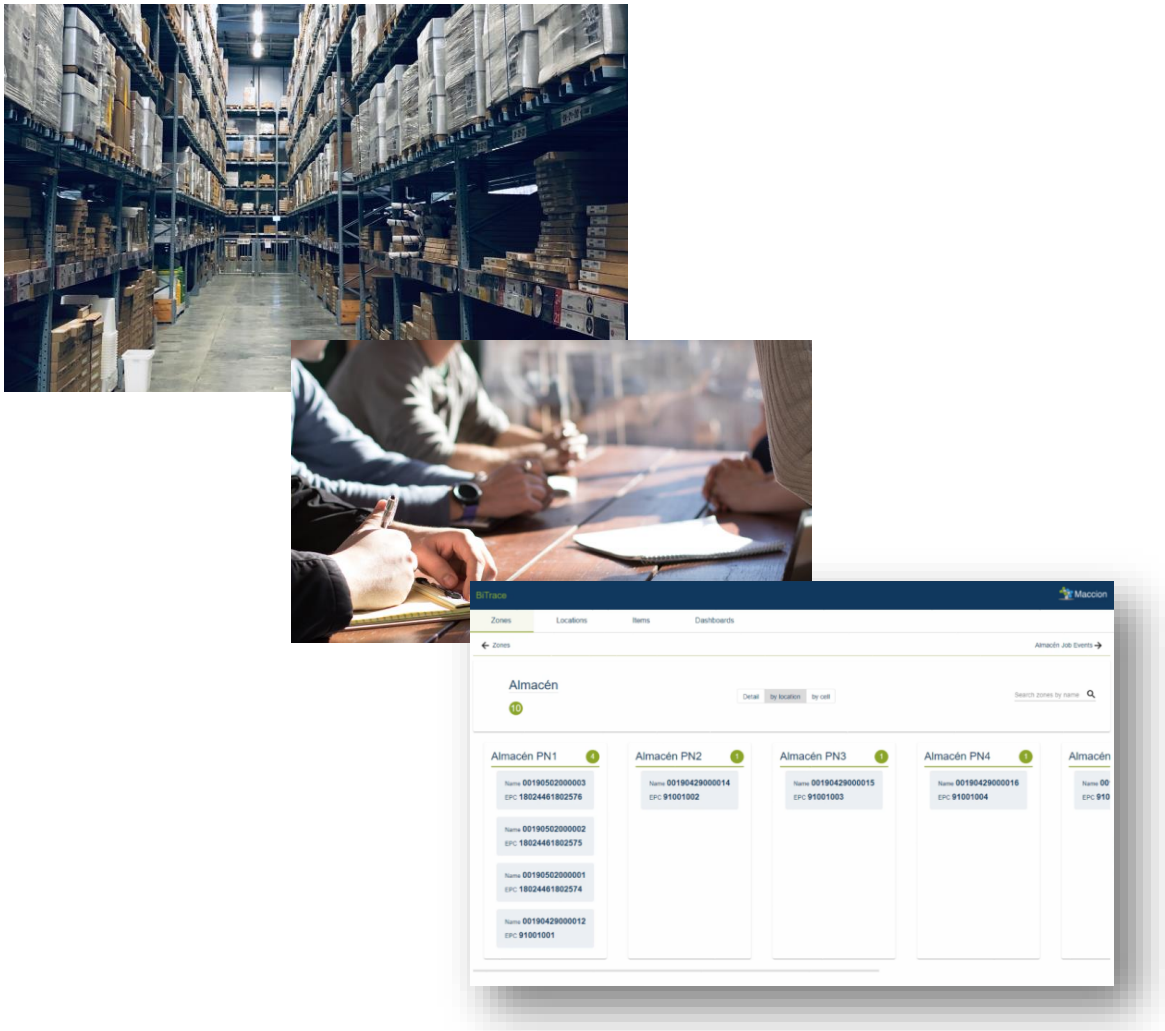
BiTrace®

Trace the improvements of your Business

12 tracking technologies in a unique platform and for multiple use-cases

Functional description



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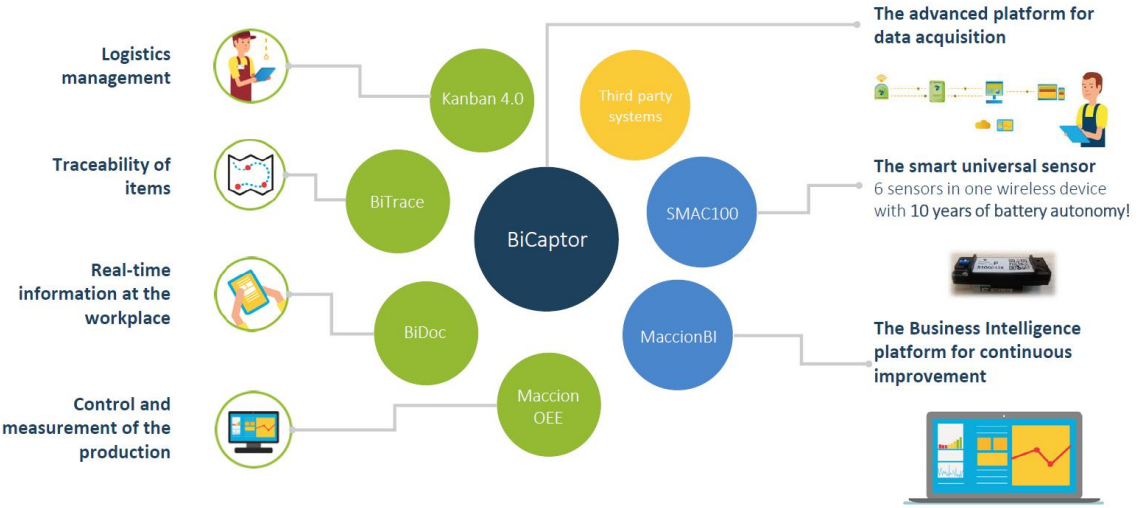
Maccion, solutions for the Industry 4.0

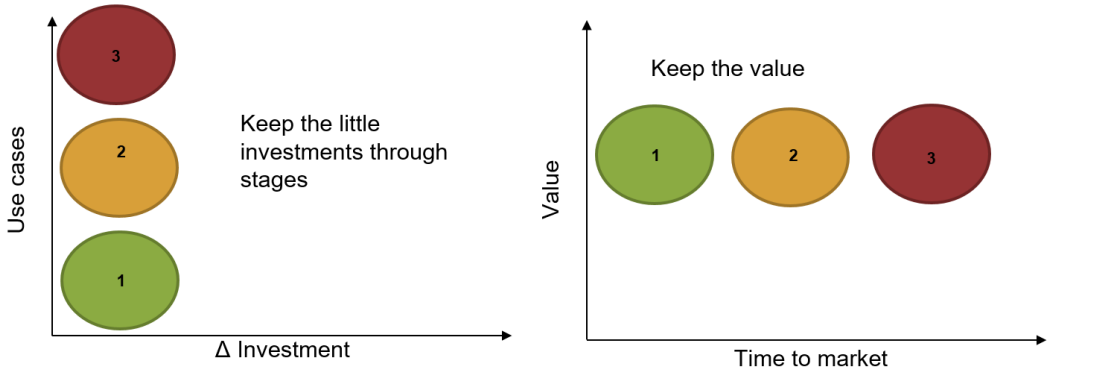
Maccion means integration, development and consultancy to implement the best solution to improve the production processes by the hand of lean manufacturing and industry 4.0.

Our solutions “Feel and manage the factory in real-time“, thanks to our technology expertise in data acquisition and integration. We develop and produce our own smart devices to sense and react in front of everything that may happen in a shop floor.



We provide short-term implementations and results because our goal is to help our customers to reach the smart factory with little investments. We work ‘Agile’ and in commitment with lean manufacturing and continuous improvement.

Our projects will keep the value and the little investment through the stages: Proof of concepts, pilot projects and deployment. The customer will be able to validate every use-case and will learn how to proceed to go big and success.



1. Integrated technologies and focused use-cases - Short-term success
2. Learned from 1? New use cases? → cost effective deployment - Mid-term success
3. New technologies? New use cases? Innovation opportunities together? - Future success

Bitrace® in a brief

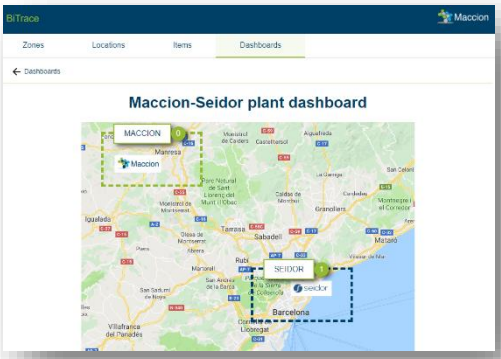
BiTrace® is the system that ensures **the track and trace in real time** of any asset in the supply chain. The solution is enabled by the combination of the latest and most advanced geolocation technologies.

Improvements for your production system will be:

- ✓ **Traceability** of all the supply chain
- ✓ **Monitoring** and control of the production flow
- ✓ **Geolocation** and active stock in real time
- ✓ Logistics management in integration with Kanban4.0
- ✓ Integration with client's management system

Imagine that...

- ✓ A non-quality of a client arrives and you have a **trace of all the productive stages of the product** and the components that make it up
- ✓ You know **the inventory in real time** in every zone and location of your warehouses
- ✓ You can create your **own dashboards** for visualising the stock levels in any location of your plant
- ✓ You can **manage material movements** automatically based on the actual inventory status
- ✓ You can **link all the information** you want to the status changes of each product (machine, worker, checklist, comments, links...)



The main functionalities:

- ✓ Design of the plant layout, its zones and locations
- ✓ Configuration of transition rules to control the production flow
- ✓ Real time monitoring of the state and location of the assets
- ✓ Tools for searching and exporting relevant information

The benefits:

- ✓ Agility in front of planification changes
- ✓ Flexibility on the logistics and production
- ✓ Control of the stages of the production process
- ✓ Traceability of the states and the product composition

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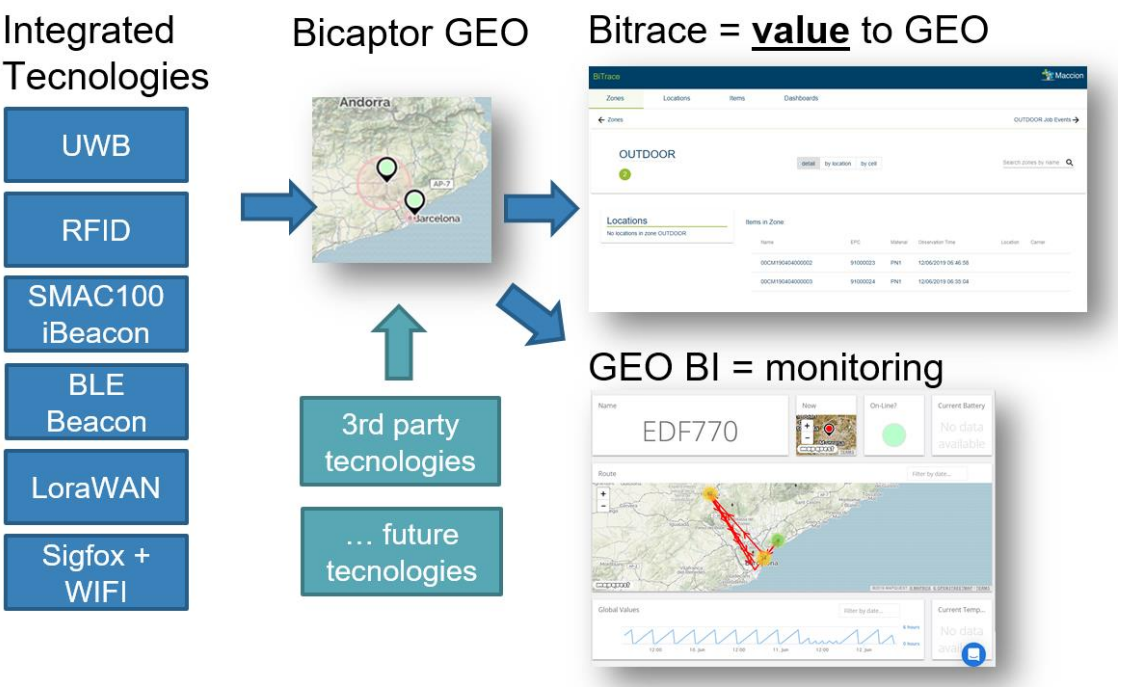
Solution Overall Description

The aim of the solution is to provide a 100% feasability for managing the different kind of items inside and outside the customer's facilities. Depending on the particular use-case a technology will be more cost-effective and reliable than others, so Maccion will implement a system which integrates all of them.



The only way to achieve the requirements above is to implement a solution in commitment with Maccion's pillars:

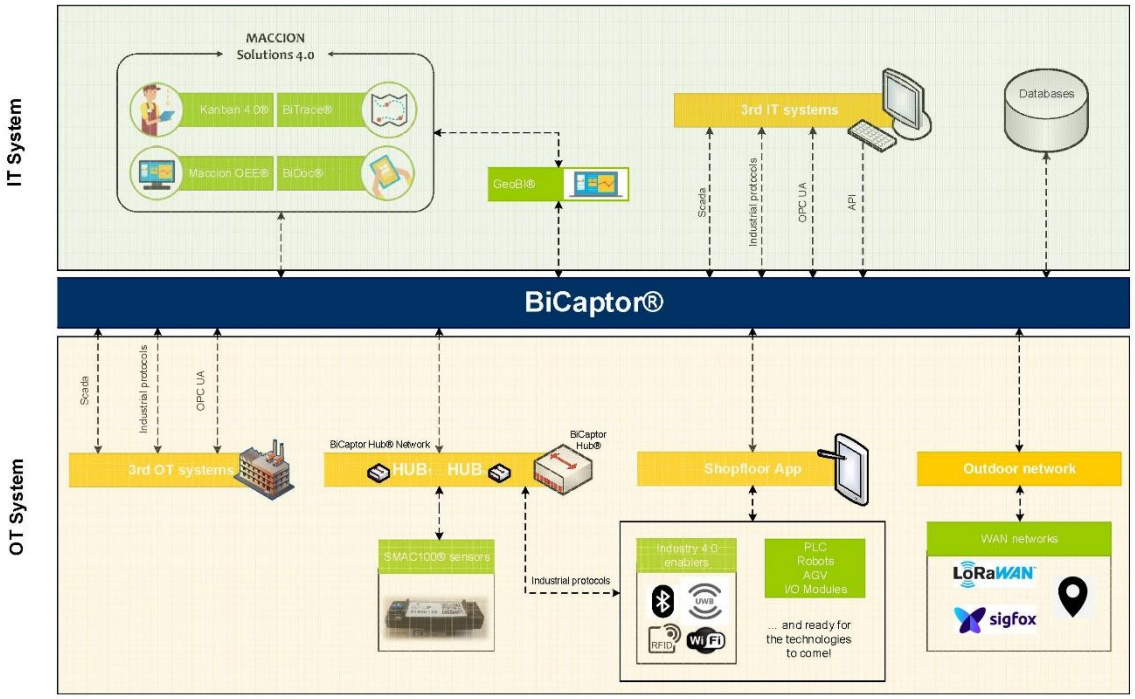
- ✓ Vertical integration from the shop floor to the IT systems
- ✓ Horizontal integration for your scalable implementation
- ✓ Modular and flexible to customize your best solution
- ✓ 3rd party systems connectivity

And for this particular case what really makes the difference:

- ✓ The technology must be transversal to the value of the solution because new use-cases may appear and new technologies may come

Platform architecture

Maccion achieves this with Bicaptor®, the platform that enables the industry 4.0:



It also fits to the CUSTOMER's IT requirements:

- ✓ Local or cloud platform
- ✓ Virtual or physical server installed in customer's facilities or hosted by Maccion

The software architecture consists in three layers.

1. **Bicaptor**, responsible for the data capture and integration of different geolocation technologies. The platform acts also as a sensor network supervisor. It can detect abnormal function on network and manages the battery level of devices. On eventual incidences, it can notify to a group of users via email.

2. **Bitrace**, responsible for the analysis of the positions of assets in a context of zones and locations, as well as the traceability of transitions. The solution allows to create a logical description of assets, zones and locations. Using devices data, it manages information and evaluates the asset position in real time.

3. **API Integration**, responsible for satisfying CUSTOMER's implementations operating over Bitrace. It exposes the API interface to manage the platform for a third party system.

Main Concepts

Item

An item is the basic working element of BiTrace. It's created in a container with an ID. An item can contain more than one piece of material and it is also defined in its attributes. Some actions can also tag contexts such as a production order.

Zone

Zones are the first way to divide the plant based on the main activities and processes in the factory. The goal is to confine the areas where the items may be. If an item is in a zone, it means it has gone through some processes and has a determined state.

Location

Those are parts of a zone. Locations can be assigned either to a warehouse location or a specific process on a production line.

Contexts

Context are key-value pairs that provide extra information to an item. Contexts can be added to an item in different situations: when it's created, when the item enters a location, if it leaves a zone…

It is a good way to label items that have passed through a concrete process, or that belong to the same manufacturing order or the same client. Items labeled by contexts are easier to find and track.

Item Events

When an item moves from one zone to another or even between locations or cells, an Item Event is generated. Item Events define the movements of an item through the plant, passing across the different stages of production.

Cell

Like locations, cells are parts of a zone. The difference is that while locations can contain different materials settled in any order, a cell must respect the FIFO cycle and contain the same material for every item. Cells are the perfect component to form a smart shelf, a good way to provide materials to a line.

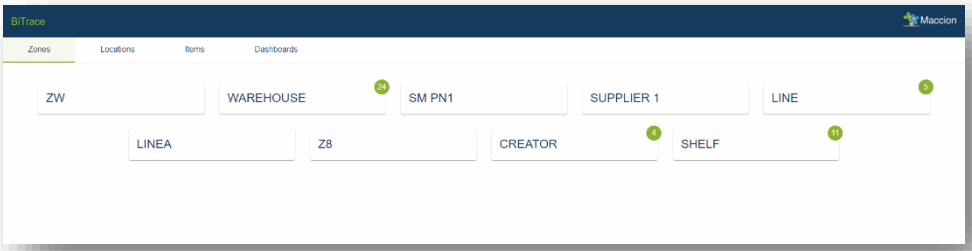
Job Event

Job Events are the events registered in a zone. Every time one or more items change from one zone to another or even between locations in the same zone, a Job Event is created. It's a useful tool to keep track of everything that happens in a zone.

Main Functionalities

Zones management

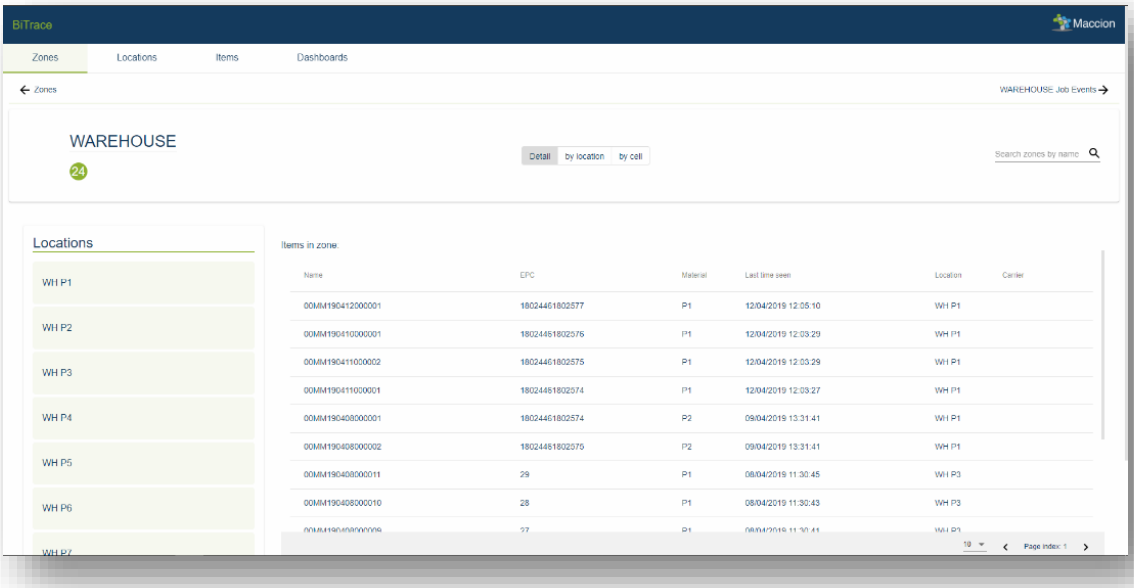
The plant is divided in zones, each one representing different processes or operations. This is the global view of the plant, zones listed and showing how many items contain. When an item changes from one zone to another, is created or is deleted, in Zones the user can see the changes in real time.



Zones Detail

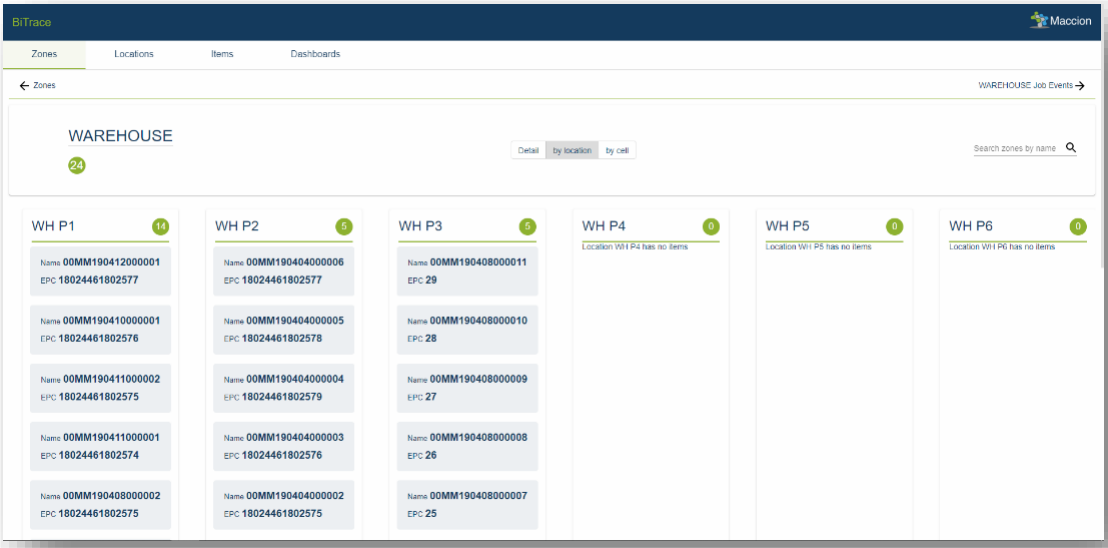
We can visualize the information of a zone in three different ways. The detail view contains a list of all the items located in the zone. There is also a list with the locations inside the zone. Each location represents a physical place in which the zone is divided.

The list of items in zone keeps getting actualized every time there is a change, so the user won't lose any item entering or leaving the zone.



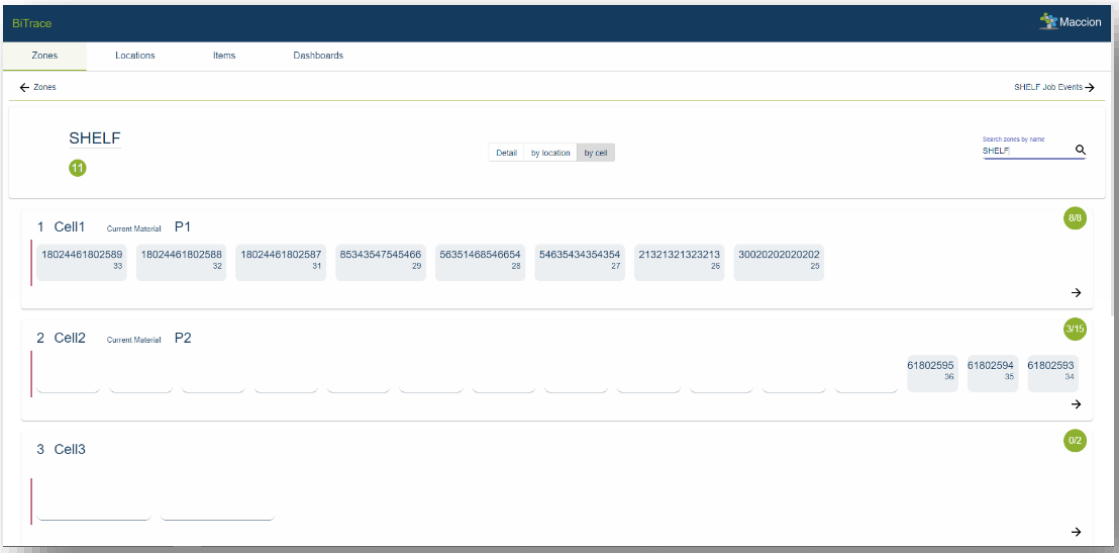
Zone view by Location

The view of zone by location allows us to visually control the number of items in each location and their distribution inside the zone. Thanks to the Real Time Notification connection, the list of items maintains actualized whether an item enters, leaves or changes location.



Zone view by cell

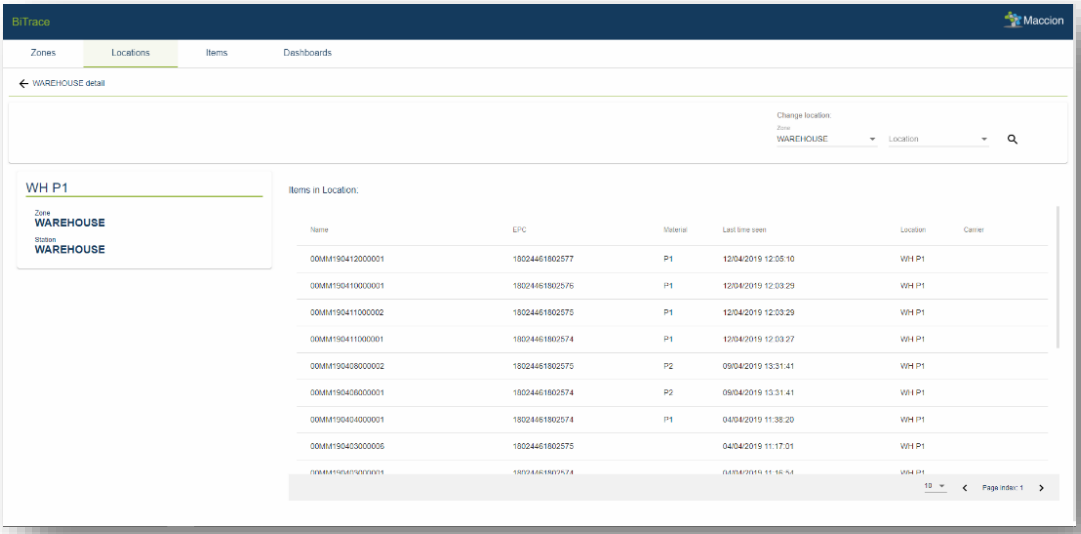
The zone by cell view contains visual information about the number of items loaded in every cell of a zone, the cell's capacity and the order in which the items are disposed.



Locations view

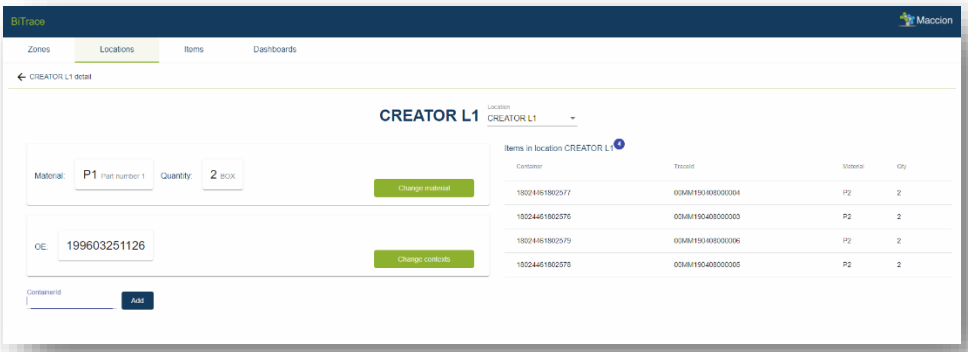
The locations view is very similar to the zone detail view. The aim is to provide detailed information of the items in a particular location. As in the zone detail page, the Real Time Notification service allows the location view to be fully actualized and change the list of items every time an item enters or leaves the location.

Some locations have an attribute that makes them a little bit different: they are creators. A creator location is able to generate new items on an empty container with an assigned material and some contexts. In this case, we'll have a link to the item creator page.



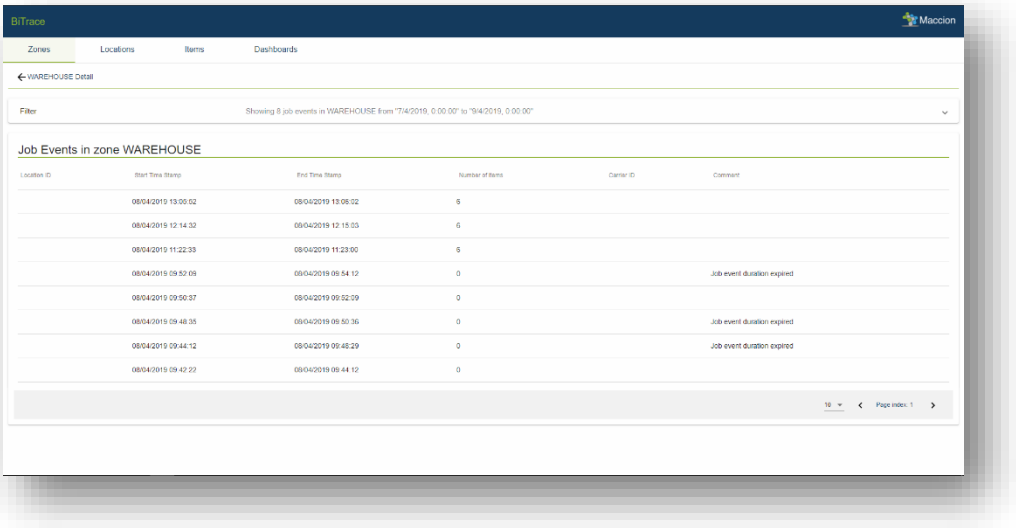
Item creator

Creator locations allow the user to access the item creator page. Here the user can select a material, change the active contexts' value if any, and create new items on empty containers. A list of items in the creator location will allow the user to see the new items added. As expected, the system will notify the user if there is any problem. For example, if the user tries to create a new item on a container that is already in use.



Zone Job Events view

The Job Events view provides a search tool for the user to search for events occurred in a given zone during a period of time. We can access the Job Events view from the Zone Info page and directly get the list of the Job Events that took place during the day, or change the filters to specify the search.



Item info

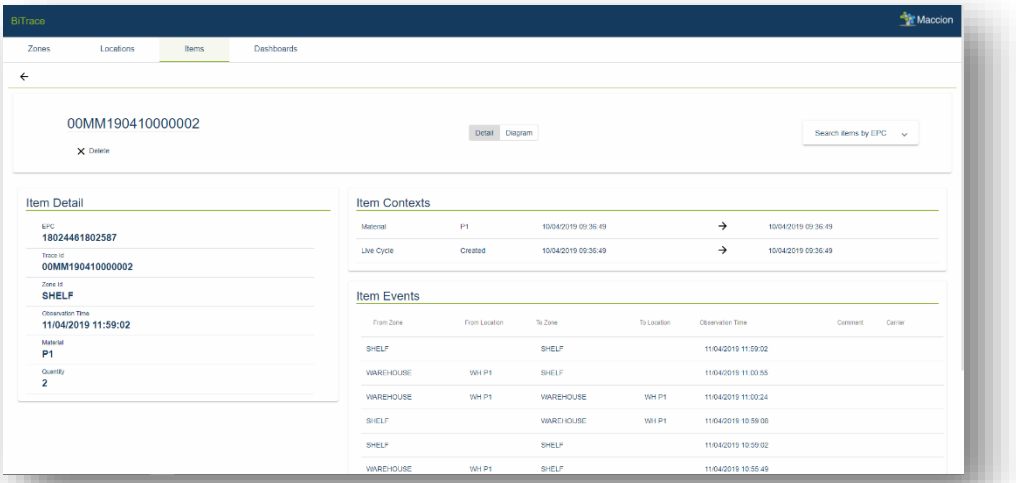
The item info page gives the user information about a specific item. There are two ways to visualize item info: the detail page, or the diagram.

Item Detail

The item info detail page is divided in three main blocs: detail, contexts and events. Each one contains a table with different contents related to the item.

In the detail card, the user gets to know the information related with the item's definition, like it's EPC, ID, material or the zone where is located at the moment.

The item contexts table lists all the contexts that have been given to the item, and the Item Events bloc contains the last item events occurred.



Search by EPC

We can search for an item by the EPC containing it. The search field will suggest EPCs matching the input of the user. It's a tool to search for a specific item.

Search by Context

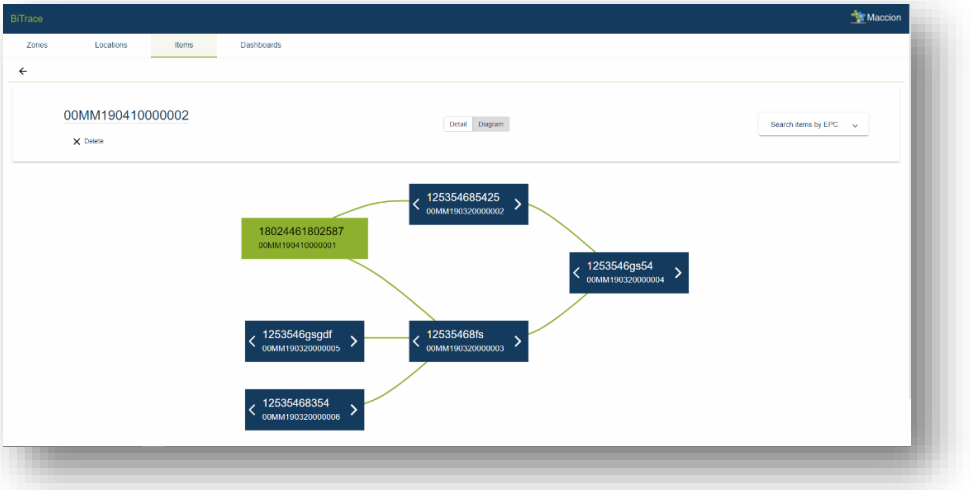
If the user wants to search for a group of items with matching contexts, this can be done by searching for the specific key-value pair. The result of this kind of search is not an item info detail page but a list of items that match the context searched.

Delete

A button to delete items is provided by the item info page.

Item Diagram

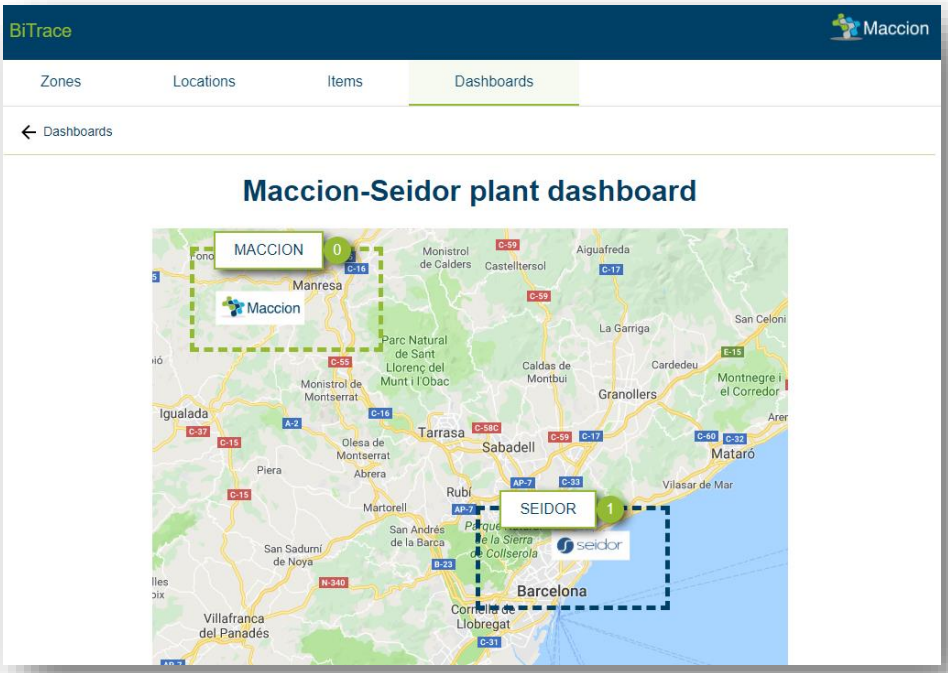
Items have relations between them. This links are defined by the production process and acquired by the items over the different stages of its life cycle. All those relationships between items can be graphically analyzed thanks to the item diagram view.



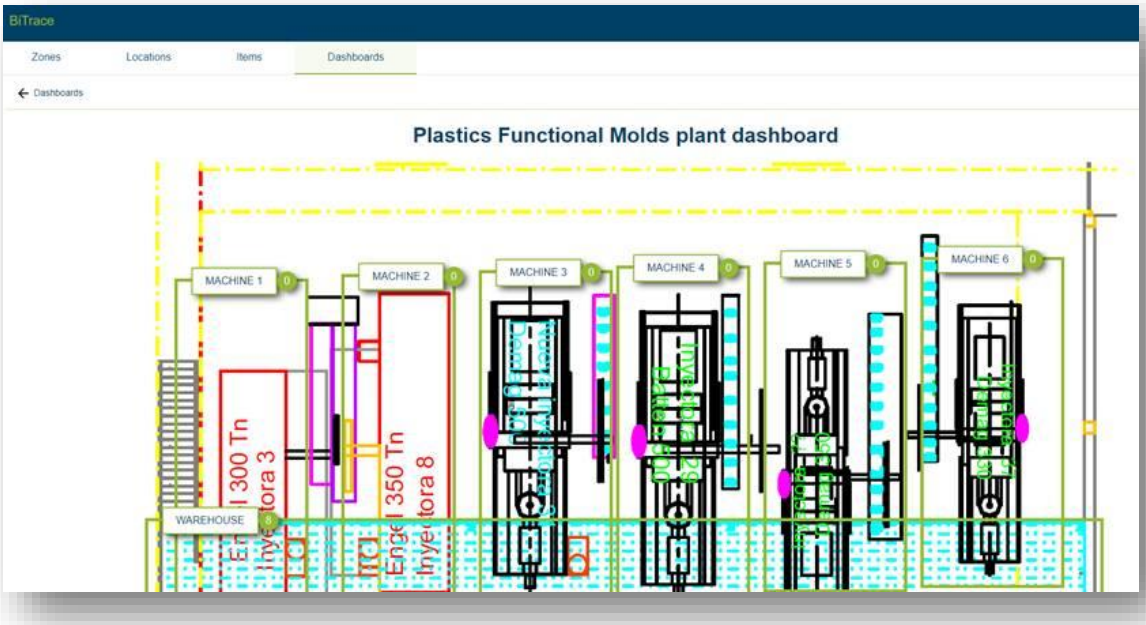
Plant dashboard by zone

The plant dashboard by zone is a tool that helps the user create an interactive view of the plants. All the zone views defined in the dashboard have access to the items that contain, and update as they move in real time.

Outdoor dashboards:



Indoor dashboards:



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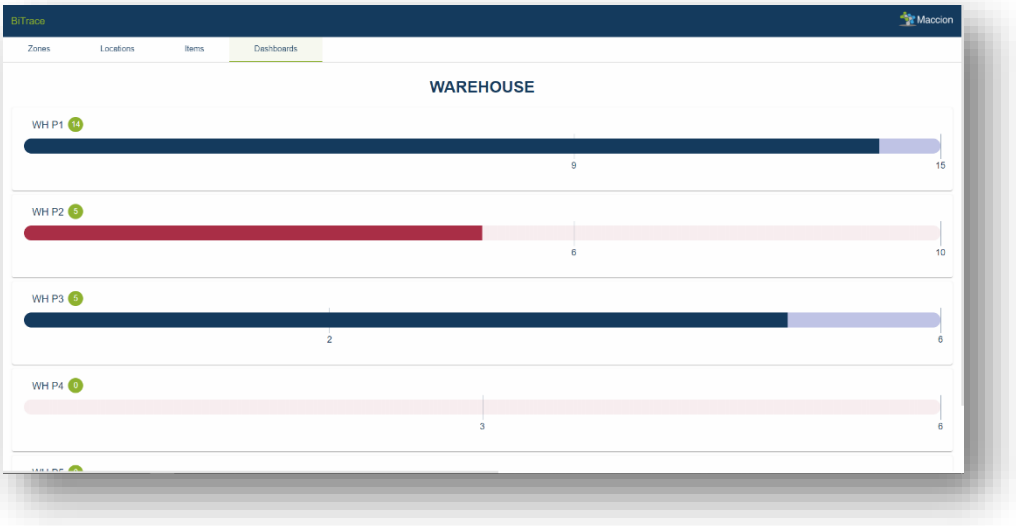
Location stock dashboard

A collection of locations can be made by the user to display in this dashboard. The aim of this page is to easily control the stock levels of the selected locations, to ensure the supply of materials to the production line.



Real Time Notifications

BiTrace® app has a Real Time Notification service. This allows the application to receive data related with new changes in the state of the plant. RTN ensures the user is getting the most recent information about items' localization and processes.

The 12 integrated technologies

In this part of the document the different solutions will be explained.

1. RFID Portal by Maccion

Description:

Control RFID portals deployed by Maccion ensures a 100% of feasibility and have been tested under metallic environments within the automotive industry.

Success story:

http://www.maccion.com/eng/rfid-for-real-time-traceability-of-the-entire-supply- chain/p/15

Precision: NOT APLICABLE

TAG

- Description: RFID passive
- Dimensions compliance: YES
- Battery Autonomy: INFINITE
- Update rate: WHEN TRIGGERED or EVERY MINUTE
- Temperature compliance : YES

Required integration: ALREADY IN MARKET

Cost model: Hardware costs. No licenses.

Time to Market: ALREADY IN MARKET

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2. RFID In-range detection by Maccion

Description:

Maccion RFID solution has the functionality to periodically request if an asset is within the coverage range of an antenna. It can work up to 30 meters if a wide area needs to be covered or less than 1 meter if very high precision is required.

Success story:

http://www.maccion.com/eng/cell-40-for-training/p/14

Precision: programmed depending on the area range to be covered. < 1 meter

TAG

- Description: RFID passive
- Dimensions compliance: YES
- Battery Autonomy: INFINITE
- Update rate: WHEN TRIGGERED or EVERY MINUTE
- Temperature compliance: YES

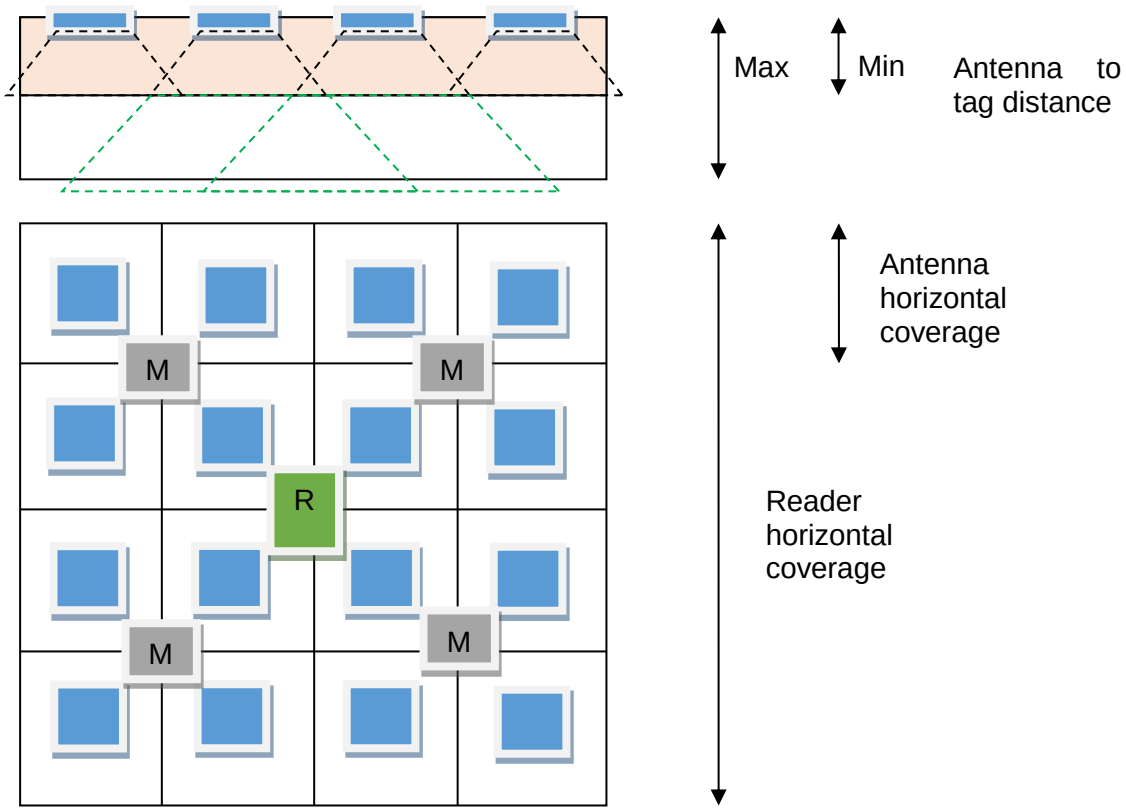
Required integration: ALREADY IN MARKET

Cost model: Hardware costs. No licenses.

Time to Market: ALREADY IN MARKET

Example of a coverage GRID with antennas and multiplexers:

This approach will solve the RFID coverage for reading the tags in a whole plant.



Example of a low-cost flexible reader:

This approach is the perfect solution if only one antenna is required and the user needs flexibility and easy installation:

Antenna Cable RF Low-cost Reader WiFi Connected

The device will perform the same way as a common reader connected to the Bicaptor platform.

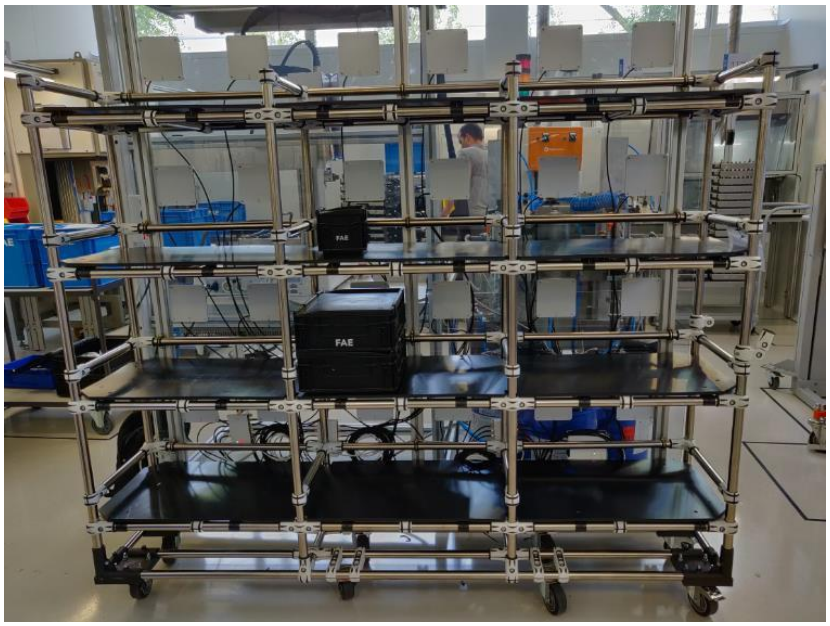
3. RFID Smart-Shelf by Maccion

Description:

By multiplexing the antennas of a unique reader Maccion owns a very cost-effective solution to precisely detect which items are on every cell of a shelf.

Success story:

http://www.maccion.com/eng/smart-shelf-for-inventory-control-in-real-time/p/16



Precision: < 20 cm

TAG

- Description: RFID passive
- Dimensions compliance: YES
- Battery Autonomy: INFINITE
- Update rate: WHEN TRIGGERED or EVERY MINUTE
- Temperature compliance : YES

Required integration: ALREADY IN MARKET

Cost model: Hardware costs. No licenses.

Time to Market: ALREADY IN MARKET

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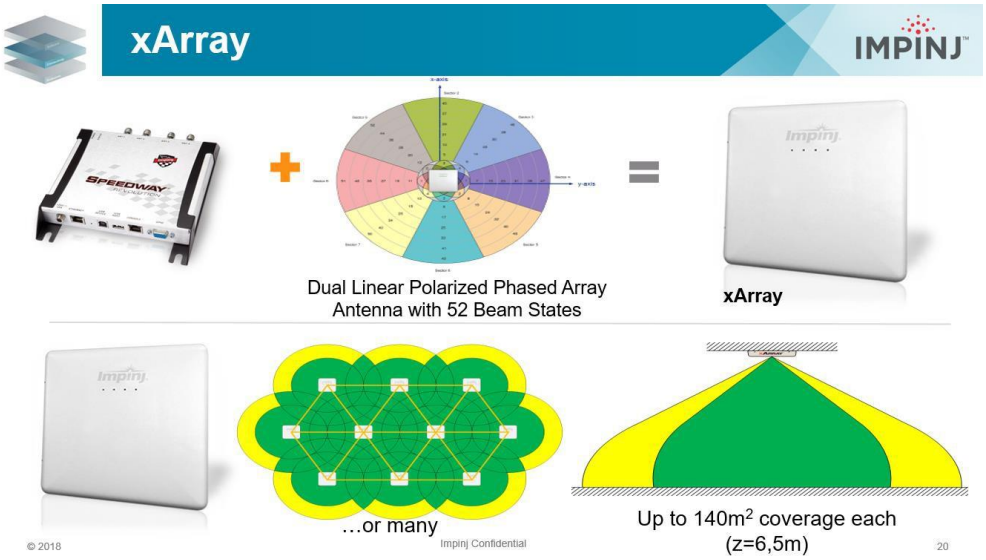
4. RFID X-Array by Impinj

Description:

Maccion platform has already integrated with X-Array solution by Impinj. This RFID system is able to geolocate passive tags from the ceiling. Have a look at the vídeo:

https://www.youtube.com/watch?v=jO6-TKkKj-I



Precision: 1m (at 3m ceiling)

TAG

- Description: RFID passive
- Dimensions compliance: YES
- Battery Autonomy: INFINITE
- Update rate: WHEN TRIGGERED or EVERY MINUTE
- Temperature compliance : YES

Required integration: ALREADY IN MARKET

Cost model: Hardware costs. No licenses.

Time to Market: ALREADY IN MARKET

5. UWB solutions for bridge cranes

Description:

The solution geolocates with a very high precision the arm of the bridge crane with UWB solution and identifies the asset that have been moved by reading its RFID tag.

Precision: < 1m

TAG

- Description: RFID Passive TAG (already validated)
- Dimensions compliance: YES
- Battery Autonomy: INFINITE
- Update rate: WHEN MOVED BY THE ARM
- Mold conditions compliance : YES

Required integration:

Maccion will provide the INVENTORY functionality with an update rate of less than a minute by adding RFID coverage in the storage Zones and detection range detection in the machines.

Cost model: Initial implementation. Hardware costs. No licenses.

Time to Market: 2 weeks

6. UWB market solution integration

Description

Our partner have a RTLS based in UWB technology already tested in market:

KIO RTLS Anchor

KIO RTLS Tag

Precision: 5-30 cm

TAG

- Description: UWB active TAG
- Dimensions compliance: YES
- Battery Autonomy: 6 month (extendable to 5 years)
- Update rate: 1 MINUTE
- Mold conditions compliance : NO

Required integration: API integration

Cost model: Initial implementation. Hardware costs. No licenses.

Time to Market: 1 week (API integration), 3 month (to extend battery life up to 5 years)

Notes: Better use-case for those assets that require high precision and have line power. For example AGVs or Forklifts.

7. SMAC100 as iBeacon by Maccion

Description

SMAC100 sensors are small wireless devices developed by Maccion with more than 10 years of autonomy. They were tailored designed to detect and notify all kinds of events that may happen in a production plant. The electronics perform at very low power and only is activated because of change of state of some physical magnitude. Then, through a secure protocol, they transmit the information to the data acquisition platform.

The solution is able to geolocate with triangulation algorithms providing the same capabilities of a BLE beacon.

Precision: 5-10 meters

TAG

- Description: Multisensor
- Battery Autonomy: 10 years
- Update rate: When triggered or 2 HOURS
- Temperature compliance : YES

Required integration: ALREADY IN MARKET

Cost model: Hardware costs. No licenses.

Time to Market: ALREADY IN MARKET

8. SMAC100 as iBeacon + UWB

Description

Based on the description above but integrating a CAPE which is already in market.

Precision: 5-10 cm

TAG

- Description: Multisensor and UWB for GEOLOCATION
- Dimensions compliance: YES
- Battery Autonomy: 10 years
- Update rate: When triggered or 2 HOURS
- Temperature compliance : YES

Required integration: Hardware design and deployment + CPU software

Cost model: Initial investment. Hardware costs. No licenses.

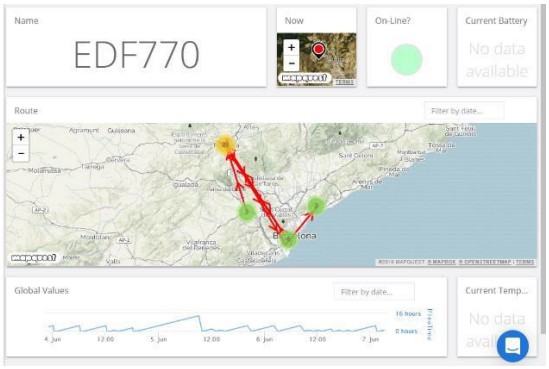
Time to Market: 6 weeks

9. LoraWAN tracker by Maccion

Description

Outdoor tracker using LoraWAN technology.

Success story:



Precision: 1 km

TAG

- Description: LoraWAN active
- Dimensions compliance: YES
- Battery Autonomy: 5 years
- Update rate: WHEN TRIGGERED or EVERY HOUR
- Temperature compliance: YES

Required integration: ALREADY IN MARKET

Cost model: Hardware costs. No licenses.

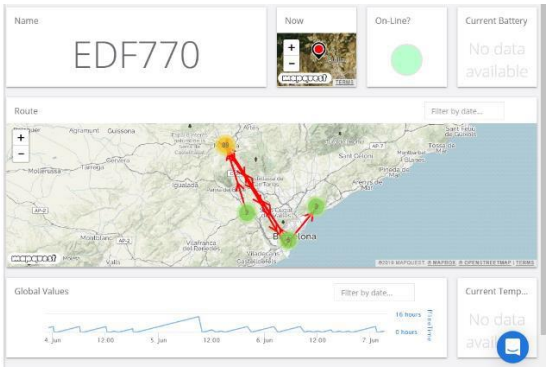
Time to Market: ALREADY IN MARKET

10. Sigfox + WIFI tracker by Maccion

Description

Outdoor tracker using Sigfox and WIFI technologies.

Success story:



Precision: 20m (indoor / outdoor)

TAG

- Description: Sigfox active
- Dimensions compliance: YES
- Battery Autonomy: 5 years
- Update rate: EVERY HOUR
- Temperature compliance: YES

Required integration: ALREADY IN MARKET

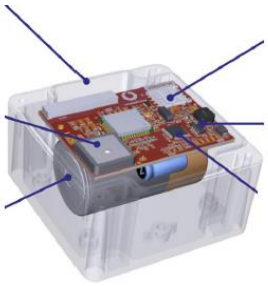
Cost model: Hardware costs. Yearly license per tag.

Time to Market: ALREADY IN MARKET

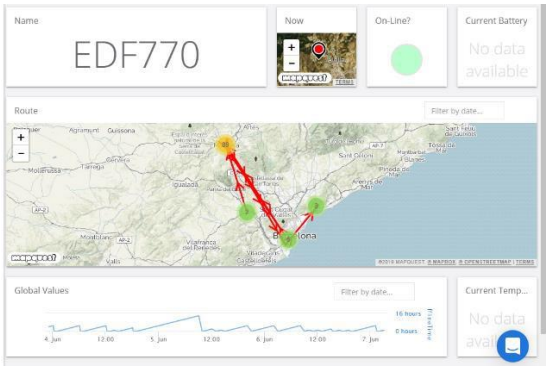
11. GPS + GSM tracker by Maccion

Description

Outdoor tracker using GPS and GSM technologies.



Success story:



Precision: 200m (indoor / outdoor)

TAG

- Description: GSM (worldwide) active
- Dimensions compliance: YES
- Battery Autonomy: 5 years (4000 messages)
- Update rate: 2 messages per day
- Temperature compliance: YES

Required integration: ALREADY IN MARKET

Cost model: Hardware costs. Yearly license per tag.

Time to Market: ALREADY IN MARKET

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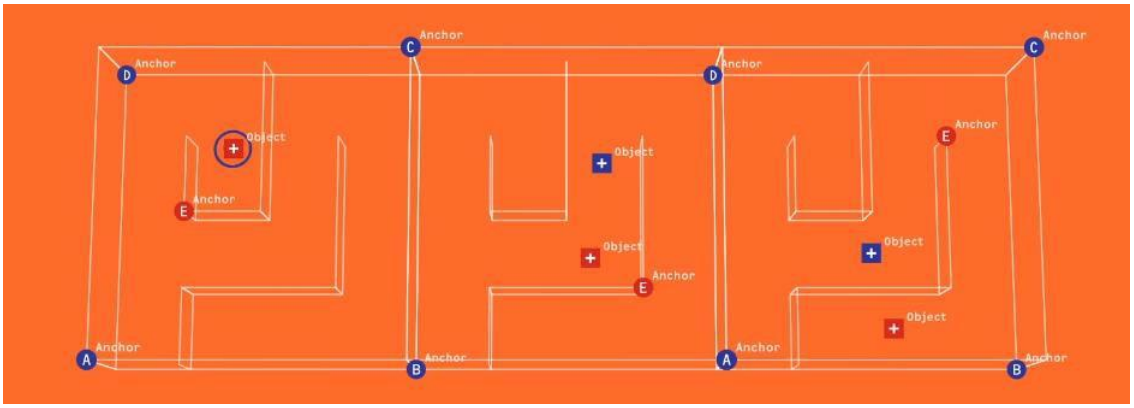
12. Integration with other RTLS solutions

Description

In few hours Maccion has the capabilities for integrating new RTLS solutions to the platform technologies.

Success story:



Required integration:	API Integration
Cost model:	Depending on the partner's conditions
Time to Market:	2 weeks

XX. New technologies?

Required integration:	API or hardware integration
Cost model:	Depending on the partner's conditions
Time to Market:	4 weeks

Contact

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