CARTRE - Coordination of Automated Road Transport Deployment for Europe

Workshop on Automation Pilots on Public Roads
European Commission
Brussels, Covent Garden, Room 05/183

16/12/2016
(09:30-16:30)

Summary of Meeting

Agenda

9.30	Registration and welcome coffee
10.00	Welcome and introduction
10.20	Presentations of ongoing large-scale public road pilots in different countries
13.00	Lunch
13.45	Workshop discussions around themes: Commonalities Data management and exchange Difficulties Impact assessments
15.30	Conclusions and next steps
16.00	End of workshop

Participants

Name	Surname	Company
Tom	Alkim	RWS
Angelos	Amditis	ICCS
Juan-José	Arriola	DGT
Alvaro	Arrue	IDIADA
Yvonne	Barnard	University of Leeds
Davide	Brizzolara	ERTICO – ITS Europe
Céline-Agnes	Domecq	Volvo
Maxime	Flament	ERTICO – ITS Europe
Aurora	Garcia	REPER
Christhard Ludwig	Gelau	Federal Ministry of Transport and Digital Infrastructure
Manfred	Harrer	CEDR
Eddy	Hartog	European Commission
Satu	Innamaa	VTT
Robbert	Janssen	TNO
Alina	Koskela	Finnish Transport Agency
Bastiaan	Krosse	TNO
Sivasegaram	Manimaaran	Innovate UK
Edwin	Nas	Ministry of Infrastructure and the Environment
Kristof	Rombaut	Flemish Agency for Roads and Traffic
Martin	Russ	AustriaTech
Anna	Schirokoff	Finnish Transport Safety Agency
David	Schoenmaekers	Belgian Ministry for Transport
Jean-François	Sencerin	Renault
Henriette	Spyra	Federal Ministry for Transport, Innovation and Technology
Arjian	Van Vliet	RDW
Hamid	Zarghampour	Swedish Transport Administration
Anthony	Lagrange	DG GROW
Liam	Breslim	DG RTD
Ludger	Rogge	DG RTD
Clara	De La Torre	DG RTD
Ingrid	Skogsmo	DG RTD
Maria	Carbone	DG RTD
Raphael	Crinier	Représentation permanent de la France auprès de l'Union européenne

1. Welcome and Introduction

1. Liam Breslin (DG RTD) welcomes the participants to the Workshop, and explains that the objective of the meeting is to gain an overview of ongoing automated driving demonstration pilots across Europe and to understand common issues and concerns associated with such tests. By sharing the main challenges in enabling public road tests, as well as experiences and results so far, valuable insights can be gained on how to leverage such pilots and demonstrations towards deployment.

2. Short introduction of the project CARTRE by the project coordinator Maxime Flament (ERTICO – ITS Europe). Maxime illustrates the main objectives of CARTRE focusing on the European and International activities.

3. The participant Member States (Austria, Belgium, Germany, Spain, Greece, Finland, France, The Netherlands, Sweden, UK) each give a presentation focusing on the following points:

- National and regional strategic plans on Automated Driving (AD)
  - Scope, Objectives, Policy measures to execute the plan, funding available
- Overview of current national large-scale AD activities, test environments, funded pilots etc.
- Challenges and lessons learned
  - Organisational, relation with industry, technical aspects, others
- Areas of cooperation

(Presentations available at http://connectedautomateddriving.eu/)

A summary of each Member State presentation is provided below:

Austria

The National Action Plan "Automated Connected Mobile" in Austria includes the following points: Legalize Tests & adapt legal frameworks; Build & Run Test-Environments (Learning Labs), Prioritize Use Cases & Applications; Secure & strengthen USPs; Monitoring & Evaluation.
The overall budget is 25 Mio € (2016-18) mainly for Test Environments (Innovation Clusters), RDI Programmes (Mobility, ICT, Security), and Digital Infrastructure Deployment.
The current pilots are: Upper Austria, DigiTrans Logistics, ZWA – Urban Chauffeur, Styria AlpLab – Highway pilot and Safety.
All Austrian funding programs and test environments are open for international participation. A testing (up to SAE 4+) is possible in Austria. Several initiatives are in the framework of European Projects (H2020, CEF/C-Roads).
A specific focus of the next activities will be the support to a suitable framework for the exchange of information.

Belgium

A code of practice for testing autonomous vehicles has been published in Belgium. This has been drafted by a Working group organized by the federal administration including the regional authorities, the private sector and experts. It has been approved by Council of Ministers on 15 September 2016. The scope is testing on public roads of all kinds of automated vehicles and all levels of automation. The objective of this Code of Practice is to guarantee a safe testing environment and provide guidelines. In order to perform tests, the following relevant documents have to be provided: risk analyses and reports (summary) of previous tests. Authorities (administrations and police) are allowed to assist testing and emergency services have to be informed.

The following projects in Flanders are presented: "EU Truck Platooning Challenge" (completed), "Platooning tests Passenger vehicles" (on-going) and "Autonomous Shuttle" (on-going).

Germany

A Strategy for Automated and Connected Driving has been released by the Federal Government including the following aspects: Infrastructure (Digital infrastructure and Standards for intelligent roads), Legislation (Legal framework at national and international level, Driver training, Type approval/technical monitoring), Innovation (Digital Motorway Test Bed, Research funding/framework), Interconnectivity (Mobility data and spatial data, Intelligent transport systems), Cyber Security and data protection (Cyber security standards, Need for action in terms of data protection), Societal Dialogue (Chances and risks of automated and connected driving and Provision of information).
Current *national* activities, supported by federal initiatives, are mainly focused on: Research programmes/funding guidelines of BMWi[1], BMBF[2], BMVI[3]; the activities on Digital Motorway Test Bed (A9); the financial support for the development of test fields in urban and suburban areas in Berlin, Braunschweig, Dresden, Düsseldorf, Hamburg, Ingolstadt, and Munich.
Currently the information reported by the car companies to the Ministry is not public. The level of detail is negotiated.

Greece

Automated Driving is addressed in the ITS National Architecture (November 2015) and the ITS National Strategy (March 2015) documents. Several aspects of automated driving have been highlighted, such as its contribution to national strategic goals on safety, efficiency, sustainability, and creation of new business and job opportunities.

As an example of practical test, the driverless bus in the city of Trikala has been presented.
The following main areas of cooperation have been identified: Harmonisation of national ITS action plans regarding automated driving (common Roadmap or Masterplan); Share knowledge and exchange of best practices through established testbeds; Share data – open data initiatives; Creation of a common and proven verification methodology; Cross-border testing, Certification procedures defined at EU level.
The described demonstration was supported by the Ministry, Trikala and ICCS.

Spain

National and regional strategic plans on Automated Driving (AD) supports the deployment of Connected and Automated Driving, in particular focusing on the following main benefits: Safety; Efficiency and environmental objectives; Comfort; Social inclusion; Accessibility.
Spain has signed but not ratified the Vienna Convention. Regulatory framework is available for the testing and operation of vehicles on public roads (specific for autonomous driving). Autonomous vehicles are already being tested in Spain. Testing requirements and conditions are flexible: based on system certification or other MS authorisation/certificate.
Main areas of cooperation are in the framework of regulation: Legal framework (UNECE Conv., National Traffic Law, Code for Vehicles, Insurance and responsibility) and Testing. Also all the aspects related to the liability has to be taken into account.
A test site was set-up in the framework of the CityMobil2 project in San Sebastian.

[1] Federal Ministry for Economic Affairs and Energy

[2] Federal Ministry of Education and Research

[3] Federal Ministry of Transport and Digital Infrastructure

Finland

The National strategy for transport automation includes all modes of transport (Air, Maritime, Rail, Road, Robots on land, in water and in the air) to promote intelligent automation in transport services.

An action plan has been published in April 2016 and the focus is on road transport and actions required by public sector and in SAE levels 3-4-5. Testing of all automated vehicles (SAE levels 0–5) is possible on public roads in Finland using a test plate certificate. Vehicle under testing must have a driver either inside or outside the vehicle.

The test plate certificate holder, who is running the test, must submit a report to Trafi[4] on the trial results. The report should describe: how the trial plan was implemented; what kind of deviations from the plan were encountered.

The following main national activities have been mentioned:

1. Extreme weather testing in Northern Finland Aurora public test section for AVs on highway E8
2. Urban testing facilities: Tampere & Tuusula; Developing testing tools & requirements for AVs
3. SOHJOA automated electric buses: Helsinki, Espoo, Tampere; Automated last-mile solutions & innovation platform

The importance of a close cooperation between authorities and stakeholders and the difficulties of testing in urban environment have been highlighted as main lessons learnt. At the moment 3 companies have applied to receive a test plate. The activities of testing will be reported to Trafi (https://www.trafi.fi/en/road/automated_vehicle_trials).

France

The autonomous driving French national plan is called “New France for industry” (nfi) plan. The coordination of this plan is done by Renault. The main goals of this plan are: Make changes to legal framework; Demonstrate socioeconomic benefit through experimentations; Demonstrate safety; Focus on Key technologies. In addition, the plan supports a strong cooperation between administrations, academics and industry within the non-competitive area. The following points have been discussed:

- New legal framework for AD experimentation
- 10 000 Kms available on open roads
- 15 experimentations
- 11 working groups on legal, technical regulation,
- homologation, technologies, safety & security
- > 30 projects (test bed, Advanced technologies, Safety)

The Netherlands

The following points are discussed:

- Adaptation of national legislation
- Learning by doing (facilitate tests) considering some pilots activities: WePod, Appelscha Pod, EU Truck Platooning Challenge, Daimler bus near Schiphol[5]
- Support to pilots and tests by: bringing parties together; identifying learning objectives and monitoring needs; helping setting necessary infrastructure conditions; disseminating lessons learnt
- Knowledge Agenda on Automated Driving
- Activities carried on during the dutch EU presidency, including the signature of the Amsterdam Declaration on the cooperation in the field of connected and automated vehicle.

[4] https://www.trafi.fi/en

[5] https://www.daimler.com/innovation/autonomous-driving/future-bus.html

The next steps at International level will include the follow up Declaration of Amsterdam, the participation to the initiatives of GEAR 2030, C-ITS Platform, UNECE and the support to cross border testing. Regarding the national next steps in legislation, they will be focused on experimental law for testing without a driver in the vehicle.
Pilots will be facilitated, providing test sites, assessing impact on infrastructure, traffic & traffic management, human factors, and organising data exchange etc.
Several tests are planned on public roads: Real life cases Truck Platooning; Last mile solutions in the Metropolitan area of Rotterdam and The Hague; IJburg pilot.

Sweden
National and regional strategic plan on Automated Driving (AD) is supported by the FFI (Fondonsstrategisk Forskning och Innovation), a research collaboration between the government and the vehicle industry to co-finance research and innovation activities.
The most important activities are:
Drive Me: 100 "normal" families will experience for an extended timeframe self-driving Volvo XC90s on public roads in Gothenburg[6]. The project was kicked off in 2013, and the pilot begins in 2017. Similar pilots will later be run also in London and China.
Scania and Volvo both participated in the European Truck Platooning Challenge, and are now preparing for multi-brand platooning projects in Sweden as well as within H2020.
Regarding the areas of cooperation, Sweden has several links into relevant branches of the European Commission. The Swedish Transport Agency represents Sweden in the DG Move led C-ITS platform work.

United Kingdom
The UK government created in 2015 the Centre for Connected and Autonomous Vehicles (CCAV) with four strategic objectives to ensure that:
A Code of Practice, set out in 2015, clearly and simply sets out that testers must obey all relevant road traffic laws and that:

- Test vehicles must be roadworthy;
- A suitably trained driver or operator (not necessarily in the vehicle) must be ready, able and willing to take control; and
- Appropriate insurance must be in place

A competition was launched in 2015/2016, and funded projects will run in the timeframe 2016-19. £20m have been allocated for Connected and Autonomous Vehicles for a total of 21 projects Collaborative R&D projects and feasibility studies to stimulate developments in autonomous vehicles.

4. Workshop – interactive sessions
Participants split up in three groups that each discuss the following three themes. A brief overview of themes discussed can be found below – a more extensive presentation of the points brought up in the respective workshops discussions are presented in the annex.

How to build a successful test environment? What are the areas where an exchange of data would be useful and beneficial for the success of your pilots?
The discussions pointed out the importance of flexible testing framework, availability of infrastructure and relevant test environment, as well as clear rules, in particular on confidentiality. To increase the interest in exchanging data there is a need to find win-win for data sharing for all stakeholders, including public administrations and OEMs.

What are the main obligations for testing on your national test environment?

[6] http://www.volvocars.com/intl/about/our-innovation-brands/intellisafe/autonomous-driving/drive-me

The participating MS exhibit a variety of obligations: long term approval without technical assessment of the CAV, or a thorough examination and issue an approval with limited validity.
It is important to understand if a test includes aspects demanding new or unique requirements on the public roads, and how liability and responsibility will be managed in a test.
For safety assessment, it should be defined what type of tests or scenarios should be considered, their scope, as well as tools and methods to be used.
There were also discussions on mutual recognition and that needs for standardisations may arise with gained experience.

What are the AD impacts you wish to evaluate?
The high expectations on AD and CAV lead to numerous questions to be answered, at times also going beyond what can be evaluated with a large scale test. The discussion ranged from system functionality and system boundaries to societal impact. Examples of evaluation areas include risks that need to be known and how to solve them, how to ensure cyber security as well as impact on individual users and the entire transport system. Which availability and quality of digital (ICT, HD maps) and physical infrastructure (lane markings, signs) is required for AD to work properly? Integration issues - with public transportation, in city planning, in traffic management, etc. – were also discussed, as were value creation, contribution to societal goals, how to realize competitiveness and growth aspirations.

5. Conclusion

Clara de la Torre (DG RTD) joins the Workshop and thanks the representatives of the Member States for their participation to the Workshop. Each moderator of the working groups reports about the results of the discussion.

The following points are highlighted as conclusion of the workshop:

- Positive appreciation from the participants for the opportunity given to share information about current national activities on the topic of pilots for connected and automated driving.
- The collaboration among Member States should be fostered also with the support of EU funded projects as CARTRE and SCOUT.
- The activities of Pilots should be oriented by clear and common research questions.
- It is very important to develop a clear and common understanding of the impact assessment to be performed.
- Interaction on data exchange is very important.
- Several participants would appreciate initiatives to improve the exchange of information at European Level in order to share lessons learnt. The possibilities of mutual learning should be increased.

Liam Breslin and Ingrid Skogsmo conclude the workshop which was a first attempt to bring together the different countries in Europe who are now carrying out FOTs.
The workshop has confirmed the high amount of MS activity in automation testing on public roads. This is in particularly true for the planning stage. Several infrastructures and procedures have been developed for this type of testing and only in a few cases is there yet large scale tests on public roads.
From the different presentations it is obvious that such FOTs are only now really beginning— 2017/2018 will be important years for these.
It is very important to share lessons learnt, and to understand what important risk elements are, as well as give relevant messages for regulators. There is also likely to be a high degree of interest from countries in EU who may soon launch FOTs.
It is thus important to share experiences from the different FOTs run both on EU-level and in member states. Given the interest in in the topic of large scale testing on public roads, the

intensified activities expected during the next couple of years and the commonly expressed need to share experiences and learnings a follow-up activity will be considered.

ANNEX:

How to build a successful testing environment?

The questions discussed in that thematic session were the following:

- What are the factors that make a good national test-bed?
- What are the elements that attract industry investment?
- What are the areas where an exchange of data would be useful and beneficial for the success of your pilots?
- How is data shared among testbed partners?
- Is there a data sharing framework in place?

The following points have been highlighted by the participants to the Workshop:

- Importance of clear rules
- It is very important to agree on what is confidential
- Relevance of an open and flexible testing structure
- Creation of a learning environment (e.g. support learning by doing, sharing of lessons learnt)
- Definition of an open test framework, installation of technical infrastructure and possibility of testing in mixed environment
- Data sharing should be considered as a benefit for all stakeholders
- Find win-win business for Public Administration and OEM to share data
- Public Administration should be open to share data
- Participants to the tests shouldn't be obliged to pay for data
- Different types of tests should be carried out including functional tests and behaviour acceptance tests by systematic observations
- Multi-brand testing should be promoted

What are the exemption procedures for testing Connected and Automated Vehicles on your national public roads?

Parties such as vehicle manufacturers, research bodies and road authorities must gain practical experience with CAV on public roads. This practical experience is needed to demonstrate the good functioning of the new technologies. Relevant European legislation only allows new technologies and functionalities on public roads if they have proven to be safe and operable. However, proving that technologies and functionalities are safe and operable usually requires practical testing out on the public road.

Some of the member state (MS) opened their public roads for testing CAV. This document wraps up the different conditions in the MS.

- What are the main steps? What kinds of tests are performed?
- Where can we find public information (on the web)?
- What are the main obligations?
- How do you ensure public safety before and during the pilots?

The following points have been highlighted by the participants to the Workshop:

- Some countries issue a long term approval without technical assessment of the CAV. Other countries carry out a thorough examination and issue an approval with limited validity.

- In the case of limited validity, it is important to define when a CAV test is considered different from a previous CAV test and would require a new application.. If an applicant makes substantial changes to their CAV under test or in the test definition (i.e. operational design domain) it is not clear when it should be considered to request a whole new application process to be put in place.
- It is important to understand if a test includes aspects demanding new or unique requirements on the public roads.
- Countries that require exemptions can follow a pre-defined detailed or a step-by-step approach. It should be clearly defined which tests do require an exemption and how to manage liability and responsibility in that test. Liability can differ per country. It could be under the entity that grants the exemption in case of an event or the applicant.
- It should be made clear which is the exposure for the licence granters in case of an event
- For safety assessment, it should be defined what type of tests or scenarios should be considered, what is the scope, and which tools and methods should be used.
- Mutual recognition can voluntarily be acceptable by MS. By working on cross border projects with CAV, exchanging procedures and knowledge this can be achieved.
- After having gained sufficient experience, the need for standardisation can arise. ABS en ESP are example of systems that developed from comfort system into standards from UNECE WP.29.

For some of the Member States the CAV approval procedure was described in headlines:

- Austria:
    - Code of practice:
        - Regulation in place
        - Description of the tests
        - The applicant must involve the road operator
        - An expert group will have the final decision on the approval and the exemption.
        - The role of the road operator in the process must be defined. CEDR will evaluate the impact.
- Finland: In Finland the authorities put trust in the knowledge and reputation of the CAV manufacturers. Manufacturers can apply for a prototype license plate without previous assessment. With this plate they candrive on public roads.
    - The exemption is according to current legislation, no need to go to the parliament to change/add/remove laws.
    - Responsibility on the applicant
    - 300€ cost for the applicant
- Sweden:
    - The Swedish regime is similar to the one in Finland. New regulation will be launched in 2017. It is expected that stricter approval requirements will be put in place.
- Greece
    - Procedure similar to the Netherlands
    - Other Member States licence plates are accepted. If a vehicle has been granted a license exemption in other EU member state it will be accepted by the Greek authorities
    - Plates for testing must have been granted
    - Insurance should be in place (3rd party)
    - New legislation: human being in control does not necessary need to be inside the vehicle
    - Safety plan validation by a public science centre
    - Safety assessment

- Germany. In Germany the procedure is managed at regional level. CAV manufacturers based in Germany need to ask permission in the federal state where they were based for instance Baden-Württemberg (B-W) or Bavaria. Application policy and procedure Germany requires that a vehicle authority assesses the prototypes for instance a TÜV. The TÜV engineers declare the vehicle fit to drive on German roads. In case of cross border testing the federal state, which is the departure point for the CAV must inform all its fellow states. The rules of the assessment are determined by a technical service (TS) like TÜV or DEKRA. The manufacturer can choose its own TS. The rules are strict. The approach at TÜV is similar to that in the Netherlands, including EMC. The states issue the permits.

- The Netherlands. The CAV admittance procedure is based on a step-by-step approach. It is based on a wide-ranging risk analysis: Intake; Desk research; Testing on a closed proven ground; Admittance based on an exemption. The expenses of the RDW have to be paid for based on the fees published in the Dutch governmental journal.

- Belgium. In Belgium the approval of CAV is the responsibility of the federal Belgium authorities (FOD). The states of Belgium like Brussels, Flanders and Wallonia are responsible for the exemption. This can include restriction on intersections. National legislation is created by the central government, FOD Mobiliteit en Vervoer. The Netherlands (RDW) and Belgium cooperated in the assessment of prototypes which have not been approved by other EU member states. The Belgian permit was based on the same assessment as in the Netherlands. Belgium accepts CAV approved in another MS.

What are the AD impacts you wish to evaluate?

The questions discussed in that thematic session were the following:

- From industrial and public authority point of view
- What are the methodologies for AD evaluation?
- Is there any evaluation framework into place? What are the main steps?

The following points have been highlighted by the participants to the Workshop.

- Who should do the risk analysis, define methods for it, do the impact assessment? OEMs vs. external evaluation partners. Should local methods be applied (e.g. Pegasus method for safety evaluation in Germany, national guideline for AD evaluations in Austria, Sim Smart Mobility framework in the Netherlands) or should approaches be harmonized (e.g. Trilateral Impact Assessment Framework)? Overview of methods and results obtained is important to collate and share
- Which are the obstacles for AD, risks that need to be known and solutions for them?
- How does the traffic behave in reality (vs. regulation)? What is the ground truth of driving behavior vs. context?
- What are the impacts on driver/user? Ethics, acceptance, use of in-vehicle time, professional vs. non-professional drivers, driver education and licensing, driving skills, behavioral adaptation (also non-users).
- What is the impact of automation of whole transport system (vs. just considering individual elements of the system)?
- What is the AD technology's contribution to overarching (societal) goals? What are the impacts on CO2 emissions, safety, accessibility, sustainability, land use and throughput? What will be the impact on transport modes and mileages? What is the

transport network (traffic) efficiency per penetration of AD? What is the impact on congestion?

- How can AD complement existing public transport?
- How to manage transition towards AD?
- How is the interaction between AV and other road users in mixed traffic?
- How should HMI be designed?
- How could the cyber security be ensured (solutions that work and address it)? It is a prerequisite for interoperability.
- How is the technical performance and functioning of the AD systems (incl. details like gap distance)? What are the system boundaries?
- How independent (autonomous) can or should AV be? Connectivity, information from infrastructure incl. operational information.
- In order for AD to work as intended –What are the needs of AD towards the quality of digital (ICT, HD maps) and physical infrastructure (lane markings, signs) is required? Who should be responsible of the quality? What is the impact of the quality?
- How should AD be taken into account in infrastructure planning? Should the infrastructure be harmonized?
- What kind of new possibilities are there for the traffic management when there is a large portion of, or even only, AVs?
- How is the value creation for AD? What is the total cost of ownership? Is AD affordable for good mobility (enabler to steer the public)?
- How can AD boost business markets and competitiveness?