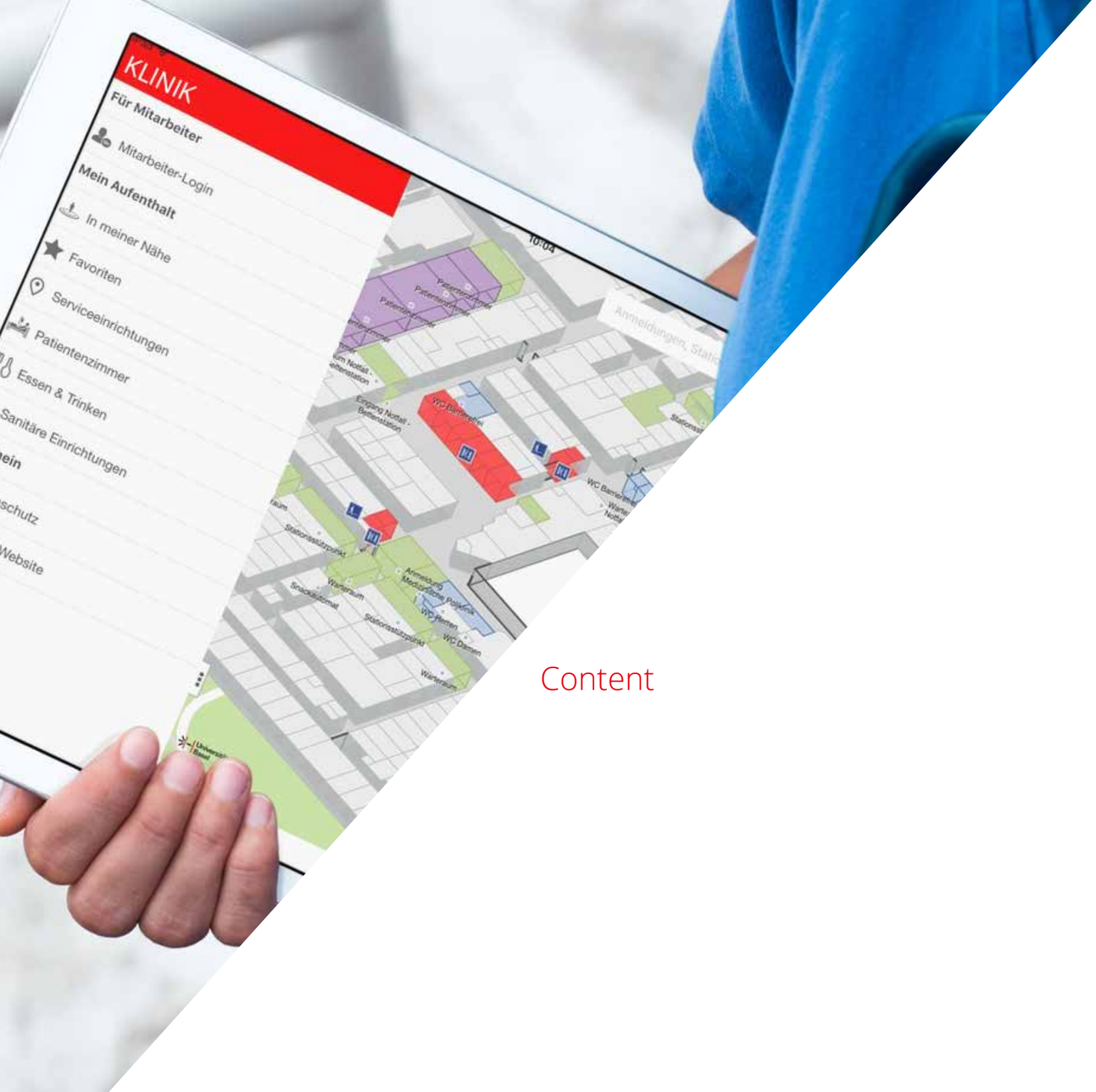
Indoor Positioning in Healthcare

smart connected locations



Content

Advantages of Indoor Positioning in Healthcare

The market for RTLS (Real-Time Locating Systems) in healthcare is expected to grow to $3.9 billion by 2025.[1] And that is for good reason. Hospitals, nursing homes, laboratories and other facilities in the healthcare sector will benefit from the implementation of an RTLS.

Actors in the healthcare sector regularly face major challenges. For example, stolen and lost assets such as wheelchairs and medical equipment cost hospitals millions each year.[2] Furthermore, nurses spend an average of one hour per shift searching for equipment, supplies and co-workers.[3] Also, many work processes are inefficient and patients regularly arrive late to appointments or miss them altogether. All of these issues represent a significant cost factor for medical facilities.

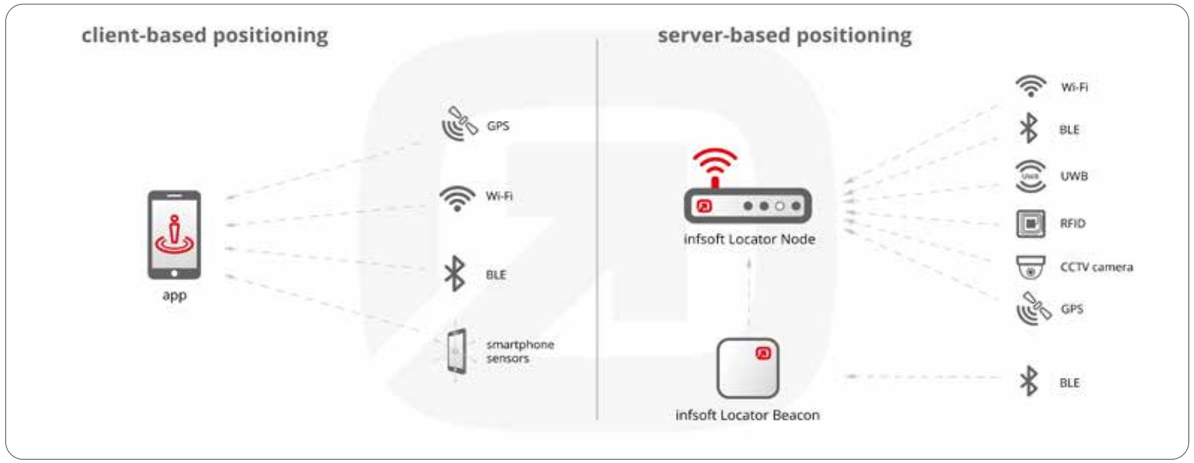
In addition to these financial challenges, there are safety aspects. In a hectic work environment, it cannot be guaranteed that every patient will be monitored at any given time. This can lead to patients getting into dangerous situations unnoticed, for example because their vital signs deteriorate or they leave their bed or ward unauthorized.

Indoor positioning can help to increase the efficiency of workflows and employee productivity. Ideally, process automation helps to prevent problems from even occuring. In addition, walking routes can be analyzed and a condition monitoring system helps to ensure compliance with hygiene regulations. In complicane with privacy protection, the location of colleagues and medical equipment can be viewed at any time, reducing search times and protecting assets from theft. Appointment management can also be improved using automated notifications which leads to reduced waiting times and fewer delayed and missed appointments. RTLS can further be used to optimize inventory management. Overall, several hundred thousand dollars can be saved every year by implementing RTLS in healthcare.[4]

Moreover, the possibility of determining the location of patients and staff increases their safety. If, for example, the vital signs of a patient deteriorate critically in an unobserved moment, the hospital staff can be on site quickly.

Sources
1. Real-Time Location Systems Market (RTLS) for healthcare with COVID-19 Impact Analysis by Offering (Hardware, Software, Services), Technology (RFID, W-Fi, UWB, BLE, IR, Ultrasound, Others), Facility Type, Application, Geography - Global Forecast to 2025
2. Bryant, Meg: „Lost and found: Keeping track of healthcare equipment“: https://www.healthcaredive.com/news/lost-and-found-keeping-track-of-healthcare-equipment/434353/
3. „Nurses waste ‘an hour a shift’ finding equipment“: https://www.nursingtimes.net/archive/nurses-waste-an-hour-a-shift-finding-equipment-10-02-2009/
4. Kamel Boulos, M.N., Berry, G. Real-time locating systems (RTLS) in healthcare: a condensed primer. Int J Health Geogr 11, 25 (2012) & Wicklund, Eric: „Study: RTLS technology can save hospitals time and money, boost care“: https://www.healthcareitnews.com/news/study-rtls-technology-can-save-hospitals-time-and-money-boost-care

Positioning Technologies



client-based and server-based indoor positioning

Basics: Indoor Positioning

Indoor positioning systems (IPS) enable you to locate the position of objects and people within buildings. GPS is not available in interior spaces, because there is no visual contact with the GPS satellites. Furthermore, with GPS, it is not possible to determine the floor level a device is located on. For this reason, other positioning technologies are used indoors.

Indoor positioning is based on a transmitter-receiver model where there are two possibilities to determine the current location of a person or asset indoors.

Client-Based Approach

A client-based technology is used to keep track of individuals that might require a back channel for further information exchange and for navigation purposes.

Indoor navigation is usually based on Bluetooth Low Energy beacons. For this purpose, beacons are mounted at regular intervals in the building.

The position is determined on a mobile device (e.g. smartphone) and an app is required.

Optionally, the position can also be transmitted continuously to a backend in order to make the data available for communication and analysis purposes.

Technology		Accuracy	Range	Suitable for	Transmitter power supply	Battery lifetime
Wi-Fi		< 15 m	< 150 m	area detection	or	medium
BLE	4.0	< 8 m	< 75 m	area detection		high
	5.1	< 1 m with line-of-sight				
RFID		presence detection only	< 1 m	spot detection	— (passive RFID tag)	— (passive RFID tag)

comparison of different technologies for server-based indoor positioning

Server-Based Approach

A server-based technology is used to keep track of assets and persons. For this purpose, transmitters are attached to assets or are carried by people.

The receiver hardware is installed within the client's premise to capture the signals of the transmitters/ senders and to transfer the data to a backend engine.

To meet the requirements of a client with regard to the requested accuracy, there are several potential sensor technologies available for server-based indoor positioning.

Wi-Fi

For positioning with Wi-Fi, the so-called fingerprinting method is used. The strength of the Wi-Fi signals (received signal strength indication, RSSI) and the MAC address (media access control) are significant.

In a server-based solution, Wi-Fi enabled devices and Wi-Fi tags are detected by the infsoft Locator Nodes 1400 (hardware specially developed by infsoft) and asset tracking is possible. People flows can also be recorded using this technology.

Accuracy depends on multiple factors, such as reflections, for example in corridors, and shielding through walls, ceilings, and your own body. The accuracy of Wi-Fi used for indoor positioning varies from 5 to 15 meters – depending on the preconditions.

Wi-Fi at a glance

Pros:

- enabled Wi-Fi is sufficient
- under certain circumstances, the customer's existing infrastructure can be used (e.g. Cisco DNA Spaces)

Cons:

- relatively inaccurate (5-15 m)
- no latency guarantees
- use of randomized MAC address if smartphone is not connected to Wi-Fi network
- high energy consumption with Wi-Fi tags

beacons for indoor positioning

Bluetooth Low Energy (BLE) Beacons

Beacons are small radio transmitters that broadcast signals using Bluetooth Low Energy (Bluetooth Smart) in a radius of up to 70 meters. These signals are detected by infsoft Locator Nodes in a server-based approach. In healthcare facilities, the localization of beacons enables various tracking solutions to be implemented.

BLE beacons are cost-effective and energy-efficient components that can run on button cells up to five years and more. The transmitters are available from numerous suppliers and come in various shapes and sizes. From ISO cards for employees to wristbands for patients and BLE tags for medical devices, there is a beacon for every application in healthcare. Beacons with E-Ink display enable digital labeling of rooms, lockers and beds. By using beacons with integrated sensor technology, sensor data can also be provided. infsoft solutions are compatible with beacons from all manufacturers.

Bluetooth beacons do not usually affect other wireless networks and also medical devices remain undisturbed.

Bluetooth 4

The current standard for BLE beacons is Bluetooth 4 (4.0 / 4.1 / 4.2), which uses RSSI (Received Signal Strength Indication) to determine position, meaning that the location is calculated based on the measured signal strength. RSSI based positioning is usually suitable for localization with area accuracy.

Bluetooth 5

The latest Bluetooth version, Bluetooth 5, achieves significant improvements in terms of signal range, bandwidth and data transfer speed compared to applications using Bluetooth 4.

Bluetooth 5.1 furthermore has a direction-finding function and can use Angle of Arrival and/or Angle of Departure for positioning. With direct line-of-sight, this determination of the direction of a Bluetooth signal enables significantly more precise positioning than Bluetooth 4. However, due to reflection behavior, this direction-finding function does not work reliably in hospitals and most other healthcare facilities.

BLE at a glance

Pros:

- cost-effective, unobtrusive hardware
- low energy consumption
- high accuracy compared to Wi-Fi
- under certain circumstances, the customer's existing infrastructure can be used (e.g. Cisco DNA Spaces)

Cons:

- attachment to mobile medical equipment is sometimes difficult

RFID

RFID stands for “Radio-Frequency Identification” and describes systems that use radio waves to identify objects or persons. In a passive RFID system, there is a transponder (“RFID tag”) on whose microchip data (usually a serial number) are stored, which can be forwarded wirelessly to a reader. The reading unit (e.g. infsoft Locator Node 1100) generates an energy field that activates the RFID tag. In order to enable information exchange, the distance between Locator Node and transponder must be less than one meter (remote-coupling). RFID tags do not require visual contact with the reader, are durable against impact and environmental factors and are almost maintenance-free.

Common applications in healthcare are systems for access control to secured areas, time recording of personnel or inventory monitoring of disposables such as syringes, bandages and various single-use products.

RFID at a glance

Pros:

- low costs per asset
- no battery needed

Cons:

- short range (< 1 m)
- only providing a “point-in-time” location
- installation requires significant planning
- infrastructure can be expensive

Summary View

Client-Based Positioning

In healthcare, client-based positioning is used for indoor navigation.

Most of the time, such a solution is based on Bluetooth Low Energy beacons. Easy installation and long battery life of beacons are big advantages of this technology. Furthermore, Bluetooth is superior to Wi-Fi for indoor navigation, as client-based positioning based on Bluetooth works on both Android and iOS devices.

Patients, visitors and staff can easily navigate to relevant destinations on site with their smartphones and view their current position on a digital map. A corresponding app and an activated Bluetooth function are required. Sensor fusion — the use of smartphone sensors — can further improve precision in client-based applications.

Server-Based Positioning

In healthcare, server-based positioning is most commonly used for tracking assets and people.
Usually, Bluetooth beacons that are attached to the assets to be tracked or carried by patients or staff members in the form of wristbands or ISO cards are used here. Since in most cases it is sufficient to know in which room a medical device or a patient is located in a hospital, room or area accurate tracking is mostly applied.

Other technologies like Bluetooth 5.1 using Angle of Arrival or RFID are only used in special use cases. Since the direction finding feature of Bluetooth 5.1 requires a direct line-of-sight, for example, it is not possible to improve tracking accuracy in a hospital where there are many walls and doors that can interfere with the signal.

Hardware

To address a client's need for a reliable indoor tracking solution, we rely on our own hardware.

Positioning is based on a transmitter-receiver model. To implement an indoor positioning project, you need hardware for receiving signals and hardware for transmitting signals. For our hardware products we offer flexible mounting options, which are sold separately. The mounts are magnetic and have additional boreholes for fixed installation.

infsoft receiver hardware for healthcare applications includes infsoft Locator Nodes 1400 and infsoft Locator Beacons.

infsoft Locator Nodes 1400

infsoft Locator Node 1400 © infsoft GmbH

infsoft Locator Nodes 1400 are hardware components that can receive Wi-Fi and Bluetooth Low Energy (BLE) signals from mobile transmitters. This enables the positioning of Wi-Fi tags and beacons attached to objects or

carried by people, as well as the localization of Bluetooth or Wi-Fi-capable mobile devices. The gateway function allows communication between different types of devices and the cloud and enables bidirectional information exchange between infsoft Locator Nodes 1400 and Bluetooth transmitters such as infsoft E-Ink Display Beacons. Connecting systems from third-party providers such as Cisco (CMX, DNA Spaces, MSE, Meraki), HP Aruba or Xirrus is also possible.

infsoft Locator Node 1400

infsoft Locator Beacons

infsoft Locator Beacons are stationary installed, battery operated hardware components, which periodically scan for signals of mobile beacons, that are used to track persons or objects, and send information about the received signals to the nearest infsoft Locator Node 1400. This technology is particularly suitable for applications in which area-accurate positioning with a small time delay is sufficient. A big advantage is that the number of deployed Locator Nodes can be minimized, which significantly reduces installation effort and costs. Moreover, infsoft Locator Beacons require very little maintenance, as their battery life is up to ten years (depending on the scan interval).

infsoft Locator Beacon

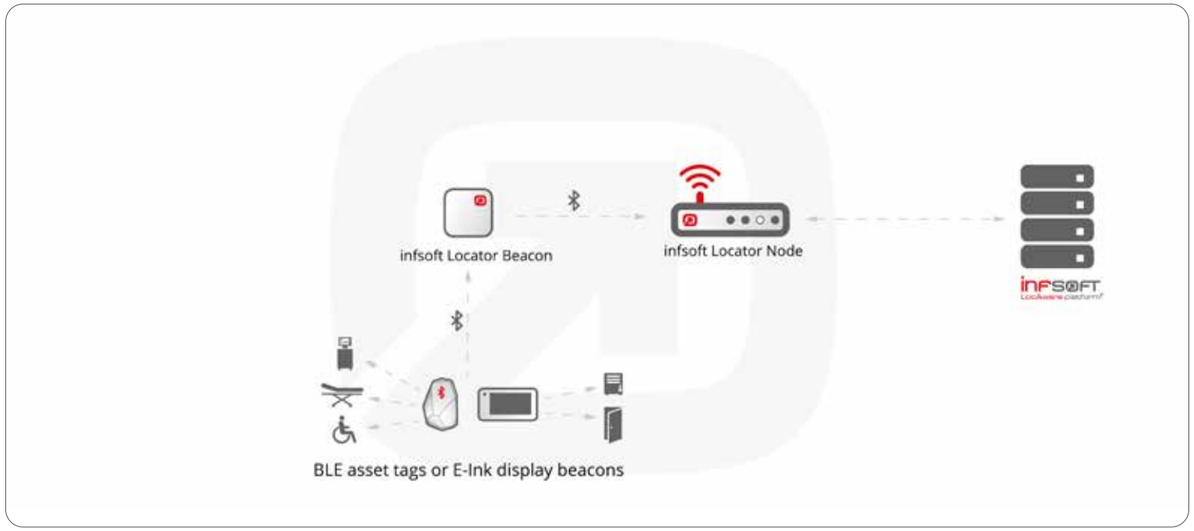
In addition to their asset tracking capabilities, Locator Beacons can also emit signals that are received by mobile devices (e.g. smartphones), making them suitable for applications such as indoor navigation and location-based services.

mount for the infsoft Locator Beacon

infsoft Locator Beacon

Transmitter hardware emits signals that are detected by the receiver hardware. Depending on the application, BLE 4 / 5 Tags or infsoft E-ink Display Beacons are used. In addition, the positioning can be enriched with sensor data.

Bluetooth Low Energy tags (beacons)



server-based positioning with infsoft Locator Beacons

BLE 4 / 5 Tags

Bluetooth Low Energy tags, also known as BLE beacons, are small battery-powered radio transmitters that broadcast signals at a specific time interval. Beacons are available in many sizes and shapes and are suitable for a variety of applications, e.g. indoor navigation and tracking solutions. Bluetooth technology is continuously subject to further development, and beacons currently available on the market are equipped with different Bluetooth versions. While Bluetooth 4 and 5.0 are best suited for room-accurate positioning, for example in office buildings or hospitals, Bluetooth 5.1 enables more precise positioning when there is a direct line-of-sight and is mainly used in positioning systems in open spaces, such as industrial halls.

infsoft E-Ink Display Beacons

infsoft E-Ink Display Beacons deliver look and utility of paper encompassing good readability, very wide viewing angles, design freedom, robustness, and low power consumption. Combining E-Ink displays and Bluetooth Low Energy (BLE) technology enables transferring content flexibly to the display as well as visualizing and tracing the device's location.

A fast, efficient and wireless update of the displayed content can be realized not only manually, but also automatically by defining triggers. The time and effort required to print labels manually is thus eliminated.

Beacons with E-Ink display are especially suitable for electronic labelling of shelves, doors or hospital beds.

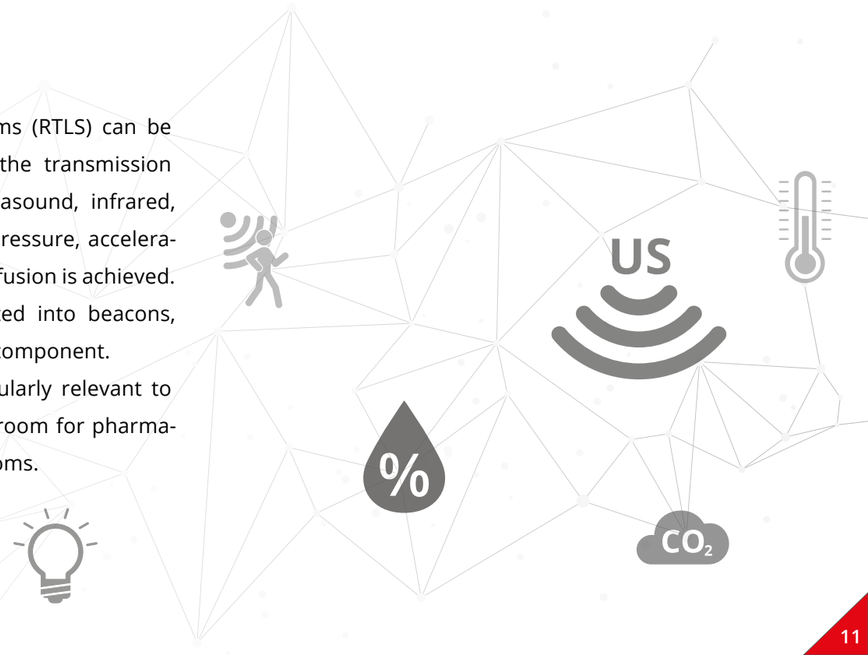
infsoft E-Ink Display Beacons © infsoft GmbH

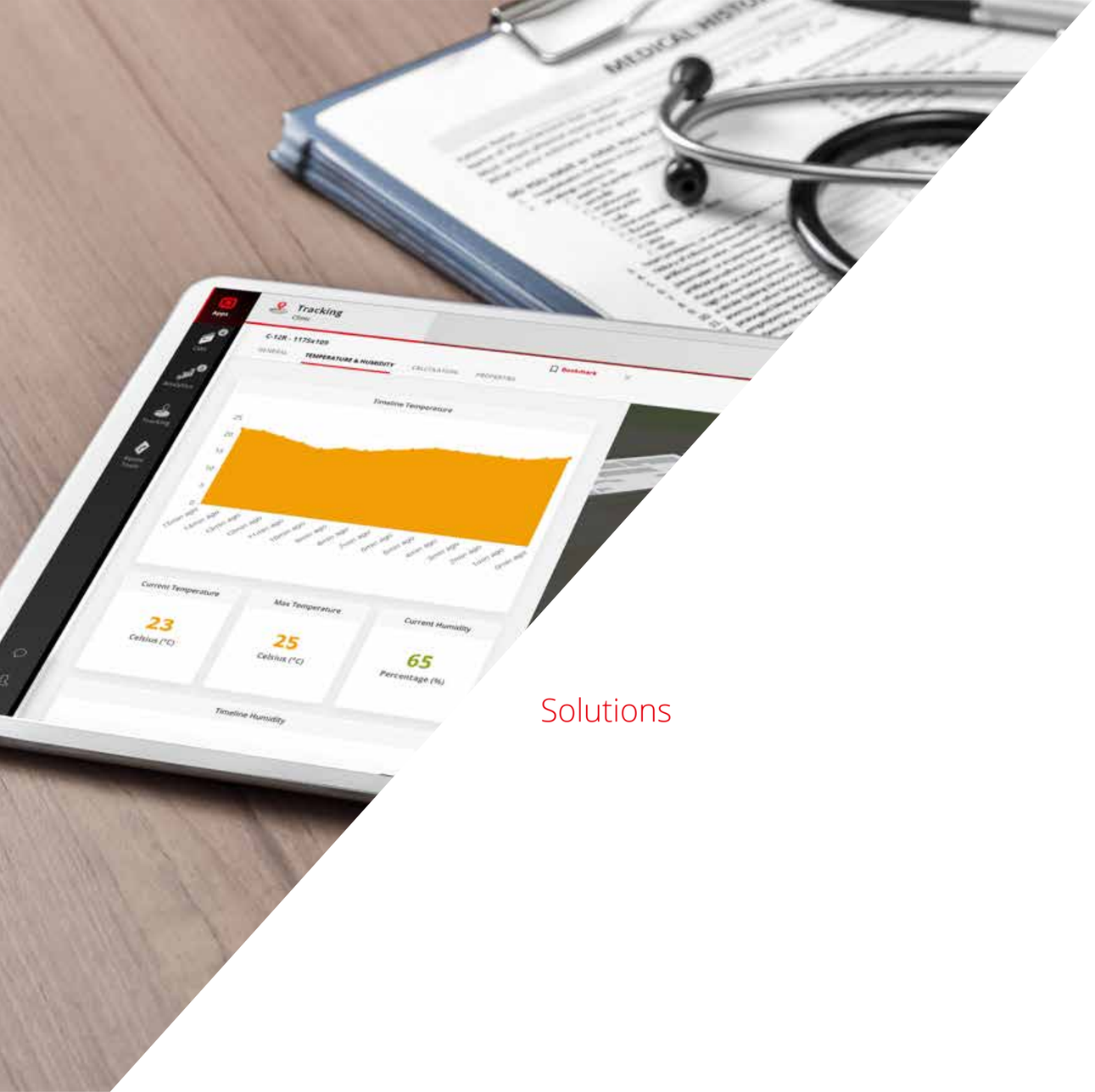
infsoft E-Ink Display Beacons

Condition Monitoring Systems

The existing Real-Time Locating Systems (RTLS) can be enriched with sensor data. Through the transmission and acquisition of this data (e.g. ultrasound, infrared, CO_2, temperature, humidity, light, air pressure, acceleration) an innovative, holistic sensor data fusion is achieved. Some of the sensors can be integrated into beacons, others represent a separate hardware component.

In healthcare, for instance, it is particularly relevant to monitor the temperature in a storage room for pharmaceuticals or the air quality in patient rooms.





Solutions

infsoft offers a full range of positioning services. This includes indoor mapping and navigation solutions as well as tracking, location analytics and geo-based services inside and outside of health-care facilities.

Indoor Digitization

Mapping a location is the first step in any indoor positioning project – and crucial for accessing the digital value of indoor spaces. It provides access to digital maps and to every layer of building information, allowing all indoor processes to be digitized.

The integration of digital maps lays the foundation for the use of indoor navigation, indoor tracking, indoor analytics, and geo-based services.

Indoor Digitization

Indoor Navigation

Due to the complex building structures in hospitals, it can get difficult for patients, visitors and even employees to reach a certain location by the shortest route. Indoor navigation, wayfinding within buildings, facilitates orientation in the hospital.

A typical application for medical facilities is turn-by-turn navigation in an app (displaying directions on a digital map). Patients, visitors and staff can use the app to navigate to points of interest (e.g. ward, patient room, cafeteria, toilets) on the hospital premises.

To implement such a system, a client-based solution based on Bluetooth Low Energy is used. In order to use the navigation, an app must be installed on the user's smartphone and Bluetooth must be activated on the phone. Smartphone sensors are always called upon to refine the positioning.

However, indoor navigation is also possible without automatic positioning – for example, when a digital building map is integrated into a digital signage system (multi-touch kiosk/interactive terminal).

Additional App Features

Additional functions can be integrated into an indoor navigation app. For example, a colleague finder is an interesting feature for hospital staff. When a specific doctor needs be consulted about a case, their location can be viewed on a digital map and navigation to that location can be started.

Patients can, for example, use the app to select meals for the next few days, book TV and telephone cards or find out about upcoming events in the hospital.

In addition, patients who come to the hospital for outpatient treatment can receive reminders and updates for their appointments via the app. In this way, on the one hand, late arrivals or missed appointments are avoided and on the other hand, waiting times for patients can be reduced.

For visitors of the hospital, the menu of the cafeteria or the opening hours of the clinic shop are particularly interesting. Moreover, the option of a sign translator can be very helpful for foreign visitors.

Use Case: Indoor Navigation in Healthcare

Indoor Navigation and Digital Signage in Hospitals

Success Story Helios Clinic Erfurt

The Helios Navi App supports visitors and patients of the Helios Clinic in finding their way around the hospital effortlessly. A free smartphone app can be used to display a clinic map, relevant points of interest and turn-by-turn directions. Furthermore, relevant information on the individual destinations, such as a brief description and, where applicable, contact persons and information, opening and office hours, is provided. In addition, kiosk systems are installed at central points throughout the hospital to provide visitors and patients with an overview of the hospital campus.

Helios Navi App

indoor navigation via terminal (photo: Helios Klinikum Erfurt)

Helios Navi App Functions

- Clinic overview and turn-by-turn navigation
- Quick overview of destinations in the hospital
- Services „Near Me“
- Stationary Terminals
- VoiceOver support for visually impaired people

Success Story University Hospital Basel

The USB Map App provides a digital routing for mobile devices and helps patients, visitors and employees to quickly and easily find their way to an individually chosen destination on the premises. The app locates smartphones and tablets using approximately 2,500 beacons and sensor fusion. The interactive map includes points of interest such as sanitation, catering facilities, patient rooms, and treatment rooms. The app users are guided to these POIs via turn-by-turn navigation. This service offer not only improves the quality of stay in the clinic, but also has a positive impact on the organization of internal processes thanks to the integration of an employee function.

USB Map App Functions

- Map view and routing
- Rooms, POIs and service facilities as navigation destinations
- „Around me“ function
- Personal favorite list
- Employee login

Indoor Tracking

Indoor tracking denotes the real-time localization of persons and objects within buildings. Depending on the application, infsoft deploys indoor tracking based on different sensors. Usually, a server-based application is implemented.

Indoor Person Tracking

Indoor tracking of people can be useful in many situations. On the one hand, safety aspects play a role, for example in monitoring high-risk patients and in evacuating staff and patients in emergencies. On the other hand, the recorded routes provide the basis for process optimization.

Mobile Emergency Button

In hospitals, dangerous situations frequently occur. For example, a patient may suddenly feel dizzy while moving around the building or an employee may be attacked while alone with a patient.

In the event of such an emergency, the location of patients and employees can be shared with other hospital staff.

Employees and patients typically wear a beacon wristband. In the event of a threatening situation, they can press a button and in addition to an emergency call, share their position with the responsible hospital staff. If a patient is unable to act because, for example, he has passed out, the emergency call can alternatively be triggered automatically after a certain time of motionlessness.

Monitoring of Vital Signs

By integrating Bluetooth Low Energy beacons into telemetry devices, the safety of patients in a critical state of health can be increased. In addition to seamless monitoring of a patient's vital signs, the patient's location can be accessed in an emergency.

Fall Detection & Out-of-Bed-System

The fall of a patient can be registered using a beacon wristband with acceleration sensor and an infrared sensor mounted on the ceiling. The infrared sensor records thermal images of the room and can also determine whether a person is standing upright or lying on the floor. The accelerometer can be used to determine whether the patient is moving or motionless.

An infrared sensor can also be used to identify whether patients are lying in their beds or whether they have left it.

The position is determined using Bluetooth Low Energy.

Fall Detection in Healthcare

Indoor Object Tracking

In the healthcare sector, indoor tracking of objects is particularly useful with regard to time saving, process optimization and theft protection. The current location of mobile medical equipment and beds can be viewed on a digital map at any time.

Coordination of Medical Equipment

Many medical devices such as mobile ultrasound or ECG devices change rooms or even wards several times a day. When the device is needed, it frequently takes a long time for employees to find it. Oftentimes devices remain untraceable for a considerable time. With the help of BLE beacons, which are attached to the devices and other assets, the position of the objects can be determined at any time and viewed on a digital map. This reduces search times and facilitates the coordination of devices between doctors and wards.

object tracking using the infsoft Tracking app

Tracking Solution with Display Device

If, in addition to the locating of assets, like for example hospital beds, a display medium is desired, E-Ink Display Beacons can be used. All relevant information about the bed (next maintenance and cleaning date) and the patient (place and time of the next appointment) can be shown on the displays. The information can be changed manually or automatically by linking to the hospital information system.

Inventory Management

Tracking disposables optimizes inventory and order management. Both over- and understocking of materials are avoided with a tracking solution, as the current stock is always visible and a new purchase order can be triggered automatically as soon as this stock falls below a predefined level.

In a laboratory, for example, consumables can be tracked using RFID to minimize the number and amount of inventory items stored, decrease waste generation and control waste disposal costs. The articles are registered on arrival and automatically booked out when they are consumed.

Use Case: Indoor Tracking in Healthcare

Monitoring and Asset Tracking in the Healthcare Sector

Indoor Analytics

The analysis software from infsoft can be added to existing indoor positioning/indoor navigation systems (client-based or server-based) or set up independently. No personal data are captured, so that infsoft Analytics can be used in compliance with data protection regulations.
In hospitals, indoor analytics gives insights into the behavior of patients, visitors and employees and thus provides helpful information for business decisions. For example, it is possible to track walking routes, waiting times in the waiting room and the overall busiest hours of the day. In addition, the movements of objects such as medical equipment, wheelchairs or beds can be analyzed.

The data is displayed in the form of diagrams and heat maps, enabling easy evaluation and further processing. infsoft's analytics dashboards are highly flexible and can be customized to the individual needs of each client.

Geo-Based Processes & Services

One application of location-based services is providing information or functions to smartphone users, depending on their location. A distinction is made here between reactive and proactive services. For reactive location-based services, the user searches for locations in the vicinity directly on his/her device. Proactive services "recognize" when a user enters a specific area and trigger an action. When using proactive location-based services, a smartphone is not necessary. Also, the detection of BLE tags at a specific location can trigger a predefined action.

Geofencing in interior spaces

The triggering of an action when taking a specific path is called geofencing (combination of geography and fencing). In hospitals and care facilities, geofencing is particularly interesting to ensure that patients at risk do not leave their wards and that only authorized persons are able to enter secured areas.

Process automation

Geofencing allows intelligent process automation. Using the infsoft Automation Engine, various geo-based triggers can be defined. It is possible to, for example, configure emails and tasks, create alerts, and protect areas by triggering automatic door locking/unlocking.

Increased Safety for Dementia Sufferers

Geo-based processes can be used in medical facilities, for example, to protect elderly patients and dementia sufferers who are suffering from orientation difficulties. The risk that these patients leave their ward or the hospital or care facility at an unsupervised moment is high. Wearing a beacon wristband increases patient safety and freedom of movement. As soon as a patient leaves a predefined area, the door is automatically locked or a warning is sent to the nursing staff.

Access Control System

Beacons in the form of ISO cards or wristbands can be used by employees to gain access to specific areas. If the beacon is registered in the immediate vicinity of a door, then the door can be unlocked automatically. This ensures that only authorized personnel have access to certain areas of the hospital.

Theft Protection

beacon wristband by Minew

In addition, the tracking of assets with beacons can protect the objects against theft. As soon as the asset leaves a predefined area, an alarm can be triggered or an automated message can be sent to the responsible personnel.

Use Cases for the Healthcare Industry

Indoor Navigation

- Indoor Navigation and Digital Signage in Hospitals
- Indoor Navigation and Asset Tracking in Hospitals
- Digital Patient Call and Indoor Navigation in Hospitals

Indoor Tracking

- Indoor Tracking of Patients in Hospitals
- Monitoring and Asset Tracking
- Tracking of Endoscopes in Hospitals
- An Emergency Call System for Elderly People
- Patient Monitoring
- Mobile Nurse Call System
- Tracking Solution with Information Display for Hospital Beds
- Tracking of Disposables in a Laboratory
- Monitoring of Environmental Conditions in Pharmaceutical Storage
- Asset Tracking and Temperature Monitoring in the Laboratory

Geo-based Processes and Services

- Patient Wandering System for Dementia Sufferers in Nursing Homes

Use Case: Geo-based Processes and Services in Healthcare

Patient Wandering System for Dementia Sufferers in Nursing Homes

Products

In addition to tailor-made, customized solutions, infsoft also offers ready-to-use solutions with powerful and innovative features. Smart applications for healthcare facilities include our solutions for tracking of medical equipment, inventory management, wayfinding, room signage and room climate monitoring.

infsoft Wayfinding

On the extensive premises of a hospital or a different kind of healthcare facility, the fastest way to reach a destination is not always apparent. A smartphone app can help visitors, patients and employees to find their way around the premises more easily. With infsoft Wayfinding, users can be guided reliably to their destination across indoor and outdoor areas.

With the software tools infsoft Maps Editor, infsoft CMS, infsoft Routes and infsoft Calibration, the application can be flexibly configured according to the customer's needs. Using our SDK (Software Development Kit) it is also possible to integrate the technology into existing applications.

Digital 2D/3D Building Map

The app provides 2D and 3D maps of the individual floors of all buildings on the site. The user can see their own location as well as relevant destinations on the premises.

Turn-by-Turn Navigation

The user can be navigated to any destination on the site – wards, patient rooms, kiosk, cafeteria and much more. Using turn-by-turn navigation, the user follows the directional instructions displayed in the wayfinding app.

Information About Points of Interest

In addition to the position of the destinations, further information about them can be found. This may include a brief description, contact details and opening hours.

Technical Implementation

Bluetooth Low Energy (BLE) beacons (or infsoft Locator Beacons) are installed at regular intervals throughout in the site. The beacons emit signals which are received by the users' smartphones. Based on the received signals, the position of the device is determined directly in the smartphone app.

Inside the app, the user can select a navigation destination and follow the directional instructions to their destination.

More information and cost examples

- infsoft Wayfinding

infsoft MedEquip Tracking

infsoft MedEquip Tracking supports healthcare facilities in managing their mobile assets. Locating objects of different sizes ranging from hospital beds to endoscopes is equally possible. Besides the position of the assets (ward, patient room, bed preparation, etc.) additional information can be stored. Furthermore, an automatic update of the status (e.g. „unclean" or „in use") is possible using geo-based triggers. The user can view and evaluate all collected data in infsoft's Analytics software in real-time and over time. This creates transparency regarding the availability of medical equipment and beds.

The position is generally determined via BLE beacons, which are attached to the assets. With modern beds, however, it is also possible to establish a connection to the software that is integrated in the bed. This allows the analytics dashboard to automatically display information such as to which height the bed is set or whether it is currently occupied.

Localization

The solution enables reliable room- and area-specific positioning of mobile medical equipment and hospital beds. The localization can be carried out seamlessly across all floors of the building.

Geofencing

Geofencing allows automatic status changes or notifications as soon as an asset enters a certain area. For example, a cleaned bed can receive the status „clean" when it arrives in an allocated zone for clean beds.

Analyses

In addition to location and status information, a comprehensive dashboard provides the user with valuable insights into the utilization and usage of all assets. Grouping and filtering of object types is also possible.

Technical Implementation

Bluetooth Low Energy (BLE) beacons attached to the assets send out signals that are received by infsoft Locator Beacons mounted in the building. These signals are forwarded to an infsoft Locator Node and sent to the infsoft LocAware platform® where the position is determined.

The use of infsoft Automation allows the definition of geo-based triggers. The collected data can be accessed in infsoft Analytics.

infsoft Inventory

With infsoft Inventory, we provide our customers with a solution that facilitates efficient inventory management of all assets.

In the basic version without tracking functionality, infsoft Inventory does not require any hardware investment. For product identification, assets are tagged with QR codes or barcodes.

infsoft Tracking dashboard

There are several options available if companies wish to use infsoft Inventory more extensively. The application can be integrated into ERP software, for example, and can thus be connected to existing databases. Another option is to link the application to geodata. Either Bluetooth beacons or E-Ink display beacons can be used for this purpose. E-Ink display beacons offer the added benefit of allowing information to be displayed directly on the asset (e.g. product details, reservation status, maintenance schedule).

Other possible functions of infsoft Inventory include automatic notifications before an upcoming inspection date or colored highlighting of borrowed items in the user interface.

Localization

The tracking solution enables reliable positioning of mobile and stationary inventory with room or area accuracy. The position can be determined seamlessly across floors and indoor and outdoor areas.

Analyses

In addition to location and status information, a comprehensive dashboard provides the user with insights into asset utilization. Furthermore, there are functions for grouping and filtering the assets.

Theft Protection

Via infsoft Automation, an automated warning can be generated, e.g. when an asset enters or leaves a predefined area or stays in a certain area for a certain period of time.

Implementation

In the basic functionality without a tracking function, QR codes or barcodes are attached to the inventory items. The data of the respective code is captured by a reading device and can then be accessed via the infsoft Inventory user interface.

For location tracking, Bluetooth Low Energy (BLE) beacons are attached to the assets. The signals emitted by the beacons are received by infsoft Locator Beacons and then forwarded to an infsoft Locator Node. From there, the information is sent to the infsoft LocAware platform® where it is intelligently processed.

infsoft Room Signage

infsoft offers innovative electronic signage systems based on battery-powered E-Ink display beacons. These modern and also very practical displays can be used, for example, for room signage or for labeling of hospital beds. As a result, they simplify workflows and create transparency, as employees and visitors can view up-to-date information about ongoing and upcoming meetings and treatments at any time. The displays enable the automation of processes and a reduction in overall operating costs.

With the help of the display beacons, not only office, seminar and conference rooms, but also treatment and patient rooms can be updated and easily managed at any time. E-Inks can also be used to digitally label lockers, which are provided to employees, visitors and patients for storing valuables and personal items.

The tricolor display is equipped with an LED indicator and uses fully daylight-compatible ePaper technology. The batteries last for about 5 years, even with several content updates a day. The battery status can be monitored using the software tool infsoft E-Inks.

Technical Implementation

Bluetooth Low Energy beacons with E-Ink display are placed next to room doors. infsoft Locator Nodes 1400 installed in the building receive the signals of the display beacons and transmit them to the infsoft LocAware platform®.

Via Bluetooth, the content is transferred from an infsoft Locator Node 1400 to the E-Ink display to be labeled. The content on the display can be automatically updated using infsoft Automation.

More information and cost examples

- infsoft Room Signage

infsoft Room Environment

This intelligent room climate monitoring solution empowers healthcare facilities to improve the well-being and performance of their workforce and to influence the patients' health positively. By collecting various sensor data that characterize the quality of the environment (e.g. temperature, relative humidity, carbon dioxide levels, illuminance), optimal conditions can be created and maintained. This can serve as an important measure to promote employee and patient health. Automated notifications can be triggered when certain thresholds are exceeded, allowing an ideal indoor air quality to be restored as quickly as possible.

The sensor data can also be integrated into a mobile app. With existing interfaces to the building control system, adjustments to the room climate (e.g. temperature regulation) can be made via the app.

infsoft Room Environment relies on cost-effective, low-maintenance Bluetooth Low Energy hardware, is non-intrusive, and integrates seamlessly with existing control systems. This product is based on the software solution infsoft Sensors.

Technical Implementation

Beacons with integrated sensors for collecting environmental data („Sensor Beacons") and infsoft Locator Nodes 1400 are installed on the premises. Based on the sensor functions, the beacons determine various values such as temperature and relative humidity in the area to be monitored. Via Bluetooth, the collected data is sent to a Locator Node 1400 within range. From there, the data is transmitted to the infsoft LocAware platform®, where it is intelligently processed and made available via web services.

More information and cost examples

- infsoft Room Environment

Software: LocAware platform®

infsoft LocAware platform®

infsoft offers customized, holistic solutions and powerful software tools for the successful implementation of Real-Time Locating Systems.

As a central data hub, the infsoft LocAware platform® represents the center piece of the infsoft tools. All tools required for the setup and data management are bundled here and are accessible with single sign-on. The platform is available as cloud and on-premise solution.
The web-based tools enable managing a location on all floor levels, analyze traces through the building, manage devices, beacons and Locator Nodes as well as to define geo-based alerts.

Setup & Administration

The setup tools include all the required features to set up an indoor positioning system – mapping, calibration, data management, and route definition.
The infsoft administration tools provide useful functions for managing the deployed indoor positioning system (e.g. registration and administration of beacons and infsoft Locator Nodes).

Data Processing & Output

infsoft's processing and output tools enable the intelligent use and evaluation of the collected data and help companies to optimize processes and improve decision-making.

infsoft Analytics

infsoft Analytics visualizes detected devices within the floor plans and enables real-time monitoring of motion profiles. You can measure frequencies in specific areas, create time- and location-related analyses and combine the system with infsoft Automation to enrich your data. The live scripting engine can filter information or visualize data links in real time and in retrospect. The tool also provides heat map visualization and route tracing.

infsoft Analytics

infsoft Tracking

Real-time visualization of the position of specific devices is enabled by the infsoft Tracking engine. You can add attributes to a device (e.g. mail address, name etc.), organize devices in groups and send push notifications to selected users. The engine can also be used for asset tracking and can be linked with other tools such as infsoft Automation.

infsoft Sensors

infsoft Sensors visualizes condition sensing devices on the map and enables real-time monitoring of status information (e.g. light, temperature, pressure, humidity, CO_2, and presence based on infrared or ultrasound).

infsoft Tracking

infsoft Automation

infsoft Automation allows for the definition of various geo-based triggers along the process chain in real time. The automated actions to be triggered can include alerts, notifications (push, email, ...), door locking/unlocking.

infsoft Workflow

infsoft Workflow enables the active planning, control and logging of work-sharing processes within RTLS projects. Using the tool, all tasks that have to be carried out with the execution of organizational procedures can be registered and structured. Additionally, it is always possible to store geo-information.

infsoft Machine Learning

infsoft Machine Learning is a visual tool that allows creating user-defined machine learning models, train them within a very short time and use them in a wide variety of applications. The powerful environment processes position and/or sensor data and uses self-optimizing algorithms that can learn from experience. By recognizing patterns and regularities in existing data, values and results can be predicted.

infsoft Automation

Software Videos

- infsoft Analytics
- infsoft Tracking
- infsoft Automation

SDKs, Web Services & Developer

infsoft's technology is also available as plugins for integration into third-party apps. The plugins contain indoor positioning, indoor navigation & routing, 2D/3D building maps and GEOItems. The determined position is issued as virtual GPS coordinates and can be used as such in the app for your own purposes. The SDK (Software Development Kit) is currently available for the Android and iOS mobile operating systems and as an HTML5 plugin. In addition to a native implementation, the use of frameworks such as PhoneGap or Xamarin is also possible.
infsoft's products can also easily be adapted to different system environments. The infsoft web services allow fast and efficient data integration via REST/SOAP interface.

infsoft Developer Hub

The infsoft Developer Hub gives developers access to the full range of functions of the infsoft LocAware platform®. The hub provides API explorer capabilities, code samples and comprehensive guides and documentation to help start working with the platform as quickly as possible.

About infsoft

infsoft GmbH, located in Großmehring near Ingolstadt (Germany), has been offering solutions for indoor navigation, indoor analytics, indoor tracking, and location-based services since 2005. In addition to comprehensive solutions for major clients, infsoft also provides developers with access to its core technologies via scalable Software Development Kits (SDK), enabling integration with third-party applications. infsoft's client base includes Frankfurt Airport, Swiss Federal Railways (SBB), UNIDO, Siemens and Roche.

infsoft Corporate Film | We do IT smart!

Imprint

Text & Design infsoft GmbH
Picture Credits ©infsoft.com, ©shutterstock.com

Publisher
infsoft GmbH
Junkers-Ring 10A
85098 Großmehring
Germany

Contact
phone +49 8407 939 680 0
fax +49 8407 939 680 12
contact@infsoft.com
www.infsoft.com