AUTOPILOT Webinar Series (II):

Developing Automated Driving Pilots for IoT: Brainport

31 May 2018 – 16.00 -17.00 CET

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731993

Webinar Agenda

1. Webinar Introduction
2. Introduction of the Brainport pilot site and overview of the services (Sven Jansen, TNO)
3. IoT configuration and functions (Emi Mathews – TASS)
4. Video surveillance (Jorge Garcia – Vicomtech)
5. Drone application (Robert Kaul, DLR)
6. Next steps towards the pilots (Sven Jansen, TNO)
7. Discussion

Webinar Objectives and Audience

Objective

- Present the pilot sites, use cases and approaches to external public
- Communicate the evaluation and findings to stakeholders
- Include external audience into the project development and into the automated driving debate

Audience

- Research stakeholders
- Industry stakeholders
- Institutions and authorities
- AUTOPILOT partners

AUTOPILOT Project - Brainport

TNO – Sven Jansen

Introducing AUTOPILOT

- **Idea** Large-scale pilots at intersection between IoT and automated driving
- **Pilot Sites** Tampere, Versailles, Livorno, Brainport, Daejeon, Vigo
- **Length** January 2017 to December 2019
- **Partners** 44, coordinated by ERTICO – ITS Europe
- **Budget** €24.16 Million
- **EU Grant** €19.92 Million

AUTOPILOT Challenge

- **Demonstrate added value of**

  Internet of Things for Automated Driving

Internet of Things:

- Information beyond reach of sensors
- Data in context (e.g. trustworthiness)
- Anything connected as source

Automated Driving:

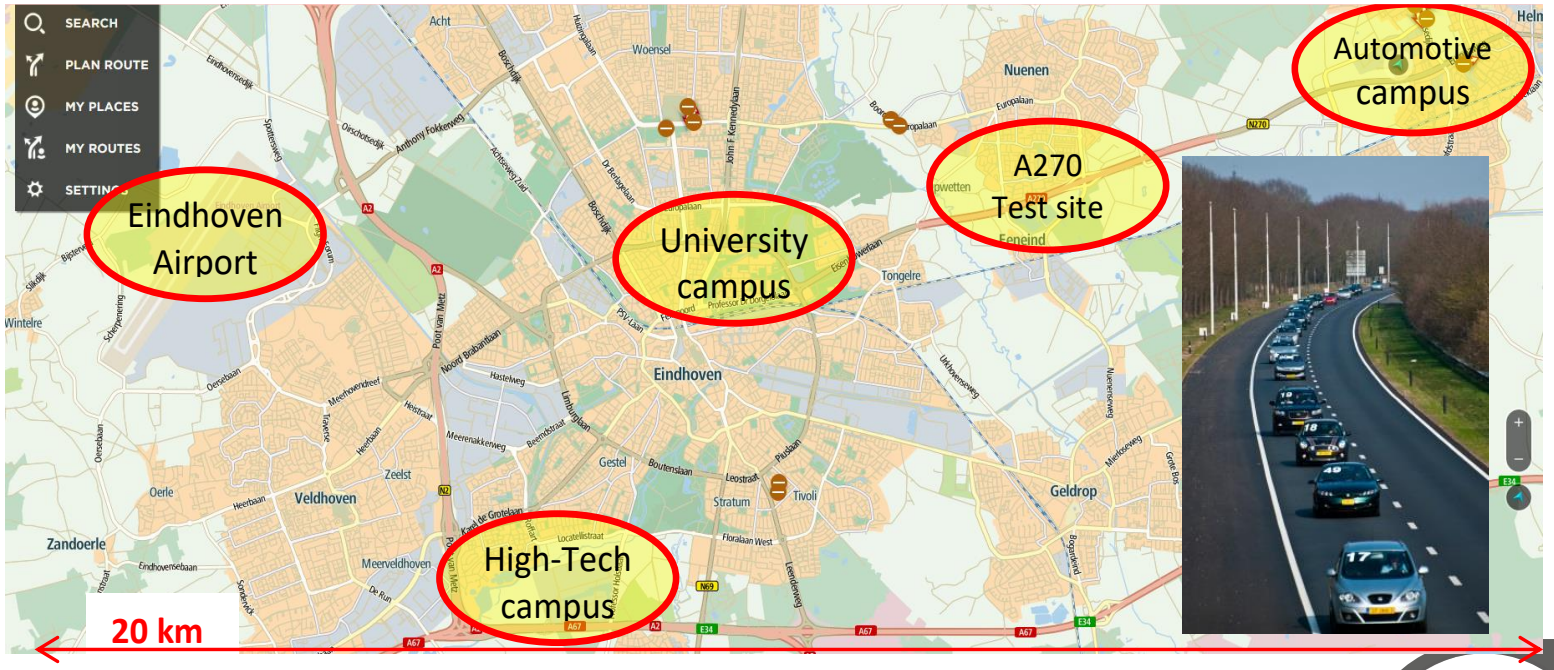
- Travel planning
- Decision making
- Steer and speed control

PILOT SITE BRAINPORT (NL)

In the Brainport, 5 “mini-projects” work together to build up a demonstration between the Automotive Campus in Helmond and Eindhoven, based on 5 use cases:

- **CAR SHARING**
- **PLATOONING**
- **HIGHWAY PILOT**
- **AUTOMATED VALET PARKING**
- **RELOCATION**

IoT sources are road-side cameras, drones, traffic lights, smartphones and wearables.



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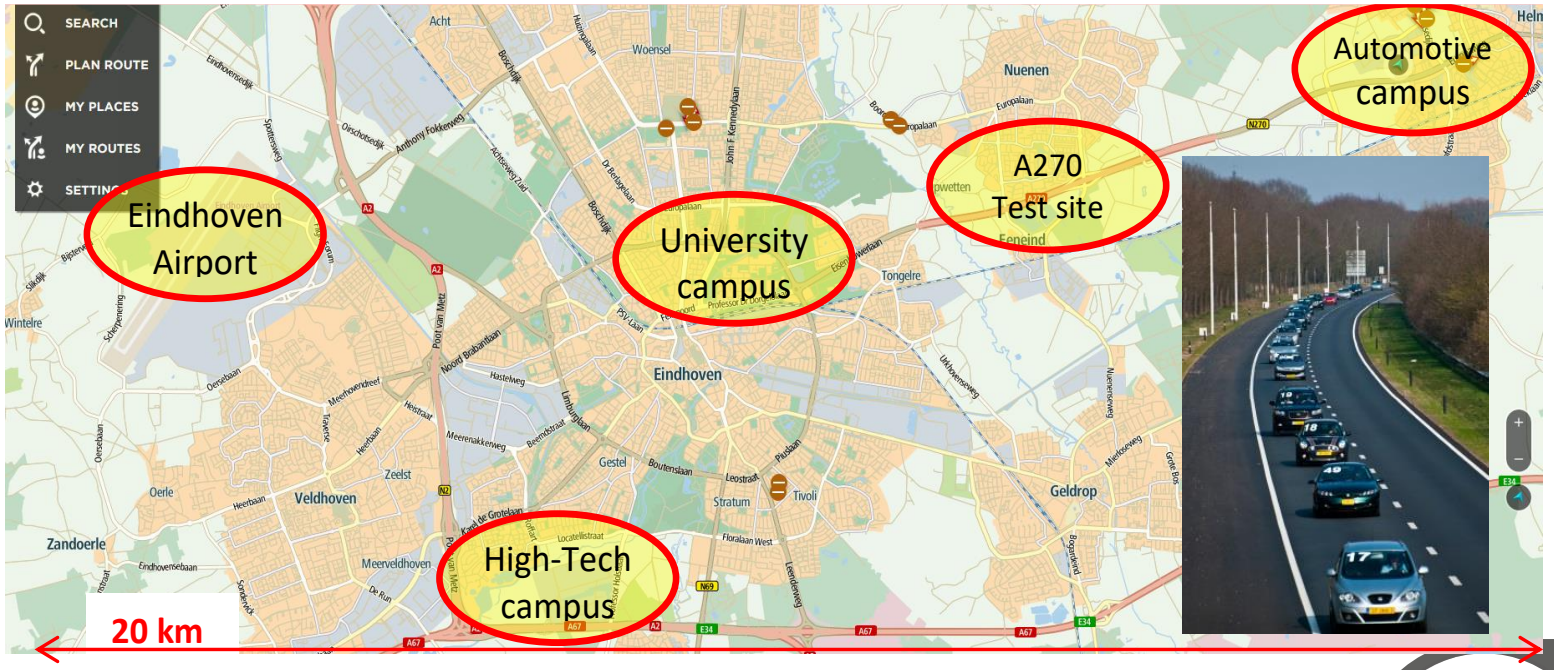
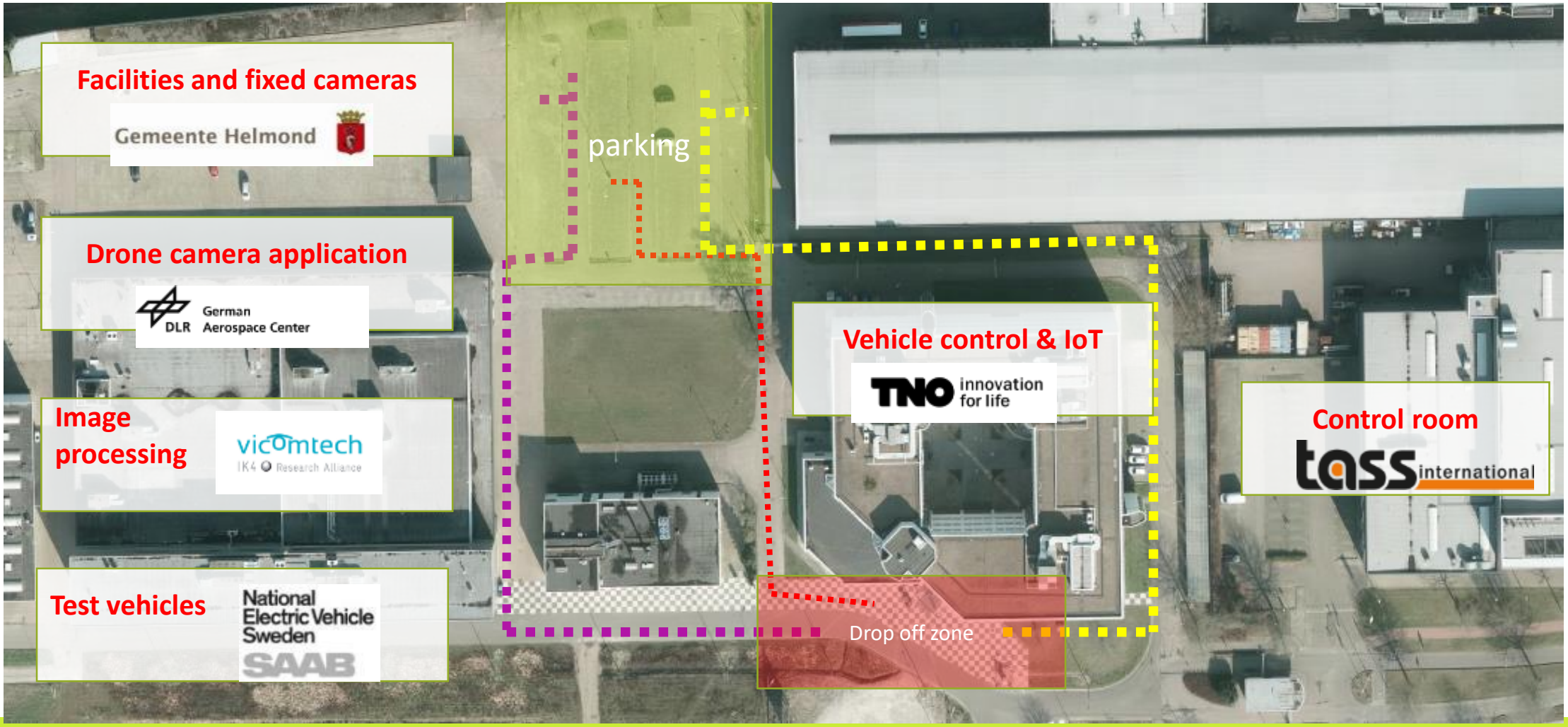


Automated Valet Parking

- The car is enabled through IoT to drive unmanned to a parking spot, and to return to the driver on command
- This offers:
  - Comfort service to car drivers (no time lost finding a parking spot)
  - More efficient use of space on parking lots (cars can be parked closer)
  - Less damage to cars during parking
  - Optimization of logistics and reducing congestion in and towards parking area
  - More efficient use of EV charging spots
  - …

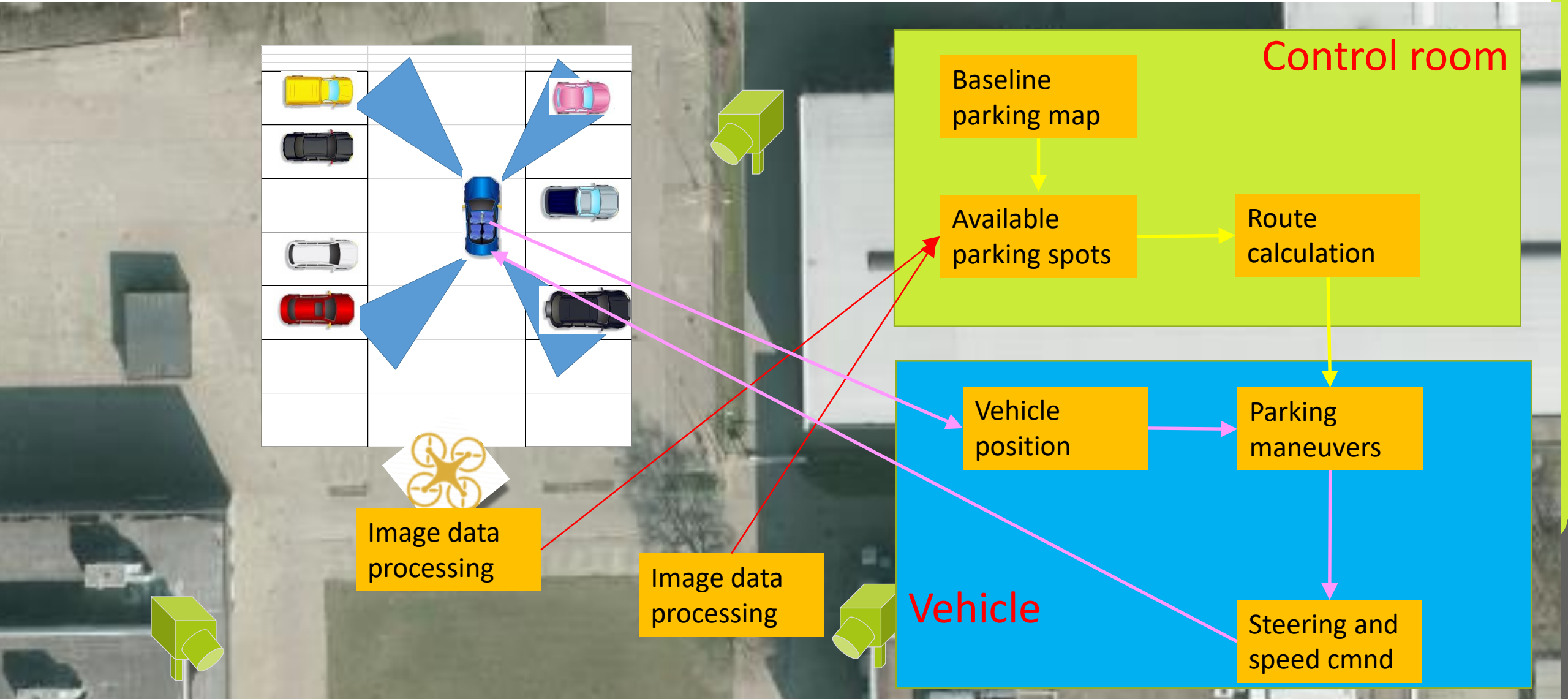
Test location: Automotive Campus Helmond



IoT configuration and functions

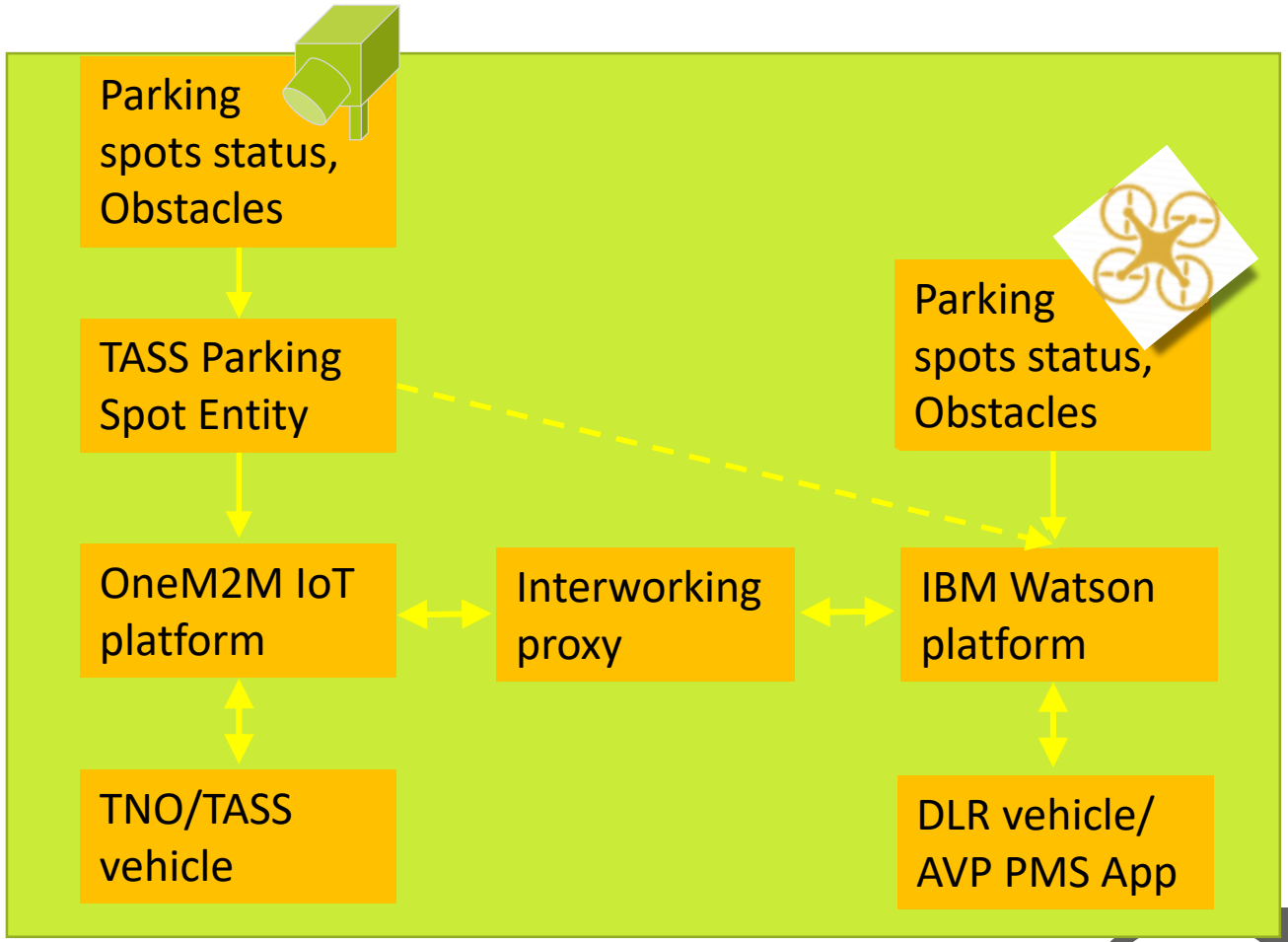
TASS - Emi Mathews

IoT concept of Automated Valet Parking



IoT configuration and functions

- Uses publish/subscribe messaging protocol
  - OneM2M - Restful API
  - IBM Watson - MQTT
- Enables data sharing
- Interworking of IoT platforms
- Standardized data models



IoT configuration and functions

sensinov
Global IoT Platform

Cae-guest

oneM2M Resource Tree

https://vmi137365.contaboserver.net:8443/~/server/cin-572852617132338832

- aeRoutePlanningTue
- aeSmartCampus1
- aeTASS
  - VBM
  - AVP
    - ParkingSpotEntity
      - DATA
      - DESCRIPTOR
      - Occupancy
        - DATA
        - DESCRIPTOR
      - ParkingSpotStatus
        - DESCRIPTOR
        - DATA
          - cin_572852617132338832
          - cin_988634324297293715
          - cin_5745612782295325939
          - cin_8658448213592790016
          - cin_6663635328524587124
          - cin_9151400989963204966
          - cin_723778011165777897
          - cin_819976997667261060O

Attribute	Value
rn	cin_572852617132338832
ty	4
ri	/server/cin-572852617132338832
pi	/server/cnt-750283068172787790 7
ct	20180516T110254
lt	20180516T110254
et	20180516T110254
st	0
cnf	application/json
cs	1173
con	{"parkingSpotCurrentStatusEntity":[{"Id":"nl_brainport_spot_0000","UUID":"49a2c831-c0cc-4155-84c4-cc93f76ea9f4","currentParkingStatus":"Available","parkingSpotId":"nl_brainport_spot_0000","updateTime":"2018-05-16T11:02:54Z"},{"Id":"nl_brainport_spot_0001","UUID":"b561ff9e-12a5-465f-a9b1-bd499a3b9d88","currentParkingStatus":"Available","parkingSpotId":"nl_brainport_spot_0001","updateTime":"2018-05-16T11:02:54Z"},{"Id":"nl_brainport_spot_0002","UUID":"3ff3a608-28e4-403a-89ff-6e376ce12305","currentParkingStatus":"Available","parkingSpotId":"nl_brainport_spot_0002","updateTime":"2018-05-16T11:02:54Z"},{"Id":"nl_brainport_spot_0003","UUID":"82b2ec71-e8e9-4855-afa3-b6cd59b8d9f3","currentParkingStatus":"Occupied","parkingSpotId":"nl_brainport_spot_0003","updateTime":"2018-05-16T11:02:54Z"},{"Id":"nl_brainport_spot_0004","UUID":"edbd85cd-3bfd-4a69-8bda-c09f7eda7f29","currentParkingStatus":"Occupied","parkingSpotId":"nl_brainport_spot_0004","updateTime":"2018-05-16T11:02:54Z"},{"Id":"nl_brainport_spot_0005","UUID":"73d3080c-e2cc-4eb5-a84f-ab2c03b123a6","currentParkingStatus":"Occupied","parkingSpotId":"nl_brainport_spot_0005","updateTime":"2018-05-16T11:02:54Z"}]}

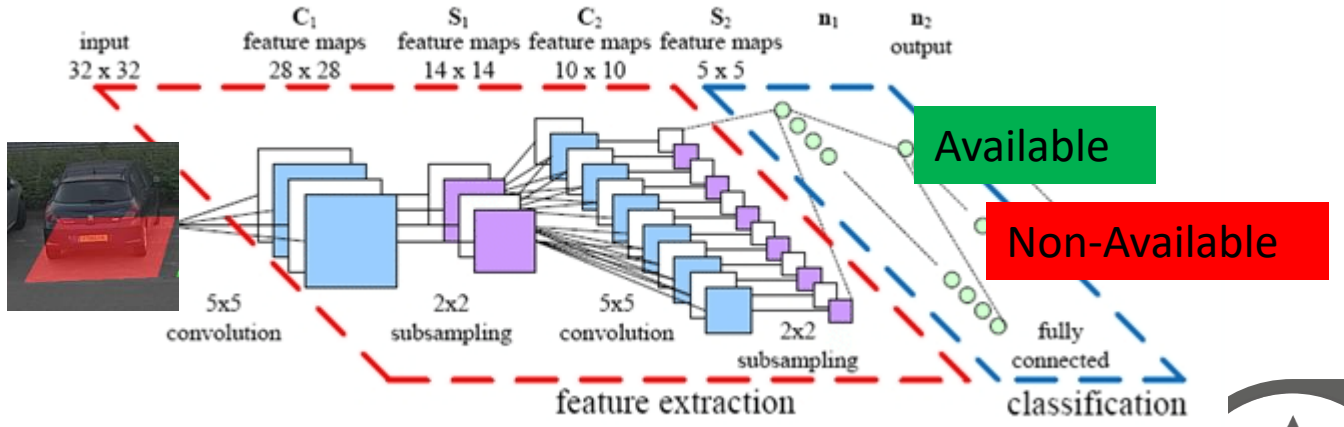
Video Surveillance

VicomTech – Jorge Garcia

Video surveillance technologies

Free parking spot detection

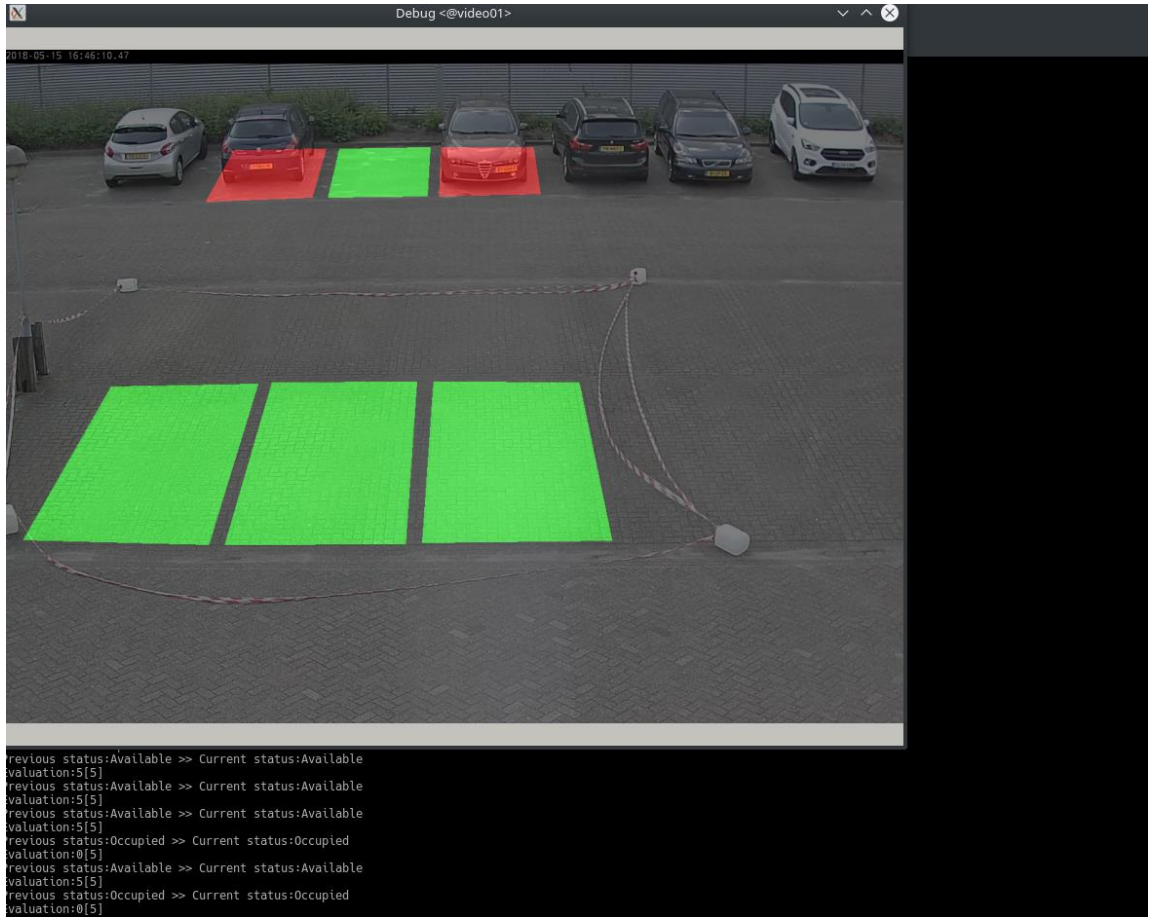
- Goal is to recognize available parking spot using video surveillance cameras.
- This technology is based on deep learning approach:
  - **2 labels**
  - **Layout of parking spots is required**



Video surveillance technologies

Free parking spot detection

- **Application:**
  - **Every a configurable time period – status of parking spots are evaluated**
  - **If there exist motion in the parking spots – status remains equal**
  - **Major problems come with occlusion – overhead perspectives are preferred**



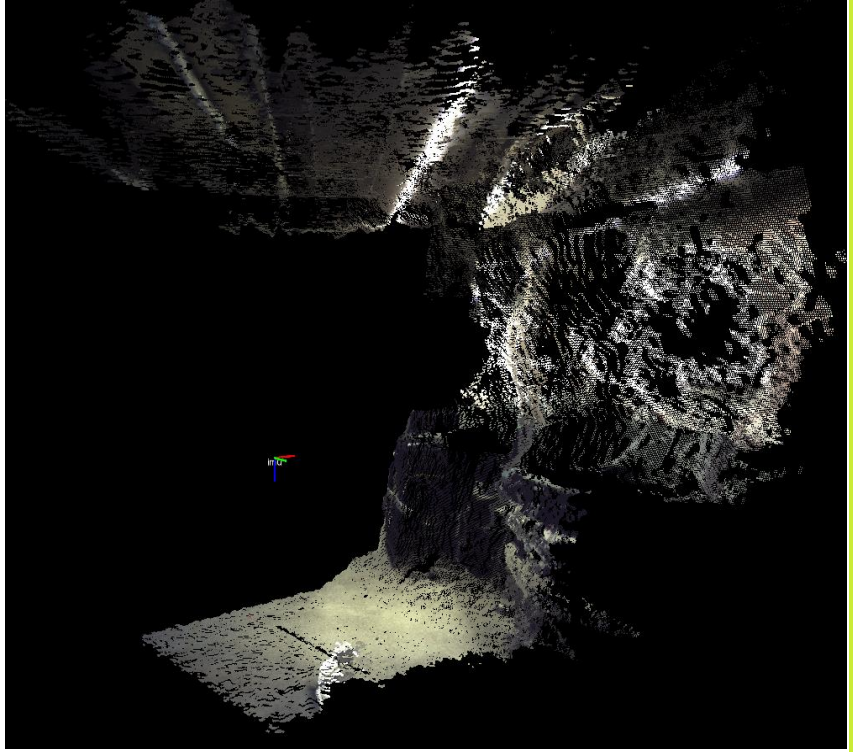
Drone application

DLR – Robert Kaul

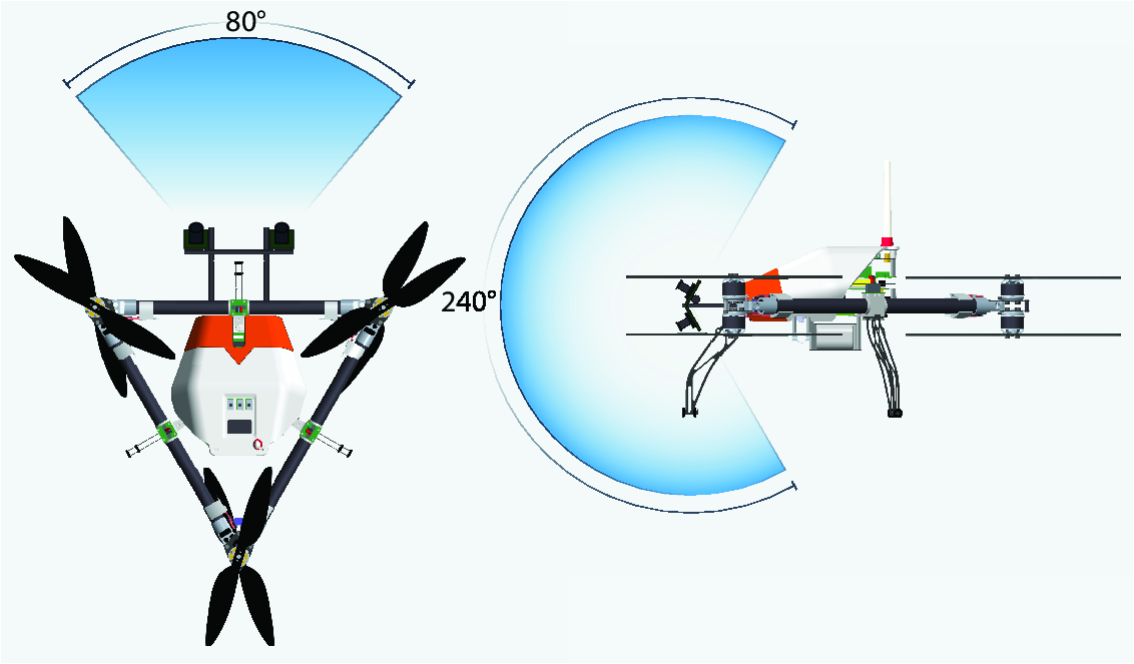
Drone application

- MAV and ground-station PC act as IoT device.
- MAV is able to navigate autonomously in outdoor as well as indoor (GPS-denied) environments.
- IoT AVP application sends list of parking spots for occupancy checking.
- Using input from cameras and deep-learning the occupancy status of parking spots is determined.

Drone application – system overview



- Custom coaxial tricopter design by DLR
- Size & weight: 68x68x30 cm, 2.6kg
- Flight time: approx. 10min



- Sensors: 2 stereo camera pairs, IMU
- Single camera field of view: 125°x80°
- Total field of view: 240°x80°
- Computers: Intel i7, FPGA (stereo processing), BeagleBoneBlack (ARM-based)

Drone application – demonstration video

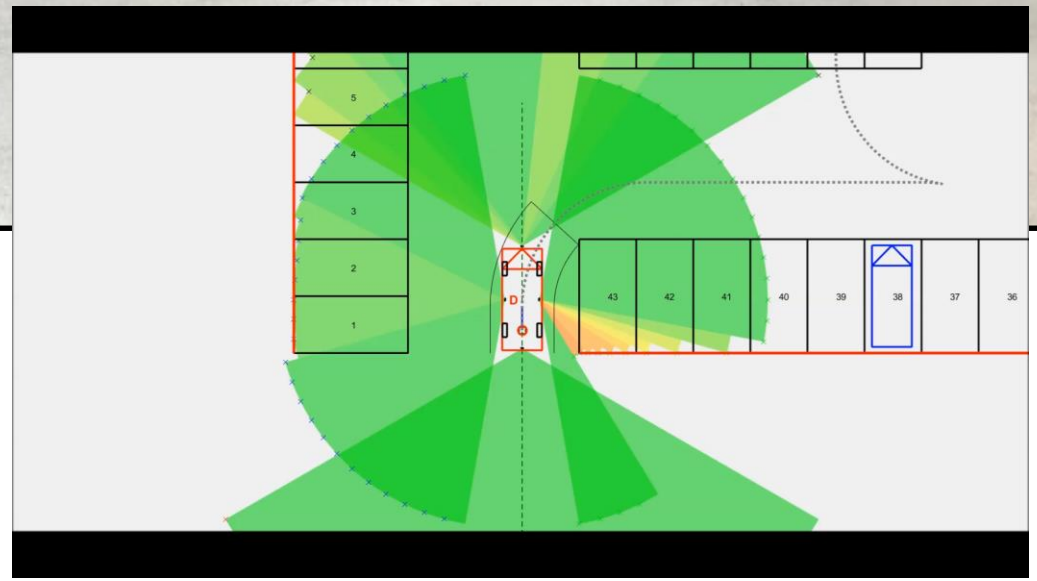
- Video von Pre-Plugfest in Braunschweig (siehe Teamsite)

Outlook on automated driving and piloting

TNO – Sven Jansen

Automated Driving

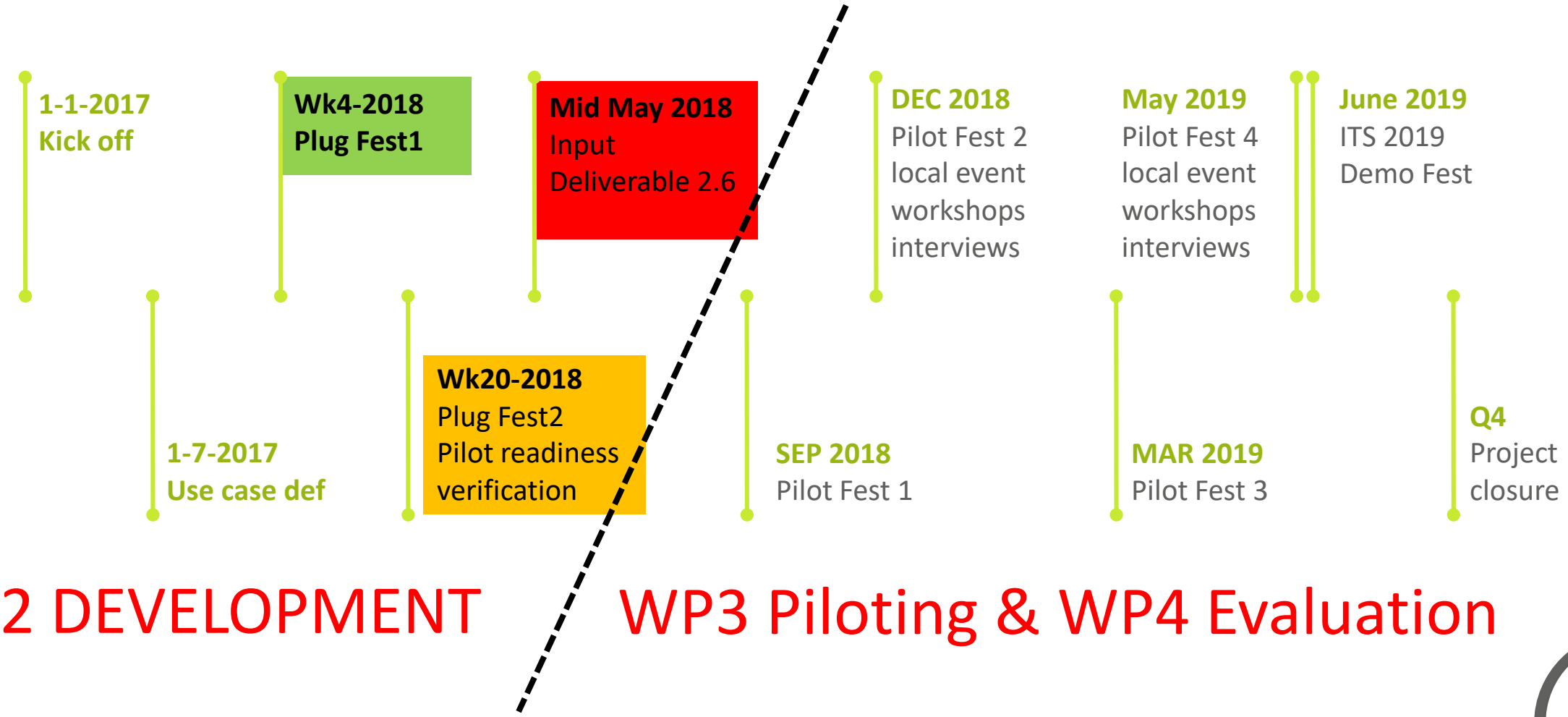
- Non-GPS localization
- Obstacle detection
- High maneuverability



Outlook to Pilot execution in Brainport

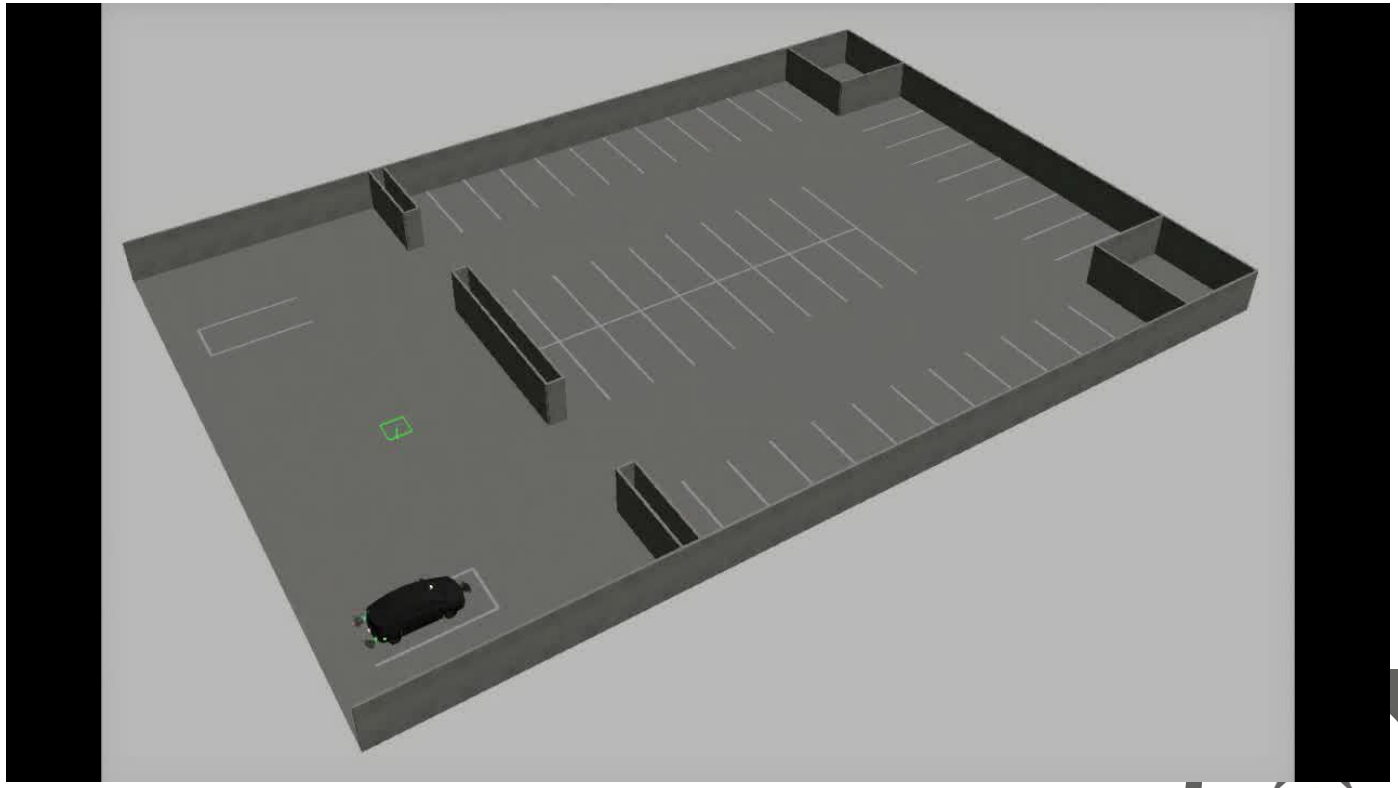
- 2 plug fest events completed
  - Most partners available on-site
  - Integration of technologies validated, baseline functionality defined for first piloting
- Piloting will consider (at least) 2 system variants
  - 2018: Main focus on service concept of individual use cases
  - 2019: Integration of services and extended automated driving
- Public demonstrations in conjunction with ITS2019 conference

Timeline of AUTOPILOT for Brainport



Thank you for your attention

Questions?



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