Vehicle, Container, or Package Tracking: What's Right for You?

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Logistics visibility has evolved to a level of granularity where you can monitor every single parcel shipped, and you can make prompt, relevant business decisions based on the location and condition of your packages. But do you really need that level of granularity or can you manage with superficial data?
It Depends.

If you are a fleet owner, a vehicle tracking or telematics system may work just fine for you. Even then, it is advisable to go for the newer type of fleet tracking devices that work by plugging into the OBDII port of your vehicle and have a battery backup of at least a week. They are more reliable than traditional GPS vehicle trackers that are wired to a vehicle's battery, and they can collect a lot of information about your fleet such as acceleration, engine health, etc.

> If you are not a fleet owner though — you're handling shipping yourself, or perhaps you are a 3PL using market vehicles — you ought to think about using an IoT package-tracking solution. With an IoT enabled parcel tracking solution, you will have a choice between monitoring your consignment at a container level by using a GSM gateway hotspot as a stand-alone system, or monitoring at a package-level by supplementing it with BLE beacons.

To help you chose the right solution for your business and make a smart investment in supply-chain visibility, let us explore how logistics tracking technology has evolved from providing visibility at a fleet level using GPS to track containers to locating specific packages in a consignment using hybrid IoT technologies. We will look at the technologies involved, the problems addressed, their individual benefits, and the drawbacks of each of the following revolutions in smart logistics:

1.0 Vehicle Tracking System in Logistics — Connected Fleet

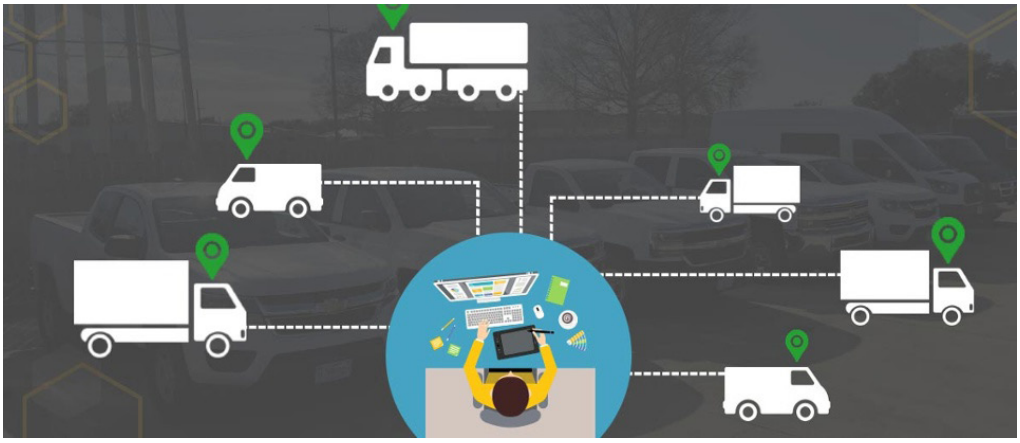
2.0 Container Tracking — Connected Cargo

3.0 Package Tracking — Connected "Things" Using Hybrid IoT (GSM/BLE/Wi-Fi)

Logistics Tracking 1.0: Vehicle Tracking System in Logistics — Connected Fleet

The connected fleet model, which consists of vehicle tracking systems or telematics systems with fleet management software, functions on the principle that by getting the location of trucks,

the goods they are carrying can be traced.



Real-time GPS vehicle tracking or fleet management gave rise to the notion that logistics visibility could be achieved by tracking all the fleets in the world. This is known as the "connected fleet" model in smart logistics. But, connected fleet turned out to be a failure because fleet-level data about cargo movements could not provide actionable intelligence to enable informed business decisions.

What Are Vehicle Tracking Systems or Fleet Telematics?

GPS vehicle tracking systems or telematics systems use GPS/GSM based tracking devices that are wired permanently onto trucks. By using a GPS vehicle tracking device, you can get the location and other information about the fleet that carries your consignments.

How Does Fleet Management Work?

A GPS/GSM vehicle tracking device uses GPS satellite data to determine its position, and then transmits its position in real-time through a GSM based cellular network. The GPS vehicle tracker draws power from the vehicle's battery to report its location in real-time. Sometimes, GPS vehicle trackers have other sensors wired to them that tell you more about it such as the vehicle's fuel levels, driving patterns, ignition status, etc. When you get more information about the vehicle than just 'location', it is commonly referred to as a fleet management system or telematics.

How to Install GPS Vehicle Tracking Systems?

Telematics devices need to be wired permanently to the truck. This means that it usually involves a one-time installation done by a trained technician without which there may be a risk of

downtime or even worse, the possibility of damaging the electrical circuitry of the vehicle.

The primary drawback of a GPS-based vehicle tracking system is that you or your 3PL will not be able to install this system easily on a rented truck or market vehicle. Their installation largely depends on the vehicle-owner and involves labor in wiring the GPS tracker onto the truck.

How Much Does Vehicle Tracking Cost?

The vehicle tracking industry typically works on hybrid CAPEX-OPEX model where the tracking device is a one-time purchase and the portal which provides the tracking data and reports is a monthly subscription. GPS vehicle trackers cost anywhere between $30 to $200+ based on the quality of the device and the additional fleet tracking sensors that you need. The monthly subscription cost depends on your service provider.

What are the Benefits of GPS Fleet Tracking?

The main benefits of GPS fleet tracking systems are:

- **Smart route planning:** That help you find the optimum route for your vehicles.
- **Transit time saving:** Use data to select shortest and fastest routes and streamline trip schedules.
- **More trips per truck:** Get faster truck turn-around times by analyzing GPS data.
- **Better fleet management:** Use data to eliminate vehicle idle time, reduce over-speeding and decrease fuel consumption.
- **Alerts:** Know if your truck has broken-down on a highway and dispatch help.

Drawbacks of the Telematics System & Why It Ultimately Failed

Here are some reasons why vehicle tracking as a logistics tracking solution could not scale:

i. Cannot track "market vehicles": Most companies, big or small, seldom own their fleet. They typically book consignments through their logistics service provider or a 3PL, who in turn, hires a market vehicle for the trip.

What is a Market Vehicle?

When a company wants to ship their products from say Cincinnati to Los Angeles (LA), they call their logistics service providers or 3PLs to arrange a pickup at the origin 'Cincinnati'. A vehicle is in turn sourced on a "per-trip basis" in the Cincinnati area by the logistics service provider to haul the items over to LA. This type of a vehicle hired on-demand is

> referred to as a “market vehicle”. Market vehicles constitute more than 80% of surface hauls across the globe.

Market vehicles seldom return to the origin after delivering the consignment at a destination. Instead, they are sourced by a different logistics service provider for another shipper. In such cases, it is extremely hard to get shipment visibility because the shipper has no insight into whether the market vehicle has a GPS tracker on it or not, and even if it does, it could be hard to extract that data because the device — with its data logs — is with the truck owner, not you.

ii. Cannot track multi-modal shipments: Let us assume that your shipment completes part of its journey via road and part by air and rail. In such a scenario, especially if market vehicles are involved, it would be hard to capture and integrate location data throughout the surface, air and rail journey.

iii. Cannot track LTL consignments: Less than Truck-Load cargo (LTL), also known as Less than Cargo-Load (LCL) shipments, could be travelling across market vehicles or across multiple modes of transport. Therefore, you will not get visibility of your cargo across the entire trip by tracking the vehicle alone.

iv. Condition of shipment is as crucial as location: Proper handling and maintaining specific conditions such as temperature, humidity, or pressure for perishables and fragile goods is as important as tracking its location.

> An anomaly in transport conditions could be dangerous, especially when it comes to pharmaceutical products. Vaccines lose their efficacy if they aren’t stored at the right temperature during their journey. Electronics items could undergo irreparable damage if handled poorly during transit too.

Therefore, temperature, shock, or vibration sensing becomes an important part of logistics tracking, something that existing fleet management systems cannot address.

v. Prone to tamper: Since the GPS vehicle tracking device draws power from the battery of the vehicle, it is prone to intentional or unintentional tamper, especially during vehicle repair and maintenance. Wiring that gets messed up when the vehicle’s electrical system is serviced is pretty commonplace.

Overall, vehicle tracking focuses on visibility by tracking a fleet. It works well when it comes to monitoring cabs or personal cars but doesn't work great for real-time logistics tracking.

Logistics Tracking 2.0: Container Tracking — Connected Cargo

A container tracking system (or the connected shipments or connected cargo approach) functions on the principle that by monitoring the containers you ship, you can gain visibility of your consignments without relying on your logistics service provider.

What Is Container Tracking?

Container tracking is the process of tracking a shipment at a container or trailer-level by fixing an IoT device inside or outside the container. The device communicates its location (similar to a vehicle tracking device), and the other parameters it captures, to the portal server through a cellular tower.
By tracking containers or trailers, you can get visibility at a container or shipment-level, eliminating the need to rely on the vehicle that is carrying your shipment. It solves the problem of real-time visibility on multi-modal transportation, tracking LCL cargo, and the condition of your goods.

How Does Container Tracking Work

Container tracking devices can either be placed inside the container with the rest of your goods, or they can be attached to the container on the outside. The biggest difference between vehicle tracking devices and container tracking devices is that vehicle tracking devices draw power from the vehicle's battery, while container tracking devices are wireless and self-powered.

i. Container Tracking Device (Externally placed)

Such devices send out GPS location and tamper data via a cellular tower. Since they are placed outside the container they can sense any unauthorised attempt to open the container and generate tamper alerts.

ii. Shipment Monitoring Device (Internally placed)
Shipment monitoring devices can monitor the conditions of goods inside a container in addition to its location. Condition parameters include: temperature, pressure, humidity, vibration, shock, etc. These devices use cellular triangulation as a backup to get a location fix since GPS signals don't easily penetrate a container's metal walls, and hence, aren't always available.

The Bee is an example of a Shipment Monitoring Device that can be used inside the container.

See how the Bee works.

https://roambee.wistia.com/medias/6jp15tnapr

These devices (internal or external types) communicate with the portal through GSM networks or Wi-Fi to provide you with real-time information and data analytics.

How to Install a Container Tracking System?

Installing external container tracking devices involves closing the container door after loading your goods and affixing the device's claws to the container's latch. It does not require a trained technician, but you do need to train the staff that's in charge of attaching these devices to your containers. Devices that are placed inside the container do not need any installation, but they must be placed thoughtfully to ensure that:

- They don't break down or get damaged in-transit.

For example, you need to ensure your sensors are placed such that they don't get crushed if/when the contents in your cargo shift or jerk in-transit.

- They're placed at the most relevant spot in the container.

For example, you need to place your sensors in or near vulnerable temperature zones of the container such as its "hot spot" or "warm zone" when it comes to tracking temperature-sensitive cargo.

How Much Does Container Tracking Cost?

Container or shipment tracking solutions typically cost anywhere between 30% to 100% higher than GPS vehicle tracking systems. Container tracking software, especially ones that handle devices and work inside metal containers are priced slightly higher due to the need for additional functionalities such as cellular triangulation, telco based location services, and shipment condition analytics that are necessary to make information readily available, and by extension, actionable for you.

> **When you invest in container tracking devices, it is important to go with an OPEX plan and to get your IoT solution provider to help you with its reverse logistics. Losing one could be costly!**

Although the cost is incremental, the overall ROI of shipment monitoring will be higher than vehicle tracking because you will not only know where your consignment is, but also know what is happening to it at any point of time — with 0% dependence on your transport company. This puts you in better control when it comes to averting theft, spoilage, and ensuring timely deliveries.

Benefits of Container Tracking

- Zero reliance on the vehicle owner or provider – you can track your own shipment.
- Ability to monitor loads shipped across market vehicles, LTL, or multi-modal shipments.
- Ability to view the condition of your shipment in addition to its location, improving actionable response.
- Less prone to tamper when compared to GPS vehicle tracking devices.

Limitations of Container Tracking Systems

The limitations of container tracking or the connected consignment model are:

i. Reverse logistics: As container tracking devices are portable as well as expensive to dispose of after use on a single shipment, they necessitate a reverse logistics operation to be put in place. This is one of the reasons go in for a fully managed OPEX model where your solution provider takes ownership of this recurring reverse logistics activity.

Learn how you can find and evaluate if your IoT solution provider is right for you.

ii. Inability to obtain visibility into specific zones inside the container: A device placed inside the container cannot give you visibility into the condition of individual packages in that container. Technologies like RFID that are used for item-level tracking inside a warehouse, cannot be extended to your logistics or in-transit movements.

See why RFID lost out to newer technologies like BLE.

iii. Cost of tracking at an individual parcel-level could be high: If you are moving a hundred LED TVs in a container, monitoring every single television is possible by slapping on a wireless shipment monitoring device on each one of them. But, your cost could become extremely high, making the overall value proposition unviable.

Overall, container tracking — or the connected cargo model — helped supply chain and logistics professionals get actionable, real-time data without relying on their logistics service providers, but they couldn't get down to package-level or item-level visibility.

Logistics Tracking 3.0: Package Tracking Using Hybrid IoT (GSM + BLE + Wi-Fi)

With container tracking paving the way for monitoring shipments (versus fleet), the challenges it posed — like the inability to secure individual packages within a consignment — stoked the need for visibility at a whole new level of granularity — Packages.

> **Package or parcel tracking – a solution that leverages GPS, GSM, Bluetooth Low Energy (BLE) Beacons, and Wi-Fi technologies to provide visibility at a parcel level.**
> **This hybrid technology helped bring out the true meaning of the Internet of "Things", because every item on your consignment-note can now be monitored as an individual unit.**

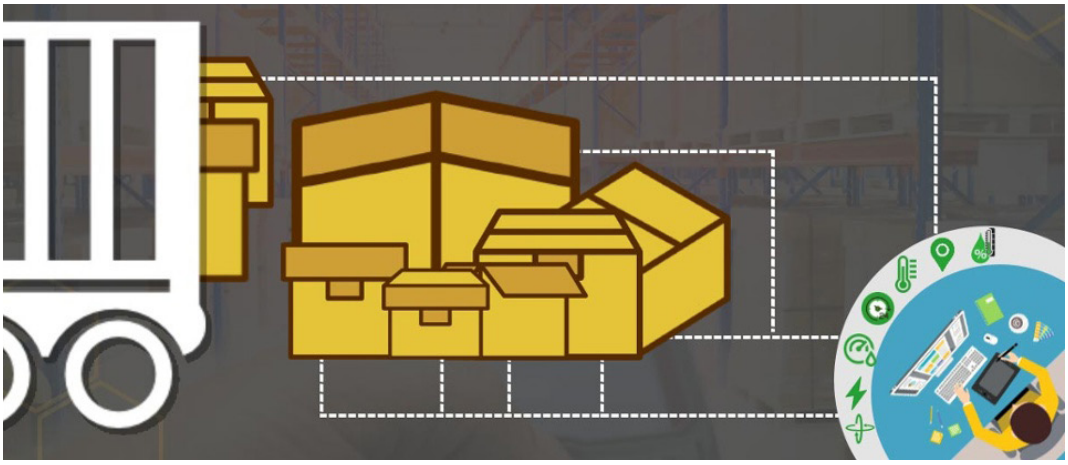
This opened limitless applications in logistics, and elevated supply chain security and delivery-confirmation to a new level.

How Does Package Tracking Technology Work?

To monitor individual parcels inside your consignment:

i. Drop BLE beacons into each package inside the container. Beacons can also carry sensors to

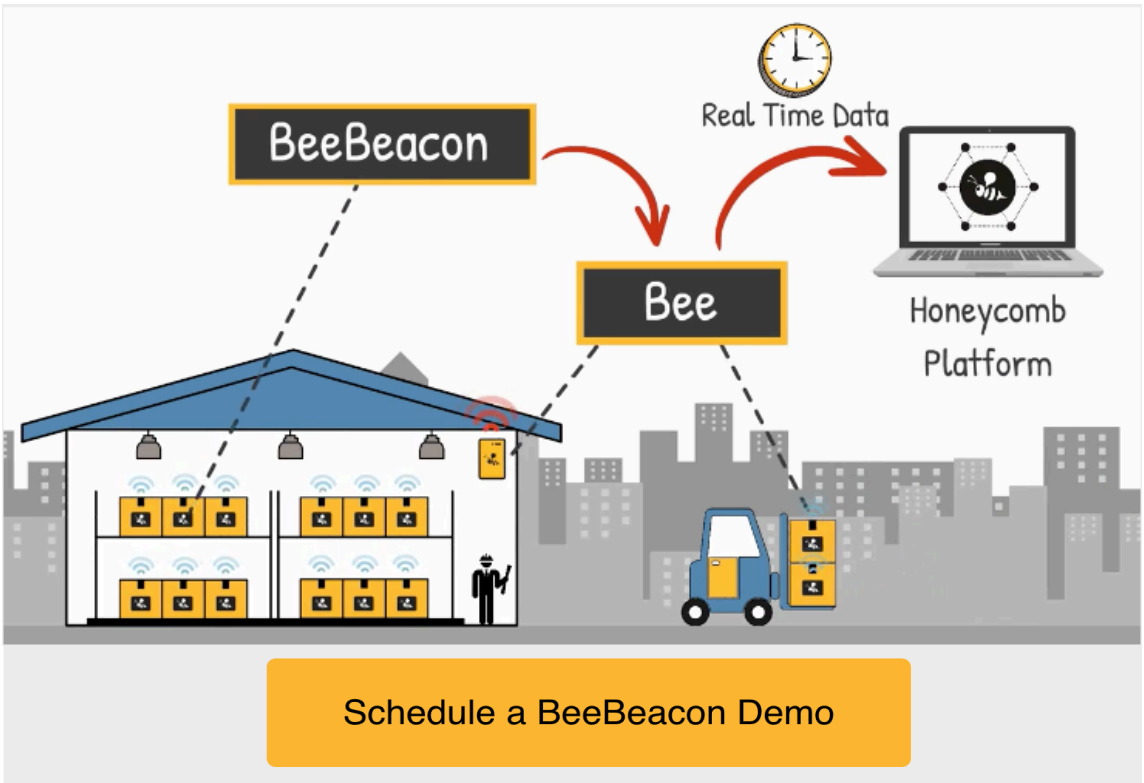
monitor temperature, pressure, humidity, shock, and so on.



ii. Use a gateway hotspot to monitor your container or trailer, and keep track of the beacons/ packages in it. A gateway hotspot is any GSM device that can monitor its location as well as sense BLE beacons in its vicinity (typically within a 30-meter radius). You can also use your mobile phone as a gateway hotspot if it has Bluetooth 4.0 functionality.> Wi-Fi usually kicks in as a backup in these devices when GSM connectivity is not available, such as in a closed warehouse or at a remote location where cellular tower density is low.

The Bee+BeeBeacon solution is the industry's first in-transit parcel-level monitoring solution. A device called the Bee acts as a gateway hotspot and the BeeBeacons are your BLE tags.

See how they works together in sync!



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