Status overview
Presentation at ITS Japan in Tokyo on June 5th, 2018
Our Goals
Closing the loop

- Data incompatibility
- Siloed data streams
- Information loss
- Implementation overhead
Ingestion and Request

Vehicle Cloud Interface

3rd party Service Cloud

Ingestion channel

Request channel
Use Case: Real-time services

- Traffic flow
- Traffic incidents
- Hazard warnings
- Environmental conditions
- Traffic signage
Use Case: Self-healing map

- Road geometry and attributes
- Lane geometry and attributes
- POI entries and exits
- Road condition
Use Case: Statistical analysis

- Historical and real-time data analysis
- Personal preference learning
- POI recommendations
Active Aliances & Liaisons

• Member of the Open Autodrive Forum (NDS, ADASIS, TISA)
Aliances proposals

- Proposals:
  - W3C consortium
  - JasPar, Japan cloud to cloud sensor data exchange
  - Ko-HAF, German automated driving project
  - CCC, sensor data transportation standard

- Benefit:
  - Reducing silos
  - Ensuring compatibility
  - Increasing data value
Outlook

• A standard is successful, when used.
• Reducing the number of competing standards increases the overall value for everyone
• SENSORIS is used in real world scenarios
SENSORIS details
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The Specification Work

- Classification of use cases in Short-Mid-Long
- Anonymous Questionaire for pan-industry requirements
- SENSORIS v1 to concentrate only on the most important Industry-Needs
- Task Forces to focus on special topics
  - GDPR, Privacy regulation
  - Data Size optimization
  - Sensor Data Catalogue
  - Release Process
Task Force: Privacy considerations

- SENSORIS is flexible
- Privacy data can be handled according to:
  - supplier-consumer agreement
  - data owner consent
  - Regional privacy regulation
- For privacy reasons action can be done:
  - Changing session identifier after a given distance or time
  - Not transmitting any identifier
  - Reducing count of position to a maximum
  - Special encryption of the data payload
Sensoris targets both cloud 2 cloud but also vehicle 2 cloud interface.

- Protobuf „double“ uses 8 byte. „Int64“ uses variable encoding between 1 byte and 10 byte.
- Common data compression.
- Overall summary: With int64 and compression 50-70% of data reduction are achieved.
- No further reduction needed.
Task Force: Release Process

- Change Request process
  - Business scope
  - Technical scope
  - General Assembly
  - Architecture
- Well defined deliverable
  - Test Cases
  - Documentation
- Definition of done
Task Force: Release Process

- **Release impact**
  - Minor with downwards-compatibility
  - Major with compatibility breaks

- **Release process**
  - Quarterly minor releases
  - Optional hot fix releases
  - Major releases every 1-2 years
  - Only changes that are „done“
  - Successfull testing mandatory
  - Including Documentation
Task Force: Catalogue

- Benefit for Liaisons and Aliances
- Attributes are mapped to a taxonomy tree
- Mapping between Standards over unified taxonomy tree.
- Proof of Concept within Open Autodrive Forum with NDS, ADASIS, TISA
- Communication with ISO and W3C
Data Format Structure

• Data format has:
  • Events (vehicle data, localization, road condition, weather, traffic signs, …)
  • Sources (sensors like GNSS or Camera, sensor fusion like algorithms)
  • Relations between Events and Events or Events and Sources

• Flexible data content according to use cases:
  • Single event content (e.g. 1x Position, 1x Speed)
  • Full drive data (e.g. 5h of position, speed, traffic signs, road attribution and weather)
Events

One event can contain:
- LocalizationCategory
- ObjectDetectionCategory
- WeatherCategory
- DrivingBehaviorCategory
- IntersectionAttributionCategory
- RoadAttributionCategory
- TrafficRegulationCategory
- TrafficEventsCategory
- TrafficManeuverCategory
- BrakeCategory
- PowertrainCategory
- MapCategory
Relations

- A relation defines a connection between events, e.g.
  - 1..* LaneBoundary LEFT_OF 1 LANE
  - 1 TrafficSign EQUALS 1 ObjectDetection
  - 1..* TrafficSignalBulb GROUP 1 TrafficSignal
Data Encoding

- Google protobuf v3
  - Efficient encoding
  - Language support
  - FieldOptions – variable resolution interpretation
  - Version compatibility
  - Including documentation generator
- Individual resolution and variable bit encoding
Request Channel

- Reducing costs
- Allowing for multiple specialized use cases
- Planned for next SENSORIS version
  - Multiple conditions
    - Geographical (bounding box, area, corridor)
    - Temporal (daterange, timerange, day of week)
    - Sensor based conditions (event based trigger)
    - Submission priority
End of Slides

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