XCOM RAN™ by Globalstar

EBOOK

Next Generation Warehousing and Logistics: Resilient Connectivity for AI-driven Automation

The Rise of Physical AI for Advanced Automation

Warehousing and logistics operations are under unprecedented pressure. The explosive growth of e-commerce, accelerated delivery expectations, and increasingly complex omnichannel fulfillment models have forced operators to rethink how goods are stored, moved, and tracked. Labor shortages, rising wage pressures, and the need for greater efficiency mean that traditional processes are no longer enough to keep pace with demand.

Against this backdrop, robotics has emerged as a critical tool in transforming warehouses and distribution networks. Autonomous mobile robots (AMRs), automated guided vehicles (AGVs), robotic picking systems, and automated sortation lines are no longer futuristic concepts; they are becoming mainstream solutions. These systems deliver faster order turnaround, improved accuracy, and optimized inventory management while allowing human workers to focus on higher-value tasks.

What is taking this shift to the next level is the convergence of powerful enabling technologies. Advances in machine vision, physical AI, and edge computing have unlocked new levels of robotic intelligence, allowing machines to navigate dynamic environments, adapt in real time, and work safely alongside people. At the same time, the network infrastructure that underpins these systems is evolving. Traditional Wi-Fi, often plagued by interference and handoff issues, cannot support dense fleets of connected devices with low latency requirements. Instead, organizations are turning to next-generation private wireless networking solutions designed for high reliability, seamless coverage, and real-time performance.

In short, the warehousing and logistics market is reaching a tipping point where robotics is not only practical but essential. The key to unlocking its full value lies in pairing these technologies with resilient, future-ready wireless connectivity.

Common Use Cases for Robotics in Warehousing and Logistics

Robotics is no longer a futuristic concept on the warehouse floor, it's an operational necessity for organizations striving to meet rising demand and tighter delivery windows.

Here are some of the most common ways robotics is transforming warehousing and logistics operations today:

Automated Guided Vehicles (AGVs) and Autonomous Mobile Robots (AMRs)

These robots move goods seamlessly across large warehouse footprints, transporting pallets, totes, and individual items. They reduce labor strain while increasing throughput and reducing time-to-pick.

Automated Storage and Retrieval Systems (AS/RS)

High-density storage environments leverage robotic arms and shuttles to store and retrieve goods with precision. This reduces errors, minimizes wasted space, and speeds up order fulfillment.

Robotic Picking and Packing

AI-enabled robotic arms can identify, pick, sort, and pack items at high speeds, improving accuracy and freeing human workers for higher-value tasks.

Fleet and Inventory Visibility

Robots equipped with sensors provide constant feedback on inventory levels and asset positions, ensuring real-time data for decision-making and reducing lost or misallocated items.

Loading and Unloading Automation

Robotics streamlines container loading/unloading operations, improving efficiency at docks and reducing truck turnaround times.

In warehousing and logistics, these robotics use cases are only as powerful as the network that supports them. High data volumes from fleets of robots demand resilient, low-latency connectivity that keeps pace with modern supply chain speed.

Why Robotics Needs Resilient Networks

Modern robotics has transformed warehouses, logistics hubs, industrial plants, and factory floors into highly automated ecosystems. But these machines, whether they are autonomous mobile robots (AMRs), automated guided vehicles (AGVs), robotic arms, or inspection drones, are only as effective as the networks that drive them. A resilient network isn't just a convenience; it's the backbone that keeps automation running with precision.

Robotics thrives on data. Every movement, sensor reading, and command is transmitted in real time to ensure that robots avoid collisions, stay on schedule, and adapt dynamically to changes in their environment. For example, an AGV in a warehouse may need to reroute instantly if a pallet blocks its path, while an AI-enabled robotic arm in a manufacturing plant may require split-second updates to keep pace with conveyor lines. If a network drops or slows down, operations grind to a halt, creating bottlenecks and costly downtime.

Resilient wireless networks also enable scalability. As organizations deploy more robots across larger or more complex facilities, their communication needs increase exponentially. A network must maintain low latency, high throughput, and interference resistance, even when supporting hundreds, or thousands, of devices simultaneously. This level of robustness allows organizations to deploy robotics confidently, knowing that performance will not degrade as demand grows.

Security is another critical layer. Robotics often handles sensitive operational data – blueprints, production schedules, inventory records – so the network must safeguard this information from unauthorized access or interference. A resilient network is built with strong encryption, precise segmentation, and the ability to isolate traffic for specific use cases, preventing disruption and ensuring compliance.

Ultimately, robotics delivers on its promise of speed, precision, and cost savings only when its wireless connectivity network matches that same standard of reliability and intelligence. A resilient network becomes the invisible engine behind higher productivity, improved safety, and optimized workflows.

What Stands in the Way: Warehousing and Logistics Environments

Warehousing and logistics environments present unique wireless connectivity challenges that can limit the effectiveness of robotics if not addressed. These facilities are often sprawling, with high ceilings, metal racks, dense shelving, constantly changing layouts, and often dry or cold storage. Every obstacle, whether a stack of pallets or a moving forklift, can cause interference or block signals. Wi-Fi networks, in particular, struggle with environmental interference in this setting, creating dead zones that lead to unreliable, inconsistent connectivity.

Another challenge is the sheer density of devices. Warehouses now host fleets of AMRs, handheld scanners, RFID readers, and sensors, all competing for bandwidth. Legacy networks weren't designed to handle this level of traffic, resulting in unpredictable latency and dropped connections. For robotics, even a split-second delay can lead to errors (missed scans, routing conflicts, or unnecessary stops) that slow down fulfillment.

Mobility adds another layer of complexity. Robots and vehicles traverse long distances at varying speeds, moving between indoor and outdoor areas, and across loading docks where coverage zones overlap. Traditional Wi-Fi often forces connected devices to attach to the nearest access point, resulting in multiple hand-offs, causing interruptions that degrade performance. For time-critical operations like order fulfillment or last-mile staging, those interruptions add up to real costs.

Finally, logistics facilities must constantly evolve to keep pace with customer demands. Seasonal spikes or new product lines often require rapid reconfiguration of floor plans and workflows. Networks that demand intensive re-planning and manual tuning can't keep up, leaving robotics unable to operate at their full potential.

The Rising Demand for Private 5G Networks

Across industries, a silent transformation is underway: the migration from public, best-effort connectivity to dedicated private networking. Organizations in warehousing, logistics, manufacturing, and beyond are asking more of their wireless networks than ever before. Automation, AI-driven analytics, and real-time visibility into assets and workflows have become cornerstones of operational efficiency. But these technologies only deliver when the underlying network can meet strict performance, security, and scalability requirements.

This is why private 5G networks, wireless systems that an enterprise owns or controls within its own footprint, are seeing explosive growth. Unlike public cellular networks, which are built for mass consumer use, private networks are tuned specifically for the needs of a facility, an enterprise campus, or even an entire supply chain. They provide predictable performance, tight security, and the ability to scale without competing with outside users.

Meeting New Needs

Private 5G networks are gaining traction because they address key pain points that traditional public cellular networks or legacy Wi-Fi systems simply can't:

Low Latency and High Reliability

Automation systems and robotics need instant, uninterrupted communications. A private wireless network removes the variability that comes with using unlicensed spectrum.

Dedicated Capacity

When a facility runs on its own private 5G network, bandwidth can be allocated based on operational priorities. High-throughput video streams, edge AI applications, and massive device fleets no longer fight for airtime.

Security and Control

With sensitive operational data flowing constantly, organizations need airtight control over who accesses their network and how. A private network enables segmentation, encryption, and strict governance.

These needs are not niche. From warehouses fulfilling orders in minutes to real time monitoring and control on a production line, reliable connectivity is becoming mission-critical.

XCOM RAN Private 5G: Driving Resilient Networks for Warehousing and Logistics

As warehouses and logistics hubs evolve into hyper-automated, AI-driven environments, the foundation that keeps everything moving isn't forklifts or conveyors; it's robust wireless connectivity. First generation private 4G/5G solutions have been on the market for over a decade, and were able to meet the early automation needs in the warehousing industry.

As automation solutions become more sophisticated, and as physical AI rapidly becomes the standard in warehousing, with over 90% of facilities using AI or advanced automation for tasks like robotic picking, inventory management, and autonomous navigation, a new approach to private 5G was needed to address the densest industrial environments.

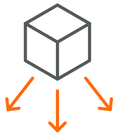
This is where XCOM RAN by Globalstar comes in.XCOM RAN is the next generation in private 5G – engineered from the ground up to deliver resilient, high-performance connectivity in RF-dense environments like massive distribution centers or sprawling logistics yards. Architected for scale, capacity and coverage using O-RAN design principles, XCOM RAN creates a single Supercell environment. Multiple radios work together as one cohesive cell, eliminating mobility handoffs and maintaining uninterrupted connections as equipment and people move through the warehouse and yard. The XCOM RAN private 5G solution provides the following benefits:

Unprecedented Performance

XCOM RAN delivers unprecedented performance by taking a new approach to private 5G, increasing capacity by 4x over current private 5G offerings for flawless connectivity in the densest automation environments.

Dedicated Spectrum

XCOM RAN runs on private 5G shared spectrum allocated around the world, and it can also uniquely leverage Globalstar's licensed Band n53 as a dedicated band for worry-free private 5G deployments.



Ease of Deployment/Management

XCOM RAN Supercell architecture reduces the need for site surveys and RF network design, for a private 5G solution that deploys quickly, is easy to manage, and provides full capacity and coverage in warehousing and logistics environments.

The result is a next-generation private 5G network that cost-effectively delivers improved productivity and operational efficiency for mission-critical warehouse automation programs. The result is optimized workflows, better asset visibility, and a wireless network that scales as you scale. Whether deploying dozens of AMRs in a single warehouse or connecting a fleet of unmanned forklifts across multiple fulfillment sites, XCOM RAN provides the bandwidth, low latency, and resilience needed in today's modern warehouse.

Key Benefits of XCOM RAN Private 5G in Warehousing and Logistics

- **Seamless coverage** with no mobility handoffs, even in massive facilities
- **Ultralow latency and high throughput** for real-time robot control and AI analytics
- **Software-defined updates** for future-proof scalability and features
- **Reduced infrastructure overhead** with fewer radios needed for full coverage
- **Enhanced interference mitigation** to maintain performance in RF-dense areas

Tap Into the Full Potential of Your Network

Robotics, automation, and mission-critical applications demand more than a basic private 5G network. To truly scale, streamline operations, and stay competitive, you need a solution designed to handle high-density environments, heavy data loads, and zero-downtime requirements. XCOM RAN delivers with the next generation in private 5G.

Private Wireless Reimagined

XCOM RAN™ by Globalstar

Ready to transform your business?

Contact our team of experts to learn how XCOM RAN can support your automation journey.

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