

# A QUICK GUIDE TO IOT ASSET TRACKING



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# WHAT IS IOT ASSET TRACKING?

IoT asset tracking is the application of IoT technology to asset management. It connects tagged items in your inventory - transportation, people, shipments and such - to your asset management ecosystem and gives real-time insights into where each item is in the world, how far along it is in your supply chain, and how long it takes each item to move through it.

Many industries can minimise human errors, losses and theft by replacing manual asset management with real-time location systems (RTLS) tracking. Gaining real-time insights and data into what is happening to the asset can improve logistics, resource management and security.

This guide will cover everything your organisation needs to know about IoT asset tracking. We'll go through the basics, the different types of asset tracking available to you, the benefits effective asset tracking can reap, and various use cases for real-time IoT tracking.

# TYPES OF IOT ASSET TRACKING SOLUTIONS

One of the first things you'll want to decide on when investing in IoT asset tracking is the type of tracking technology to rely on. RTLS solutions have a broad range of use cases and depending on what your business needs, you will need to start by asking:



## Where are your assets going?

Do you need a solution on global or local scale? Do you need to track assets indoors, outside, underground or in remote locations. There are different asset tracking solutions depending on what your asset route is - some are designed for indoor and some can track your cargo anywhere in the world.



## What do you need to track and how often?

Do you need to track your asset in real time or once per day? How much data do you need your asset to send - just location time-stamps or maybe weather condition and real-time asset status. You may need a data-heavy real-time asset tracking solution or one that sends just a few bytes once in a while.



## How secure do you need your solution to be?

Do you need your asset tracking solution to have the highest level of security with limited user access? Do you need to know the exact location of your asset within centimeters or is approximate location sufficient?



## How much power are you looking to use?

Some assets require low-power tracking solutions, while dynamic assets may need to send frequent updates on the location. If you are an OEM, you may encounter device limitation for embedding your trackers.

Below is a breakdown of the most popular long and short-range asset tracking options available to businesses right now:

# LONG AND WIDE RANGE ASSET TRACKING

## GPS

The Global Positioning System (GPS) is a satellitebased navigation system developed by the US Government. It uses global satellites to triangulate the location of an asset by sending and receiving several signal types to a set of 4 satellites in position. It is part of the GNSS and one of the GNSS most accurate systems.

GPS trackers are the most widely used type of trackers, which makes them a ready-available low-cost option. They are also a suitable low-power option. Current system accuracy is within 3m or 95%.

The system is ideal for tracking assets that travel around the world on long routes and through remote locations.

### + Pros

- Low-cost
- Widely available
- Remote location penetration

### - Cons

- Uses only GPS satellites
- Transmits only location data
- Doesn't work indoors or underground
- Can be influenced by weather conditions

## GNSS / SATELLITE

Satellite tracking utilises the Global Navigation Satellite System (GNSS) that encompasses a number of international navigations systems, among which GPS, GLONASS, Galileo and BDS.

GNSS tracking determines the position of an asset by measuring the time it takes the signal to reach from orbit. Sending and receiving signals from the orbital satellite also means the strength of the signal is influenced by obstacles, so this type of tracking is not suitable for indoors and underground.

GNSS trackers are compatible with all navigation systems within the network, which makes them a good option for global scale operations that require more frequent updates.

### + Pros

- Low-cost
- Largest number of navigation satellites
- Remote location penetration

### - Cons

- Prone to security risks
- Doesn't work indoors or underground
- Can be influenced by weather conditions

## CELLULAR

Tracking assets with cellular connectivity relies on getting location data from nearby cell towers. Each tower location is mapped within a global database and by passing in proximity of one, the tracker sends an update that is currently in its vicinity.

Cellular tracking is currently the most popular solution for IoT, because it supports highly accurate location tracking with real-time and high-volume data capabilities.

This solution type is suitable for highly mobile assets, such as road vehicles and cargo, where location stamps and asset status data is needed on a regular intervals.

With the advancement of 5G, cellular tracking accuracy is expected to increase even further.

### + Pros

- Reliable connectivity
- Robust IoT capability
- Global coverage
- Can be utilised in suboptimal terrains and weather conditions
- Scalable

### - Cons

- Accuracy falls with reduced numbers of cell towers
- Implementation may require technical expertise
- Could be expensive on a global scale

## LPWAN

Low Power Wide Area Networks are a subset of cellular connectivity that has been developed specifically for the IoT industry. It includes networking options like NB-IoT and LTE-M.

LPWAN solutions exist to make cellular connectivity more affordable, secure and less power-intensive by transmitting data with a shorter, weaker signal. While the hardware for LPWAN is similar in price to cellular, it can cut down on networking costs.

LPWAN solutions create an internal network subset, hence the increased security and are perfect for tracking assets within the designated area. Examples may include shipping docks, construction sites, farms and such, where the assets are expected to remain on premise.

### + Pros

- Very secure
- Reliable connectivity
- Low power consumption
- Robust IoT capability
- Scalable

### - Cons

- Costly setup
- Limited range
- Requires technical expertise and a dedicated team
- Fewer towers

# SHORT-RANGE ASSET TRACKING

## ULTRA-WIDE BAND

Ultra-wide band has grown in popularity in recent years thanks to its high level of accuracy. It can detect assets with centimetres and remains accurate in the face of interference.

UWB uses precision tracking anchors to define an operational space and uses radio signals to track tagged assets within it. Because it uses a wide bandwidth, it does not interfere with other transmissions, making it ideal for indoor use cases.

Tracking with UWB is based on several methods. Your tracker can calculate positioning based on the signal send and arrive times or the angle of arrival.

UWB is a popular choice for warehouse logistics, entertainment, sports and any other case that requires high precision tracking.

### + Pros

- Very accurate
- No interference
- Wide bandwidth
- High data rate for short range
- Low power consumption

### - Cons

- Requires anchor set up
- Not suitable for outdoors
- Short range

## BLUETOOTH

Tracking via Bluetooth is based on measuring the signal strength of the Bluetooth receiver compared to the Bluetooth beacons within range. This is the so called received signal strength indicator or RSSI value.

With the advancement Bluetooth 5.1, the technology has incorporated tracking via angle of arrival (AoA) and can produce real-time meter accuracy and direction finding.

Much like UWB, Bluetooth tracking solutions are often used for indoor logistics, where you can set up the beacons and define the tracking space for best results.

### + Pros

- Low cost
- Low power consumption
- Standardised tech
- Simple adoption
- Meter-level accuracy

### - Cons

- Not suitable for outdoors
- Accuracy relies on the number of beacons
- Short range

## WI-FI

Wi-Fi is unique among the IoT asset tracking options thanks to its ability to transmit large quantities of data in a short amount of time. It's fast and reliable, making it ideal for short-range data transmission.

On the other hand, Wi-Fi is less than ideal when it comes to accuracy. It relies on triangulation and is only accurate within 15m. It's expensive as well, especially when supporting more than ten to twenty devices.

Wi-Fi uses RSSI technology, much like Bluetooth to track assets via the signal strength, and can leverage angle of arrival in some cases.

### + Pros

- Supports high-data volumes
- Simple implementation
- Real-time capabilities
- Inter-operable

### - Cons

- Prone to interference and network congestion
- High power consumption
- High cost
- Doesn't scale
- Security risks
- Short range

## RFID

The last type of IoT asset tracking to consider is RFID tagging. RFID is a passive form of asset tracking because it cannot pinpoint a device's location. Instead, it just reports whether or not a particular RFID tag is within range of an RFID scanner.

For instance, you could have a handheld RFID scanner that only detects tags within a few centimetres of the scanner. Or you could have a scanner with up to 800m of range that alerts you whenever a tag enters that range.

Although RFID can't provide precise location information or transmit data, it is available in various form factors and ranges. It doesn't require a battery and is very low cost. RFID is highly susceptible to interference, though, which is important to keep in mind.

### + Pros

- Low cost
- No power requirement
- Relatively flexible range

### - Cons

- Doesn't transmit exact location or other types of data
- Requires reader setups
- Highly susceptible to interference

# HOW IOT ASSET TRACKING WORKS

Asset tracking relies on having **three technologies** working together:

## Tags

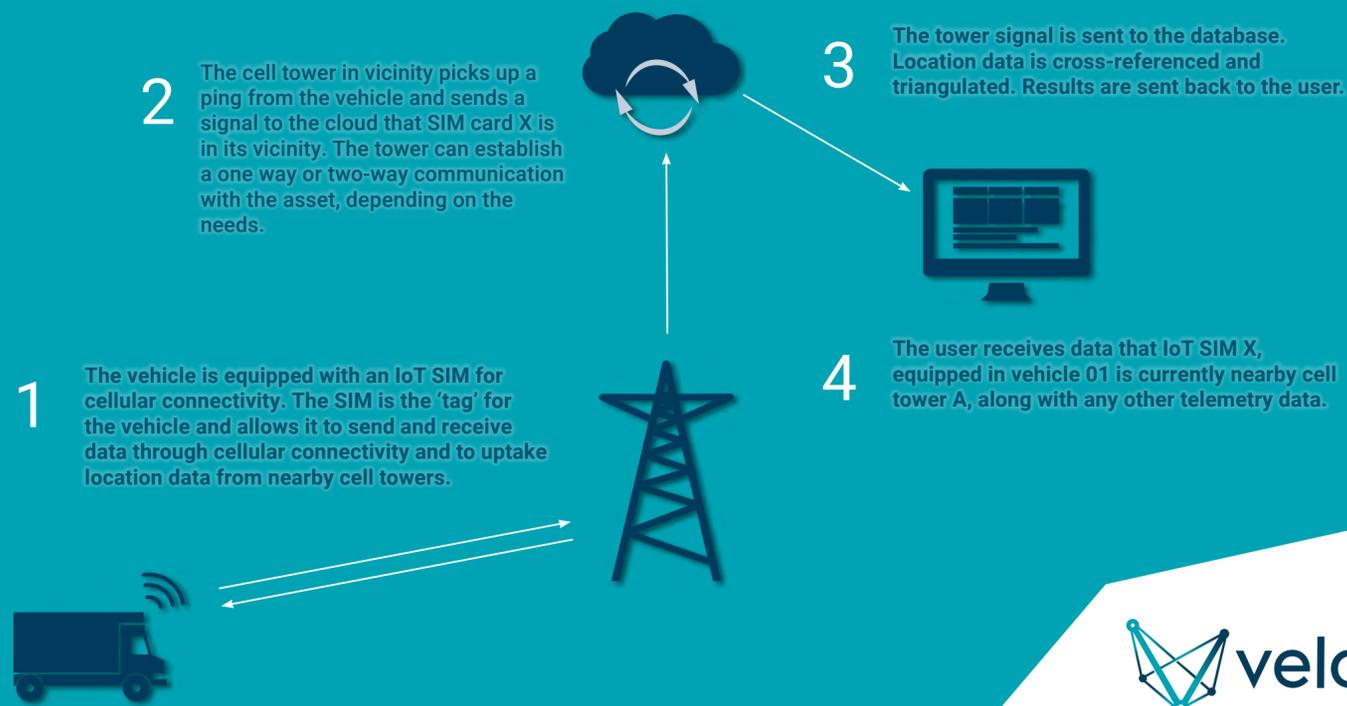
In order to track an asset it has to be visible for the tracking system. This could be done through the so-called 'tag' which transmits signals. Both short and long-range navigation systems require your asset to be able to send and receive on specific bandwidths. The tags can come in many forms and be built-in or attached to the asset.

## Connectivity infrastructure

The connectivity infrastructure is the way to connect the tags to a system and locate them. GPS asset tracking, for example, would include a set of orbital satellites to which your asset would send signals. Cellular navigation would require cell towers and indoor tracking would rely on connecting via beacons and anchors. Your infrastructure would need to send the location data back to a database.

## Management software

Asset location information needs to be sent to the business asset management software. The software identifies each of your tags and reads the data transmitted by your connectivity solution. You can use this system to view the location of your inventory in real-time.



# THE BENEFITS OF IOT ASSET TRACKING

## Track your assets in real-time

The core benefit of IoT asset tracking is that it provides real-time insights into the location of your inventory items. IoT asset tracking lets you offer more precise shipment tracking to customers and build more advanced insights into your logistics timeline.

Depending on your operation, real-time asset tracking can be fully automated. Automated monitoring not only provides real-time location insights, but it can do so instantly at all hours.

## Prevent theft and losses

IoT technology makes it much easier to reduce theft and loss as well. You immediately know when an item is moved without authorisation, reducing the time between loss and discovery of a loss.

Additionally, it's easier to find items because they have built-in tracking. So whether an item was stolen or lost within your system, you can recover it faster and more reliably.

## Save time and reduce disruptions

There are several ways you can use IoT asset tracking to save time and reduce disruptions in your logistics.

It's more accurate and automatic than manual methods, reducing errors and hangups. You can use the real-time data you collect through IoT tracking to find slow points and issues in your supply chain, highlighting potential solutions.

Finally, because IoT asset tracking is automatic, you can save person-hours for every item moving through your inventory.

## Achieve sustainable growth

One significant long-term benefit of investing in IoT asset tracking is its potential to boost your sustainability efforts.

For most businesses, their supply chain accounts for 90% of their environmental impact. Making this impact positive is essential to promoting sustainability, winning over customers, and adhering to regional requirements.

To reduce this footprint, though, you need data. IoT asset tracking can provide you with this data, empowering you to strive towards carbon neutrality.

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# INDUSTRY USE CASES AND APPLICATIONS

## Logistics

Keeping track of a supply chain is a lot of work with many different stages. IoT solutions can help you track where goods are in the supply chain, and even provide you with actionable data about fast-selling assets and stock to help your business grow. Asset tracking is often used to monitor freight and cargo units, tanks, rail cars, trailers, shipping containers and more.

## Transportation

Vehicle tracking and telematics are some of the hottest fields for IoT. With IoT you can monitor fleets of vehicles like taxis or buses, keep track of maintenance requirements for each vehicle and keep drivers safe using sensors.

## Healthcare

Did you know that hospitals need to keep track of massive inventories? They need to monitor every medical instrument, gauze pad, wheelchair, and medication cart. IoT asset tracking technology can help hospitals efficiently manage their equipment.

## Manufacturing

The manufacturing industry can put IoT asset tracking to use in a variety of ways. Bluetooth and RFID technologies can help reduce human error when scanning and tracking components or help expeditors find missing parts that haven't made it from one workstation to another. Cellular and satellite tracking can keep a safe work environment.



## Construction

Construction equipment is expensive, and equipment theft from work sites can be a serious concern. IoT asset tracking can let you know as soon as a piece of equipment leaves a specified geo-fenced location to help prevent theft and loss.

## Agriculture

As one of the world's oldest industries, agriculture has seen plenty of innovations. Using IoT asset tracking solutions can help farmers manage the condition of their equipment, monitor supply levels, and see location data of livestock.

## Pet monitoring

Having a pet go missing is a stressful, potentially heart-breaking experience. With IoT asset tracking, you can keep track of your dog or cat with collars or tags that use cellular or satellite technology.

## Law enforcement

Law enforcement organisations can use IoT asset tracking to monitor everything from weapons to patrol cars to police officers themselves. IoT tracking can be beneficial for directing teams of backup officers to specific locations and locating suspects.

## Education

IoT asset tracking helps teachers keep track of school-issued laptops or tablets and can allow administrators to keep an eye on an entire school district's inventory.



# THE VELOS IOT APPROACH

For IoT asset tracking to provide you with these benefits, it needs to balance mobility with accuracy. On their own, it can seem like the available types of asset tracking require that you choose between these two factors, but that is not necessarily the case.

At Velos IoT we specialise at providing cellular connectivity for IoT asset tracking in both single system and hybrid solutions. Thanks to our global network, you'll be able to accurately track your devices as they travel around the world and reduce the price and technical complexity of implementing cellular tracking to your solution. You can couple your cellular tracking solution with the Velos IoT Connectivity Management Platform for a complete overview of your asset tags and data usage.

Reach out today to learn more about tracking with cellular connectivity and how it can help your business grow with actionable data.

