ITEA Smart City Day session III

Smart mobility
Smart City Dortmund

Mobility Challenges
Smart City Dortmund
Topics

- Energy & Climate
- IT Platforms & Services
- Mobility & Logistics
- Sports & Culture
- Intercommunal Exchange
- Safety & Security
- City Infrastructures
- Demographic Change & Living
- International Cooperation

NEW
Smart City Dortmund
Mobility

- A. Mobility for everyone – Equal Participation
- B. Ensure and improve Dortmund’s accessibility
- C. Make Dortmund a city of short distances
- D. Reduce negative environmental impact of traffic
- E. Promote and foster walking, cycling and public transport
- F. Improve traffic safety and perception of safety
- G. Improve freight and commercial transports
- H. Reclamation and regeneration of urban public space

Target Fields Masterplan Mobility 2030
Smart City Dortmund
Mobility

Air Quality

Fields of Action

A. Automotive engineering

B. Traffic management & Traffic flow

C. Regulatory framework

D. Monetary incentives

E. E-Mobility & Alternative drives

F. Short range mobility

G. Public transport

H. Information & Communication

I. Passive immission reduction
# Smart City Dortmund

## Concrete Mobility Challenges

### Connecting Transport Modes
- Development of local and regional rail transport
- Improving the quality of rail transport
- New on-demand services

### Electrification
- Driving forward electrification of taxis
- Expansion of city-wide charging infrastructure
- Covering municipal driving needs by electric cars and bikes
- Expansion and replacement of the existing bus fleet by electric buses

### Digitalisation of Transport
- Dynamic traffic guidance system on the motorways around Dortmund
- Gatekeeper traffic lights in combination with measures for fluent traffic
- Park&Bike and Park&Ride Apps on entry roads
- E-Car Sharing and digital mobility platforms
- Digital mobility platform for bike traffic
- Digital parking management

### Bike Traffic
- Development of priority routes for bicycles, cycle paths, protection strips
- Development of a city-wide cargobike rental

### Parking & Inactive Traffic
- Expansion and implementation of city-wide parking space management
- Expansion of bicycle parking opportunities

### Urban Logistics
- Establishment of E-Logistics-Hub
- Environmental-sensitive truck routing on highly congested roads
- Privileged status for environmentally friendly vehicles

### Electrification
- Expansion of city-wide charging infrastructure
- Covering municipal driving needs by electric cars and bikes
- Expansion and replacement of the existing bus fleet by electric buses

### Mobility Management
- Mobility management across actors and institutions
- Reduced public transport rates
- Free annual tickets for public transport when you return your driving licence in your old age

### Information & Communication
- Umbrella brand and communication strategy „Dortmund mobil“
Many Thanks for Your Attention!

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“When things seem to be under control, you are just not fast enough.“
- Mario Andretti
Unique & internationally attractive
Tampere Urban Rail Mobility Living Lab (TURMS) featuring:

- The whole city transport system forming one big Living Lab arrangement
- Special tram for experimentation of product and service innovations including autonomous tram & depot
- World’s first test environment for pilot series first/last mile autonomous feeder busses
- Testbed for smart parking
- City traffic monitoring and management system and test environment
- 5G connectivity through smart lighting pole system
- Autonomous drone swarm for traffic management and urban air mobility
- City data platform and predictive situational awareness system
- Urban mobility research data platform and Living Lab tools and services for supporting RDI activities

Tram based urban mobility + feeder traffic

5G + Smart lighting poles

Speeding up co-learning within urban mobility testbed network

Source: Tampereen Ratikka
Open Standard Application Platform for Cars and Transportation Vehicles.

ITEA Smart City Day 2021
16 March 2021 – Online
Teemu Karvonen, University of Oulu
APPSTACLE Project goals

• Establishing an Open Source project for external applications and software developers and to start to use open source code for connected vehicles and smart mobility

• Developing an open and secure car-to-cloud-to-car platform that interconnects transportation vehicles via internet connection and utilizing 5G opportunities

• Enabling development of secure onboard and connected car services and applications
Eclipse Kuksa

Providing a solid technical foundation routed in Open Standards and proven software will benefit everybody.

Create a cross-vendor connected vehicle platform that relies on open standards and uses open source software to leverage the potential of a large developer community!
What is Eclipse…

…and how do I use it?
Eclipse Kuksa

Use case example

Vehicle Owner

Select Apps

Publish Apps

Install Apps

Data / Commands

User Interaction

Mirroring System

In-Vehicle Platform

OBD dongle

OBD

W3C API

Layer

Core Services

Share

Data

Analysis

Visualization

Data Management

Report

Generation

Data Management

Data

3rd Party

Data
Eclipse Kuksa

- Eclipse Kuksa is not trying to reinvent the wheel
- use and foster Open Source solutions instead
  - create a harmonized composition of existing Open Source projects
  - enriched with specific Kuksa components
KUKSA targeted segments

- **OEMs**: Manufacturers of vehicles
- **Suppliers**: Provide parts and components
- **Rental/Leasing companies**: Track vehicle status
- **Insurance companies**: Insure vehicles
- **Device Manufacturers**: Provide electronic parts
- **Operators**: Provide connectivity and services
- **Start-ups**: Innovative solutions
- **Remote diagnostics and repair services**: Diagnose and repair vehicles remotely
- **Usage-based insurance services**: Insurance based on usage
- **Rental companies**: Track vehicle status
- **Remote diagnostics**: Diagnose vehicles remotely

**Mainly app-based business models** with bundling of services:
- **Start-ups**: **AVM**, **VINCAR**, **Innova**, **Bosch**, **Sixt**
- **Device Manufacturers**: **Samsung**, **O₂**, **TeliaSonera**
- **Suppliers**: **Ford**, **Peugeot**, **Hyundai**
- **Rental/Leasing companies**: **AVIS**, **Europcar**
- **Insurance companies**: **O₂**, **TeliaSonera**
- **Operators**: **TankTaler**, **PAC**, **Vinli**
- **Remote diagnostics and repair services**: **SIGNAL IDUNA**, **AT&T**, **Allianz**

**Retrofit car parc and dongle solution for cheaper models**
- **Dongle production and leverage usage through services and partnerships**
Telematics per service focus

Service providers
(Insurance,
Repair/maintenance,
Rental, etc)

Service providers
(Insurance,
Repair/maintenance,
Rental, etc)

Vehicle manufacturors
(MB, GM, VAG, Volvo etc)

Application based systems
(OBDeleven, Apple carplay,
Telia sense)

Data monetization per connectivity subscription

Functionalities

• OBD 2 solutions
• Media & entertainment
• PaaS solutions
• OEM solutions
• Fleets & UBI
Kuksa

Where to go from here?

- Eclipse Kuksa Open Source project
- Contribute with own ideas and development
- Use and try the software
- Be part of the development community

https://www.eclipse.org/kuksa/

https://github.com/eclipse?q=kuksa
Thank you
Smart City Platform

Application Platform: vertical applications for Transportation Demand Management, Traffic Flow Optimization, and Transportation Alternatives Planning

Analytics Platform: modelling and predictive analytics platform

GIS: system of record combining transportation data with other municipal data sets

Data Analytics Platform: apply analytics and machine learning to extract de-identified and aggregate insights from data feeds.

Data Ingestion Platform: ingest, normalize, and aggregate near real-time transportation data feeds.

Mobile Sensors
- Commercial Vehicles
- Consumer Vehicles
- Cyclists
- Pedestrians
- Induction Loops
- Pneumatic Tubes
- Radar/RF
- Video

Infrastructure Sensors
- Commercial Vehicles
- Consumer Vehicles
- Cyclists
- Pedestrians
- Induction Loops
- Pneumatic Tubes
- Radar/RF
- Video
Challenges in mobility

130B € economic loss in EU/yr
14-39% average delay

European urban mobility report, 2017
EUROPEANMOBILITYWEEK 2016: Sustainable transport is an investment for Europe.
Challenges in mobility

Safety Fact

70% are vulnerable road users
200B € External cost
120,000 fatalities

European Road Safety Observatory – Care database
Smart City Platform dashboard
Automatic Acquisition of infra

- Texturing of 3D models
- Road section topology
- And much more ….
  - Traffic Signs,
  - Billboards,
  - Road markings,
  - Road surface cracks,
  - (Road) surface type,
  - Utility poles,
  - Manholes,
  - Public lighting,
  - Building images,
  - Pedestrian ramps, roof measurements,
Automatic Acquisition of infra
Automatic Acquisition of infra
Floating car data

- Many use cases
  - tracking, congestion map, road wear map
Traditional traffic control
SMART traffic control
AI-based observation

- Embedded AI firmware on industrial quality level
  - Data collection of all traffic participants in real-time
  - Object tracking, classification, speed, directions, etc
Anomaly detection

- Accidents with vehicles, pedestrians or bicyclists
- Vehicles in reverse direction
- Stopped vehicle
- Speeding or under speeding
- Moving cargo track tilted on a side due to e.g. flat tires
- Throwing medium/large objects from moving vehicle
- Deadlock in the middle of the intersection
- Pedestrians/bicyclists crossing the lanes during heavy traffic
- A pedestrian/bicyclist stuck or fallen on a zebra crossing
SMART Conclusions

- A Smart City Platform
  - On a large city scale and beyond
  - Static data of infrastructure: 3D digital twin
  - Combined with dynamic GIS-based sensor data
  - Advanced AI-based sensing for high semantic information

- Enabling many application for many stakeholders

- Scalable through partners with existing market access