



# A roadmap to Enterprise Intelligence

**Rethinking distribution and logistics for the digital future**

# What is Enterprise Intelligence?

From autonomous mobile robots (AMRs) to real-time condition monitoring, digital technologies are reshaping the distribution and logistics industry. At the same time, rising costs are threatening to impact profits, and operators must tackle new regulations and new cyberthreats. Change—and new disruptors—are everywhere you look.

Digital transformation is essential to building a more efficient, more agile and more successful distribution and logistics organization. But it isn't enough. Leaders must embrace new ways of working and set out a strategy that brings together disconnected systems to create powerful, scalable platforms that help enable innovation and order-of-magnitude change.

Old ways of working simply aren't up to the challenges of today. They are too expensive, too inflexible and too hard to scale. The network is key to changing how transportation and logistics companies operate. It enables operators to leverage the latest technologies—including artificial intelligence (AI), machine learning (ML) and the Internet of Things (IoT)—to generate unprecedented insight and help make decision-making smarter and faster. We call this Enterprise Intelligence.

In distribution and logistics organizations, Enterprise Intelligence means tapping the vast quantities of data that often go unused to help improve routes and cut delivery times. It means having visibility of every shipment—not just where it is, but also what condition it's in. And it means using robotics to reduce processing times and alleviate the physical burden on staff.

Organizations that achieve Enterprise Intelligence can be more agile, more resilient to events beyond their control and ultimately more successful. The insight that Enterprise Intelligence gives these organizations will give them the confidence to act and the ability to deliver.

They'll be able to think like a startup while caring for all the things that enterprises need to worry about—like workforce shortages, regulatory change, shareholder returns and cybersecurity. They'll be able to go looking for innovation that will enable them to achieve amazing things such as improving turnaround times or increasing the number of deliveries per person—and they could capitalize on those ideas quickly.

In this paper, we look at the challenges facing distribution and logistics organizations and how achieving Enterprise Intelligence can help solve them.



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# Introduction

Logistics companies face many challenges. In addition to long-standing challenges such as improving accuracy, increasing efficiency and boosting productivity, operators must deal with new ones such as reducing environmental impact, achieving next-day/same-day service and tackling growing cybersecurity threats.

The volume of shipments is growing as consumers change buying behavior. But those changes are unpredictable, and consumer expectations are growing. Consumers expect visibility and control over their shipments, as well as fast delivery.

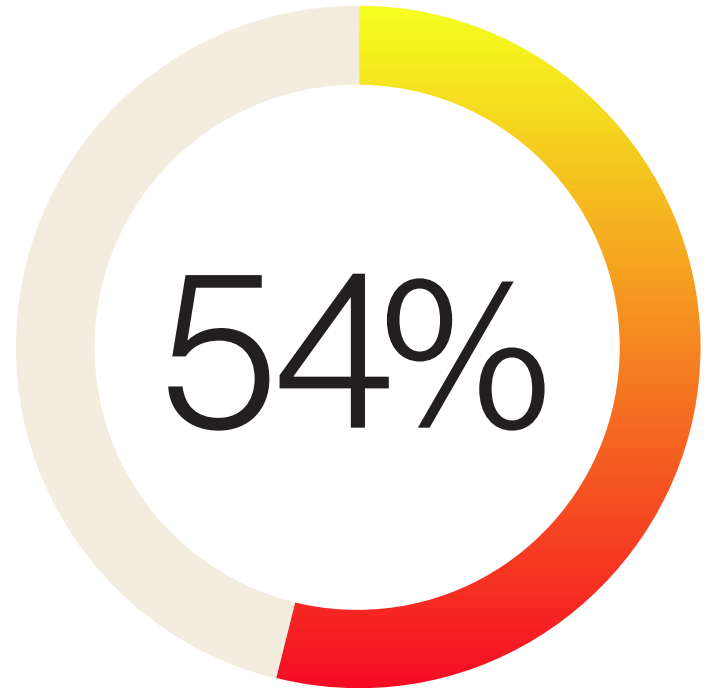
At the same time, supply-chain complexity is growing. Recent events have shown the fragility of many supply chains, and companies are looking to improve, while minimizing expenses.

There are also internal challenges to tackle. Distribution and logistics face ongoing labor shortages for drivers, warehouse staff and other roles. Plus, companies are looking to reduce their environmental impact.

Digital technology will be critical to addressing these challenges and others that lie ahead. Next-generation automation—enabled by sensors, automated guided vehicles (AGVs), robotics and AI—can help lift distribution center productivity and accuracy. Once in transit, visibility and traceability can be improved by IoT-enabled systems for fleet management, real-time tracking and condition monitoring. And blockchain technology can help enable granular, real-time, secure records for traceability.

Wherever organizations are in their digital maturity for logistics, they need to think about their future business requirements, potential process improvements and the infrastructure they will need to support them.

This white paper looks at the technologies that are transforming logistics today, those that are expected to emerge in the near future, and the data and communications network infrastructure elements that will be required to enable them.



**Approximately 54% of warehouse/distribution center tasks will have some level of automation by 2026, up from 31% in 2024.<sup>1</sup>**



# Faster, more efficient and more secure

Logistics organizations have always been under pressure to do things faster, more accurately and at lower cost. Digitalization has simply raised the bar. Automation has provided many opportunities to make improvements and create competitive advantage.

Whether or not logistics operators service consumers directly, their influence and heightened expectations are behind changing operational requirements and opportunities to innovate.

The opportunities can be grouped into four imperatives:



## Visibility

Improving visibility into the extended supply chain can help increase efficiency and open up new revenue opportunities. It can also help make operations more robust and able to take disruptions to fleet, route and delivery operations in stride.



## Efficiency

Increasing efficiency in operations—including ports, yards, distribution centers and in fleets—can boost productivity and help tackle labor shortages. It can also help reduce costs, environmental impact and waste.



## Security

Enhancing security, both physical and cyber, is essential. It can help reduce losses through shrinkage and keep staff safe. The knock-on benefits of improved traceability can contribute to achieving customer service and efficiency goals.



## Innovation

Creating a powerful, flexible platform can help embed innovation in the company's culture. This can generate iterative improvements that help sustain competitive advantage. And it can help scale successful innovations more quickly.

While every company has specific complications based on its industry competition and legacy systems, we see some common challenges they all face.

# The questions leaders are asking

Addressing the challenges and seizing new opportunities isn't straightforward, especially for large distribution and logistics companies with legacy infrastructure and processes. Many of these companies are also people-intensive, which adds an additional layer of complexity. Leaders are faced with many questions.

## How can risk and the cost of innovation be kept under control?

Distribution and logistics companies face big challenges and are sensitive to disruptions in their operations. Many operate 24/7 and cannot afford lengthy maintenance windows. Prioritizing investment and reducing the interruption associated with change are crucial.

Leaders must ask:

- How can we reduce the risk of project failure?
- How can we prioritize investments to make the best use of our money?
- Can capital expenditure (CAPEX) models help reduce the barriers to innovation?

## Where could increased use of robotics improve competitive advantage?

Autonomous mobile robots (AMRs) provide opportunities to improve the efficiency of distribution center operations, but where to invest is a complex decision that's dependent on many factors.

Leaders must ask:

- Where could AMRs help deliver a competitive advantage?
- Could robotic pick cells significantly improve material handling throughput?
- Could digital twins of hub operations help reduce unexpected downtime?



# 34%

**One-third of companies plan to replace their manual forklifts with automated forklifts by 2026.<sup>2</sup>**

## How can technology help tackle the labor shortage?

In the 2024 State of Smart Distribution Study: The Age of Efficiency and Resilience, conducted by Incisiv, 86% of distribution companies cited "labor shortages and workforce management" as a significant challenge.<sup>3</sup>

Leaders must ask:

- Where can we use automation to help mitigate the labor shortage?
- How can we make existing employees more engaged and productive?
- How can we bring new hires up to speed more quickly?

## Can supply chain visibility improve physical security and cybersecurity?

Manufacturers, third-party logistics (3PLs) partners and other players in the logistics value chain are conducting blockchain pilots to evaluate its effectiveness at strengthening supply chain traceability, securing movements and streamlining data exchange.

Leaders must ask:

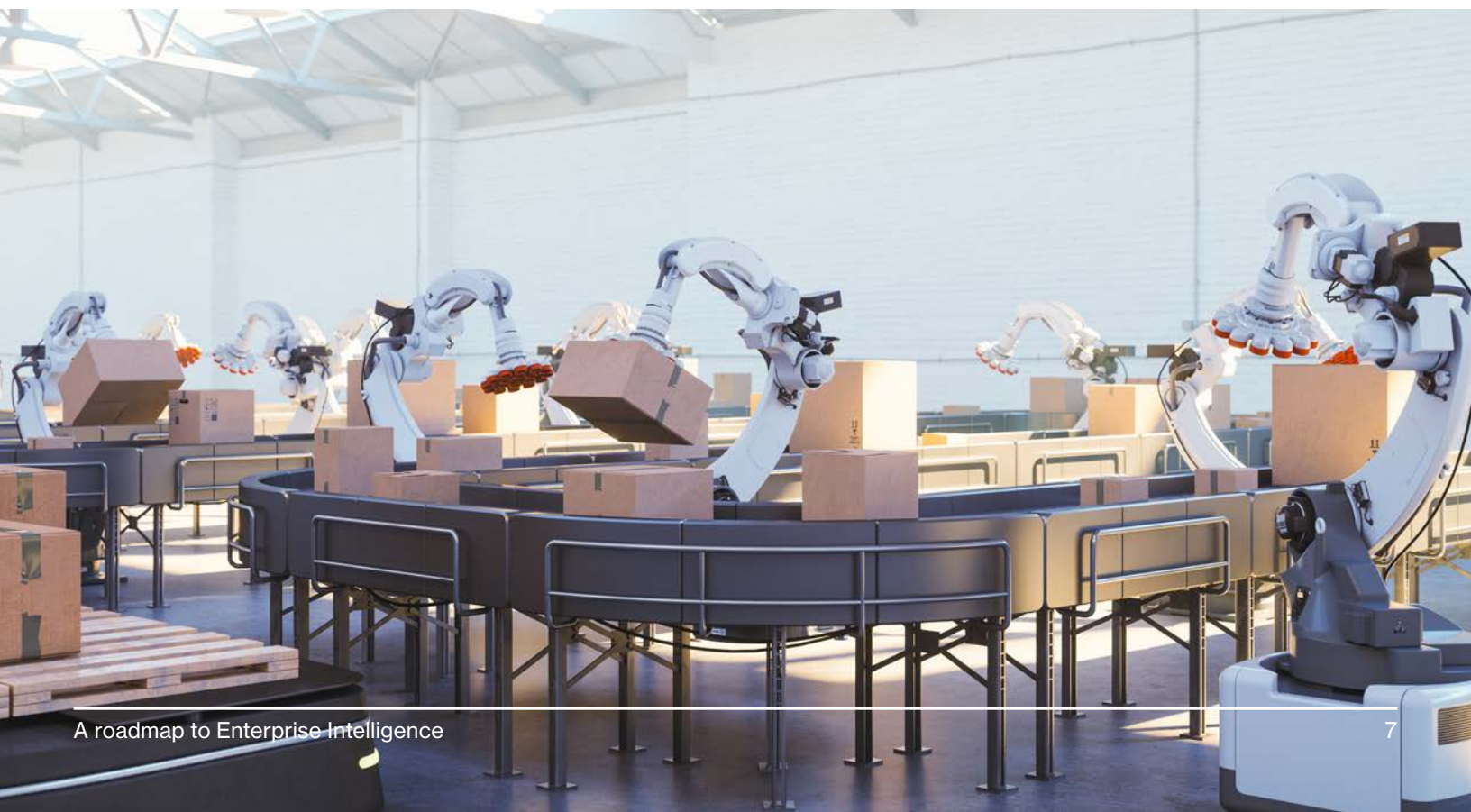
- Where would it make sense to implement real-time cargo and shipment tracking to help reduce shrinkage and diversion?
- Do we have the expertise required to secure the sensors and IoT devices that provide visibility from cybersecurity threats?
- How could intelligent video analytics help improve the physical safety of our workers?

## Is existing IT and network infrastructure adequate to support innovation?

Distribution and logistics companies already collect vast amounts of data, and that's growing with the adoption of item-level tracking, real-time locating systems (RTLS), IoT devices and more. Companies must ensure they have the proper infrastructure to store and process this data efficiently.

Leaders must ask:

- Is real-time visibility into shipment status and condition important to our customers?
- Could the low latency of private 5G networks and edge computing give us an edge?
- Do we have the skills and expertise to turn the data we collect into insight?



# A roadmap for transformation

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## Drone delivery

Optimize the last mile delivery for business-to-business-to-consumer (B2B2C) leveraging drones for lightweight packages.

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## Multi-modal transition support

Transfer goods safely and securely between sea, road, rail and air, including physical safety and digital tracking.

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## Network load monitoring and optimization

Capture, keep, process and protect vast amounts of data, enabling always-on solutions to uptime, availability and global accessibility.

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## Overall compliance automation

Navigate security and compliance requirements, and identify potential weaknesses and compliance gaps.

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## Loss prevention

Increase visibility and transparency with loss risk management from sensor telematics and localization technologies.

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## Augmented training and safety

Get advanced experiential training with near-real-time monitoring and alerting of process conditions to help prevent accidents and injuries.

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## Fleet management

Monitor vehicle condition to limit downtime from required maintenance, and identify route optimization and complete dynamic routing to help enable timely delivery and efficiency.

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## Network health monitoring

Identify and correct weak points before they turn into problems with device health monitoring and early failure detection.

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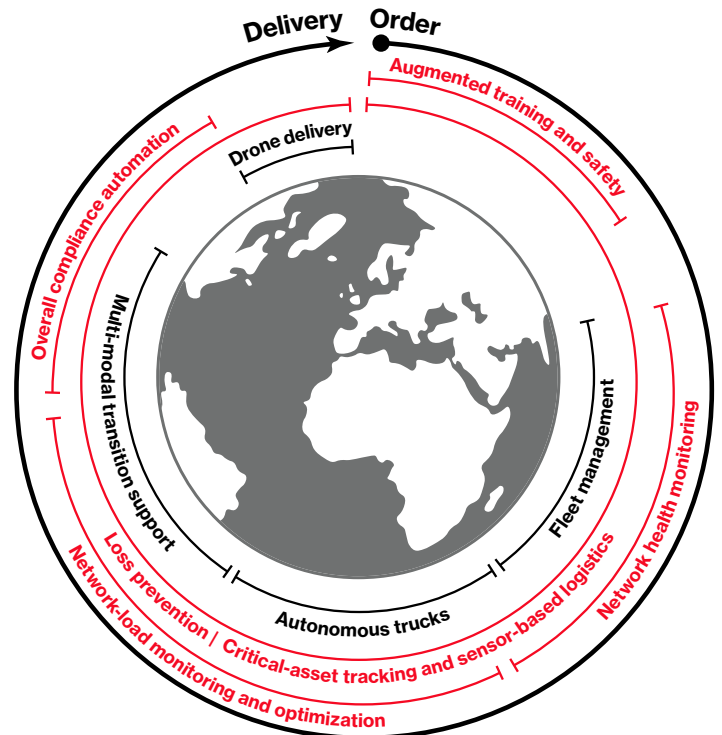


Figure 1: Verizon's vision for a secure, intelligent, connected logistics operation.

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## Critical asset tracking and sensor-based logistics

Track critical assets end to end using wireless IoT sensors to check that delivery and product condition matches requirements.

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## Autonomous trucks

Use geographical data to improve route efficiencies, and share data to continually update and improve map databases and algorithms.

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## Improving supply chain visibility

Gaining the level of visibility needed to respond proactively is difficult today because supply chains are complex. Complexity has increased because more enterprises are contributing goods and services, and e-commerce patterns often cause demand surges that require logistics companies to serve many locations simultaneously. This means there are more potential points of disruption and more variables to account for. Plus, ever-tighter delivery windows mean goods are moving faster, which makes it harder to align information flow with material flow. Despite all the effort already spent to improve supply chain visibility, 96% of distribution companies cite "supply chain disruptions" as a top 5 challenge.<sup>4</sup>



## Boosting internal efficiency

Much of what could be automated with existing technologies has already been automated, making incremental improvements more difficult. Yet, continued productivity gains are necessary to help offset the labor shortage and costs associated with making more frequent, lower-volume shipments and deliveries. To achieve improvements that truly move the needle for productivity gains and cost reduction, many organizations will need to redevelop their processes and augment them with new enabling technologies for new ways of working.

## Helping improve security and traceability across all operations

Security and traceability are separate things, but efforts to improve one can complement the other. The new twist to ongoing cyber and information security threats is the challenge of securing the many new digital devices used in logistics operations, including AMRs, cameras, sensors, in-vehicle systems and more. This represents an area where physical and digital security can converge. Cameras, condition sensors, automatic identification and data collection (AIDC), and other digital components can help improve the security of physical goods.

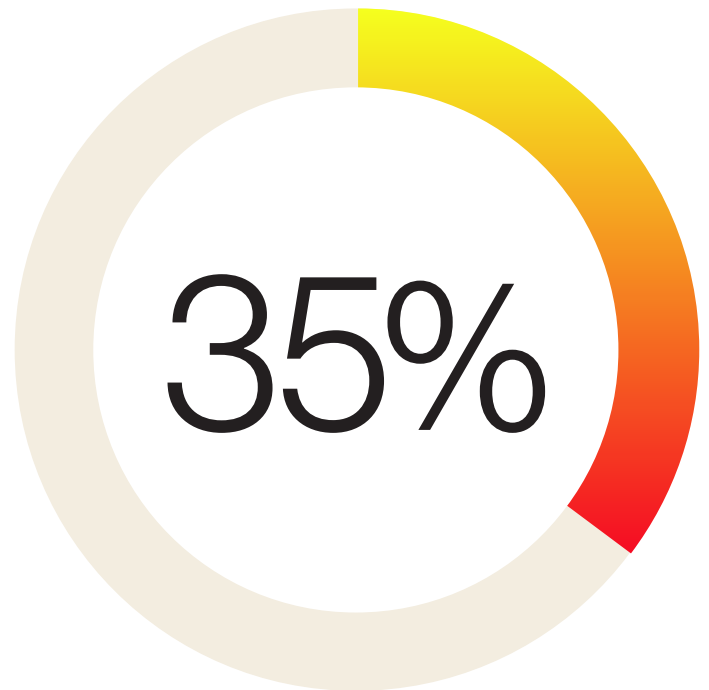
## Creating a platform for future growth and innovation

This requires developing an understanding of what's next to guide actions and investments that can be taken now. There are likely some technology-enabled processes that will be commonplace in 10 years that don't currently exist.

Without collaborating with peers and partners outside your immediate industry or sphere of operations, it is difficult to develop the perspective on what is coming next, what will be helpful and what is just hype.

For each market development, there are numerous related details and complications that must be planned for and solved. When considering how to prioritize and address all these requirements, organizations should ask: How can we future-ready our current improvement efforts so they can be leveraged to support future improvements?

Organizations have an opportunity to reshape their operations and set a higher bar for competition by embracing such use cases. Some can be accommodated with current communications and other infrastructure. Others require enhancements so new inputs can be captured and processed at the point of activity.



**In 2024, only 35% of distribution companies have deployed real-time inventory tracking.<sup>5</sup>**

## Applying cross-industry learnings

Transport and logistics organizations can learn from innovations in other industries—if they know where to look. The retail industry is advanced at making better use of the data gathered, turning it into insight that drives greater efficiency and new revenue opportunities. The financial services industry has embraced digital communication with clients—take mobile banking as an example. This has forced it to innovate in cybersecurity to help protect customers' data. And the health care industry is leading the way in rich remote monitoring applications.

Logistics companies should look outside their bubbles for innovations that could be applied to their operations.

# Setting the technology foundation

The planned deployment of new technologies indicates a strategic move toward automation, real-time data access and advanced analytics to meet the demands of improving operational efficiency. According to the 2024 State of Smart Distribution Study: The Age of Efficiency and Resilience conducted by Incisiv, distribution companies surveyed are planning to increase the use of key technologies. The chart below shows the current and planned deployment of key technologies of respondent companies.<sup>6</sup>

As companies expand the deployment of innovative technology in their distribution centers, many of these applications will rely on low-latency network connectivity to perform effectively.

Logistics operations face many challenges, including dealing with increased volatility in demand, servicing more locations, improving traceability and security, increasing efficiency, improving customer service levels and responsiveness, mitigating labor shortages and addressing growing competition. Whether you need to tackle all of these or just a few of them, you will need to prepare your systems, processes and people to support a more secure, intelligent and connected future.

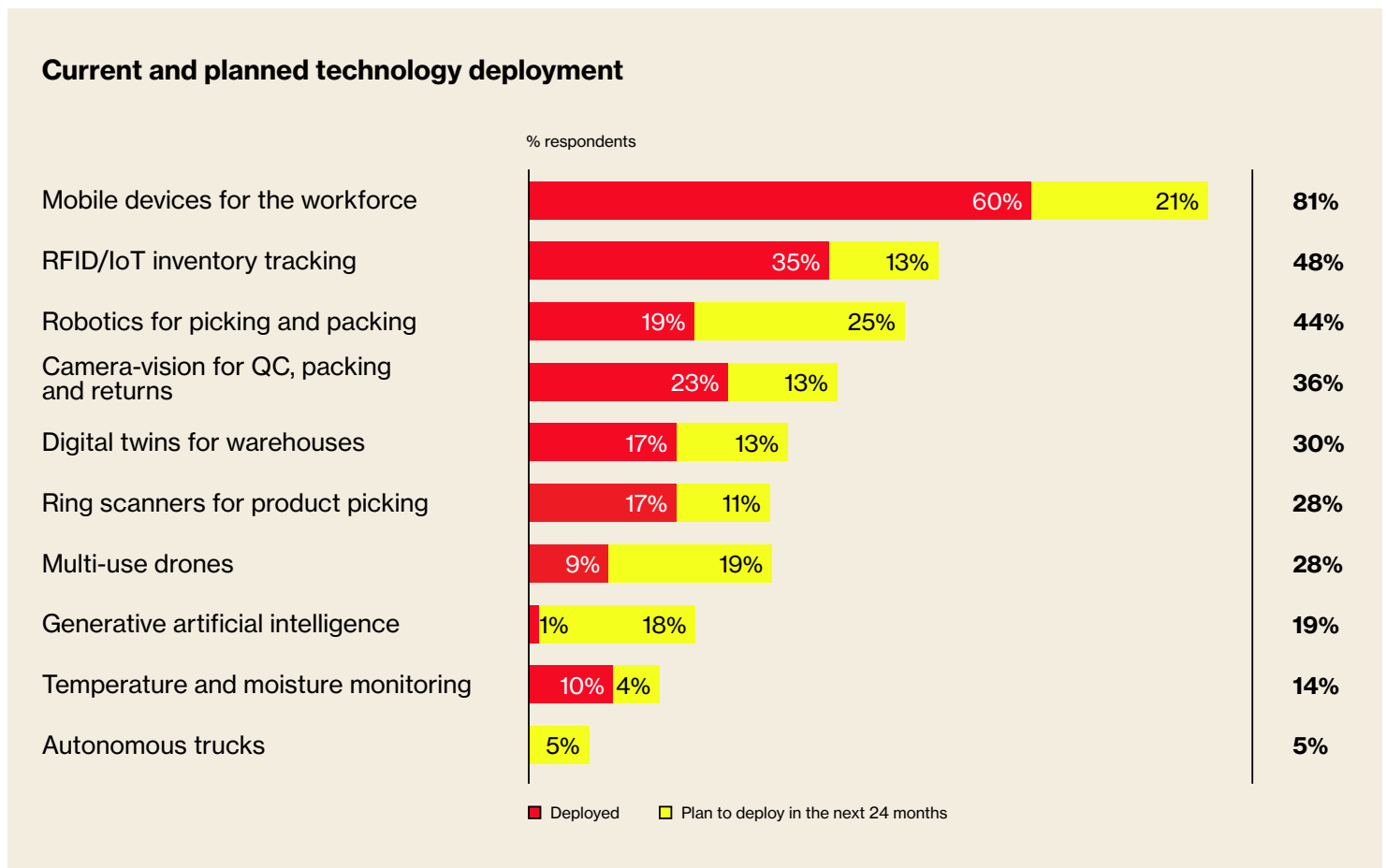


Figure 2: Existing and anticipated use of key technologies<sup>7</sup>

The enabling capabilities to overcome latency-related limitations include:

- Fast networks based on dense fiber and spectrum deployments
- Private 5G cellular network deployments that enable a massive increase in device density with enhanced security for converged operational technology (OT)/information technology (IT) networks
- Multi-access edge computing (MEC) that brings compute and storage resources closer to the end user, helping to reduce latency and enable faster visibility to the enterprise
- Edge security models such as secure access service edge (SASE) and Zero Trust Network Access (ZTNA) that enforce security inspection at the edge and help enable secure connectivity across the network

#### **Training and safety**

Help transform training (e.g., onboarding and safety) with augmented reality and help prevent accidents with near-real-time monitoring and alerting.

#### **Facilities**

Help reduce downtime and repair costs by enabling near-real-time monitoring of critical systems (e.g., HVAC, lighting) and predictive maintenance.

#### **Maintenance**

Help reduce unplanned downtime and maintenance costs by collecting data from equipment in near real time and applying AI/ML techniques to detect anomalies.

#### **Physical safety**

Help reduce accidents and losses by using video monitoring to monitor the perimeter, implement access control, manage air space and create virtual checkpoints.

#### **Material movement**

Help improve the efficiency of the storage and transportation of goods.

#### **Contact centers**

Help improve customer engagement and increase sales by using conversational AI to increase personalization and provide interactive services and recommendations.

#### **Fulfillment**

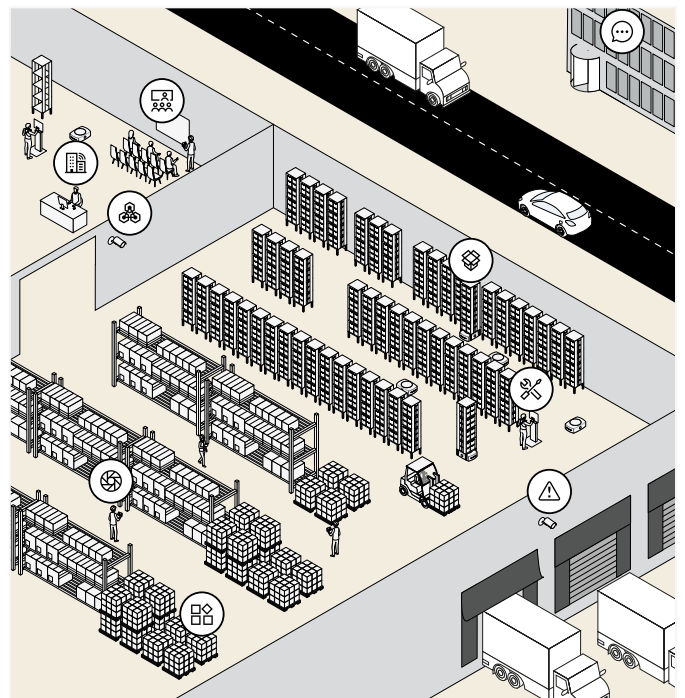
Automate tasks to help increase efficiency and reduce staffing requirements: Implement package sort stations, AGV swarms, robotic pick cells and automated scanning and sorting of both light and heavy packages.

#### **Repair support**

Help accelerate repair work with near-real-time access to expert training and guidance via augmented reality, and use “see what I see” glasses to engage expert support virtually.

#### **Loss prevention**

Help reduce losses by leveraging computer vision to generate alerts when assets are moved to unanticipated locations, by unauthorized people or at unexpected times.



**Figure 3:** Vision for secure, intelligent, connected future logistics operations

No single technology can solve every use case. That's why we believe that defining a path to embedded responsiveness in all technology layers is critically important. It is important to note that future infrastructure decisions won't come down to 4G versus 5G and legacy Wi-Fi versus Wi-Fi 6. These and other technologies will be complementary. For example, existing network technology will still work fine for a system that counts items on a moving conveyor. However, a low-latency, high-bandwidth network will be needed if an intelligent camera will be performing quality inspection on items moving on the conveyor.

The warehouse of the future will have a heterogeneous range of communications. Current IT and OT networks, legacy Wi-Fi, LTE, 5G and other technologies can coexist and interact in public and private networks. Each will be used according to process needs and environmental constraints. Enterprises, therefore, need network optionality that can be managed through a single provider to help reduce unnecessary network management, integration complexity and cost.

Such smart operations require both IoT sensors and actuators to boost performance. MEC infrastructure is needed to effectively orchestrate a high density of sensors, process the large volumes of data per sensor these systems demand and respond with ultra-low latency.

## Key definitions

### Edge computing

This is a network architectural model that brings technology resources (including compute and related infrastructure) closer to the end user and automated devices where the data is generated and consumed. It's a decentralized extension of cellular networks where the data is processed and stored at the edge and only certain workloads are transmitted to centralized networks (like the cloud).

### Private 5G networks




Because private 5G networks are enterprise-specific, they are segregated from public networks—cellular communication stays on premises—and can be configured to the organization's specific security and performance requirements. Private 5G networks can enhance organizational capabilities by providing high-bandwidth, low-latency coverage that can support scaled implementation of AI and machine learning, virtual and augmented devices, remote monitoring and other networked devices.

# Next steps

As operators embark on the road to digital transformation, one of the steps is to identify opportunities for transformation where early value can be unlocked. Verizon has developed a framework that helps our customers identify these opportunities in a simple, two-step approach. Step one is to identify the optimal connectivity technologies to support the desired use cases. Step two is to conduct a readiness assessment for folding those technologies into existing operations.

## Connectivity technology selection


Identifying the connectivity necessary to support key use cases should be the jumping-off point. Many connectivity options are available—such as Wi-Fi, 4G, 5G, MEC and others—and it's important to base decisions on quantifiable parameters that are relevant to the use case. Verizon's framework considers three key aspects:

- 
**Performance**  
 Technical requirements such as network bandwidth, latency, compute power and device density
- 
**Privacy and compliance**  
 Issues like data residency, data sovereignty, privacy and regulatory compliance
- 
**Availability**  
 Considerations such as availability of spectrum, cost and local regulatory constraints

These factors together lead to several choices for an optimal connectivity technology, including wired or wireless and public or private. The list of options can be further reduced by considering the operational cost of the transport and assessing the use of backhaul traffic.

## Deployment readiness evaluation

The next step is to perform a deployment readiness evaluation by analyzing what it should take to develop and deploy the use case. Key considerations are:

- 
**Capabilities**  
 A review of the internal platforms and systems that are available to support the use case; missing capabilities may be developed internally or sourced from a partner



## Device readiness

Identification of the readiness of existing devices intended to be included in the use cases; the need for costly replacement or retrofitting could inhibit deployment

The figure below shows how Verizon can help address these questions.

<b>Verizon's connected solutions</b>	<ul style="list-style-type: none"> <li>• What solutions are currently available?</li> <li>• How can they be connected and leveraged?</li> </ul>
<b>Verizon's enabling technologies and capabilities</b>	<ul style="list-style-type: none"> <li>• What technology enablers are essential to the use case?</li> <li>• Are internal platforms/systems capable of supporting these?</li> <li>• What new capabilities must be developed/outsourced?</li> <li>• Who are the key partners we will work with?</li> </ul>
<b>Verizon and third-party technology</b>	<p>Based on the connectivity technology choice:</p> <ul style="list-style-type: none"> <li>• What new hardware/network infrastructure will be required?</li> <li>• Will devices need to be upgraded?</li> </ul>

Figure 4: Readiness evaluation questions to investigate

# The partner you need

It's easy to say that you have extensive global industry experience, but how many providers can back it up? Our experience includes working with many of the most recognizable distribution and logistics organizations. We have helped them to develop and implement successful programs that are helping improve efficiency, increase automation and reduce costs.

With Verizon, organizations have a strategic partner. Our networks—which include America's most reliable 5G network<sup>8</sup> and one of the world's largest global Internet Protocol (IP) networks.

Verizon maintains the Vocabulary for Event Recording and Incident Sharing (VERIS) database and publishes many highly respected cybersecurity reports, including the annual Data Breach Investigations Report (DBIR). While many companies have visibility into the IP addresses of some bad actors, Verizon has visibility across its entire network of customers served. This enables us to design and secure systems from a wide variety of current and emerging threats. This capability is especially relevant when securing OT environments.

While Verizon's deep insight can be valuable, the future will undoubtedly bring changes that require even greater cybersecurity knowledge and measures. Emerging technologies challenge existing cybersecurity techniques. Quantum computing could break the encryption currently used by e-commerce and virtual private networks (VPNs). This could enable bad actors to decrypt vast data lakes collected over decades of clandestine operations, giving them critical insights, and, most worryingly, access to embedded systems that are still in operation today.

The race is on to develop quantum-safe algorithms and procedures before that happens. Verizon is trialing the use of next-generation cryptographic keys so that when quantum threats emerge in the real world, we will be more ready.

We're a world leader in cybersecurity, including preserving authorization boundaries, controlling cost, assuring predictable execution and managing supply chain risk. We understand how to apply network scanning, anomaly detection, segregation and other security techniques across OT and IT networks to improve protection and performance.

Our customers also benefit from the billions that we have invested in developing the platforms, technologies and solutions that organizations need. But our greatest strengths are our vision, our people and our proven ability to deliver.

The network can be a multiplier, increasing the value of your investments and expanding your capabilities. The combination of our advanced networks, cutting-edge solutions, and professional and managed services can connect systems across your enterprise to empower you to overcome business challenges. We can connect your ecosystem, bringing users and applications together.

We call the result Enterprise Intelligence. It can help you become more efficient, more agile, better prepared for unexpected challenges and ready to seize new opportunities.

Our platforms could help you achieve your goals. To find out more about our capabilities and experience that can help your organization achieve Enterprise Intelligence, visit our website:

**[verizon.com/enterpriseintelligence](https://www.verizon.com/enterpriseintelligence)**

1. "2024 State of Smart Distribution Study: The Age of Efficiency and Resilience," Incisiv, in partnership with Verizon, July 2024.

2. Ibid.

3. Ibid.

4. Ibid.

5. Ibid.

6. Ibid.

7. Ibid.

**8. Based on RootMetrics® State of 5G Report, United States, 1H 2024. Tested with best commercially available smartphones on three national mobile networks across all available network types. Your experiences may vary. RootMetrics rankings are not an endorsement of Verizon.**

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