W3C Vehicle Data Access with Eclipse KUKSA

Blueprint for Vehicle Data Oriented Strategy - Return of Experience

Sebastian Schildt | 16.05.2019
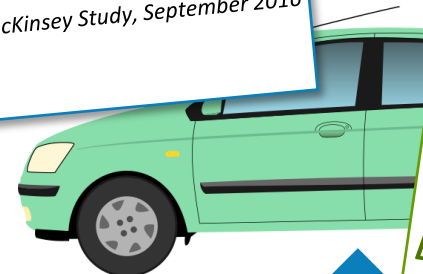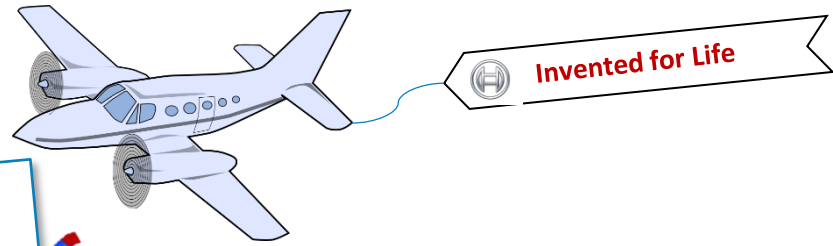
What Is Eclipse KUKSA And Why Should You Care?

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# The World is Changing

Invented for Life

Thing

"The overall revenue pool from car data monetization at a global scale might add up to USD 450 - 750 billion by 2030"

Source: Monetizing car data- McKinsey Study, September 2016

"The Global Connected Car Market is Estimated to be USD 72.89 Billion in 2017 and is Projected to Reach USD 219.21 Billion by 2025."

Co... ...Market - Global Forecast 2025, ResearchAndMarkets.com

In 2017, there were 107 million connected cars out on the road. This number is expected to increase to 358 million connected cars in 2022

Connected Car Report 2018, statista, June 2018
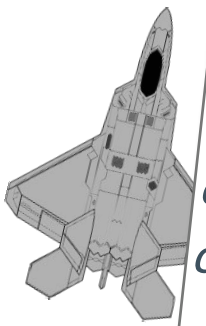
...nnected!

A challenging playing field

Established OEMs and Large Suppliers

- Value creation moves to digital services
- Much faster innovation cycles
- Protect existing business

- Domain knowledge
- Access to in-car data
- Extend existing business

Large Cloud Players

- No direct access to in-vehicle data
- Software-focussed

- Experience in generating value from data
- Experience to handle millions of users

Newcomers, SMEs

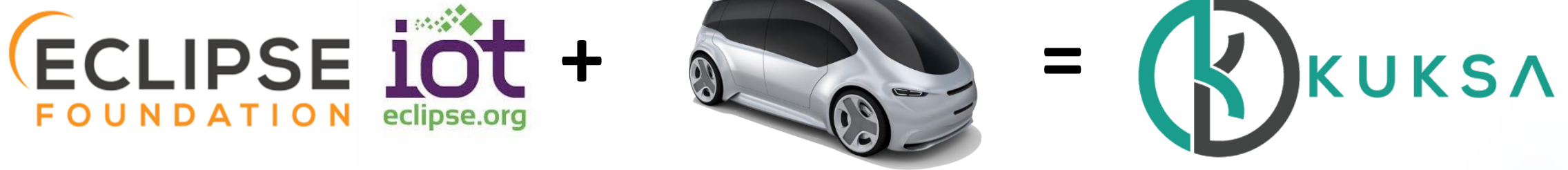- Require open systems and low market entry barriers

- Innovative business ideas

Eclipse KUKSA – A solid technical foundation

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

Mission

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!***

Eclipse KUKSA Ecosystem

Eclipse Kuksa is not trying to reinvent the wheel,

We use and foster Open Source solutions to create a harmonized composition of existing Open Source projects enriched with specific KUKSA components

Using **proven IoT technologies** such as Hono, Hawkbit, Ditto, ….

Can be deployed on **existing Linux distributions** such as Automotive grade Linux, Apertis, Ubuntu,…

Eclipse Kuksa Ecosystem
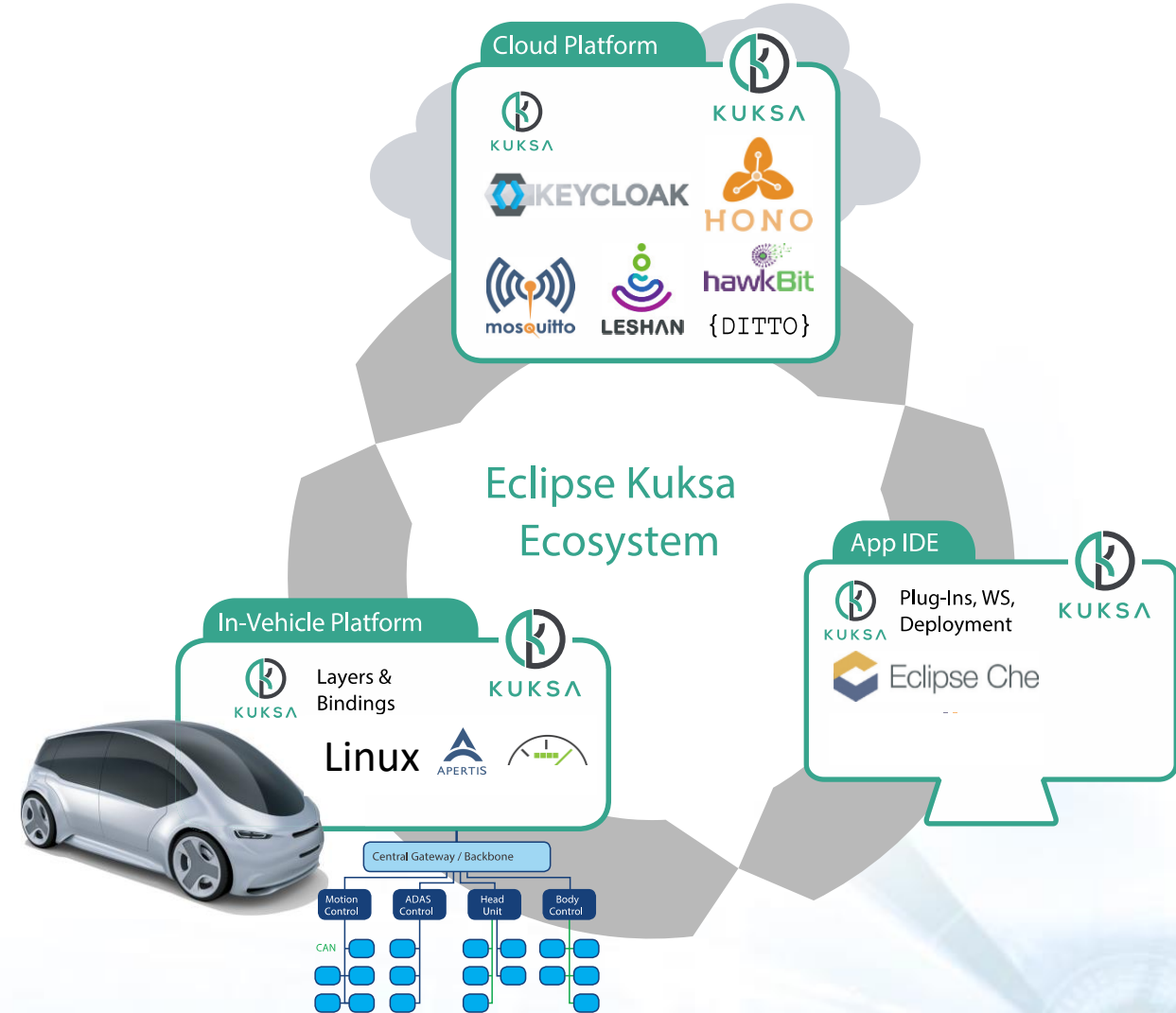
KUKSA: Some ingredients

back-end framework for rolling out software updates
https://www.eclipse.org/hawkbit/

Automotive Grade Linux
https://www.automotivelinux.org/

Connecting large numbers of IoT devices to a back end
https://www.eclipse.org/hono/

Apertis, Debian/Ubuntu based Linux for Autmotive
https://wiki.apertis.org/Main_Page

Access and ID management
https://www.keycloak.org/

Eclipse Cloud IDE
https://www.eclipse.org/che/

Container Platform
https://www.docker.com/

...

In-Vehicle Data Access with KUKSA

Eclipse KUKSA Deployment
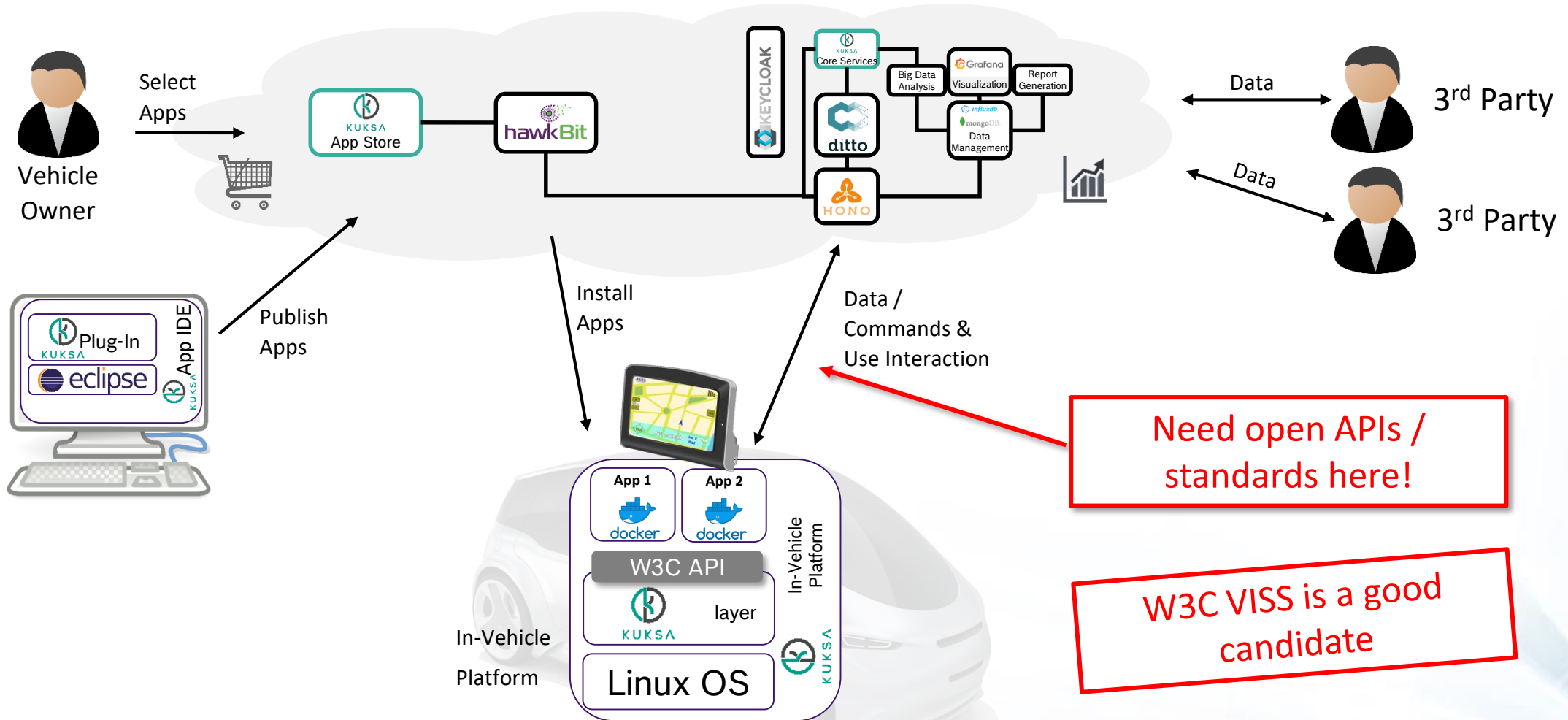
Data Access Hello-World in KUKSA

cloud

In-vehicle

Datalogger App

HTTP
MQTT

W3C Vis Server

https://www.w3.org/TR/vehicle-information-

ELM327 VIS Feeder

Bluetooth

OBD Adapter

engine — body

rpm | speed | mirrors | doors | weight

fuel_type

left | right | ...

heated | dimmed | ...

signal | branch | attribute
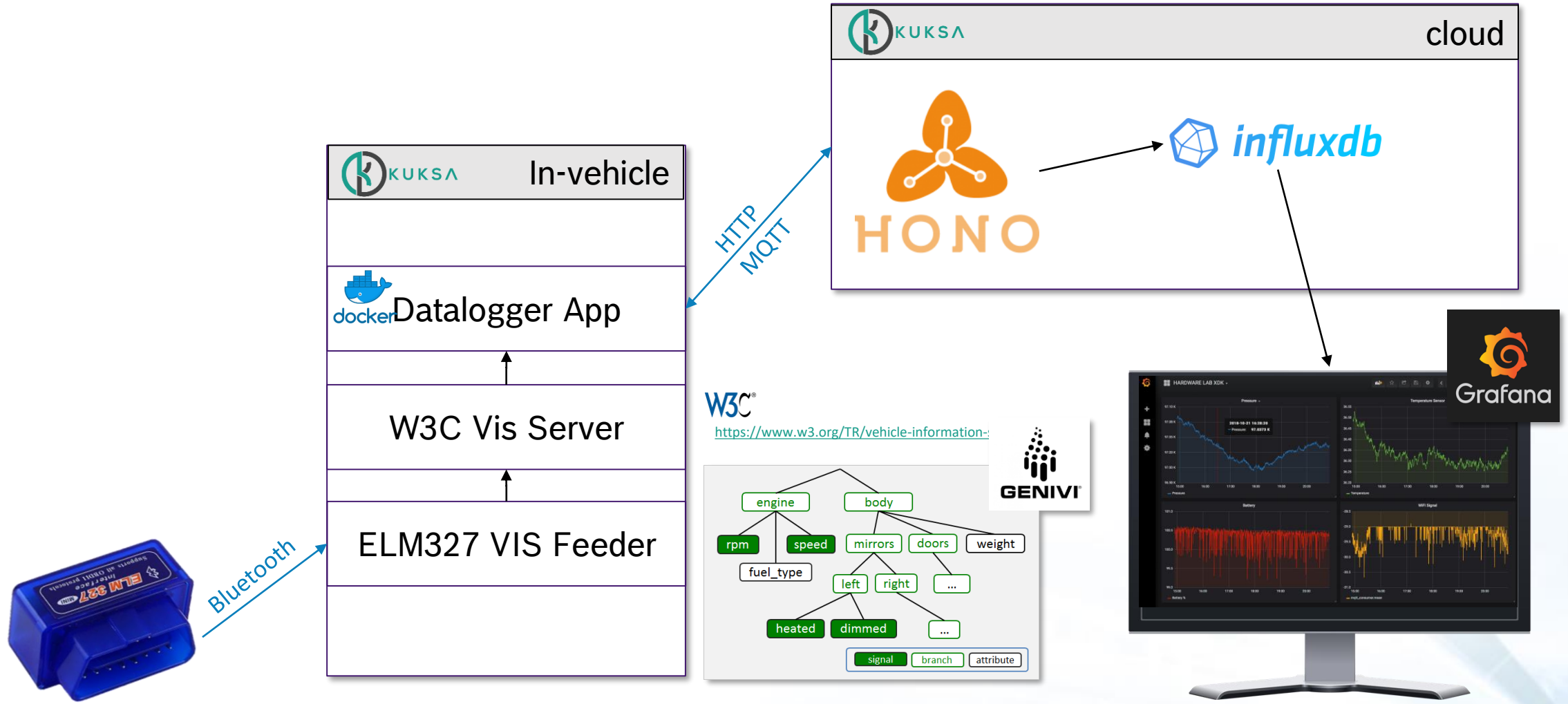
Enabling more use cases with KUKSA
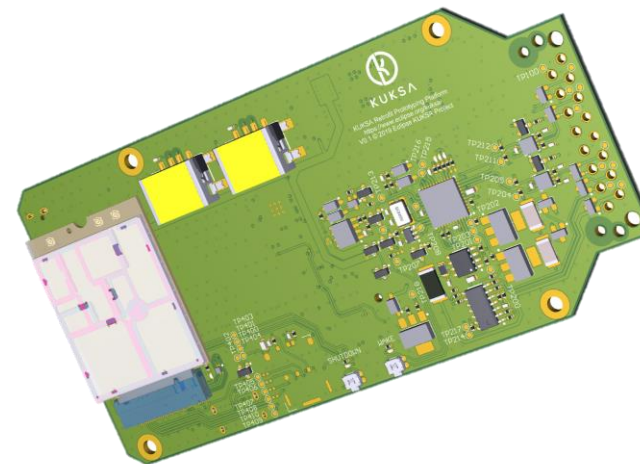
Driver Authentication using direct access to vehicle bus

Otokar

KUSA retrofit prototyping platform

Combines Compute+LTE+OBD access

Will be released as open-source soon

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Experiences with W3C VISS V1

- No concept for different network transports
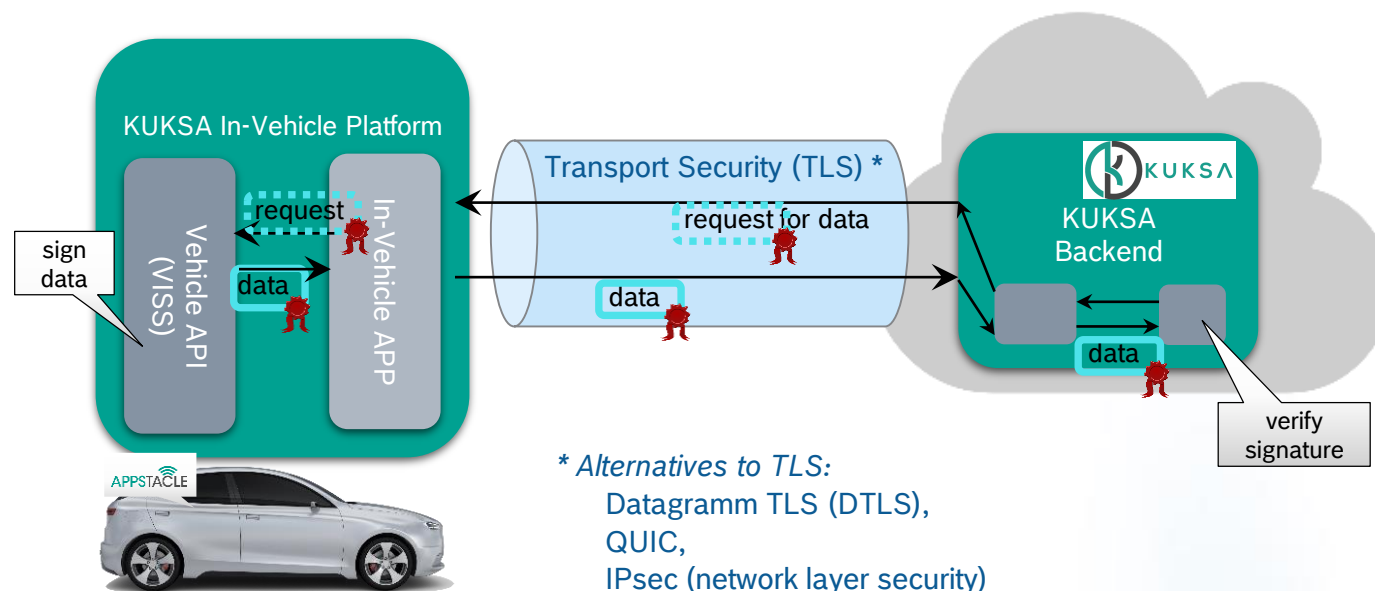 - Specification is websocket only → not a good choice for cellular connections

- No **security** whatsoever
  - Maybe it was "out-of-scope", but this **is a must**

- The provided **abstraction is key** to enable fleet-wide use cases

- Current VSS data model might need some **standardized extensions**
  - The data structure allows this

https://www.w3.org/TR/vehicle-information-
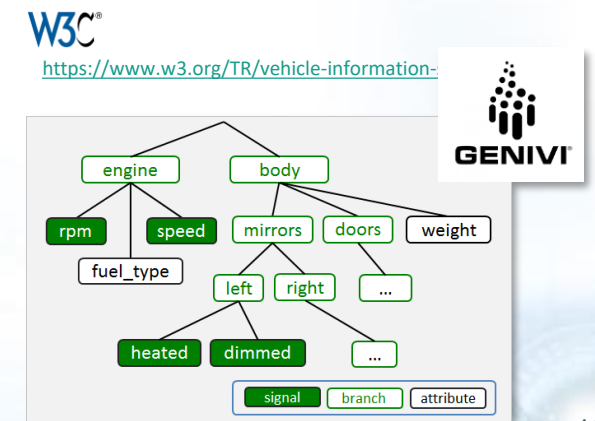
KUKSA Security for W3C VISS

▶ **Request is authorized by a token**

  ▶ JSON Web Token (JWT) encodes permissions

  ▶ JWT is issued by Authorization Server (Keycloak)

  ▶ Tokens must be stored and transmitted securely to protect against token stealing

Authenticate on VISS message level → transport agnostic

Leave encryption to the transport(s)

KUKSA In-Vehicle Platform

Vehicle API (VISS)

In-Vehicle APP

sign data

request

data

Transport Security (TLS) *

request for data

data

KUKSA Backend

data

verify signature

* *Alternatives to TLS:*
   Datagramm TLS (DTLS),
   QUIC,
   IPsec (network layer security)

signed object:

optionally(?) signed object:

KUKSA Permission Model for Vehicle API

Support for different vehicle APIs

▶ W3C VSS
  ▶ Permissions for "subtrees"
  ▶ Flexibel: fine- or coarse-grained, as needed
  ▶ "wildcard": * (top level), a.*.door (intermediate)
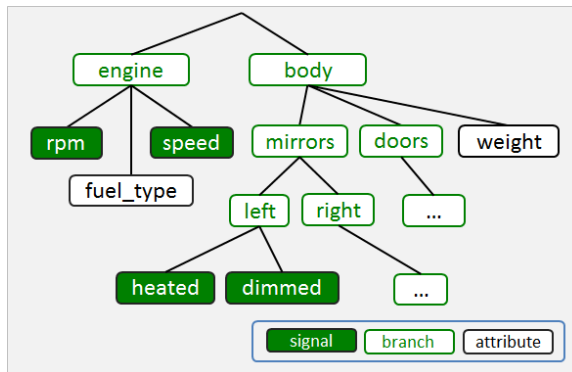
▶ Direct Access API
  (raw can frames)
  ▶ Permission for CAN IDs

Proposal: List of APIs with permissions
(JWT claim in token)

▶ Simple read / write permissions (get / set): r, w, rw
  ▶ More complex "logic" seems unnecessary
▶ Default: forbidden (white list)

```
"api-permissions" : {
   "w3c-vss" : {
           "drivetrain.fuelsystem" : "r",
           "infotainment.media.action" : "rw",
           "cabin.door.*.islocked": "r"
           },
   "can-raw" : { "3A" : "r", "1E" : "w"},
   "sensoris" : { ... }
}
```

Summary

- Data-based business requires **open standards**

- A single use case can not pay for the infrastructure needed

- A **large ecosystem** enables economies of scale and allows to monetize more use cases

- **Eclipse KUKSA provides technical solutions** for a connected car ecosystem

- Regarding data access the extensible VSS data structure and W3C VIS is a good start

- More work is needed

Thank you!

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

https://github.com/eclipse?q=kuksa

KUKSA

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