recosense

PRODUCT OVERVIEW

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IRID-RTLS

We integrate the advantages of Infrared technologies into a Real Time Location System.

To achieve this, we equip the followable assets with the infrared light emitting TAGs. Their ID number is percieved by our cameras (DFMUs) located above them.

The signals are processed in the DFMUs and are forwarded to our MiddleWare for further processing. The hardware hierarchy is simple, only two types of devices are required for the system.

INTEGRATION

APPLICATION

Technology Overview

The RecoSense technology is based on infrared light emission and detection, also known as IRID-RTLS (InfraRed IDentification Real Time Location System). The asset identification codes are embedded in the periodically transmitted beams. The infrared signals emitted by the TAGs are received by a uniquely self-designed, FPGA based camera known as DFMU (Digital Field Mapping Unit). The frame processing algorithm in the DFMU is able to decode the tag IDs and calculate the position of the tags. The raw position data is then passed on for further handling, processing and evaluation to the MiddleWare. The process result is an accurate and instantaneous coordinate stream in 3D or 2D. For 3D reconstruction at least the position data of at least 2 DFMUs is needed. The light propagation is always linear, resulting in a **sub-centimeter position accuracy** with IRID-RTLS technology, overcoming other known RTLS technologies. The positioning is also **highly precise**, no "jumping" or repositioning is experienced, the received location always stays the same when the asset is not on them move. ID handling between cameras is provided by unique processing algorithms.

Key Advantages of the IRID-RTLS Technology

Low power consumption and long battery life

Low cost

Easy Scalability

Unlimited amount of tracked assets

Real-Time processing

High asset Density

RF immunity and no RF emission

Sub-centimeter accuracy with high precision

Low power consumption and long battery life

Low cost

Easy Scalability

Unlimited amount of tracked assets

Real-Time processing

High asset Density

RF immunity and no RF emission

Direction tracking (not just position)

Simple hardware hierarchy

Easy integration into existing RTLS systems or assets

Easy implementation

Easy to track 2D and 3D position

|	Infrared based IRID-RTLS (RECOSENSE)	Ultrawide band (UWB)
Localization principle	Angle of Arrival (AoA)	Time Difference of Arrival (TDoA) or AoA, or Time of Flight (ToF)
Accuracy	1 cm	30 cm
Max. tag – reader distance	1-15 m	30 m - 100 m. Larger distance may cause interference
Sync needed	No	TDoA -Yes ToF - No
Plan Calibration complexity	Easy	TdoA - Complex ToF - Easy
Fast moving object navigation possible (Fast AND accurate location calculation)	Yes	No, location calculation ~ 1 sec
Asset density	Very high	ToF - Very high TDoA - medium
Determining the direction of even small objects	Yes (with two tags on the object)	ToF – No AoA - Yes
Number of readers needed to connect with a tag **for location calculation**	11	9
HW hierarchy	TAGs and DFMU-s	Tags, anchors, master anchors
RF emission	No	Yes (bellow noise level)
Tag battery life	Up to 2 years	Up to 1 year
Line-of-sight needed (LoS)	Yes To reduce LoS problem, DFMU density is to be increased.	Case-by-case. Location calculation can be disturbed by metallic object To reduce LoS problem, anchor density is to be increased.
Tag hardware complexity	Simple	Medium
Tag price	Cheaper	More expensive

Technology comparison
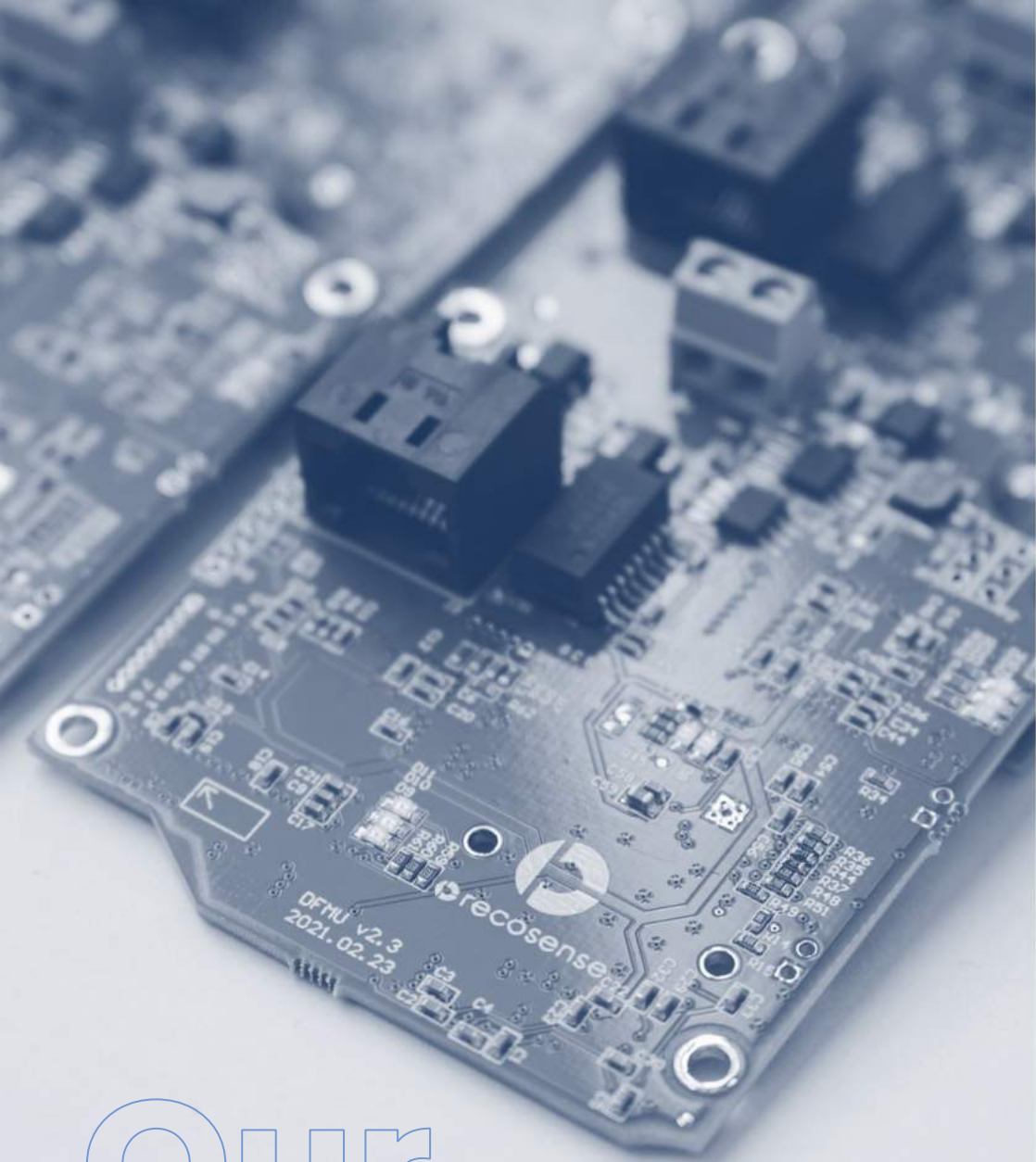
Our
products

Middleware is the software that processes raw data. It is capable of standalone operation on-demand, but it can also act as a simple data provider that it transmits to the desired software for further operations.

Through pre-defined interface the RTLS system provides identification and location data for higher level applications. The enterprise applications support operations that can serve partners or customers with real-time data. **Zone based processes** become fully transparent with tracking each asset accurate and in real time. User interface can be tailored to specific needs. The location based and identified object related functions can range from reports, events, alerts, and actions to enterprise resource management level.

Enterprise software can support thousands of sites, users, and hundreds of thousands of tracked resources. In order to improve efficiency and lower waste production, it is essential to collect as much information about assets as possible. With the location information of assets at hand, it is possible to optimize the movement of assets and minimize the necessary number of certain tools.
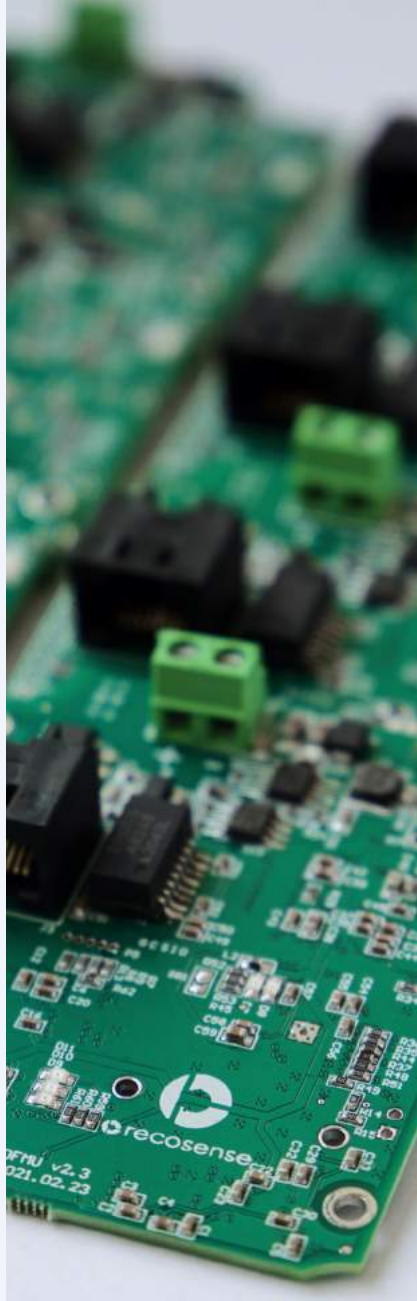
MIDDLEWARE

The heart and soul of RecoSense.

TAG

Small-scale asset,
yet easy to find.

Simplicity and reliability were the key aspects of the design process for the main hardware components. This is the reason why all versions of the **low-cost and small-size** TAGs provide high uptime with **cost-effective** solutions. TAGs electronics operate with **low power consumption**. Built-in motion sensors further reduce power consumption with "sleep" mode being activated when their motion is stopped. Batteries on non-constantly moving assets **may last for years**. Assets constantly on the move can be integrated with TAGs to their battery source directly, and no external power supply will be needed. TAGs are available with standard and rechargeable batteries. Continuous tracking is available with **up to 10 Hz** signal emission rate.

The TAGs can also be complemented with **e-paper displays**, which can be controlled through two-way IR communication. This allows the TAGs to also display changing information, with low energy consumption.

With the help of two LEDs allocated to one ID (be it two TAGs or a double-sided TAG), IRID-RTLS can not only determine the location of an object, but the current heading of it. This direction is not derived from the moving direction, but **the actual direction of the object**. All of these are also suitable for tracking real-time drones or other fast-moving objects. Location data of tracked assets and people can be used to **increase safety** and to increase process efficiency.

Apart from reliability and simplicity, the cameras were designed with special care in terms of scalability. This allows you to find the optimal camera for every task. **Easy scalability** originates from the fact that there is no hardware hierarchy, thus expanding the system only requires the installation of new DFMUs to expand coverage dynamically and adding TAGs to new assets.

As a result of the unique FPGA architecture, IRID-RTLS gives us the ability to alter the hardware over a wide range. The cameras contain an infrared light filter layer, thus the processed picture doesn't contain any sensitive images, only the signals from the beacons. All factors, including picture resolution, framerate and sensitivity can be personalized to provide the best solution for any need. The ID length (number of bits) can be set without limitations, allowing you to track an **unlimited amount of assets**.

The DFMUs can be powered as per your choice in the $9 - 24$ V range, or use the inbuilt **PoE** capabilities. The highest framerate is **90 FPS in 720p HD**, which is sufficient to operate anywhere between **1 and 15 meters**.

DFMU

The camera that senses even the smallest movements.
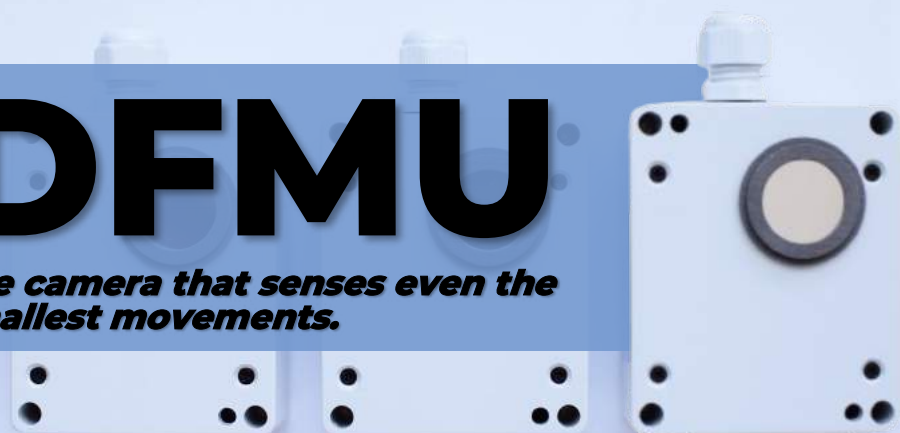
How IRID-RTLS will
REFORM
your production

RecoSense is able to serve all individual needs and adapt the properties of the existing basic system to them. At both the hardware and software levels. In terms of use, even the starting base allows a great deal of flexibility in terms of use, but this is fine-tuned or expanded to solve the problem that arises.

The great advantage of the IRID-RTLS over other, widely used technologies such as UWB or RFID technology, is that it has no interference-sensitive components, the technology is completely **immune to any kind of radio frequency** and has **no RF emission**. This allows it to work in environments where no RF is allowed. If the direct line of sight is not available to a certain TAG, the last available coordinate can also carry useful information, which can be interpreted in the software. Due to the immunity to interference, the technology enables us to track and trace objects in an area with **high object density** with no loss in accuracy.

The technology can operate as a main RTLS in most industrial environments, as communication with Siemens PLC controllers is available. The small size of the TAGs allows the system to be **integrated into existing RTLS Systems**, thus complementing other, less accurate technologies. Autonomous Guided Vehicles (AGVs) or containers can be installed with fixed TAGs give new available features to manufacturers and handlers, as the location of the objects would be known in real time with important information being represented on them with the e-paper displays. This way all trolleys and containers can be identified and located in real time. Finding a replacement component or add-on equipment in a factory is essential to minimize process waste times. The maintenance process is also faster if the tools are tagged, and they are found quickly. Finding equipment in hospitals can be critical in emergency situations.

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As a bottom line, the IRID-RTLS technology can provide a locating and tracking system with greater accuracy and higher allowed object density, while maintaining the ability to track high velocity objects too. The processing capacity of the FPGA can be scaled according to the requirements. Integration with other systems and technologies enables the use of the advantages of both technologies. The Infrared Technology provides a powerful, low-cost, and highly customizable solutions for all industries like manufacturing, transportation, agriculture and healthcare.

Usual applications

Tool Tracking

Carrier Tracking and Navigating

Personnel Safety

Movement Analysis

Workforce and process optimization

Indoor Forklift Tracking

Indoor Navigation (AGVs)

Real Time Location Systems

The ability to track and navigate people and devices has become increasingly important in many environments. There are several real-time positioning system (RTLS) technologies available on the market, each with its own advantages and disadvantages. It is important to assess the performance parameters of all technologies and adapt them to user needs.

RecoSense RTLS (IRID-RTLS) is designed to solve **common tracking problems** and offers a very high accuracy for localization and **identification** of large number of objects.

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RecoSense Software

Technical Data Sheet

System Requirements	
PC Running:	Windows 10
	Linux

Base Software Package	
DFMU data receiver	
Tag ID decoder	
Web based GUI, plugin configuration	
Tag position reconstruction to real 2D, 3D coordinate systems	
Region identification in camera image coordinates	
Region identification in real 2D coordinates	Included
2D Layout visualization	
DFMU configuration (network, etc)	
Demo user interface (calibration and 2D layout demo)	
Software Development Kit Plugin	

Additional Options	
Send tag position data:	
over MQTT to a broker	
to MSSQL database server	
to MySQL database server	
to SQLite database	
to OPC UA (on PLC)	
S7 Profinet communication	
Modbus TCP Communication	
Save tag position data to CSV files	Contact us for a quote
Send data over UDP	
other protocols on request	
PLC Integration (hourly rate)	
3D View (GUI)	
Improved precision for position reconstruction	
Heatmap visualization	
Spaghetti diagram visualization	
Low battery voltage signaling	
Custom Development Tailoring (hourly rate):	
Custom Position Transformation	
Custom GUI Visualization	
Custom Business Workflow Implementation	
Custom Report Generation	

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RecoSense DFMU
Technical Data Sheet

	Normal angle	Wide angle
Properties		
Camera Sensor Resolution	1640 × 1232 (2 MP)	1640 × 1232 (2 MP)
Camera Framerate	90 fps	90 fps
FOV	62.2° × 48.4°	90° × 81°
Accuracy*	± 5 cm	± 15 cm
Working Range	1 - 15 m	
Working Temperature	-5 - 50°C	
Default Networking Setup	DHCP / Static IP	
Power Supply	9 - 24 V DC or PoE (IEEE 802.3at type-2 compatible)	
Data output	over 10/100 Ethernet (TCP/IP)	
Encrypted data output content	Timestamp; 2D position (U,V), tag ID	
Dimensions		
Width	74 mm	
Depth	90 mm	
Height	42 mm	
Weight	140 g	
*Accuracy measured at	1 - 3 m, multiple TAGs, accuracy may decrease along the edges	

RecoSense TAG
Technical Data Sheet

	Battery Powered	Rechargable Battery Powered
Properties		
Working Range	1 - 6 m	1 - 15 m
Battery Life*	up to 1 year	up to 1 year
Max. locating frequency	1 Hz	18 Hz or continous locating without ID
Powered by	CR2450	Rechargable Li-Ion Battery
Transmission Angle	120°	
Transmisison Wavelength	940 nm	
Maximum ID Length	21 bit	
Wake-On-Motion	yes	
Working Temperature	-5 - 50°C	
Fixing mode	Can be fixed on any surface with magnet, glue, velcro, bracket, etc.	
Dimensions		
Width	73 mm	65 mm
Depth	45 mm	35 mm
Height	16 mm	21 mm
Weight	30 g	45 g

*Battery life measured as:

Rechargeable: 1 év, ha 6 m távolságból 5 sec transmission period mellett óránként 3 percet mozog (egész nap alatt 1 órát)

Rechargeable: 2 hét, ha 6 m távolságból 18 Hz követés mellett egy nap 6 órát mozog

Battery: 6 hónap, ha 6 m távolságból 5 sec transmission period mellett óránként 3 percet mozog (egész nap alatt 1 órát)

Battery: 1 hét, ha 6 m távolságból 18 Hz követés mellett egy nap 6 órát mozog

RecoSense DemoKit
Technical Data Sheet

The full experience of the RecoSense IRID - RTLS System capabilities even on your desktop for demonstartion and pilot purposes

System requirements	
PC operating with	Windows 10
	Linux (Tested on Ubuntu)

Contents of the DemoKit Basic Package
1 DemoKit Structure (assembly required)
1 Carry Bag for easy transport
1 DFMU
4 TAGS (Battery Powered)
Tools and accessories necessary for assembly
Base Software package
Quick Start Guide

Details

DFMU Data Reciever	
Camera Resolution	1640x1232@90 fps
FOV	62.2x48.4°
Default Networking Setup	DHCP
Power Supply	(IEEE 802.3at type-2 compatible)

ID Tags	
Update Interval	optional: continuous refresh rate
Operation mode	periodic / optional: continuous refresh mode
Wake-On-Motion	
CR2450 Battery	Optional USB rechargeable Li-Ion Battery

Base Software Package
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Region identification in camera image coordinates
Region identification in real 2D coordinates
2D Layout visualization
DFMU configuration (network, etc)
Demo user interface (calibration and 2D layout demo)
Software Development Kit Plugin

Additional Options (not included in Basic Package)	
3D View (GUI)	
Heatmap visualization	
Spaghetti diagram visualization	
Low battery voltage signaling	
Send tag position data:	over MQTT to a broker
	to MSSQL database server
	to MySQL database server
	to SQLite database
	Save tag position data to CSV files
	Send data over UDP
	to OPC UA (on PLC)
	S7 Profinet communication
	Modbus TCP Communication
Improved precision for position reconstruction	
PLC Integration (hourly rate)	
Custom Development Tailoring (hourly rate)	Custom Position Transformation
	Custom GUI Visualization
	Custom Business Workflow Implementation
	Custom Report Generation

Dimensions	
Width	70 cm
Depth	45 cm
Height	70 cm