Car 2 Cloud
Connected Vehicle Data Architectures

Gerald Spreitz | May 15th, 2019
Car 2 Cloud BoF
Connected Car and Cloud

Variants of V2X, Connected Car, Cloud and IoT for the car

• Safety related C2C, C2I, C2N or in the US V2V, V2I and V2N
  - Based on dedicated radio technology
  - Limited standardized data protocol

• Car status related connected car systems
  - Based on standard mobile radio IP connection
  - Car maintenance and Comfort oriented function
  - Target is the individual car or driver

• Automotive IoT
  - Based on standard mobile radio IP connection
  - Heterogeneous car data and sensor information
  - “Big Data” style of data usage to generate new services
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Radio technology standardization organisations

• C2C-CC - Car-to-Car Communication Consortium  www.car-2-car.org
  - Objective: Development and contribution to C-ITS standardization, demonstration of technical and commercial feasibility
  - Technology: (pWLAN / 802.11p; dedicated band at 5.9 GHz
  - Standardization Body : ETSI
  - Partners: 80 members w/ 17 vehicle manufacturers, 39 suppliers and 30 research organizations
  - Foundation in 2007

• 5GAA - 5G Automotive Alliance
  - Objective: Evolve, test and promote communication solutions, to support their standardization and accelerate their commercial availability
  - Technology: (C-V2X/5G )
  - Standardization Body : 3GPP
  - Partners: > 40 members, founding members
  - Foundation 09/2016
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ISO 20078-80  Extended Vehicle (ExVe)

- Standard for collecting car status data
- Maintenance use cases.
  - Remote Diagnostic Support
- Access for 3rd part and aftermarket service supplier via Neutral Server (VDA concept)
- Rules for data access still open
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SENSORIS

• Standard for collecting car data and sensor data.

• Focus on vehicle surrounding:
  - Street signs
  - Lanes

• Capability to distribute sensing task to car fleets.
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CCC

- Used to be Mirrorlink

- They added
  - Car Data
  - Digital Key
  - Car sharing

Source: [www.carconnectivity.org](http://www.carconnectivity.org)
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Protocol, Data and Application oriented organisations
To be analysed

• SENSORIS (Protocol for sensor data, Vehicle surrounding and internal car data)
• Automat Project [http://automat-project.eu/]
• W3C (Vehicle Signal specification) / existing GENIVI cooperation for VSS
• ISO 20078 Extended Vehicle (ExVe)
  - Use cases, Aftermarket data access
• CCC (Mirrorlink, Car Data, Digital Key) [https://carconnectivity.org/]
• Open Connectivity Foundation (OCF) [https://openconnectivity.org]
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SW for V2X and IoT oriented organisations

- Eclipse Kuksa
  - System SW components for Vehicle IoT solutions for the vehicle and the cloud.

- Autosar
  - SW supporting safety features and automated driving.
  - Based on C-ITS
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What about GENIVI?

• Possible fields of action
  o SW Architecture and SW components integrating non-safety C2X / IoT for in-car & infrastructure
  o Framework which facilitates the integration of open and closed APIs from different organisations
  o Reuse of existing SW components from the Eclipse Kuksa project
  o Based on standard mobile radio IP-links
  o Cooperation with Eclipse Kuksa, Sensoris, W3C
  o Perspective: CCC, ExVe
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Exemplary SW Reference architecture

Cloud
- Hawkbit SW update
- GENIVI Connected Car – Cloud Framework
  - Sensoris
  - ExVe
  - W3C
  - Kuksa, Communication
  - HONO Protocol Adapter MQTT or...
  - 4G/5G Network

Vehicle
IVA-System, Connectivity
- Hawkbit SW update
- GENIVI Connected Car Framework
  - Authorization
  - Kuksa, Communication Management
    - W3C
    - Sensoris
    - ExVe
  - HONO Protocol Adapter MQTT or...
  - 4G/5G Modem
  - Vehicle Bus
  - Sensor & State Manager
  - C-ITS
  - V2V, V2I
  - pWLAN 5GAA

Road Infrastructure

AUTOSAR

Sensor & State Information
Draft Workplan & sprint planning with 2 month iterations

Kick-off and call for participation GENIVI AMM  MAI ’19

- Project Backlog filling and Definition of done  Mai ’19 and June ’19

ANALYSIS PHASE (from Jul ’19)

1. Sprint
   - Analysis of existing data and signal specifications
   - Review of other project charters and architecture

2. Sprint
   - First requirement collection
   - Business case selection

3. Sprint
   - Analysis and definition of architecture building blocks
     - E.g. authorization, protocol adaptors, cloud and vehicle architecture

Dec 19: Retrospective

- Verified Overview/Reference System Architecture
- Selection of prototype scope
Header of section
 Draft Workplan

DESIGN PHASE

1. Sprint
   • Identification of communication and interface structure

2. Sprint
   • Selection of possible SW and communication technologies for the building blocks
   • Requirement update

3. Sprint
   • Definition of reference System and SW Architecture

Jul ’20 Retrospective

Definition of prototype architecture
IMPLEMENTATION PHASE

1. Sprint
   - Selection of prototype building blocks
   - Selection of prototype platform

2. Sprint
   - Implementation or Integration of mandatory components

3. Sprint
   - System Test

DEC ’20 Retrospective
Prototype testing and presentation (CES Jan 2021)
Thank you!

Visit GENIVI:
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http://projects.genivi.org

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