

Universität  
Rostock



virtual  vehicle

Enabling future vehicle technologies



# Towards a Privacy-Preserving Way of Vehicle Data Sharing – A Case for Blockchain Technology?

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dissertation titled: “Quantified Vehicles: Data, Services, Ecosystems“

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## AEGIS

Advanced Big Data Value Chain for Public Safety and Personal Security.

3.6 m EUR · 01/2017 – 06/2019

12 Partners

**Fraunhofer**, EPFL, GFT Italia, HYPERTECH, KTH Stockholm, NTUA, VIRTUAL VEHICLE, UBITECH, etc..



## SCOTT

Secure Connected Trustable Things.

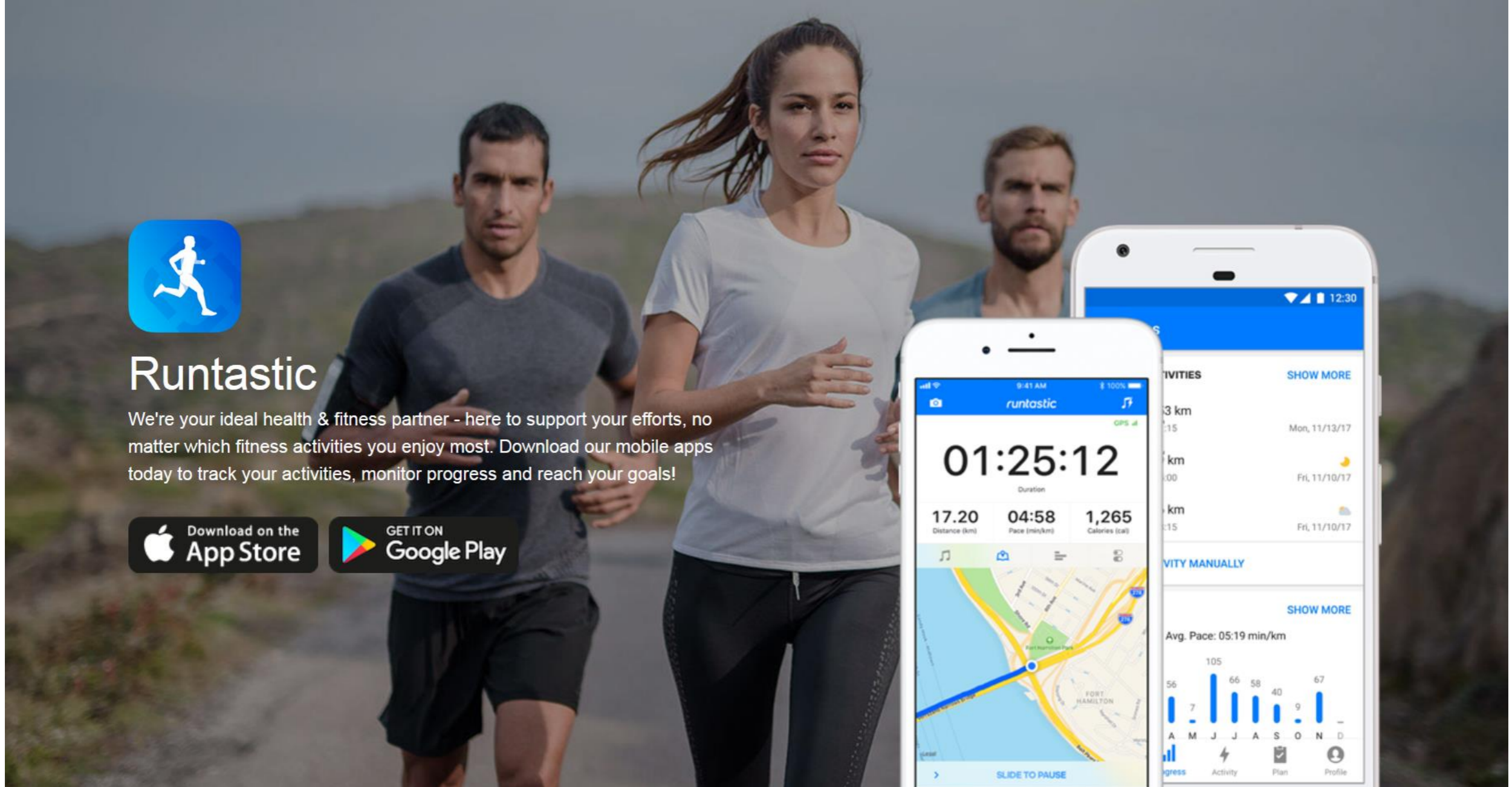
42 m EUR · 05/2015 – 06/2020


57 partners

VIRTUAL VEHICLE, AVL, AIT, Ericsson, Eye, NXP, Philips, TU Graz, Bosch, Nokia, etc.





- **Quantified Self**
- **Quantified Vehicles || Vehicle Data Sharing**
- **Vehicle Data Value Chain (VDVC)**
- **Vehicle Information Systems (Vehicle IS)**
- **Blockchain basics**
- **Open Vehicle Data Platform (OVDP) based on Blockchain Technology**
- **OVDP Workflow**





## Runtastic

We're your ideal health & fitness partner - here to support your efforts, no matter which fitness activities you enjoy most. Download our mobile apps today to track your activities, monitor progress and reach your goals!

The advertisement features three runners in athletic wear against a blurred outdoor background. Two smartphones are overlaid on the right side, displaying the Runtastic app interface. The foreground phone shows a running activity with a duration of 01:25:12, a distance of 17.20 km, a pace of 04:58 min/km, and 1,265 calories. Below this, there is a map showing the running route and a bar chart of monthly activity. The background phone shows a list of activities with columns for distance, date, and weather.

Source: Runtastic.com

*DEFINITION of **Quantified Self**:*

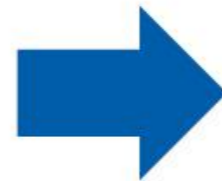
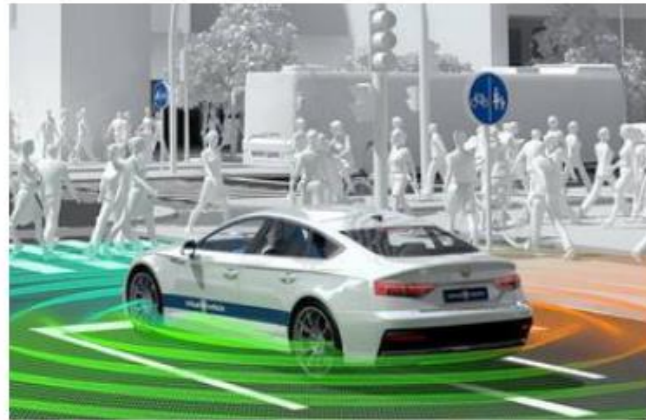
*“A key contemporary trend emerging in big data science is the quantified self (QS)- individuals engaged in the **self-tracking of any kind of biological, physical, behavioral, or environmental information..**”*

*(Swan, 2013)*

## ■ Modern cars offer access to data enabling the creation of (useful) services

### Data from the vehicle

- **On Board Diagnostic (OBD) data** / = (rather) open  
(emission relevant data, limited data, e.g. speed, rpm, ..)
- **Controller Area Network (CAN) data** = (rather) closed  
(access to a plethora sensors and measurements, e.g. gear shifts, steering wheel movement, ADAS usage ...)



### Data from the vehicle driver

- Smartphone data
- Smartwatch data
- Smart glasses data
- Social networking data
- Camera data



*DEFINITION of Quantified Vehicles:*

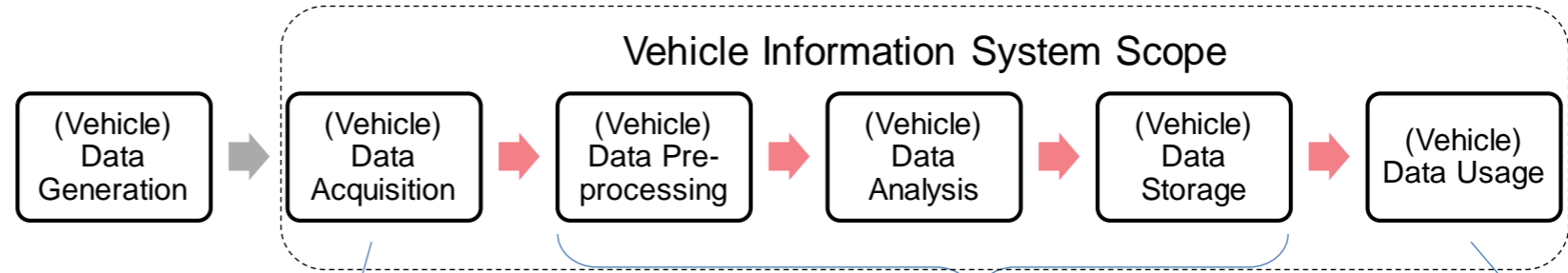
*“The behavioral patterns of self-tracking can be transferred to **vehicles, which capture sensory data about themselves and about their environment, thus becoming ‘Quantified Vehicles’**”*

*(Stocker et al., 2017)*

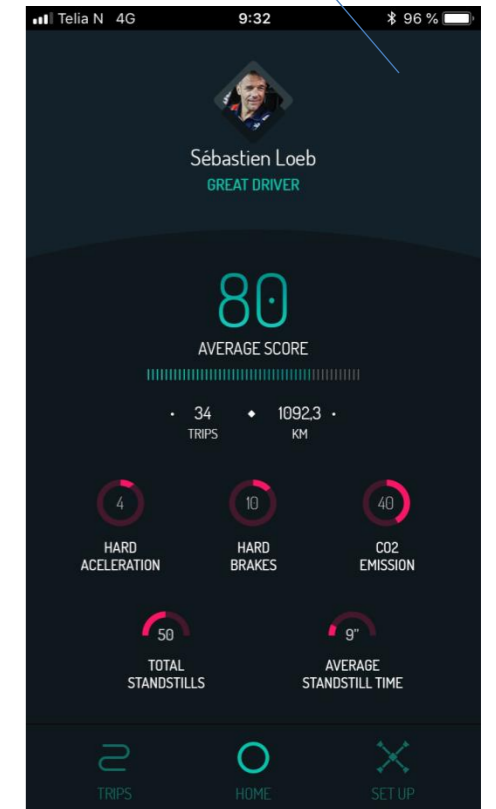
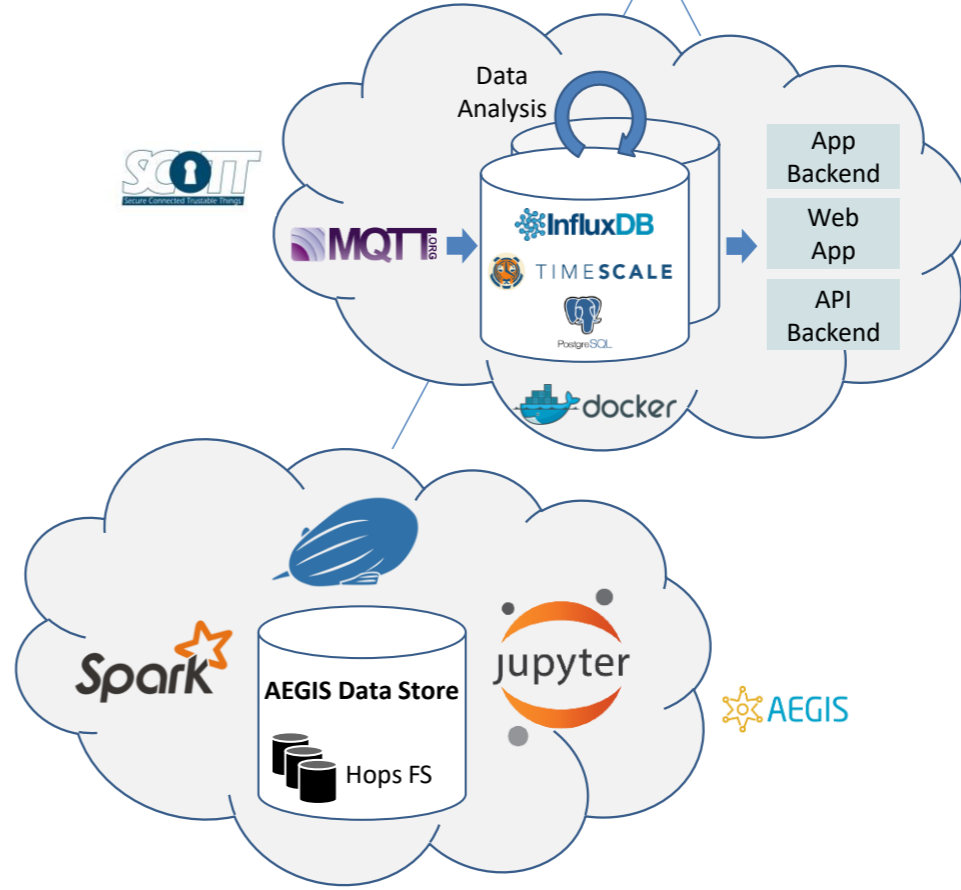
# Vehicle Data Value Chain (VDVC)

Derived from Curry et al. (2016)

Vehicle Data Value Chain:

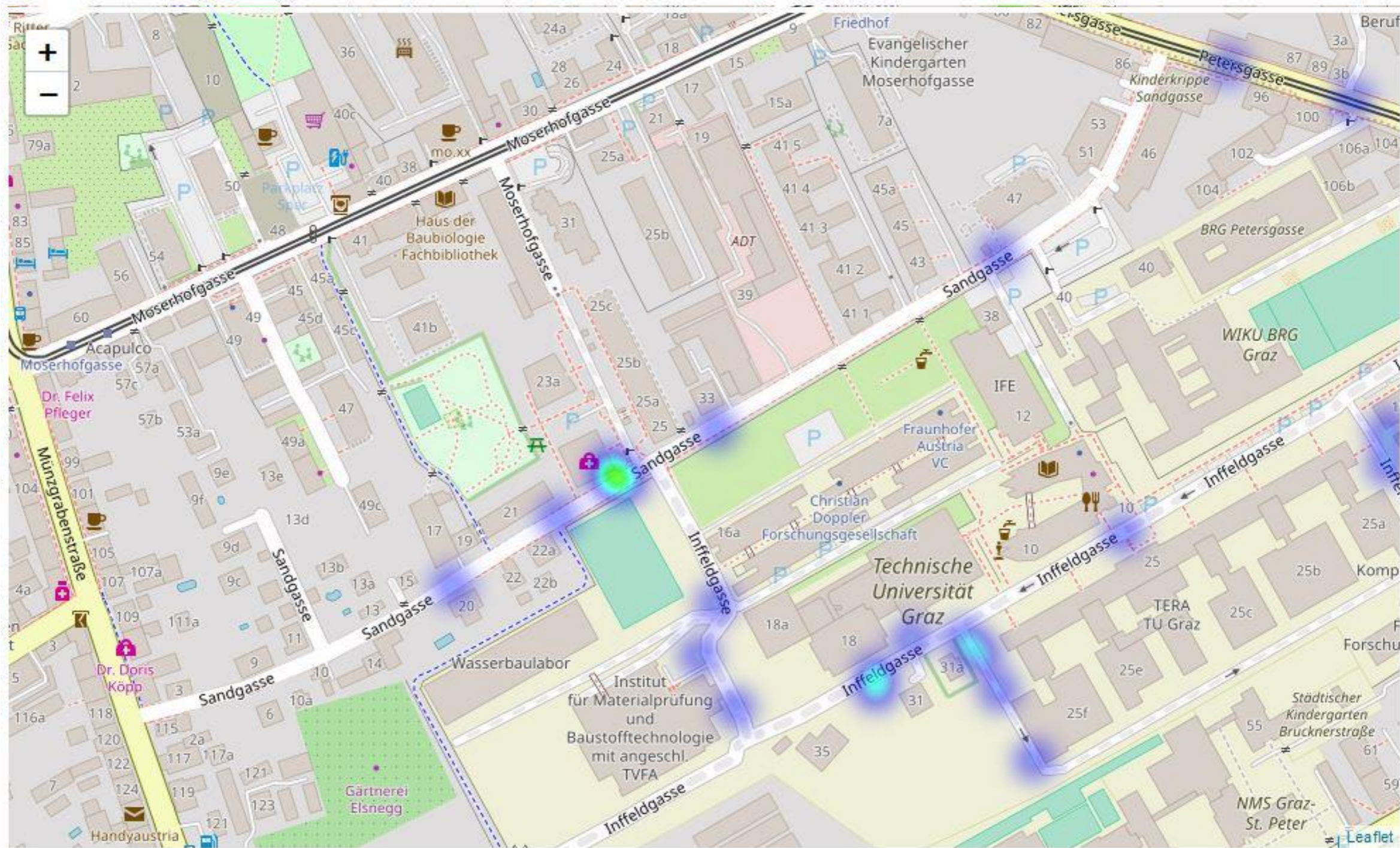


Source: Kaiser et al. (ECIS 2018)





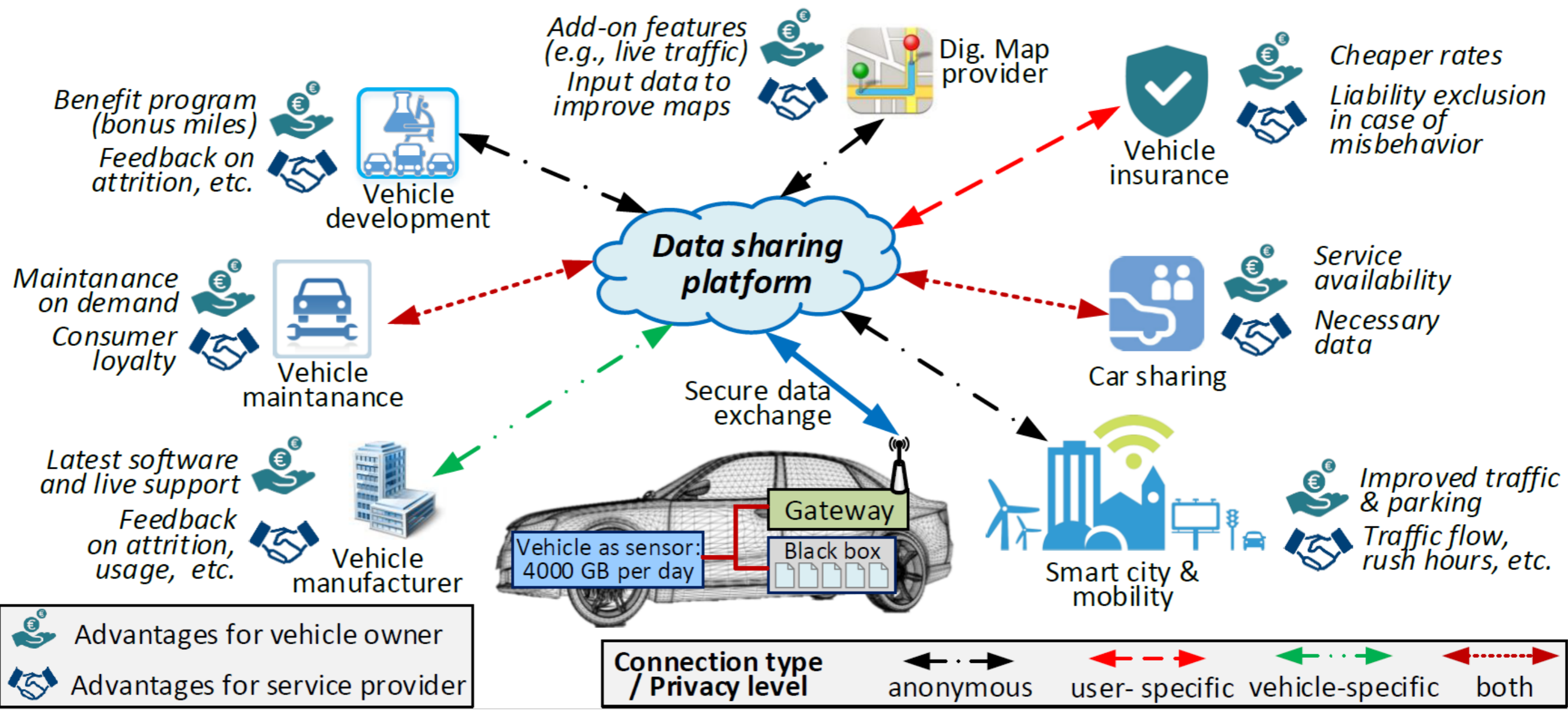
# Project AEGIS: Event map and speed bump / pothole heatmap



TOWARDS A DEFINITION of *Vehicle IS*

*“..**software applications processing vehicle data** and/or other relevant data from different sources **to finally provide valuable and action-relevant information** to the vehicle driver and/or to other stakeholders.”*

*(Kaiser et al., 2018)*



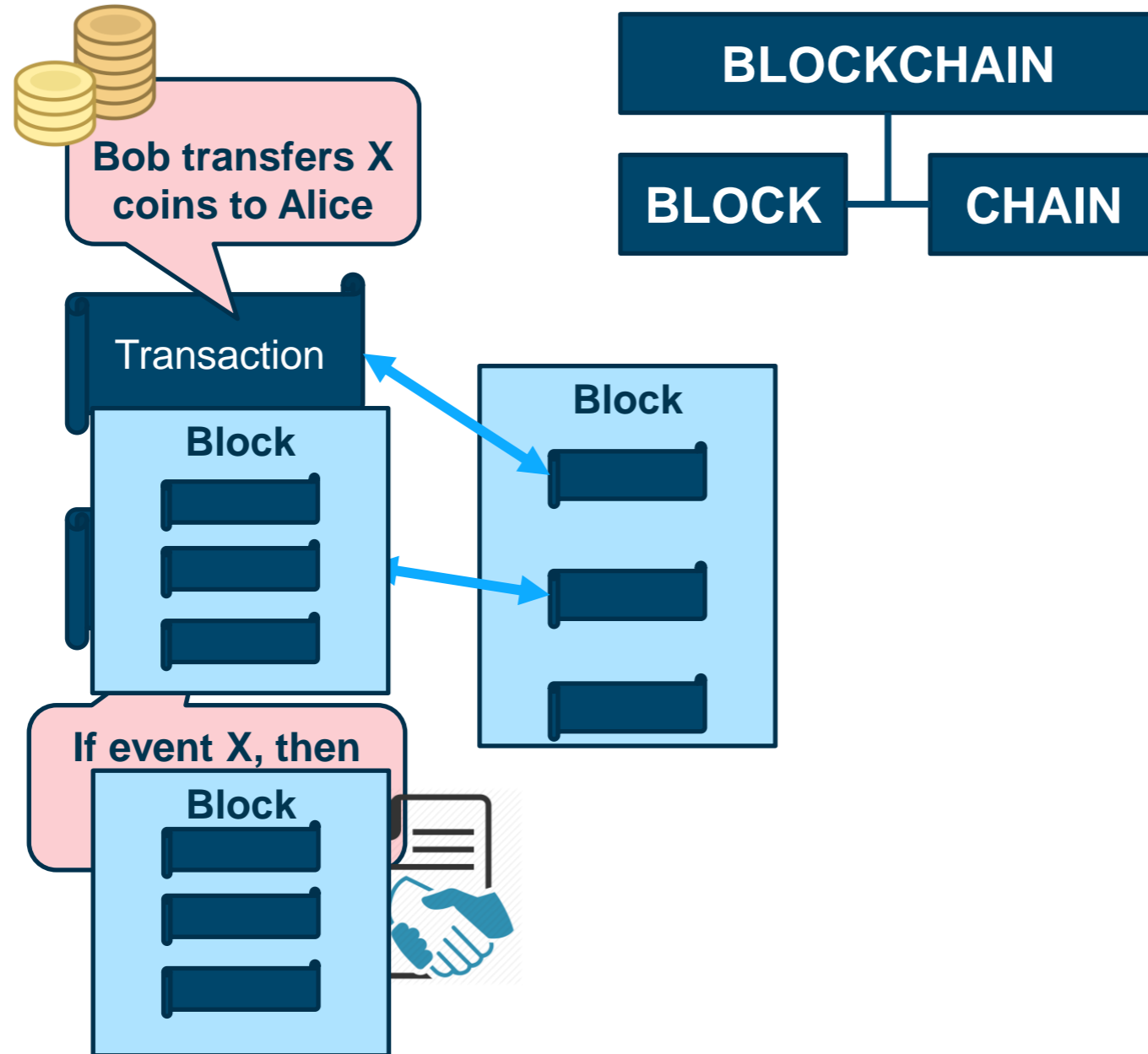
## Some facts:

- Cars will be connected  
→ essential part of the IoT
- Vehicles can collect a huge amount of data (existing sensors)
- ICT companies are targeting the automotive market
- Cloud services are interesting for OEMs, suppliers, and third parties
- Lack of concrete applications  
→ data collection vs. sharing

## What are the related problems?

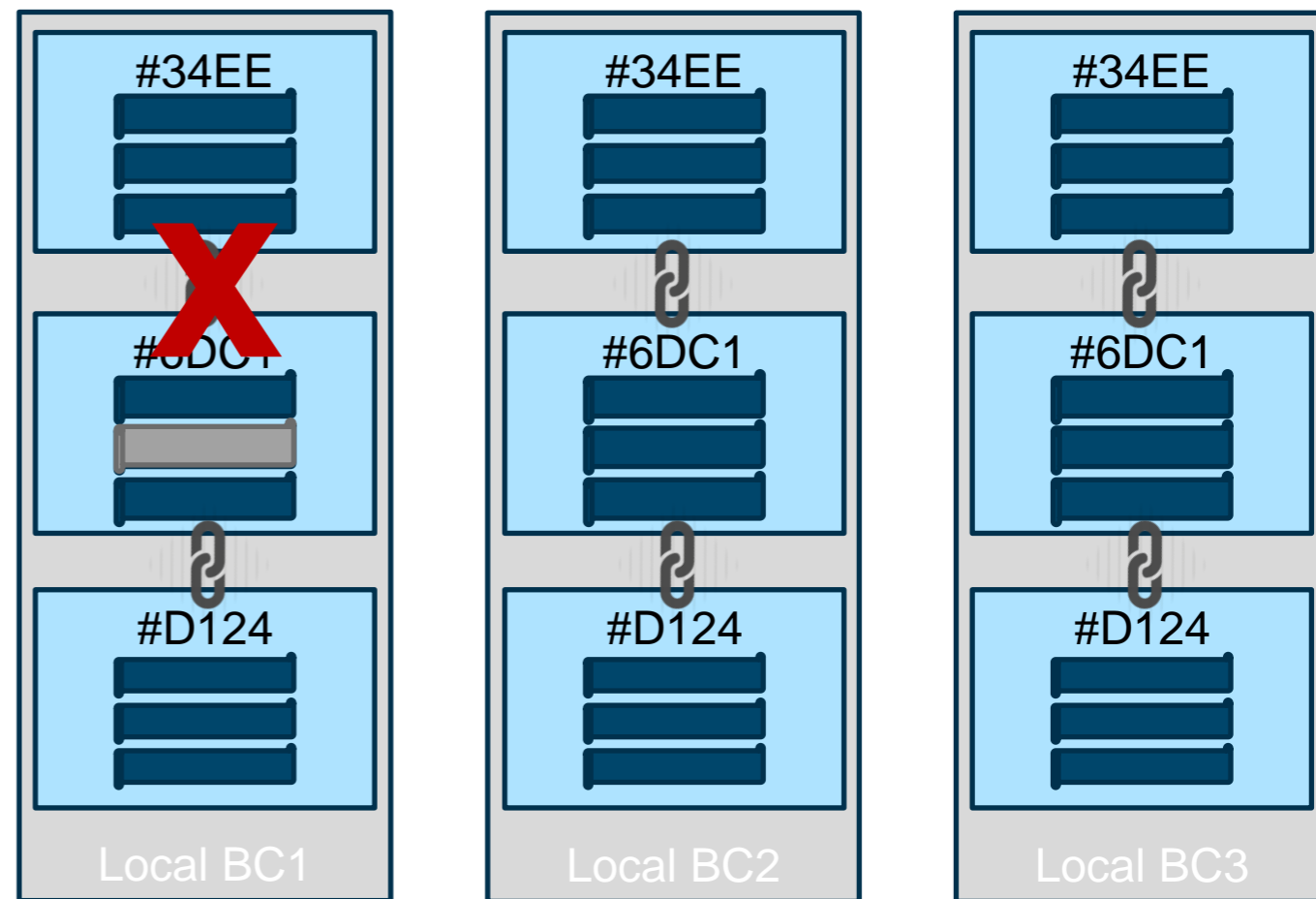
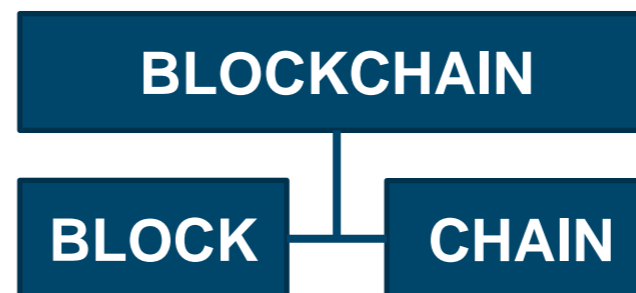
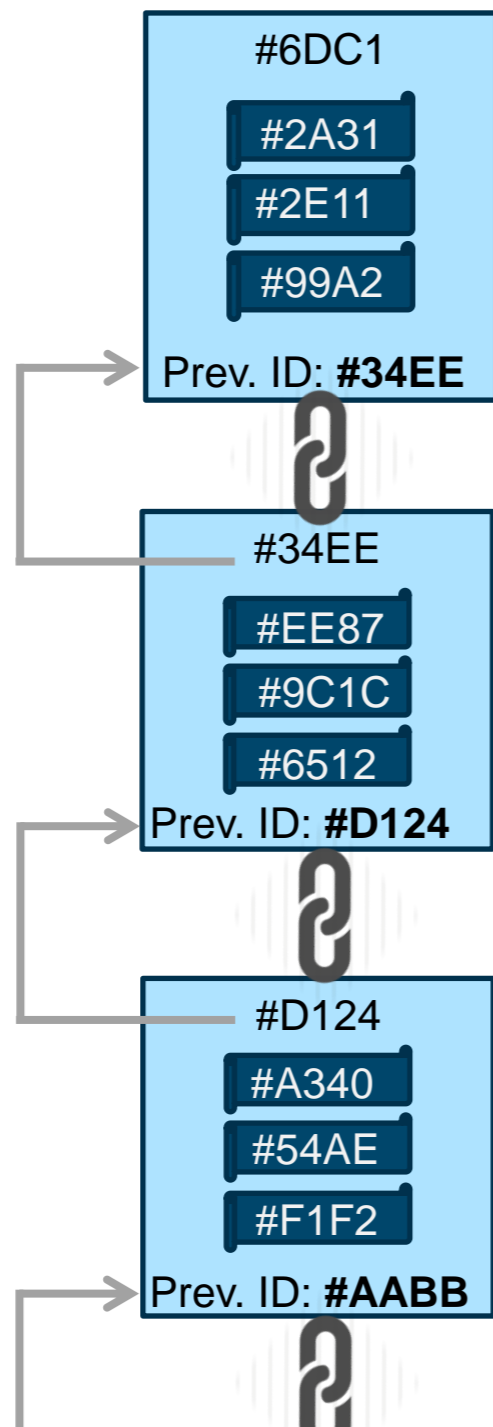
- How to transfer data → 5G, c-roads?
- Where to put the data?
- **How to share the data?**
- How to provide services?
  
- **How to control my data?**  
→ **privacy setting per service**
- How to ensure data integrity?
- Earn money by data sharing?

# Blockchain Basics – functionality



# Blockchain Basics – functionality & key benefits

- Tamper-proof data storage
- Scalability & decentralization
- Privacy preserving
- Trust & Transparency

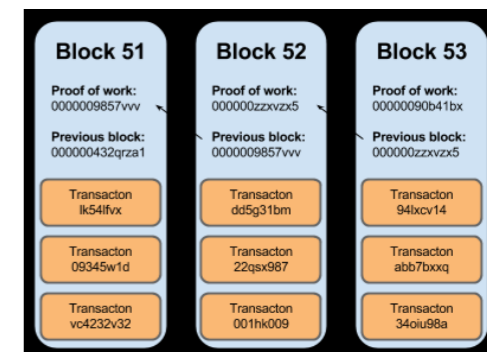
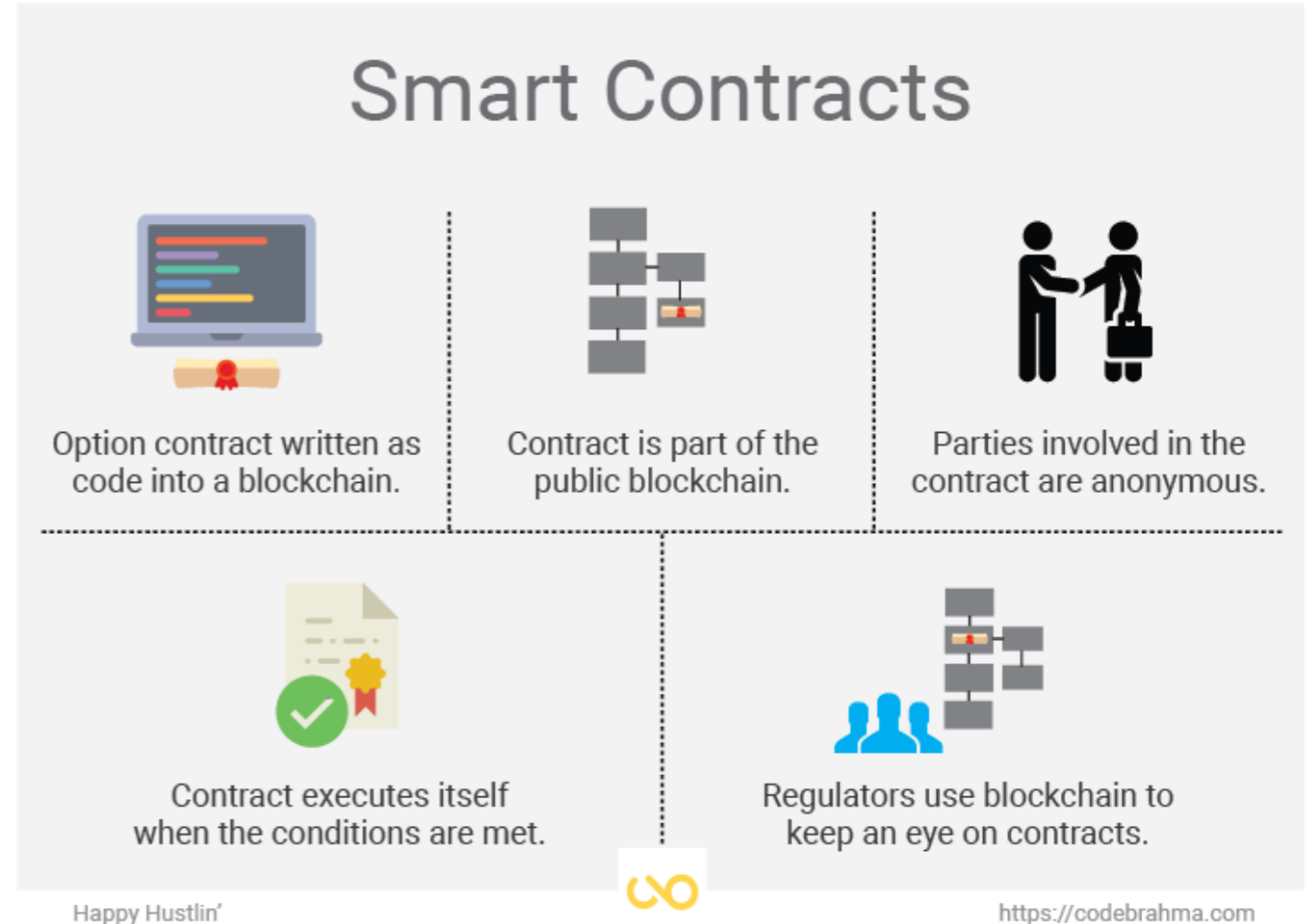


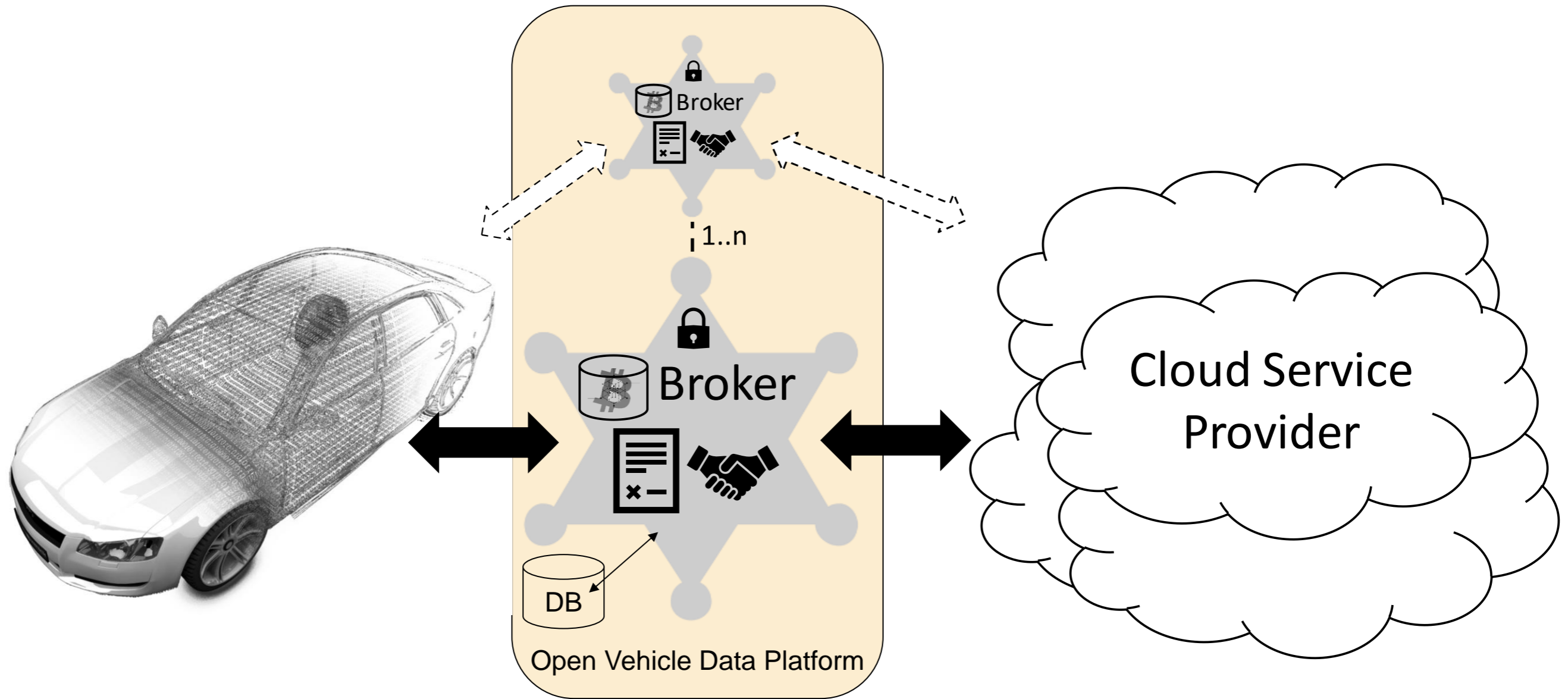
Smart contracts using Blockchain technology: specify data access per data type for each service

Driver is able to decide if and how driving data is shared with service providers

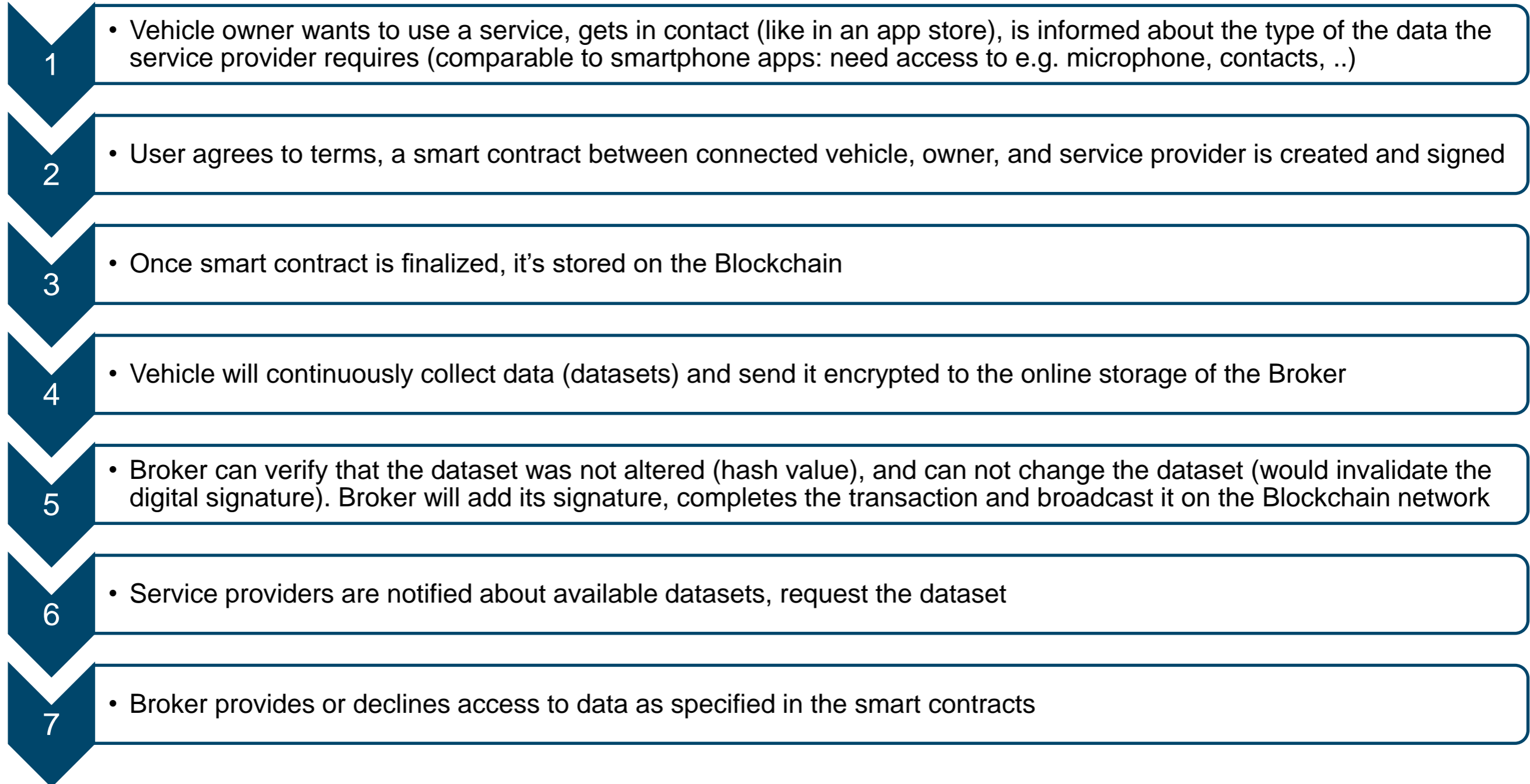
Signed contract, Blockchain techn. ensures:

- Contract can not be manipulated
- Contract is available to Brokers which provide / manage the secure data storage and are responsible to handle data access for service providers











THANK YOU

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