

The Asset Tracking

WHITE PAPER



You are wondering how Asset Tracking could improve your processes?

Through this white paper, we present the different concepts of Asset Tracking as well as the services offered by our products and the possible gains that our offer brings.

In the industry 4.0 era, production lines are integrating more and more **digitalization in their process** to be more efficient. Moreover, productions need a great flexibility because of the tendency to increase the number of variants while maintaining a good cost control. Integration in factories of IOT sensors (Internet of Things) is now a real tool in this new industrial revolution.

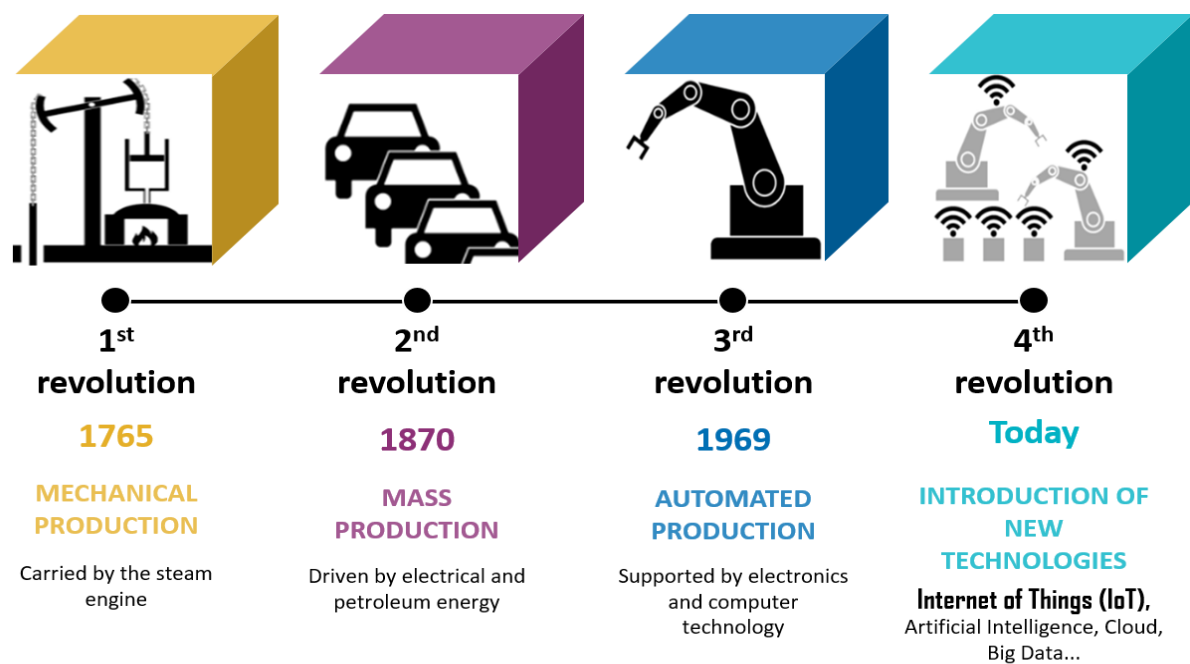


Figure 1 - The 4th industrial revolution

Most industrialists are convinced of the value of making their factories «smarter».



Figure 2 - Deloitte Analysis of the 2019 Deloitte and MAPI Smart Factory Study data

Basic element of **Lean Management**, flow control, whether physical (matter) or virtual (data) is essential (tool VSM - Value Stream Mapping). The most critical assets must be fully under control.

There are many challenges: decrease inputs errors, save time, inventory automation, flow optimization, increase utilization rate, people and equipment security, investments reduction, traceability requirement, ...

This is where the notion of **Asset Tracking** take place, made fully accessible and relevant by the use of the latest IOT technologies.

Production factories, especially in aeronautics or automotive, are generally organized in production plants according to the different transformation/preparation steps of the product.



Figure 3 - Organization of the factory into workshops (Source *L'Usine Nouvelle*)

Based on this observation, many questions can appear:

- At which step my product is?
- Where the manufacturing order associated to my intervention is?
- How can I reduce my series changeover times (SMED - Single Minute Exchange of Die) by quickly finding my tools?
- How can I maximize my machines SRT (Synthetic Efficiency Ratio)?
- Where are the bottleneck stations that are slowing down my production? (IT - Idle Time)
- How can I measure my KPI (Key Performance Indicators)?

- What must I prioritize in my buffer zone?
- How to avoid manual inputs or scanning errors?
- Has the required material arrived? (JIT – Just In Time)
- Have my tools been stolen or are they somewhere in the warehouse forgotten from all?
- What is the real inventory status at a specific time?
- ...

All these questions, which are not exhaustive, causes not only productivity losses or even downtime, but also additional investments and fixed assets of parts or tools.

Assets Tracking by Geolocalisation or Geofencing?

Real-Time Locating Systems (RTLS) have been existing for several years now and mainly use RFID or Bluetooth technologies. Performances of these systems are quite impressive, approximately a few tens of centimeters. But the technologies being short-range, this implies deployment of a rather heavy infrastructure in the building.

Therefore, one question appears: **Is it really necessary to have a maximum precision in a building of several thousands of square meters?**

In some use cases maybe, but most of the time and with the factories organized by islands, a monitoring by zone is enough. We then talk about the monitoring of life phases of an asset.

This approach provides **sufficient accuracy** to identify the presence, entry or exit of an asset in a few meters zone. Based on longer range waves, the required **infrastructure** is smaller. Therefore, it is more flexible to meet the factories adaptation needs and, above all, **way cheaper**. Finally, radio frequencies used are called sub-gigahertz with the benefit of good indoor propagation and lower consumption.

The direct result of all these arguments, is that a big investment in the infrastructure at the start and thousands of objects, are not necessary to provide Return On Investment (**ROI**).

	Active/Passive Rfid	BLE, UWB	Long-Range Radio
Type	Passage screening Proximity	Tracking Indoor navigation	Presence Geofencing
Accuracy	1 to 5m	<1m	5 to 15m
Infrastructure	High Local (Gate)	High Many beacons	Very low
Consumption	Very low	Higher	Low
Tags cost	Very low	Low	Moderate
Beacons cost	High	Moderate	Low

To resume, these technologies are not opposed, but are for different use cases. There are some requirements to be considered in order to make a choice.

For example, RFID is more appropriate to items deployed in very large quantities and that do not require real-time location but rather a number of weak and punctual control points (identification) distributed throughout the process.

Regarding BLE or UWB technologies, they are more dedicated to precision tracking of sensitive objects and/or in smaller operating areas. This implies the risk of having a very high infrastructure cost.

Finally, long-range radio is optimal to serve some use cases for objects in quantity in a space which can be very important (Indoor and Outdoor). It provides a “real-time” location service while maintaining a high degree of flexibility.

Ineo-Sense solution

The **by zone geofencing** solution developed by Ineo-Sense and already deployed in volume is already positioned in this way.

As in all localization system, the architecture is made up of **tracers** fixed on the object which has to be monitored and of **fixed autonomous beacons** to delimit zones (generally called beacons).

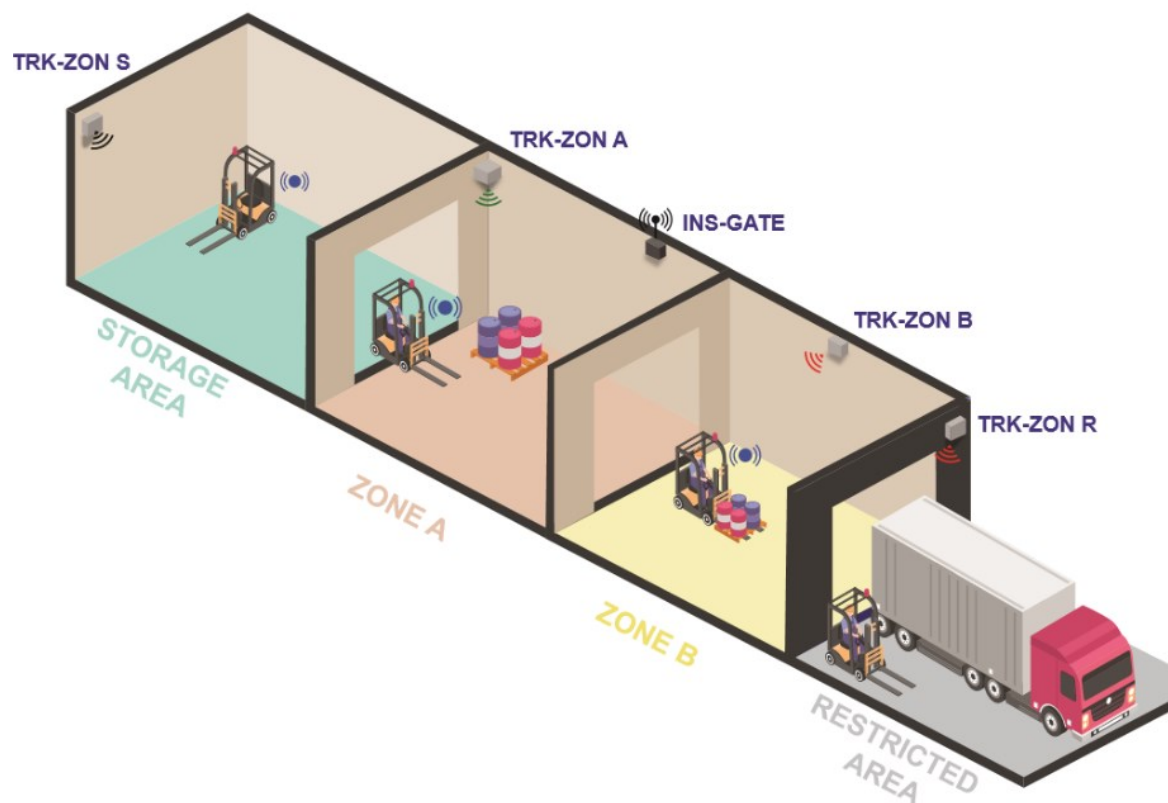


Figure 4 -INEO-SENSE solution's architecture

Ineo-Sense adds to this architecture a LoRaWAN radio infrastructure to ensure communication between all these elements.

Indeed, the Tracers, called **TRK-Tracer** and the autonomous beacons, called **TRK-Zon**, are all equipped with **LoRaWAN** connectivity allowing, on the one hand, the feedback of usage information and, on the other hand, the remote configuration.

As opposed to the current RTLS system, it is the Tracer that will communicate its life and location information to the system.

This architecture choice also allows exploitation in a public operated network. It can therefore switch to TDOA geolocation mode (using the LoRaWAN operator infrastructure) during transit between two places.

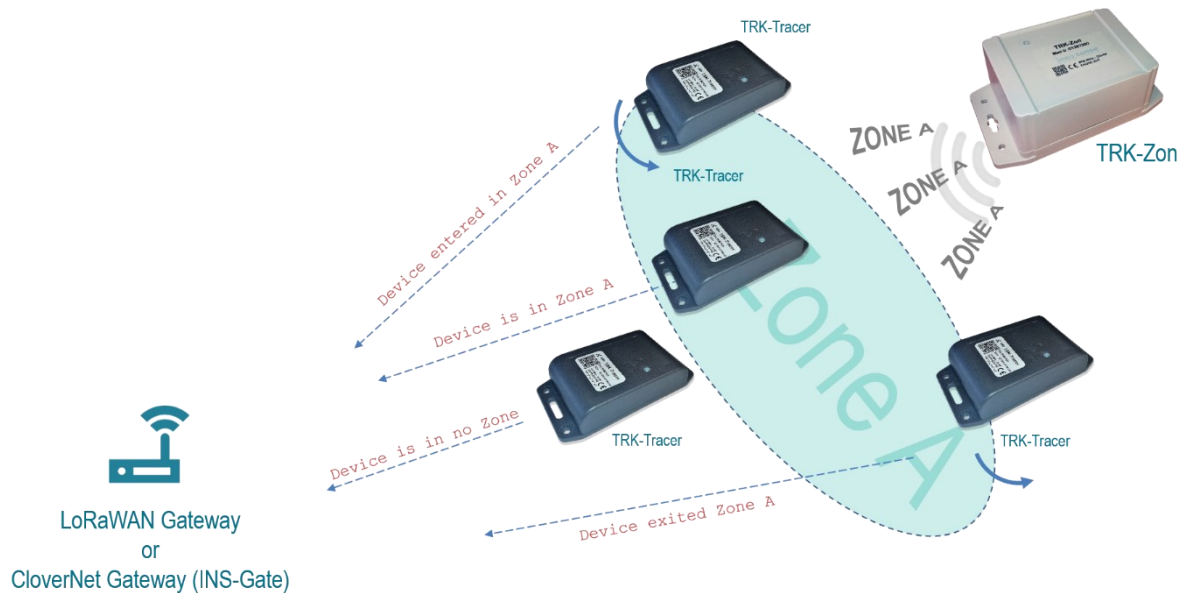


Figure 5 – Communication principle of the INEO-SENSE solution

This technical architecture is made possible thanks to the Tracers that can autonomously provide usage, activity history and location information without requiring a specific software post-processing.

It also shows a very **important flexibility of the infrastructure** allowing the addition of zones according to the evolution of the project: warehouse, crossing points. Even a rack could become a clearly identified zone.

For the products that have an IP66 protection class, the zoning can also be implemented **outside of the factory** (loading docks). Thanks to the LoRaWAN network, the tracers can automatically switch to a public network and also continue to be used outside the factory (for example during transfer of equipment from one site to another).

Did you know that?

The LoRa radio modulation technology and its LoRaWAN protocol allow short messages to be sent over long distances with very low power consumption.

The **LoRa Alliance**, composed of more than 500 members, ensures the development and promotion of this open standard.

A LoRaWAN infrastructure is therefore compatible with all manufacturers who respect the standard, which ensures the durability and scalability of the installation.

ZOOM ON...TRK-TRACER

Autonomous Tag intended to be fixed on the object.

The TRK-Tracer allows different functionalities according to the chosen configuration:

- Location by zone
- On-the-fly inventory by the information system and/or mobile by smartphone
- LED identification (Pick-To-Light)
- Search mode by « sniffing radio »
- Alarm on movement, on zone entry and/or exit
- Monitoring of usage rate (% movement per time period)
- History of passage on site and by zone
- Battery level and temperature indicator
- Call button to request an intervention (Option)
- Indoor and Outdoor use (IP66)
- Secured data transmission by encryption (AES 128)



Did you know that?

If necessary, some methods can compensate overly macro location:

- **Pick-To-Light:** using a light signal to highlight the object that the operator has to pick-up,
- Its sound variant: use of a buzzer,
- A radio sniffing to search the lost product with a mobile application.

ZOOM ON...TRK-TRACER GPS (GNSS)

The TRK-Tracer GPS has similar features to the TRK-Tracer and includes a high-performance GPS chip to track outdoor equipments with an accuracy of a few meters.

- GPS points' acquisition is configurable and dynamic: periodic, at the beginning of a movement or when stopped...
- Alarm on movement, on entry and/or exit of zone thanks to its compatibility with TRK-Zon.
- Inclinator, shock sensor and anti-tear sensor to follow the life of the equipment.
- LED identification (Pick-To-Light)
- Radio sniffing search mode
- Usage rate monitoring (% movement per hour)
- Battery level and temperature indicator
- Outdoor use (IP66), compatible with TRK-Zon, in private or public network
- Secured data transmission by encryption (AES 128)



Did you know that?

Behind the name **GPS**, there is in fact a set of technologies and satellite constellations called **GNSS** (Geolocation and Navigation by Satellite System). GPS, an American solution, was the first to be put on the market in 1973. Currently there are several constellations available, **Galileo** (European), **GLONASS** (Russian) and **BEIDOU** (Chinese). Our TRK-Tracer GPS is compatible with all these constellations, so we should call it TRK-Tracer GNSS. But the term GPS has become the reference name for all these solutions, which is why we chose it.

ZOOM ON...TRK-ZON

Autonomous beacon covering an area that may contain the object to be monitored. This tag will emit information about the covered area.

More than just a position identification by periodically sending zone information, it has many advanced features:

- Adjustable detection range (2-300 m),
- Indoor and Outdoor use (IP66),
- Remote test mode for adjustments,
- Multi-zoning detection,
- Periodic status frame (battery level, status...),
- Daily planner for automatic adaption to a behavior,
- Bidirectional communication for a remote configuration,
- Triggering capacity in different cases of use:
 - Real-time input detection,
 - "Zone maintenance" management,
 - Input/output alarm triggering,
 - Sector creation by beacon group.



Did you know that?

In order to cover areas of constraining exploitation (walls, cladding, group of non-uniform spaces) it is possible to create a single Geofencing zone with several TRK-Zones in clone mode. This configuration allows all the TRK-Tracer to consider that they are all in one and same zone. This **clone mode** can also be used to create detection repetition in critical passage area (i.e. Guardhouse).

ZOOM SUR...INS-GATE

IP gateway connected to a LAN (Ethernet) or cellular network, for information feedback to an information system. The LoRaWan gateway communicates bidirectionally with the TRK-Tracer and TRK-Zon on site. It collects all the data (status, battery level, location information, etc...) and also transmits the commands (LED identification, change of configuration, etc...).



To complete these basic elements, Ineo-Sense has developed tools and a software to facilitate installation, operation and maintenance in operational conditions.

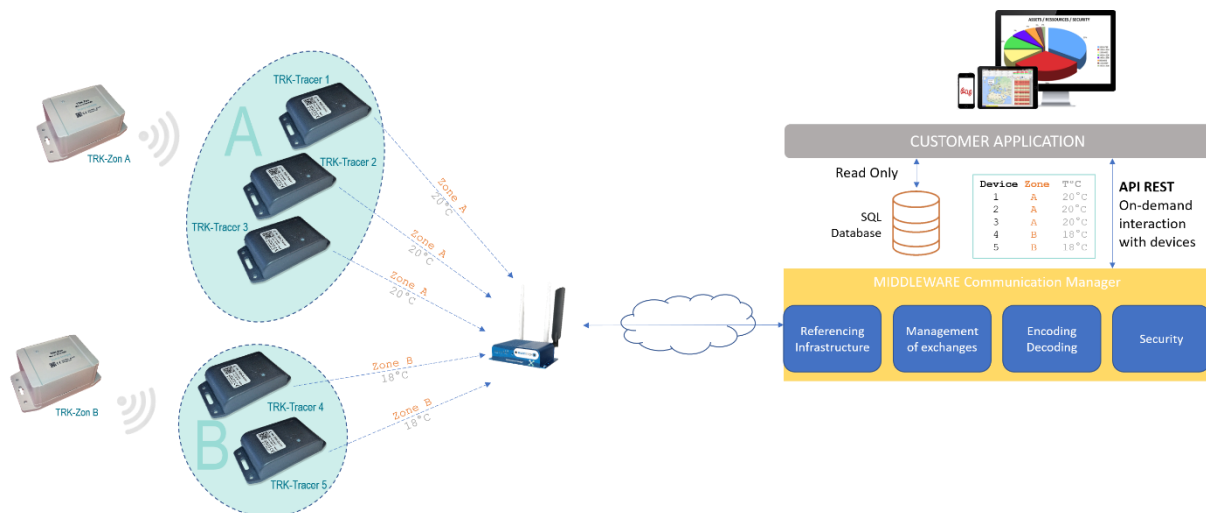


Figure 6 – Global private network architecture of the INEO-SENSE solution

In order to simplify data collection and facilitate the integration into the customer's information system, Ineo-Sense's solution has a middleware (communication manager) available:

- An SQL database to analyze all the collected data
- REST APIs to interact in real time with the equipment

For business exploitation of data, Ineo-Sense chose not to impose its own software but to leave the customer the freedom to set up his own solution or simply to integrate it into his existing system.

However, in order to offer a global solution for the exploitation of its sensors, Ineo-Sense has an ecosystem of partners who provide softwares to realize the functionalities of geolocation and asset management.

Moreover, for installation and maintenance on site, the LoRa Bluetooth Mobile Reader (**INS-BlueRead**) and its associated smartphone application allow the realization of exploitation services on all Ineo-Sense products.

ZOOM ON...INS-BLUEREAD

INS-BlueRead® is a Bluetooth access point to communicate with the TRK-Tracer and TRK-Zon. Used for on the field operations, it fits in a pocket as it is very light and small.

INS-BlueRead® makes operations simple with the INS-Player® mobile application available on Android platform.

It allows different functionalities:

- Product configuration
- On-demand reading and inventory
- Radio coverage test
- Collection of historical events
- Over-The-Air (FOTA) software update.



Use cases



UC1 :

Environment: Aeronautic industry.

Monitored products type: Production bins containing fuselage parts, aeronautical rivets, composite parts...

Objectives:

Monitor the progress of the production stages in real time,

Identify priorities,

Retrieve the Bins out of process.

Implemented solutions:

Geofencing of zones to follow the stages of the product,

Pick-To-Light to identify priorities,

Radio sniffing to find the bins out of process.

Gains:

Reduction of lost cases requiring the launch of new production orders,

Highlighting of waiting times,

Better knowledge of available stock at each stage of the process.



UC2 :

Environment: Automotive industry.

Monitored products type: Tools.

Objectives:

To inventory and locate tools,

Use the right tools,

Detect exits from the operating area.

Implemented solutions:

Geofencing of work/storage areas and zone exit,

Pick-To-Light for the identification of the right equipment,

Radio sniffing to find tools.

Gains:

Save time to find the tools,

Better compliance with procedures by using the right instrument,

Securing equipment (zone exit).



UC3 :

Environment: Logistic warehouse.

Monitored products type: Handling trolley.

Objectives:

Analyze the utilization rate,
Calculate transit times,
Reduce thefts.

Implemented solutions:

Geofencing of the work / storage / recharging and exit zone,
Radio sniffing to find the trolleys.

Gains:

Decrease of more than 20% of the rental park,
Better stock arrangement to optimize routes,
Security of the trolleys.



UC4 :

Environment: Mass distribution.

Monitored products type : Reusable packaging.

Objectives:

Analyze transport times,
Inventory the packaging on each site for a better dispatching.

Implemented solutions:

Geofencing of storage entries/exits
Radio sniffing to find the packaging

Gains:

Better control of inter-site transport times,
Optimization of the number of packages,
Better organization of the recovery rounds,
Decrease in thefts.



UC5 :

Environment: Building sites.

Monitored products type: Construction equipment..

Objectives:

Check the availability of equipment in the storage area that serves several sites,
Automatically identify that all the equipment planned for a construction site is loaded in the trucks travelling to the construction sites.

Implemented solutions:

Geofencing of entrances / exits and storage areas,

Radio sniffing to find the equipment.

Gains:

Better delivery planning,

Decrease in delivery errors (lack of equipment),

Decrease in thefts.

The previous use-cases show that there are several possible gains brought by the 3 main functions that are: by zone geofencing, pick-to-light and radio sniffing.

The location (beacons) and collect (gateway LoRaWAN) infrastructures are simple to install and easily adaptable to any changes in the logistic flows to be traced. The cost of this management architecture is marginal as it generally represents **less than 5% of the project cost.**

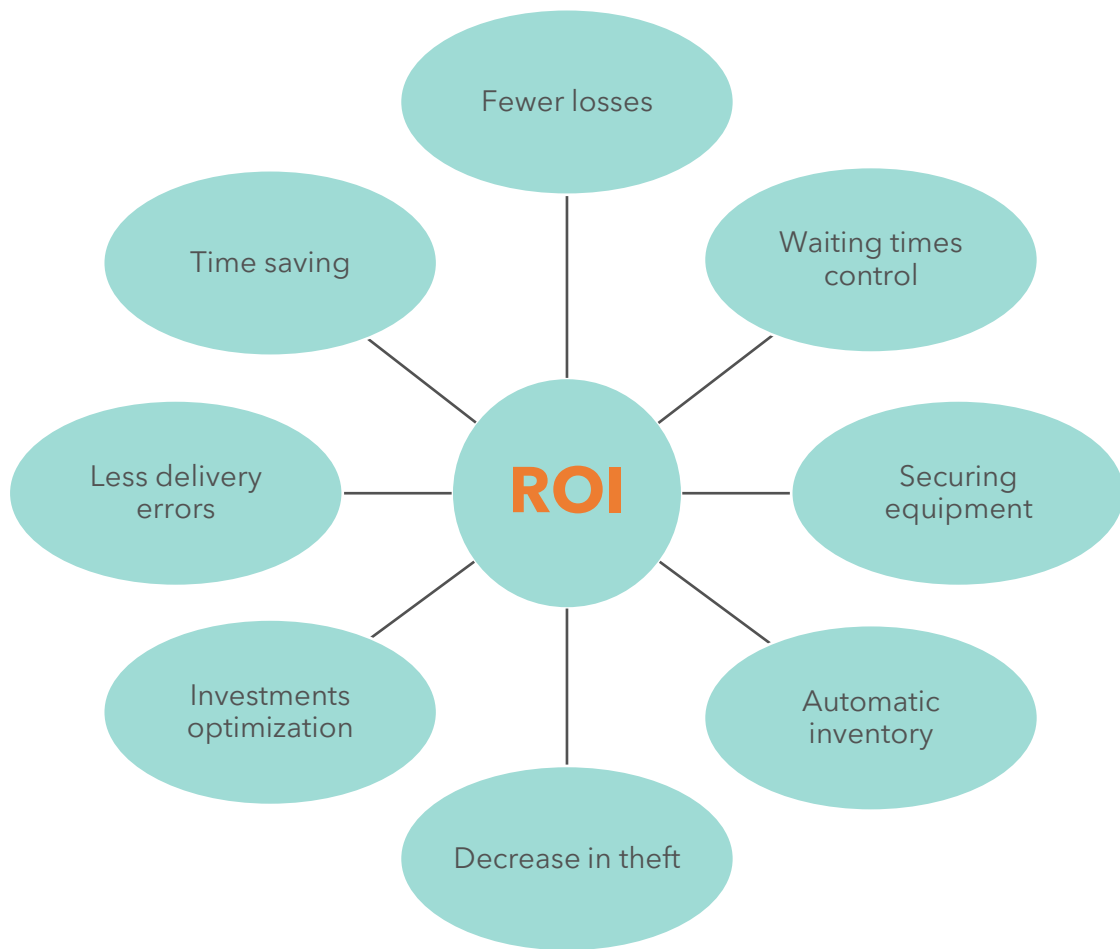


Figure 7 - Benefits brought by an effective asset tracking solution

You know that

Ineo-sense answers Asset Tracking issues with **concrets advantages:**

- Tracers with real time functions (Pick-to-Light, Inventory, ...).
- Light, flexible and evolving infrastructure.
- Exploitable Indoor/outdoor and in private/public LoRaWAN network.
- Stand-alone tracers that do not require software post-processing.
- Infrastructure can be shared with other use cases.

To go even further and accelerate the return on investment of the global solution, two levers are interesting to look at:

1. **The possibility to add monitoring** of other physical values such as temperature, hygrometry, dry contacts... you not only trace but also monitor the product or its environment.
2. **Customization of the embedded software** to your use case. Add behavior rules to your tracers to automate actions when entering / leaving zones.

About INEO-SENSE

Ineo-Sense is a developer and supplier of IOT sensors for the optimization of industrial processes and organizations. Ineo-Sense has a catalog of products in the field of asset tracking as well as process safety and predictive maintenance.

