Tracking and Tracing in Production Scenarios with passive RFID Transponder

3rd RFID Workshop for RFID Systems and Technologies
Duisburg – Fraunhofer IMS
12.06.07 – 13.06.07

Christian Gorldt, Dieter Uckelmann, Uwe Hinrichs, Jan Topi Tervo
University of Bremen, LogDynamics Lab, BIBA-IPS
Email: gor@biba.uni-bremen.de

Overview

Objectives

Introduction to RTLS

RSSI based system

Vehicle tracking

Hybrid RTLS

University of Bremen

- The University of Bremen was founded in 1971.

- Research and teaching are characterised by interdisciplinary as well as practice-oriented project studies - known as the „Bremen Model" - which enjoys a high degree of acceptance in the academic world as well as in business and industry.

- As the centre of science for North West Germany, Bremen University is a place of research for 1,700 scientists, a place of study for nearly 22,000 students, a place of work for more than 1,100 employees.

- The University has 12 Faculties representing various sciences, among them the Faculty for Production Engineering

BIBA

Bremen Research Cluster for Dynamics in Logistics

LogDynamics

Physics / Electrical Engineering

Mathematics / Computer Science

Production Engineering

Logistics

Business Economics

Research

Education

Application

SFB 637 Autonomous Logistics
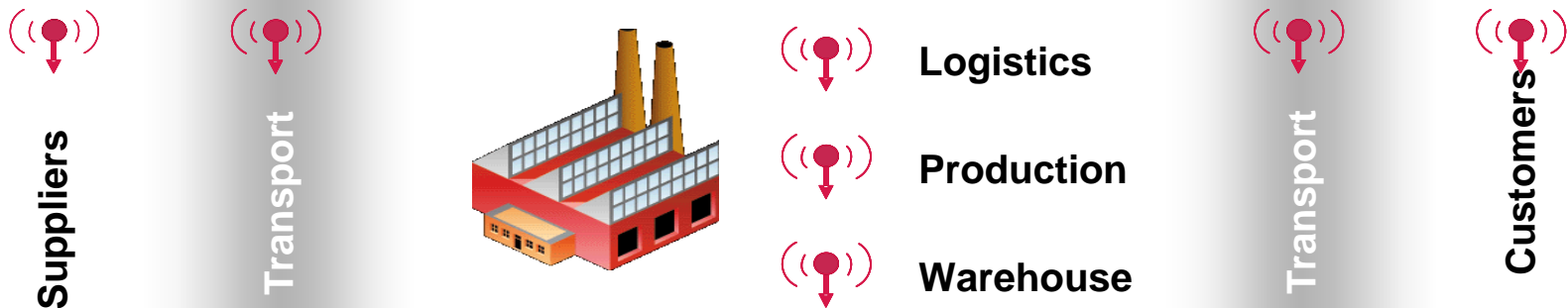
LogDynamics International Graduate School

LogDynamics Lab

BIBA

Objectives

- Evaluation and testing of low-cost RF solutions for location tracking

- Use case
    - Production line
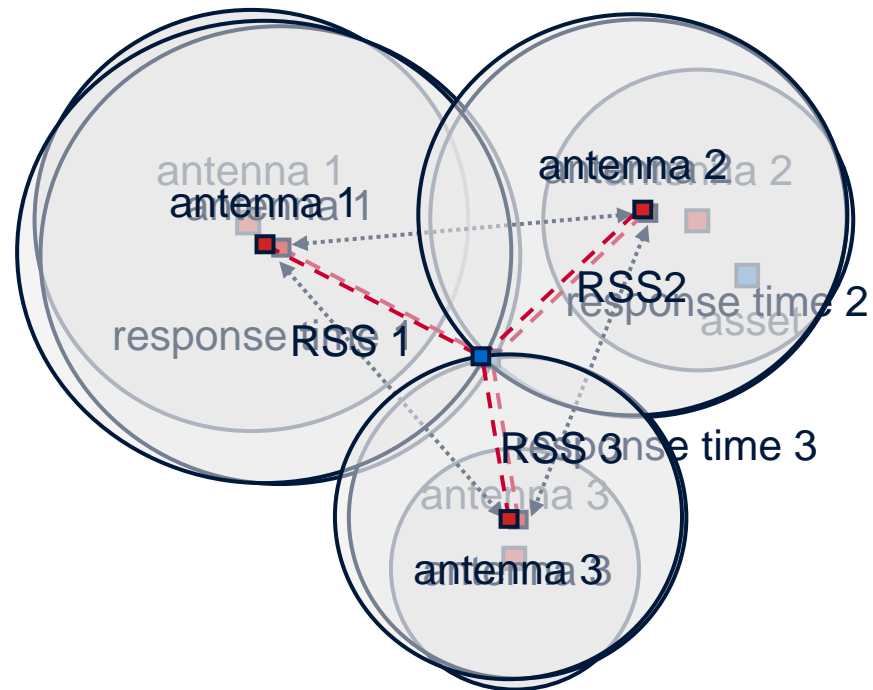   - Slow, linear movement
    - Vehicle tracking

Improvement of flow of information by RFID in logistic processes

Suppliers

Transport

Logistics

Production

Warehouse

Transport

Customers

Application of RFID-Technology

Approaches of RF location systems

Established techniques

- Cell-of-origin (transponder-of-origin)
- Time of arrival (TOA)/
  Time difference of arrival (TDOA)
- Signal strength triangulation
  (RSS, received signal strength)

RSSI based system

- Measurement of "Received Signal Strength Indicator" (RSSI) of backscatter signal in order to indicate the distance to next workstations

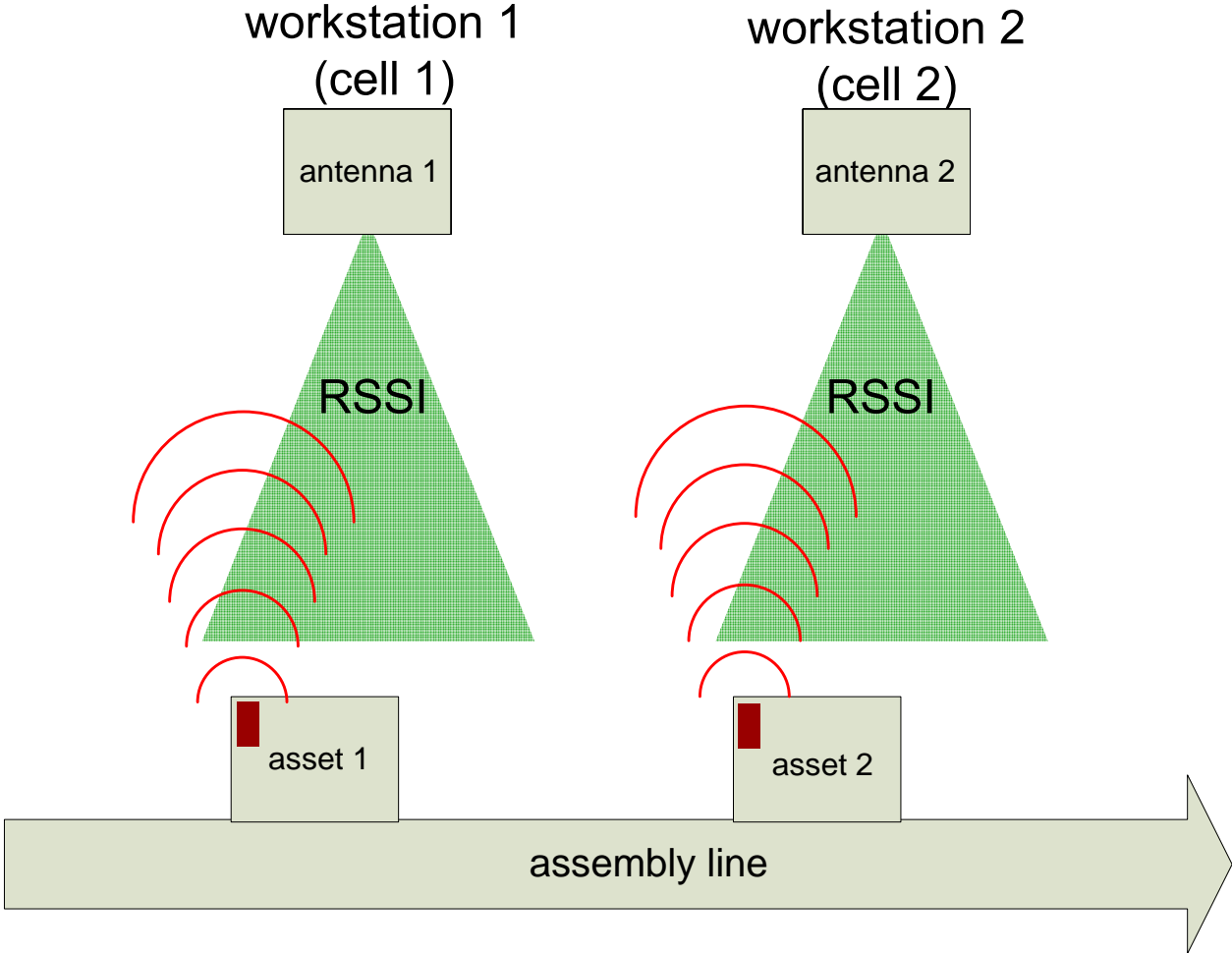- Integrated in a slow production line with linear movement
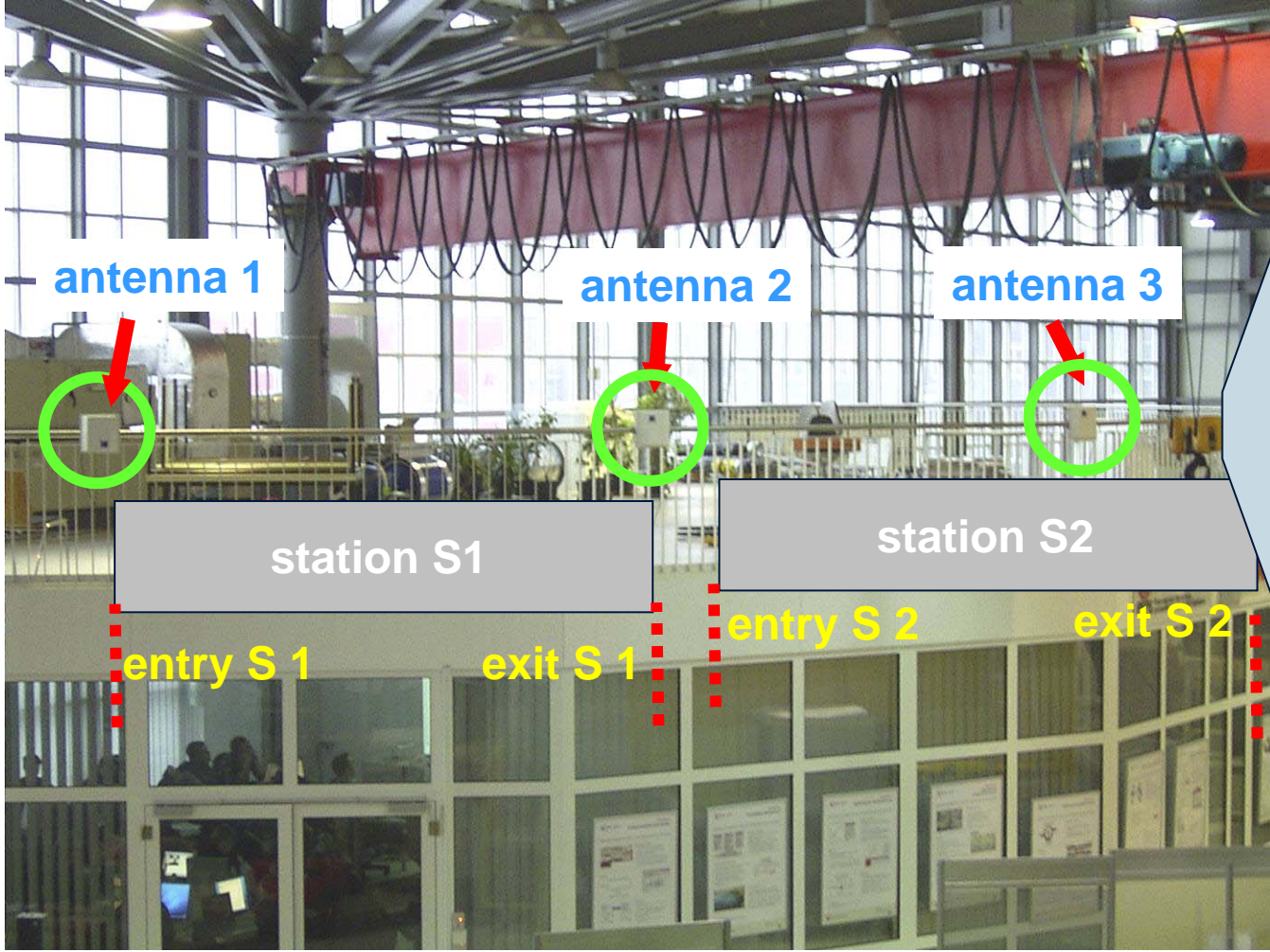

www.meshedsystems.com

http://www.rfid.caen.it/rfid
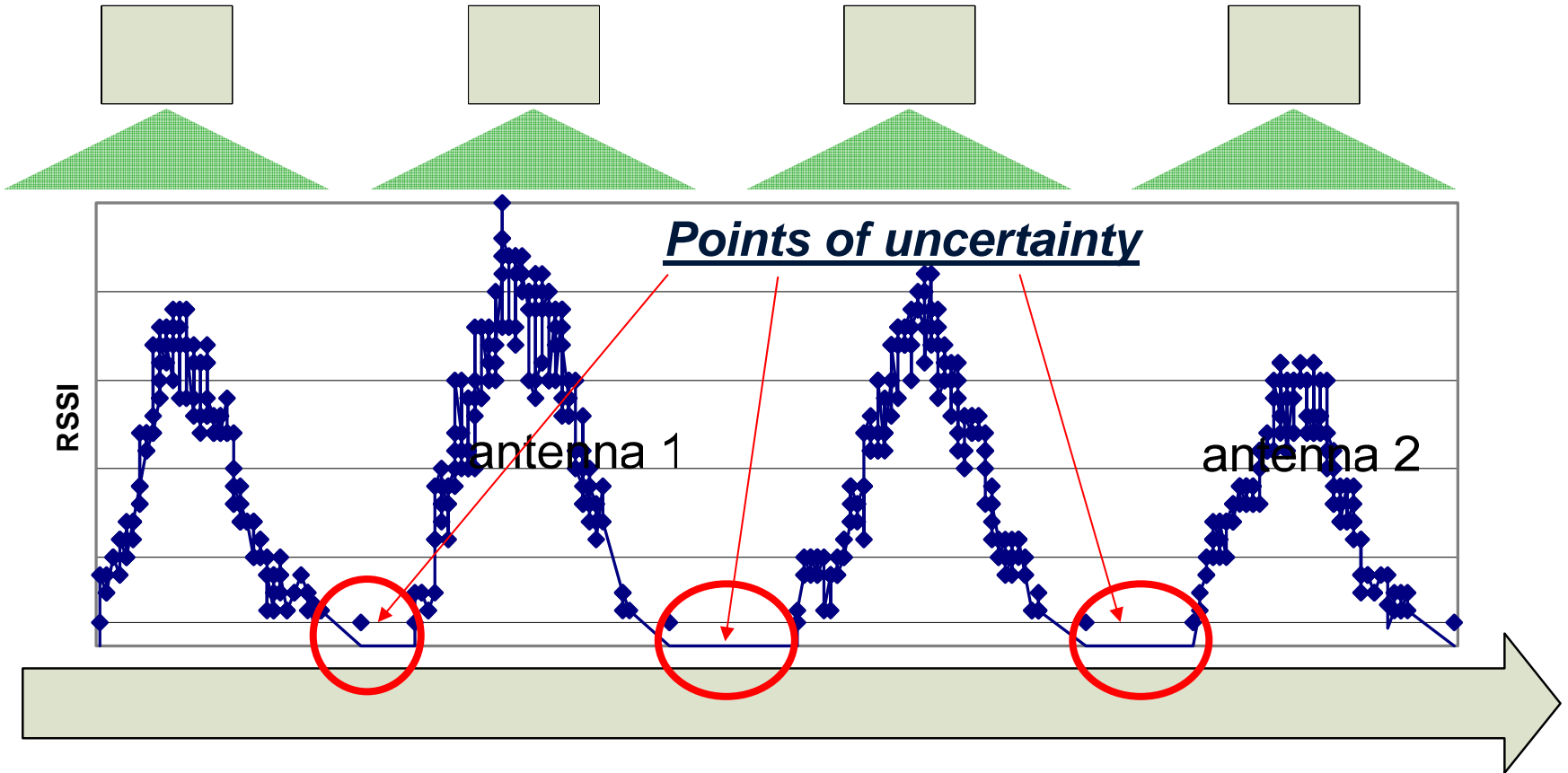
BIBA

RSSI based system

Setup at the LogDynamics Lab

Setup at the LogDynamics Lab

RSSI as indictor for distance to the antenna

Points of uncertainty

antenna 1   antenna 2

RSSI

BIBA

Tag placement vs. signal strength

tag 1m lower than antenna
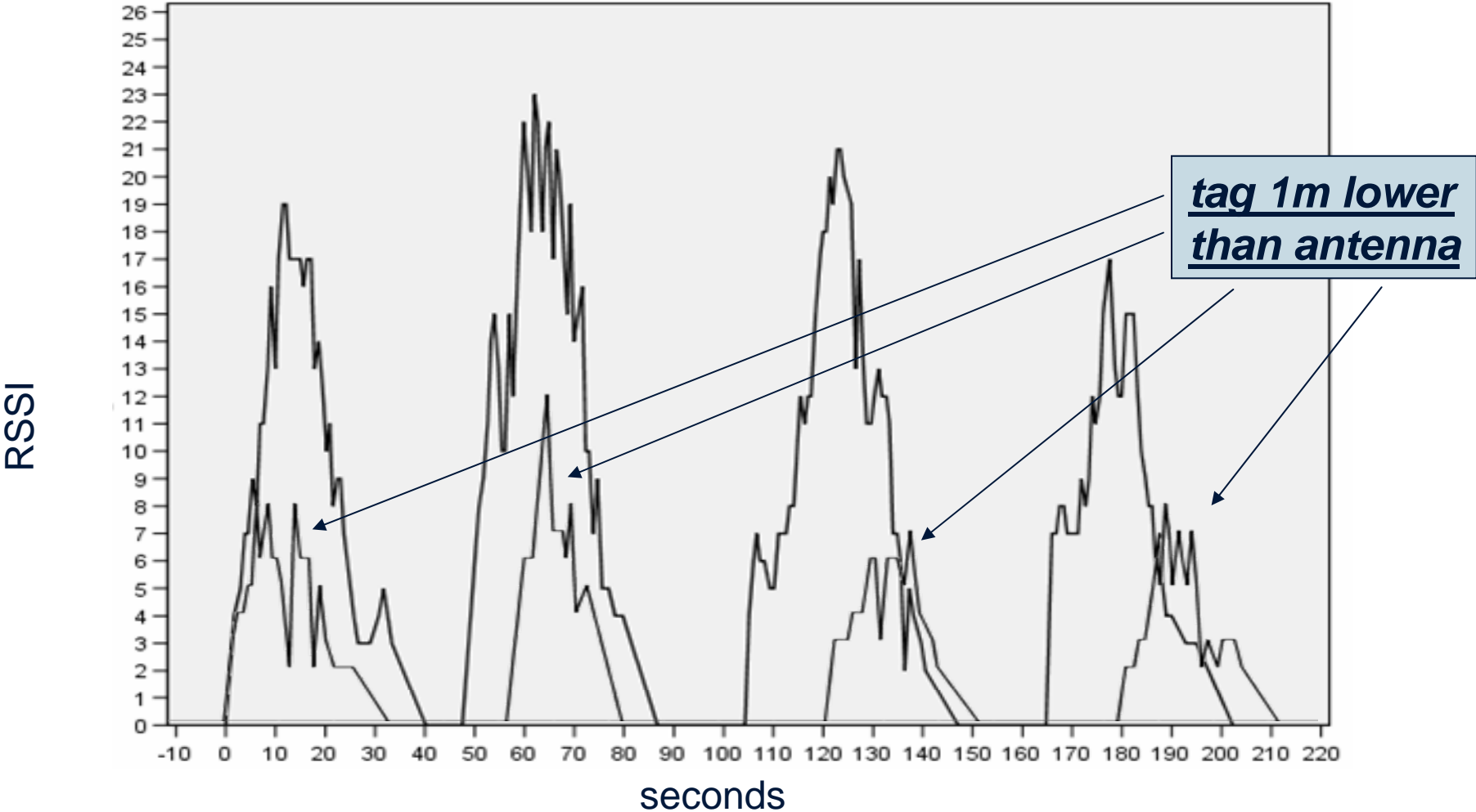
Utilizing two tags to achieve better coverage
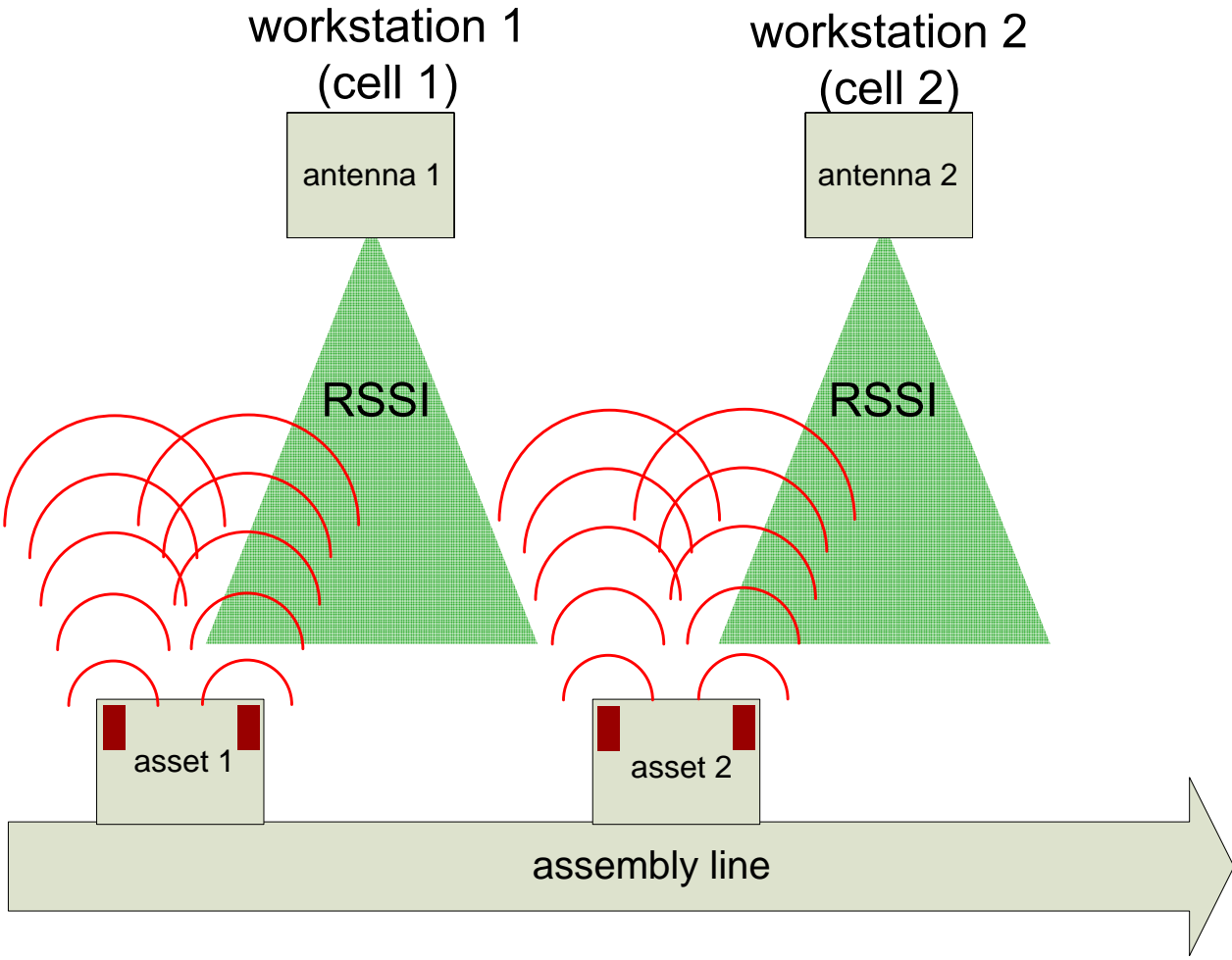
Utilizing passive RFID for locating (CoO)

asset 1

WS 1

WS 2
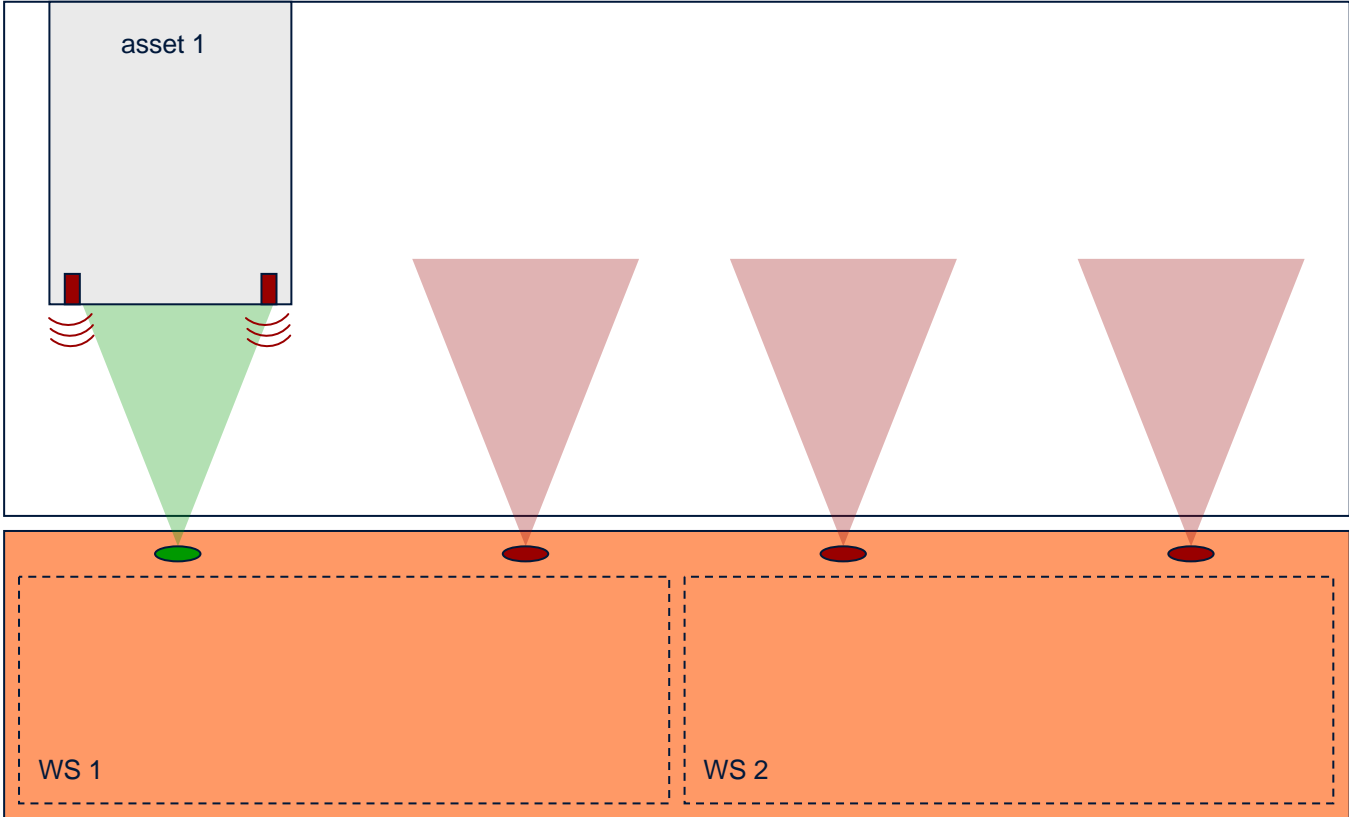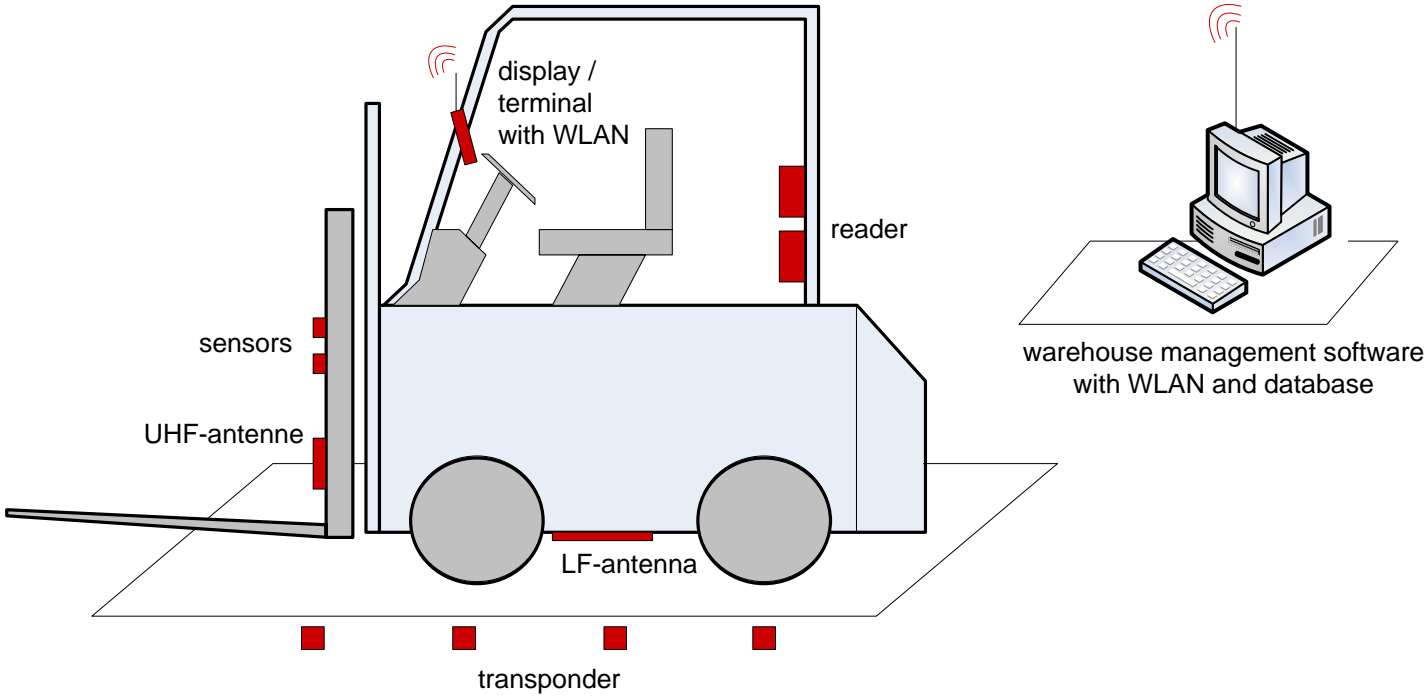
RFID-antenna (including range)   RFID-transponder   workstation

Vehicle tracking

- Solution for internal production and warehouse logistics with chaotic storage system

- Based on the utilisation of shop floor vehicles

- Passive Transponders for tracking and tracing of vehicles and products

- UHF lables to identify the assets, LF glass transponders discharged in the ground to locate the fork lift truck

- A sensor measures the horizontal distance between fork and cargo

BIBA

Vehicle tracking

display /
terminal
with WLAN

reader

warehouse management software
with WLAN and database

sensors

UHF-antenne

LF-antenna

transponder

BIBA

Hybrid RTLS

- Hybrid solution with passive RFID and GPS

- Examined in an europe-wide network for vehicle track and trace

- Expected improvements:
  - Enhancement of data quality
  - Acceleration of processes
  - Reduction of processes
  - Increase of transparency in the processes

Hybrid RTLS
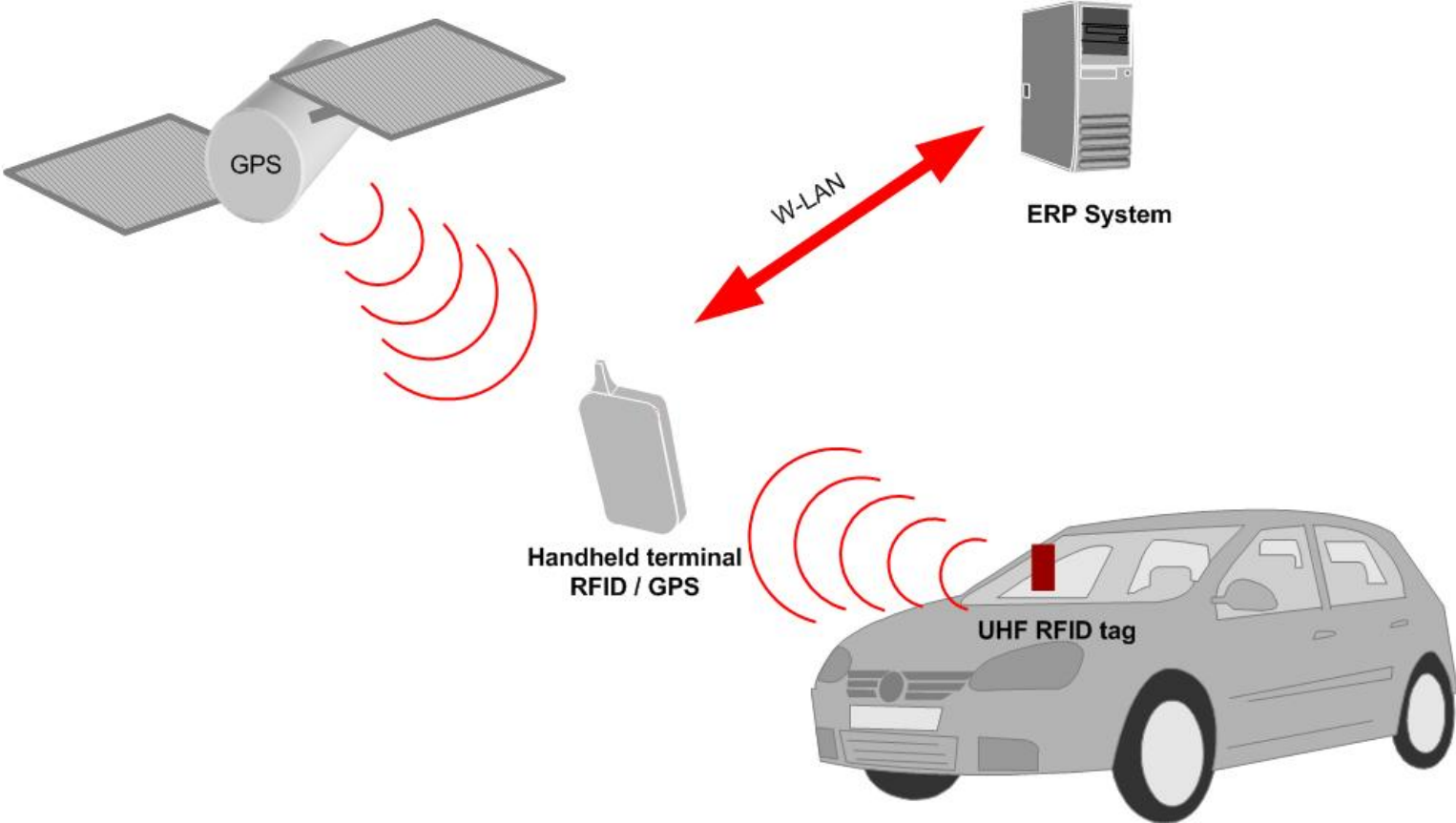
Conclusion

- There is no plug and ident for RTLS

- Pre-testing in defined test set ups will bring the best combination of technology and hardware

- For an integrated visibility it is necessary to locate the objects indoor and outdoor
    - → combination of different RTLS systems

The Global RF Lab Alliance (GRFLA)
Creating a network of excellence among international RF Labs

- What is the Global RF Lab Alliance (GRFLA)?
    - The GRFLA is confederation of RF-focused labs
    - Purpose is to provide a mechanism for communication and collaboration among RF labs
    - GRFLA members share resources, such as students and professors, and collaborate (as appropriate) on research projects
    - Each participating lab will maintain its own identity, yet hold membership in the GRFLA

- Why is the GRFLA needed?
    - Little collaboration among the RF labs on a a global basis
    - Duplicate research
    - Sub-optimization of research funding
    - Difficult for individual labs to handle projects of sufficient magnitude
    - Slow dissemination of research results to industries

Founders

- Asia
    - Chinese Academy of Sciences' Institute of Automation (CASIA)
    - Hon Kong University of Science and Technology
    - Pusan National University

- Europe
    - University of Bremen
    - University of Parma

- USA
    - University of Arkansas
    - University of Florida
    - Georgia Institute of Technology

Take-aways?

http://www.logdynamics.de/
http://biba.uni-bremen.de
http://www.grfla.org

Thank you for your attention

Christian Gorldt
Phone: ++49 421 218 5580
gor@biba.uni-bremen.de