manufacturing facilities, hospitals, and office complexes where you need reliable coverage within buildings. These systems use lower-power access points optimized for indoor environments.
- **Outdoor PCNs** serve large outdoor areas, such as ports, airports, mining operations, and utility sites. These deployments use higher-power equipment to cover expansive areas with fewer access points.
- Many organizations benefit from **hybrid approaches** that combine indoor and outdoor coverage. A manufacturing campus might use outdoor PCNs for yard operations and indoor systems for production floors, thereby supporting seamless connectivity across the entire facility.
- **Standalone PCNs** operate independently with their own core network infrastructure. **Integrated systems** work alongside existing network infrastructure, often sharing internet connectivity and management systems with Wi-Fi networks for simplified operations.



From Simple to Sophisticated: PCN Architecture Options

CBRS-Only Deployments

For many organizations, a CBRS-only architecture provides the perfect balance of performance and simplicity. Such deployments use CBRS spectrum exclusively, offering straightforward implementation with reliable coverage for most enterprise applications. CBRS-only systems are well-suited for warehouses, manufacturing facilities, and campus environments that require consistent, dedicated connectivity without complex integration requirements.

Enterprise Private 5G (EP5G) with Macro Integration

For organizations requiring the highest levels of performance and coverage, Enterprise Private 5G with Macro Integration represents the most sophisticated approach. These systems combine private 5G infrastructure with existing macro cellular networks, creating seamless connectivity that automatically hands off between private and public networks as users move between coverage areas.

EP5G with macro integration enables:

- **Seamless mobility** across private and public network boundaries.
- **Load balancing** between private and public networks during peak usage.
- **Redundancy**, ensuring connectivity even if one network experiences issues.
- **Advanced network slicing** for different applications and user groups.

5G Indoor Advanced Positioning

One of the most compelling enterprise 5G capabilities is indoor advanced positioning. Unlike GPS, which struggles inside buildings, 5G indoor positioning provides precise location tracking within facilities using the 5G network infrastructure itself. Our partner Ericsson describes this as a "game-changer for smart buildings and factories."

5G indoor positioning is well-suited for manufacturing floors, hospitals, warehouses, airports, and large retail facilities, where knowing the exact location of assets, equipment, or personnel is crucial.

Key benefits include:

- **Asset tracking** with sub-meter accuracy throughout indoor spaces.
- **Personnel safety monitoring** in hazardous environments.
- **Workflow optimization**, by providing data to understand movement patterns and bottlenecks.
- **Emergency response capabilities** with precise location data for first responders.
- **Inventory management** with real-time location data for high-value assets.

5G Indoor Advanced Positioning

PCNs with integrated edge computing capabilities represent an advanced architecture option that brings computing resources directly to the network edge for applications requiring ultra-low-latency. This approach enables on-premise data processing without relying on distant cloud services.

Potential applications include manufacturing automation, autonomous operations, and AR/VR applications where latency can impact performance. Organizations can process sensor data locally, run AI/ML inference for quality control, and enhance security by keeping sensitive data onsite.

Multi-Site/Multi-Location Deployments

For organizations with distributed operations, centrally managed PCN architectures provide unified network management across multiple facilities. This approach is particularly valuable for retail chains, healthcare systems, and multi-campus manufacturers who need consistent connectivity policies and centralized oversight.

Key benefits include:

- **Unified management** of network policies, security settings, and performance monitoring.
- **Consistent user experience** across all locations with standardized connectivity.
- **Simplified operations**, with centralized troubleshooting and maintenance.
- **Cost efficiency** through shared infrastructure and bulk purchasing.
- **Scalability** for adding new locations without redesigning network architecture.

Temporary/Mobile PCN Deployments

Portable PCN solutions address the growing need for reliable connectivity at temporary locations and in dynamic environments. These rapidly deployable systems serve events, construction sites, emergency response operations, and other scenarios where permanent infrastructure isn't feasible or necessary.

Applications include:

- **Event connectivity** for festivals, conferences, and sporting events where public networks become overwhelmed. (See, for example, our recent white paper on "Seamless Connectivity at the WM Phoenix Open.")
- **Construction sites** requiring reliable communication for safety systems and project coordination.
- **Emergency response,** providing first responders with dedicated, secure communications.
- **Disaster recovery,** rapidly restoring connectivity after infrastructure damage.
- **Seasonal operations,** supporting temporary facilities such as holiday pop-up stores or agricultural processing.

IoT-Focused Architectures

PCN deployments optimized for IoT device connectivity address the unique requirements of sensor networks and connected devices. These architectures can be designed to prioritize device density and efficient connectivity over high-speed data transmission.

Industry applications include:

- **Utilities** for smart grid monitoring and automated systems.
- **Agriculture** for soil monitoring, livestock tracking, and precision farming.
- **Smart cities** for environmental monitoring, traffic management, and infrastructure oversight.

Network Slicing Implementations

Network slicing creates isolated network segments on shared physical infrastructure. Network slicing enables a single PCN infrastructure to support multiple virtual networks, allowing organizations with diverse connectivity requirements to optimize performance for different applications and user groups.

Potential slice configurations include:

- **Critical operations** with prioritized connectivity for safety systems.
- **IoT devices** optimized for sensor and device connectivity to meet latency needs and other requirements.
- **Guest access,** providing internet connectivity with appropriate security boundaries.
- **Video surveillance** with dedicated resources for security camera networks.

Implementation Considerations

Spectrum Access

CBRS spectrum operates on a three-tier sharing model. Most enterprises can access this spectrum without lengthy licensing processes, though some coordination may be required in high-density areas.

Integration With Existing Infrastructure

PCNs complement rather than replace existing networks. The most successful deployments use PCNs for mission-critical operations while maintaining Wi-Fi for guest access and general connectivity needs. This hybrid approach maximizes the strengths of both technologies.

Device Compatibility

Modern smartphones and tablets support CBRS frequencies by default. Industrial IoT (IIoT) devices increasingly include CBRS capabilities, making integration straightforward.

Getting Started: Key Questions for Your Organization

Before implementing a PCN, consider:

- What are your current connectivity pain points?
- Which operations require guaranteed uptime?
- How large is your coverage area? Is it indoor, outdoor, or a combination of both?
- What security requirements do you have?
- How many devices need connectivity? For what purposes?

The Bottom Line

Private cellular networks aren't just about better connectivity – they're about business resilience. When your operations depend on real-time communication, seamless device connectivity, and secure data transmission, PCNs provide the reliability that public networks and Wi-Fi alone cannot guarantee.

The question isn't whether PCNs will become mainstream; it's whether your organization will lead or follow in adopting this transformative technology.

Ready to eliminate connectivity problems for good? *Discover how Sparro can design and deploy a private cellular network tailored to your enterprise needs. Visit gosparro.com to learn more about future-proofing your operations with private cellular technology.*