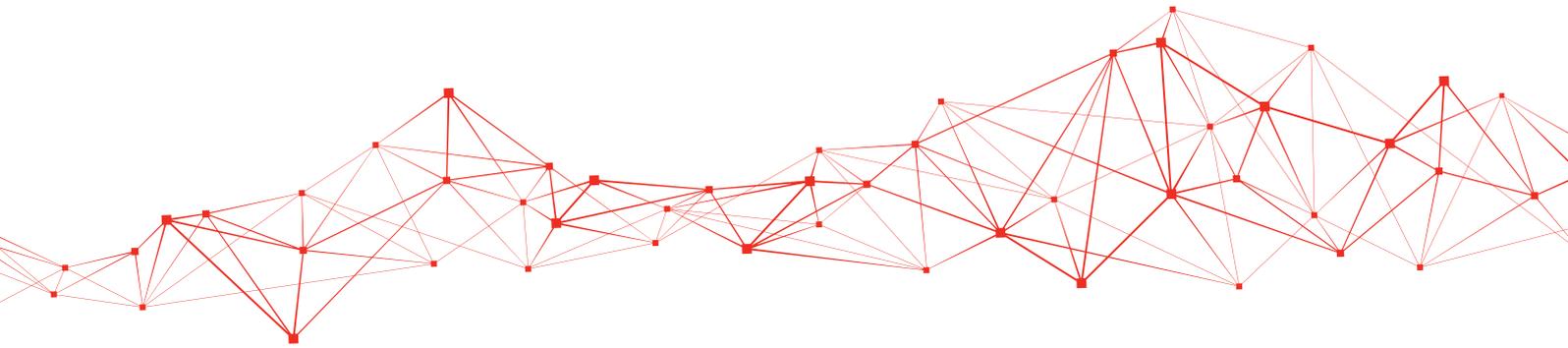


INDUSTRY OVERVIEW

Manufacturing and Logistics Systems

100% Identification Technology



KATHREIN

We Provide Solutions for Better Business

Kathrein Solutions provides modular AutoID turnkey solutions including hardware, software, services and support. From the first proof of concept to the go-live implementation, Kathrein supports customers in applications for manufacturing and logistics, healthcare and intelligent transportation systems. The possibility of offering all necessary components and tools from one source enables us to provide our customers and partners the most powerful solutions. From track-and-trace visualisation to seamlessly incorporating any

kind of identification technology — including solutions such as barcode readers, active RFID systems and wide-area network technologies — we combine the best suitable features and generate interfaces with all kinds of ERP systems. First-class service and customer-oriented support round off our portfolio. We provide RF simulation, application support, software integration and implementation as well as operation and maintenance.

> Hardware

The Kathrein Gen3 RAIN RFID readers are the leading IoT devices for all industrial AutoID solutions. Kathrein Solutions hardware is the first choice for vehicle identification in ruggedised environments. Kathrein's portfolio provides modularity for high-speed identification and end-to-end security at the same time.

> Software

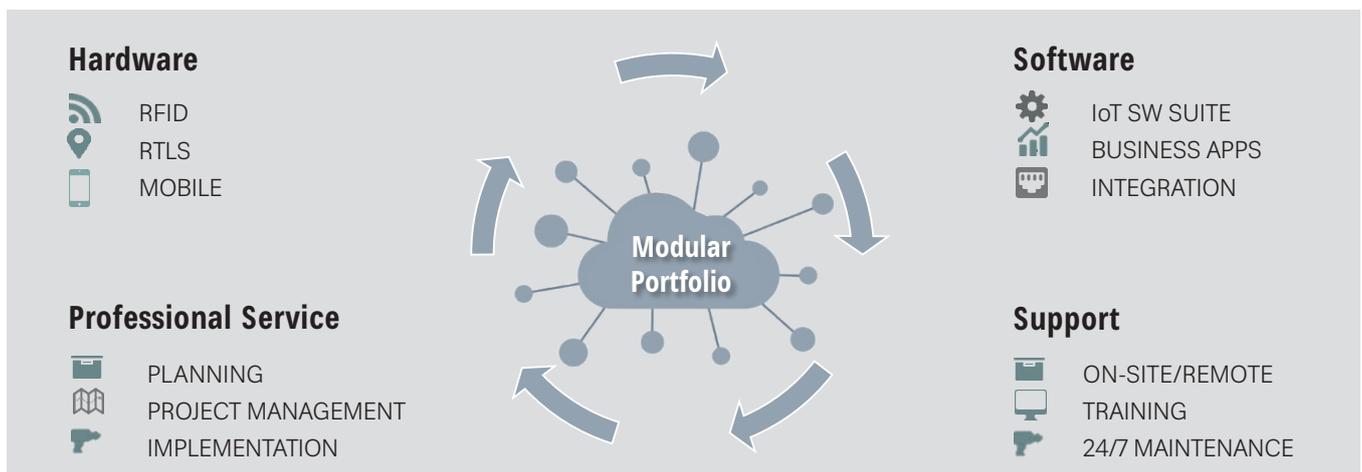
CrossTalk, Kathrein's integration software layer, is a modular IoT suite for different identification applications. Passive UHF RFID, ANPR cameras, sensors and various other technologies can be handled with CrossTalk. We provide centrally controlled integration — from device management to a customised handshake to backends and traffic management solutions.

> Professional Services

Our services reflect the profound expertise of an innovative technology leader acquired over a whole century. Our experts and highly motivated teams work on excellent solutions together with our partners and customers. We offer reliable support in implementing projects according to your high-quality standards.

> Support

Our maintenance team support on site or remotely with the appropriate service concepts, training of local service personnel and build the backbone of a professional maintenance concept.



Introduction

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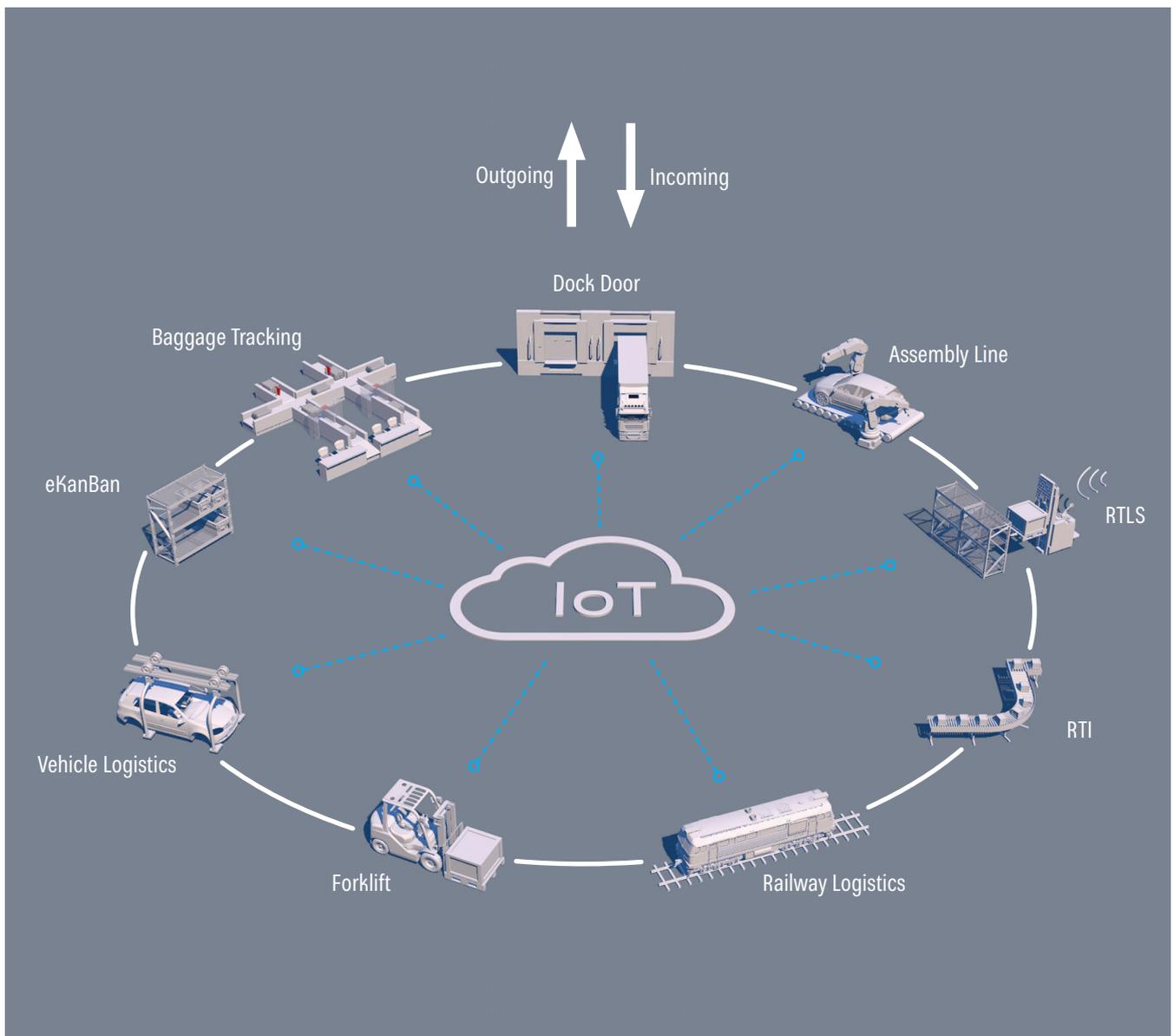
Introduction

> Industrial Internet of Things

IIoT* incorporates big data technology, utilising sensor data, machine-to-machine (M2M) communication and technologies for industrial automation. Smart devices are more efficient than humans when it comes to capturing and communicating data accurately and consistently. This data can enable companies to save resources and support business intelligence efforts.

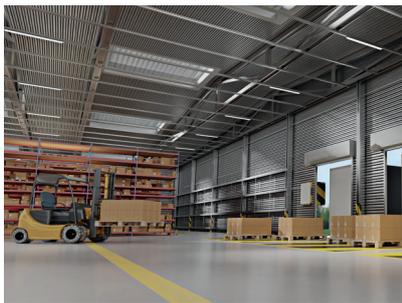
Particularly in manufacturing environments, IIoT holds comprehensive potential for quality control, sustainability, supply chain traceability and efficiency. IoT** offers innovative opportunities to create solutions that connect digital and physical components as well as services and support.

*) IIoT = Industrial Internet of Things **) IoT = Internet of Things



IoT Solutions and Scenarios

> Key Applications



Dock Door

- Supply Chain Management
- Inbound/Goods Receipt
- Outbound/Goods Issue



Assembly Line

- Track and Trace
- Lean Production
- Quality Control



Returnable Transport Items

- Container Management
- Track and Trace
- Sorting



eKanBan

- Real-Time Stock Transparency
- Lean Material Handling
- Quality Management



Real-time Location System

- Track and Trace
- Stock Management
- Security



Railway Logistics

- Supply Device Management
- Fleet Management
- Maintenance



Forklift

- Mobile Reader Application
- Stock Management
- RTI* Management



Baggage Tracking

- Check-In
- Screening/Sorting/Transfer
- Loading/Unloading



Vehicle Logistics

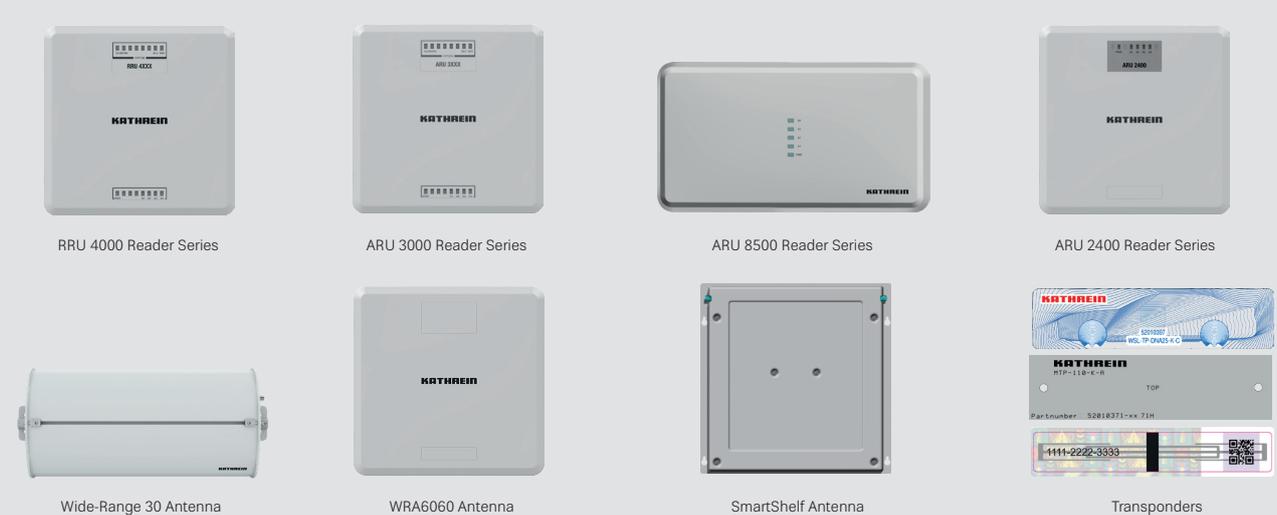
- Supply Chain Management
- Quality Management
- Prototype Tracking

*) RTI = Returnable Transport Items

Hardware Overview

> RFID Hardware

Kathrein provides a mature and powerful UHF RFID hardware platform with a large variety of reader and antenna types for many different applications and requirements.



The image displays seven different Kathrein RFID hardware components arranged in two rows. The top row features four square or rectangular readers: the RRU 4000 Reader Series, ARU 3000 Reader Series, ARU 8500 Reader Series, and ARU 2400 Reader Series. The bottom row features four different types: a cylindrical Wide-Range 30 Antenna, a square WRA6060 Antenna, a square SmartShelf Antenna, and a stack of Transponders with various labels and QR codes.

- RRU 4000 Reader Series
- ARU 3000 Reader Series
- ARU 8500 Reader Series
- ARU 2400 Reader Series
- Wide-Range 30 Antenna
- WRA6060 Antenna
- SmartShelf Antenna
- Transponders

> Real-Time Location System (RTLS)

The new real-time location system „K-RTLS“ combines high localisation accuracy in an industrial environment with unique technical features which allow a broad use of the system in different applications. In production, for example, it enables precise monitoring of the manufacturing progress and a transparent material flow. The real-time data comprising the location and status of the objects captured by the RTLS solution form the basis for end-to-end tracking and tracing in the supply chain and logistics network. The system consists of mobile transponders, permanently installed nodes and the CrossTalk IoT suite.



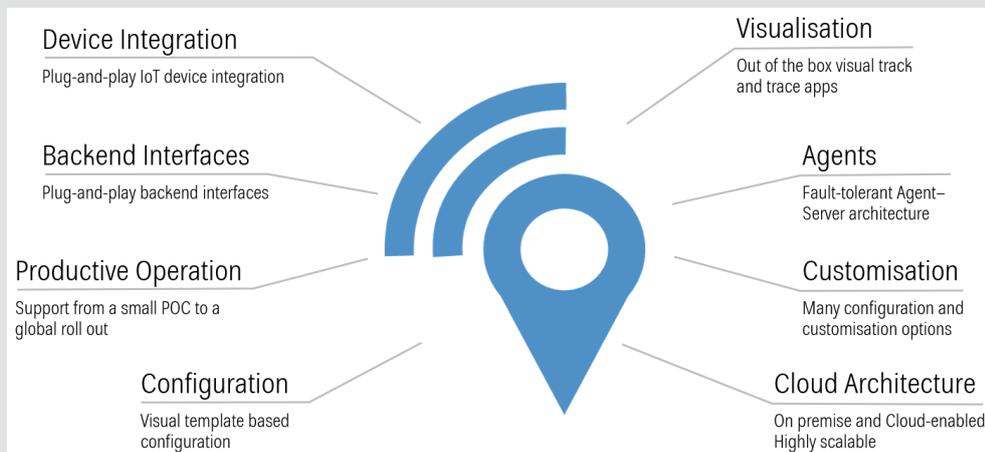
The image shows three components of the K-RTLS system. On the left is a white, rectangular Node with a small display and a green indicator light. In the center is a black Transponder with a white label that reads 'RTLS-T-1000-07'. On the right is the CrossTalk IoT Suite software logo, which consists of a blue location pin icon with three curved lines above it, and the text 'CrossTalk IoT Suite' next to it.

- Node
- Transponder
- Software

Software Overview

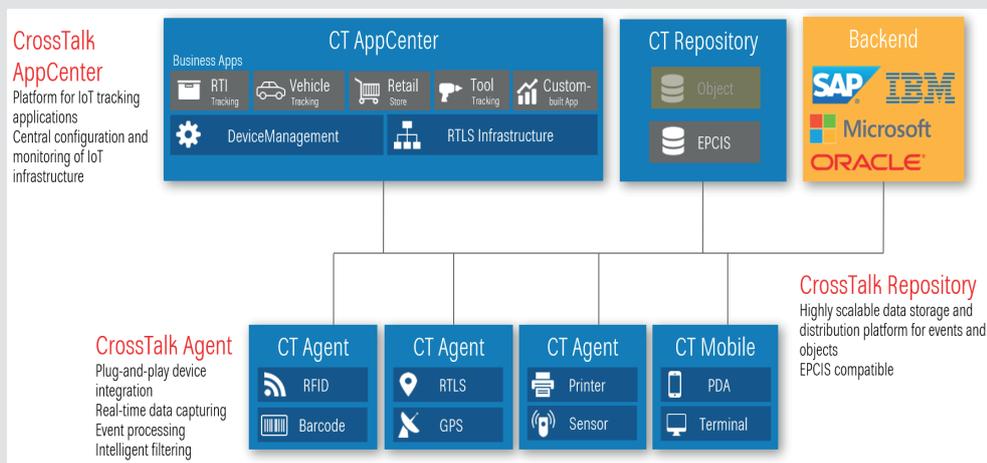
> CrossTalk IoT Suite

CrossTalk IoT Suite is the most advanced software suite for AutoID & IoT device management and Track & Trace visualisation. The highly configurable, modular and customisable AutoID software suite CrossTalk allows a mix of technologies from major RFID, RTLS, barcode and sensor providers to fit into any customer environment.



> Architecture

One of the key features of CrossTalk is its distributed architecture based on the CrossTalk Agent software component.



Professional Services

> Services Portfolio

Our professional services reflect the profound expertise of an innovative technology leader acquired over a whole century. Our experts and highly motivated teams work on excellent solutions to coordinate all relevant project activities and implementation tasks, and provide our customers and

partners with up-to-date information and direct visibility of the implementation status and progress. We provide reliable support in implementing the projects according to the highest quality standards.

Blueprinting Service

- Process analysis and workflows
- Specification and rough schedule
- Documentation
- Project kickoff

RFID application engineer in HF & Field Analytics

- On-site proof of concept at customer/partner location
- Definition of the appropriate RFID hardware
- Evaluation and testing of RFID tags
- RF measurements and performance tests

Hardware Installation

- Material evaluation and provisioning
- Installation planning
- In-house pre-assembling
- On-site installation

Project Management

- Planning
- Project documentation
- Coordination and organisation
- Execution & finalisation

Integration Tests Software/Hardware

- Hardware and software configuration and tests
- Interaction tests between modules
- Interaction tests with customer backend systems
- Acceptance & documentation

Training

- RFID basics
- Reader, antenna and UHF transmission basics
- Safety standards and human exposure
- EPCglobal RFID Class 1 Gen2

Support Service for all project phases:



Support

> Maintenance and Support



Support Portal

- Download portal
- Ticket tracking



Repair Operations

- Return note
- Warranty handling

> Project and Sales Support

- Field Sales Support
- Global Partner Network
- Testing and Application Center

Kathrein Solutions has recently started operating a new measuring chamber at the Stephanskirchen location. This creates new possibilities for the optimisation of individual antennas and antenna systems, RFID/RTLS transponders and customer-specific analyses during the development phase.

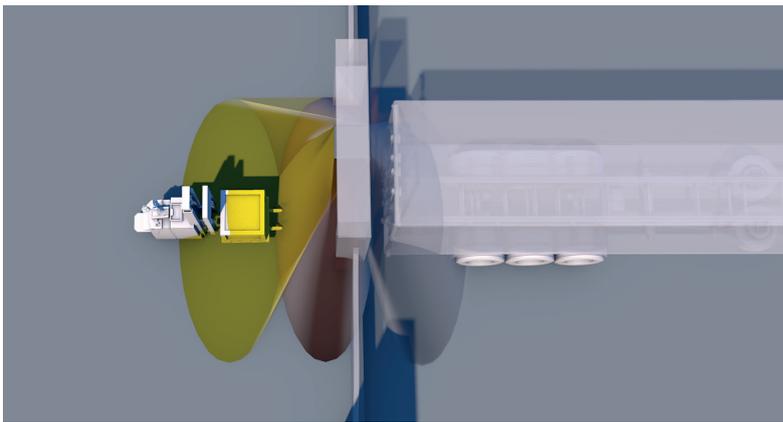
In this facility, Kathrein Solutions offers the customers and partners advanced functionalities and provides and develops innovative and first-mover applications focusing on future AutoID technologies. The key work packages cover:

- | | |
|---|--|
| <ul style="list-style-type: none"> ▪ Proof of concepts with the focus on customer or partner needs ▪ Choosing the appropriate RFID readers and antennas for the project requirements ▪ Evaluating and testing RFID tags for customer or partner requirements | <ul style="list-style-type: none"> ▪ RF measurements and performance tests of RFID hardware ▪ 3D antenna/application simulation ▪ 3D transponder development and measurement ▪ Documentation of work |
|---|--|



Identifying the Right Solution

> Dock-Door Overhead



Core Applications

- Medium-speed direction detection
- Limited installation space

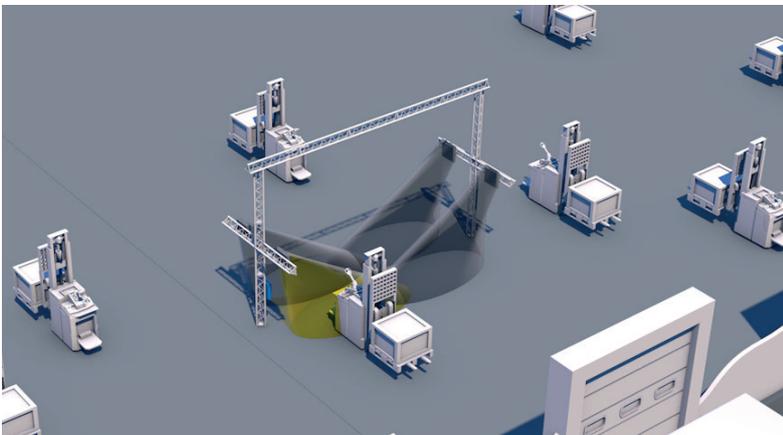
Hardware Features

- ARU 8500 with integr. CSB antenna
- Circular-switch beams
- ©KRAI technology
- Low installation cost

Software & CrossTalk Features

- Unwanted reads filtering
- Configuration and monitoring
- Backend IT integration

> Dock-Door Gate



Core Applications

- High-speed direction detection
- Reduced tag performance

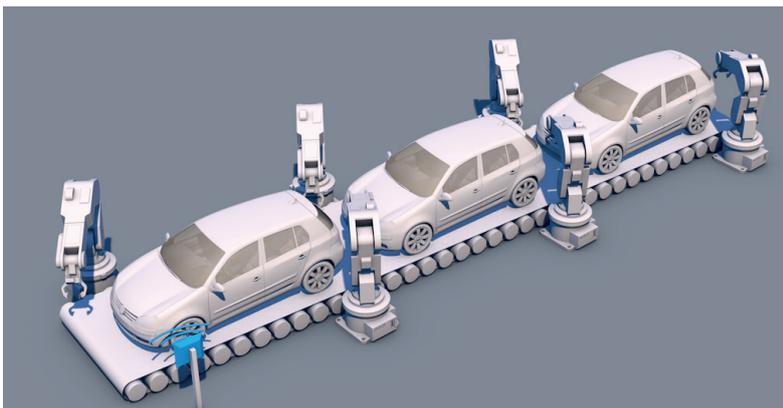
Hardware Features

- RRU 4500, 4x WIRA 30/70 antenna
- ©KRAI technology
- High-speed multi-tag reading

Software & CrossTalk Features

- Unwanted reads filtering
- Configuration and monitoring
- Backend IT integration

> Assembly Line



Core Applications

- Selective read zones for complex tag orientation
- Limited installation space

Hardware Features

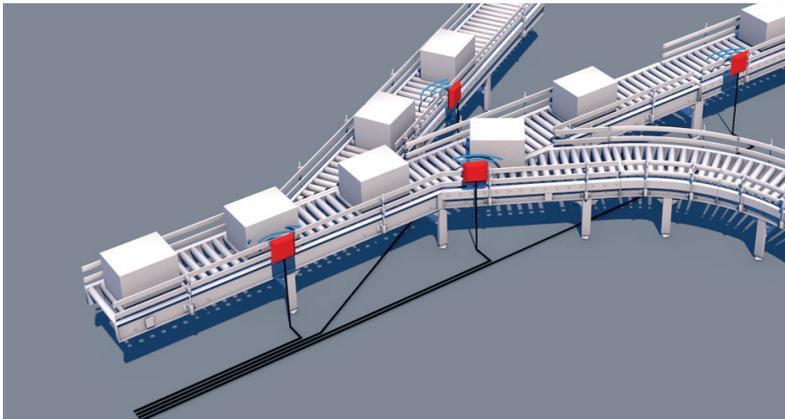
- RRU 4xx0, ARU 3xx0 with diverse antennas
- Polarisation switch
- ©KRAI technology

Software & CrossTalk Features

- Unwanted reads filtering
- Configuration and monitoring
- Backend IT integration

Identifying the Right Solution

> Returnable Transport Items Sorting



Core Applications

- High-speed identification
- Reduced tag performance

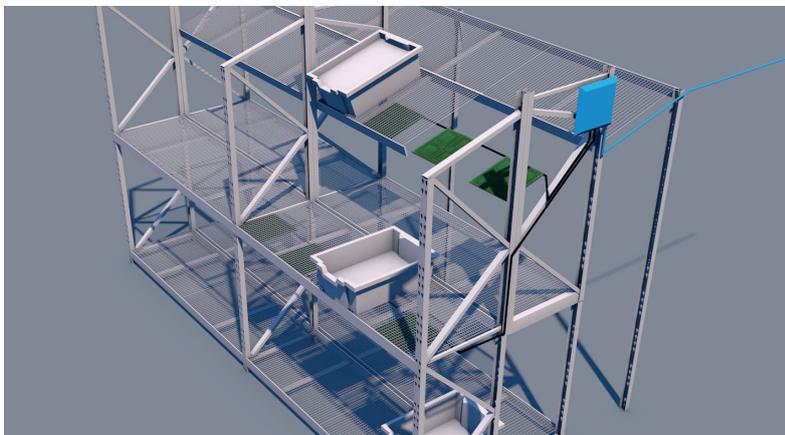
Hardware Features

- RRU 4x0, ARU 2400 with diverse antennas
- Selective read zones
- Optional high-speed multi-tag reading

Software & CrossTalk Features

- Unwanted reads filtering
- Configuration and monitoring
- Backend IT integration

> eKanBan



Core Applications

- KanBan
- Contactless picking

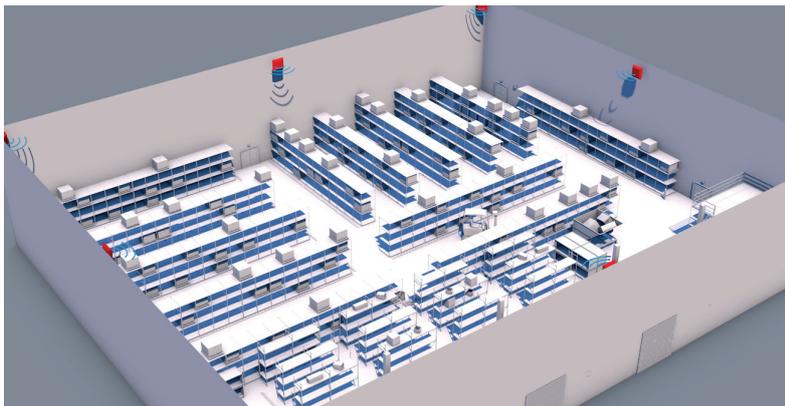
Hardware Features

- ARU 2400, RRU 45x0 and up to 32 smart-shelf antennas
- Cascadable with ©KRAI technology
- Selective read zones
- No shielding needed

Software & CrossTalk Features

- False positive read filtering
- Configuration and monitoring
- Backend IT integration

> Real-Time Locating Systems (RTLS)



Core Applications

- Precise item localisation
- Tracking & Tracing

Hardware Features

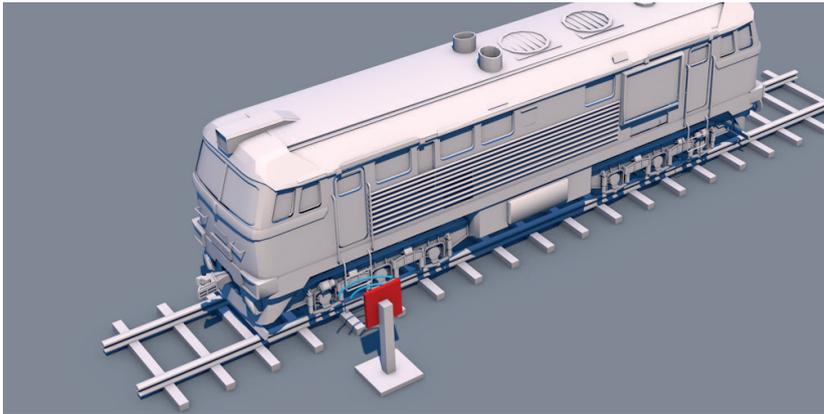
- Kathrein RTLS node and transponder
- High-accuracy and various mounting adapters
- Additional UHF & NFC tags integrated

Software & CrossTalk Features

- Map visualisation and real-time tracking
- Configuration and monitoring
- Backend IT integration

Identifying the Right Solution

> Railway Logistics



Core Applications

- Vehicle localisation/identification
- Maintenance optimisation

Hardware Features

- ARU 3570 or 4570 with ext. antenna
- Selective read zones
- Optionally, high-speed multi-tag reading

Software & CrossTalk Features

- Unwanted reads filtering
- Configuration and monitoring
- Backend IT integration

> Forklift



Core Applications

- Logistics optimisation
- Forklift control system

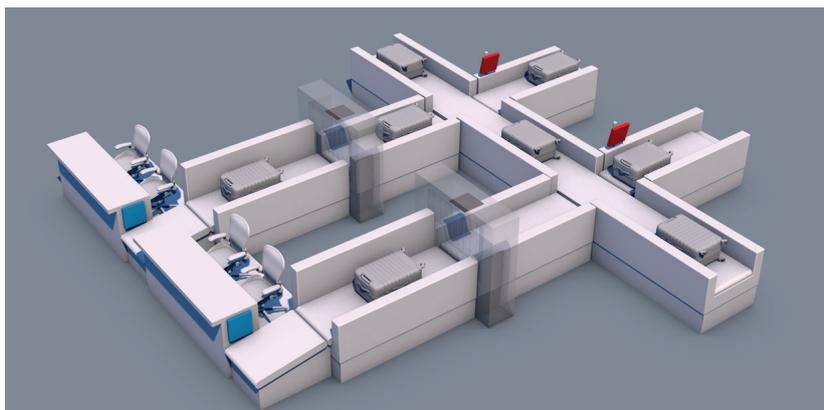
Hardware Features

- ARU 34X0/RRU 44X0 with diverse antennas
- IP67
- Selective read zones

Software & CrossTalk Features

- Unwanted reads filtering
- Configuration and monitoring
- Backend IT integration

> Baggage Tracking



Core Applications

- Check-in counter/baggage carousel
- Luggage conveyor
- Conveyor wagon

Hardware Features

- ARU 2400 with diverse antennas
- Selective read zones

Software & CrossTalk Features

- Unwanted reads filtering
- Configuration and monitoring
- Backend IT integration

References

> Train Identification

Due to Kathrein's RFID readers, wide-range antennas and tags, the Greek rail operator can efficiently track the movements of its freight trains throughout the entire rail network. The company now has an enhanced overview of the network use and improved calculation of the service life for the leased carriages.



> Car Manufacturer AUDI Rolls out RFID in the Vehicle Logistics in Plants Worldwide

Kathrein RFID readers detect the ID number of the transponder of the corresponding vehicle and transmit it together with the direction recognition to the backend system. The CrossTalk software interprets the reading events and filters unnecessary data, reporting the exact position of the vehicle to the IT systems. This way, a standardised concept for vehicle tracking was created at all production locations.



> A Rental Service Provider Relies on Availability Detection

The complete rental fleet has been equipped with active RFID tags and the rental stores received a corresponding active reader infrastructure. The RFID tags are directly connected to the ERP system, thus, each rental device is automatically identified during the coming and going registration, providing faster equipment availability and a more efficient use of other resources and spaces.



References

> Optimisation of the Transport Chain

An RFID tag is attached to each block of steel. A reader device fixed on the crane reads the slab ID as well as other data. Every loading event is processed and archived at the central CrossTalk AutoID platform. By means of standardised interfaces, the steel company's employees are able to access data everywhere. The RFID solution considerably reduces the processing time, increases the reloading speed and prevents transport errors.



> Sparkling Vehicle Logistics for a Car Manufacturer

When the vehicles are accepted by the in-plant logistics, they receive a shipment label which contains an RFID chip. From this moment on, each movement of the vehicle on site is controlled and documented when it passes RFID read points, thus increasing transparency and improving the process execution on the company's site.



> Precise Tracking for a Sports Car Manufacturer

Due to EPC UHF RFID tags and RFID gates, it is possible to precisely identify individual components installed in various prototype vehicles both on the factory site and on test tracks in combination with the data of the on-board unit in real time.



References

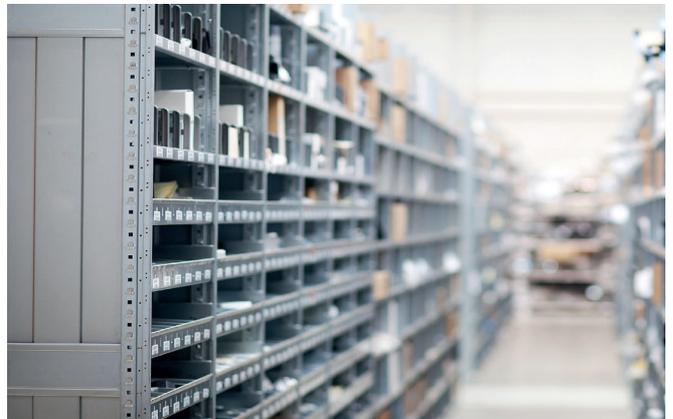
> Carrier Registration for a Car Manufacturer

The CrossTalk-based container management application runs in the data processing service centre of the car manufacturer. The individual local read points are connected by means of the intelligent Kathrein RFID readers with the integrated CrossTalk agent. Each carrier is automatically assigned a status which provides information about the individual state, which results in high transparency and optimisation of the total number of containers.



> Capturing the Flow of Goods in Real Time

A Kanban process received the new RFID technology. Each of the 4,000 identification cards in circulation received an RFID tag. Gate-like reading devices recognise the goods when they leave the production site in the lattice boxes. It is possible to identify even a pile with dozens of cards in a split of a second. The tags and the end products merge into one entity and provide more information than before. The SAP software creates added value due to versatile RFID applications.



> Additional use Cases

We offer comprehensive but modular end-to-end solutions to our customers and partners — covering RFID and RTLS hardware, the CrossTalk IoT suite and Services & Support. Find out how our customers and partners are successfully using our IoT technologies in additional use cases.

Find all case studies on our website:
www.kathrein-solutions.com/newsroom/case-studies



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