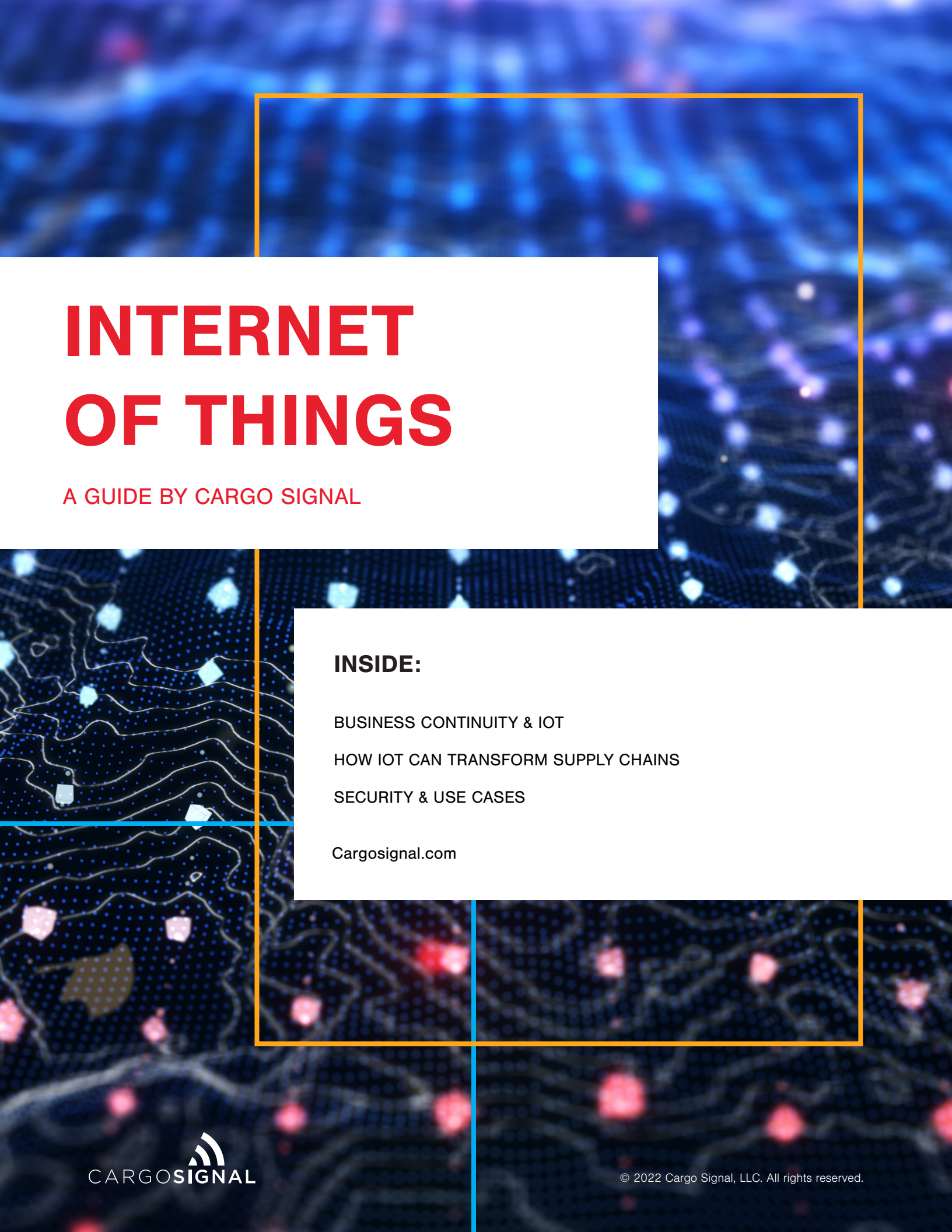


INTERNET OF THINGS

A GUIDE BY CARGO SIGNAL

INSIDE:

BUSINESS CONTINUITY & IOT

HOW IOT CAN TRANSFORM SUPPLY CHAINS

SECURITY & USE CASES

Cargosignal.com

CARGOSIGNAL

ITS TIME FOR SMART CARGO

The evolution and advancement of IoT (Internet of Things) technology has led us to being surrounded by connected devices. Smart phones, smart watches, smart homes...smart things are everywhere. When physical objects can connect to the internet and give you the ability to view their data or make changes through a digital platform—that's IoT. And now IoT is coming to the logistics industry, making "Smart Cargo" a reality.

Cargo Signal brings real-time visibility to supply chains struggling with disturbance, damages, and delays by placing IoT sensors on global shipments. Our sensors get attached to your container, pallet, or box, then go on to transmit data about its location and condition. If the data points signal an issue, an alert will be generated letting you know action is needed. Or you can have our logistics professionals in the Command Center, who monitor your shipments 24/7, 365 days a year, intervene on your behalf to solve the issue.

An investment in IoT is an investment in supply chain resilience. Our single-use devices don't require reverse logistics, are compliant on all modes and can be installed in a few seconds. With the proliferation of climate/weather events, political unrest, and digital disturbances, having the data from the IoT devices on your cargo can help you stay informed, involved, and in control of your supply chain, despite the disruptions.

To highlight the power of IoT, we have created this guide to help you learn more about how this technology can transform your organization.

Randy Gould
Global Director, Cargo Signal

HOW TO LEVERAGE IOT IN YOUR SUPPLY CHAIN

Advancements in IoT technology can help monitor, lessen, or in some instances even prevent the effects of supply chain disruptions altogether. For instance, Cargo Signal's IoT-powered sensors can be attached to a box, pallet, container, trailer, or truck, transforming freight into "smart cargo." IoT devices use sensors to measure specific aspects of the world around them, including location, temperature, humidity, light levels, movement, handling, speed of movement, and other environmental factors. Having real-time visibility is crucial for supply chain agility.

BETTING ON IOT

IoT devices make it easier to manage supply chains by providing transparency and real-time updates on the location of goods. This allows for better decision-making and faster response times to disruptions.

GET REAL-TIME VISIBILITY

IoT sensors get attached to specific storage containers and transmit their location, which is then picked up by GPS satellites and used to track the movement of goods. This information is invaluable in keeping track of shipments and inventory.

TRACK THE ARRIVAL OF GOODS

By tracking the speed of movement and traffic flow of products, it's much easier to predict how goods will move through the supply chain. This information can help suppliers, manufacturers, and distribution centers prepare to receive goods, reduce handling times, and ensure efficient processing of materials.

MONITOR STORAGE CONDITIONS

IoT devices can monitor temperature, humidity, exposure to atmosphere, light intensity, and other environmental factors. These devices will trigger an alarm if certain thresholds are breached. This makes it much easier to track the quality of goods through the supply chain and to reduce spoilage.

STREAMLINE OPERATIONS

IoT devices can help identify where and when goods are delayed in transit. This information can then be used to create contingency plans and alternative routes, speeding up the entire process.

PREDICTIONS: WHAT'S AROUND THE CORNER

- Every piece of freight will be trackable in real time.
- You will no longer need to scan in your warehouses.
- Inventory control will be automated, and resources will be repurposed.
- Basic milestones of departure, arrival, and split shipments will be automated.
- Automated pickup and delivery will become a reality.
- Customers will label their own freight and track their cargo in their systems as well.
- Customer will have true end-to-end visibility.

OVERCOMING SUPPLY CHAIN DISRUPTION WITH IOT

Supply chains are complex by nature, and there are a number of world events that can profoundly impact their ability to run according to plan. If you don't have access to end-to-end supply chain visibility, you are increasing your risk that those events will have serious consequences. Here are a few key disruptions that Cargo Signal can help with:

CYBERATTACK

If your organization falls victim to a cyberattack, you may temporarily lose access to crucial systems. With sensors attached to your shipments, you stay connected to real-time data about the location of your shipments. Should one of your systems or your service provider's systems go down, Cargo Signal's sensors will continue to collect and display tracking data. And our team of logistics professionals in the Command Center are available 24/7 to help facilitate communications between your stakeholders and keep your supply chain operating.

WEATHER EVENTS

Wildfires, snow storms, hurricanes, heat waves, and other significant weather events can cause delays across trade routes and sometimes inhibit workplace accessibility. With Cargo Signal, you can set customizable alerts that keep you updated when there are delays or route deviations, when dwell times occur, or when the temperature of your freight falls outside acceptable ranges. The data you receive can be leveraged to remotely determine the risk of product spoilage. No matter the scenario, the Command Center will work with you to ensure that the shipment arrives at its destination unspoiled and as quickly as possible.

THEFT

Cargo Signal keeps you informed in real time about the condition of your freight. Customizable alerts of your choosing will keep you informed of compromised shipments, telling you the exact time and location it happened. Additionally, our platform connects you to "heat maps" that use historical data to identify high-risk areas, so you can stay informed and plan accordingly. If an emergency occurs, our Command Center will sound the alarm on your behalf, contact the authorities, and connect you to local resources to take immediate action.

QUICK FACTS ABOUT IOT

DATA

- The data collected by these devices is typically delivered to a digital platform that allows the user to access and/or interact with that data.

INDUSTRY

- IoT is now recognized as a driving force of the Fourth Industrial Revolution.

DEVICES

- As of 2021, there were over 11 billion IoT devices active around the world. Even despite the COVID-19 impact on supply chains, that number is predicted to surpass 27 billion by 2025.

ADOPTION

- In 2018, it was reported that 57% of companies had adopted IoT-powered technology in some form. That number is expected to surpass nearly 70% in 2022.

OVERCOMING SUPPLY CHAIN DISRUPTION WITH IOT

POLITICAL TURMOIL/WAR

War and political or civil unrest can wreak havoc on a supply chain. If manufacturing materials are delayed, transportation routes are blocked, or new sanctions are announced, the regular movement of product across your supply chain could suffer. Cargo Signal allows you to view your shipment locations in real time and plan around any unforeseen obstacles that arise. The Command Center will alert you immediately of any stoppages or dangers so that you can reroute shipments and immediately take proactive measures.

LABOR ISSUES

Understaffing can cause significant stress on supply chains. Cargo Signal provides you with the real-time data necessary to determine exactly when your freight will arrive at its destination so you can keep your warehouses prepared with the right number of staff at the right time. If your shipment stops moving due to labor unrest, you will know exactly where it is and how long it has been there, allowing you to determine what action to take next.

SUPPY CHAIN VULNERABILITIES

ECONOMIC

- Work stoppages, company bankruptcies, unexpected fluctuations in supply and demand, and recessions.

ENVIRONMENTAL

- Natural disasters like earthquakes, hurricanes, tornados, tsunamis, floods, blizzards, cyclones, extreme heat, and other forms of inclement weather.

ETHICAL

- Exploitative business practices, corruption, violation of state and federal law, or disregard for crucial safety and security measures.

POLITICAL

- Civil unrest, trade wars, or the installation of new administrations.

HOW IOT CAN HELP DIFFERENT STAKEHOLDERS

TRANSPORTATION

Freight moves 24/7, making 24/7 visibility a must. If you're still using milestone data to track and trace your shipments, you may not have reliable information about your shipment while it's in transit. With Cargo Signal's sensor-based logistics, you'll no longer have to physically search for your freight when asked for an update. Our sensors automatically keep you and your chosen stakeholders informed of exactly where your shipments are at all times, and our customizable alerts let you know when they will arrive and in what condition. By increasing the transparency of your carriers, you'll be able to provide your stakeholders with more accurate information and better recognize and troubleshoot inefficiencies while facilitating the movement of your cargo toward its destination.

WAREHOUSE

The warehouse is the epicenter of moving freight, and it can be difficult to keep an eye on everything all at once. Cargo Signal ensures that you'll always know the location and condition of your freight. With real-time visibility at your fingertips, you can focus on building efficient internal warehouse processes. Cargo Signal will keep tabs on your cargo for you as it moves in and out of the warehouse, significantly reducing the probability of human error and ensuring accurate record-keeping and proper organization in a fast-paced analog environment.

RISK AND SECURITY

Cargo Signal significantly reduces the risk involved in shipping freight. With real-time visibility, access to data that keeps you mindful of high-risk areas, and full carrier transparency, you have the data necessary to ensure your stakeholders and insurers that your cargo is safe and secure, so you can negotiate the lowest rates. And if your cargo is mishandled or compromised, Cargo Signal's automated customizable alerts will inform you immediately. You'll know the exact moment when and where it happened. Our Command Center, staffed by logistics professionals with additional military, law enforcement, and insurance expertise, will raise the alarm, contact the authorities, and connect you to local resources to take immediate action.

HOW IOT IS INCORPORATED IN DIFFERENT INDUSTRIES

AGRICULTURE

- Monitoring climate and soil conditions, tracking livestock, and automating dispersion of water/fertilizers.

ENERGY

- Remotely observing/managing energy grids, forecasting energy consumption, and improving visibility of resource allocation and energy use.

MANUFACTURING

- Monitoring production flow and waste, automating maintenance notifications, tracking assets, and optimizing supply chains.

RETAIL

- Observing supply and demand, tracking inventory, automating checkout, and surveilling assets.

HOW IOT CAN HELP DIFFERENT STAKEHOLDERS

DATA, TECHNOLOGY, AND STRATEGY

The real-time visibility of shipments made possible by Cargo Signal allows you to source reliable end-to-end data about your supply chain straight from the source. With sensor-based logistics, you don't have to rely on self-reporting carriers or warehouses. Reliable information is delivered to you in real time on one easy-to-use platform, allowing you to focus on eliminating stress points and increasing overall supply chain resiliency. Cargo Signal is turnkey technology, so you don't have to build out extra hardware or complex systems. Our API allows you to integrate our technology into your system with ease and extract data from whatever platform is most convenient for you and your customers. With data organized and streamlined, your tactical teams will operate at peak efficiency.

ALERTS FROM IOT SENSORS

LOCATION & DELAY

- Waypoint entry/exit, waypoint arrival/departure, route deviation, stationary times, predictive delay, distance from origin, and distance from destination.

SECURITY

- Light exposure, dwell time, route deviation, and door opened/door closed.

TEMPERATURE

- Consecutive/cumulative temperature and humidity.

SHOCK & TILT

- Improper handling, impact, and unlevel/unsafe positioning.

HOW IOT SECURITY WORKS

IoT devices generally feature a few core components that allow them to function: a physical device/sensor, a network connection, data processing capability/software, and a digital platform. With the proper precautions, each category becomes a protective layer contributing to the optimal security of the device:

DEVICE/SENSOR (HARDWARE SECURITY)

- A secure casing is fitted over the device and port access is restricted.
- Firmware is embedded and consistently updated.

NETWORK CONNECTION (COMMUNICATIONS SECURITY)

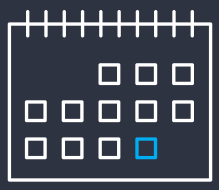
- Data-in-transit encryption is implemented to protect against common network attacks.
- Additional security features are applied according to the network security connection (e.g., Bluetooth, WIFI, etc.).

THE CLOUD (CLOUD SECURITY)

- Data-at-rest encryption is implemented.
- Endpoint security for user applications/systems and access-controlled infrastructure is maintained.
- Penetration testing is performed to scan for lingering security vulnerabilities.

DIGITAL PLATFORM (SOFTWARE SECURITY)

- Platforms are updated regularly with manufacturer patches and security upgrades.
- A multi-tenancy environment is secured, establishing two-factor authentication and expiring API access.



A BRIEF HISTORY OF IOT

1982

- David Nichols of Carnegie Mellon connects a soda vending machine to the internet, allowing users to monitor the temperature and quantity of product inside.

1989

- John Romkey and Simon Hackett connect a Sunbeam toaster to the internet, allowing users to turn it on and off remotely. It debuts at the Interop Conference and propels IoT technology into the mainstream.

1991

- Quentin Stafford-Fraser and Paul Jardetzky of Cambridge University connect a coffee pot to the internet to monitor daily real-time quantity.

1994

- Steve Mann attaches a small internet-capable camera to a pair of eyeglasses, livestreaming his field of vision. It is the first wearable IoT device.

1999

- Kevin Ashton of Procter & Gamble, attempting to optimize company inventory and supply chain visibility, starts placing sensors on product. He coins the phrase “Internet of Things” in a presentation to leadership.

READY TO TAKE CONTROL OF YOUR SUPPLY CHAIN?

Rather than waiting for someone to physically search for your freight to give you an update, placing a sensor directly on your cargo can automatically and in real-time provide you information about where it is and what condition it's in.

Cargo Signal provides real-time visibility of your cargo, so you can make decisions to keep your supply chain moving. Our customers use our sensors and data to optimize their shipping operations, reduce costs, and improve customer service.

Don't waste your time tracking and tracing your shipments.

DATA

Log on to our platform to view the real-time location and condition of your cargo at any time.

ALERTS

Receive milestone notifications along with being alerted of specific shipments that have encountered issues.

COMMAND CENTER

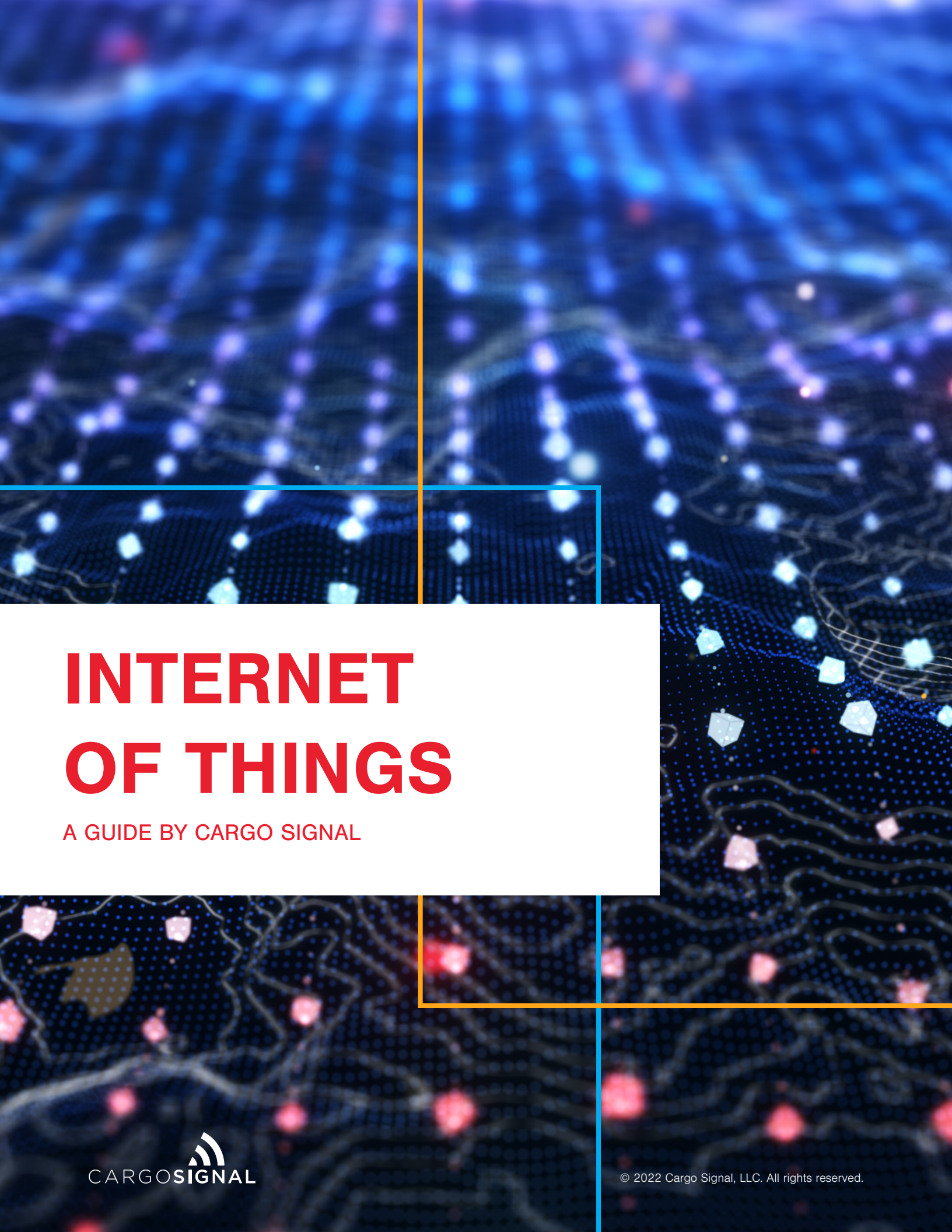
24/7 live monitoring 365 days a year focused on intervening in instances of route deviation, predicted delay, cargo being stationary and/or temperature deviation.

SENSOR-BASED LOGISTICS WILL ALLOW YOU TO:

- See exactly where your cargo is with single-use devices that do not require reverse-logistics.
- Identify if your freight is stationary when it shouldn't be.
- Catch your cargo before it gets misrouted.
- Course-correct to prevent delays.
- Avoid product spoilage or damage.

WHY YOU SHOULD GET STARTED TODAY

- $30 billion of cargo is stolen every year.
- 71% - 87% of global cargo theft happens while cargo is in transit.
- Over the past 20 years, extreme weather-related disasters have increased by 83%.
- In 2021, trucking companies in the United States suffered a record deficit of 80,000 drivers.
- In 2022, 73% of warehouse operators experienced labor shortages.



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