Standardisation needs of Artificial Intelligence to support automated driving

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Acknowledging the work of ISO/IEC JTC1/SC42

Standard and/or project under the direct responsibility of ISO/IEC JTC 1/SC 42 Secretariat (9)	Stage	ICS
ISO/IEC AWI TR 20547-1 [Under development] Information technology -- Big data reference architecture -- Part 1: Framework and application process	20.00	
ISO/IEC DIS 20547-3 [Under development] Information technology -- Big data reference architecture -- Part 3: Reference architecture	40.92	35.020
ISO/IEC WD 22989 [Under development] Artificial intelligence -- Concepts and terminology	20.20	
ISO/IEC WD 23053 [Under development] Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML)	20.20	
ISO/IEC NP TR 24027 [Under development] Information technology -- Artificial Intelligence (AI) -- Bias in AI systems and AI aided decision making	10.99	
ISO/IEC NP TR 24028 [Under development] Information technology -- Artificial Intelligence (AI -- Overview of trustworthiness in Artificial Intelligence	10.99	
ISO/IEC NP TR 24029-1 [Under development] Artificial Intelligence (AI) -- Assessment of the robustness of neural networks -- Part 1: Overview	10.99	
ISO/IEC NP TR 24030 [Under development] Information technology -- Artificial Intelligence (AI) -- Use cases	10.99	
ISO/IEC NP 38507 [Under development] Information technology -- Governance of IT -- Governance implications of the use of artificial intelligence by organizations	10.99	

Why to standardize AI related items in the context of ITS?

- weak AI or narrow AI – for specific tasks
- strong AI – still far far away!!!
- ITS applications and related areas/actors which may use AI technology:
  - **Automated vehicles**
  - **Road side units**
  - **Traffic management centers**
  - **Map providers**
  - **Service providers**
  - **Network providers**
  - **Mobility operators**

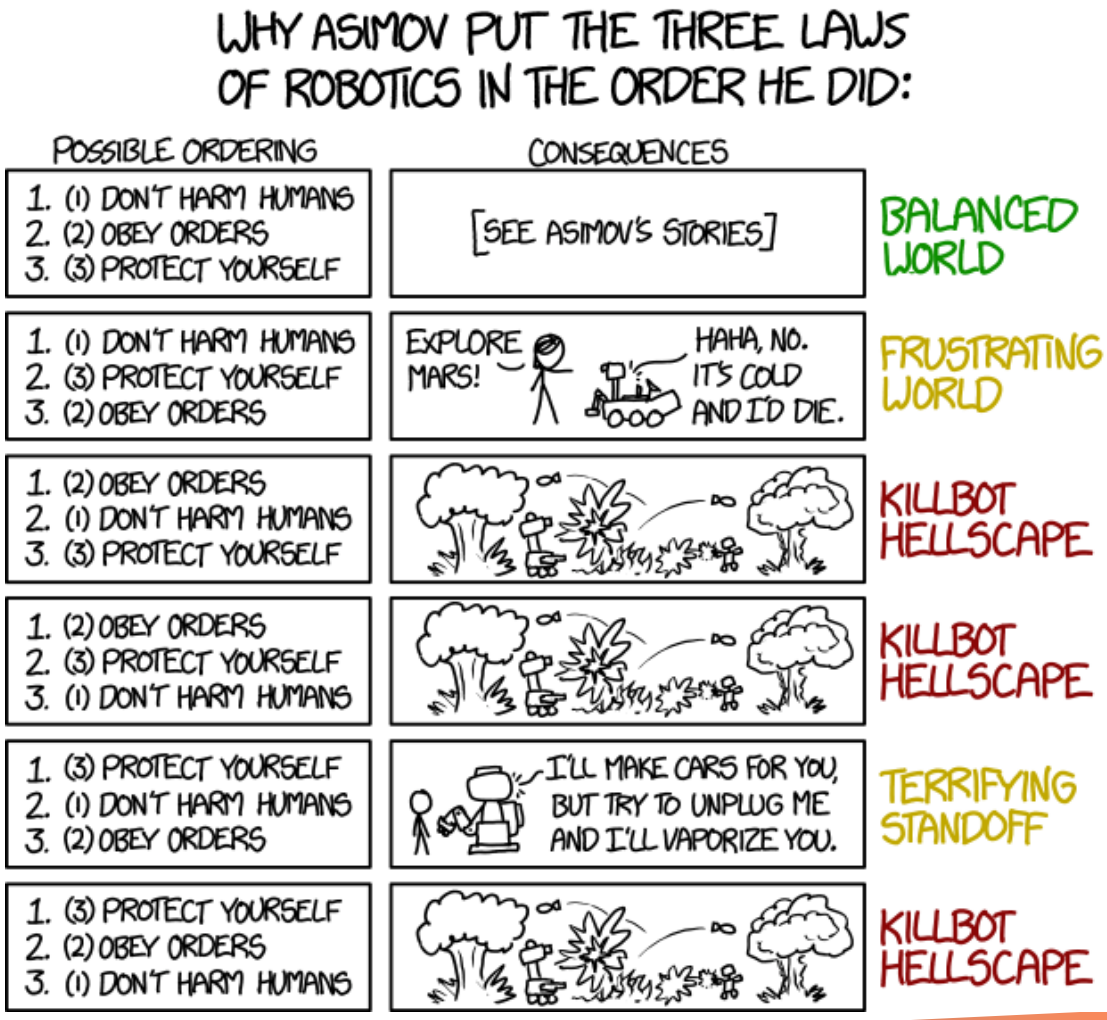
  and many more…

Why to standardize AI related items in the context of ITS?

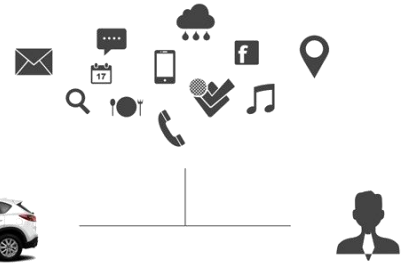
1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.

2. A robot must obey orders given it by human beings except where such orders would conflict with the First Law.

3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law



AI 4 Mobility - HMI



AI can provide the basis for efficient Human/Machine interaction with e.g. speech recognition and providing as an output for the driver a personalized driving experience enhanced with intelligent assistants that can be summoned with a voice command.

They can potentially provide applications such as driver behavior monitoring (attention detection, drowsiness detection etc.)

FACE RECOGNITION

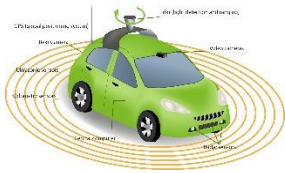
HEAD TRACKING

GAZE TRACKING

LIP READING

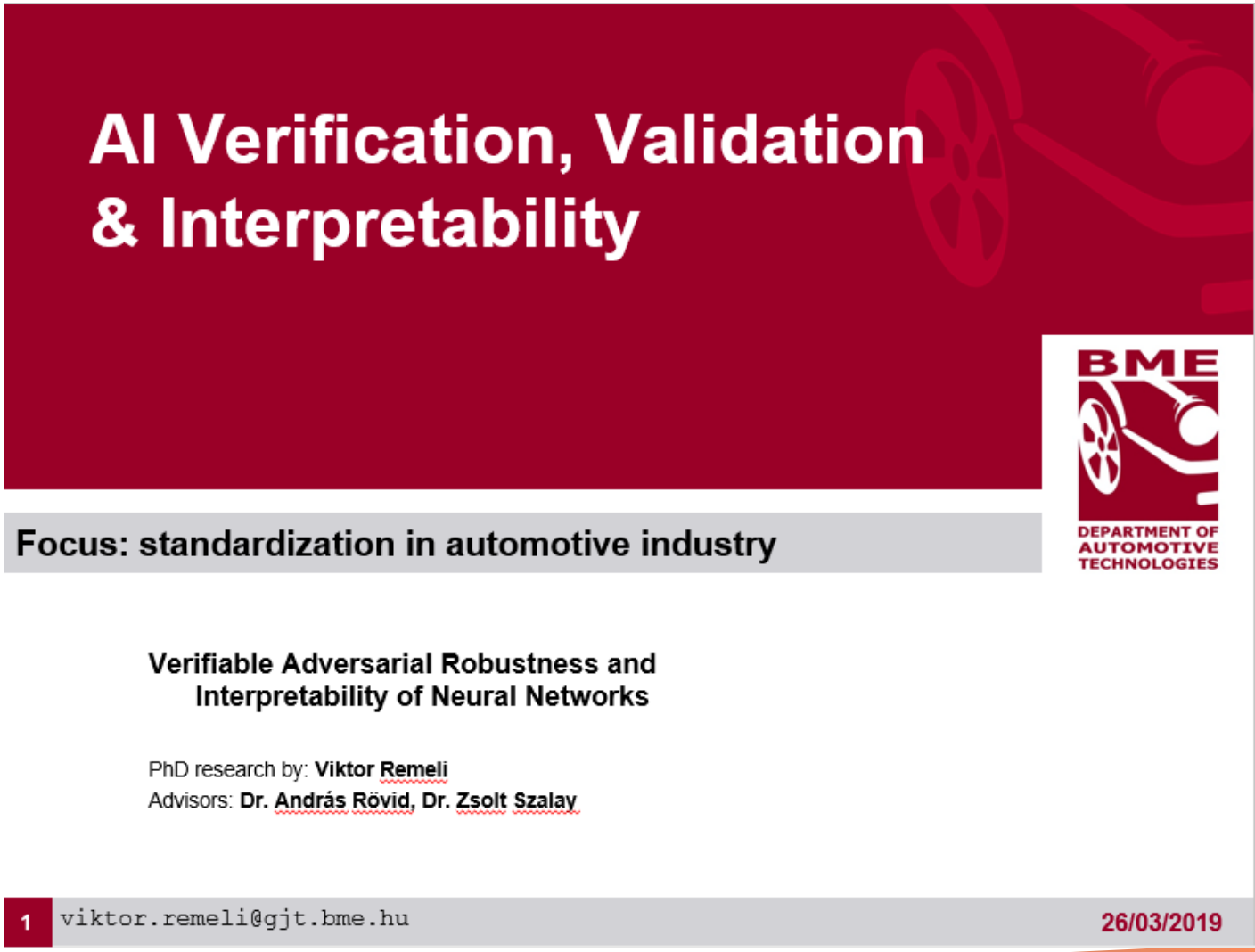
NVIDIA

AI 4 Mobility – Vehicle control

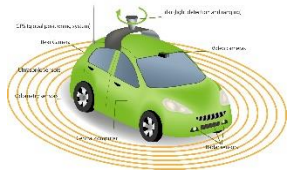


Budapest University of Technology – Department of Automotive Technologies:

- from the perspective of the vehicle
- considering deep learning models
- from the perspective of adverserial examples attacking AI algorithms
- „logical skull” to develop around the AI „brain”?



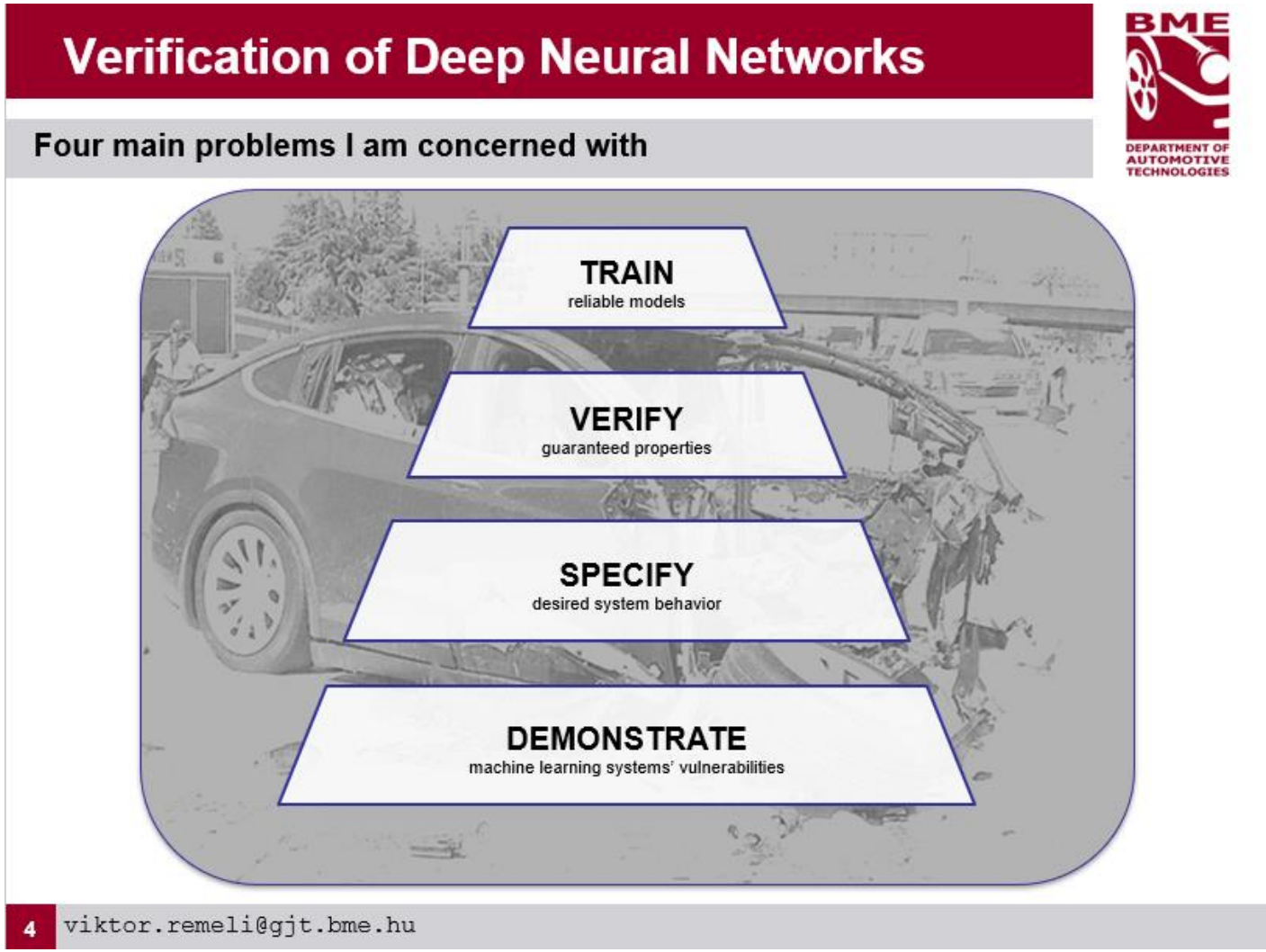
Source: Viktor Remeli, Budapest University of Technology and Economics, Department of Automotive Technologies



AI 4 Mobility – Vehicle control

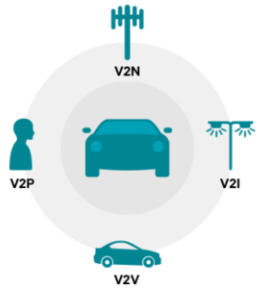
Budapest University of Technology – Department of Automotive Technologies investigating 4 apsects of AI systems:

- demonstration of the vulnerabilities of AI
- specification of the intended AI behaviour
- Verification of the guaranteed properties of the system with AI
- Training reliable models – is it possible? And how?



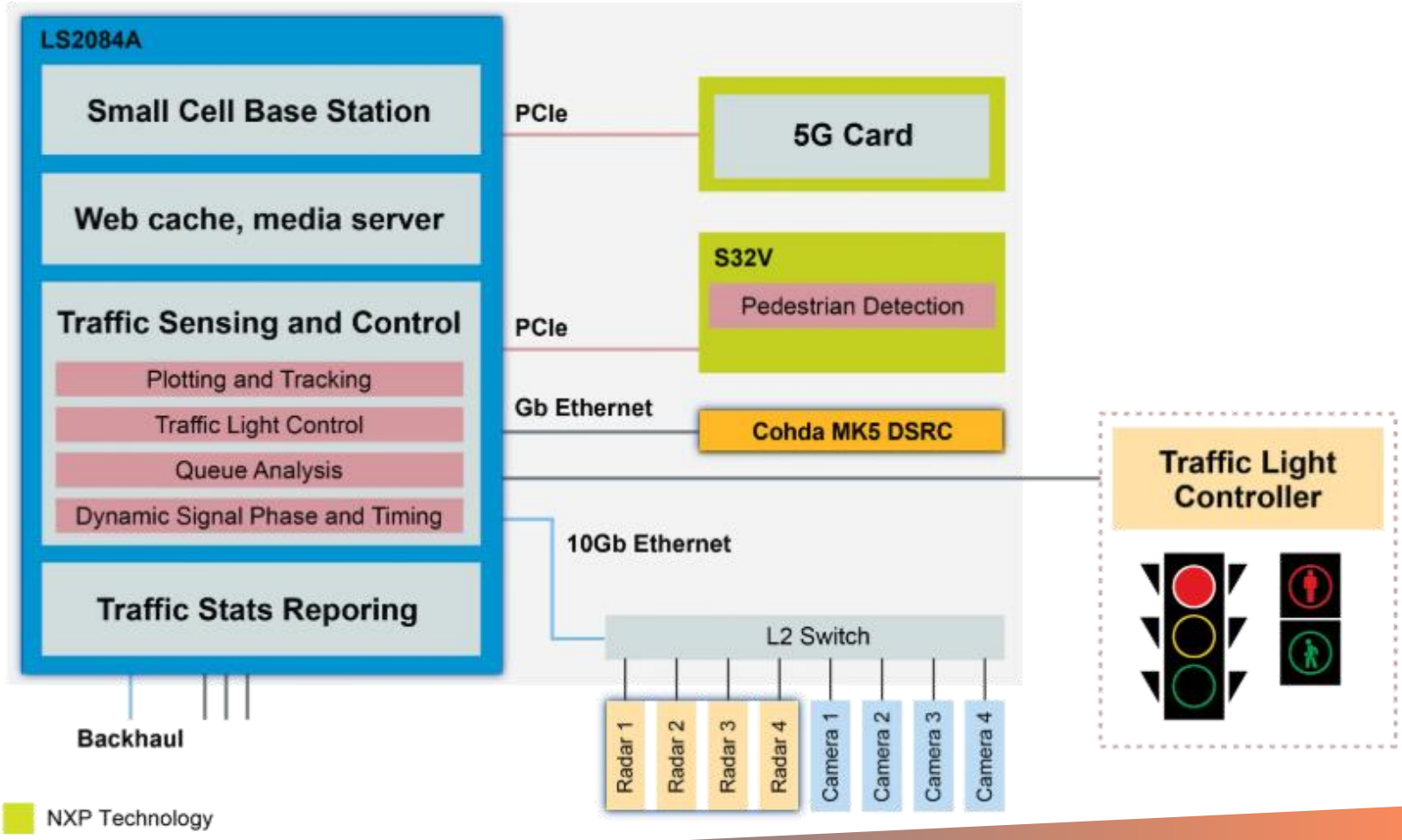
Source: Viktor Remeli, Budapest University of Technology and Economics, Department of Automotive Technologies

AI 4 Mobility – Roadside infrastructure



Intelligent Roadside Units by NXP

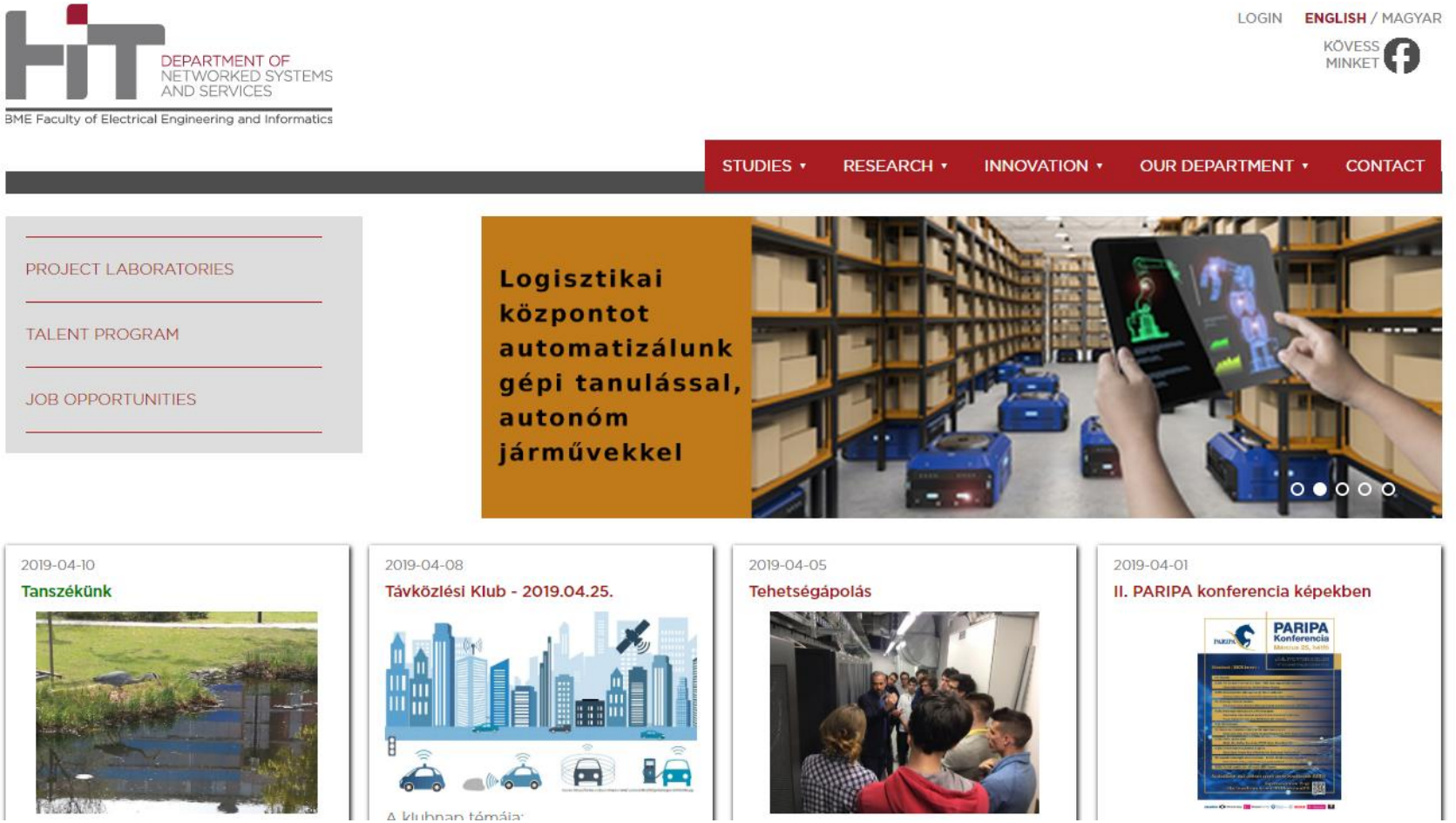
- Sense
  - Direct sensing of vehicles and pedestrians via cameras and RADAR
  - Direct sensing of vehicles from their V2X position reports
  - Indirect sensing via Cloud provided information
- Think
  - Sensor fusion
  - Traffic flow optimization
  - Vulnerable Road User Warnings
- Act
  - Traffic light control
- Communicate
  - Direct communication of signal phase and timing to approaching vehicles
  - Broadband wireless hotspot connectivity (cellular and Wi-Fi)



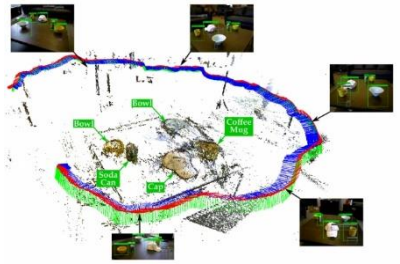
AI 4 Mobility – Traffic Managment

Budapest University of Technology – Department of Networked Systems and Services:

- launches a government funded project to develop an Intelligent Traffic Management System
- using AI technology and historical traffic data
- to deliver a predictive services to support traffic management decisions
- the project will be able to provide first hand requirements and needs

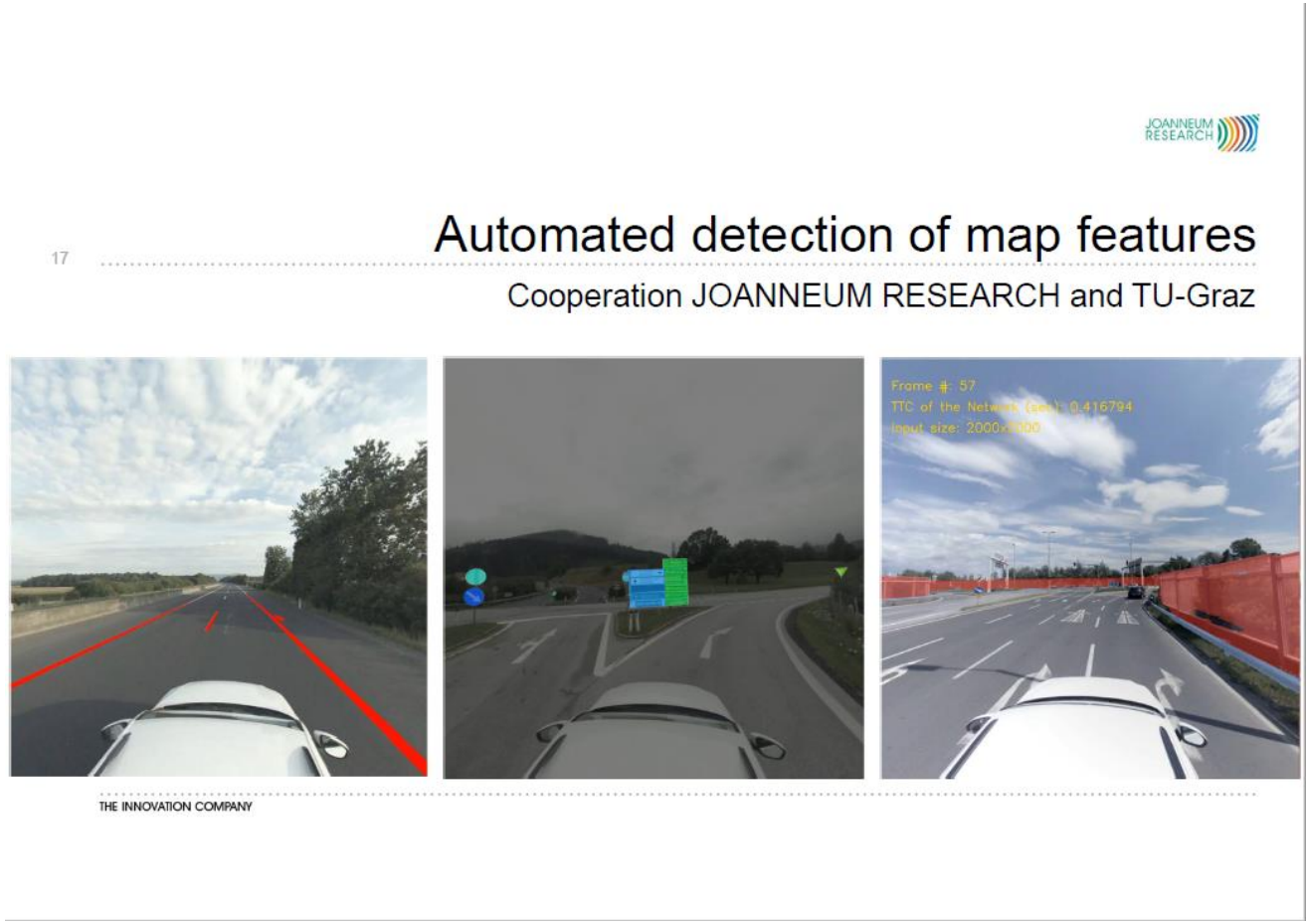


AI 4 Mobility – Map production and provisioning

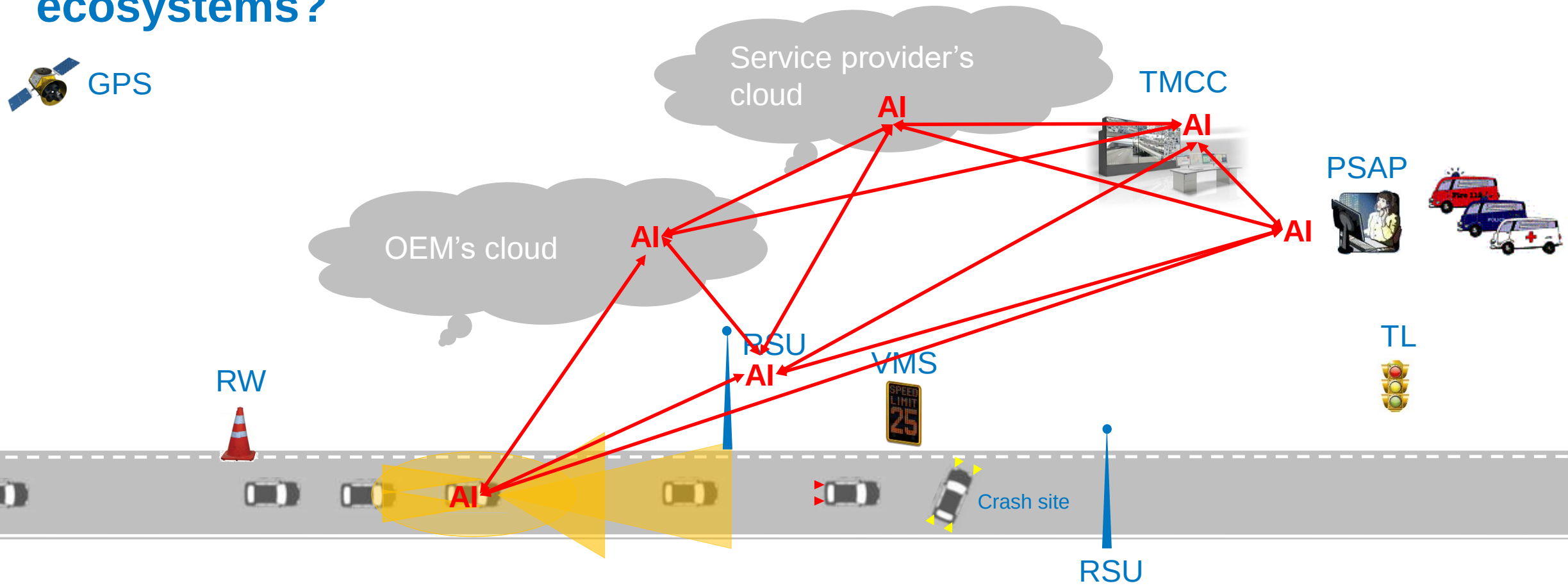


Hungarian Mobility Platform is planning to work on the below topics:

- make raw HAD map data (LIDAR point cloud) object classification automated
- re-annotate/re-process Budapest Public Roads' raw map data of Budapest to make it suitable for automated driving
- to help discover and map changes on the road infrastructure (surface, localisation landmarks and obstacles)



Interaction of AIs located in different locations of the ITS ecosystems?

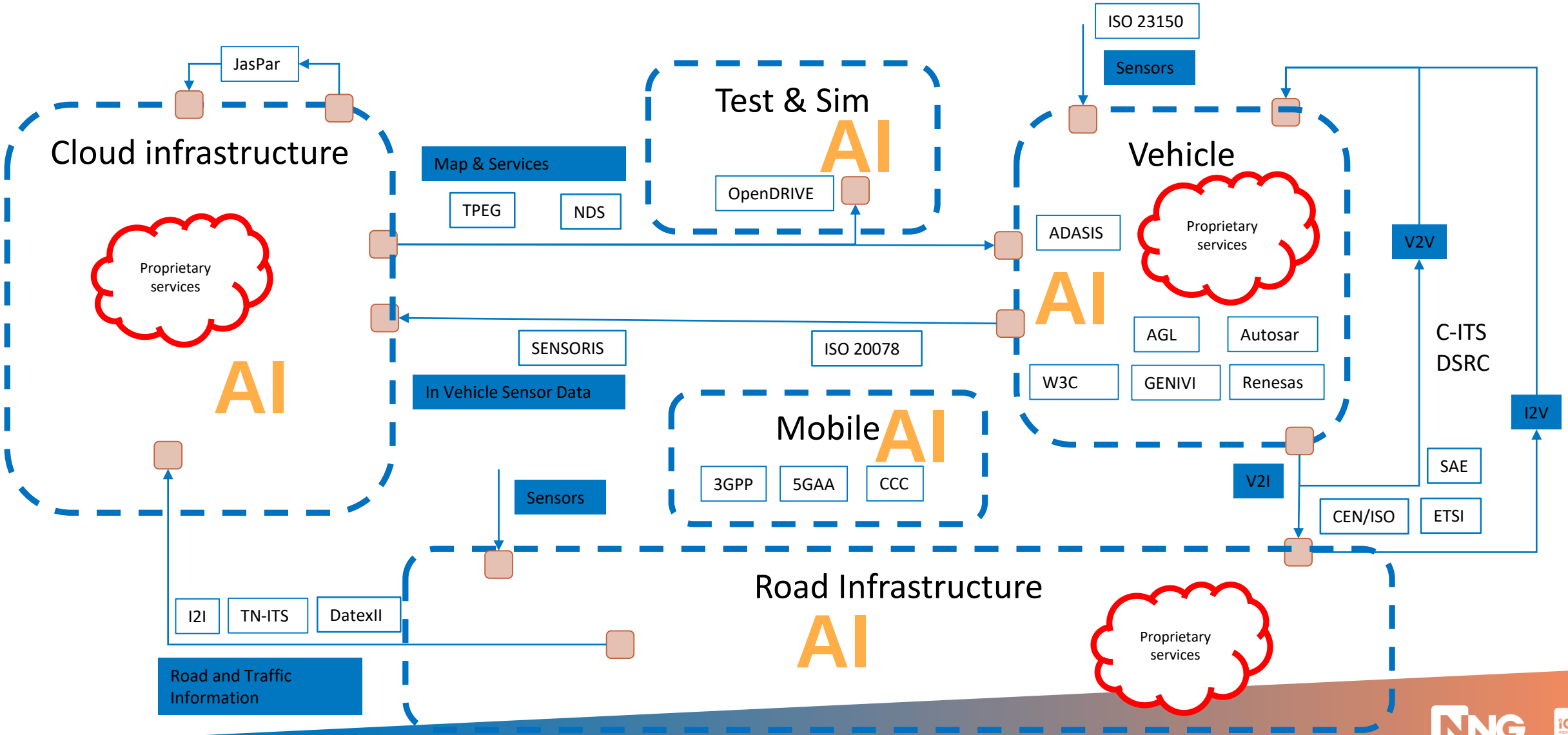


RW: Road Works mobile beacon
GPS: Global Positioning System
VMS: Variable Message Sign

TMCC: Traffic Management and Control Centre
TL: Traffic Light
RSU: Road Side Unit

PSAP: Public Safety Answering Point

Map-centric automotive ecosystem supported by AI



Source: Prokop Jehlicka, SENSORIS, HERE Technologies

ISO TC204 ad-hoc working group on AI

Seoul Resolution 1265:

➢ ISO/TC 204 resolves to create a new “AI (Artificial Intelligence) ad hoc group” focused on “The impact of AI on ITS and the identification of standards that ISO/TC 204 will seek to develop”. The ad hoc group will provide reports to each ISO/TC 204 plenary meeting and provide its final report at the ISO/TC 204 plenary meeting in the Autumn/Fall of 2019.

➢ The convenor is **Mr. Dean Zabrieszach** (Australia)

➢ **APPROVED**

2 Workshops held to date:

1. **Budapest - September, 2018**
2. **Kennedy Space Centre – April, 2019**

Further Workshop planned for Singapore Plenary in October, 2019.

Workshops have focused on greater understanding of AI, with presentations from:

1. Knut Evensen (Norway) – Budapest
2. Mahmood Hikmet (New Zealand) – Budapest
3. Andras Csepinszky (Hungary) – Budapest and Kennedy Space Centre
4. Young-Jun Moon (Korea) - Budapest and Kennedy Space Centre
5. Haruo Ozaki (Japan) – Kennedy Space Centre
6. William Diab (US) (in abstentia) - Budapest and Kennedy Space Centre

Interesting conversation and debate has centred on:

1. **Meaning of AI and its relevance to ISO TC 204**
2. **Extent of work on AI already underway in JTC1 SC 42**
3. **Type of recommendation which might emanate in Singapore:**
   - ***a. Create a new WG on A1, or***
   - ***b. Allow existing WG’s to undertake AI standards development, or***
   - ***c. Create a Study Group which reports/presents to the TC on a regular basis & allow existing WG’s to undertake AI standards development***

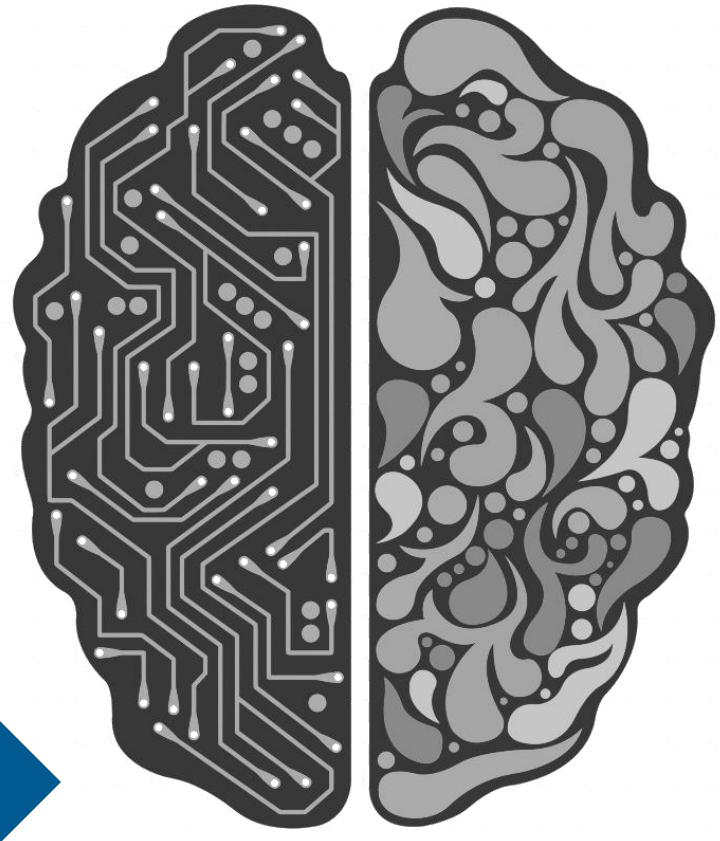
Questions to answer – holistic approach needed?

Are there ITS/mobility specific AI standardisation needs? Let's focus only on weak AIs already available!

Road traffic has special requirements for products to be used on public roads – type approval, certification. What about legal requirements?

Are automotive safety (ISO 26262-11:2018) and Safety of the intended functionality (ISO/PAS 21448:2019) relevant? ISO TC22 is working on automated driving related safety?

Is there a need to standardise the interaction between in-vehicle AIs, RSU AIs, AIs implemented by mobile edge computing platforms, AIs in traffic management centres? Swarm intelligence concept? Ant colony algorithms?



Thank you!

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