Why Cellular Access Is Critical for Warehouses:

Delivering Continuity, Efficiency, and Security Through a Layered Connectivity Strategy

Modern warehouse, distribution, and logistics operations rely on the ability of goods, data, people, and automated equipment to continuously flow. From the arrival of goods to order fulfillment, people, systems, and robots/automation depend on reliable, high performance wireless connectivity to move and track inventory. For this reason, cellular connectivity is no longer an IT luxury, but a mission critical necessity directly linked to productivity, employee safety, and business continuity.

Warehouses are uniquely difficult places to maintain wireless continuity. They are typically large, mostly metal buildings where the interior contents can be very dense and are constantly changing. Macro cellular signals fail to penetrate effectively, and traditional Wi-Fi lacks the range and predictability required to efficiently support automation. Here we look at the measurable business and operational improvements that result from implementing a layered cellular and IoT connectivity strategy using Nextivity DAS network infrastructure. The Nextivity solution for warehouses allows enterprises to DO More with DAS by providing a cost-effective means to maintain seamless wireless connectivity for people and systems.

Cellular Connectivity is a Competitive Advantage

35%
MORE PACKAGES PROCESSED
Faster order processing, real-time inventory updates, and automation reliability.

50min
PER SHIFT GAINED—NO STALLED DEVICES
Connectivity-related downtime costs enterprises over $300,000 per hour on average.

$1.1M
ANNUAL SAVINGS WITH PRIVATE 5G
Reduced downtime, maintenance, and labor inefficiency.

30%
FASTER OPERATIONS
AGVs and MRs operate faster on ultra-reliable cellular vs. Wi-Fi-only networks.

Sources:
ericsson.com, Five key trends shaping 5G investments in warehouses
globalstar.com, Private 5G in Warehouses: Solving the Connectivity Challenges Wi-Fi Can't in the Warehouse of Tomorrow

Warehouse Operations Need Hassle-Free Connectivity

Warehouses form the operational backbone of commerce. They are large, complex environments where uptime and efficiency directly drive profitability. Growing industry trends are reshaping how these facilities are managed:

- **Automation and Robotics** are scaling rapidly to address labor shortages and demand fluctuations
- **Data Driven Management** depends on real time visibility into inventory, equipment, and environmental conditions
- **Regulatory and Safety Expectations** increasingly view wireless connectivity as part of essential risk management infrastructure
- **Sustainability and Cost Control** push logistics operators to leverage intelligent sensors and predictive maintenance to reduce waste

The Connectivity Challenge

Warehouses are some of the most difficult radio frequency (RF) environments to manage. Steel racking, automated machinery, and high ceilings obstruct signals. Layouts change regularly as inventory and workflows evolve. Inconsistent signal coverage can lead to communication delays and operational risk.

Wi-Fi alone struggles to meet the needs of modern warehouse operations. It was designed for fixed or nomadic devices operating in a defined area - not for large scale mobility, low latency control, or consistency across millions of square feet. At the same time, macro cellular networks often cannot penetrate warehouse structures effectively, leaving gaps in coverage where staff and systems lose connectivity.

As one logistics manager summarized:

"Continuity, efficiency, and safety are no longer separate goals – they're three sides of the same connectivity problem."

The Cost of Coverage Gaps

15%
TIME LOST
Lost productivity through call and scan failures

15min
DELAYED
Slowed incident response time

30%
SLOW DOWN
Missed hand-offs, Wi-Fi interruptions

10%
WASTED
Equipment downtime and reduced efficiency

Justifying an Investment in Cellular Coverage: Improved Operations and Safety

To better understand the case for cellular in a warehouse setting, we'll start with an overview of the Nextivity approach.

DAS Connectivity Infrastructure: Unified Wireless Communications Platform

Warehouses require a layered connectivity architecture that delivers reliability for every use case while minimizing future complexity. Nextivity's Connectivity Core concept provides this foundation by combining:

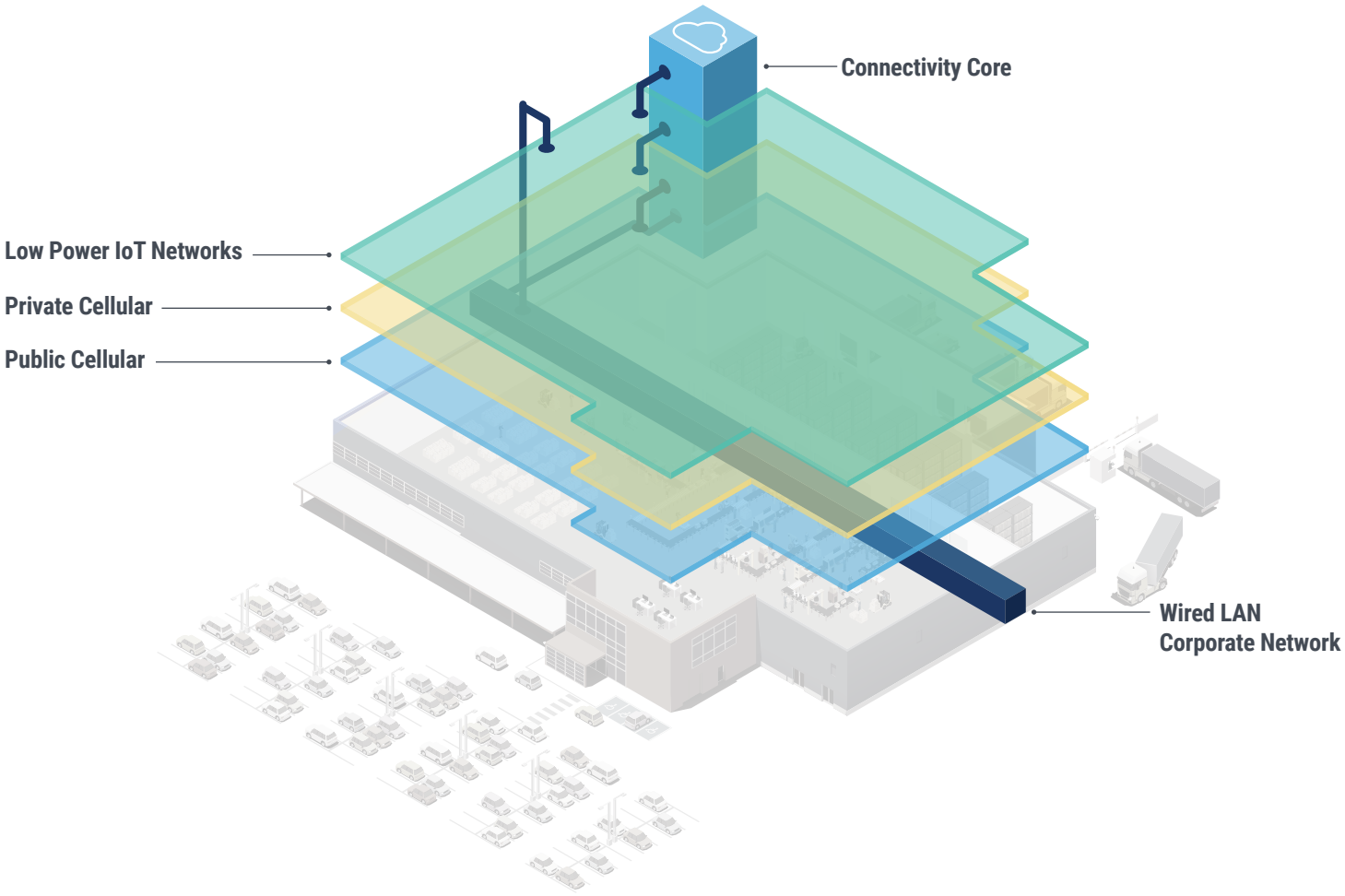
- **Public Cellular** – Connecting people and ensuring safety
- **Private Cellular (Private LTE / 5G)** – Connecting machines, robots, and automated systems
- **Low Power IoT Networks (LP IoT)** – Connecting assets, sensors, and environmental insight

Each layer builds upon the last, utilizing the proprietary features and functionality in the Nextivity CEL-FI QUATRA DAS as the heart of the connectivity core. This "design once, support everything" approach creates a single shared infrastructure that addresses current operational needs and is ready for automation, analytics, and AI integration.

Public cellular connects people.

Private cellular connects machines.

IoT connects insights to action.



Next, we'll build the case by examining each layer in the context of the benefits and value to warehouse operators.

Public Cellular: The Foundation for Continuity and Compliance

Public cellular coverage supports the daily rhythm of warehouse operations — from employee coordination and task assignment to contractor access and delivery management. Coverage gaps directly influence both productivity and safety.

Consider the following operational realities:

- Employees rely on smartphones and handheld scanners as primary work tools
- Supervisors and contractors must remain reachable anywhere on site
- Regulations similar to OSHA's workplace safety expectations require reliable communication for emergencies and lone worker protection

5–10 MINUTES OF LOST TIME

Warehouse lost time per mobile worker per shift.

Operational and Financial Impact

Warehouse studies show that lack of reliable coverage typically results in 5–10 minutes of lost time per mobile worker per shift. For a 200 person workforce operating two shifts, productivity recovery alone can exceed 20–25 hours of regained labor per day — effectively offsetting the cost of a Nextivity system specifically for public cellular connectivity within 12–18 months.

The U.S. Department of Labor estimates the cost of even a minor workplace injury (such as a sprain) at more than $30,000 in direct and $30,000 indirect costs. While connectivity cannot prevent incidents, reliable cellular coverage can speed response, reduce severity, and mitigate financial exposure.

The Value of Nextivity DAS: Cost-Effective Wireless Platform Deployment

Traditional DAS deployments are often too costly or complex for warehouse environments. Nextivity's QUATRA architecture is an intelligent dynamically adapting neutral host system supporting multiple network operators simultaneously, allowing quick deployment with minimal disruption and no carrier dependence.

By solving today's public cellular gaps with a scalable QUATRA DAS, the single infrastructure is in place for all future wireless functions - automation, IoT, and analytics.

Private Cellular: Reliable Automation at Scale

As automation density increases, reliance on Wi-Fi becomes a limiting factor. Interference, variable latency, and poor handoff performance disrupt automated guided vehicles (AGVs), autonomous mobile robots (AMRs), and conveyor systems. Private 5G or LTE provides the deterministic, low latency coverage required for mission critical operations.

12-24 MONTH PAYBACK PERIOD

Private 5G Operational Improvements

Operational Efficiencies Drive ROI

Private 5G and LTE deployments offer tangible benefits in warehouse environments including:

- Consistent, predictable network performance for mobile robots and PLC controlled systems
- Secure segmentation between automation and IT/guest traffic

When operating in a mission critical environment, downtime costs compound quickly. Industry analysis shows that eliminating connectivity related automation outages can raise throughput by 2–3 %, with total downtime reduced by up to 50 %. The increased productivity / reduced downtime translates to a payback period of 12-24 months for a Nextivity system specifically for private cellular.

The Value of Nextivity Private 5G or LTE: Scale as Needed

Nextivity allows public and private cellular layers to coexist on the same CEL-FI QUATRA DAS platform, minimizing incremental capital investments and simplifying system management. Certified Nextivity Partners can overlay private LTE/5G service zones in a phased deployment approach — starting small and scaling to meet business needs - always leveraging the same RF platform. Deploying the Nextivity Connectivity Core and overlaying the public cellular foundation with private cellular improves the individual payback times for each layer.

Scale for future deployments without redesigning the network.

Low-Power IoT: Turning Data into Action

Warehouses depend on continuous insight: where assets are, what conditions they're stored in, whether equipment is healthy, etc. Manual checks for such critical conditions as temperature, humidity, leaks, and vibration are slow, inconsistent, and labor intensive. A lack of visibility leads to more spoilage, increased downtime, and compliance risk.

Real-time Monitoring Cuts Costs and Improves Safety

- Environmental and equipment monitoring reduces spoilage and unplanned downtime by 15–20%
- Condition based maintenance decreases emergency repair costs by 10–15%
- Real time alerting enhances safety for lone workers and high traffic zones

Typical industry benchmarks show payback within 18–30 months, on a per system basis, for a solution deployed specifically for IoT.

When deployed as part of Nextivity's layered approach, the ROI and TCO improve even further: one unified infrastructure supports public cellular, private cellular and multiple IoT functions, lowering deployment cost and simplifying scalability.

The Value of Nextivity IoT Sensor Networks: Single Infrastructure

The same antenna and cabling backbone used for public and private cellular can host IoT sensor monitoring. This unified design means no rip and replace when new monitoring systems are added — a single infrastructure to enable an ever wider range of connected intelligence.

Nextivity's "Do More with DAS" philosophy reduces complexity over the life of the system. By designing once to support public cellular, private 5G, and IoT, warehouse operators benefit from:

- Faster deployment and lower installation impact
- Reduced lifecycle cost through shared infrastructure
- Simplified expansion when new technologies are added
- Improved ROI versus maintaining three separate networks

This approach typically improves cost efficiency and payback period by 20–50 % compared to traditional standalone systems.

GOAL ACHIEVED:
Design Once, Support Everything

Case Study: Robust 5G Private Network Improves the Bottom Line

In a recent warehouse project analysis, a fleet of 11 autonomous mobile robots (AMRs) were monitored over an 8-week period. Some were connected to Wi-Fi and some to a Private 5G network to compare performance.

- 7 private 5G connected AMRs
- 4 Wi-Fi connected AMRs

The customer was experiencing frequent lost communication and bottlenecks under Wi-Fi based AMR operation - suffering high labor costs and losing operational efficiency Over this analysis period, those AMRs connected over private 5G experienced near zero loss of communication. The customer achieved a positive ROI on the Nextivity Private 5G deployment within months purely through productivity improvements and reduced labor waste.

	Number of communications without AMR location data	Time for missing location data	Distance without data reporting[1)]	Number of bottlenecks[2)]
Private 5G	**1 time**	**1 sec**	**0.7 m**	**0**
Wi-Fi	**1,055 times**	**6,356 sec**	**4,449 m**	**29**

Table 1 – Operational Error Comparison
NOTE: 1) AMR Speed : 0.7m / Sec
2) Predictive bottlenecks based on AMR route, crossing point, moving distance without location data

This case demonstrates how automation reliability translates directly into financial value — and how the Nextivity layered design accelerates payback.

Summary of Financial Impact

Implementing a layered wireless strategy improves ROI (vs. multiple single-purpose network deployments)			
Connectivity Layer	**Business Impact**	**Payback Months**	**Nextivity Advantage**
Public Cellular Connecting People	Workforce efficiency, safety, incident response	**12–18**	Neutral host deployment; immediate operational benefits
Private Cellular Connecting machines	Automation reliability, reduced downtime	**12–24**	Shared backbone; deterministic performance without redesign
Low Power IoT Connecting insight to action	Insight, compliance, and predictive maintenance	**12-30**	Same infrastructure; lower incremental cost, faster scaling

Industry ROI data are per system averages. When deployed together under a Nextivity layered infrastructure that supports all three systems, ROI improves as total cost of ownership (TCO) measurably reduces.

Compounding Value Over Time

Each connectivity layer delivers standalone return — but true value emerges when they work together. Shared RF infrastructure creates compounding ROI through incremental capability, reduced maintenance, and improved operational control.

- **Immediate Returns:** Workforce mobility, safety, and communications continuity
- **Near-Term Returns:** Improved automation uptime and throughput
- **Long Term Returns:** Predictive insight, data driven maintenance, and asset protection

Every stage builds on the same system — a continuous path from installation to digital transformation.

Conclusion

Reliable wireless connectivity inside warehouses is no longer optional. It is fundamental to communication, safety, productivity, and automation efficiency — all which affect a facility's profitability and reputation.

By adopting a layered wireless strategy built on a single, future ready infrastructure, warehouse operators can improve ROI, reduce operational risk, and prepare for the next generation of supply chain automation.

Nextivity's CEL-FI QUATRA DAS Connectivity Core allows organizations to design once, expand later, and always Do More with DAS.

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