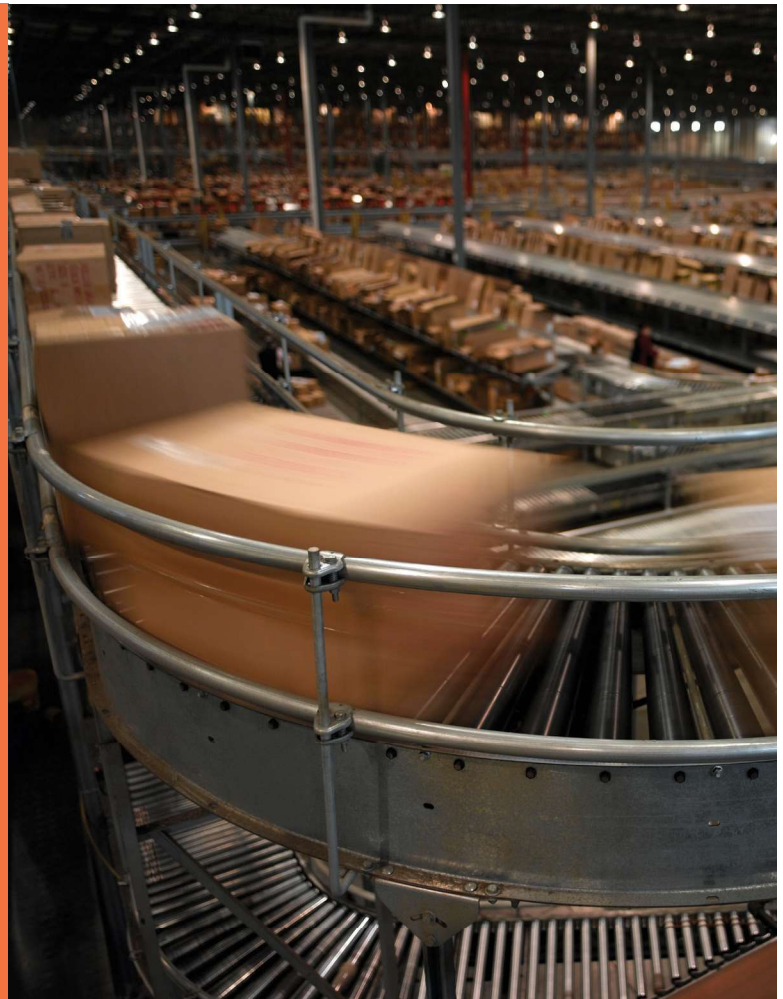# FEDEX DELIVERS THE **FUTURE OF SMART SHIPPING**

Rob Carter, executive vice president at FedEx, takes a small piece of plastic out of his pocket and excitedly sets it down on the table, gesturing as if to say, "ta da."

Carter, who also serves as the shipping giant's chief information officer, has been with the company since 1993 and seen it evolve with new technologies like the World Wide Web, e-commerce and mobile. The palm-sized slab of plastic on the table, he believes, is next on that list. Smart sensors connected to the Internet of Things and embedded in packages have increased FedEx's potential to gather data at the edge by a staggering 1,000 times over. For shippers, what that means even more transformative — insight, through real-time analytics, into a shipment's entire journey.

That's a game changer for supply chains, especially in fields like healthcare that depend on the reliable and secure movement of sensitive goods. The pharmaceutical industry loses an estimated $15 billion annually just from products that were stored outside of temperature range, while 1.5% of pharmaceuticals overall are rendered unusable because of logistics issues. But what if pharma companies had the opportunity to intervene before it was too late? "Putting actively communicating sensors with shipments gives you real-time insight as to not just where it is but what are the temperatures of it? Has it been jarred in any way that would make it not viable?" says Carter.

"We've in many ways changed the world with the tracking systems that have existed up to this point, but that stochastic data about the last time it was touched isn't going to be enough as you go into the future," he says. "We've gone from being able to look at what happened to what is happening to predictive analytics about what is going to happen."

THE SMART PACKAGE: A USE CASE

IoT sensors embedded in packages offer senders end-to-end shipment visibility, which can be crucial for sensitive materials like medical devices or fresh produce. Consider the path a shipment of pharmaceuticals takes from manufacturer to hospital. Analytics on data collected at the edge — on location, temperature and more — enable smarter, safer real-time decisions.
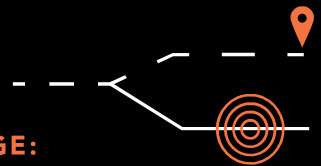
1

DAY 1 - 7:45AM

READY TO GO:

The pharmaceutical company loads the drugs onto a refrigerated truck, whose temperature is recorded by the sensor.

2

DAY 1 - 5:45PM

ROUTE CHANGE:

If the delivery driver deviates from the predetermined route, the pharmaceutical company is notified and can connect with the carrier to confirm whether the delivery driver made a necessary detour — or there was a potential breach.

3

DAY 2 - 2:17AM

TEMPERATURE CONTROL:

A rise in temperature outside of the established range will trigger an alert, notifying the driver to adjust the truck temperature and the pharmaceutical company to determine whether the pharmaceuticals have been compromised.

4

DAY 2 - 4:30PM

REAL-TIME GPS:

As the shipment approaches its final destination, hospital staff can prepare to receive the pharmaceuticals.

5

DAY 2 - 6:32PM

ARRIVAL:

The sensor verifies that the package has reached its final destination.

ANALYTICS EVERYWHERE

Right now, FedEx's in-use tracking system, SenseAware, is leveraged mainly by large corporations because the cost, at $150 for a single domestic journey, is not insignificant. But later this year, the company plans to unveil another sensor, **The Tron**, that will be limited in the metrics it measures but smaller, cheaper and accessible to more people. Real-time analytics won't be exclusively for supply chain shipments but for that beach read you want to arrive before your vacation or the surprise birthday gift whose delivery you want instant updates on, too.

Also in beta is what Carter calls **The Bean**, a small, bluetooth-connected and blockchain-enabled sensor that will not only track data on a FedEx package's whereabouts and conditions but also enter them into a blockchain's immutable ledger for greater, tamper-free reliability. That, he says, is the future of shipping. "Super critical in this world that we live in is that we begin to have a system of trust about the provenance of things, the ability to know that something is in fact what it says it is," he says.

As FedEx continues to expand data collection, solving problems once accepted as inevitable, the new challenge becomes overload. "These things throw off so much data," Carter says of IoT sensors. "So we have to learn how to curate that data, to say, 'What are the relevant things that it's telling us?' Not just swamping the boat but really sorting and picking out the gems that can give you critical information."

And in order to locate those gems, he says, we need to organize data in a way that's not specific to a one-time project but that's flexible enough to cooperate with different systems and serve varied goals. "The most important thing that happened in information technology [in the last two decades] was something that I call dominant design," says Carter of this guiding principle. He draws a comparison to railroads, which revolutionized transportation — but only once rail companies established the standard-track gauge, turning disjointed dead ends into an interconnected system. "The same thing has happened with compute. We've gone through the nascent era of everything trying to go about solving the problem in different ways to, today, Internet communications technologies, cloud data centers and mobile computing's abilities to seamlessly interact. That's what's driving acceleration of the digital world."

That infrastructure is what unlocks an organization's ability to turn raw data into real growth. "Then you can turn loose AI and machine learning against the data to get to that clairvoyance to reveal the information you didn't even know to [look for] — the unknown unknown," says Carter, of FedEx's commitment to learn from the information its sensors are gathering. "The known unknown is something we've been working on for decades, but the unknown unknown is a critical journey that we're on to try and say, 'What can the data tell us that we haven't even thought to ask?'"

FEDEX'S SENSEAWARE

sensors measure data on a package's:

TEMPERATURE

HUMIDITY

BAROMETRIC PRESSURE

SHOCK

LIGHT EXPOSURE

LOCATION

ROUTE