

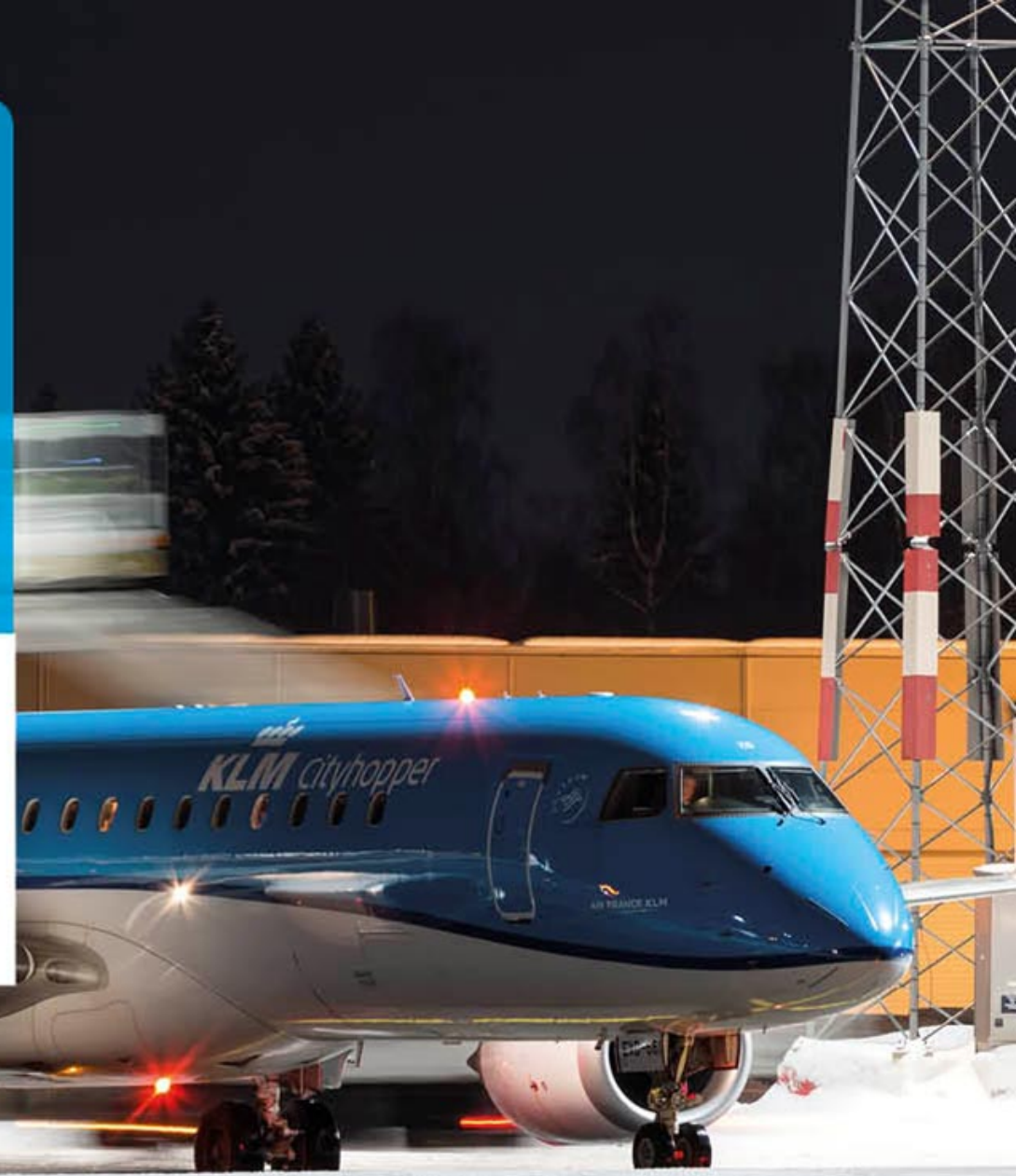
- **Technology Innovation**

Elevating IoT sensor data towards a Digital Twin

Peter Huisman

CWTe 2017 Research Retreat

Royal Dutch Airlines



Internet of Things a hype or “old wine in new bottles”?



2016 introduced
Ø 25.000 sensors



1980's introduced
Ø 1.200 sensors
Ø Automated event reporting
Ø Wireless communication

A dumb asset made smart...

AIRFRANCE KLM

Finding my « Things »

IoT changes planning-based organization to Real Time organization



Current organization

+ Adding “Monitoring”

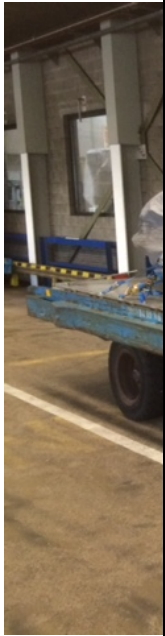
+ “Control”

è “Insight”



Finding my « Things »

Experiments and business impact



ROBIN UTRECHT PHOTOGRAPHY/GETTY IMAGES



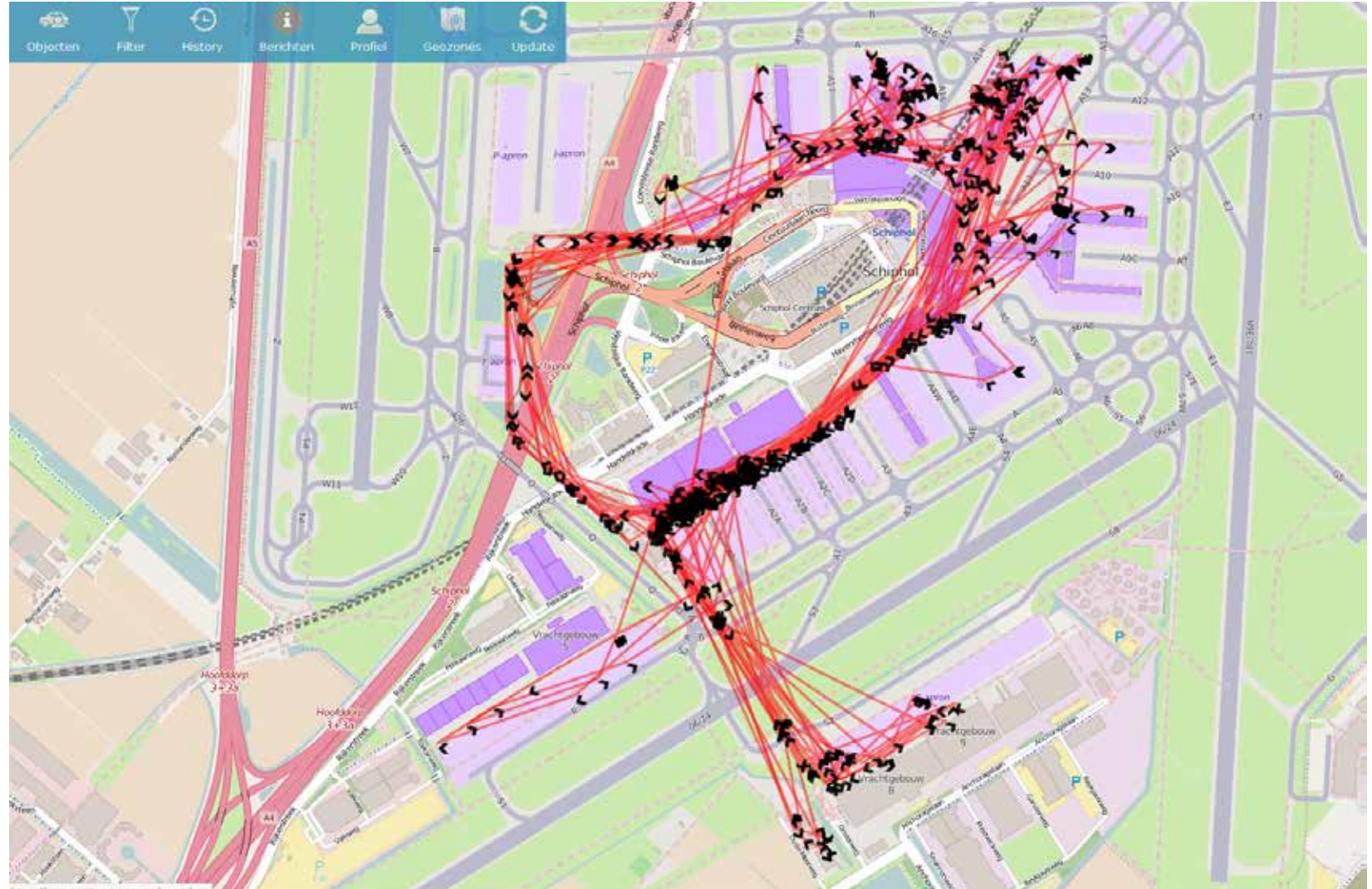
Finding my « Things »

Experiments – Outdoor navigation - 3 Cargo trucks



3 cargo trucks equipped

Data shown is 1 day, 3 trucks



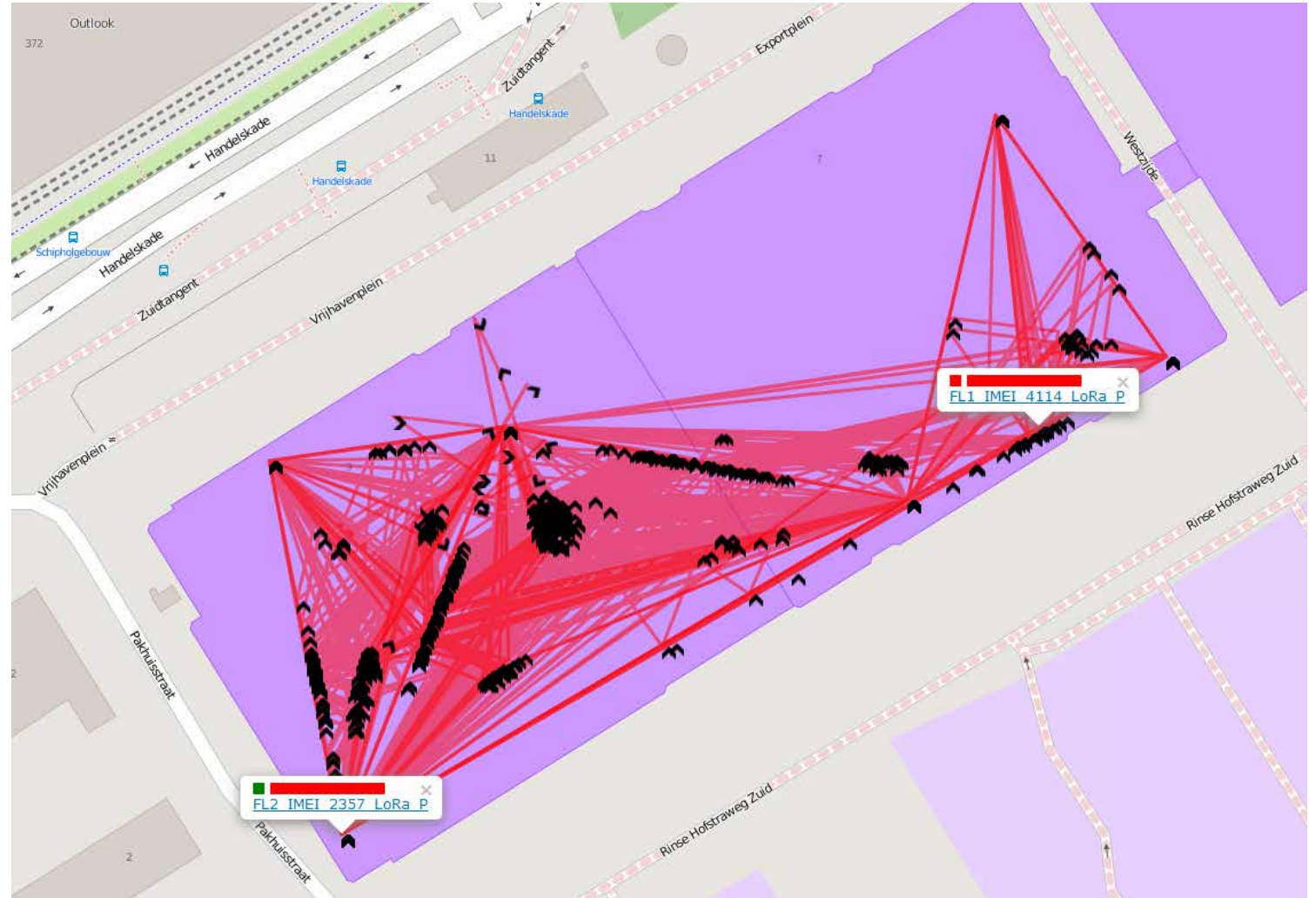
Finding my « Things »

Experiments – Indoor navigation - 2 Forklifts



2 Forklifts equipped

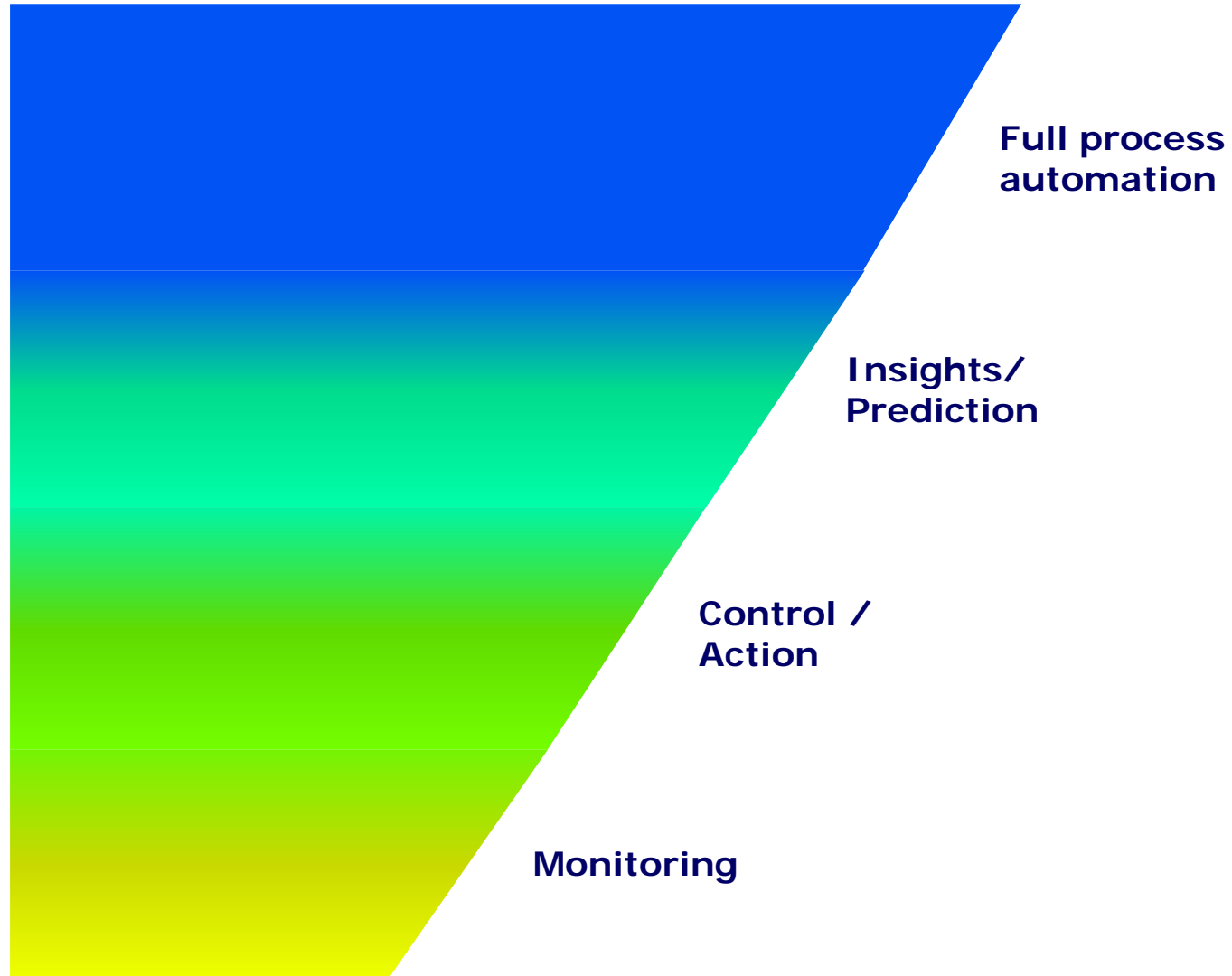
Data shown is 1/2 day



Building the business case benefits of Internet of Things



Benefits
Plateau



E&M Equipment tracking

Where is my tool?



Catering Trolley tracking

Asset management



Connected Car

Sense elements inside and outside vehicle
Get insights to enable analytics and improvements



GS Baggage tracking

Compliancy IATA 2018



Internet of Things

RFID enabled Baggage scanning conveyor



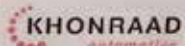
 **KLM** IT Technology Innovation
TAG READER TEST UNIT



Lyngsoe
Systems



KLM Equipment Services



KHONRAAD
automotive





X-Gates Baggage tracking
Visual for quick off-loading





Commercial Baggage tracking
Improve Customer experience by insight in their checked-in baggage





Opportunities

Baggage data *(example only)*

Passenger



Analytics
Marketing
Law & Regulations



Route length
Transit / leg
Destination
Origin



Current location
Time handling
Color
Characteristic
ULD#
Photo



Historical context data
Historical locations

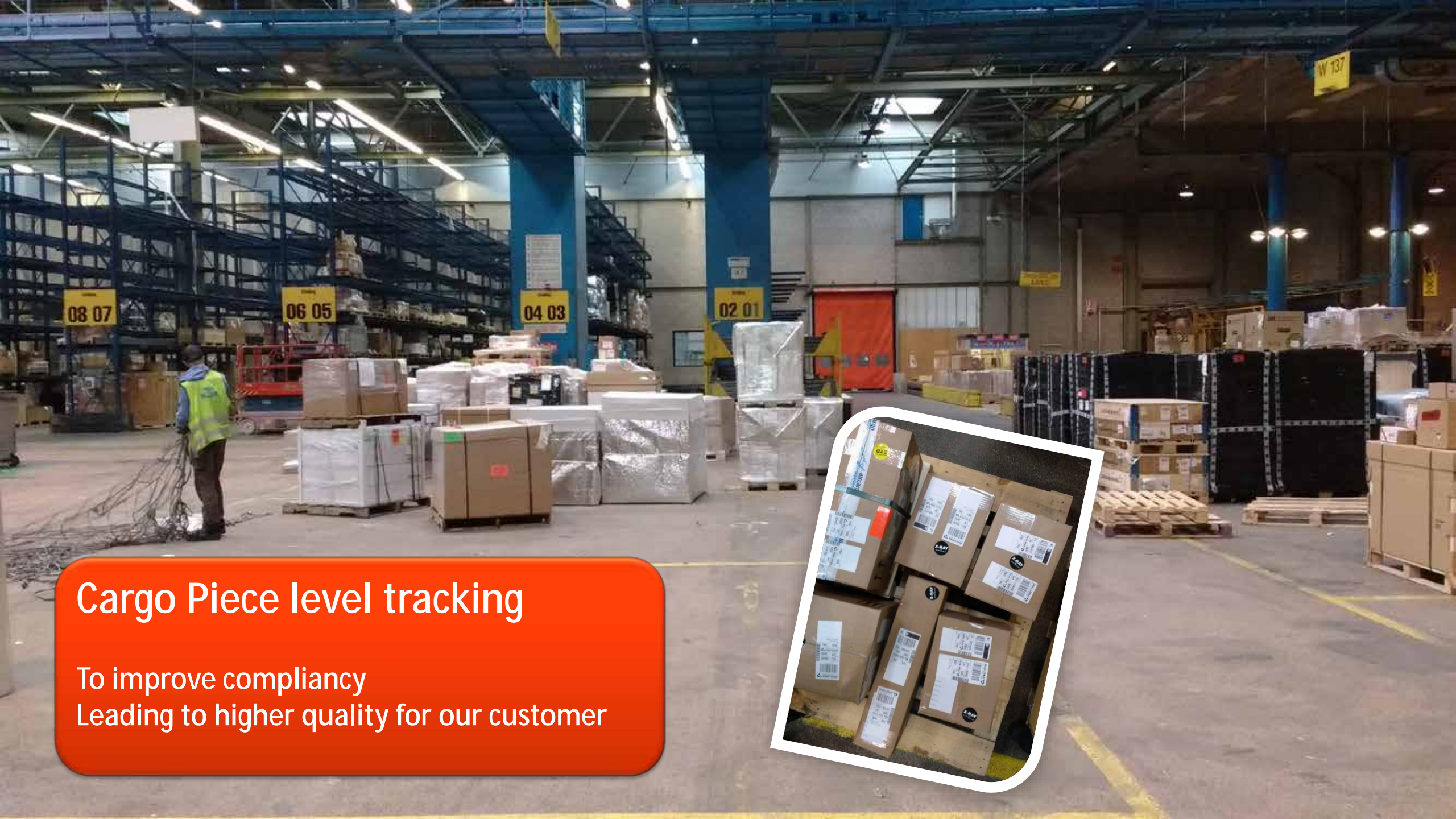


Operational staff

Volume
Width
Depth
Height
Weight



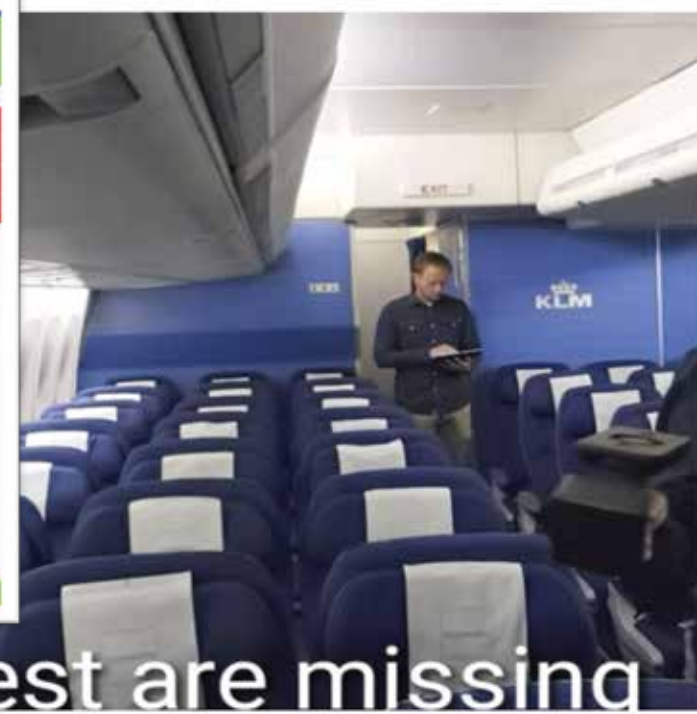
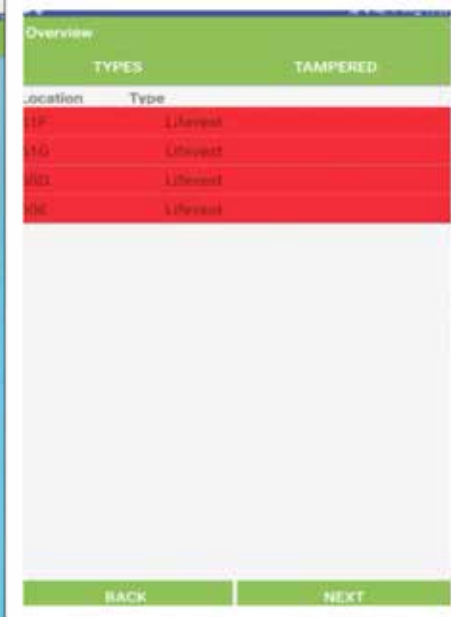
New Business
opportunities



Cargo Piece level tracking

To improve compliancy
Leading to higher quality for our customer





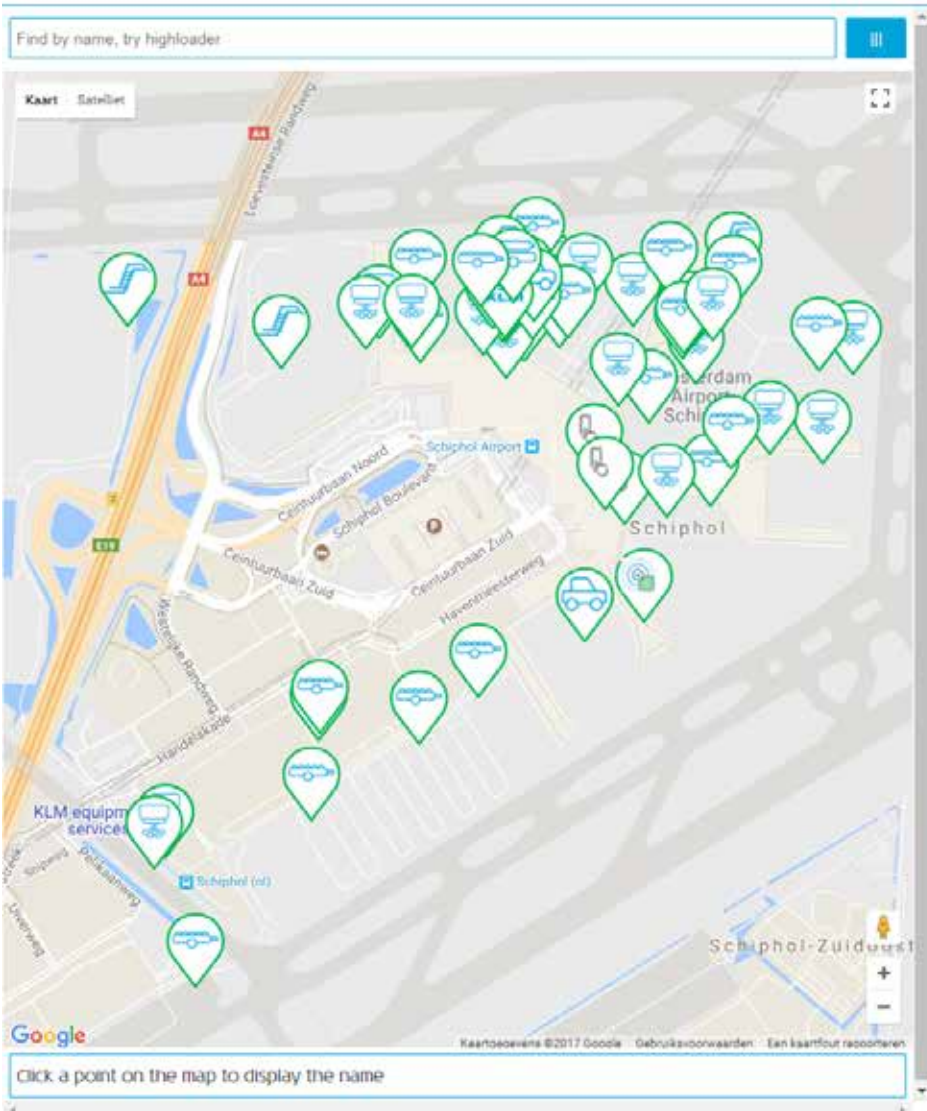
E&M Cabin Inspection
Quick insight in status on board equipment,
security, due date



Internet of Things Implementation status



Find equipment on map



- Internet of Things Core infrastructure up & running (in support of IT)
- [Front end application](#) available (Quick & Dirty) to find assets

LoRa IoT Devices:

- 20x Highloaders (X-Gates)
- 20x 10 ft pallet cars (Cargo)
- 20x E&M Line Maintenance equipment (E&M)
- 20x E&M Line Maintenance Van's (E&M)
- 6x Bagmanager Terminals (X-Gates)
- 1x RFID Conveyor

Coming soon:

- 95 Catering trucks

Applications

API's

Enterprise Services
Mediation

IoT Business Services

IoT Core Services
Mediation

IoT Core Services

Communication &
Federation

IoT Devices

Physical assets



Operational Insights

Improve employee experience by having visibility of tools and equipment at the right time and right place

Digital Twin



- Real life objects and processes
- Vehicles and objects equipped with sensors
- Real time action

- Virtual copy of the real life objects
- Vehicles and objects position are representing real objects
- Real time action
- Can be used as:
 - Analysis tool
 - Simulation tool
 - Play "what if scenario's"
 - Stop the real time action and replay past x minutes.
 - ...



Digital Twins

a hype or “old wine in new bottles”?



1976's introduced Fokker F28 Flight simulator

2017
Pilots acquire their license
in a Digital Twin.

In theory 1st real
flight is with
passengers...



Data from real
flights is used
as trainings input

New operational
Procedures
and products
are first tested
in the “digital twin”

- Any Questions?

Royal Dutch Airlines



AIRFRANCE KLM