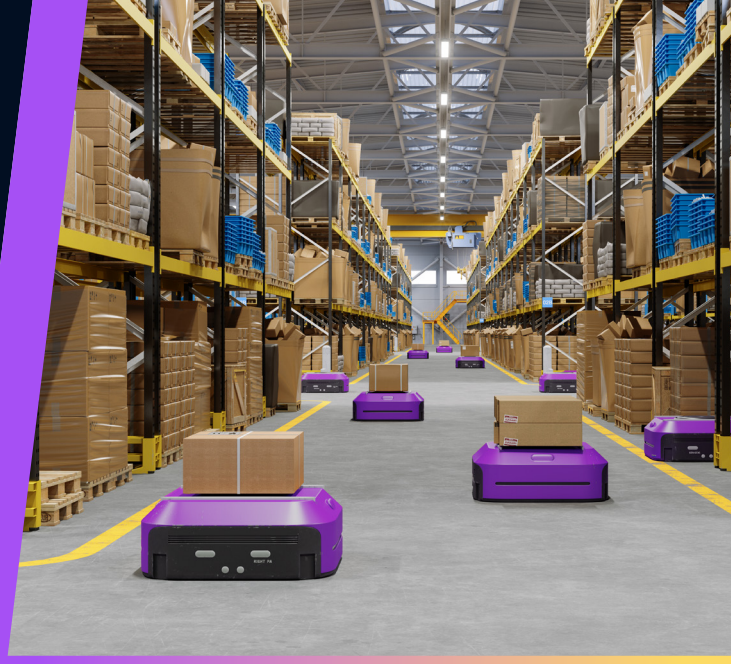
Belden

Mobile asset connectivity

Solution Brief



As orders keep rising, labor remains in short supply and delays continue to impact revenue and loyalty, warehouses aren't just running out of time to meet demand — they're running out of hands and usable space to get work done.

Being able to get work done faster, safer and without disruption can be your competitive advantage. Orders leave the warehouse faster, customer satisfaction rises and errors are minimized.

Mobile asset connectivity unlocks high-speed operations

Using cellular or Wi-Fi technology, it links a warehouse's mobile devices and systems to the critical data, control systems and people required to maintain peak productivity.

These assets can include:

- AGVs 
- AMRs 
- Autonomous forklifts 
- HMIs 
- Tablets 
- Wearables 

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Challenges that put wireless performance at risk

In a warehouse full of moving parts, maintaining seamless connectivity is no small task. Poor planning can cause coverage gaps, overloaded access points and performance slowdowns that disrupt safety and efficiency.

These challenges can take many forms:

- **Roaming delays:** Delayed transitions between wireless access points cause assets to stall or fail.
- **Coverage gaps:** Obstacles cause dropouts as assets struggle to maintain connections to wireless signals in dead zones.
- **Interference:** Wireless signals emitted from other equipment or networks interfere with mobile devices and networks and lead to slow response times.
- **Integration with control systems:** Poor bridging makes it difficult for mobile assets to connect to control systems, which can cause process errors, missed tasks and the need for manual intervention.
- **Interface with existing networks:** Incorrect configuration causes compatibility and security issues, making it difficult for mobile assets to link to networks.

Mobile asset connectivity

The foundation for mobile asset connectivity is built on ultra-reliable wireless networks that offer low-latency, high-throughput and scalable connectivity. Through cellular or industrial Wi-Fi, Belden's complete connection solutions unifies devices, people and protocols to enable:

- **Uninterrupted data flow**
- **Continuous operations**
- **Real-time visibility into assets and inventory**
- **Secure connectivity to guard against human error**

Belden enables networks that are built to support industrial mobility and engineered to handle the demands of your busy warehouses.

3 steps to wireless implementation

Our projects follow a clear plan to connect your business goals to technical execution. By creating an implementation roadmap together, we guide you through every stage of your project, from mapping operational needs to designing robust infrastructure and sustaining performance over time.

Align the network design with operational KPIs — STEP 1

Belden begins by mapping how your workflows progress and interact from the application to the network. Translating KPIs into network specs, we define the outcomes you expect in terms of metrics like uptime, cycle time and productivity. From there, we design a network that empowers your operation to achieve those targets.

For example:

- **Real-time visibility →** low latency + minimal roaming delay
- **24/7 uptime →** resilient coverage + interference mitigation
- **Fast cycle times →** high throughput + seamless handoffs

This prevents costly disconnects between your warehouse automation systems and what your network can actually sustain.

Design for success with infrastructure and device integration — STEP 2

Reliable mobile asset connectivity depends on seamless integration, from the wireless network backbone to every device on the floor. We ensure successful integration in three ways.

- **Conducting a wireless assessment**
  First, we conduct thorough site surveys that involve wireless scans, heatmaps and interference mapping. This identifies weak spots, coverage gaps and possible sources of disruption. The results serve as our reference point for designing a network that scales without sacrificing reliability.

- **Designing the infrastructure**
  Next, we help you choose network topologies, access points and antennas engineered for warehouse environments and to overcome coverage barriers like racking and metal obstructions.

- **Integrating and securing devices**
  To protect operations and data, we make sure every device on your floor, including HMIs, tablets and wearables, remains securely connected and easy to manage as needs change. By connecting each device to the wireless network and supporting industrial control protocols like PROFINET and EtherNet/IP, we enable real-time performance without interrupting workflows. From there, we can enhance cybersecurity by deploying a network access control supervisor to actively manage who and what gains access to the network.

Implement and sustain by delivering on SLAs

STEP 3

Belden's services don't begin and end at installation. We're here every step of the way to make sure your wireless network delivers reliable, consistent performance and supports critical automation by:

- Validating network design before and during deployment
- Confirming coverage, device compatibility and system performance
- Training your team on network best practices and wireless management
- Providing details on network configuration, coverage, integration and troubleshooting guides
- Ensuring that your warehouse's wireless performance meets or exceeds KPIs

Customer success story

While a fleet of AGVs and AMRs empowered this warehouse to achieve **new speed and safety milestones**, unreliable wireless performance was threatening to stall progress and growth.

Faced with **strict uptime targets** and **costly setbacks** when downtime occurred, it needed a way to ensure wireless connectivity and turn risks into gains.

Belden stepped in as a strategic partner, conducting a network assessment before implementing targeted design and deployment improvements. By designing a tailored, industrial-grade wireless backbone, Belden helped the warehouse achieve **high availability** and **fast response** so their automation investments consistently meet performance targets.

Your dedicated global warehousing & logistics team

Belden is more than a solutions provider - we're your trusted advisor when it comes to unlocking new possibilities.

Our global team of industry experts works closely with you to design a network infrastructure that aligns with your unique goals, whether you're upgrading your existing warehouse or building a new one.

We don't believe in one-size-fits-all. We deliver scalable, secure and future-ready solutions tailored to your needs.

For more information about how Belden supports warehousing and logistics, contact us. We're available where and when you need us.

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Scalable network infrastructure

Solution Brief

As warehouse automation accelerates, facility operators face a critical challenge: ensuring their network infrastructure can scale seamlessly to support new automation investments while maintaining reliable performance.

Without proper planning, operators often invest heavily in automated systems—AGVs, robotic picking, smart inventory management—only to discover their existing network can't support the data demands these technologies require. A scalable network infrastructure ensures every automation investment enables seamless integration rather than creating new bottlenecks.

Scalable network infrastructure unlocks sustainable automation growth. Using industrial-grade technologies, it connects distributed assets and operations to enable real-time coordination, centralized management and consistent performance as businesses expand.

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Challenges that put automation success at risk

Poor planning can cause capacity bottlenecks, integration delays and performance degradation that disrupt operations and limit growth potential:

- **Capacity limitations:** Network architectures hit bandwidth limits during expansion, requiring complete redesign
- **Integration complexity:** Connecting new facilities or equipment becomes difficult with rigid designs
- **Performance inconsistency:** Maintaining reliable communication is difficult across distributed operations
- **Protocol conflicts:** Different automation systems struggle to coexist on incompatible networks
- **Cybersecurity gaps:** Expanding networks create vulnerabilities without proper security frameworks
- **Use case misalignment:** Discrepancies in use case priorities can lead to missed opportunities or inefficient operations

Scalable network infrastructure

Our solutions enable truly scalable network infrastructure designed for continuous growth, adaptability and use case attainment through:

- **Future-proof capacity planning** with modular, expandable architectures
- **Seamless multi-site coordination** via centralized management and monitoring of network systems
- **Consistent performance during expansion** through built-in redundancy and load balancing
- **Simplified integration processes** supporting diverse OT and IT protocols

Belden's complete connection solutions deliver unparalleled performance, security and operational efficiency across your automation operations, encompassing both industrial and enterprise level solutions.

3 steps to network infrastructure implementation

Our projects follow a clear plan to connect business goals to technical execution. By creating an implementation roadmap together, we guide you through every stage of your project, from mapping operational needs to designing robust infrastructure and sustaining performance over time.

Align network design with operational KPIs — STEP 1

We translate your productivity metrics, whether it's throughput targets, availability requirements or efficiency goals, into specific network specifications like bandwidth, latency and redundancy levels. Our infrastructure approach enables any current or future use case by unlocking your data's hidden potential before you even identify the perfect warehouse application

For example:

- **Multi-site coordination →** centralized management + monitoring
- **Increased automation →** modular architecture + plug-and-play integration
- **High availability →** redundant paths + automatic failover

Design for success with infrastructure and integration — STEP 2

Taking the KPIs from Step 1, we design a robust and secure network architecture that's built to last. We meticulously plan for capacity, modularity, and security to ensure your infrastructure supports your ambition, both now and in the future.

- **Network capacity assessment:**
  For brownfield projects, we analyze existing infrastructure identifying constraints and opportunities. For greenfield deployments, we design modular architecture supporting planned growth.
- **Modular infrastructure design:**
  We help you choose topologies, switches and expansion strategies engineered for industrial environments without requiring infrastructure replacement.
- **Secure scalable systems:**
  We implement segmentation, access control and cybersecurity frameworks supporting protocols like PROFINET, EtherNet/IP and Modbus TCP alongside IT standards.

Implement and sustain scalable performance

STEP 3

We ensure reliable, consistent performance throughout growth by:

- Validating scalable design before and during deployment
- Confirming capacity headroom and expansion readiness
- Training teams on network expansion best practices
- Providing configuration and troubleshooting documentation
- Ensuring performance meets scalability and compliance requirements

Customer success story

A conveyor system manufacturer needed to help its customer expand from one warehouse to five sites. The original network couldn't scale without complete replacement.

Belden conducted a comprehensive network assessment before implementing a modular, scalable design with built-in expansion capabilities and cybersecurity frameworks.

Results:

- Zero network-related delays
- 40% reduction in integration time and built-in capacity for future expansion without infrastructure changes

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