Indoor GIS to Streamline Maintenance Work

A Success Story in Work

DB Systel GmbH | Konrad Winkler & Philippe Rieffel | Frankfurt am Main | April 2023

DB Systel
Moving the digital future.
Together.

Combining Tracking Technology and our Esri platform

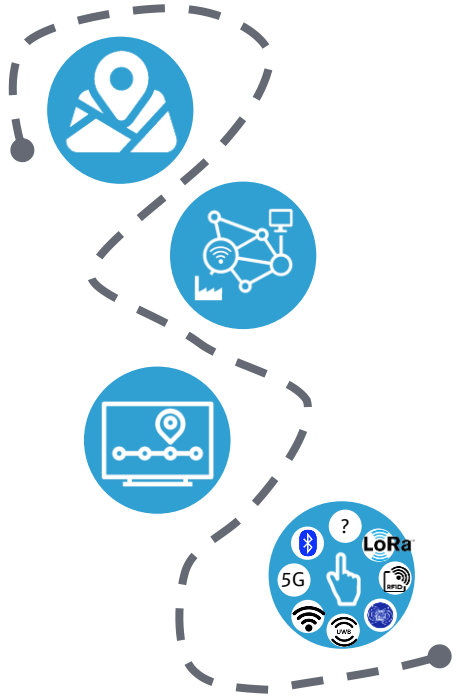
What do we do?

TracE: Platform Architecture and Services

The open platform architecture enables many use cases

Location Services

In addition to their focus on the plants, location services have potentials in the entire production cycle



Platform-Architecture

TracE is vendor-agnostic and can display location data on a map on the web or on a smartphone

Front-End

Live Map | esri | App

Web-Dashboard

Features & Orchestration

Asset management, Geo Fencing | esri | Event Processing, Monitoring

Asset Tracking

Setup & Configuration

Mapping Service | esri | Location Setup

Quuppa

UWB, Bluetooth, WiFi, RFID, 5G, LoRa

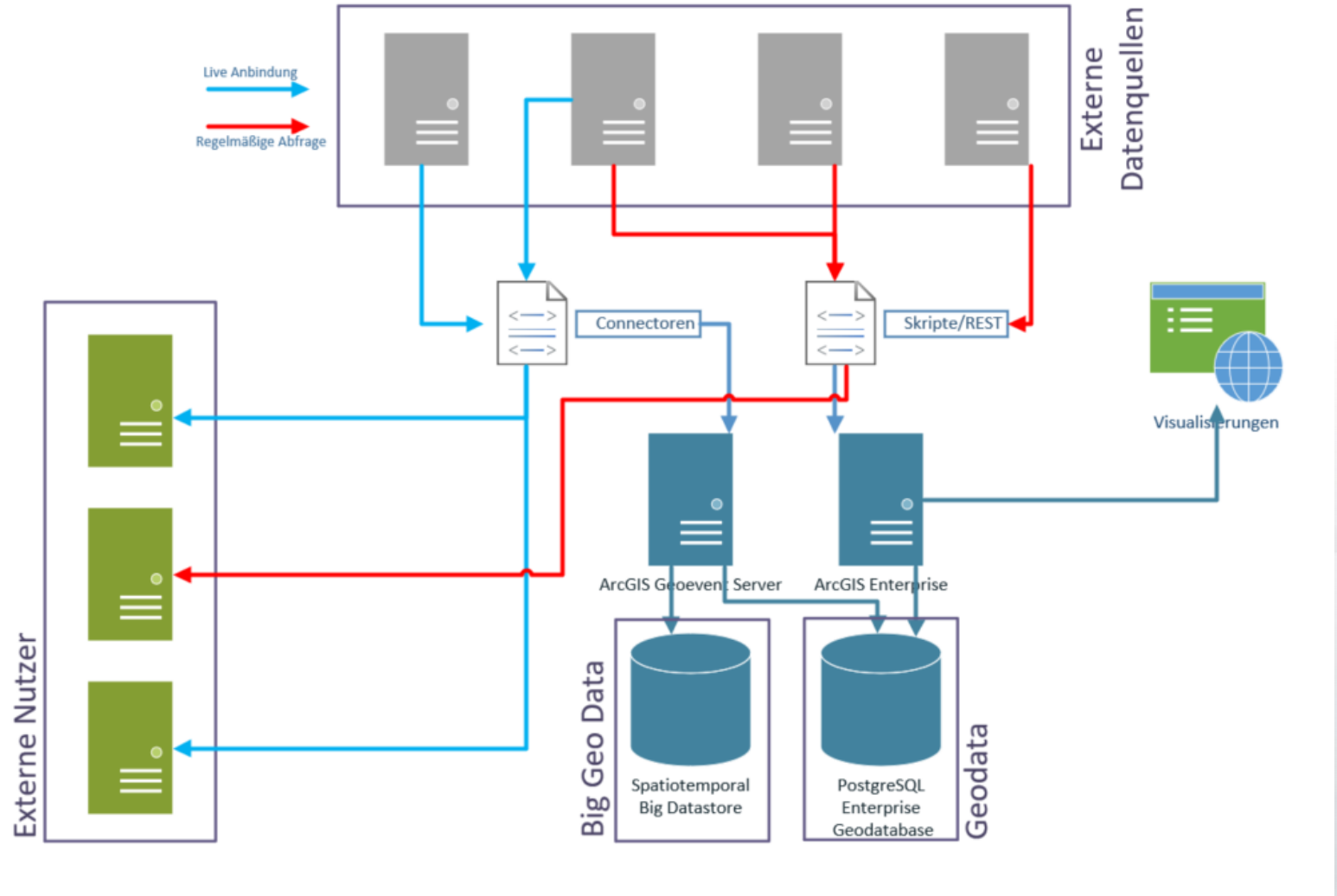
Interfaces

The platform also offers interfaces to relevant DB systems.

- IoT Platform
- SAP EWM
- TAG FOR TRACE
- Event Broker
- Data Mgmt Plattform
- ...

TracE: Platform Architecture and Services

The open platform architecture enables many use cases

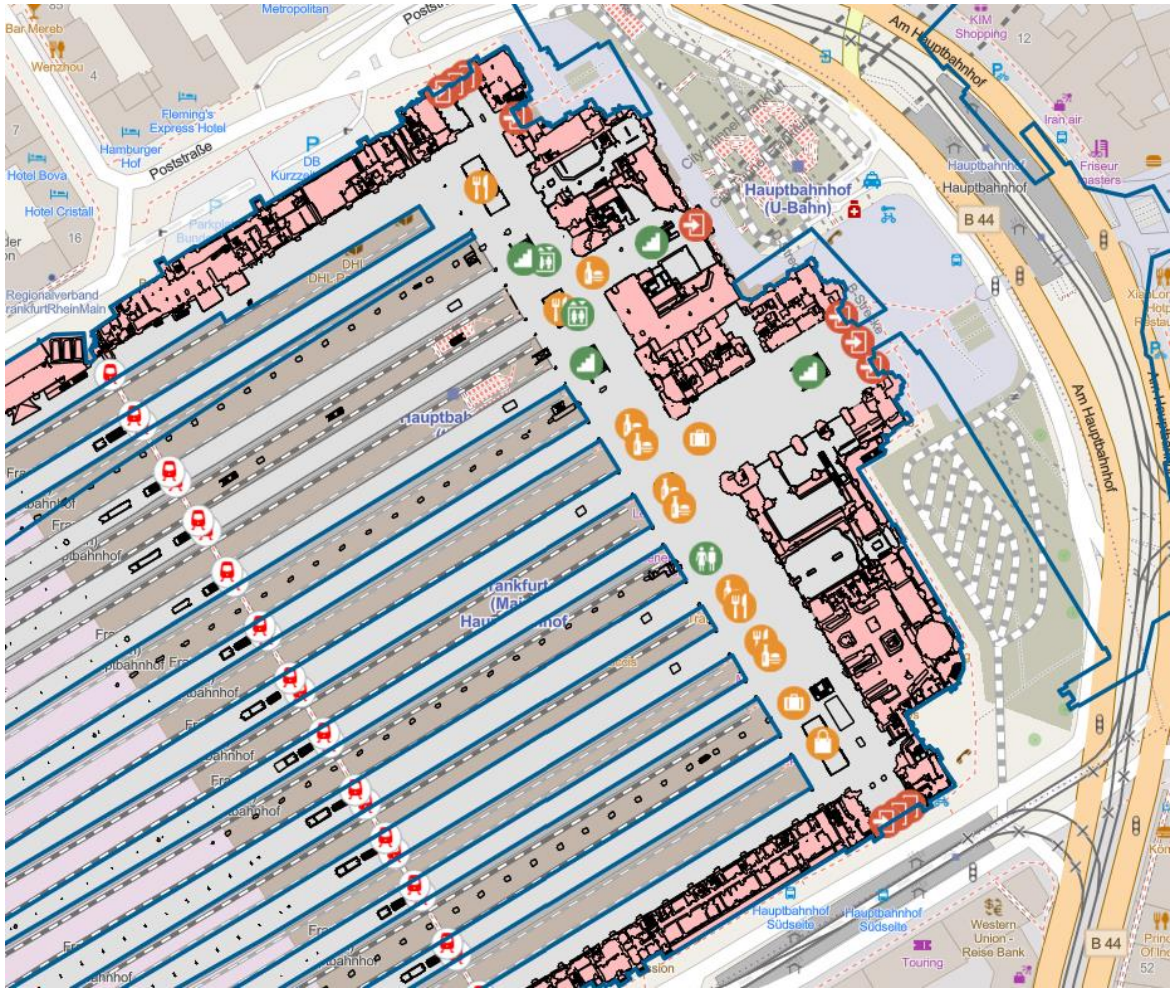


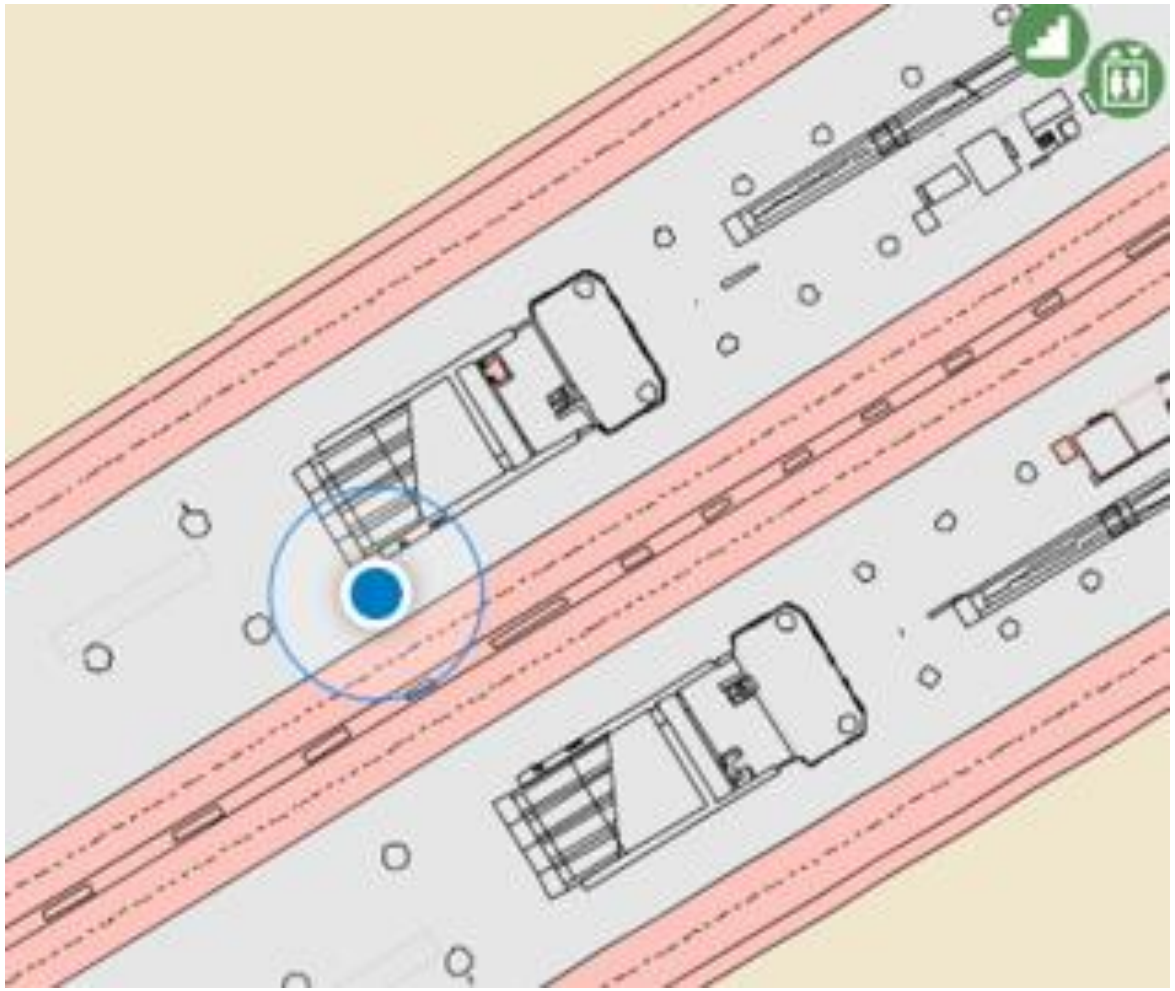
Utilizing state of the art tracking systems

With which technology do we work?

ArcGIS IPS

Facilitating indoor navigation in Frankfurt HBF with BLE





Our way to an RTLS Solution - From PoC to tender

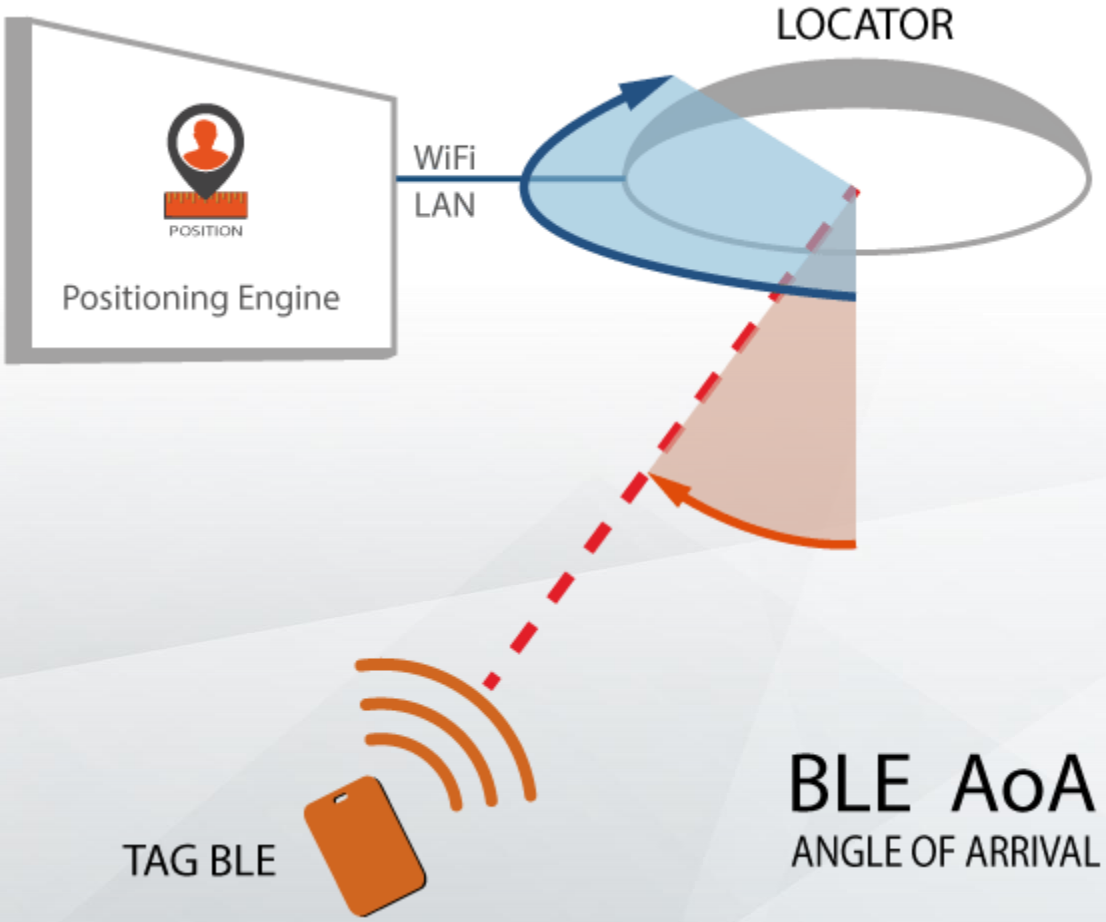
- We start whith Indoor Tracking in some PoC's together with our DB customers in the factories and plant.
- We challenge our learnings during market requests and so we know whats possible and "state of the art" in RTLS business.
- We fix our requirements together with our customers.
- The requirements we use in a tender for RTLS hardware with focus on BLE AoA/AoD

The Winner for this tender was Quuppa from Finnland!

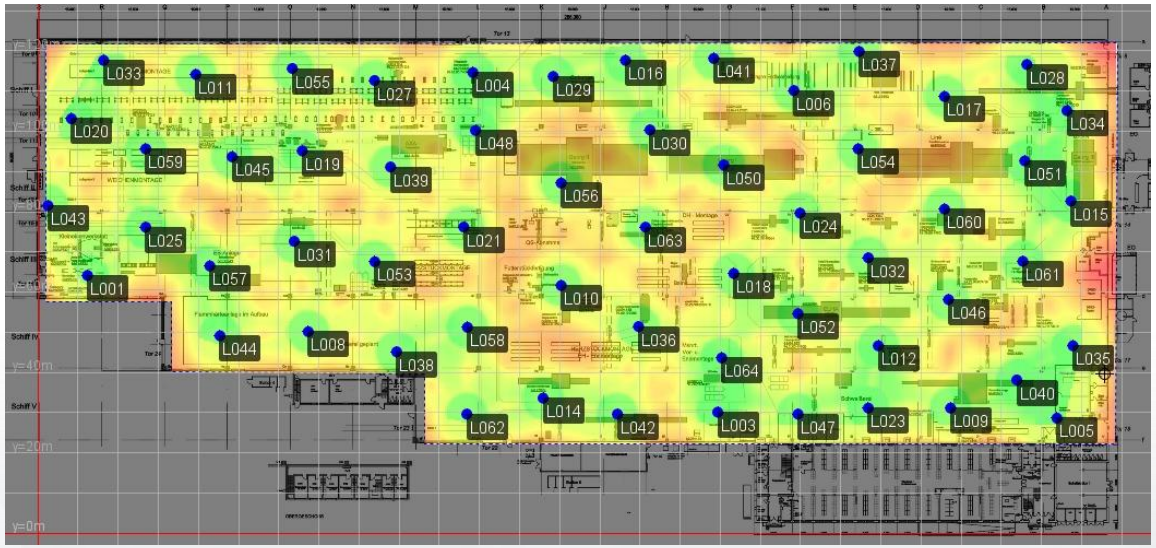
Requirements for an RTLS solution in an heavy industrial environment – some main facts

- ❑ High robustness and reliability of the technology (IEC 60068, IP68)
- ❑ Extremely dynamic position data acquisition (low latency, high sampling frequency)
- ❑ Fully configurable "over the air" (tags, RTLS Infrastructure)
- ❑ Reliable and precise localization (down to the sub-decimeter range)
- ❑ Simple and fast setup of the infrastructure
- ❑ Good Possibilities for simulation, troubleshooting and monitoring

Quuppa
Technology brief



Why do help as Quuppa so much?
Tools for Locator Positioning and "etimate coverage "

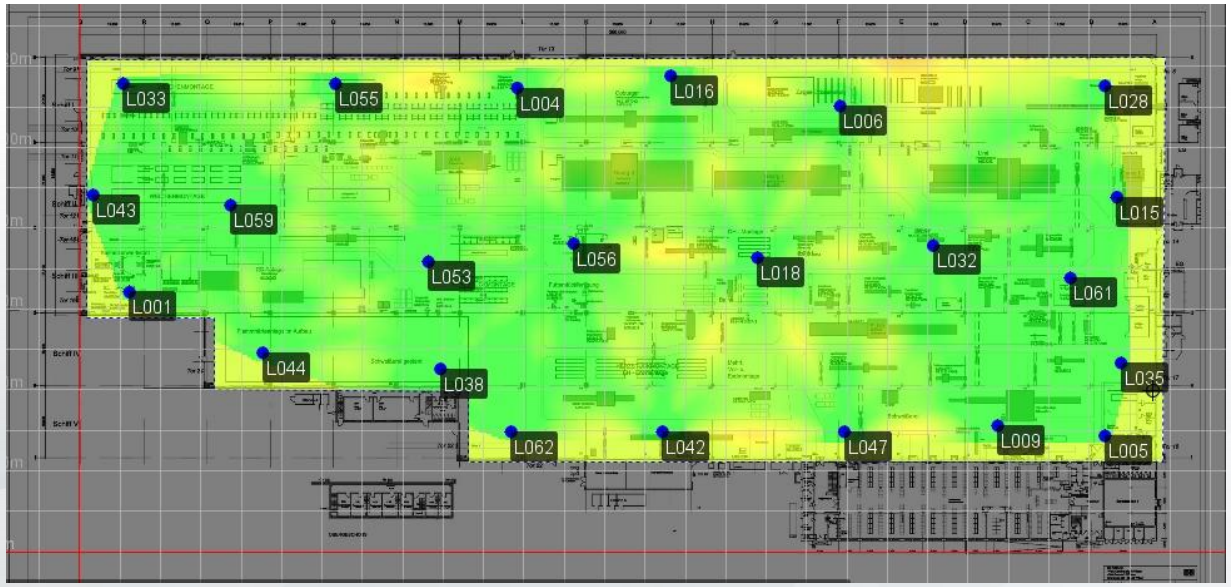


Worst Case:

Calculated with "semi-confidential area"
Comparable with supermarket areas Various disturbances caused by e.g. machines

Best Case

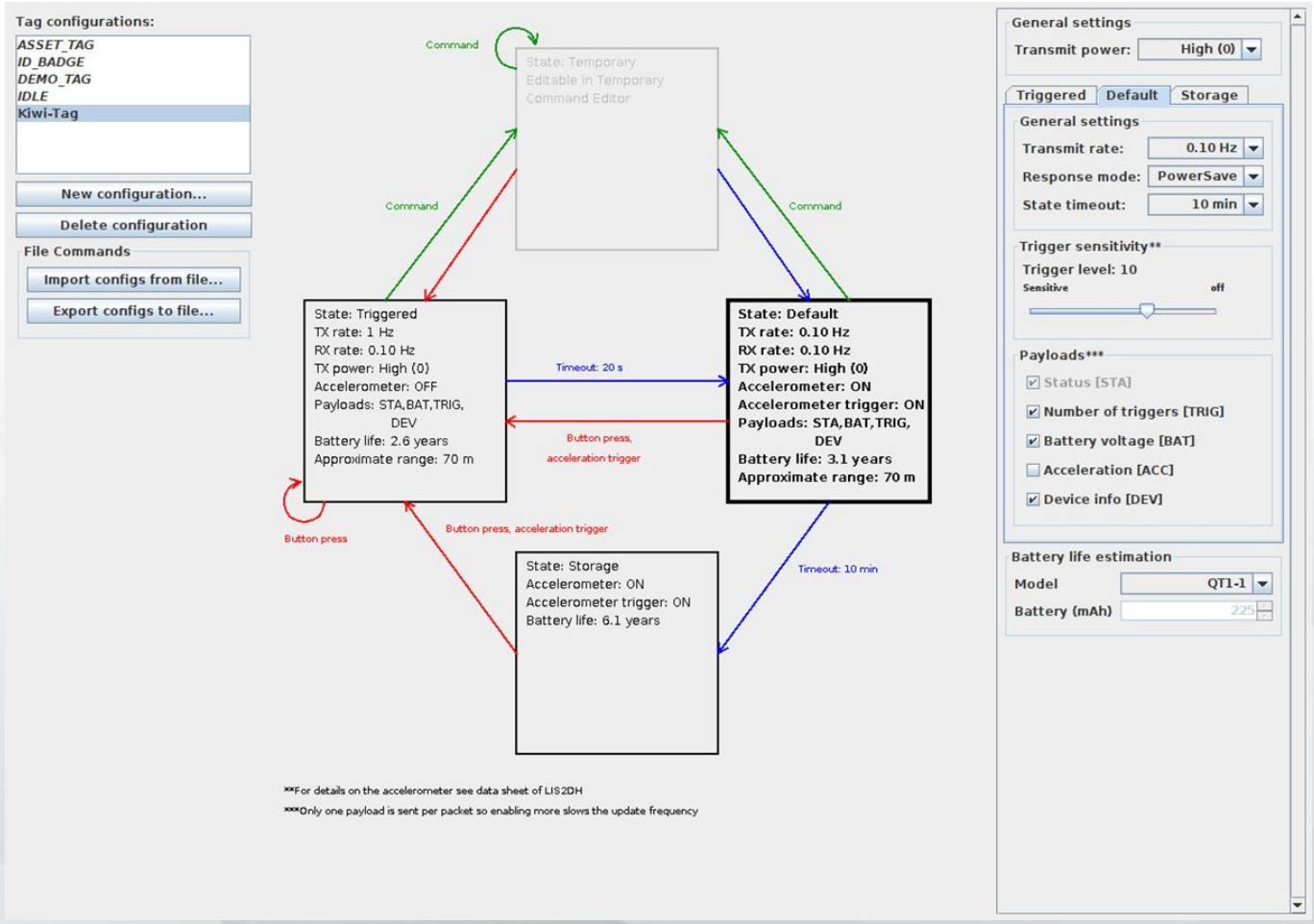
Calculated with "Open Area" Open area without interferences

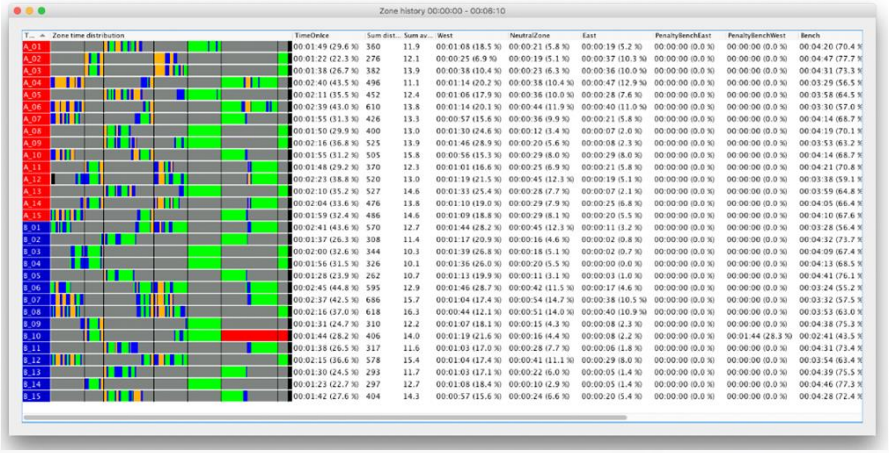


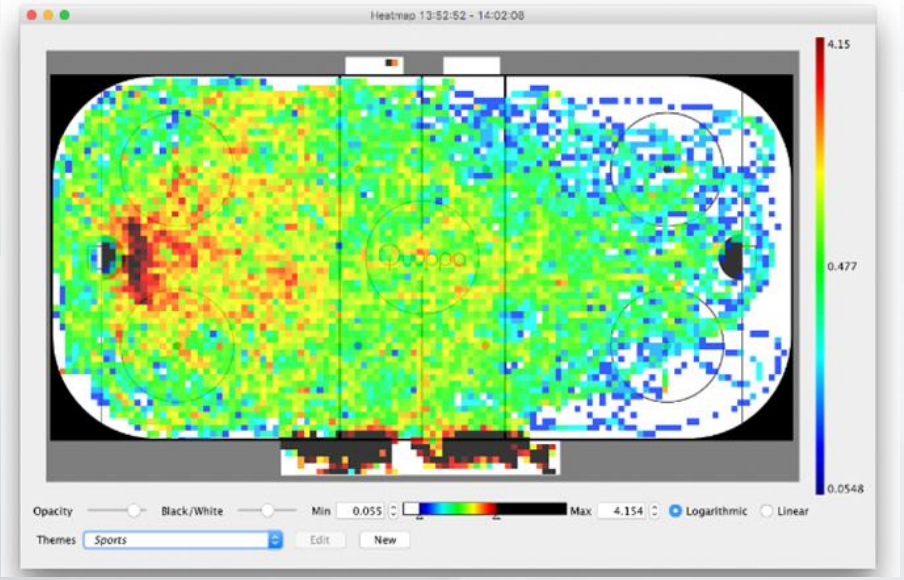
Inaccurate (presence)

Very high (approx. 30cm)

Why do help as Quuppa so much?
Tools for Tag Configuration, Monitoring, Data Simulation







Why do help as Quuppa so much?
Robust and well tested hard- and firmware

Test	Reference
Dry heat, +60 °C / <50 %RH / 8 h, in operational mode	IEC/EN60068-2-2
Cold, operational	IEC/EN60068-2-1
Damp heat operational, +60 °C / 85%, 1 week IEC/EN60068-2-78	IEC/EN60068-2-78
Change of temperature, +60°C/-20°C 1 h cycle, 24h	IEC/EN60068-2-14
Dry heat, storage, 70°C	IEC/EN60068-2-2
Cold, storage., - 30°C	IEC/EN60068-2-1
UV exposure IEC/EN60068-2-5, procedure C	IEC/EN60068-2-5, procedure C
IK (mechanical impact) test -IK06: • impact energy : 1 J • number of impacts: five	EN62262 IEC60068-2-75
Random vibration test	MIL-STD-810F
UL (Impact, drop, temperature, flammability, needle flame, chemicals test)	UL 60950-1 & CAN/CSA C22.2 No. 60950-1-07
CB test certificate by UL	IEC 60950-1(ed.2), IEC 62368-1:2014

Reducing cost and turn-around times

Where do we do that?

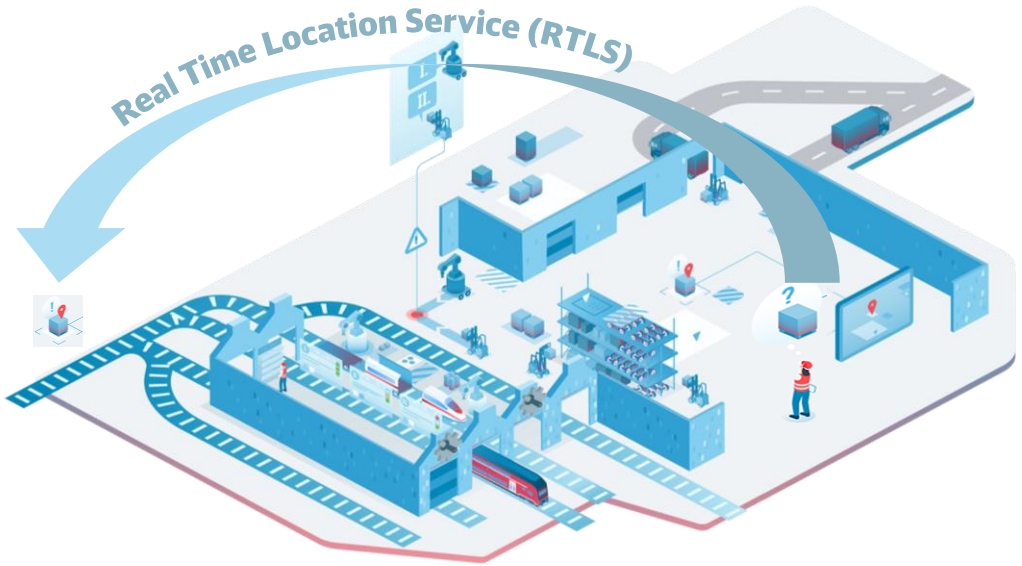
TracE: Standardising Location Services

Processing of location data in plants and in the whole DB Group

Load carrier location in the factory

DB Netz plant Witten

DB vehicle maintenance plant Nürnberg



Vehicle localization in the DB AG

Project: DB Group-wide platform for location data

Component wear

Vehicle localization

Example 1: DB Netze plant in Witten, Germany

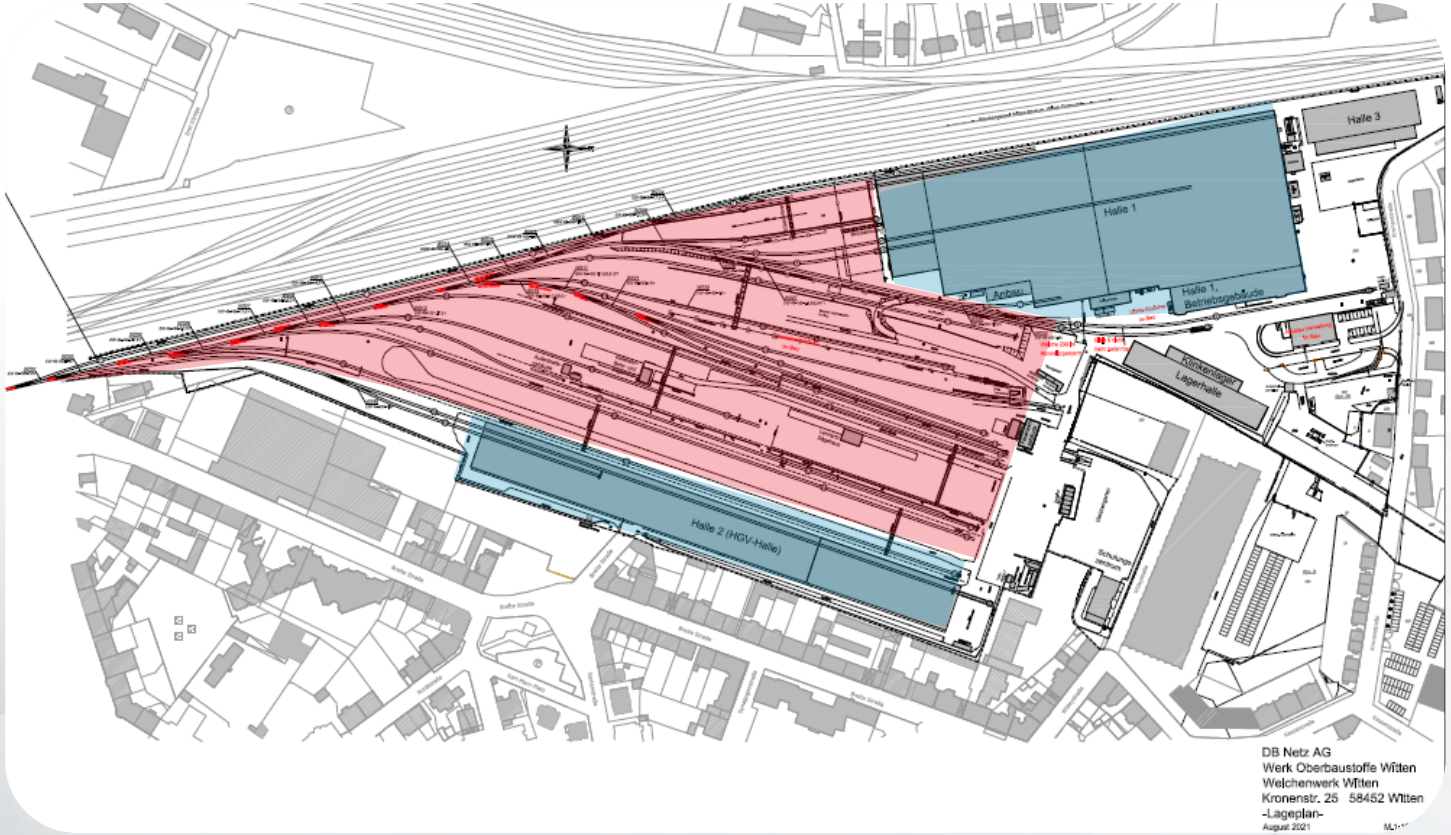
Combining Indoor & outdoor tracking

Goal:
Locating assets indoor and outdoor
Creating a ‚Amazon like' delivery experience for site management

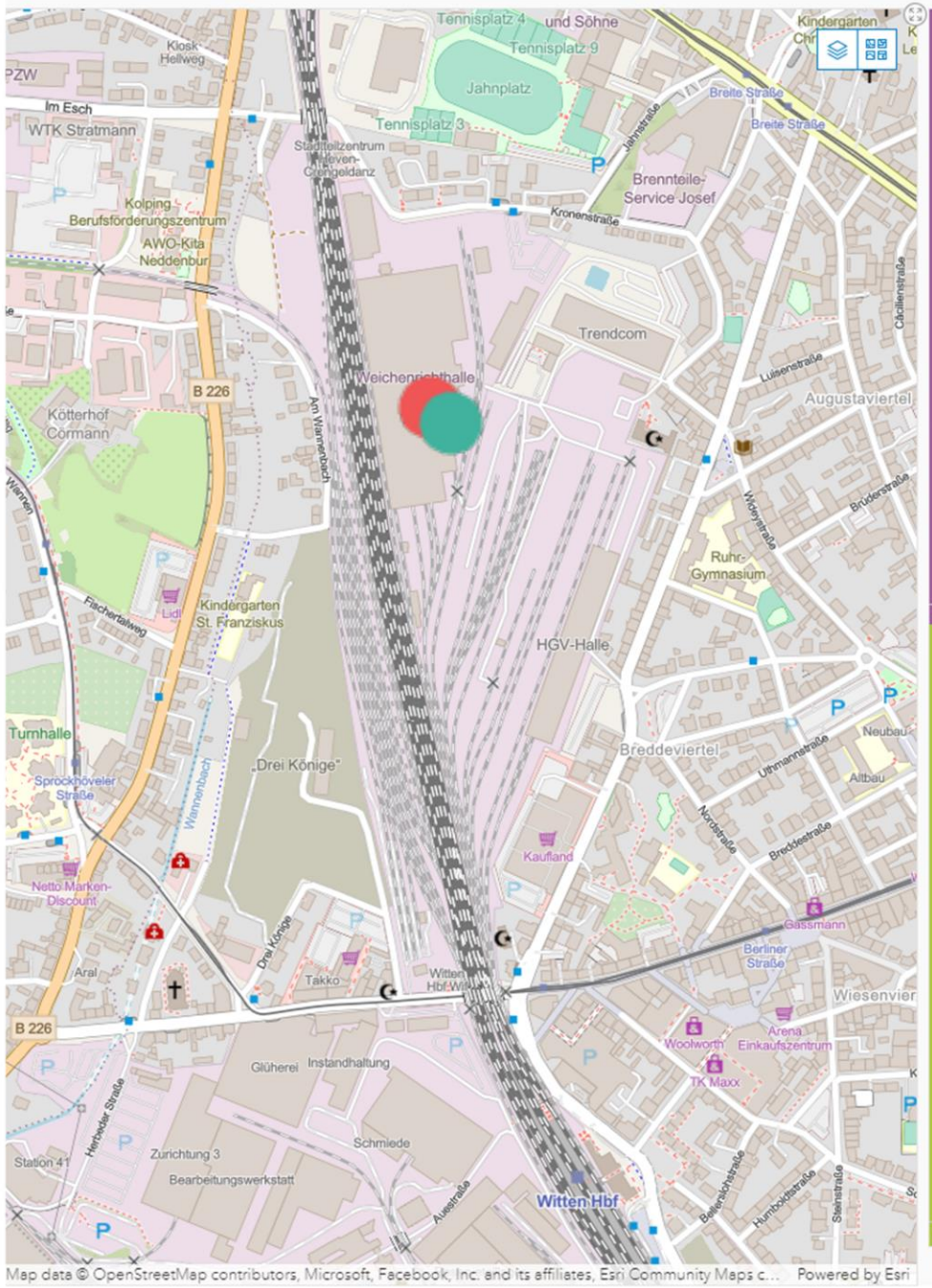
Challenge:
Big outdoor areas with little infrastructure

Technology:
ArcGIS Enterprise
Quuppa & GPS

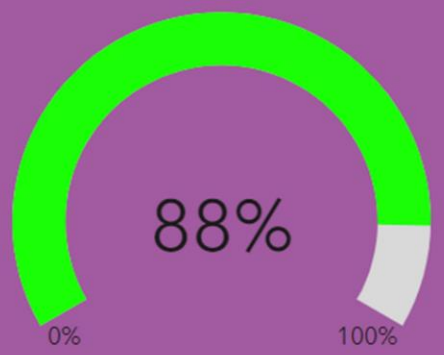
Solution:
Combining Indoor and Outdoor Sensors with smart geofences and Geoevent-Server to turn on the adequate tracking module
Implementing a notification service for parts that leave the plant towards construction sites based on temporary geofences



Tracking der GPS Geräte des DB Netz Werk Witten Ein Prototyp des Team TracE



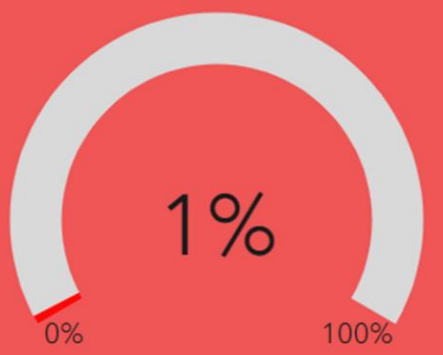
Ladezustand Device 9058659662



Letzte Daten: 11.4.2023, 14:19
Geschwindigkeit: 0 km/h
Batteriezustand: 88%
Satelliten: 16

Letzte Aktualisierung: vor ein paar Sekunden

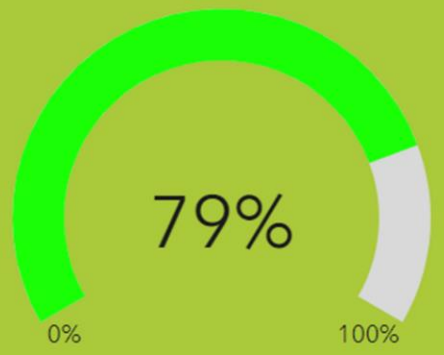
Ladezustand Device 9058657129



Letzte Daten: 9.4.2023, 09:59
Geschwindigkeit: 0 km/h
Batteriezustand: 1%
Satelliten: 0

Letzte Aktualisierung: vor ein paar Sekunden

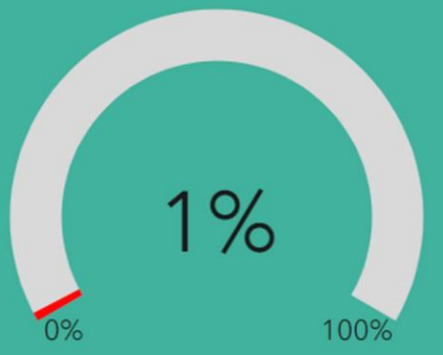
Ladezustand Device 9058659637



Letzte Daten: 11.4.2023, 17:33
Geschwindigkeit: 0 km/h
Batteriezustand: 79%
Satelliten: 17

Letzte Aktualisierung: vor ein paar Sekunden

Ladezustand Device 9058659645



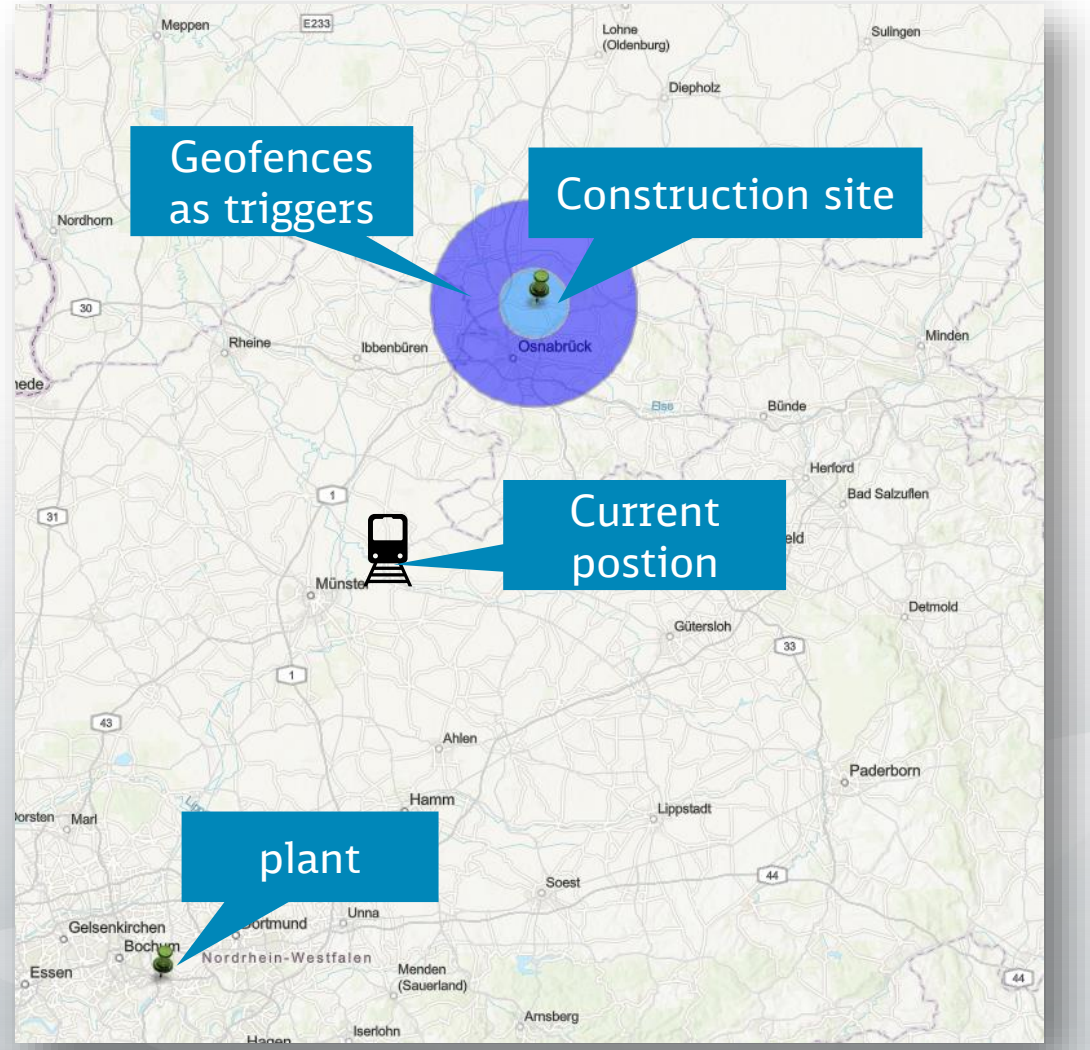
Letzte Daten: 11.4.2023, 14:09
Geschwindigkeit: 0 km/h
Batteriezustand: 1%
Satelliten: 0

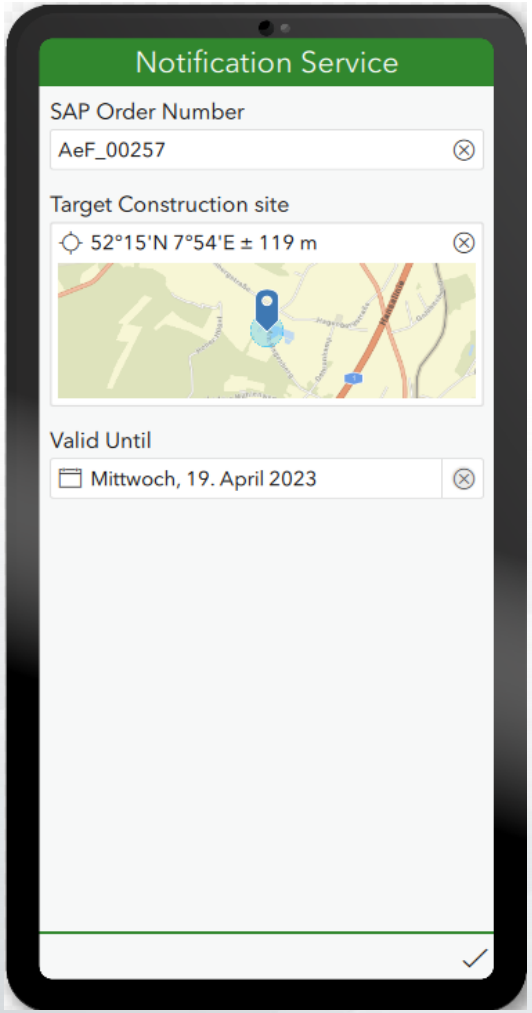
Letzte Aktualisierung: vor ein paar Sekunden

Details | Ladezustand

Example 1: DB Netze plant in Witten, Germany

Combining Indoor & outdoor tracking





Example 2: FZI Plant Nürnberg

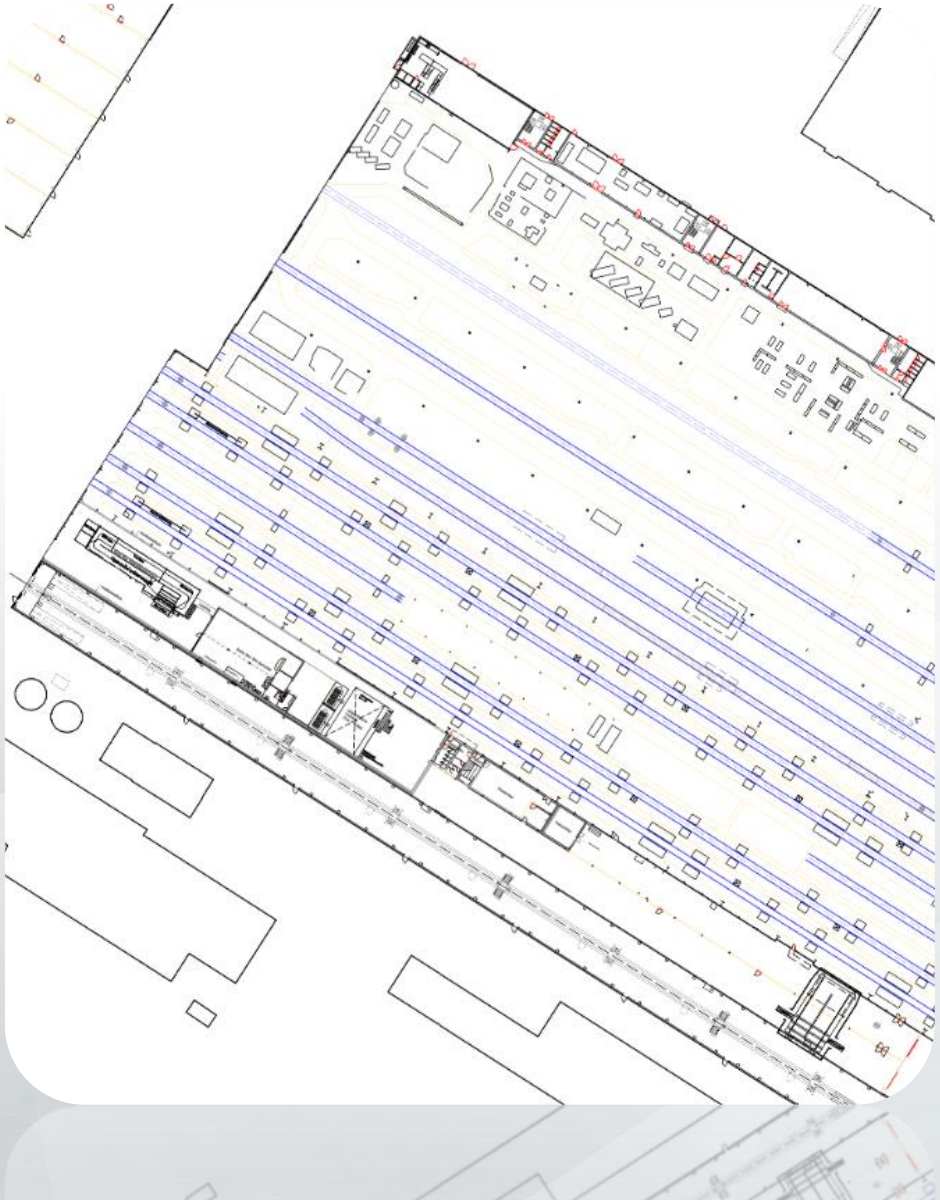
Integrating ArcGIS into existing systems

Goal:
Locating assets indoor and creating automated processes based on the current location

Challenge:
Integration and combination with existing process management software

Technology:
ArcGIS Enterprise
Quuppa
Proprietary process management software
Forklift management software

Solution:
Using REST capabillities to interconnect systems
Using ArcGIS Workforce & Indoors Navigation to control forklift orders (planned)



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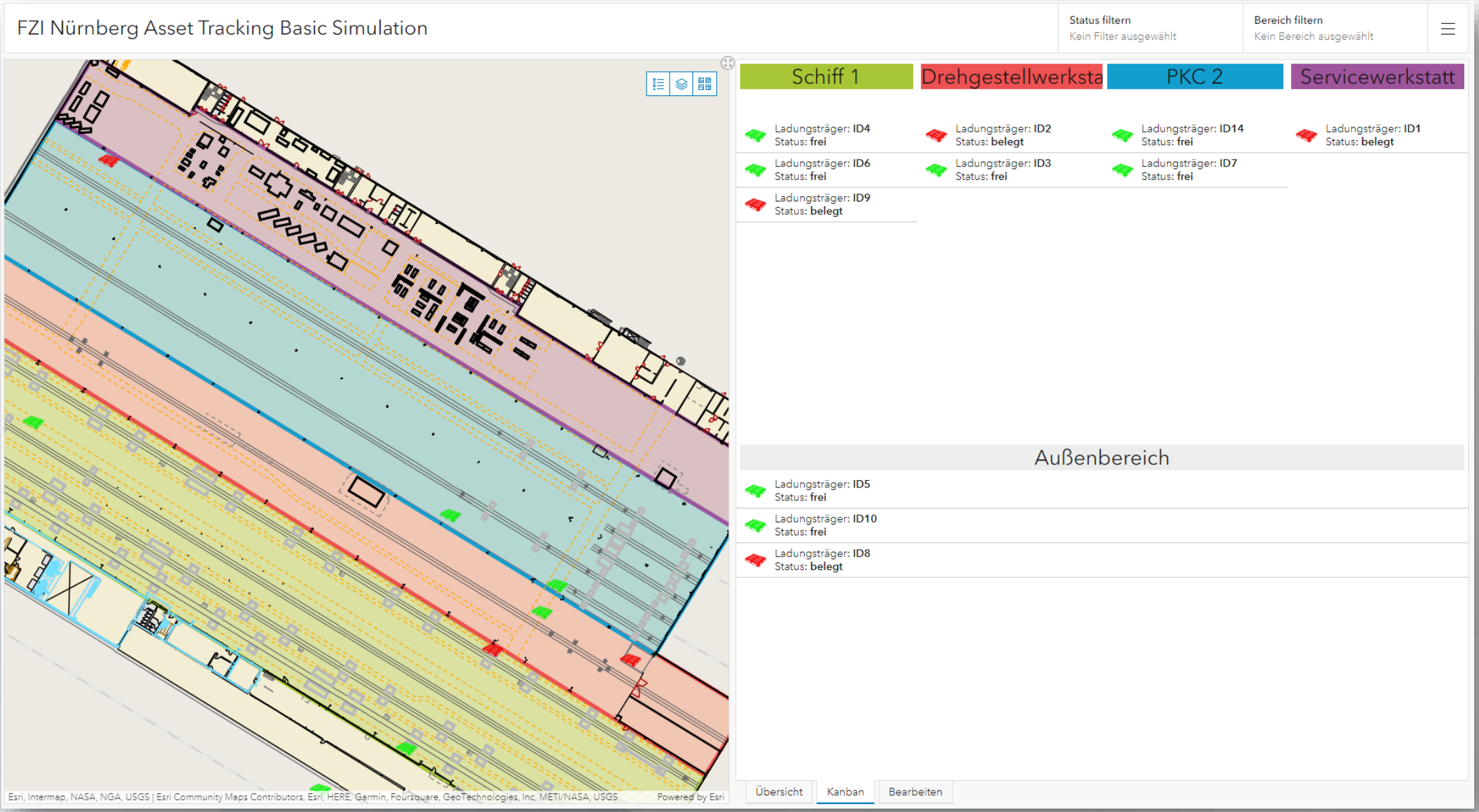

Example 3: Group wide localisation platform for DB AG

ArcGIS Geoeventserver as the I/O Hub for localisation data

Goal:

Providing up-to-date, precise and reliable location data for vehicles from the different business units of DB AG to create added value and minimize delays and cancellations

Challenge:

Harmonizing, proofing and matching a huge amount of tracking data from different systems, formats and technologies

Technology:

ArcGIS Enterprise, ArcGIS Geoevent Server, Geospatial Big Data Store, Message Broker

Solution:

Using the versatility & performance of the Geoevent Server to ingest, process and persist the data from different sources and present them in a harmonized format for users

Image Source: Deutsche Bahn AG / Uwe Miethe

Whats on the horizon?

Where do we go from here?

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Moving the digital future together.