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WHITE PAPER

# The first step on the path to end-to-end supply chain visibility

Explore how IoT is transforming supply chains with real-time visibility, intelligent shipment monitoring, and connected track-and-trace insights that improve operational performance and resilience

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## Executive summary

As digitization continues to radically transform the landscape for global supply chains, intelligent digital technologies are opening the way for true end-to-end supply chain visibility. The need has never been greater, as supply chain disruption has reached record levels. The optimum route to achieve effective, real-time visibility is a phased approach that begins with IoT-driven track and trace.

Recent research shows that limited end-to-end visibility remains one of the biggest barriers to effective supply chain disruption response and resilience.[1] Industry research continues to show that supply chain disruption remains a persistent operational challenge across global networks.[2]

Visibility, automation, and real-time orchestration remain top priorities for logistics providers as organizations work to improve resilience, delivery accuracy, and operational agility.[3]

Within visibility, supply chain track and trace is receiving increasing attention. New intelligent digital technologies—especially IoT, artificial intelligence (AI) and analytics—are enabling companies to monitor and manage their products as they move through the supply chain. Analysts continue to project strong investment growth in real-time supply chain visibility, IoT-enabled monitoring, and intelligent track-and-trace technologies.[4]

## The role of IoT in modern track and trace

Replace with - Today, tens of billions of connected IoT devices are generating real-time operational data across industries worldwide, with continued growth expected over the next several years.[5] For business, the emphasis for IoT investment has been within production and the supply chain. Research continues to show that organizations with integrated, connected supply chains outperform peers in agility, resilience, and operational efficiency.[6] And analysts continue to identify operational efficiency, process optimization, and supply chain visibility as leading drivers of IoT investment.[7]

This is particularly true within the supply chain, where the inflection point for IoT to enter mainstream technology has passed. Logistics providers increasingly view IoT, AI, and real-time data orchestration as foundational technologies for next-generation supply chain operations.[8]

This suggests that carriers see IoT reaching maturity with vehicles, pallets and individual products fitted with IoT devices. Whether simple RFID tags and labels or more sophisticated smart sensors and GPS-enabled devices, IoT provides a solid foundation to effectively track and authenticate products and shipments within the supply chain.

By adding IoT devices onto cargo and vehicles, organizations can capture, manage and augment IoT data to provide visibility across the supply chain with IoT-driven track and trace (See Figure 1).

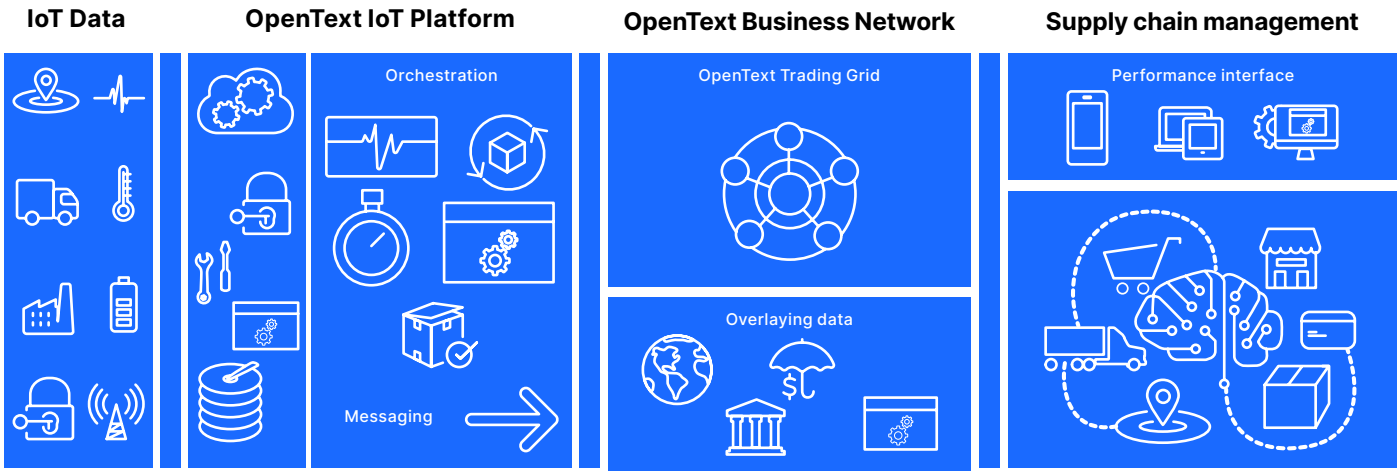


Figure 1: OpenText–Extending and enabling the digital supply chain

## The phased approach to supply chain track and trace maturity

Organizations have been working towards supply chain visibility for decades. The ability to monitor goods in transit and minimize supply chain disruption has major benefits in terms of cost and loss reduction, optimized inventory levels and faster customer delivery, as well as reducing risk, fraud and diversion.

As supply chains digitize, the ability to track products has improved. Initially, this meant electronic documentation exchange, such as POs, invoices and shipping notices, using a B2B integration platform like OpenText™ Trading Grid™. It also included B2B transaction monitoring and management to measure suppliers and customers against key performance indicators (KPIs) to identify the top and bottom performers and improve trading partner performance management.

The introduction of RFID and GPS technologies enabled supply chain tracking to become more effective, but there are many gaps in supply chain visibility from when a shipment is scanned leaving one location until it arrives at another.


The development of increasingly affordable and more intelligent IoT devices has allowed for the large-scale deployment of context-based solutions that can deliver the real-time, condition and environment monitoring of goods and vehicles in transit. IoT allows not just for the location of the goods to be constantly reviewed but also the condition or health of the cargo, the environment and the shipping asset performance.

In addition, supplementary information, such as weather, port and traffic conditions or the political climate, can augment IoT data, through the use of AI and analytics, to provide actionable insight to continually improve supply chain planning, security and performance.

However, there are two important considerations when deploying IoT-driven track and trace. First, not all companies need the sophistication of a track and trace solution with fully embedded AI and analytics capabilities. Organizations shipping robust, non-perishable goods may only need to know where the goods are and be able to plan for business continuity. This initial pervasive visibility of goods in the supply chain can be a stepping stone to further use cases.

Secondly, the more complex the digital transformation project, the more difficult it is to achieve success. Following a phased approach to introducing digital, IoT-driven track and trace allows an organization to benefit from its investments early while transitioning to more complex track and trace capabilities as the business dictates.

OpenText has developed a range of three IoT-driven track and trace solutions (See Figure 2) that allow organizations to build their digital visibility capabilities:

## Shipment Track

With the entry-level Shipment Track, companies can use IoT-driven track and trace to connect shipment and assets throughout the supply chain. All shipment and product movements can be monitored in real time. Data from sensors and other IoT devices can be augmented with other supply chain data, such as warehouse and transactional information, to provide more granular visibility.

## Shipment Monitor

Building upon Shipment Track, this solution delivers condition-based monitoring to supply chain operations. Every aspect affecting goods in transit can be monitored in real time, including temperature, humidity, location and product condition, so that immediate corrective action can be taken if an exception of aberrant conditions is reported. This provides much greater control of the shipment of perishable and high value goods with high levels of transparency and supply chain efficiency, while reducing the waste and damage of products in the supply chain.

## Shipment Insights

The most complex solution, Shipment Insights, combines IoT data management with AI and machine learning to bring end-to-end visibility and continuous improvement to all parts of the supply chain. Moving beyond simple track and trace, this holistic solution uses the captured data to apply predictive and prescriptive analytics to areas, such as supply chain planning, route optimization and predictive maintenance.

The three inter-related solutions have been designed to enable a smooth and effective transition to complete, end-to-end supply chain visibility.

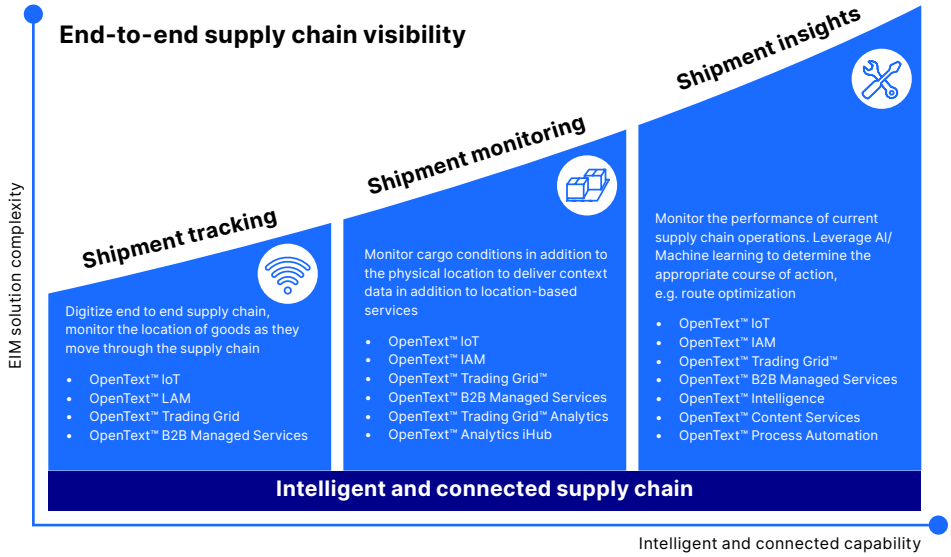


Figure 2: Three steps to IoT-driven track and trace maturity

## The importance of an identity-driven IoT platform

Any IoT solution is about much more than the IoT devices alone. It is a digital ecosystem that connects all actors on the solution. A central, identity-driven IoT platform is required to ensure that all IoT data flowing across the supply chain is trusted, reliable and accurate. (See Figure 3)

The IoT platform effectively manages the identities of the three key entities of the IoT network: connected people, connected systems and connected things.

### Connected people

The platform creates a single digital identity for every person in this IoT-enabled ecosystem—employees, suppliers, partners, carriers, 3PLs and customers—who needs access to the IoT network and the associated IoT-enabled products, assets and the permitted data streams from each based on their established role and purpose. Identities are quickly, often automatically, provisioned, delivered and managed, securely and at scale.

### Connected systems

The IoT platform enables secure information integration and sharing between disparate systems over the IoT network. The data can be collected from a wide range of sources, such as warehouse management systems (WMS) or transport management systems (TMS), and presented in the right format to securely connect IoT capabilities with enterprise and external systems.

### Connected things

With a wide range of IoT devices, such as smart sensors, tags and labels, each using a different set of standards and protocol, the platform provides secure support for an IoT device to connect and share information. It has to be agnostic of device type, communications protocol or data standard to enable legacy or retrofit deployments, while ensuring seamless future technology integration.

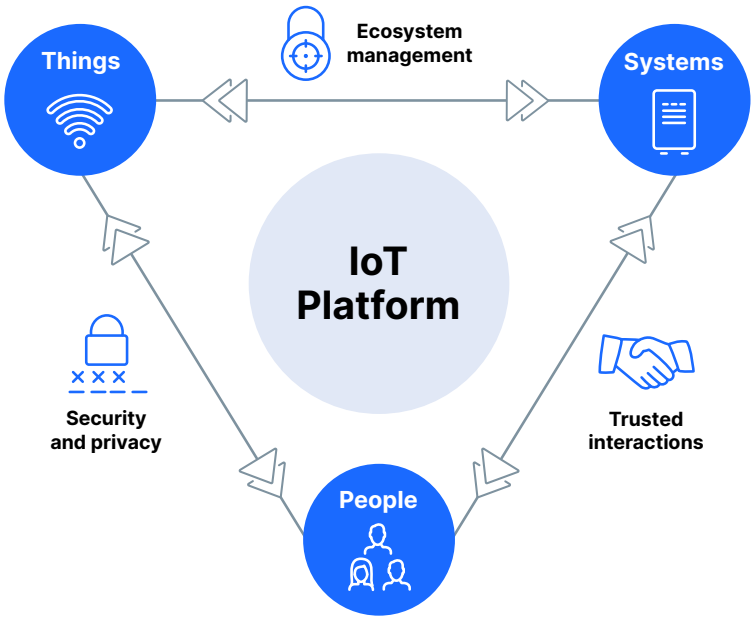


Figure 3: The identity-driven IoT platform: Connecting people, systems and things

The identity-driven IoT platform manages all identities and the complex set of relationships between the various entities, as well as establishing and enforcing the access control and permissions necessary to govern network interactions. It allows the secure, real-time data flows across IoT networks needed to enable IoT-driven track and trace.

## Towards the autonomous supply chain

Organizations are quickly reaching a convergence where intelligent digital technologies, such as predictive analytics, IoT, blockchain and AI, integrate with traditional supply chain management systems and business network processes to deliver new levels of productivity and efficiency. This is the autonomous supply chain. Many supply chain processes, especially visibility, are digitized and, to a very large extent, conducted with little or no human intervention.


Figure 4: Build a platform for the autonomous supply chain through IoT-driven track and trace

OpenText's portfolio of IoT-driven track and trace solutions provides a solid foundation for organizations to continue their digital transformation towards a completely autonomous supply chain. It allows companies to put in place the building blocks to digitally monitor and manage their supply chain and logically add capabilities when required to drive business agility, flexibility and innovation.

It allows organizations to take their current supply chain visibility initiatives and use intelligent digital technologies, such as IoT, AI, blockchain and analytics, to evolve increasingly intelligent and connected supply chain processes.

## Resources

**IoT traceability**
Learn more ›

**Industrial IoT**
Learn more ›

**Technologies**
Learn more ›

## About OpenText's IoT platform

Authenticating an ecosystem of things requires experience and understanding of the complex web of relationships between them. The interaction of people, systems and things requires dynamic control of what each unique thing can do, with whom and when. The OpenText IoT Platform is massively scalable and delivers secure data integration, exchanging millions of messages per second, between millions of things, in real time. It allows organizations to design for the future by connecting manufacturers to products, while providing robust security and connectivity.

OpenText IoT Services accelerates secure, scalable connected product solutions, enabling organizations to register and manage physical things and create solutions that connect their people and systems with the integrated world. The OpenText IoT Platform provides everything an organization needs to monitor the health of products and equipment, create secure interactions and integrations and manage the identity lifecycle of connected things.


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4. IDC, IDC FutureScape: Worldwide Supply Chain 2025 Predictions, 2024
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