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?
The World is Changing

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

“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.”
Connected Car 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
### A challenging playing field

<table>
<thead>
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<th>Established OEMs and Large Suppliers</th>
<th>Large Cloud Players</th>
<th>Newcomers, SMEs</th>
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<tr>
<td>• Value creation moves to digital services</td>
<td>• Domain knowledge</td>
<td>• Require open systems and low market entry barriers</td>
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<td>• Much faster innovation cycles</td>
<td>• Access to in-car data</td>
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<td>• Protect existing business</td>
<td>• Extend existing business</td>
<td>• Innovative business ideas</td>
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<tr>
<td>• Experience in generating value from data</td>
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<td>• Experience to handle millions of users</td>
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<tr>
<td>• No direct access to in-vehicle data</td>
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<td>• Software-focused</td>
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Eclipse KUKSA – A solid technical foundation

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**!
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,....
KUKSA: Some ingredients

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

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

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

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

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

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

Eclipse Cloud IDE
https://www.eclipse.org/che/
In-Vehicle Data Access with KUKSA
Eclipse KUKSA Deployment

Vehicle Owner

Select Apps

Publish Apps

Install Apps

In-Vehicle Platform

Linux OS

W3C API

In-Vehicle Platform

App 1

App 2

docker
docker

3rd Party

3rd Party

Data

Need open APIs / standards here!

W3C VISS is a good candidate

Application IDE

App Store

hawkBit

ditto

KUKSA

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App 2

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Data / Commands & Use Interaction

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Data
Data Access Hello-World in KUKSA

In-vehicle

- Datalogger App
- W3C Vis Server
- ELM327 VIS Feeder

HTTP Mqtt

cloud

influxdb

Grafana

OBD Adapter

W3C
https://www.w3.org/TR/vehicle-information-

Bluetooth

Datalogger App

W3C Vis Server

ELM327 VIS Feeder
Enabling more use cases with KUKSA

KUSA retrofit prototyping platform
Combines Compute+LTE+OBD access
Will be released as open-source soon
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-service/
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 Permission Model for Vehicle API**

**Support for different vehicle APIs**

- **W3C VSS**
  - Permissions for “subtrees”
  - Flexible: 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)

```json
"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