Driving the Future Connected Vehicle with Eclipse Kuksa

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Outline

• What is Eclipse Kuksa?
• Who is Eclipse Kuksa?
• Why do we need Eclipse Kuksa?
• What can you do with Eclipse Kuksa?
  • Cloud Platform
  • In-Vehicle Platform (2 demo videos)
  • IDE (Demo video)
• Where is Eclipse Kuksa heading?
What is Eclipse Kuksa?
What is Eclipse Kuksa?

- A secure and open automotive ecosystem
- Strengthen collaboration and innovation in the vehicle industry
- Standardized IoT, 5G, V2X, and cloud technologies
- Making legacy cars smart traffic compliant
Who is Eclipse Kuksa?
Who is Eclipse Kuksa?

• “open standard APplication Platform for carS and TrAnsportation vehiCLEs”
  • Open source software
  • Car-to-cloud connectivity
  • External applications
  • Security

• Key figures:
  • 3 Years (until 12.2019)
  • 4 Countries
  • 20 Partners
  • 146.62 Person-Years
  • 18,8 M€ Budget
Who is Eclipse Kuksa?

**WP6: Management**
Why do we need Eclipse Kuksa?
Why do we need Eclipse Kuksa?

Figures not approved
New Apps, Updates and Upgrades for Vehicles* (thr. HMI)

*Not safety related

<table>
<thead>
<tr>
<th>Adaptive Cruise Control</th>
<th>Active Parking Assistant</th>
<th>Active Lane Keeping Assistant</th>
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Figures not approved

Cloud-based wrong-way driver warning | Community-based parking
Why do we need Eclipse Kuksa?

... to create a cross-vendor connected vehicle ecosystem that relies on open standards and uses open source software to leverage the potential of a large developer community!
Varying Market Access

• OEMs & BEs
  • Domain knowledge
  • In-Car data access
  • Fast innovation cycle
  • Protect existing business
  • Extend existing business

• Large Cloud Players
  • No in-car data access
  • Software and Cloud knowledge
  • Experience with data and domain value

• SMEs, newcomers
  • No market (without OS) access
  • Innovation
Why Open Source

Compete on products and services
Build this in and with open source, even if that means working with your direct competitors
Market Value

“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.”

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

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.
What can you do with Eclipse Kuksa?

Cloud, In-Vehicle, and IDE platforms
Eclipse Kuksa - General Overview

Vehicle Owner

Select Apps

Vehicle Owner

Publish Apps

Install Apps

Data / Commands & Use Interaction

In-Vehicle Platform

In-Vehicle Platform

In-Vehicle Platform

In-Vehicle Platform

App 1

App 2

W3C API

layer

App Store

hawkBit

ditto

3rd Party

Data

3rd Party

Data

3rd Party

Data

3rd Party

Data
Eclipse Kuksa - Cloud Platform

- Third Party Services
  - Keycloak
  - App Store
  - Core Services
  - Third Party Services

- Core Services
  - Kuksa
  - ditto
  - Hono

- Big Data Analysis
  - Grafana
  - Visualization
  - Report Generation
  - Data Management
    - influxdb
    - mongoDB

(Automatic) Deployment
Eclipse Kuksa - Appstore
Eclipse Kuksa - In-Vehicle Platform

• What can we use that already exists?

(Bar chart showing platform features and runtime with AGL, Apertis, Ubuntu Core, SuSE embedded, Legato, QNX, and Android Automotive)
In-Vehicle Platform: Current State

• Created
  • bitbake recipes
  • custom (cmake & bash) scripts
  • various AGL layers, and services
  • Raml2Agl tool

• to provide
  • App installation (Demo video)
  • MQTT messaging (Eclipse Paho)
  • Eclipse HawkBit communication
  • RPI image setup

• Tracccar client (Demo Video)
• MQTT / HTTP data logger
• W3C Visserver API
• Direct Access API
• AGL websocket communication generation
• …
AppManager Video
In-Vehicle Setup Example

- ELM 327 OBD-II Adapter to get data:
  - Speed (vehicle, motor rpm)
  - Temperatures
  - Distance (ultrasonic data)
  - GPS
  - Error Codes ...

- RPI collects data, translates data to W3C standard, and sends it to the Kuksa Cloud (Hono → InfluxDB → Grafana)

- Email notification app

- W3C = Vehicle information service specification (websocket based)
In-Vehicle Setup Example

- OBD Adapter
- Datalogger App
- W3C VIS Server
- ELM327 VIS Feeder

Cloud

HTTP/MQTT

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

influxdb

Grafana

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OBD Video
Eclipse Kuksa - Direct Access API

- Secure access to in-vehicle busses for authenticated applications

Request Access → Check Access → Access CAN

App queries specific CAN ID

Access granted → Access CAN

Access denied → END

Black / White list, rules → Real CAN device

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Eclipse Kuksa—Use Cases

2.3. User Story: Vehicle Tracking

Idea
The owner of a car or a third party need to track the position of a specific vehicle. Such scenario may occur for several reasons (e.g. for fleet management, stolen vehicle tracking, may also drive insurance.

2.8. User Story: Driver Seat Configuration

Idea
Cars used by several drivers can store the configuration of each driver. Car fleets (e.g. bus or truck.

2.4. User Story: Wrong Way Driver Warning

Idea
A vehicle takes part in a wrong way driver warning system in order to increase its own and other

2.5. User Story: Augment vehicle functionality

Idea
This user story describes a scenario where a vehicle will be enhanced by a specific functionality in order to adjust to special equipment. For example, adding a roof rack or a trailer to a vehicle might

2.12. User Story: Car Theft Registration, Car Vandalism Registration

Idea
*Dash Cam* videos may upload the current seconds preceding and during a car theft to the cloud.

https://itea3.org/project/workpackage/document/download/4464/15017-APPSTACLE-WP-1-SpecificationofIn-carSoftwareArchitectureforCar2XApplications
Eclipse Kuksa IDE

- Based on Eclipse Che
- Allows Cloud and In-Vehicle Application development
- Platform independent
- AGL stack
- Yocto SDK
- Target specification
- Shared workspaces
- Almost configuration free
- Docker-based
IDE Video
New Telemetry UI
Where is Eclipse Kuksa heading?
Eclipse Kuksa Roadmap

- **01.2017** Start of APPSTACLE
- **12.2017** Initial Kuksa In-Vehicle Setup
- **10.2017** Platform study finished → AGL
- **04.2018** Kuksa-AGL running with OBD-II
- **02.2018** BCX presentation & Hackathon
- **05.2018** IDS
- **06.2018** W3C data
- **12.2018** OTA & FOTA
- **06.2018** Initial contr. Direct Ac. API
- **05.2018** Yocto & target deployment
- **10.2018** Appstore
- **12.2018** Appstore Direct Ac. API
- **05.2019** BCX
- **02.2019** IoT Day
- **12.2019** Kuksa 1.0
- **--.2019** TLS support
Thank you for your attention

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