White Paper

Indoor Positioning & Services
## Content

### 1 The Basics of Indoor Positioning

1.1 Quick Start – Client- and Server-Based Indoor Positioning .......................... 4

1.2 Technology Overview .................................................................................. 5
  1.2.1 Wi-Fi ........................................................................................................... 5
  1.2.2 Bluetooth Low Energy (BLE) Beacons ..................................................... 6
  1.2.3 Ultra-wideband (UWB) ............................................................................ 8
  1.2.4 RFID .......................................................................................................... 9

### 2 Hardware for Indoor Positioning

2.1 infsoft Locator Nodes .................................................................................. 10
2.2 infsoft 360° Antennas ................................................................................. 13
2.3 infsoft Locator Tags ..................................................................................... 14
2.4 infsoft E-Ink Display Beacons ................................................................. 16
2.5 infsoft Sensor Tags ..................................................................................... 17

### 3 Solutions & Software

3.1 Solutions ..................................................................................................... 18
  3.1.1 Indoor Digitization .................................................................................. 18
  3.1.2 Indoor Navigation ................................................................................. 19
  3.1.3 Indoor Tracking ..................................................................................... 20
  3.1.4 Indoor Analytics .................................................................................... 22
  3.1.5 Geo-Based Processes & Services ............................................................ 23

3.2 infsoft Software Tools ................................................................................. 24
  3.2.1 Setup of Indoor Localization ................................................................. 24
  3.2.2 Administration of Indoor Localization .................................................... 25
  3.2.3 Data & Output – Analytics, Tracking, Geotrigger .................................. 26
  3.2.4 SDKs & Web Services ............................................................................. 27

### 4 Industries & Examples of Use

4.1 Industrial Areas .......................................................................................... 28
4.2 Airports ........................................................................................................ 29
4.3 Railway Stations ......................................................................................... 31
4.4 Health & Care ............................................................................................. 32
4.5 Offices ......................................................................................................... 33
4.6 Automotive .................................................................................................. 34
4.7 Tunnel ......................................................................................................... 35
4.8 Retail ............................................................................................................ 36
4.9 Trade Fairs ................................................................................................. 37
Dear readers,

The field of indoor positioning and indoor navigation has been undergoing sustainable changes and experiencing exciting new developments since I founded infsoft in 2005. Over the years, we successfully demonstrated our ability to adapt fast to new trends and circumstances, anticipating and inventing new ways to connect locations. Today, positioning and navigation solutions for indoor contexts include technologies based on Wi-Fi, Bluetooth Low Energy (BLE), Ultra-Wideband (UWB), and RFID, just to name a few. We intend to build on this momentum, combining fundamental concepts in hybrid approaches to aim for more accurate, precise, and efficient solutions. There is always plenty of space for improvement and innovation, and I am very excited for what is yet to come!

With this white paper, we want to provide you with a guideline to help you find a way through the complex topic of indoor positioning and related services. You can use it to get an overview of the different positioning techniques, learn more about the wide range of possible applications, and get to know our products and solutions. If you want to dig deeper, you can always have a look at our website, or our indoor navigation wiki.

If you have any questions, please don’t hesitate to contact us.

Would you prefer to reach out to us via Facebook or Twitter? No problem, please stay connected and let us in on your thoughts!

All the best,

Tobias Donaubauer

CEO Tobias Donaubauer
The Basics of Indoor Positioning

Indoor positioning systems (IPS) enable you to locate the position of objects and people within buildings. GPS, however, 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. That is why an IPS has to rely on other localization methods. There are two approaches to put such an “indoor GPS” into practice.

Quick Start – Client- and Server-Based Indoor Positioning

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- and server-based approaches.

**Client-based**

A client-based technology is used to keep track of individuals that might require a back channel for further information exchange (visualization of own position on a map, location-based alerts, task management etc.) and for navigation purposes.

Hence, a smart device with a specific application is handling the indoor positioning based on external signalers such as Wi-Fi and Bluetooth Low Energy (BLE) in combination with the internal smartphone sensors (e.g. accelerometer, gyroscope, magnetic field sensor etc.).

The position is determined on the smart device but can also be transferred continuously to a backend to provide supervisors with the user’s current location. Therefore, the device requires a network connection.
A server-based technology is used to keep track of assets and persons and typically comes with a one-way communication towards the receiver. However, a return communication to the asset tag is also possible, e.g. in the form of an activation of an LED or an output on an E-Ink display.

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.

Infsoft can set up interfaces for indoor positioning from third-party providers such as Cisco, HP Aruba and Xirrus to visualize the position data within our Analytics and Tracking engine.

Technology Overview

To meet the requirements of a client with regard to the requested accuracy, there are several potential sensor technologies available:

**Wi-Fi**

Inside buildings, Wi-Fi is a good alternative to GPS. In most cases it is easy to install a Wi-Fi positioning system (WPS), since existing Wi-Fi infrastructure can be used (e.g. cash register systems, public hotspots, access points of shops or exhibitors). The user doesn't necessarily have to connect with the Wi-Fi, it is sufficient to have Wi-Fi enabled.

For positioning, 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. There must be a corresponding app installed on the smartphone which calculates the current position based on these data.

If a server-based solution is more suitable for the project, infsoft's self-developed hardware – the Locator Nodes – can be used. In this case no app is required, all Wi-Fi capable devices (e.g. smartphones, tablets, Wi-Fi tags) are detected and asset tracking is performed based on the signal strength and MAC address.
possible.
Accuracy depends on multiple factors, such as the number of available access points, reflections for example in corridors and last but not least 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. Sensor fusion (the use of smartphone sensors) can improve accuracy in client-based applications.

Wi-Fi at a glance

Pros:
• existing Wi-Fi infrastructure can be used
• enabled Wi-Fi is sufficient
• large range (up to 150 m)
• detects floor level

Cons:
• relatively inaccurate (5-15 m) compared to BLE/RFID
• no latency guarantees
• use of randomized MAC address if smartphone is not connected to Wi-Fi network
• client-based positioning is not possible with iOS devices

EXAMPLES OF USE:
• occupancy analysis of office buildings
• utilization analysis in rail traffic
• investigation and prevention of criminal offences at ATMs

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 a mobile device (e.g. smartphone) in a client-based approach or by a specific hardware (infsoft Locator Nodes) in a server-based approach.

The underlying technology is using a signal strength (RSSI) measurement to determine the beacon's position.

BLE beacons are cost-effective and energy-efficient components that can run on button cells up to five years and more.

For calibrating the position determination in a client-based approach, infsoft provides a calibration app, by which clients can work independently. infsoft also offers a beacon management tool to monitor battery levels and set up business logics to replace batches in certain areas.

During installation and parameterization, attenuation properties of different materials have to be taken into account (e.g. wood or glass with low attenuation properties as opposed to metal or water with high attenuation properties).
BLE beacons are available from numerous suppliers and come in various shapes and sizes. infsoft solutions are compatible with beacons of all manufacturers.

**BLE beacons at a glance**

**Pros:**
- cost-effective, unobtrusive hardware
- low energy consumption
- flexible integration into the existing infrastructure (battery-powered or power supply via lamps and the domestic electrical system)
- works where other positioning techniques do not have a signal
- compatible with iOS and Android
- high accuracy compared to Wi-Fi (up to 1 m)

**Cons:**
- additional hardware
- relatively small range (up to 70 m)
- instability with layout changes and radio interferences

**EXAMPLES OF USE:**
- condition monitoring
- personnel and vehicle tracking
- automated workflow management
- digital services for hotels
Ultra-wideband (UWB)

Ultra-wideband is a short-range radio technology that is mainly used in industrial environments with high precision needs.

With less than 30 cm, the accuracy is considerably better than when working with beacons or Wi-Fi. Also, height differences can be measured accurately. Another advantage can be the low latency times with position updates up to 100 times/second.

In contrast to Bluetooth Low Energy and Wi-Fi, the position is determined by a transit time method (Time of Flight, ToF) instead of a measurement of signal strengths (Receive Signal Strength Indicator, RSSI). This method measures the running time of light between an object and several receivers (infsoft Locator Nodes).

The asset to be tracked is equipped with a small UWB tag (infsoft Locator Tag) which runs on battery power or can draw its power via a forklift, for example. The tag sends data (ID, ToF, timestamp) to the infsoft Locator Nodes. They have a fixed position in the infrastructure and can use the running time of light to calculate the distance of the asset.

If the positioning data should be immediately displayed on a mobile device (smartphone), the infsoft Locator Tags can directly communicate with the smartphone via Bluetooth or USB interface.

Due to the usage of extremely wide frequency bands with a bandwidth of at least 500 MHz, there are almost no interferences. UWB is one of the preferred solutions when it comes to the tracking of a modest number of assets in large industrial areas. However, the price per unit is significantly higher and the battery lifetime is shorter compared to BLE beacons.

UWB at a glance

Pros:
- high accuracy
- low latency times
- almost no interferences

Cons:
- cost-intensive
- shorter battery lifetime than BLE beacons

EXAMPLES OF USE:
- tracking of emergency services
- process optimization in automotive manufacturing
- utilization analysis of work devices
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 (infsoft Locator Node) 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).

No matter which industry you are thinking of – since it is a very versatile technology, RFID can be used almost everywhere. Common applications are systems for access control, time recording or inventory control in logistics. Since reliable identification of products or objects is required in many industries, RFID is particularly suitable as an asset tracking solution.

Since passive transponders do not have their own energy source, they are almost maintenance-free. As a result, initial acquisition costs will pay off in the long term in most cases. RFID tags do not require visual contact with the reader, and they are durable against impact and environmental factors.

Combining RFID systems with other positioning technologies can solve the biggest problem of passive RFID technology: objects equipped with RFID tags can only be located at a specific point – namely exactly where RFID hardware (e.g. Locator Nodes) has been installed. However, if for example a forklift truck is equipped with an infsoft Locator Node, whose sensors not only respond to RFID, but also to Ultra-wideband (UWB), a link between the position data of the forklift truck and the identification times of RFID-tagged goods can be established.

RFID at a glance

Pros:
- very high accuracy
- immunity to interferences
- no battery needed

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

EXAMPLES OF USE:
- tracking of disposables
- asset tracking in logistics
- analysis of consumer behavior in a supermarket

Combination of RFID and UWB for identification and localization of goods
To address a client’s need for a reliable indoor tracking solution, we rely on our own hardware: infsoft Locator Nodes, infsoft 360° Antennas, infsoft Locator Tags, infsoft Sensor Tags and infsoft E-Ink Display Beacons.

infsoft Locator Nodes

With the Locator Nodes, infsoft is providing a modular component for tracking and analysis purposes. Integrated into the central data hub – the infsoft LocAware platform® – the Locator Nodes allow for a comprehensive detection of different device types, enabled through the modular system with different sensors.

Beside the consumer standards Wi-Fi and Bluetooth Low Energy (BLE), the infsoft Locator Nodes are able to address high-precision needs with Ultra-wideband (UWB) and can also be equipped with an RFID reader. Data correlations with external camera systems and self-positioning via GPS in mobile scenarios are further capabilities. In addition to positioning, infsoft Locator Nodes are also able to communicate with Bluetooth devices via back channel, allowing bidirectional exchange of information.

Complementary sensors

Locator Nodes can detect all mobile, Wi-Fi-enabled devices (such as smartphones, laptops, wearables) within a building and track them via server (without an app). This works across all mobile operating systems and due to the use of a hash algorithm (SHA-1) in compliance with data protection requirements.
Moreover, the infsoft Locator Nodes enable a detection of Bluetooth Low Energy (BLE) beacons, which can be attached to persons or goods. They enable location analytics and indoor tracking and can also function as beacon controllers to monitor fixed beacons, for example in the context of a client-based indoor navigation, and to carry out possible reconfigurations.

In addition to BLE, classic Bluetooth (Basic Rate (BR) / Enhanced Data Rate (EDR)) can also be detected by infsoft Locator Nodes. Devices with activated Bluetooth (e.g. smartphones) can be located with an accuracy of approximately five meters.

Equipped with an integrated Ultra-wideband (UWB) module, Locator Nodes can also achieve a high-precision localization of less than 30 cm, which is often used in industrial applications. With this technology, the position of for instance forklifts and trucks or the storage location of goods can be determined precisely and with low latencies.

The use of RFID (radio-frequency identification) is suitable for a selective object identification. The RFID reader of the Locator Nodes offers a cost-effective tracking option, especially with high quantities in pallet tracking. Intelligent connections with additional sensors can detect and optimize storage location and service life.

The addition of imaging systems such as CCTV cameras plays an important role in security and logistics. Connected to the Locator Nodes, a correlation between camera image and position data can be established (for example based on Wi-Fi, BLE or UWB).

In mobile application scenarios, infsoft Locator Nodes can also be equipped with a GPS module, which determines the current location of the Locator Node. The built-in complementary sensor system thus not only enables the detection of goods in a static space context, but also completely flexible.
Seamless integration
The Locator Nodes require a power supply and network connection and are transferring the scanned data to the infsoft LocAware platform that is available as cloud and on-premise solution. Using the various tools then allows to view positions, analyze movements, or use location-based services.

Flexible mounting
infsoft Locator Nodes can be mounted on a ceiling or wall. The flexible mounting solution (sold separately) is magnetic and has 4 boreholes with a diameter of 5 mm each.

Connection to infsoft 360° Antennas for utilizing Angle of Arrival technology and integration with third-party systems such as Cisco (CMX, MSE, Meraki), HP Aruba or Xirrus are also possible.

Examples of use for infsoft Locator Nodes:
• management of tugger trains
• lone worker protection
• people flow analysis

Videos
• RTLS made easy – infsoft Locator Node
• features of the infsoft Locator Node
infsoft 360° Antennas

Angle of Arrival (AoA) is an emerging technology that indicates the direction of the signal sources and can be used for tracking assets as well as for indoor positioning and wayfinding. infsoft 360° Antennas use AoA for real-time measurement of the direction of a radio signal emitted by a mobile 2.4 GHz transmitter (e.g. beacon). Based on the angle and signal strength determined, it is possible to calculate the position of an object equipped with such transmitter with an accuracy of 1 to 3 meters. This opens up opportunities for numerous use cases and makes server-based BLE solutions a favorable alternative to cost-intensive Ultra-wideband (UWB) applications – as long as no centimeter accuracy is required.

Measurement of signal direction

infsoft 360° Antennas deployed in the area of interest detect incoming signals from a mobile transmitter operating on 2.4 Ghz (e.g. BLE beacon, Wi-Fi-enabled smartphone). The antenna submits the scan data via mini USB port to an infsoft Locator Node. From there, the data are sent to the infsoft LocAware platform®, where the device's position is computed.

By using AoA technology, even just one antenna enables determining the direction of movement of a person or object. This is an important factor for applications such as access control or door control in protected areas. Using 360° Antennas can reduce the number of required hardware for a localization project.

Using a minimum of three infsoft 360° Antennas (triangulation) allows for continuous positioning and substantially improves accuracy and reliability.

Examples of use for infsoft 360° Antennas:
- cargo tracking at a container port
- tracking of goods in logistics
infsoft Locator Tags

infsoft Locator Tags are small modular components using LoRa/BLE or Ultra-wideband (UWB) that enable tracking objects and vehicles indoors. They are also suitable for analyzing walking routes. Much like infsoft Locator Nodes, they work with server-based installations, which means that the position is determined on a server (cloud or on-premise).

infsoft Locator Tags are designed to fit our clients’ specific needs. This is why they can be equipped with various modules (LoRa/BLE or UWB), so they can be used in a very flexible way and can be changed according to current requirements.

LoRa/BLE

There are two possibilities for indoor positioning with LoRa/BLE Locator Tags: The tags can either be attached to the mobile assets or function as fixed anchors distributed evenly throughout the building.

In both cases, in addition to the LoRa/BLE tags, Bluetooth Low Energy (BLE) beacons are required for positioning. The Locator Tags transmit the location data via LoRaWAN (Long Range Wide Area Network) to the infsoft LocAware platform®. The LoRa network operates in the 868 MHz frequency band. Depending on the amount of data and the spreading factor, transmission is only possible with higher latencies (approx. 30 seconds to 5 minutes), which makes the technology unsuitable for live tracking systems. The position of the Locator Tag is calculated in the backend and provided via web services.

In the first scenario (mobile LoRa/BLE tags), evenly distributed beacons are necessary. Since beacons are relatively cheap (3-30 Euros) and easy to install
Examples of use for infsoft Locator Tags:
- localization of medical equipment
- vehicle tracking in a car showroom
- indoor tracking of tugger trains

(can be glued to walls/ceilings, battery-powered), they are especially suitable for large areas with just a few items to track. The tag itself is battery-powered or can be operated by electricity. It is adhered to the object to be tracked. The beacons installed in the building can also be used for precise indoor navigation, for example for employees and clients. In order to make use of indoor navigation, an app is necessary. Hence, this option is interesting for all application scenarios in which relatively few objects should be tracked on large areas and a beacon infrastructure already exists or indoor navigation is an interesting additional feature. The LoRa/BLE tag can optionally be equipped with a GPS module for localization in outdoor areas.

In the second scenario (fixed LoRa/ BLE tags), the Locator Tags are distributed evenly throughout the premises, while the BLE beacons are attached to the assets to be tracked. Due to the low cost per beacon (and thus per asset), this method is particularly suitable for smaller areas with a high number of assets. The Locator Tags are battery-powered and can also be installed outdoors. The advantage here is that the tags do not have to be wired and there is no need for a power supply or individual connection via Ethernet or Wi-Fi. With a large number of assets, latency times are lower the more Locator Tags are installed.

UWB
Thanks to their modular construction, infsoft Locator Tags can be used in different application scenarios. Besides BLE, Ultra-wideband is a possible module. UWB enables asset tracking in industrial environments with an accuracy of 10-30 cm.

The system can either be set up server-based (visualization of positioning data in the backend, no display on a client (smartphone)) or client-based (visualization of positioning data on a client (smartphone) and if necessary transmission to the backend).

Examples of use for infsoft Locator Tags:
- localization of medical equipment
- vehicle tracking in a car showroom
- indoor tracking of tugger trains
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.

In order to display content on the infsoft E-Ink Display Beacon, the desired device and content are selected in the infsoft Locator Nodes Management or a corresponding app. Via Bluetooth, the content is transferred from the Locator Node to the display. The content can not only be updated manually, but also automatically - using the infsoft Automation Engine to define corresponding conditions.

For positioning, the infsoft E-Ink Display Beacon sends BLE signals to infsoft Locator Nodes that are installed in the area. The Locator Nodes process the provided data and send it to the infsoft LocAware platform, where it is intelligently processed.

Beacons with E-Ink displays are a perfect fit for electronic shelf, door or product labels. Businesses are offered the ability to wirelessly update content on the displays quickly and efficiently, without needing to print paper tags and deploy personnel to change them manually. In real time, E-Ink beacons can display product information, status, inventory levels, barcodes, and much more. In production and logistics, for example, when assets are traced along the process chain, the display can be rewritten automatically with the current status and individual information such as instructions on the next work step.

Examples of use for infsoft E-Ink Display Beacons:
- information display for hospital beds
- display beacons in logistics
- tracking and labeling of containers in production

Example of an infsoft E-Ink Display Beacon
infsoft Sensor Tags

infsoft offers real-time data transmitters that can be used to extend and complement existing localization systems. By collecting and transmitting sensor data (e.g., ultrasound, infrared, CO₂, temperature), an innovative integrated sensor fusion architecture can be achieved. The primary use of infsoft Sensor Tags is the realization of condition monitoring systems. Here, operating and condition data are gathered by suitable sensors for the purpose of continuous monitoring and documentation of parameters.

infsoft Sensor Tags are highly configurable and integrate easily and seamlessly into infsoft’s software solutions. Wireless data communication from the sensor tags to the infsoft Locator Nodes is provided via Bluetooth Low Energy (BLE). The Nodes then send the data to the infsoft LocAware platform®, where it is intelligently processed and can be used in conjunction with reporting and analysis tools. infsoft Sensor Tags require a power supply or can optionally be battery operated.

infsoft Infrared Sensor
Particularly the infrared (IR) sensor from infsoft can be used as a useful addition to localization systems.

The IR sensor can be used for tracking movement and temperature of people and objects. It is composed of an 8×8 (64) pixel thermopile array, comes with a built-in lens with 60° viewing angle and measures actual temperature as well as temperature gradients within its viewing area.

Based on thermopile technology, the sensor can detect the direction of moving people and objects. Its coordinated array of sensing elements can even detect multiple people or objects moving in different directions.

Examples of use for infsoft Sensor Tags:
- intelligent car parking management
- workplace safety and health management in an industrial complex
- patient monitoring in a hospital
- fall detection in the healthcare sector
infsoft offers customized, comprehensive solutions and powerful software tools that allow for successful implementation of a Real-Time Locating System (RTLS).

**Solutions**

infsoft offers the whole range of indoor positioning services: indoor mapping, indoor navigation, tracking, location analytics and geo-based services.

**Indoor Digitization**

There are many ways indoor digitization can benefit buildings. Digital recording of interior spaces serves multiple customer requirements, such as easy orientation, efficient management of buildings, and connection of digitized processes and information with building structures, interior attributes and building facilities.

infsoft offers an innovative, easy way to capture even large, complex indoor environments. Using the infsoft Maps Editor, a location can be created with just a few clicks and can then be easily managed afterwards. 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 enables indoor navigation within a building. Besides that, it lays the foundation for the use of indoor tracking, indoor analytics, and geo-based services.

[YouTube video: indoor digitization](https://www.youtube.com/watch?v=dQw4w9WgXcQ)
Indoor Navigation

Indoor navigation deals with wayfinding within buildings. Because GPS reception is normally non-existent inside buildings, other positioning technologies are used here when automatic positioning is desired. Wi-Fi or BLE beacons are often used in this case to create a so-called “indoor GPS”. Contrary to GPS, however, they also enable you to determine the actual floor level. Most applications require an “indoor routing” functionality that guides people precisely through a building and, in this way, automatically determines their position – very similar to the navigation systems that we use in our cars. A typical application is turn-by-turn navigation in an app (displaying directions on a digital map) used for train stations, airports, shopping centers and museums.

However, indoor navigation is also possible without automatic positioning – for example, when a digital building map is integrated into a website or in a digital signage system (multitouch kiosk/interactive terminal). In this case, no location hardware is required (Wi-Fi, beacons).

Indoor navigation with automatic positioning is normally used as a client-based application. This means that the position is determined directly on the smartphone of the user, which requires an app. The location is determined usually via Wi-Fi or beacons. A feedback channel is also available, for example for sending push notifications.

Smartphone sensors are always called upon to refine the positioning function – for example, GSM, 3G/4G (LTE), magnetic field, compass, air pressure, barometer, accelerometer and gyroscope.

Because all infsoft products are integrated into one platform, it is easy to enable additional features, for example route and visitor analyses.

Indoor navigation by infsoft can also be integrated into existing apps: an SDK (Software Development Kit) is available for the Android and iOS mobile operating systems and as an HTML5 plugin.

Indoor navigation with Wi-Fi

Indoor navigation with Wi-Fi has an accuracy of 5-15 meters. The various signal strengths of several Wi-Fi access points are evaluated for this purpose. Precise positioning within the building, even over multiple floors, is made possible through specific shielding characteristics. The available Wi-Fi infrastructure can be used (e.g. customer hotspots, Wi-Fi-capable point of sale systems, routers) – the user only has to activate Wi-Fi on his/her smartphone, a connection is not required.

However, client-based positioning via Wi-Fi is not supported by Apple devices. Beacons are a good alternative if you want to include all smartphone users.
Indoor navigation with beacons
Indoor navigation using beacons is quite widespread because Bluetooth transmitters function across platforms and have an accuracy of 1-3 meters. The most well-known types are called iBeacon (from Apple) and Eddystone (from Google). Both operate using the BLE standard (Bluetooth Low Energy) and thus are very energy efficient.

Numerous hardware manufacturers market these small devices. A beacon should be placed every 7-10 meters depending on the desired accuracy. Beacons are the most popular hardware for indoor positioning due to their high level of flexibility and accuracy.

Indoor navigation with Ultra-wideband
Indoor navigation with Ultra-wideband has some significant advantages in industrial environments: high accuracy (10-30 cm), low latency times (position request up to 100 times/second), and accurate measurement of height differences.

For client-based positioning using UWB, infsoft Locator Tags are required. They transmit their position directly to the smartphone – either via a USB dongle which is directly plugged into the smartphone or via Bluetooth.

However, the technique is a special solution which requires appropriate components and thus is mostly suitable for special industry applications.

One possible use case are floor conveyors whose drivers should receive precise turn-by-turn directions. Because of their high speed, latency must be kept to a minimum.

Application examples of indoor navigation:
- indoor navigation in a shopping mall
- visitor management in office buildings
- indoor navigation and LED identification of goods

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. Wi-Fi or BLE localization is cost-efficient and provides accuracies under 5 meters. Ultra-wideband allows a very precise indoor tracking of people and objects. Passive RFID enables selective object identification. All solutions presented here also work seamlessly under the open sky in case the plant grounds are not uniformly covered by a roof.
Indoor tracking is normally implemented as a server-based application. No app is required because a back channel to the object to be located is not necessary in most cases. infsoft Locator Nodes are used here.

The Locator Nodes can localize all Wi-Fi devices (smartphones, Wi-Fi tags and wearable Wi-Fi transmitters) as well as Bluetooth Low Energy beacons (e.g. available as a wristband or wafer-thin sticker), Ultra-wideband tags and RFID tags. In some cases, client-based positioning is used, e.g. when person tracking is part of an employee app. The position is then determined directly on the user's smartphone and regularly sent to a server. An app is required in this case, and a feedback channel is available.

The intervals at which Bluetooth beacons, Wi-Fi or UWB tags send signals significantly affect the density and thus also the reliability of the acquired position data. A short interval which sends a signal every 20 to 350 milliseconds for positioning captures a person's or asset's path more precisely than a longer interval of 500 milliseconds or more. Short intervals are useful for quickly moving objects (e.g. vehicles) or high precision requirements. With long transmission intervals, the actual route cannot always be traced precisely, but battery life is significantly longer when using battery-powered tags/beacons.

infsoft offers various web-based tools for managing the digital map and checking the status of beacons, for example. Indoor tracking by infsoft can also be integrated into existing systems (e.g. apps). An SDK (Software Development Kit) is available for the Android and iOS mobile operating systems and as an HTML5 plugin.

Indoor person tracking
The indoor tracking of persons can make sense in several situations. On the one hand, it plays a major role regarding safety, e.g. for patients in high-risk categories or for the evacuation of employees from large company premises. On the other hand, it helps with the optimization of work processes, e.g. when the analysis and optimization of walking routes is desired.

Application examples of indoor person tracking:
- personnel tracking in tunneling
- kid finder and crew monitoring on a cruise ship
- tourist tracking in ski resorts

Indoor object tracking
The indoor tracking of objects is in great demand, particularly in the industrial sector. Here, it is often necessary to determine the current location of work equipment or goods. The systems from infsoft are based on a detailed digital map that shows the current position of the object(s) and that can be displayed on all (even mobile) end user devices.

Application examples of indoor object tracking:
- pallet tracking in logistics
- railway train tracking system
- fill level measurement of waste containers
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. The technology recognizes end user devices, Wi-Fi and Bluetooth transmitters, RFID and Ultra-wideband tags and measures the time spent in certain areas and which routes were used. This enables you to, for example, find out how many people pass a certain spot during the day or which hours of the day or week are the least busy. The movements of objects, e.g. work equipment, goods or products can also be measured along with the walking paths of visitors. 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.

Insights on visitor behavior
infsoft Indoor Analytics provides helpful information for business decisions. Heatmaps, route analyses and dwell times allow the targeted analysis of customer or visitor behavior. Indoor Analytics helps to improve customer/visitor satisfaction, product placement, personnel planning and the evaluation of marketing activities.

For example, a retailer can determine how successfully their current layout draws customers’ attention to a specific offer. Operators of a shopping mall can make rents in different areas dependent on the respective visitor numbers. A museum director can establish which works of art are especially popular and whether optimization is necessary in the guided tours. Trade fair organizers can measure visitor numbers at individual points of the premises and set stand prices based on this information. The driving routes of machinery on factory grounds can be measured and visualized so that optimizations can be developed.

Data protection and technical requirements
When indoor navigation from infsoft is being used, you can work directly with the analysis software. The mobile devices of users that have installed the corresponding app can send their position to the server on a regular basis. No personal data are captured, so that infsoft Indoor Analytics can be used in compliance with data protection regulations.

If you are not using an indoor positioning system from infsoft or you want to generate a wider database, then we recommend server-based data collection. infsoft Locator Nodes are used for this. Thanks to their modular approach, they can not only track smartphones via server, but also beacons, Wi-Fi tags, Ultra-wideband tags or RFID tags.

Application examples of indoor analytics:
- traffic flow analysis in cities
- analysis of visitor flows at a trade fair
- calculation of waiting times
Geo-Based Processes & Services
Location-based services are location-specific mobile services. They provide information or functions to smartphone users, depending on their location. Various methods can be used for indoor positioning within buildings to implement location-based services. 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, e.g. for ATMs at the airport. Proactive services “recognize” when a user enters a specific area and trigger an action - e.g. sending information or an offer to the user's smartphone. This is referred to as location-based marketing. An app is required for these services.

Geofencing in interior spaces
The triggering of an action when taking a specific path is called geofencing (combination of geography and fencing). This can also be used inside buildings without GPS reception. Geofencing is quite interesting for marketing in shopping centers, airports, train stations and at trade shows, among others. Customers can be assigned anonymous “tags” that are based on their interests and behaviors. This could include characteristics such as age, gender, visited areas / stores and length of stay. This helps to provide customers with information, offers and coupons that are only relevant for them.

Process automation
Geofencing allows intelligent process automation. Using the insoft Automation Engine, you can define various geo-based triggers along the process chain, speeding up operation and streamlining processes. It is possible to, for example, configure emails and tasks, create alerts, and protect areas by triggering automatic door locking / unlocking.

When talking about geofencing, we need to distinguish between client-based and server-based positioning.

With client-based positioning, the user has a corresponding app installed. A feedback channel is available that can be used to send messages to the user’s device.

With server-based positioning, the user cannot be addressed directly. However, interesting conclusions regarding interests and behaviors can be drawn from the location of numerous devices. Server-based positioning can also be used to trigger different actions along the process chain.

Application examples of Geofencing:
- content triggering in an app
- geo-based access restrictions
- safety for dementia sufferers
infsoft Software Tools

infsoft offers powerful software products that are bundled and linked in the infsoft LocAware platform®. As a central data hub, the 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 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.

Furthermore, all data from the LocAware platform® can be exchanged easily via interfaces (bidirectional connection) with third-party systems.

The platform is available as cloud and on-premise solution.

Setup of Indoor Localization

The setup tools include all the required features to set up an indoor positioning system – mapping, calibration, data management, and route definition.

The infsoft Maps Editor allows you to create your location with just a few clicks and then easily manage it afterwards at any time. You can set up outlines of the building, rooms and custom patterns, define points of interest (POI), contextual pathway-relationships and much more.

Closely related to the Maps Editor is the infsoft CMS, which provides the information in list format. You can easily manage attributes for a large number of POIs, set information for different menu items and handle data that are not necessarily geo-related.
The infsoft Route Tool allows you to test the contextual pathway-relations you have created. You can evaluate the routing (e.g. barrier-free) over several floors and check the priorities of different navigation graphs. The routing and mapping information shown is provided by the infsoft Maps Editor.

The infsoft Calibration Tools assist you with the setup of a client-based indoor positioning based on Wi-Fi, beacons and sensor fusion and are also used for the calibration of the infsoft Locator Nodes. Within the Calibration Tools you can create calibration routes, manage beacon proximity UUIDs, visualize the detected signalers, check heatmaps of signal strengths and filter access points or beacons that should not be used for the IPS. The tools are synced with the related infsoft Calibration Apps and are exchanging the calibration information.

Administration of Indoor Localization
The infsoft administration tools provide useful functions for managing the deployed indoor positioning system.

In order to simplify the administration of the beacons within your location, the infsoft Beacon Management can be used. You can maintain and register beacons, check their position within the map and monitor the battery status including historical data such as downtimes.

Within the Locator Nodes Management, you can register and organize the infsoft Locator Node hardware in your location. You can set up groups, push firmware updates to the nodes, configure scan intervals and check on the current scans of the Locator Node. The management platform also provides an overview over any downtimes and can be configured with alert mechanisms.

With the infsoft Device Management, you can check on different attributes of devices by entering the UID or MAC address. The information can be provided by an application or the infsoft Locator Nodes and can cover e.g. the current coordinate, last seen...
timestamps or vendor details. You can also add different properties to tag the device.

The infsoft Administration Portal offers a variety of configuration possibilities that are available for super users. You can manage registered users, give them access to specific tools and check on the status of backend systems such as the tile service, infsoft Automation Engine and infsoft Location Analytics.

infsoft Search allows to check on all information that has been detected related to a specific device or location. You can search for UIDs, MAC addresses or sort the data by location to get an overview over the transferred data. Beside the device attributes, the current position of the device can be visualized.

infsoft Diagnostics provides an overview over the status of all server instances and their activities. Users can check on possible downtimes and historical data.

**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 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 the infsoft Automation Engine 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.

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 the infsoft Automation Engine to define alerts when a device enters / leaves a defined area.

infsoft Sensors visualizes condition sensing devices on the map and enables real-time monitoring of status information (e.g. light, temperature, pressure, humidity, CO₂, and presence based on infrared or ultrasound).

The infsoft Automation Engine 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, just to name a few.
infsoft Workflow Management enables the active planning, control and logging of work-sharing processes within RTLS (Real-Time Locating System) 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.

SDKs & Web Services

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.

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.

Software videos

- infsoft Analytics
- infsoft Tracking
- infsoft Automation Engine
Indoor positioning and services are not restricted to any specific industry – the fields of applications are limitless. Nonetheless, you can point out several industries that are particularly embracing this technology and its benefits.

**Industrial Areas**

infsoft offers tracking solutions in complex industrial areas. A Real-Time Locating System (RTLS) provides location-relevant data for operators, making the logistics process faster and smoother. An RTLS can not only help with productivity enhancement, but also with real-time decision support and the identification of hidden costs.

**Advantages for operators**

infsoft provides you with solutions for the monitoring of mobile goods. Whether it is pallets, forklifts, robots or equipment inside complex industrial areas – the tracking solution detects all required goods and allows for seamless tracking. One possible application scenario is tracking pallets along the supply chain in order to monitor the whole process including incoming and outgoing goods, amount, delivery date as well as actions at the point of sale. All data can be accessed at any time via a web-based portal or a standalone app and can also be integrated into existing ERP systems.

**Advantages for security administrators**

infsoft’s indoor tracking solutions offer an operations control system for plant security, which sends the positions of staff and objects to the control center in real time. Security services staff who is located in the vicinity of certain events can be directly assigned to patrols. An alert function notifies the control center as soon as a security-relevant area is entered by a non-authorized person. Thanks to the analysis of movement profiles inside and outside the building, detailed data is available that can be used to undertake refinements to the security concept. Should goods, equipment and vehicles leave a certain area without permission, a warning mechanism can be triggered via geofencing (theft protection). Furthermore, user-specific areas can also be created with individual access authorization.
Airports

When business or leisure travelers go on a trip by plane, they want to keep the waiting times to a minimum and make good use of it. As an airport operator, it is your goal to offer passengers a trouble-free and comfortable stay. Shops and restaurants wish for passengers who have enough free time to consume. All of those needs can be better satisfied by infsoft’s branch solutions.

Advantages for passengers
People who travel infrequently may need support in complex infrastructures like airports. This is where the benefits of indoor navigation become apparent. It shows the exact routing from car park or railway station to the terminal. It is even possible to implement intermodal door to door navigation. When passengers cover the distance quickly, there still remains enough time to discover shops or take a break in a restaurant. Merchants can push tailored advertising directly to the smartphone and offer a lot of added value for the customer. For example, it could be a coupon or a custom-fit offer. Back from the journey, the airport app helps passengers to find back to their car or public transportation. Business travelers have all information concerning their flight and their boarding pass in their pocket and can quickly find a place to work and relax.

Advantages for stores and restaurants
Merchants can push custom-fit offers directly to the smartphone of interested clients: For example, those who have already visited this or similar shops. And for sure everyone is delighted by a discount of his favorite shop. In addition, you learn a lot about visitor flows in or nearby the store. Large shops can also use indoor localization for asset tracking, for example in order to improve theft protection or logistics.
Advantages for airport operators
The advantages for merchants and passengers listed above improve customer satisfaction. Using indoor location analytics, operators can even get detailed information about the stream of visitors. These data can be used as a substantial argument when leasing floor space. It can also help your security staff: As soon as somebody enters a restricted area or when certain areas are overcrowded, predefined actions can be triggered.

In addition, a tracking system provides real-time location information about vehicles and equipment and contributes to improving operational productivity at an airport. Such a solution can be implemented indoors and outdoors and ensures safe and efficient operation and the best possible utilization of equipment (this can include motorized and non-motorized assets, e.g. ground support equipment, cleaning machines and baggage carts). Operators can be alarmed if speed, idle, or location violations occur, can get reports based upon the assets’ historical activities, review utilization, and identify underutilized assets.
Railway Stations

Modern railway stations must satisfy high requirements: Of course, it is extremely important that passengers reach their destination fast and safe. Especially people with reduced mobility may welcome support. The large number of merchants wishes for a good platform to present themselves and the possibility to realize location-based advertising. For the station operator, a lot of opportunities arise considering facility management.

Advantages for travelers

Particularly on longer journeys with several change-overs, things sometimes don’t go as planned. Platform changes or delays don’t cause so much stress when the passenger is informed about it as early as possible. Passenger applications for smartphones can offer this via push notifications and real-time schedule updates. Being able to book a ticket whilst travelling and having a precise routing towards the right track may save the passenger some valuable minutes. It is even possible to implement intermodal door to door navigation including public transport. Passengers arriving by car can be shown the best possible car park – including a transparent overview of parking fees. If there is any time left in the station, the app helps passengers to quickly find the way to a certain shop or food stall.

Advantages for merchants and restaurants

Merchants can send their potential customers tailored offers – for example picking those who have already been to similar shops or who are returning visitors. And for sure everyone is delighted by a discount of his favorite shop pushed directly on his smartphone.

Advantages for railway station operators

Using infsoft’s indoor location analytics, station operators gain a lot of information about visitor flows inside the building. With a clearly arranged web interface, they see much frequented areas and can take action if it tends to become overcrowded. Based on these data, a lot of further functions can be realized.
Health & Care

Indoor positioning systems can not only be beneficial for patients, but also for hospital operators: Mobile medical equipment can be found quicker, staff is being relieved, hygiene rules controlled, itineraries analyzed, appointments coordinated and costs reduced.

Advantages for patients and visitors
Most people who enter a hospital want to reach their destination (e.g. the emergency room, the cafeteria, a treatment room or a patient room) as fast and as easy as possible. An app for patients meets these requirements. In a clear 2D or 3D map, the user can see his/her current location and navigate to a chosen destination – barrier free, if desired. An integrated calendar reminds him of treatment appointments in time and shows the way there. When an appointment is postponed, a message is being sent – this way, everyone’s waiting time becomes shorter. Additionally, all services which a hospital offers can be integrated (for example meal selection, TV and phone card booking). The growing sector of medical tourism can profit from these applications as well, since they facilitate orientation in foreign environments.

Advantages for hospital operators
infsoft’s solutions follow the internet of things (IoT) approach. More and more things are interconnected and facilitate people’s work. Tracking mobile equipment, for example medical devices and hospital beds, ensures preventative maintenance, inventory control and prevents loss and theft. An indoor positioning system for hospitals can be integrated into third-party systems, for example hospital information systems. Possible applications include coordination of appointments and waiting times (leading to saving of time for doctors and patients), monitoring of patients, indoor navigation for patients and visitors, transmission of patient data across several medical stations, control of hygiene regulations, and relief of triage nurses in the emergency room.
Offices

Indoor positioning and indoor navigation can make the management of large offices a lot easier. Visitor and invitation management, workplace management and access control systems, among other features, can lead to simplified internal processes and reduced costs.

Advantages for companies

Using an indoor positioning system can create added value for staff and visitors. Visitors can be routed directly to their respective contacts (invitation management). Optional tracking of the movement profile can be realized without breaching data protection policies. In addition, a location memory function for cars (car finder) and the integration of public transport facilitate the arrival. In order to help visitors and new employees orientate themselves in the foyer, the maps can be integrated into terminal solutions.

In a control center, you have a comprehensive overview of your staff’s location and can therefore delegate tasks more efficiently. Available staff near a location can directly be assigned tasks using push notifications. Furthermore, additional geobased information can be collected and forwarded, meaning that, for example, a length of stay analysis can be realized.

Advantages for employees

Within an indoor navigation app, users can search for the offices of individual employees or unoccupied meeting rooms, which can be booked and navigated to. Using the “Colleague Finder” function, employees can share their location with each other and thus better coordinate their work. Company news, messaging, canteen plans and a parking space finder are other useful features.

Location-based employee services using Bluetooth Low Energy (BLE)
Automotive

Mainly due to the high-quality standards that are demanded in the production cycle, the automotive industry is highly advanced in the adoption of precision automation technology. Indoor positioning is one such technology that has made significant forays into the industry. Dealerships and service centers can also benefit from indoor localization since it helps making the customer journey as smooth as possible.

Advantages for manufacturers and suppliers
infsoft’s solutions span the entire automotive manufacturing chain. They may be used for vehicle identification and tracking, quality control in production or asset management. A Real-Time Locating System (RTLS) increases manufacturing flexibility and access to real-time production information. A precise tracking solution can allow for a smooth production process and make sure that supplying material to the assembly workstations runs smoothly. Workers can check at any time whether they are still on schedule. Automatic calculations determine whether a material supply will be delayed, which makes it possible to initiate countermeasures in due time.

Advantages for dealerships, workshops and service centers
Car dealerships and service centers can optimize internal processes and customer experience by the use of an indoor positioning system. If the arrival of a car of an (existing) customer is captured, a message can be triggered that is sent to responsible employees who can make preparations to ensure an optimal client experience. Furthermore, the status of a vehicle within the repair / maintenance process can be tracked, which allows a more efficient organization of the maintenance procedures.

Salespersons can get access to the current position of individual cars via app and can use a filter to browse cars that meet certain criteria. The time a car has been standing in the showroom is measured and automatically influences the selling price in all digital systems. Data about itineraries and dwell time of clients can also be accessed. Thus, it is possible to determine which days and times are most popular and which cars attract a lot of interest.
Tunnel

Indoor tracking can be used during construction, maintenance and cleaning of tunnels. Tracking solutions by infsoft provide real-time location information on people, equipment and vehicles. This increases the overall safety of the workplaces in tunnels. At the same time, the implemented technology facilitates an efficient coordination of work processes.

Benefits for operators
Indoor tracking of personnel, equipment and vehicles facilitates an efficient coordination of work processes. Locating workers allows an effective and efficient deployment of personnel. It can be ensured that workers are only assigned to areas or undertake tasks for which they have sufficient training and authorization. Tasks and alerts can be automatically generated and transmitted to a worker’s smartphone if desired. In addition, vehicles and equipment can be tracked and thereby coordinated efficiently.

Benefits for workers
When carrying out construction, cleaning and maintenance work in tunnels, a tracking system ensures increased personal safety for workers. In case of an accident, the person affected can be located via indoor tracking. Furthermore, mechanisms can be configurated that inform the control center whenever a worker or a vehicle enters or exits a defined area.

In case of an emergency like a fire or the emission of dangerous gases, all persons in the tunnel can be evacuated quickly and safely.
Retail

Infsoft’s solutions can offer operators, shops and customers real added value. They help retailers to increase sales, profits and customer satisfaction. A good mall navigation app improves the shopping experience and increases revenues. Location analytics provide reliable data concerning visitor flows in the building.

Advantages for customers in shopping centers
Shopping center apps improve the shopping experience. Its functionality is not limited to display the latest offers and a list of shops and points of interest. It can also guide customers there – if desired even with means of augmented reality. Additionally, it can recommend offers that might be interesting for them – based on previous stays or purchases.

Advantages for mall operators
A mall navigation app can help customers have a better shopping experience – with the help of routing or location-based marketing. For example, an offer or a coupon can be sent to the smartphone of a customer who is near a certain store. This kind of information is customized and offers him individual added value instead of bothering him with unsuitable advertising.

Using indoor location analytics, mall operators can measure and analyze visitor flows easily. The security department can also take advantage: They can receive a message when people enter restricted areas or when certain sectors are overcrowded.

Advantages for shop owners
Shop owners can easily learn a lot about their clients: How many visitors are near my store at a certain time, how many enter it? How do they move inside? Additionally, they can make use of precisely targeted location-based marketing: For example, purchasing incentives can be sent on the smartphones of a selected group.

Indoor navigation and person tracking in a shopping mall using Bluetooth Low Energy (BLE)
Trade Fairs

Visitors to trade fairs often struggle to keep an overview. Modern indoor navigation solutions can solve this problem. A cross-channel trade fair solution provides added value to trade show organizers, exhibitors and visitors.

Advantages for trade show organizers
The intention of a trade show organizer is to create an attractive event both for visitors and exhibitors. A trade fair application provides information about exhibitors, services, public transport and framework programme. Personalized content matches the right visitors and exhibitors. Using infsoft’s analytics engine, you can analyze visitor flows, obtaining precise information about hot spots and preferred routes.

Advantages for exhibitors
Of course, exhibitors have the possibility to present themselves in the trade fair app, including pictures, contact data and description. Furthermore, they can use location-based marketing in order to get the attention of the matching visitors. The analysis of visitor flows makes it possible to choose the best stand location.

Advantages for trade fair visitors
Indoor positioning in exhibition halls helps visitors find the way to certain stands. The app can be personalized, which means that exactly those stands can be highlighted on a map which are interesting for the individual app user. Visitors also benefit from features like an event calendar and the arrival and departure times of public transportation.

Challenges
Due to the large, open halls and the booths which might undergo some (last-minute) changes, trade fairs present a challenging environment for indoor positioning technology. Installation can be problematic because you have to deal with short set-up periods. When installing beacons in a space with lots of Wi-Fi signals, you have to pay attention to avoid interferences by not using the same channels which is tricky, as exhibitors are often configuring their networks as they like.
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.

Indoor positioning systems enable better orientation in complex buildings and allow new applications in the field of geo-based solutions and location-based marketing. “Smart connected locations” is infsoft’s guiding principle. All backend tools and collected data are linked and exchanged in the infsoft LocAware platform® to create added value – going far beyond the blue dot on a map.