PROJECT HIGHLIGHTS, EXPECTED IMPACT & FUTURE DIRECTIONS

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Final Event
AstaZero, Sandhult, Sweden
The scope...

- **Beyond pure sensor-based automation**: to enable the **convergence** of vehicle automation with cooperative V2X communications and decentralized maneuvering control algorithms; focusing on:

  - Cooperative decentralized control system to realize fully-automated vehicles & drive the advised maneuvering of manually-driven vehicles
  
  - V2X-message-based communications to (feed ETSI ITS standardization and) enable automated maneuver planning
  
  - Onboard sensor-based architecture to enable accurate positioning and reliable perception capabilities
AutoNet2030 work in the course of time

11/2013
- Project Start
  - Milestone: Requirements analysed
  - Milestone: Components design

Fall '15
- Milestone: Communication Specs
- Milestone: Control algorithms
- Milestone: Components implementation

Start of '16
- Milestone: System integration

Spring '16
- Milestone: Vehicle integration

Summer '16
- Milestone: Test-track testing & validation

10/2016
- Completion

10/2016
- Deployment horizon

~ 2030
- Industrialization Steps
AutoNet2030 highlights!

• 360° perception layer
  – High-confidence data through sensor-fusion
  – Combination of on-board and communication sensors

• Distributed graph-based convoy control
  – Innovative algorithm design to address the dynamic number of heterogeneous vehicles

• Hierarchical Control Architecture for Cooperative Automated Driving
  – Robust and cooperative-aware motion planning algorithm
  – Intersection management algorithm for automated vehicles at intersections without traffic light
AutoNet2030 highlights!

- Enhance V2X communication for Cooperative Automated Driving
  - *Extensions* of V2X message set and *optimization* of protocol stack
  - Contribution to V2X standardization

- High positioning accuracy (cm-level) during high speed driving
  - Advanced differential positioning approach
  - Cooperative 5.9GHz broadcasting of RTK support data

- Dual-display HMI for vehicles of various automation level
  - Customized Android apps to provide directives/informative messages
The AutoNet2030 work has clearly illustrated the benefits of cooperation in automated driving.
Places to look for AutoNet2030.. footprints

• The experimental evidence of the effective collaboration between automated and manually-driven vehicles
  – shows how vehicle-automation leads to safer & cost-effective mobility
  – provides higher confidence for (potential) users of vehicle automation technology
  – significantly contributes to the increase of user acceptance for emerging C-ITS technologies

• Impact on ITS research
Future directions

• Mixed traffic with automated/non-automated vehicles are about to emerge in near feature (especially when automated trucks are involved)
  – The AutoNet2030-considered use-case points towards that direction!!

• Connectivity: a key-aspect for future automation
  – Relevant standards for automated driving expected to shape the market

• Verification: explore vehicle-automation in real-life environments (TRL7) and under a scaling number of vehicles

• Standardisation
Snapshot of AutoNet2030 liaison activities

- Considering similar high-way & urban UCs
- Communicate the system-design specs
- High-frequency CAM extensions validated by each project

- Joint design and ETSI proposal for a high-frequency CAM broadcasting mechanism
- Agreement of using the same service channel (SCH1) for additional CAM broadcasting

- Cooperation on methodology for testing of automated functions
- Support of VRA activities and participation to its networking activities
Recognition from EC...

• Cyber Secure Car int'l conference (Dresden, Sept. 2015):
  • Dr. Florent Frederix (Principal Administrator, Trust and Security Unit, EC’s Directorate-General for Communications Networks) explicitly mentioned AutoNet2030 as one strategic contribution by the EC to bolster the safe-fail automated driving.

• Car2Car forum (Mainz, Nov. 2015)
  • Wolfgang Hoefs (Head of the Sector "Strategic Planning and Communication" at European Commission - DG CONNECT) mentioned AutoNet2030 when elaborating on the question “Where do we stand with connected automated driving?”
Recognition from the ITS community

• Invitation from the TRB 2016 (Washington D.C.) and the EUCAR 2015-’16 conferences to present AutoNet2030

• Proposal by Vector INFORMATIK for free-of-charge use of their analysis tool (accepted)
  – Leader in serial bus systems now moving also into V2X communications

• Proposal by Commsignia to assist the RSU coverage in the final demo (rejected due to competitiveness reasons)

• Request from AustriaTech to use the AutoNet2030 test-plan (as best practice) for a National call for test-sites (accepted)
Recognition from the academic community

• IEEE Intelligent Vehicles (Gothenburg, Jun 2016)
  • AutoNet2030 members Prof. Arnaud de La Fortelle and Xiangjun Qian won the **Best PhD paper award—First Prize** for their AutoNet2030-acked paper “*A Hierarchical Model Predictive Control Framework for On-Road Formation Control of Autonomous Vehicles*”

• ITS World Congress (Bordeaux, Oct. 2015):
  • ITS-2894 Special Session on “*Theoretical and technical challenges for automated driving*” organized and supported by AutoNet2030 members Prof. A. de La Fortelle and Pär Degerman won the **best session award**
  • AutoNet2030 members Prof. A. de La Fortelle and X. Qian won the **best paper award** for their AutoNet2030-acked work “*Autonomous driving at intersections: combining theoretical and practical approaches*”
THANK YOU!
ANY QUESTIONS?

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