DESCARTES™

The Future of Pharmaceutical Shipment Tracking

Introduction

The global manufacturing and distribution of pharmaceuticals and the regulatory requirements of countries has always made pharmaceutical logistics a challenge. However, the anticipated volumes of COVID-19 vaccines that need to be distributed for the next 3-5 years will be unprecedented and pharmaceutical logistics chains will be severely strained as they try to get these to market quickly and safely.

Three factors will shape how pharmaceutical manufacturers and their logistics partners effectively address this pressing challenge:

1. To eliminate waste, theft, diversion, counterfeiting and ensure the efficacy of the medicine, pharmaceutical manufacturers and governments will demand that logistics companies provide door-to-door tracking and visibility as well as the condition of the shipment.
2. Today's global pharmaceutical manufacturing landscape and the need to quickly get the drugs to market will mean the majority of vaccine shipments move by air.
3. Distribution complexity and the negative impact of COVID-19 on air cargo capacity will force the pharmaceutical logistics chain to be much more efficient and effective.

Perceived readiness of supply chain logistics companies to handle COVID-19 vaccines

Well Prepared

Very Unprepared

The poll was conducted in September 2020 by the International Air Cargo Association (IATA) and Pharma.Aero.

POTENTIAL ISSUES

Pharmaceuticals face a range of potential issues as they move through the supply chain before reaching the end consumer.

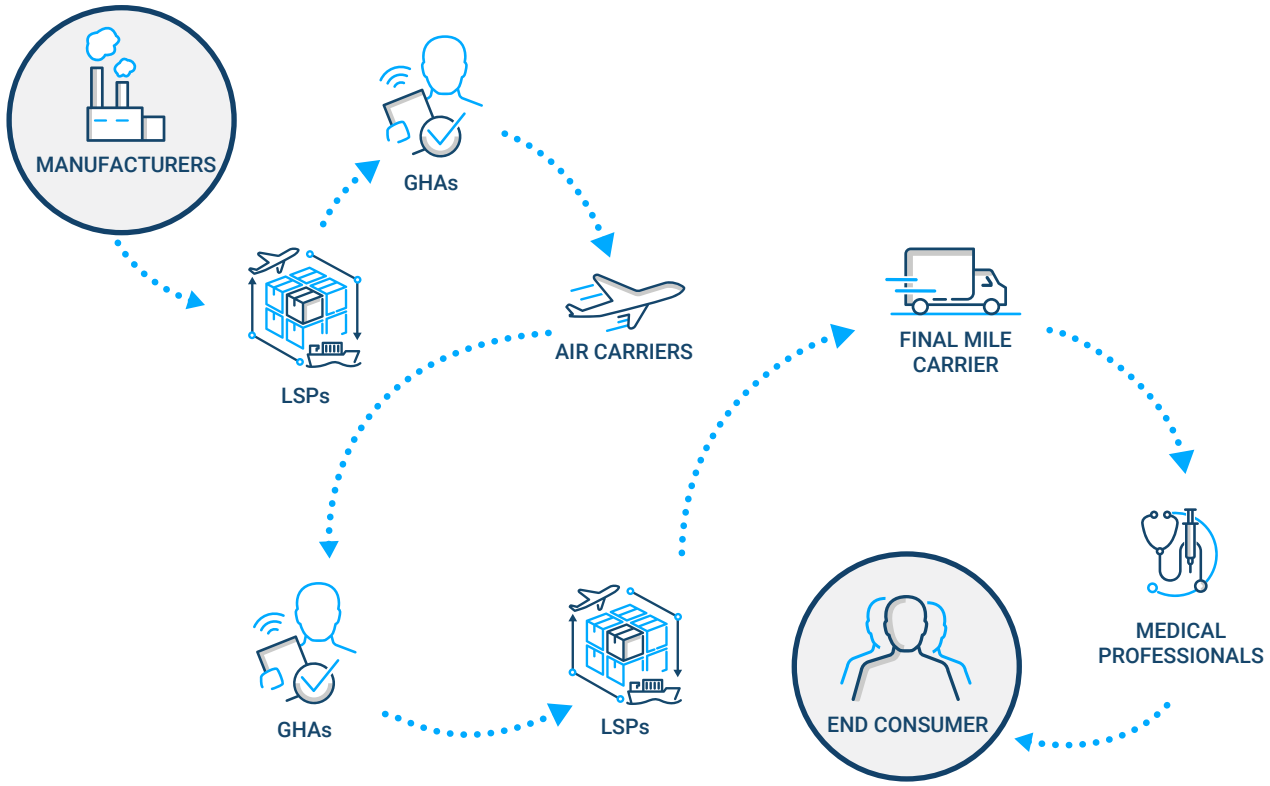
Navigating the complexities of air cargo

Shipping via air cargo has always been the best choice for high velocity, high-value goods such as pharmaceuticals. However, because of the nature of air cargo, it has always been a complex process with many hand-offs:

1. Air-based shipping is a multi-party process. Including the manufacturer, logistics service providers (LSPs), ground handling agents (GHAs), air carriers, final mile distributors, medical professionals and end consumer, there are many parties that touch the drugs and disparate data collection points.

CHAIN OF CUSTODY

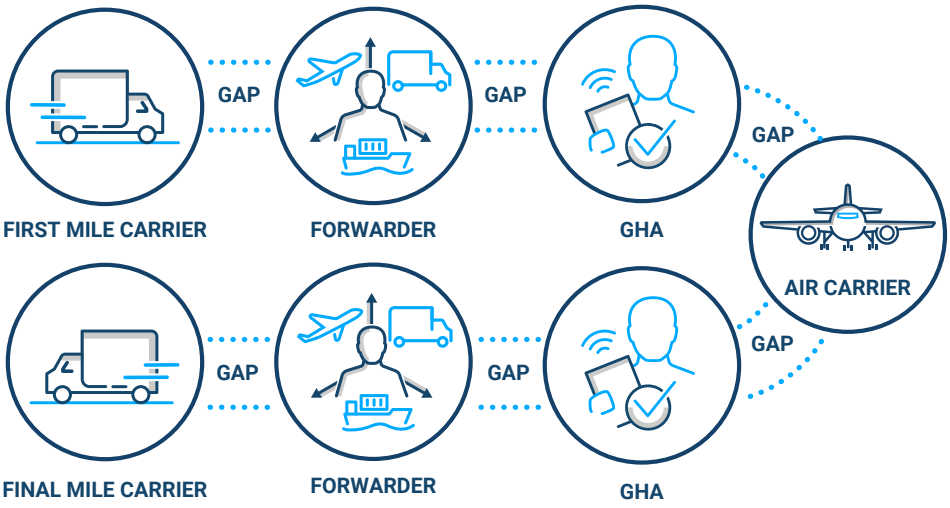
With over eight hand-offs between the manufacturer and the end consumer, it is critical to have end-to-end visibility of the location and condition of pharmaceutical shipments.



IATA reported in 2015 that 25% of all vaccines are degraded when they reach their destination due to improper shipping.

2. Visibility across the entire supply chain is limited because there are gaps in the end-to-end shipment tracking and monitoring processes, and it is impossible to reconcile data coming from disparate systems.

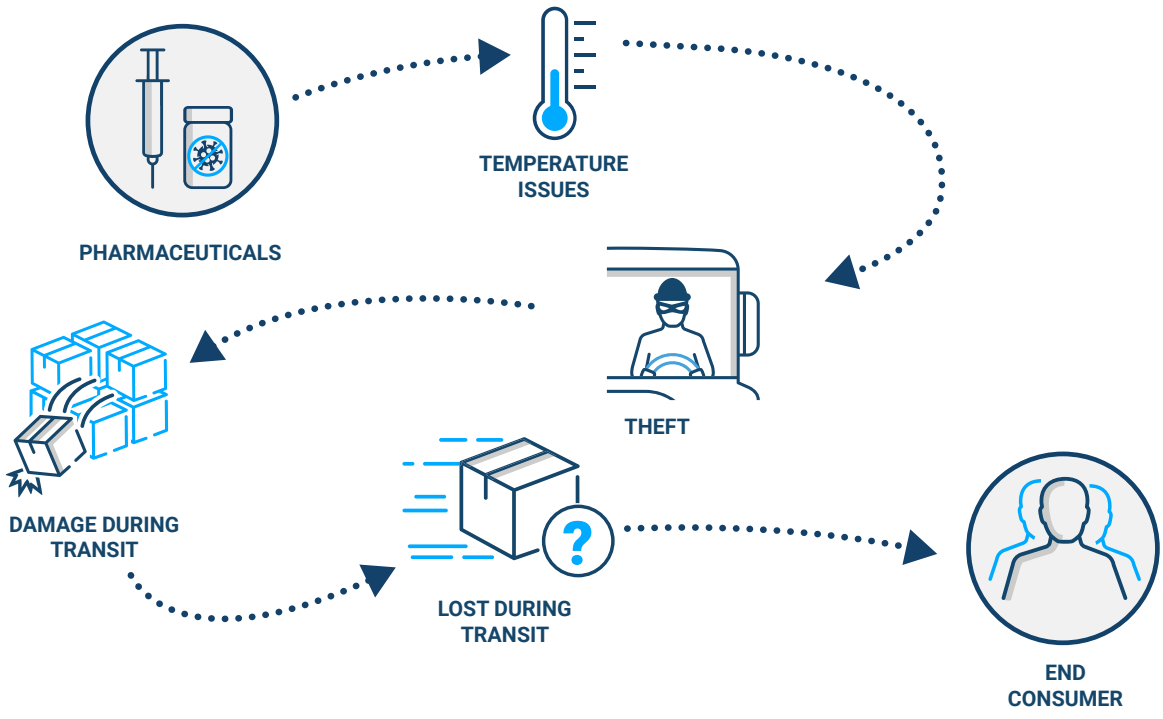
GAPS OF VISIBILITY



3. After-the-fact data logging doesn't provide the manufacturer, distributor or LSP with real-time information when product conditions are deteriorating in order for them to intervene before the product goes bad or track the product's location to ensure it doesn't end up somewhere it shouldn't be.

LACK OF REAL-TIME INFORMATION

The lack of end-to-end real time pharmaceutical shipment visibility can result in product degradation, diversion and even loss.



Leading the way forward

Because pharmaceuticals move via logistics service providers, it is up to the logistics community to lead the way in creating a transparent end-to-end pharmaceutical supply chain. To create this transparency, the logistics community must adopt these five principles:

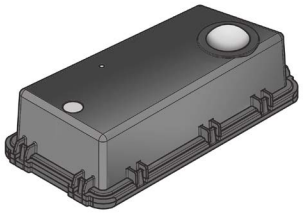
1. **Unify the tracking process across all parties in the supply chain:** Eliminate the gaps and standardize the data for a true end-to-end view
2. **Deploy common tracking technology and open network connectivity:** Ensure tracking across the entire logistics chain despite the numerous hand-offs
3. **Automate data capture:** Improve data accuracy and timeliness, reduce tracking labor
4. **Create a closed-loop process for reusing tracking tags:** Reduce tracking costs and improve sustainability of the logistics chain
5. **Proactively provide manufacturers and distributors with location and in-transit vaccine health status:** Prove the efficacy of the logistics chain and allow them to make more dynamic deployment decisions

Transforming the logistics chain

Recent Internet of Things (IoT) advancements enable the air cargo logistics community to transform the pharmaceutical logistics chain to provide seamless end-to-end location tracking and monitoring. Traditional tracking technologies were expensive, had limited battery life, didn't capture key environmental statuses, had tracking "holes", were company-centric instead of logistics chain-centric, and were not environmentally friendly. As a result, they were not widely deployed however, next generation IoT has the elements that make global tracking of pharmaceutical shipments a reality.

Next generation tags

By taking advantage of advances in electronics, devices now offer a smaller form factor, are easier to deploy, less expensive to produce, are more rugged, have a longer tracking range and battery life, and are recyclable. Equally important is the range of tracking status that they capture. It is not limited to location anymore and includes data capture on temperature, humidity, light, shock and smoke to provide a more comprehensive view of the health of the shipment.



Next generation sensor-based tracking tags can be attached to pharmaceutical shipments to better monitor shipment status.

Mesh networks

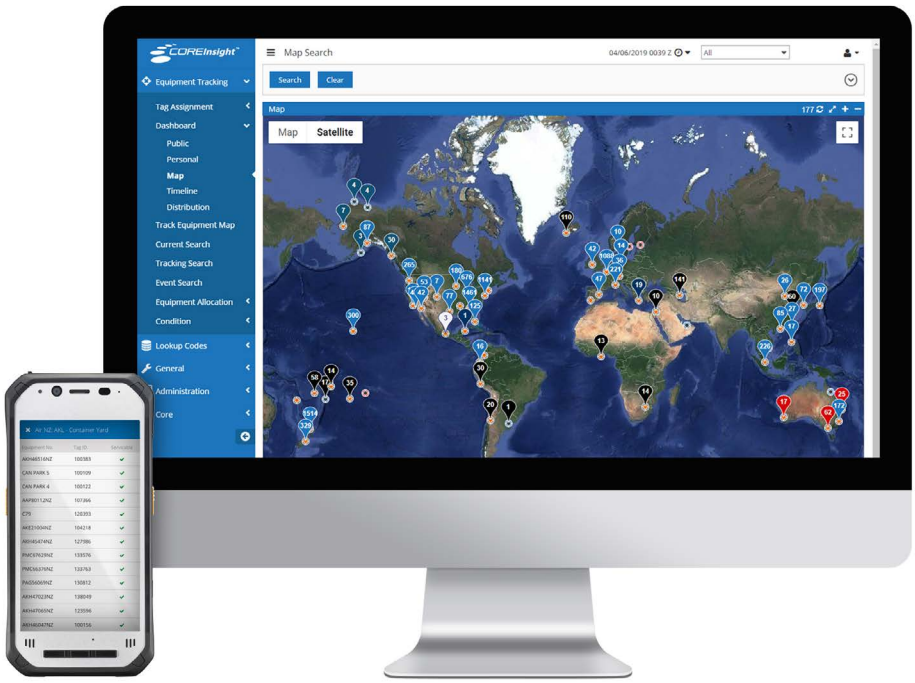
Traditional tracking networks are expensive to deploy and provide limited coverage, which leaves tracking gaps in the pharmaceutical logistics chain. Mesh networks fill in the "blank spaces" because they are lower cost to implement as they require minimal internet connections. In addition, they can be deployed more widely because many mesh devices can run on solar power instead of electricity. Mesh networks are more resilient because of overlapping coverage and the use of multiple paths to move data. They can be located across the logistics chain in airports, air cargo stations, loading/unloading docks, etc. to automatically capture the movement and status of shipments.

What is a mesh network?

A mesh network is a local network topology in which the infrastructure nodes connect directly, dynamically and non-hierarchically to as many other nodes as possible and cooperate with one another to efficiently route data from/to clients." *(Wikipedia)*

MESH NETWORK COVERAGE

Mesh networks provide more complete coverage at a lower cost. Nodes are connected to active gateways to transmit information outside of the mesh network. Overlapping coverage results in the elimination of coverage gaps.



Advanced cloud-based platforms and mobile applications can better capture data, eliminate data silos, and enable better decision making.

Mobile Applications

While mesh networks extend the ability to automatically track shipments across the logistics chain, mobile apps are needed to extend the tracking process and make it truly door-to-door. Because smartphones are a global phenomenon, they can provide greater flexibility to capture data, receive or deliver shipments, or interrogate shipment status on-demand. In addition, any size of logistics organization can participate in the logistics chain by simply visiting the major application stores and downloading the tracking app.

Cloud-based Tracking Platform

Providing a common repository that unifies the end-to-end tracking data from all of the parties involved in the pharmaceutical logistics chain is essential to eliminating the silos of tracking information that exist today. With one version of the truth, all participants will know the status of a shipment and be able to use that information to make better decisions about managing it effectively. The cloud is the perfect technology for the tracking platform because of its accessibility and scalability.

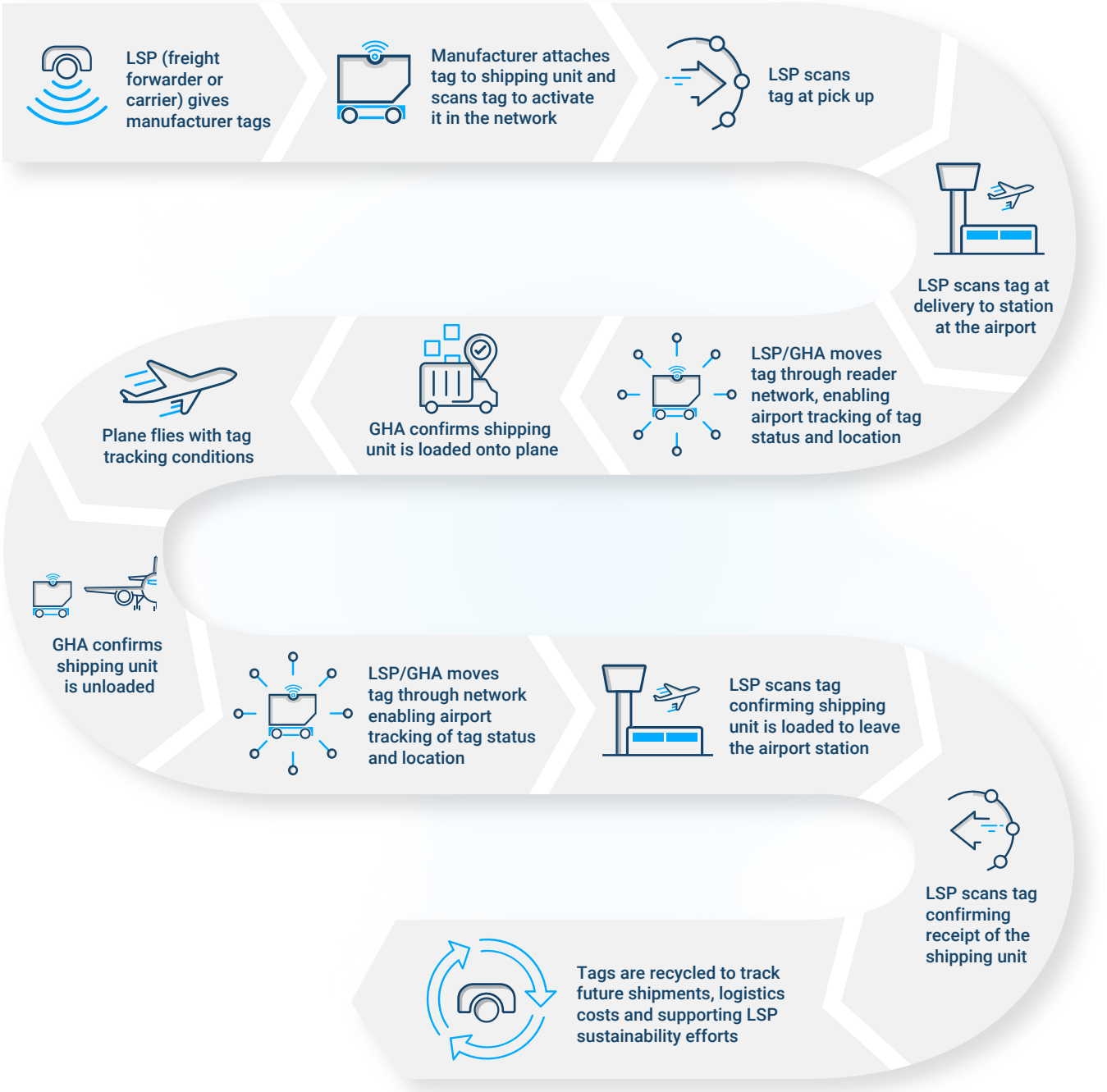
Open Architecture

Because of the number of participants in the pharmaceutical logistics chain and the global nature of manufacturing and distribution, interoperability is going to be critical as no one technology provider will be able to deliver all of the tags and tracking hardware required. The tracking network must allow any technology provider that meets tag or tracking standards to participate. This will increase the velocity of deployment, foster innovation and help to keep costs down. In addition, there should be flexibility to deploy various mobile applications that capture shipment status as part of broader logistics activities and then pass that information to the cloud-based tracking platform.

Creating end-to-end visibility for the pharmaceutical logistics chain

E N D - T O - E N D V I S I B I L I T Y I L L U S T R A T I O N

Technology to monitor the status and location of shipments throughout the pharmaceutical logistics chain and track cargo as it moves though multiple hands-offs is needed to enable end-to-end visibility.



Conclusion

Simplicity, resiliency, pervasiveness and interoperability are the key requirements to establish true end-to-end pharmaceutical shipment visibility across the multi-party logistics chain. Advances in IoT capabilities and advanced network strategies make it possible for the air cargo logistics community to meet these requirements now. The result will be a more safe, secure and efficient logistics chain that will meet the upcoming challenges of COVID-19 vaccine distribution.

How Descartes Can Help

As a logistics professional in the pharmaceutical supply chain, if you want to know how your organization can use advanced IoT technology to help deliver end-to-end shipment visibility, contact Descartes. Descartes is a leading provider of technology solutions to the air cargo community and a long-standing innovator in the digital evolution of the industry. We operate one of the world's largest air cargo messaging networks and provide technology solutions that streamline cargo tracking, shipment management and customs clearance for carriers, forwarders, ground handling agents and other logistics organizations.

About Descartes Systems Group

Descartes (Nasdaq:DSGX) (TSX:DSG) is the global leader in providing on-demand, software-as-a-service solutions focused on improving the productivity, performance and security of logistics-intensive businesses. Customers use our modular, software-as-a-service solutions to route, schedule, track and measure delivery resources; plan, allocate and execute shipments; rate, audit and pay transportation invoices; access global trade data; file customs and security documents for imports and exports; and complete numerous other logistics processes by participating in the world's largest, collaborative multimodal logistics community. Our headquarters are in Waterloo, Ontario, Canada and we have offices and partners around the world.

Learn more at www.descartes.com and connect with us on LinkedIn and Twitter.

Contact Descartes to learn how to achieve end-to-end visibility throughout the pharmaceutical logistics chain.

Uniting the People & Technology That Move the World.