How IoT Enables Mobile Asset Tracking Throughout the Supply Chain

A SIERRA WIRELESS WHITE PAPER

In an increasingly complex and globalized logistics landscape, being able to accurately track assets as they move throughout the supply chain can be a huge advantage for businesses. But generating real-time data on mobile assets has traditionally been difficult to achieve. Containers and pallets are often transported through remote areas that have low connectivity and limited global positioning system (GPS) coverage, making them difficult to locate. Alternatively, they can be stuck indoors making them difficult to track as there is not a clear sky view for GPS. Attempts to use tracking devices have also been held-back by their high-power consumption and low battery life, making them expensive and impractical to use in many situations.

Due to recent advances in Internet of Things (IoT) technology, this dynamic is now changing, culmniating in a new generation of asset tracking solutions that enable enterprises to follow people, assets and equipment in real time, wherever they are located in the supply chain.

Advanced and Low Power Wide Area (LPWA) technologies – such as Long Term Evolution for Machines (LTE-M) and Narrowband IoT (NB-IoT) – are helping to provide reliable, global coverage; even in basements or remote rural areas. LPWA supports low data rates, which makes it ideal for IoT devices that only need to transmit small amounts of data (as compared to consumer devices). This results in higher coverage and ultra-low power consumption, giving the devices far greater longevity. Meanwhile, new edge solutions mean that data from huge volumes of individual, connected devices can be filtered and pre-processed at the source with only relevant information uploaded to the cloud. This further increases efficiency and reduces the demands on storage and battery-life, as well as the cost of transferring the data.

The advent of SIMs specifically designed for the IoT is also helping ensure resilient, global connectivity for high value mobile assets. Meanwhile, embedded SIMs (eUICC) mean that multiple devices can be managed globally with a single programmable SIM. These devices can work with any operator subscription in any part of the world and can be programmed to change subscriptions, giving supply chain managers more flexibility and control to manage connectivity. For more information, see our white paper on The eUICC Opportunity: How to Harness the Power of eSIMs in the IoT.

Supply chain transformation leading to business transformation

With more visibility and control over their logistics network, businesses have a great opportunity to reduce costs, optimize their return on investment (ROI) and provide better customer service to clients. For example, knowing exactly where all inventory is at every factory or warehouse can reduce the chance of delays along the supply chain and the subsequent negative impact on late shipments and customer expectations. Managers can also prevent stock from being lost or damaged by using tracking technology to carefully monitor the condition of each shipment as it is transported. There is even the possibility of introducing new business lines based on the detailed data being produced. For example, a rail car with a tracker could be leased based on the exact distance and time it is in use. Indeed, a recent report calculates that if IoT devices and asset tracking solutions were fully utilized in the global logistics sector then $1.9 trillion dollars of economic value would be created.[1]

This white paper explores the latest asset-tracking technologies and their benefits for companies. We also look at the most effective ways for organizations to implement these technologies.

Key asset tracking technologies

Costly legacy asset tracking systems are being replaced by the next-generation of flexible and customizable solutions, based on revolutionary technologies.

ADVANCED WIRELESS MODULES

The latest Global Navigation Satellite System (GNSS) positioning modules are superior to previous applications, as they make use of both GPS and GLONASS satellite navigation networks to fix locations more accurately and speed up the time-to-first-fix. These modules are also designed for LPWA deployment.

LOW POWER WIDE AREA (LPWA)

LPWA technologies – such as LTE-M and NB-IoT –support lower data rates which makes them suitable for connecting large volumes of IoT devices, each of which only needs to transmit small amounts of data. The result is that devices need lower processing power memory requirements and can have much longer battery life, making them more cost-efficient and reliable. Because only small amounts of data need to transmitted, coverage is easier even in remote areas.

IOT SIMS

Connectivity is at the center of effective asset tracking solutions, with specialized IoT SIM cards providing the foundation of the network architecture. Unlike cell phone SIMs, IoT SIM cards are more durable and can withstand adverse weather conditions, including extremely high industrial temperatures and damp environments. To ensure that there is a constant connection between IoT SIMs and the cloud, they are roaming at all times, allowing a constant flow of data. If assets are damaged or in an area with poor coverage, the IoT SIM will still be resilient enough to alert the logistics manager of the situation, with data integrity sustained even when assets are underground. For more information, see the blog on IoT Platforms: Key Features to Look For.

EMBEDDED UNIVERSAL INTEGRATED CIRCUIT CARD (eUICC)

eUICC is another term for an embedded or eSIM. These SIMs can be reprogrammed remotely, meaning the devices are not tied to a single Mobile Network Operator (MNO) or Mobile Virtual Network Operator (MVNO). This gives supply chain managers flexibility to manage and change subscriptions depending where their devices are in the world. For more information, see our white papers on The eUICC Opportunity: How to Harness the Power of eSIMs in the IoT and Moving Beyond Consumer SIMs for IoT.

CLOUD PLATFORMS

With the number of IP-enabled sensors on course to reach 50bn by 2020[2], any asset tracking solution will need to be able to pre-process and filter huge amounts of data at the edge to be truly scalable. Comprehensive IoT cloud platforms give enterprises the ability to deploy and manage devices in innovative new ways, with both standalone and integrated-antenna GNSS positioning modules used to add existing enterprise devices to the IoT platform. By bringing all IoT devices together in a single platform, the data they create can be collated in an easy-to-access operational dashboard and also provide a basis for applications that can analyze the information and make insights. Device-to-cloud (DTC) platforms provide better security, allowing companies to control and safeguard the data they transmit. For more information, see the blog on IoT Platforms and Key Features to Look For.

The key benefits of IoT for mobile asset tracking

Having accurate data on mobile assets gives enterprises the ability to modernize their logistics operations, lower costs and improve the flow of assets as they make their way to clients. We look at some of the key ways IoT asset tracking tools can be used to improve business performance.

REDUCING IN-TRANSIT DAMAGE

With claims for damaged cargo totaling over $800m per year[3], asset tracking has great potential to help companies prevent wastage and make substantial savings or ultimately assess liabilities. By using advanced sensors securely connected to a cloud platform, supply chain managers can instantly access comprehensive information about the location, temperature, pressure or humidity of a mobile asset. As a result, companies can not only track where their assets are, but also the condition they are being transported in.

ELIMINATING THE HIGH COST OF DAMAGED ASSETS

IoT supply chain company Tive, has found that even well-managed companies struggle to identify the origin of shipping damages. To find the source of the problem, companies had to look through the damaged item's shipping history and manually keep track of every item that was damaged over a period of time. Eventually, asset managers might identify a particular route that experiences the most damage, but to get to this point, the company may have already lost dozens—perhaps even hundreds or thousands—of products to damage. Failure to find the source of in-transit damage could result in millions of dollars in lost profits, a slower time to market and unhappy customers.

After teaming up with Sierra Wireless, Tive now helps shippers pinpoint the cause of damage much more quickly, enabling them to identify and sometimes even prevent damage before the product reaches a customer. Tive's proprietary trackers and cloud-based software, connected using Sierra Wireless' device-to-cloud solution, give companies the visibility they need, enabling alerts, reporting and analysis on their inbound and outbound shipments. From there, shippers can take immediate action to prevent further damage or offer their shipping partners better training on how to handle their products in the future. By tracking historical damage, a manufacturer may find that a particular route tends to damage products, such as fragile mechanical washing machine components. With this insight, the manufacturer may choose to use a smoother, less rugged route in the future, even if that route is longer.

For more information, see the blog on IoT Asset Tracking: How Tive is Reimagining Supply Chain Visibility.

John Deere
SUPPLY CHAIN ENABLEMENT FOR HIGH VALUE ASSETS

Expensive containers are shipped to various manufacturing locations and multiple supplier locations. Often they get lost or misplaced; however, manual tracking is time consuming and labor intensive.

An end-to-end hardware, network service and software solution is used to capture and report container locations, movements and waypoints. The **result is** optimal container deployment, reduction of expedited shipping ($60K per month savings), reduction in line-down scenarios and elimination of lost or stolen racks.

TRANSPORTING HIGH-VALUE ASSETS

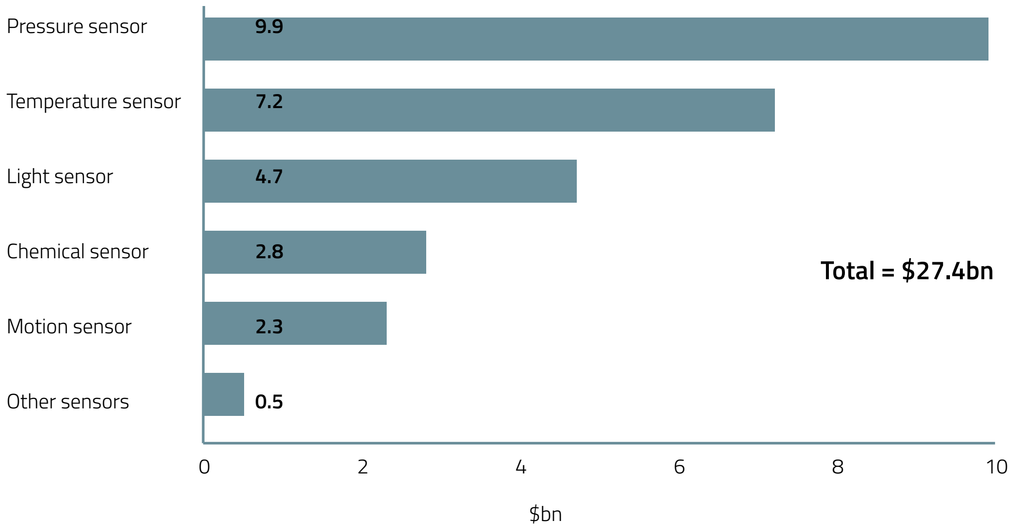
Providing logistics personnel with access to detailed tracking solutions can be especially useful in industries with complex supply chains. For example, automotive manufacturing requires many thousands of components to be coordinated and delivered. Any delays can result in the manufacturing line being stopped, with huge potential costs. At the same time, managing replacement parts can be challenging, as demand for spare parts does not necessarily follow the same demand patterns as for products, making the system hard to plan. The aftermarket involves a very complex inventory with the need to deliver the right part in the right quantity to the right location often at short notice. This requires an efficient and responsive supply network. If any replacement parts are lost between the factory and the repair center, it can cause delays on getting a vehicle roadworthy and impact customer experience and, consequently, the brand image.

STAYING COMPLIANT

Meeting regulatory requirements and reducing supply chain risk is of central importance for all businesses, no matter their size or industry sector. Falling short of the regulations can do much more damage than just a single fine for non-compliance, with adverse press coverage having the potential to cause permanent brand damage. Industry regulators want extensive evidence that the assets are being shipped in optimal conditions, which requires a tracking system that is constantly monitoring for changes in external and internal environments and sending reports back to the cloud platform. Indeed, as shown in Figure 1, the IoT enabled sensors market will reach $27.4bn in 2018.

Figure 1: Projected global IoT-enabled sensors market in 2022

Source: Statista



WORLDWIDE CONTAINER TRACKING REDUCES THEFT & LOSS

Containers are shipped all over the world and it is challenging to get real-time location data.

An end-to-end asset tracking solution that includes satellite tracking provides real-time tracking and monitoring to reduce theft and loss.

Eliminating delays

In a modern supply chain, it's common for assets to cross many international borders in their journey to customers. But as items move through different elements of the logistics network, delays are sometimes inevitable.

In the past, these delayed assets could have thrown the entire supply chain into disarray, especially if these issues happened in areas with weak network coverage. But by using IoT-enabled trackers with built-in alerts for inbound and outbound shipments, logistics managers can take contingency measures if any assets are postponed or disrupted. If a certain route is found to regularly cause delays or bottle-necks, then the collected data can be analyzed to provide alternative routes. Predictive analytics could even be used to forecast delays before they happen. In addition, being able to accurately locate and track assets can help reduce demurrage and detention, as it allows better schedule planning and co-ordination. In fact, it is estimated that real-time visibility of assets can reduce demurrage and detention fees by 25%-50%[4]. With 81% of companies reporting at least one disruption in the past year[5], asset tracking can be a key tool in improving the responsiveness of the supply chain and reducing time to market.

Cutting costs and improving ROI

Having the ability to track exactly where any mobile asset is in the entire supply chain is particularly useful when looking for items that have been stolen or lost. In the US alone, cargo theft is estimated to cost more than $30bn a year[6], with even a small improvement on this figure potentially generating hundreds of millions of dollars in savings.

Meanwhile, by improving inventory management, companies can reduce the amount of stock laying idle, thereby lowering the working capital required. Also, by leveraging the IoT to create a more efficient and agile network, they can reduce lead times. Imagine being able to synchronize all trucks and train shipments to ensure they arrive in the correct time window to allow them to be unloaded with minimal downtime.

Assets can also be tracked and monitored whilst indoors. Traditionally it has been difficult to track assets indoors because there is no sky view for GPS. This is now changing due to a number of technologies. For example, geolocation can be done via Cell ID positioning rather than just relying on GPS. LPWA technologies can slow the data rates so an asset will not lose connectivity even if indoors or in an area with low network coverage. LPWA can be complimentary with other approaches such as Bluetooth Low Energy (BLE) devices, which also transmit simple data and have very low power consumption.

As a result, with this deeper coverage if a package has stayed too long in one warehouse, the logistics team can be alerted and make sure the shipment gets out on time. Such innovations are necessary as consumers increasingly demand next-day, or even same-day delivery for consumer goods.

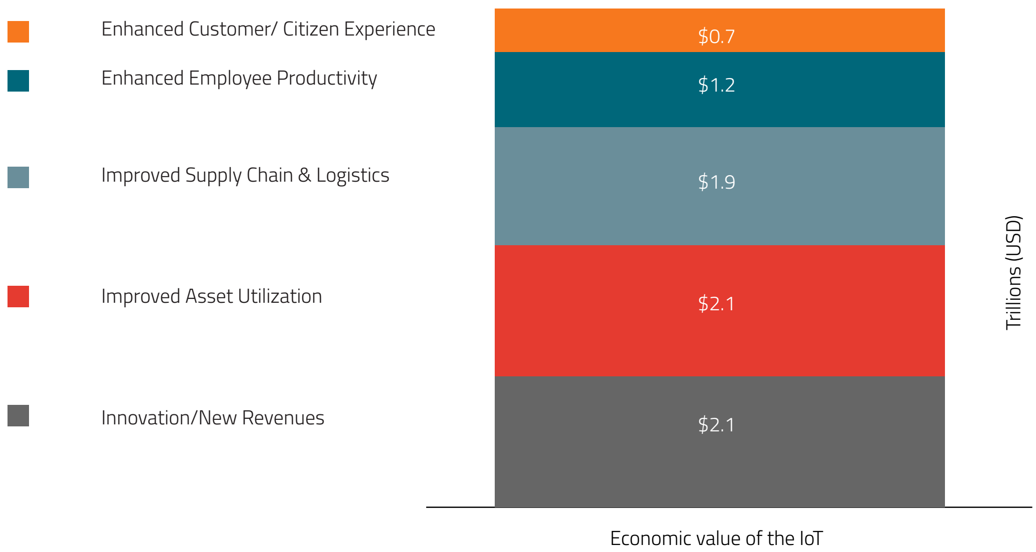
CREATING NEW BUSINESS MODELS

There is also the potential to establish new revenue streams. In fact, 79% of supply chain leaders record higher revenue growth than their industry average.[7] The detailed data collected on asset supply and asset usage is immensely valuable when used effectively. As the adoption rate of IoT devices continues to grow, so will the cases of enterprises creating new business lines or more accurately pricing their services for clients.

For example, industrial leasing companies could use the data collected by IoT devices to reshape their business models. For instance, a rail wagon that is equipped with a tracker can then be sold as a service, with the lease based on an accurate recording of distance traveled and time. Alternatively, instead of providing rental services on a daily or monthly basis, a crane hire company could outfit their machinery with advanced tracking devices that are able to accurately calculate the load lifted and charge based on actual usage, rather than time. Standard LPWA technologies are ideal in these instances as they are low cost, low power and provide broad coverage, even in remote areas. As shown in Figure 2, it is estimated that the IoT could create $2.1trn in economic value from innovation and new business models.

Figure 2: Total global economic value of the IoT

Source: Cisco, DHL



Improving customer experience

With 89% of companies now competing mostly on customer experience,[8] IoT-based asset tracking can allow businesses to create a truly customer-centric supply network and generate a crucial competitive edge. For example, customers can now get complete visibility on where their assets are at any part of the supply chain, including the last mile of delivery. In order to provide this level of service a key element is the cloud-to-cloud integration. The IoT devices in the supply chain have to be able to connect seamlessly and reliably to the cloud wherever they are located. Also, the data has to be transferred efficiently to the client's IT platform, allowing them to run various applications that can create insights from the information. This requires processing and analytics at the source device, so only the most relevant data is transmitted. Edge computing reduces the amount of bandwidth needed, as well as the demands on cloud processing and cloud storage. It also speeds up the transmission of information, allowing for a real-time view of the supply chain.

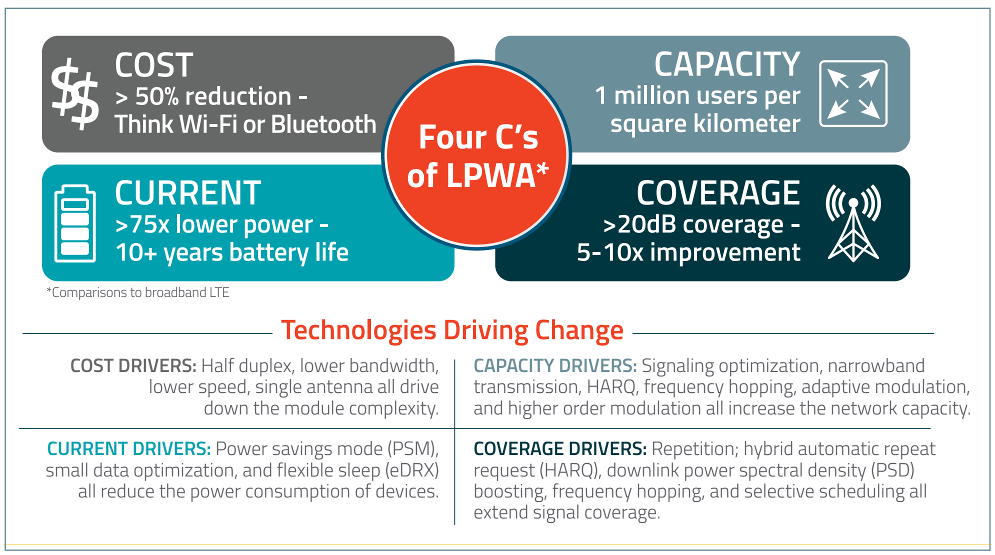
Implementing IoT-based asset tracking across the supply chain

CHOOSING A CELLULAR SOLUTION

Traditionally, it has been considered too expensive to connect devices to a cellular network. However, the development of LPWA has changed the equation. These technologies are perfectly suited for the IoT, as they are designed to transmit small packets of data at lower cost. Although this level of data transmission would be too low for consumer devices, it is suitable for even complex IoT devices, such as sensors. Figure 3 outlines the core benefits of LPWA.

By leveraging globally available and secure cellular networks, there is the potential to connect millions of devices around the world to the internet. However, when taking this approach there is a need to ensure that all aspects of the system – modules, gateways, SIM cards and the cloud platform – are communicating effectively.

Figure 3: The four C's of LPWA



OPTING FOR AN END-TO-END SOLUTION

To realize the full benefits of IoT-based asset tracking, there is a need to harmonize all of the new supply chain technologies into the existing network infrastructure. Having multiple external providers can complicate the transition to a modern asset tracking system, as hardware, software and data insight tools will be supplied by a fragmented range of providers. Managing and integrating all of the different connectivity pieces can cause problems with interoperability or, more seriously, create gaps in security. One of the main factors that is stopping decision makers from embracing IoT programs are concerns around the standardization of IoT infrastructure and whether it will be compatible with wider business systems.

Technical complexity is one of the biggest challenges when it comes to IoT deployments. Having multiple external providers implementing siloed solutions only adds to this. For example, what will happen if some of the solutions have compatibility issues? How will communication be effectively managed between several providers? Who will take responsibility if one part of the system fails? When one provider updates their standards or software, this will also have to be communicated to all other suppliers. This can cause a larger administrative burden and have the potential to cause downtime if all elements are not aligned. Using a single end-to-end provider that designs, implements and runs the asset management solution gives enterprises one point-of-contact for any queries or questions they have during the entire implementation process.

THE IMPORTANCE OF EXPERIENCE

Selecting a provider that has years of experience in not only implementing, but also developing IoT platforms will provide much needed knowledge in deploying complex solutions. It is estimated that 70% of digital transformation projects fail,[9] and this is often due to deficiencies in collaboration, project management and integration. In an IoT project, you have a complex ecosystem to manage between hardware, software and service providers. This is where Sierra Wireless is best positioned to make a real difference, as we bring all of these pieces together to deliver a seamless integration from device to cloud. Indeed, by using a simplified IoT deployment model based on interoperable standards, Sierra Wireless can reduce time-to-market by up to a year. [10]

GETTING VALUE FROM DATA

Data collected from state-of-the-art IoT devices and uploaded to a cloud platform can then be analyzed to unlock previously unknown operation efficiencies. For example, fleet management can be perfected by leveraging data to discover optimum routes that will reduce fuel costs and identify journeys that are inefficient. But to achieve these gains, the company has to be able to access complete and standardized datasets from millions of connected devices. It also needs to collect, sequence, clean and contextualize the data in order to feed the analytics applications. End-to-end managed solutions that allow any devices to be connected to the customer's enterprise platform and provide a cloud service for managing the devices can offer far more functionality than relying on custom solution.

SIMPLIFY DEPLOYMENT AND REDUCE COSTS

Most substantial IoT-based projects are expected to streamline business operations, improve connectivity and analyze data more effectively than before - all without exceeding tight budgets. Due to the many layers needed to form a comprehensive asset tracking solution, companies often fear that they will be complex and difficult to manage. Yet, advanced cloud platforms make tracking assets simple, as all IoT-enabled devices can be managed on a single unified platform.

Meanwhile, LTE-M and NB-IoT technologies have significantly lower processing power memory requirements. This means that IoT-enabled devices will have lower levels of energy usage and be able to last for up to ten years, while still offering constant connectivity. In turn, this has the potential to reduce costs significantly, making it an excellent solution for large-scale deployments.

Conclusion – Start with Sierra

The new generation of asset tracking solutions presents major business opportunities. By partnering with Sierra, companies can benefit from the competitive advantages offered by these cutting-edge technologies. As a leading provider of end-to-end managed tracking solutions, we help forward-thinking enterprises create truly connected tracking networks that utilize the latest LTE-M and NB-IoT standards to provide superb positioning capabilities in an extremely compact size.

Our embedded wireless modules with integrated GNSS can effectively turn any existing device into an IoT-enabled piece of equipment that can be connected to our AirVantage® IoT Platform to not only generate significant cost and energy savings, but also provide an always-on user experience. Implementing our Smart SIM in IoT deployments creates an instantly available solution that will work globally and be highly reliable even in areas with poor coverage. We provide scalable asset tracking solutions to enable applications and manage connectivity, devices and data, giving enterprises the ability to move away from legacy system and embrace the revolutionary potential of IoT.

Start with Sierra Wireless and we will partner with your organization in two main ways. The first involves offering specific building blocks that can be put together by a company in order to create a comprehensive IoT solution for asset tracking. For example, a company could purchase Sierra's advanced wireless modules, Smart SIM and use the AirVantage connectivity platform to build their own IoT system for asset tracking. Or if you prefer to save the development time and reduce your time to market, Sierra Wireless offers end-to-end business solutions for specific industry requirements.

[1] BI Intelligence. '$1.9 trillion of economic value could be created by the use of IoT devices and asset tracking solution.'' Available at: http://uk.businessinsider.com/asset-tracking-in-the-supply-chain-and-logistics-2016-9?r=US&IR=T. Accessed February 2018.

[2] Huffington Post. 'Cisco: Enterprises Are Leading The Internet of Things Innovation'. Available at: https://www.huffingtonpost.com/entry/cisco-enterprises-are-leading-the-internet-of-things_us_59a41fcee4b0a62d0987b0c6. Accessed February 2018.

[3] Entrepreneur. 'Damage Control: Getting Your Shipping Claims Paid'. Available at: https://www.entrepreneur.com/article/226539. Accessed February 2018.

[4] PLS, '3 Global Supply Chain Issues Affecting Your Bottom Line.' Available at: http://info.plslogistics.com/blog/3-global-supply-chain-issues-affecting-your-bottom-line. Accessed April 2018.

[5] Raconteur. 'Rising risks in supply chain'. Available at: https://www.raconteur.net/business/rising-risks-in-supply-chain. Accessed February 2018.

[6] PLS Logistics Services. 'Shocking Statistics about Cargo Theft'. Available at: http://info.plslogistics.com/blog/shocking-statistics-about-cargo-theft. Accessed February 2018.

[7] Deloitte. 'Supply chain leadership'. Available at: https://www2.deloitte.com/content/dam/Deloitte/at/Documents/strategy/supplychain-leadership-report.pdf. Accessed February 2018.

[8] Gartner 'Gartner Surveys Confirm Customer Experience Is the New Battlefield.' Available at: https://blogs.gartner.com/jake-sorofman/gartner-surveys-confirm-customer-experience-new-battlefield/. Accessed March 2018.

[9] IDC. '2016 IDC FutureScape CIO Agenda Prediction 4: 70% Failure Rate of Siloed Digital Transformation Initiatives in 2018.' Available at: https://www.idc.com/getdoc.jsp?containerId=US40550115. Accessed March 2018.

[10] Sierra Wireless Internal Data

About Sierra Wireless

Sierra Wireless (NASDAQ: SWIR) (TSX: SW) is an IoT pioneer, empowering businesses and industries to transform and thrive in the connected economy. Customers Start with Sierra because we offer a device-to-cloud solution, comprised of embedded and networking solutions seamlessly integrated with our IoT services. OEMs and enterprises worldwide rely on our expertise in delivering fully integrated solutions to reduce complexity, turn data into intelligence and get their connected products and services to market faster. Sierra Wireless has more than 1,400 employees globally and operates R&D centers in North America, Europe and Asia.

For more information, visit www.sierrawireless.com.