senaya

# PALLETS AND RETURNABLE ASSET TRACKING

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Across asset supply chains, the ability to reduce the cost of asset loss, increase asset cycle time, and reduce asset damage have been constantly challenged due to lack of visibility of asset movement. By enabling visibility of any asset, anywhere, and at any time, we can automate the counting and tracking processes that are required to provide real-time event information. This allows for the opportunity for intervention, ultimately resulting in a faster and more accurate asset pool creating strategic and more collaborative new business. In turn, the visibility of assets allows customers to gain insights into the path, the environment and the handling conditions their products are exposed to through their supply chain. With enhanced visibility across the supply chain, the potential benefits of Internet of Things (IoT) are proving to be substantial for both asset owners and asset users.

# THE NEED FOR VISIBILITY

Optimized supply chain management is based on the premise of getting more done in less time and with fewer resources. With an extensive and complex supply chain, asset owners find that traditional asset management is time-intensive, largely based on manual procedures and is prone to human error. In addition, it is considered that there are behaviors within the supply chain that contribute to the loss of assets, reduced velocity of assets, and enhance damage impairments. It is hard to track and manage what you can't see.

**End-to-end visibility facilitates more accurate, timely reporting to provide the business information to answer some very familiar questions:**

- What are the supply chain breakpoints where asset loss and damage happens?
- Where do the lost assets go?

- Which locations are responsible for more shocks or poor environmental conditions impairing the condition of the asset?
- What is the true cycle time of an asset?
- Where are assets being reused or dwelling longer than anticipated?

By developing an understanding of the location, frequency, and severity of the actions that causes the impairments in velocity, loss, and damage, asset owners can develop mitigation strategies and/or develop collaboration opportunities with customers. Asset users can obtain the same level of visibility of their own supply chain as it affects the products that are loaded to these assets. They can troubleshoot impairments in their supply chains and ensure on time and quality products even offering consumer's full traceability.

# THE CHALLENGE

**In order to get the type of information needed to mitigate problems, and offer strategic opportunity for growth, asset visibility across the full supply chain – upstream and downstream is required.**

It has always been very difficult to have all players in a supply chain to collaborate to provide this information, and therefore there is a clear need for a technology that allows for an asset to report its location and the environment it is in, without the need for any infrastructure at any location, and provide reads both indoors and outdoors.

Any device attached to a movable asset in the supply chain must meet some very specific requirements. The tracking unit must be a specific (small) size yet have a useful operational life; the unit must be non-flammable; the batteries must withstand an extended temperature range; the tracking unit needs to meet food safety standards at all times; and the unit has to be completely compliant with the appropriate industry standards and regulations (FCC, RoHS, UL, etc.). Besides these difficult requirements, the tracking device must be significantly durable, so that it can withstand the rigors of a harsh supply chain including being run over by a forklift.

# THE SOLUTION

**The Senaya Asset Intelligence platform can stand up to this challenge, with a combination of technology and design customized to maximize performance for Supply Chain.**
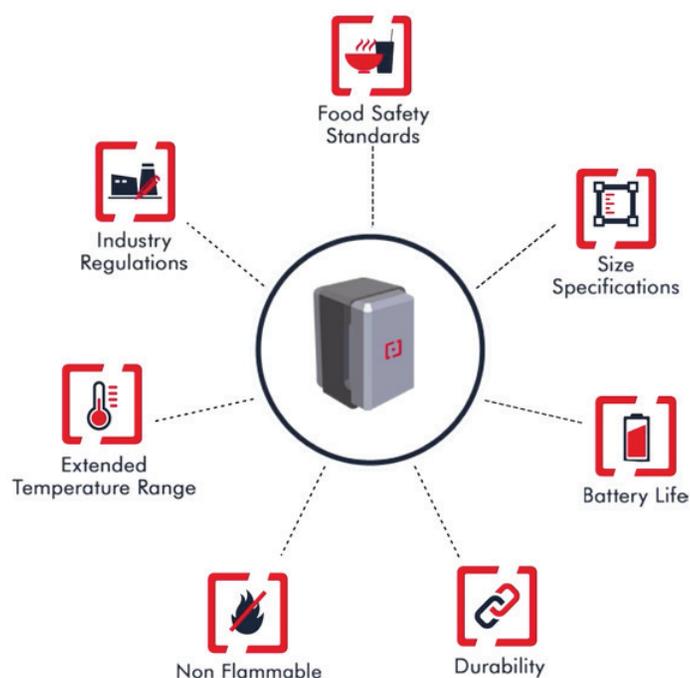
This infrastructure-free, cloud-enabled, fog-based, scalable, asset management solution provides the visibility on location, environment, usage and handling across the full supply chain. This also provides financial benefit for low capital
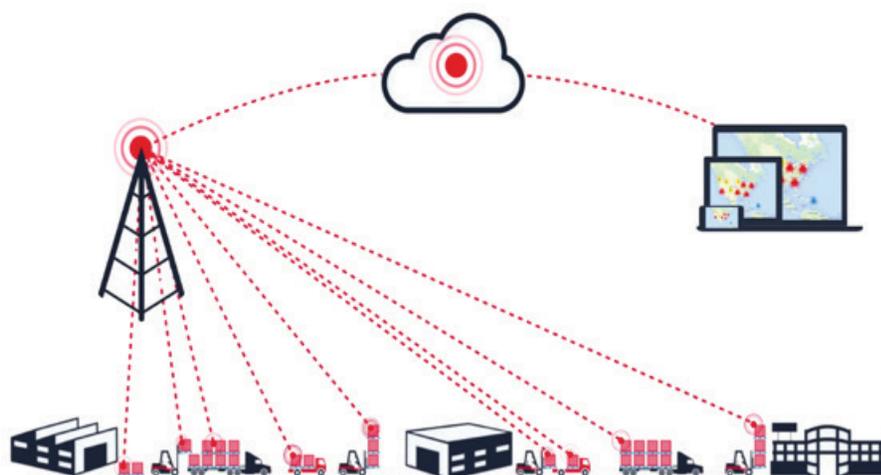
**In order to meet this challenge for the supply chain, some mission critical design and functionality considerations.  It covers three functions:**

# DEVICE INTELLIGENCE

**1. The Physical Design** - After extensive field-testing, the smart tag design has been customized to ensure the required performance, functionality and compliance is maximized for supply chain. This innovative design considers antennae design to enable sensory device placement in or on an asset and is optimized for indoor and outdoor performance. Size and shape restraints to fit such technology in an asset means state of the art form factor design and housing. To further complicate the design, the inclusion of metal casing for battery safety impact both the size and strength due to the possible interference from the metal.



Food Safety Standards

Industry Regulations

Size Specifications

Extended Temperature Range

Battery Life

Non Flammable

Durability

Despite all of these challenges, Senaya has successfully built their Smart Tag that meets all of these challenges and the rigorous industry certifications.

**2. Event based communication and learning** - After initial testing, it was identified that a device that reports its location back on a timed interval (e.g. once every 12 hours) alone does not deliver the supply chain transparency required. An asset needs to report its movement and other critical event information to allow for each link in the supply chain to be observed.

Senaya Asset Intelligence combines motion sensors with the intelligence of movements within the supply chain so that an asset can report based on a business event, more specifically, inbound and outbound movements. The intelligence of the solution continues to learn more about a supply chain, and as more motion data is collected and analyzed, a sequence of specific motions has been 'learned' to be a specific event.

**3. Sensing** - With the location information providing the visibility requirements, additional information about the environment provides even more information to allow asset owners and users even greater insights into the handling behaviors that effect reusable assets.  Some of these include - temperature monitoring, motion recording, and impact reporting (high velocity impact).

This information provides insights into 1) reuse within a location; 2) poor handling behaviors resulting in damage, as seen through the impact reporting; and 3) insights into how temperate can affect the reusable asset behavior and the goods on them.



Able to track temperature over span of full cycle
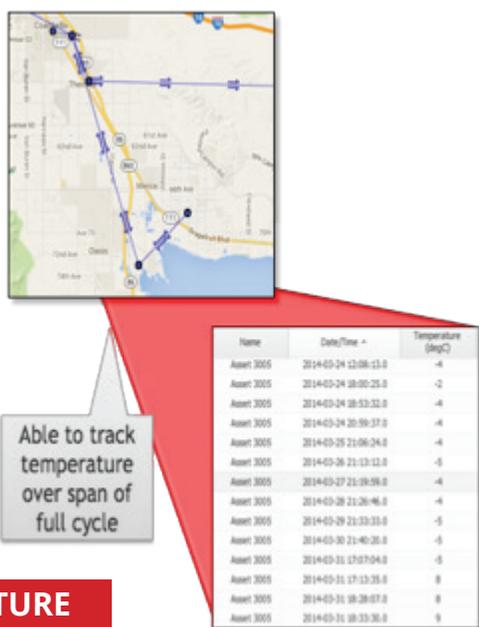
**TEMPERATURE CONDITIONING**
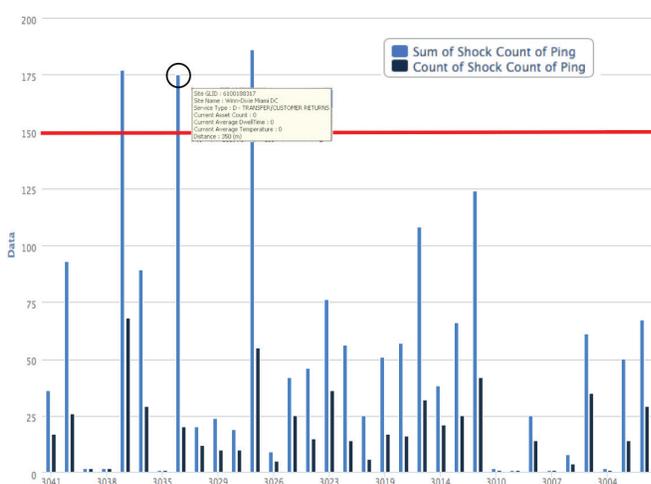


**DAMAGE FORENSICS**

**4. Battery Safety** - The SmartTag is a battery-powered device. Standard off the shelf batteries could not be used due to the potential fire and safety hazards and due to the extreme environmental requirements of the assets (winter in Alaska, and summer in Arizona). There are no wirelessly rechargeable batteries available today to meet these requirements. After extensive evaluation, Senaya has partnered with a battery manufacturer of military grade batteries with a super capacitor and intelligent battery management. This battery has been verified as the most optimal performing solution for these extreme conditions.

**5. Certified and Rugged for Supply Chain** – The Senaya SmartTag has been ruggedized for use in extreme situations in the supply chain. The SmartTag is IP67 rated for dust and water protection. Extreme design considerations have been taken to protect the battery and thereby the SmartTag and the asset and finally the goods on them from any potential chemical exposure from a leaking battery. The SmartTag also has an enclosure that is built with a material that is self-extinguishing. The SmartTag has also been certified for multiple key certifications – Carrier Certification (CDMA – Sprint currently, Verizon in progress; GSM – Vodafone, others in future), FCC, IP67, UL, FDA, RoHS, and FM. Importantly, the SmartTag is designed to be airplane mode compliant; and Intrinsically Safe (IS) and will get certified for both these capabilities based on customer demand.

# THE COMMUNICATIONS

The Senaya SmartTag reports its location (latitude and longitude) along with detailed sensory information. The Senaya solution can give accurate location based on GPS but in specific supply chain environments (inside warehouses, during transportation, etc.) situations where the tag is not able to get clear line of site access to the satellites in the sky, the solution is also capable of giving building level accuracy without GPS.

To further assist this, there is innovation built into the solution from Senaya called 'Smart Location', which effectively continues to 'learn' about the spread of pings and the actual location they are referring to. This provides a greater level of location accuracy, which will continuously improve as more assets are deployed and the data is built up. This results in supply chain reporting, and matching the 'ping' of an asset to a known location, and matching to an unknown location for insights into where assets are going when they are leaving the network.

Unlike traditional asset tracking systems, the Senaya devices connect directly with cellular networks eliminating the need to purchase and deploy any additional networking hardware. The device uses an encrypted and secure cell-based communication channel to push the data it gathers directly to a cloud-based server. All the data on the device and server is also encrypted to ensure total data security. To ensure there are no breaks in communication between the devices and our server, Senaya's advanced hardware performs all updates over-the-air.

Fully certified by the FCC, the Senaya tags contain a combination of the following communication technologies: CDMA; GSM/GPRS; PASSIVE RFID; 3G/WCDMA; ZigBee; CHIRP; GPS; WiFi; BLE

# THE DATA CLOUD

The Senaya solution platform has four building blocks. The first is the multi-modal communication module, the second is the power management module the third is the sensor module and these three blocks, or modules, combine to create a comprehensive tracking solution with devices that record critical location and sensory information and send it back to the Senaya visualization platform – Asset Intelligence.

The fourth block is the business intelligence visualization platform, which enables business analytics, event alerts, and notifications – all on a secure cloud platform. The Senaya Asset Intelligence platform integrates enterprise master data with the location and sensorial information from Senaya edge devices to deliver business intelligence tailored to customer's specific business needs. Reports and charts provide information including transit time, dwell time, and cycle histories, while custom alerts can send notifications based on a specific event or a change in condition. One can even build a custom library of reports with complex queries and rules. Reports on the state of assets are easily accessible over the web, allowing for continuous monitoring on any internet-connected device and enable more informed business decisions and predicative analytics.

**SUPPLY CHAIN VISIBILITY**

**DWELL TIME ANALYSIS**

**TRANSACTION REPORTING**

Cycle Time by Vertical

Average of Cycle Time (days)
Maximum of Cycle Time (days)

200

150

100

50

0

Dairy Foods | Beverages | Produce | Paper Products | Canned Food | Frozen Foods | Durable Goods | Meat & Fish | Poultry | Snack Foods | Pet Foods

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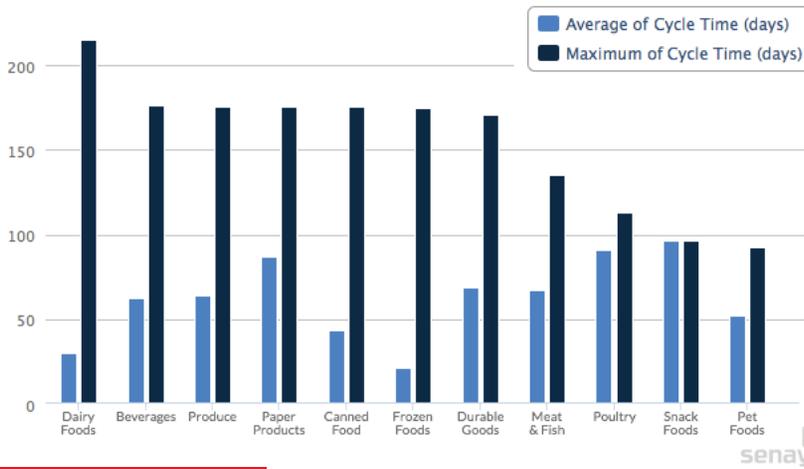
**CYCLE TIME ANALYSIS**

# THE BUSINESS SOLUTION FOR EVERYONE IN SUPPLY CHAIN

The Innovation for a smarter asset is not just about the technology, but creating an end-to-end supply chain solution to deliver powerful business information. The power of the Senaya Asset Intelligence solution opens the door for an entirely different way of doing business with previously unattainable visibility and tangible return on investment.

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