

**WORK PROGRAMME
SECOND PHASE C-ITS
PLATFORM**

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GENERAL INTRODUCTION

This draft paper presents an overview of the work programme to be undertaken during the second phase of the C-ITS Platform. During this phase, enabling C-ITS deployment will remain a priority. At the same time, as progress towards higher levels of automation is advancing fast, there are a number of issues in the crossroad of connectivity and automation, especially in relation to transport infrastructure that will be addressed in the context of this work programme.

From a content point of view, this work programme is built on the basis of the conclusions and recommendations contained in the Final report of the first phase of the platform.

Concretely, work packages identified are as follows:

Some work packages are direct continuation of work already on-going, for instance "Security" or "Data Protection and Privacy".

Areas such as "Road Safety Issues" and "Urban Issues" previously included in a rather large work package on "Implementation Issues", have being identified as separate work packages.

Other work packages, where work is still needed, but priority is lower at the moment of facing deployment are being grouped, in view of a better use of existing resources. There is a new horizontal area on "Public Acceptance, Implementation Issues and Business Models".

Some areas are being kept, though no work programme is identified for them at this stage, e.g.: "legal issues" and "technical issues", in case new questions would arise at a later stage, that should be addressed in the framework of these work packages.

However, the most important novelty of this work programme is the establishment of a new area linking connectivity and automation, focussing in particular on those aspects related to transport infrastructure. In this respect, aspects such as physical and digital road infrastructure, traffic management and road safety issues, will be addressed in the second phase of the C-ITS platform in view of the preparation of a stakeholder roadmap of vehicle automation within GEAR 2030.

This Work Programme will be implemented through working groups, already existing in the framework of the C-ITS Platform or outside, or establishing new ones for the new work packages. In comparison to the first phase of the C-ITS Platform, work packages will have in some cases a more "ad-hoc" implementation and frequency of meetings adapted to their specific topics and constituencies.

The C-ITS Platform envisages to establish additional work packages during Phase II, mainly the field of "C-ITS and logistics and professional drivers", and "Common Technical Specifications".

The expected outcome of the second phase of the C-ITS Platform is a Final Report, consolidating the conclusions and recommendations on the different work packages. This report is tentatively expected to be ready by September 2017.

WORK PACKAGE: C-ITS SECURITY

The second phase of the C-ITS platform on the topic of C-ITS security shall concentrate on the implementation of all the recommendations that have been agreed upon in the January 2016 C-ITS platform report. The C-ITS Platform activities on security have as the only working group of the C-ITS platform already continued in 2016 to regularly meet and to work on the implementations of the recommendations due to the importance of the topic and need for quick solutions by the involved stakeholders.

The primary focus of the activities will lie on the formulation and agreement of the common security and certificate policy for Europe with dedicated regular meetings, encompassing stakeholders from ALL European C-ITS deployment initiatives. Further the roles and concrete actors for the security scheme for the operative C-ITS deployment will have to be worked and agreed upon. Of course also the topics of revocation of trust, crypto-agility and updateability will have to be covered in that process, but are mostly already implicitly included in the huge task of defining the common security and certificate policy for Europe. In this context also the global dimension will have to be taken into account.

C-ITS Security is further considered as a potential element within a delegated act under the ITS Directive 2010/40/EU on C-ITS – therefore the expertise of the C-ITS Platform group on security will provide a vital support for the elaboration of legal certainty for C-ITS security.

WORK PACKAGE: C-ITS COMPLIANCE ASSESSMENT

In the first phase of the C-ITS platform the topic of C-ITS compliance assessment has been covered under the umbrella of the C-ITS Security working group. As described in the final January 2016 report of the first phase of the C-ITS platform there indeed exists a strong link between compliance assessment and the security scheme. However, the topic of C-ITS compliance assessment is much broader than only the link to security and should therefore be analysed in more depth in the second phase of the C-ITS platform as a topic of its own.

The term “compliance assessment” has been used to describe the process by which a C-ITS station is validated through a set of tests to be deployed on the market. For the achievement of key public policy goals, C-ITS stations require compliance assessment before being placed on the EU’s internal market. A high level overview and process for compliance assessment of C-ITS systems or stations and C-ITS enabled vehicles has been defined in the first phase of the C-ITS Platform. However, none of the roles and actors in that process have been concretely selected yet. Further several risks and challenges have been identified that require further analysis.

In addition, the topic of compliance assessment will also have to cover the topic of common agreed standardisation profiles that have been started to discuss in the first phase of the C-ITS platform. In this context the discussions of compliance assessment could further cover the topics of unique (European or global) C-ITS application identifiers.

Therefore the topic of C-ITS compliance assessment will need to take a prominent role in the 2nd phase of the C-ITS platform to discuss and agree on the processes for C-ITS deployment.

C-ITS compliance assessment is further considered as a potential element within a delegated act on C-ITS under the ITS Directive 2010/40/EU – therefore the expertise of the related C-ITS Platform working group will provide a vital support for the elaboration of legal certainty for C-ITS compliance assessment.

WORK PACKAGE: DATA PROTECTION AND PRIVACY

Within this work package, the work will continue building on the conclusions and recommendations contained in the Final report of the first phase of C-ITS Platform.

In this respect, the first milestone following this report is to test, discuss and possibly validate the proposals and solutions formulated by the WG on Data Protection in front of e.g. national DPA's or with the technology sub-group of Art 29 Data Protection Working Party. This step should test in particular the proposed solution to implement "informed consent" (by providing vehicles with ad-hoc technologies allowing to attach "consent markers" to personal data).

The second milestone is to work with the relevant actors and stakeholders on the definition of the criteria that will be used to categorize the applications. The applications that may fall univocally under public or vital interest could indeed be processed without drivers' explicit and informed consent. Other applications, more 'commercially' oriented (cooperative local services and global internet services) will instead require consent.

Another set of issues to be addressed within this work package relates to the difficulty to control the way the data is stored and used after being broadcasted in the CAM messages and received by unknown receivers, as well as any solutions to fulfil the "right to be forgotten".

Considering the importance of the Privacy Impact Assessment in the new data protection Regulation, this element will also be further investigated as a next milestone.

When and if a delegated act under the ITS Directive 2010/40/EU on C-ITS will be envisaged, the expertise and input of the C-ITS Platform working group on data protection will provide a vital support in the preparation phase.

A new area of relevance identified for this WP relates to the analysis of the implications of the C-ITS Apps identifier registry initiative (currently carried out in the context of the Harmonisation Task Group 7 HTG#7 of the EU-US-Japan ITS Cooperation) and the potential link to C-ITS compliance assessment. The envisaged future existence of a harmonized registry may serve and support the management of driver's informed consent instantiation: a 'tick the box' menu could be maintained and updated, according these univocally identified applications through the registry, allowing the driver to select the family of applications for which he is giving consent.

AREA C-ITS AND AUTOMATION

During the first phase of the C-ITS Platform, the work programme was deliberately restricted to connectivity, and vehicle automation was left outside of the topics and discussions held. This decision was taken with the aim of progressing on C-ITS deployment as soon as possible, and to focus on the relevant open issues reflected in the work programme.

As progress towards higher levels of automation is advancing fast, and considering the preparation of a stakeholder roadmap of vehicle automation within GEAR 2030, there are a number of issues that would also need to be tackle: physical and digital road infrastructure, traffic management and road safety issues. These are meant to be addressed in the second phase of the C-ITS platform.

The work package on Public Transport, C-ITS, and Automation in Urban areas has not deliberately be included in this area to give it more visibility. However, there are certainly links and connections with some issues to be covered here. A smooth coordination among the work package on Public Transport, C-ITS and Automation in Urban Areas, and the Area on C-ITS and Automation will be ensured throughout phase II of the platform.

In order to ensure complementarity, and avoid overlapping, work in this area will be undertaken in close liaison and cooperation with other Commission's initiatives such as GEAR 2030, the High Level Round Table between the Telecoms and the Automotive Industry, etc.

WORK PACKAGE: PHYSICAL & DIGITAL ROAD INFRASTRUCTURE

The impact of connected and automated driving on the physical infrastructure includes new requirements imposed on road construction to help unlock maximum benefits from this new technology but also the possibility that old practices may no longer be necessary (e.g. removal of physical road signs and their maintenance).

Road infrastructure was traditionally seen as concrete and asphalt, road signs and traffic lights, bridges and tunnels, but today this is complemented by the digital infrastructure, such as digital mapping and real-time traffic information.

The digital infrastructure can then be seen as an accurate, dynamic and live digital representation of the physical infrastructure. This digitisation of infrastructure will greatly support connected and automated vehicles into understanding their surroundings and is potentially much more cost effective than extensively modifying both the physical infrastructure and equipping the vehicles with an array of redundant sensors. This digitisation also brings new possibilities in dynamic traffic management; it is for example far easier to introduce variable speed limits (e.g. in case of road works, dynamic lane management, or to tackle shockwaves).

This does raise however new topics, such as the need to maintain a high quality standard for this digital representation, both on accuracy and timeliness of the updates, requiring an increased collaboration between public and private sector, between road authorities and C-ITS service providers. Next, and in particular for the live data, the communication infrastructure (ITS-G5 Road Side units and/or cellular network coverage) needs to be put in place in order to guarantee the infrastructure to vehicle (I2V) communication. Lastly one should consider a feedback loop from the vehicle to the infrastructure, helping identifying areas where the vehicles lack adequate support from the infrastructure, thus allowing prioritising maintenance tasks on both the physical and digital road infrastructure.

Because of the close links between the two aspects of the infrastructure, the (partial) shift of maintenance burden from one to the other, and the need to bring these two traditionally very different sectors together, they will be addressed together in a single working group.

This work package will further focus, inter alia, on the following questions:

- Is every road suited for automated driving? What about the quality of the road markings? If it is not easy for a human driver to understand the traffic signs, it might be confusing for automated systems as well. Does road design need to be altered to allow automated systems to detect events more quickly? Should there be a compliance assessment process for road infrastructure?
- How can physical infrastructure advancements support connected and automated vehicles? How can vehicles use both physical and digital infrastructure in an

integrated fashion? How do we ensure adoption of the technology (e.g. C-ITS enabled traffic lights, rather than relying on cameras)?

- What technical and policy challenges exist when discussing digital and physical infrastructure on a national scale for connected-automated vehicles? What research is needed to address these challenges?
- Assuming hybrid communication for C-ITS, where should the focus be on infrastructure side? Which criteria should be used to decide where and when to invest? In the case of cellular, what type of telecom contract could be constructed and how would that affect roaming costs?
- How can we manage the transition period? What if new requirements create conflicts with traditional road transport? How will we fund the transition period, regardless of whether infrastructure cost would be lower or higher in a fully connected and automated world?
- Is there a difference between the publicly owned network and roads under concession?
- What is included in the definition of digital infrastructure and how does it support connected and automated vehicles? Which hardware is required, for communication or maintenance and storage of data? When talking about data is it more than just mapping? What infrastructure related data is needed and how is it obtained? What are the hurdles faced in collecting and maintaining (the quality of) this data?
- The provision of high definition mapping seems to be ensured by private parties but what is the role for public authorities? What should be the coverage of such high definition digital maps? Should the entire road network be covered, or not (partial coverage implies automated driving would not be supported everywhere)?
- How do public authorities see their role changing with connected-automated vehicles on the road? E.g. real time traffic information is needed to identify the most optimal (shortest, least congested ...) route but what information would road authorities need to provide and what would the required quality (accuracy, timeliness)?
- What will we be able to learn from Day 1 deployment of C-ITS for later phases, such as higher levels of automation and Day 2 services?

WORK PACKAGE: ENHANCED TRAFFIC MANAGEMENT

Under EC's Gear 2030 high level group, a stakeholder roadmap on vehicle automation is being prepared, taking into account the recommendations of the Cooperative ITS platform.

Since the uptake of autonomous driving is therefore years, rather than decades away, the transport road sector will have to assess and adapt existing procedures and create new ones in order to ensure the full compatibility of these vehicles with the public's expectations, as automation and automated driving are seen to positively impact traffic management, enabling congestion smoothing, improving efficient control of volumes and flows, and safer network operations.

Facing this shifting period, from conventional driving to fully automated systems, will be challenging, as from setting up the right strategies, to understanding the impact of automation and the changes to come on the roles and borders of the Road Authorities, Traffic managers, the Service providers, the Vehicle manufactures and the physical Infrastructure stakeholder groups, at operational level.

In order to better assess those impacts and identify the benefits of connectivity and automation as a way to enhance Information Services and Traffic Management, building upon already established use cases seems a proper field to address the topic, posing questions such as 'How would Dynamic Lane Management have to be redesigned to harvest the full potential from automated driving?', 'Would Variable Speed Limits be easier to implement and assess under this framework?', 'How could Hard Shoulder Running or HGV Overtaking Ban procedures be adapted to promote platooning or to segregate automated driving, when dealing with mixed flows during this transition period?'. And since automation will likely be deployed in different types of road vehicles, involving heavy-duty vehicles and buses operating on specific routes, 'Should new procedures be designed having in mind e.g. bus rapid transit or container shuttles on dedicated lanes, across certain sections of the network and under specific conditions e.g. motorways at night?'.

But also from road safety perspective 'What needs to be done to take advantage of connectivity and automation while enhancing Event/Incident Warning and Management?', 'Would Traffic Management Plans for Corridors and Networks have to be adapted to better fit the requirements for autonomous vehicles? How?', 'Are there any physical/digital infrastructure new requirements to promptly deploy them?'.

Activating circulation or traffic management plans, along core corridors or urban networks, easily show the need to ensure simultaneous and coherent dissemination, across all communication means available, (e.g. VMS, Road-side units, Service provider apps or in-Vehicle information systems on board semi or fully automated vehicles).

As information will be dynamically provided from very different vehicle equipment, physical-digital infrastructure, any of which may be public or private, the increasing benefits from

connectivity and automation lie upon identifying the relevant use and business cases and prioritizing actions.

Building upon and beyond the C-ITS day 1 and 1,5 services, should make possible to map the existing technologies, the implementation options and the gaps to fill towards different or higher levels of automations and accordingly road types suitability, while evaluating the real life costs of deployment, its scalability and replicability.

A short list of possible technical key issues to address, when forward thinking on connectivity automation and enhanced Traffic management, could be drafted taking into account; 'Location and information accuracy': for dynamic management; 'High definition maps': 'what type of road, which lane, what are the rules applying?'; 'Data collection and Data sharing requirements': for data exchange requirements, data sets and quality requirements, 'what are the recommended standards to use or what protocols to put into place?'; 'Access to digital Traffic Circulation or Management Plans': accessibility and availability of data, including static and dynamic information for the automated vehicle to interact and comply with, will enhance traffic management taking advantage of this bi-directional dynamic and adaptive dialogue. And in a more broader sense, 'Should the National Access Point be considered as the right place to upload those Plans?', 'What are the technical barriers to overcome, in terms of content harmonization and format?'; 'What are the requirements for continuously maintain a up-to-date timely accessible database, for map providers, service providers and in-vehicles systems to feed from and 'trustfully' provide accurate and high quality added value information.

The work plan

The work plan will then focus on a based case Working Group, establishing a more jointly cooperation framework between all the relevant stakeholders, dedicated Meetings and Workshops, looking into synergies with other Working Groups and the recommendations from previous development stages.

Facing incremental levels of automation under Traffic management context, the Working Group will focus on trying to identify where to begin with, what to deploy and why, assessing geographical prioritization, impact on traffic efficiency or relevance for safety.

Automation test-bed opportunities and use cases along the Core Ten-T corridors will be integrated, as motorways tend to be more uniformly designed, better maintained and operated. Recommendations towards addressing particular urban mobility system, on physical/digital infrastructure including vehicle-to-vehicle and vehicle-to-infrastructure communications technologies addressing day 1 and 1,5 but also looking ahead on day 2 and 3 services, are foreseen.

Technical inputs to Gear 2030 are expected, as well as identifying the links and opportunities to address the CEF and the H2020, in terms pilots, research fields and funding and investment tools.

WORK PACKAGE: C-ITS, AUTOMATION AND ROAD SAFETY

The barrier for deployment of automation is the boundary condition that it must be safe.

Partial automation, intended to take over some of the driving tasks, is quickly finding its way into commercial products. Although in principle intended to make driving and traffic not only more comfortable but also safer, the deployment of such partial automation functions raises some new safety challenges. Connected and automated vehicles, and solutions based on C-ITS need to demonstrate a safety enhancing performance.

The safe deployment of connected and automated vehicles automation requires that the technical regulations which define the performance of partially or fully automated vehicles are conceived, defined and tested taking into account the interaction of these vehicles with the human driver and other road users.

All road users involved in traffic: including fully or partially automated motor vehicles, non-automated motor vehicles, motorcyclists (non-automated yet), cyclists and pedestrians must respect the rules of behaviour established in each Member State's highway code. These rules may need to be updated to reflect a traffic environment including connected and automated vehicles, which in turn will need to integrate some, or eventually all, of these rules of behaviour into the system design (coded into the system software).

Moreover, automation technology will be available across borders, so the behavioural rules should be adapted in a harmonised manner.

One aspect problem is the interaction between the partially automated vehicle and its human driver which was addressed in the C-ITS Platform under the topic of HMI (Human Machine Interface/Interaction). The discussion needs to also ensure the safe interactions also with other road users in mixed situations: co-existence between vehicles with automation reaching from none to eventually full automation, and between road users that can be unconnected or connected.

Given the nature of these challenges, which calls for a deeper exchange between the authorities responsible for the approval of vehicle technology and those responsible for road traffic safety, the C-ITS platform will take advantage of existing discussion fora in order to address them, such as the **High Level Group on Road Safety**.

However, in the context of the C-ITS platform, ad-hoc meetings dedicated to road safety may be convened if such a need is identified during the activity of some of the working groups, when road safety comes across as part of the discussions in the various working groups.

The aim of the discussions concerning automation and road safety will be to:

- Identify the new opportunities to improve road safety and the challenges resulting from needed for a safe deployment of partially or fully automated vehicles and/or C-ITS based solutions.
- Identify if and how the traffic rules (rules of behaviour) should be adapted to ensure that fully or partially automated vehicles are safely integrated into traffic.
- Contribute to the discussion and coordination between authorities dealing with rules of behaviour and technical vehicles regulations on how to address these challenges and adaptations like for example:
 - The definition and testing /assessment of automated systems
 - The compatibility between automated functionalities of different vehicles and with non-equipped vehicles and road users

WORK PACKAGE: PUBLIC TRANSPORT, C- ITS, AND AUTOMATION IN URBAN AREAS

Cooperative-ITS technologies can contribute to the over-arching goals of making our transport system more efficient, safer and sustainable.

In the urban context, local authorities across the EU need to address problems associated with congestion, air quality, safety and ultimately deploying tools that can support the integration of different transport modes and creating a truly multimodal transport system. To support such multimodality, C-ITS technologies that can enable a wide range of transport modes to communicate with each other is therefore essential. To justify investments and to continue to support the aforementioned policy goals, cities need to be able to deploy C-ITS if it can also positively impact public transport and support the integration of different transport modes.

However, different transport modes have different characteristics, different stakeholder groups and even different operational cultures. Deploying C-ITS systems in a complex city environment will have far-reaching implications on their operations and it essential that all transport modes and their communities are aware of the potential and implications of such technologies.

C-ITS in cities was a topic addressed in the first phase of the C-ITS Platform, especially (though not exclusively) in the Implementation Working Group. In this respect, it was stressed that to successfully deploy C-ITS in cities, decision makers must be presented with tangible results of what can be achieved by C-ITS application in their specific context. It is important to note the cost-benefit analysis identified that more than half of all benefits take place in urban areas. The right applications, their naming, quantification of their benefits, etc. are key to make such deployment decisions. Hence, there is a big potential for knowledge sharing among cities and other local stakeholders, and local champions have an important role to play.

Building upon the relevant recommendations of the Final report and last plenary of the first phase of the C-ITS Platform, areas which need to be explored in further detail include the use cases of C-ITS deployment in cities, the potential business models associated to them, and the identification of practical tools to support local actors e.g. pre-commercial procurement. Close cooperation should be established with existing initiatives or projects that could be of help for the development of such tools.

Moreover, the use of C-ITS to support vulnerable road users (non-motorised road users, such as pedestrians and cyclists as well as motor-cyclists and persons with disabilities or reduced mobility and orientation) is a topic that was identified in the first phase that required specific attention. It will also be specifically investigated including identifying

relevant use cases and identification of further technical and organisational actions to support the deployment of C-ITS to help vulnerable road users.

In the frame of the second phase of the C-ITS platform, such aspects will be investigated by engaging with the relevant stakeholder groups at city and public transport levels and also mapping all of the relevant projects and initiatives exploring such issues (i.e. CIMEC, CODECS, the Amsterdam Group etc.) and bringing such results to the attention of the relevant stakeholder groups and C-ITS platform members overall. Such findings can be fed to the relevant working groups of the C-ITS Platform and incorporated in the final report of the second phase of the C-ITS platform to bring this dimension to the forefront of different stakeholder groups and relevant policy initiatives.

Automation

The introduction of automated vehicles will undoubtedly make us rethink how vehicles are used in cities but rather than seeing them as a threat it should be explored how automated vehicles can support sustainable urban mobility and multimodality. This topic in the urban and public transport context is gaining a lot interest by public authorities and public transport operators who are posing questions such as **'what impact will the arrival of autonomous cars have on urban mobility?'**, **'Is automation purely restricted to passenger cars or can this stretch to public transport vehicles as well?'** and **'what is the potential impact that automated vehicles, and especially public transport could have on urban planning and design?'**

In the frame of providing input to GEAR 2030, is important to highlight such issues in terms of how far could things change, how soon and what impact on urban mobility this may potentially have. In the frame of the second phase of the C-ITS platform, such aspects will also be investigated by engaging with the relevant stakeholder groups at city and public transport levels and also mapping all of the relevant projects and initiatives to explore such issues. Such activities will help assess in what ways automated vehicles can support sustainable urban mobility and multimodality and what potential further actions by both the public and private sector are needed to support this introduction.

WORK PACKAGE: HORIZONTAL ISSUES (PUBLIC ACCEPTANCE, BUSINESS MODELS, IMPLEMENTATION ISSUES)

There are a number of topics on which further work is needed as recognised in the conclusions and recommendations included in the Final Report of the first phase of the C-ITS Platform. However, based on the experience of the previous phase, we have come to the conclusion, that probably these topics might not need specific individual working groups holding meeting on monthly basis, but could be better addressed through a different concept.

An area of horizontal issues is hence identified, grouping existing issues such as: "Public Acceptance", "Business models", and "Implementation Issues", and eventually others that could be added later.

The area would work in a very flexible way, both in terms of configuration of membership, and pre-established work programme.

The proposal in this area is to launch very clearly identified topics for discussion, based on the conclusions and recommendations of the first phase of the C-ITS Platform, in each of these sub-areas under the form of short series of seminars (e.g. 1 to 3 seminars). These seminars would have the objective to generate clear deliverables to become inputs for the Final Report of Phase II of the C-ITS Platform.

The membership of these ad-hoc working groups would as well be very flexible depending on the topic proposed for discussion.

With no intention to be exhaustive in the list of topics, some are included below as examples:

Public Acceptance

There are three recommendations coming from the first phase of the Platform on which work could be carried out:

- There is a need for factual messages addressing legitimate concerns related to C-ITS services. Further work needs to be done in defining clear non-technical messages on demonstrated solutions based on reliable evidence. Focusing on concrete use cases could help construct such clear messages.
- Difference in impact between the optional or compulsory character of certain C-ITS services. Work into the various mechanisms (e.g. incentives) to obtain a workable and acceptable solution finding the balance between societal and individual needs.
- Addressing public acceptance issues of non-connected road users – in particular those that are likely to remain non-connected.

Business Models

One key conclusion contained in the Final Report of the C-ITS Platform is to use the "list of Day1 services" to focus future discussions on business models. This exercise could be tested selecting a very limited number of these applications and involving in the discussions the stakeholders concerned in the implementation of these services.

Another area potentially worth to explore via ad-hoc meetings, is for instance the role of private road infrastructure operators, and their ideas on business models in view of the deployment of C-ITS.

Implementation Issues

An assessment will be undertaken if recommendations on issues (other than road safety and urban issues) are not being covered in other work packages, and should urgently be addressed in view of preparing C-ITS deployment.

"DORMANT WORK PACKAGES"

There are a number of work packages of the first phase of the platform, for which immediate activity is not foreseen at this stage. Although, it is recognised that further work might be needed in this areas later on. Hence, these working groups will be kept in the work programme as "dormant areas". This will give the possibility to re-open any of them if new questions arise later in the process.

The "dormant areas" areas identified are:

- legal issues
- technical issues: specifically the subgroups: on "Hybrid communication & frequencies" and "Access to in-vehicle data"