iMobility Forum WG Automation in Road Transport

Sub-WG on Digital Infrastructure

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VRA NETWORKING IN AUTOMATION

Outline

- Introduction to VRA
- Definition of Digital Infrastructure (EU) and motivation
- Role of Digital Infrastructure
- How and who will provide the data
- Vision
- Current R&D Needs

VRA in Short

VRA – Vehicle and Road Automation is a support action funded by the European Union to create a collaboration network of experts and stakeholders working on deployment of automated vehicles and its related infrastructure

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Objectives of VRA Support Action

Create an active European network of experts on Vehicle and Road Automation and foster cooperation within the Automation WG

iMobility Forum

EU ★ US ★ JAPAN ITS COOPERATION

Contribute to EU-US-JPN trilateral WG on road vehicle automation
(EC – US DoT – MLIT)

Identify deployment needs for Vehicle and Road Automation

Deployment paths, Regulatory issues, Testing, Connectivity, Benefits, Maps, Cybersecurity, Human Factors, Decision and Control

VRA-net.eu/wiki

Promote the Research on Vehicle and Road Automation

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VRA: Deployment needs discussed in Sub-WGs of the iMF Automation WG

Deployment paths (VOLVO)	• Viable business models and deployment paths including socio-economic implications
Regulatory issues (ERTICO)	• Clarify current regulatory and liability issues among European countries
Road Worthiness Testing (IDIADA)	• Identify needs for standardisation, testing, compliance and certification
Connectivity (ICCS)	• Identify additional requirement on C-ITS
Digital infrastructure (HERE - ERTICO)	• Identify role of digital maps for automation
Human factors (DLR-TRL-LEEDS)	• Identify solutions for driver and other road user interactions
Evaluation of benefits (CTL)	• List potential direct and indirect benefits of automation
Controls and decisions (DLR)	• Identify gaps in current control and decision solutions
Reliability and CyberSecurity (→HTG6)	• Clarify reliability concerns and make recommendations

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Digital Infrastructure (for Road Transport Automation) (EU)

Definition

Static and dynamic digital representation of the physical world with which the automated vehicle will interact to operate. This includes sourcing, processing and information.

Motivation

- Along with the investment needed on the physical road infrastructure, a “digital representation of the road infrastructure” will be needed.
- Need cooperation from the vehicles and the infrastructure operators to collect, update and correct eventual changes made on the physical infrastructure

Reference Data

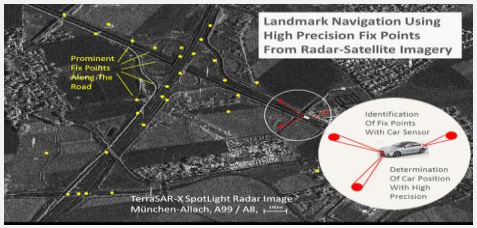
Real-Time Information

Drive Patterns

Feedback loop

Highly accurate Maps

Landmarks

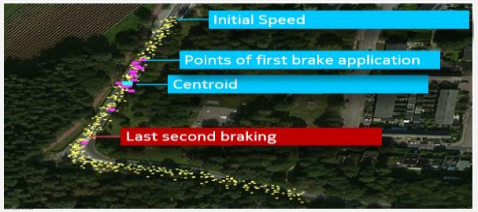


Source: DLR – Hartmut Runge

Electronic Horizon

Source: GAIN Project

Probe Data



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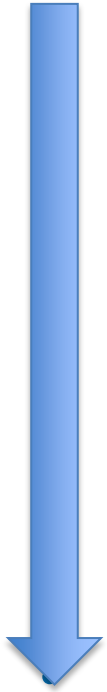
Roles of the DI for Automation



- Provide accurate map data (e.g. HD Maps)
- Provide apriori knowledge along the road (Electronic Horizon)
- Enable high relative position accuracy (landmarks)
- Reproduce human like driving (driving patterns)
- Allow or not automated functions on specific roads (e.g. managed lanes)
- Notify the vehicle about situations ahead that may require human attention or even intervention (L4→L3→L2…)
- Provide dynamic information around the vehicle (LDM)

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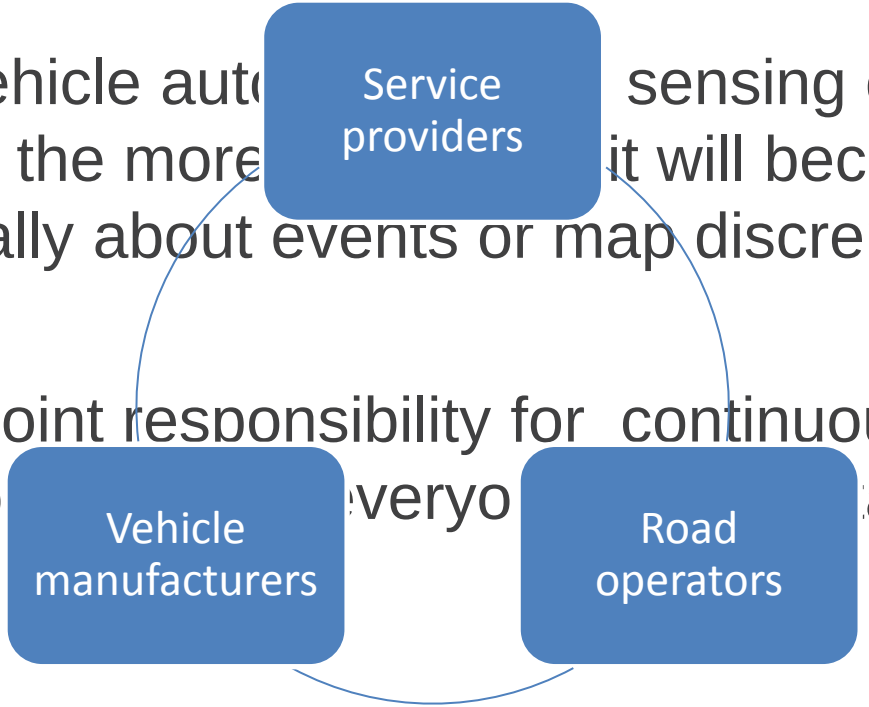
Who will provide the DI content and Why

The more vehicle auto sensing capabilities and connectivity, the more it will become to provide data especially about events or map discrepancies

→ Towards joint responsibility for continuous updating of the map info veryo a chain?



How to provide the DI content

- Main limitations: Maintenance of the Digital Infrastructure
- Focus on features of the roads that are (almost) permanent
  - Like road geometry, curb, post signs,… rather than painted features

- Concept: Vehicles build and share their own maps or any discrepancies with service providers or road operators

→ Feedback loop to notify discrepancies

  - “Affordable” updating and validation
  - Building on existing incremental update mechanisms
  - Map error detection using standardized APIs

Vision (EU)

- The digital infrastructure will become a trusted and reliable resource essential to the operation of vehicle automation and may eventually become a critical infrastructure
- A clear governance should be proposed for data sourcing, processing, sharing and maintenance
- Any changes to the infrastructure (planned or unexpected) can have an impact on safety and road operations and will need to be shared digitally.
- The digital infrastructure will need to be maintained, requiring a close cooperation between the road operator managing the physical infrastructure, the service/map provider bringing the information to the users and finally the vehicle reporting on any discrepancies
- Harmonized interfaces and common resources will be needed to collect and maintain the DI.

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Current R&D needs (EU)

- Create a Digital Infrastructure framework between public authorities and map providers including
  - Governance, Role and responsibilities
  - Roadmap towards a digital infrastructure
  - Regulations
- Investigate impact/benefits of shift of investments between roadside furniture (post signs) and digital infrastructure.
  - What does it cost for PA to get involved / not to get involved in the DI

Current R&D needs (EU)

- Define cloud-based spatial data infrastructure for highly automated driving
  - State map content requirements for automation operations
  - Propose standardised interface with cloud
- Demonstrate applications using accurate mapping and precise localisation
  - Show differences with and without precise positioning
- Demonstrate an “automated” map data feedback loop

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Thank you for your attention…

Any questions?

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