



What does the future of **indoor positioning** look like?

Expert guide on the current development
work and future possibilities of the next
major technological breakthrough.



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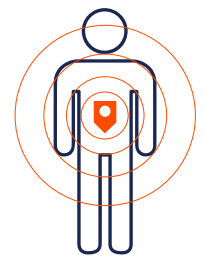
Indoor positioning is a profitable investment

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What does the future of indoor positioning look like?

*Indoor positioning is a rapidly developing technology that offers significant benefits across various industries. It enhances workplace safety, increases operational efficiency, and enables better customer experiences. Indoor positioning is expected to become as commonplace in spatial technology as Wi-Fi is today. Shedding light on future prospects are **Jukka Kämäräinen**, founder and chief engineer of Iiwari Tracking Solutions, and COO **Esa Viljamaa**.*



The Future of Indoor Positioning: Accuracy, Safety, and Efficiency

According to Grand View Research, the global indoor positioning and navigation market is projected to grow from USD 25.68 billion in 2024 to USD 174.02 billion by 2030, reflecting an annual growth rate of 37.6 %.

The Role of UWB Technology

Ultra Wideband (UWB) technology has become a key enabler of indoor positioning. With its centimeter-level accuracy, low power consumption, and resistance to interference, it is an ideal choice for environments like hospitals, factories, and smart buildings.

Fira Consortium: **Why is UWB Important for Indoor Positioning?**



Location Data Enhances Work Environments

Indoor positioning is already widely used across different sectors:

- **Industry and logistics:** Real-time tracking of equipment and materials improves efficiency and reduces waste.
- **Healthcare:** Locating patients and equipment speeds up care and enhances safety.
- **Retail:** Tracking customer movement enables personalized offers and improves the shopping experience.
- **Smart buildings:** Real-time location data allows optimization of energy usage (lighting, ventilation, heating) and enhances security.



Looking Ahead

The future of indoor positioning is promising. As the technology evolves and costs decrease, adoption will become even more widespread. UWB technology is expected to play a pivotal role in developing and deploying new applications. The integration of artificial intelligence (AI) with indoor positioning will unlock numerous possibilities—especially in industries like manufacturing, logistics, healthcare, and smart infrastructure.

+100 %

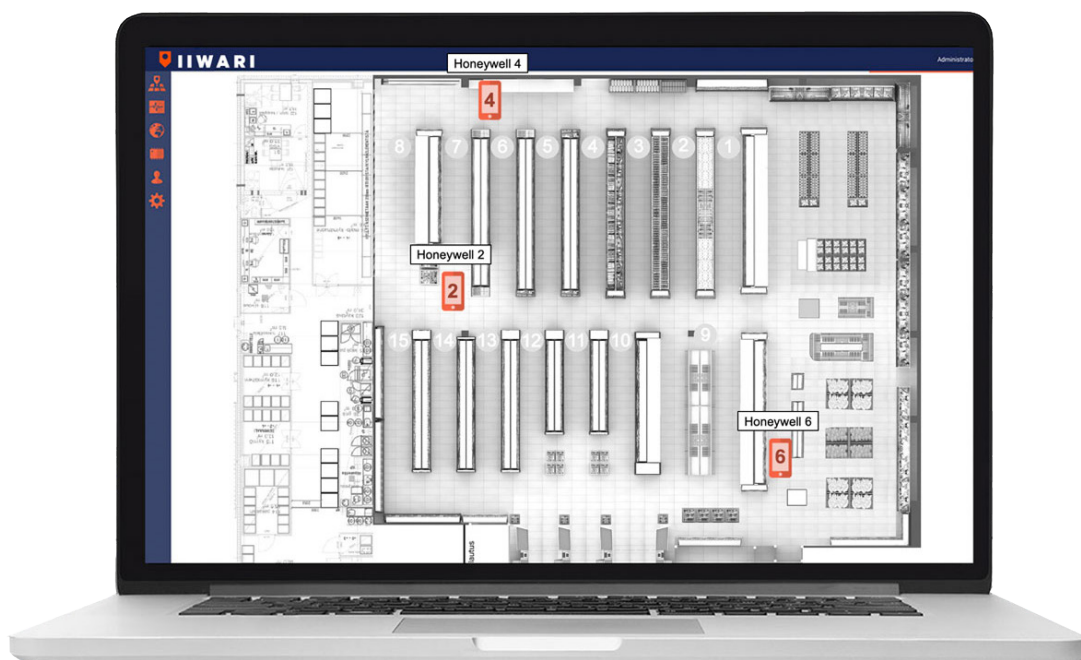
Equipment utilization can be doubled.

-40 %

Equipment acquisition costs can be reduced by nearly half.

+20 %

Operational efficiency increases through automated reporting and resource management.



Better safety, efficiency and work management in real time

The role of **real-time location systems** (RTLS) in healthcare will continue to grow in the future. The following development trends can be observed:

- **Real-time monitoring of functional capacity** combined with artificial intelligence enables more precise planning and implementation of individualized care.
- **Predictive analytics** helps identify high-risk patients and allows preventive measures before significant deterioration of functional capacity.
- **Automatic measurement of nursing work:** The system anonymously tracks time and movement spent on nursing tasks within the unit. This data provides a reliable basis for resource planning and improving work distribution. The effects of development measures, such as new operating models, can be measured in real-time.
- **Smart hospital environments** react to the movement of nurses and patients, increasing safety and improving care efficiency.
- **Data-driven management:** Leaders gain an up-to-date overview of unit operations: staff presence, workload, and equipment usage. Accurate data enables well-founded decisions on resource allocation and unit development.
- **The positioning system utilizes** modern wireless technologies such as UWB positioning and IoT-compatible sensors. Recent advances have made these solutions lighter, more accurate, and easier to use than ever before.

*RTLS = Real Time Locating System



Ensuring Safety Remains a Priority

- Patients and staff can easily send help requests via a button on the location tag.
- In emergencies, help requests are directed immediately to the nearest available nurse.
- Calls are automatically acknowledged when a nurse arrives—resulting in faster responses and less administrative work.





Technology Trends in Care Work

More accurate indoor positioning

UWB technology enables positioning accuracy up to 10 cm, opening new use cases such as precise room-level alerts and work optimization.

Wireless and easy deployment

Modern systems require only lightweight infrastructure: small anchors and sensors can be installed quickly without major construction.

Integration with existing systems

RTLS can be combined with patient record systems, nurse call systems, and equipment maintenance management systems, bringing increased efficiency and transparency. Hybrid models combine positioning, imaging, and biosensor data into a comprehensive patient picture.

Data security and anonymization

New systems offer high-level data security and enable anonymization at the individual level, supporting increasing data protection requirements.

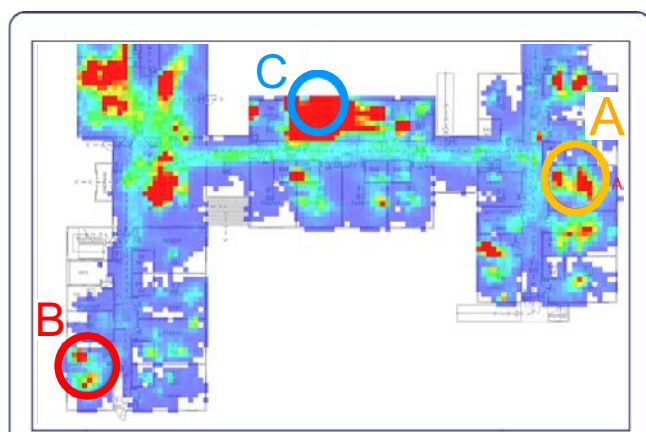
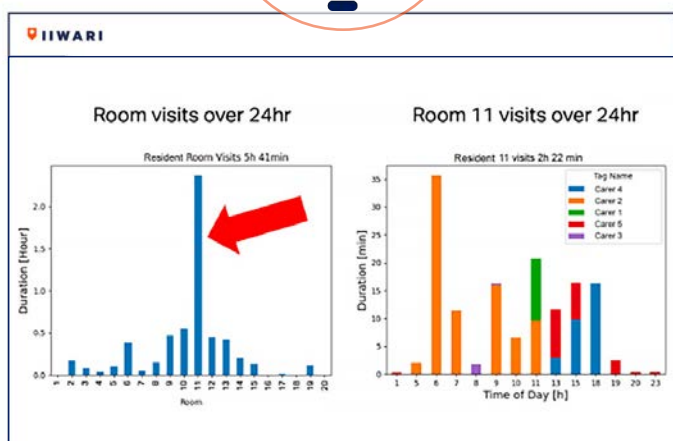
Predictive analytics

AI and machine learning-based analytics solutions allow predictive care planning, prevention of workload peaks, and automatic risk management.

Summary

Indoor positioning technology has rapidly evolved to meet the growing demands of healthcare and care work. It supports staff wellbeing, improves patient safety, and enables effective data-driven management across all environments.

In the future, indoor positioning combined with other technologies will enable increasingly personalized, efficient, and safer care pathways, becoming an even more integral part of everyday care work.



Read more

We have compiled a list of daily management challenges in healthcare that can be alleviated with indoor positioning technology.

[Download the free PDF: RTLS in Healthcare »](#)

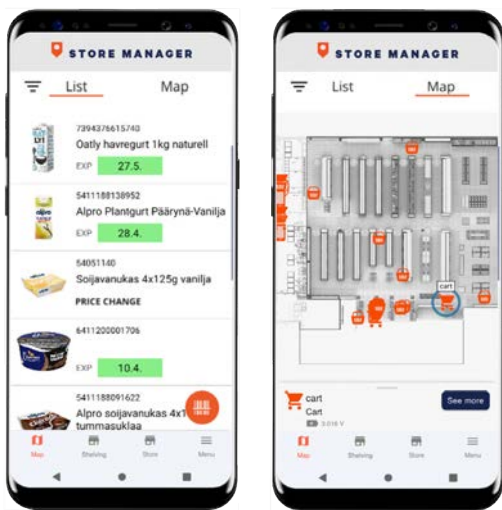


Smart Store Management

In the stores of the future, real-time location tracking, smart glasses applications, and data-driven tools will transform work practices, boost sales, and reduce waste.

Product Expiry and Waste Management

The Store Manager app increases efficiency in daily store management. It optimizes shelf stocking, expiry date checks, and task allocation—saving working time. With smart glasses, employees see directly in their field of vision the location of the next product to check, eliminating unnecessary searching.



Making Customer Flows Visible

Shopper Insights analyzes how customers move around the store. This allows measuring the impact of store changes, verifying the effectiveness of campaigns, and ensuring key promotional products actually get noticed.



Security and Equipment Management

Location tracking solutions enhance security: shared devices such as handheld terminals can be found quickly, and the system alerts if a device leaves a permitted area. Workflow improves as less time is spent searching for equipment.

Real-Time Situation Awareness for Store Managers

Real-time information on store conditions, task completion, and product movements improves planning, forecasting, and sales—even when the manager is not physically present.

Read more

We have compiled a list of the most significant practical challenges in the retail industry that can be alleviated with indoor positioning technology.

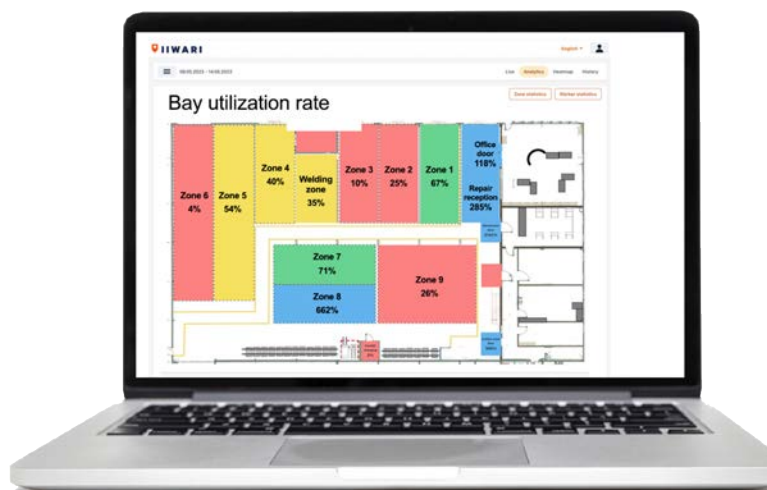
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Smart Factory Now: RTLS as a Driver of Efficiency and Safety in Industry

Real-time location technology (RTLS) has become a key tool in optimizing industrial production. **It enables significant improvements in efficiency, safety, and quality.**



Production Optimization and Transparency

RTLS allows real-time monitoring of production processes. AI can model and learn the operating environment, identify bottlenecks, and suggest more efficient workflows. For example, assembly lines can automatically measure the duration of work stages and employee movements, providing valuable data for process improvement. Forklift routes can be optimized automatically based on traffic and needs. The latest systems can create a digital twin of the production line, enabling simulation and optimization of processes before physical changes are made.

Improving Occupational Safety

RTLS technology can enhance safety walks and area alert management. Safety observations can be recorded directly on digital maps, and the system can send automatic notifications to responsible personnel. Additionally, RTLS can monitor that employees do not linger in hazardous areas without proper authorization and provide real-time evacuation instructions during emergencies.

Predictive Analytics and Maintenance

By 2025, RTLS systems will increasingly integrate with other technologies. AI can analyze movement and usage data collected by RTLS to detect anomalies and predict maintenance needs before equipment fails. This reduces downtime and extends equipment lifespan.

Benefits of RTLS Technology in Industry

- **Automatic measurement of lead times:** Enables more precise monitoring and optimization of processes.
- **Improved equipment utilization:** RTLS can increase equipment usage rates up to 100%, reducing the need for new equipment purchases.
- **Increased operational efficiency:** Automated reporting and resource management can improve efficiency by up to 20%.
- **Optimized production layout:** Real-time data helps design more efficient workspaces.
- **Enhanced occupational safety:** Enables faster response to safety observations and emergencies.

Adopting RTLS technology in industry is no longer a future vision but a present opportunity. It allows companies to gain significant competitive advantages by improving efficiency, safety, and quality.

Smart Warehouse: RTLS Enhances Logistics and Reduces Environmental Footprint

Storage and internal logistics are constantly changing and complex operations. Real-time location solutions (RTLS) provide visibility across the supply chain—and help companies reduce their environmental impact.

Real-Time Situational Awareness Saves Time and Space

Interim storage of goods without clear location markings causes wasted effort and slows warehouse processes. RTLS offers a continuously updated view of the locations of goods, forklifts, and personnel. This ensures fast retrieval of goods, optimized transfers, and more efficient use of capacity.

Smart Logistics = Green Logistics

By automatically optimizing loads and transfers based on location data, it can be ensured that transport carts and trucks are fully loaded before departure. This means less driving, lower fuel consumption, and reduced CO₂ emissions. Location tracking also enables transparent and documented logistics chains—an important competitive advantage in markets demanding responsibility.

Occupational Safety to a New Level

RTLS monitors forklift and personnel movements in real time. AI can analyze location data and alert on abnormal or dangerous behaviors—such as a person approaching a forbidden area or a machine moving abnormally. In emergencies, real-time personnel location data facilitates evacuation.



Key Benefits of RTLS in Warehousing

- **Fast retrieval of stored goods** → less wasted effort
- **Automatic acknowledgments when goods arrive in the area** → fewer errors
- **Improved transport load efficiency** → fewer trips, lower emissions
- **Collision risk management between forklifts and personnel** → better safety
- **Evacuation management** → personnel locations known in real time
- **Transparency across the entire internal logistics chain** → better planning and forecasting

RTLS is no longer an add-on feature—it is the cornerstone of a modern, responsible, and efficient warehouse.

Read more

We have compiled a list of the most significant practical challenges in the industry that can be alleviated with indoor positioning technology.

[Download the free PDF: RTLS in the Industry »](#)



Indoor Positioning – A Technological Enabler with Growing Potential

5G and Wireless Networks Support the Development of Indoor Positioning

The deployment of new local 5G and WiFi networks offers an opportunity to “kill two birds with one stone.” — *There is still a lot of untapped potential here, says Esa Viljamaa*, COO of Iiwari. — As base stations are built increasingly closer to users, it's worthwhile to also consider investments in indoor positioning. Integrated installation of 5G, WiFi, and positioning networks can bring cost efficiency, but it requires close cooperation between operators, network providers, and companies offering positioning solutions.

Depending on the need, one can utilize the native positioning capabilities of 5G and WiFi networks or integrate devices specifically developed for positioning, such as UWB or BLE devices, as part of 5G or WiFi equipment. So far, large-scale integrated solutions like these have not been widely deployed, but interest is growing especially in industrial and logistics environments.

UWB in Smartphones: An Evolving Opportunity

The initial expectation that UWB capability in smartphones would revolutionize everyday indoor positioning has been realized more slowly than anticipated. The adoption of UWB technology in phones started with object locating (e.g., AirTag, SmartTag). Since then, development has accelerated thanks to the Car Connectivity Consortium's work on using UWB for vehicle access control.

Additional momentum for compatibility efforts has come from recent advances in radio interfaces (FiRa) and applications (Omlox). Other promising signs include Qualcomm's pledge to integrate UWB radios directly into its higher-end system chips.



— *Enabling precise, real-time indoor navigation directly on consumer phones is coming, but not within the next two years, notes Jukka Kämäräinen*, founder and chief engineer at Iiwari. Challenges include variations in smartphone UWB chip implementations, unfinished standardization, and lack of developer interfaces.

The development will lead to a global indoor positioning service for phones similar to how GPS works outdoors today.

In industrial and closed environments, such as hospitals or logistics centers, where hardware and usage environments can be fully controlled, UWB already offers highly precise and interference-free positioning.

Distributed Computing Scales Widely

Indoor positioning solutions are being developed and used where positioning calculations are done on the end device. This reduces network load and enables scalability to very large numbers of users. — *When location data is computed on the user's device, the system works equally well with one user or a thousand users, says Kämäräinen*. This approach also improves security since the user controls the sharing of their location data.



Indoor Positioning Progresses at Different Speeds for Different Uses

Combination of UWB and BLE Creates New Solutions

Apple and Samsung have adopted combined use of BLE and UWB technologies, for example in object tracking. BLE acts as a communication channel, while UWB enables precise distance measurement when devices are near each other.

This development has increased user awareness of UWB but has not yet led to widespread consumer adoption of indoor navigation. So far, the biggest benefits have been seen in asset management and secured access control, not yet in tracking people.

Interference-Free and Technologically Secure

A key advantage of UWB is that it operates outside the ISM bands, **making it a very reliable technology** in places where radio interference is a problem. This is important in environments such as hospitals, electronics manufacturing, and laboratories. **A reliable positioning system can thus integrate seamlessly with existing processes without the risk of disturbing other systems.**

Standardization Enables Compatibility

The indoor positioning field is still fragmented. GPS is a global infrastructure outdoors, but indoors, common open interfaces and networks are still being built. International standardization of UWB and Bluetooth is progressing, aiming for all devices compliant with the standard to be able to use a shared positioning network. This will enable market growth and ecosystem formation.

Battery Operation Reduces Installation Costs

The biggest cost factor in positioning networks remains installation and cabling. A true breakthrough will happen when networks become fully wireless. Battery-powered base stations allow fast and cost-effective installation, and many industry companies—including Iliwari—are actively advancing this development.

A Future Universal Technology?

Indoor positioning was predicted to become a basic infrastructure like Wi-Fi. Although this vision has not materialized on the expected schedule, the technology's role is growing rapidly in certain sectors. **Analysts like Gartner still forecast the market to multiply by 2030**, especially in asset management and production optimization.

— *Indoor positioning is not yet everyday basic infrastructure, but it is a necessity in many places, says Kämäräinen. — Operational efficiency, safety, and user experience improve significantly when accurate location information is available.*

The Significant Potential of RTLS

Indoor positioning development continues, with industry, logistics, and healthcare adopting the technology quickly, while consumer adoption advances in small steps. The technology's potential remains significant—but fulfilling it requires standardization, compatibility, and practical applications.

Artificial intelligence is transforming RTLS from passive positioning to an active decision-making and optimization tool. While RTLS tells where things are, AI can help understand why they are there and what should be done next. Together, they form the foundation for smarter, safer, and more sustainable business.

Smart technology builds a more sustainable tomorrow

Companies will need to systematically consider environmental aspects in the future.

Not only due to legislation and climate targets, but also for cost-efficiency, reputation, and competitiveness. In this change, indoor positioning (RTLS, Real-Time Location System) takes a key role.

Accuracy Reduces Waste

RTLS technology provides real-time visibility of assets, equipment, and materials indoors. When a company knows exactly what it has and where, overstocking, unnecessary purchases, and pointless replacements of lost items can be avoided. This means less material consumption, less manufacturing, and thus a direct impact on both costs and carbon footprint.

Enabler of the Circular Economy

The linear model of production → use → disposal is giving way to a circular economy where products are designed to be reusable, maintainable, and recyclable. RTLS supports this transition by accurately locating resources, improving material reuse, and enabling predictive maintenance, for example. This extends product lifecycles and reduces environmental impact. AI can utilize location data to monitor the use of materials and components, identify waste, and suggest better recycling or reuse methods — supporting sustainability goals.

Reducing Plastic and Waste

With RTLS, companies can avoid unnecessary manufacturing and plastic packaging. When spare parts, tools, or components are not ordered unnecessarily, plastic packaging waste is also reduced. Additionally, systems improve the traceability of recyclable materials, which is critical for sustainability.

Cost Efficiency Is Not at Odds with Green



Values

Environmental responsibility is often seen as a cost, but RTLS proves otherwise. Better visibility and automation reduce operating costs and minimize production downtime. Through pilot projects, system benefits can be evaluated with low risk before full deployment.

Company Reputation and Market Position

Responsibility is no longer just an internal strategic choice — it is also a market advantage. Stakeholders, customers, and investors increasingly assess companies based on how they consider the environment and resource use. RTLS provides a concrete way to demonstrate progress in these areas.

Future Winners

Indoor positioning is a technology that not only improves efficiency but enables a shift to truly sustainable, resource-wise, and cost-effective business. The future winners are companies that seamlessly combine technology and environmental responsibility.

The importance of location in today's business and technological environment



Location Accuracy

Location accuracy has improved, with 3D positioning and indoor mapping taking center stage. This enables more accurate and versatile use of location data in different environments, such as smart buildings.



Real Time Data

In addition to real-time data, predictive analytics that leverage machine learning have become increasingly important. This enables the prediction of problems before they occur, further improving responsiveness and efficiency.



Safety & Security

The smooth operation of the UWB signal continues to be a significant factor in safety and reliability, especially in environments requiring precise measurement devices. At the same time, the importance of cybersecurity has increased, and it is important to protect location data from potential cyber attacks.



Improve Routing

Real-time location data enables the optimization of pickup routes for multiple orders, significantly speeding up the picking and warehouse operations process. In addition, the sustainability perspective has become increasingly important, as optimized routes can reduce fuel consumption and carbon emissions.



Work efficiency

Knowing the exact location of goods, equipment and people at all times can significantly improve the efficiency of the work environment. At the same time, employee well-being becomes a priority, as optimized workspaces can promote safe and efficient working.



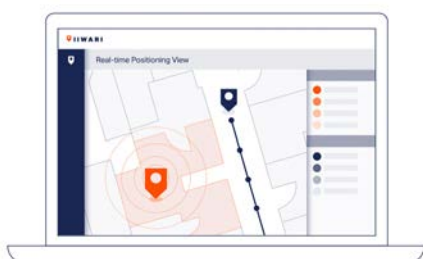
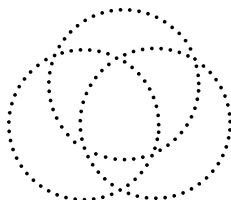
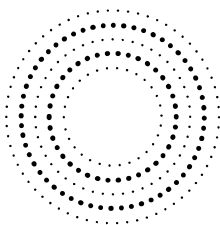
Zone Alerts

Production downtime is reduced when raw materials and components are always ready and in the right place. Smart alert systems not only notify arrivals, but also monitor inventory turnover and anticipate needs, improving process flow.

Iiwari Indoor Positioning System

Our technology provides real-time visibility of people, assets and equipment in addition to powerful analytics and planning tools.

Working as a stand-alone or complementing your existing system it provides you with greater insight than ever before.



Signal Flow

The indoor positioning system is built by attaching the base stations to the ceiling or the walls. Tracked objects have a tracking tag that communicates with base stations using UWB (Ultra Wide Band) signals.

The network is designed completely around your particular requirements. We have installed systems in less than 1 business day, it's that easy.

Iiwari Tag

Iiwari tag is a small battery-powered device which can be attached to the tracked object or mobile phone and it communicates with the positioning network.

Base Station Network

Positioning network consists of master base stations and supporting base stations which exchange positioning signals with the tags.

Gateway

Gateway is the core computing device of the site. It manages the local positioning system and connects to cloud infrastructure with network connection. It collects positioning data and forwards it to our cloud infrastructure.

Iiwari Cloud

The data management system stores positioning data, takes care of data processing and manages all sites.

End User App

There is an easy-to-use user interface (Iiwari Dashboard) to visualize positioning data. A public API is available for your software development. Applications are developed according to the customer's needs.



Indoor positioning is a worthwhile investment.

The total cost of ownership (TCO) of a real-time positioning system (RTLS) mainly includes costs related to anchors, tags, cabling, accessories, installation and maintenance.

liwari uses wireless data channels in 80 percent of its devices, which makes cabling and installation faster and more cost-effective. liwar's devices are affordable, functional and durable. In addition to moderate maintenance costs, it is possible to agree on very useful diagnostic and application development support.

The direct and indirect cost benefits of applications utilizing indoor positioning can be calculated and in many cases it has been found that the indoor positioning investment pays for itself, depending on the case, within a few months - a few years in the form of increased work efficiency or direct additional sales.



Intelligent indoor space
with the help of positioning.



We make the invisible visible!

liwari Tracking Solutions Ltd., a pioneer in indoor positioning, has its roots in VTT (Technical Research Centre of Finland) and its extensive research on UWB (Ultra-Wideband) technology. liwari innovates cost-effective network solutions and products based on UWB technology for increasingly accurate and reliable indoor positioning.

If you want to learn more about intelligent
positioning solutions, do not hesitate to contact us.

Contact us »