Standardisation supporting Automated Driving

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ISO/IEC JTC1 AG6
Autonomous vehicles technology landscape

ISO/IEC JTC1 AG6 Autonomous and Data Rich Vehicles
- Assess the current state of Vehicular Data standardization activities
- Establish relations and coordinate Vehicular Data standards development and harmonization
- Engage with standards setting organizations that are involved in vehicular data in the area of Autonomous Vehicle standardization

AG6 ran a gap analysis on available standards and activities
ISO/IEC JTC1 AG6 – gap analysis’ key findings

- **Fully automated vehicles** are already found in limited environments such as rail systems, farming and mining.

- Automated and autonomous vehicles may be connected to other systems or may be self-contained.

- **Standardization** activities are currently done in silos and are rather road vehicle centric.

- Standardisation is needed where data is exchanged between vehicles and infrastructure for interoperability or regulatory related certification reasons.

- Currently, there are around **400 standards on connected road vehicles**. An inventory of some of the work can be found at http://htg7.org

- The terminology used to characterise automated and autonomous vehicle has not be fully standardised yet. Eg. the confusion about the definition of ‘automated’ and ‘autonomy’.
Open AutoDrive Forum (OADF)

Cross-domain discussion platform driving standardizations in the area of automated driving

**ADASIS**
The data exchange interface to support Advanced Driver Assistance Systems (ADAS) applications.
www.adasis.org

**SIP-adus**
Develops ITS as cross-ministerial collaboration, working on AD system implementation in Japan and next-gen urban transport.
http://en.sip-adus.go.jp

**SENSORIS**
The interface specification for vehicle sensor data.
www.sensor-is.org

**TISA**
Traffic and travel information services and products based on RDS-TMC and TPEG™.
www.tisa.org

**NDS**
The worldwide standard for map data in automotive eco-systems.
www.nds-association.org

**OpenAuto Drive Forum**
Cross-domain discussion platform driving standardizations in the area of automated driving.
A map-centric ecosystem supporting AD – the beginning

Source: OADF @ Copenhagen, ITS World Congress
The map-centric ecosystem in more details

Map Infrastructure

Simulation
Proprietary functions

Vehicle
Proprietary services / ADAS/AD functions

Infrastructure
TMC / PSAP / EFC / Grid
Proprietary Services

Proprietary Services
The map-centric ecosystem in more details

Map Infrastructure

Proprietary Services

Simulation

ASAM
OpenDRIVE/OpenCRG/OpenSc

Vehicle

Proprietary services/ADAS/AD functions

Infrastructure

TMC / PSAP / EFC / Grid

Proprietary Services
The map-centric ecosystem in more details
Standardisation environment

Joint (European-international) approach was adopted in the standardisation of Intelligent Transport Systems (ITS) enabled by the Vienna Agreement in order to…

- …avoid duplication of work
- …avoid the creation of technology islands (which in fact exist unfortunately)
- …ensure the access for global stakeholders to regional initiatives
- …bring in expertise on missing competences
- …facilitate collaboration and leverage common goals
- …use internal and external liaisons’ outreach is more efficient

Liaison organisations: ETSI TC ITS, ISO TC22 SC31 and ADCG, ISO TC211, ISO TC268, ISO/IEC JTC1 SC42, SAE ORAD, TISA, IETF, RTCM

Liaison organisations are extending even further the above mentioned points.
Infrastructure classification Supporting Automated Driving

The other side
### ISAD levels (Carreras et al. 2018)

<table>
<thead>
<tr>
<th>ISAD</th>
<th>Name</th>
<th>Infrastructure side</th>
<th>AV side</th>
<th>Digital information provided to AVs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Digital map with road signs</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VMS warnings, incidents, weather</td>
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<td></td>
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<td></td>
<td></td>
<td>Microscopic traffic situation</td>
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<td></td>
<td>Guidance speed, gap, lane changes</td>
</tr>
</tbody>
</table>

- Conventional Infrastructure
  - **E**: Conventional infrastructure / no AV support
    - Infrastructure side: Road geometry and road signs have to be recognized by AVs on their own
    - AV side: None
  - **D**: Static digital information / map support
    - Infrastructure side: Digital map data (including static road signs) complemented by physical reference points
    - AV side: Traffic lights, short term road works and VMS have to be recognized by AVs on their own
  - **C**: Dynamic digital information
    - Infrastructure side: All static and dynamic information can be provided to the AVs in digital form
    - AV side: AVs perceive infrastructure support data
  - **B**: Cooperative perception
    - Infrastructure side: Infrastructure is capable of perceiving microscopic traffic situations
    - AV side: AVs perceive infrastructure support data in real time (C-ITS Day 1)
  - **A**: Cooperative driving
    - Infrastructure side: Infrastructure is capable of perceiving vehicle trajectories and guide single AVs (or AV groups)
    - AV side: AVs are guided by the infrastructure in order to optimize traffic flow (C-ITS Day 2+)

- Based on the ISAD Level of information and services different on-board vehicle decisions can be supported
- CAVs will have to be able to drive on E-level, but the additional possibilities provided by A-level sections enable a much higher customer satisfaction as well as support road safety and capacity management related goals

Source: Jacqueline Erhart (ASFINAG) – CCAM Single Platform
How to handle temporary/local missing ODD?

Definition of ODD gaps

Local roadwork zone

Temporary adverse weather conditions

Required ISAD functional

Source: Jacqueline Erhart (ASFINAG) – CCAM Single Platform
The Ecosystem approach

Automated Driving Functionality - Perspective

Infrastructure/Road Operator - Perspective

Regulation/Homologation - Perspective

Source: Jacqueline Erhart (ASFINAG) – CCAM Single Platform
Conclusions

- Connected and Automated Vehicles need joint standardisation efforts
- Interoperability of services is a must in an ubiquitous networking environment
- Standardisation is still fragmented and driven by different interests (Car industry, Infrastructure Operators, Network Operators, Policy-makers)
- Standardisation and harmonization efforts need to be invested on the road infrastructure side to support automated driving (such effort exists in CEN/TC226 Road equipment)
- Cooperative ITS is one of the enabler technology of Automated Driving, but only one of the list
- Map technologies, Sensor Technologies, Artificial Intelligence, Big Data, Internet of Things are on the list of the enablers
- Standardisation is resource and time consuming activity – we need technology experts and their delegating organisations
- Standardisation is below the horizon of the Hungarian stakeholders – we need to shake the boat!
Thank you!

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