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The changing roles of Road Authorities and Service Providers in Traffic Management 2.0 deployment: A Guidelines Document

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Abstract

All around the world ITS developments are growing from deploying 'collective' means of traffic management (TM1.0) towards more individualised, functional and tailor-made traffic management (TM2.0). The members of the ERTICO TM2.0 innovation platform believe in cooperation among traffic stakeholders to grow towards TM2.0, however also acknowledge this will require changes in the traditional role of the road authority or the service provider. By building on previous knowledge from the TM2.0 platform, and lessons from multiple international ITS projects deploying TM2.0, the taskforce on Guidelines for Stakeholders will provide a set of guidelines that can serve as a start of a standard approach when getting involved in TM2.0 collaboration. This is done by structuring roles of stakeholders, different TM collaboration phases and a possible TM2.0 approach, and mapping the activities and lessons from multiple past and ongoing international ITS projects on these structures. This will show different approaches to tackling common challenges, as a starting point for future TM2.0 collaboration.

Keywords:

Traffic Management 2.0, Changing Roles, Deployment Guidelines

Introduction

Over the past few years, increased connectivity, use of in-car services and improvements in traffic management ICT infrastructure have opened up a new range of possibilities in traffic management deployment. Throughout Europe ITS developments are showing a gradual shift from focusing on deploying 'collective' measures (traffic management 1.0) towards more individualised, more functional and tailor-made traffic management (traffic management 2.0). The members of the ERTICO TM2.0 innovation platform[1] believe in cooperation among European traffic stakeholders in order to work towards (1) better insights in the infrastructure status for road authorities, (2) more effective tools to influence this status where needed, and (3) improved services that service providers can offer to their users. The TM2.0 concept focuses on enabling vehicle interaction with traffic management

plans and procedures, keeping in mind the heterogeneous character that traffic management operations in Europe can have in terms of availability and quality. By discussing different aspects of TM2.0 deployment in Europe, the TM2.0 innovation platform members aim to pave the way for the TM2.0 concept to be implemented in various cities and regions around Europe, based on the win-win of its actors. The group of members consists of traffic management stakeholders such as Public authorities, Road Operators for cities and regions, OEMs, Traffic Information Service Providers, Road Infrastructure Providers, ITS research centres and road-network users associations.

In previous phases of the TM2.0 innovation platform, different taskforces have worked on several subjects related to TM2.0 deployment such as identifying barriers and enablers, exploring value propositions, contractual agreements & schemes, links to other traffic modes and the exchange of traffic management plans. This has, among other results, led to the identification of involved stakeholders and roles[2], definition of traffic management plans exchange[3], and description of multiple use-cases[4] in which TM2.0 deployment will provide a win-win for all stakeholders involved. In the meantime, several projects and pilots were deployed throughout Europe in which TM2.0 aspects were tested in practice, some of which have been described by the taskforce on best practices. The combination of previous insights from TM2.0 platform taskforces and the experiences from the different deployment projects allow for a conversion of this knowledge by focusing on how the traditional roles of road authorities and service providers are gradually changing in TM2.0 deployment, and if guidelines extracted from previous knowledge and projects can help stakeholders to collaborate effectively this context. The current taskforce on the Guidelines for Stakeholders focused exactly on this task: how can we use the lessons from previous taskforces and experiences from TM2.0 deployment projects be extended to provide traffic management stakeholders with guidelines on how to collaborate effectively in a TM2.0 ecosystem.

Changing roles of stakeholders

The shift from TM1.0 to TM2.0 brings many opportunities in more effective traffic management. Apart from a technological transformation where individual technical columns are increasingly integrated with each other, TM2.0 deployment also has consequences for changing work processes, collaboration schemes and roles. For example, the road authority will actively have to start considering the way of working for a service provider and the range of added capabilities in traffic management measures and information, when executing its traffic management plans. The other way around, service providers will have to start considering more road authority traffic management plans and collective traffic management when providing their service to their customers. Parts of these challenges are already considered in the 2005 ITS platform deployment guideline document[5] where corridor collaboration between different road authorities is described. This document however does not consider service providers yet, as this is a very recent development. For these new forms of collaboration, and the increased involvement in the activities of other stakeholders, it is essential to understand for stakeholders what each other's motives, intentions and strategies are, and how these

can be aligned clearly for all stakeholders involved. In order to address these challenges and learn from past experiences, this paper will first describe the general vision and mission of road authorities and service providers under TM2.0. Then, based on a Common Operational Picture approach of a TM2.0 development (one of the developments TM2.0 might enable), three European projects are described that deploy (parts of) TM2.0, regarding the issues of changing roles of stakeholders.

Vision and Mission of stakeholders

On the tactical level of traffic management (with strategic level being the policy development, and operational being the actual execution of individual identified traffic measurement measures), the situation in the network will be described and compared with the traffic policy to determine and analyze the bottlenecks, incidents and emergencies. For the services and measures to be triggered into action under TM 2.0, the vision and mission of the two main groups of road stakeholders have to be clarified: road authorities and service providers differ to a great extent in this respect given their different background, interests, operations and dependencies.

The vision on behalf of the road authorities is:

- Safe, efficient and sustainable management of road infrastructure
- Use available means for traffic management in the most (cost-)effective way
- Responsibility for road infrastructure

The vision on behalf of the service providers is:

- Fast, efficient and safe driving experience for its users
- Make routing and navigation a tool for reliable journey planning and better driving
- Competitive advantage

The mission on behalf of the road authorities is:

- Cooperation with service providers so that a better overview of road infrastructure in gained, and more effective and individualised measures are available
- Gain better insight in what is happening on the roads by collecting data
- Improve ways of taking measures to adapt road infrastructure use

The mission on behalf of the service providers is:

- Cooperation with the road authorities so that they can contribute to their tasks on traffic management
- Acquire knowledge of the TMPs well in advance so that the user/driver has the best information and service

The differing interests and viewpoints of the two groups of stakeholders in traffic management, those of TMCs and Service Providers, have to be aligned according to the TM 2.0 concept. For TM 2.0 to work, the stakeholders understand and respect each other's interests and effectively translate the traffic management strategy towards measures taken by both.

Traffic Management Collaboration phases

In order to have the best alignment between different stakeholders when exchanging Traffic Management Plans information, stakeholders must commit to a longer term collaboration, encompassing both the TMP preparation, actuating the TMPs as well as the evaluation of TMPs effects. The whole functionality of a traffic management plan can be divided into three different phases which by their nature strongly differ:

- **TMP elaboration phase:** A common management task of various stakeholders/organizations involved, not only in combining Traffic Management Services and Traffic Information Services, but also with regards to networks operated by different authorities. Hence a thorough preparation of the service and documentation by means of intermediate deliverables is a must in order to create and agree upon a clear common understanding between all stakeholders involved.

- **TMP operation phase**: This is the phase where a traffic management plan is executed.

- **TMP evaluation phase:** Traffic conditions change rapidly. In particular, end users change their behavior when confronted with traffic management measures. Hence a thorough analysis of impact a measure has and – if necessary - revision of the service as this is offered, is also a must and should be undertaken recurrently. The evaluation results must be documented and, in-turn, provide input for improving the traffic management plan that was executed.

In all the above mentioned three phases, road authorities and service providers can strengthen each other's role and impact with regard to insights in traffic management situations and effects, the toolbox of measures that could be included in a TMP, and the short iterative evaluation possibilities.

Guidelines for the traffic management collaboration phases

In the following initial guidelines/recommendation for the implementation of the traffic management collaboration phases are provided based on stakeholder workshops and discussions within the taskforce for Guidelines for stakeholders.

Collaboration of stakeholders in TMP elaboration phase

General aspects:

- Establish common understanding goals/responsibilities (e.g. user vs network optimum)
- Establish common understanding of means/measures (e.g. detour recommendation via VMS, flow control via traffic lights, route recommendations (based on traffic information) via navigation service) to influence user behaviour, improve user acceptance
- Establish common understanding on existing means (e.g. speed data, demand data, volume data, cameras) to identify traffic state or incident information
- Identify means to derive user acceptance ratio

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Location specific aspects

- Agree/discuss/understand local policies
- Identify local means to influence traffic (e.g. available infrastructure and alternative)
- Establish common understanding of goals and possibilities
- Define triggers and measures for TMPs
- Agree on protocols and distribution channels

Collaboration of stakeholders in TMP operation phase

General aspects:

- Identify and agree on proceedings for evaluation of active strategies/measures in real-time
- Agree and define on feedback loop

Location specific aspects:

- Identify and agree on available measures for actuating TMPs
- Identify and agree on local 'special' restrictions for TMPs deployment

Collaboration of stakeholders in TMP evaluation phase

General aspects:

- Identify and agree on proceedings/methods for evaluation of active strategies/measures (continues before and after evaluation)
- Identify required (and available) data for evaluation

Location specific aspects:

- Avoid local direct feedback loops by measures from different stakeholders

TM2.0 COP approach

Within the TM2.0 concept several collaboration architecture models can be developed. One example might be a central trusted third party concept where data authorisation is managed between different stakeholders. Another example could be that stakeholder-owned data clouds are interlinked with a multitude of other stakeholder-owned data clouds. A hybrid form between these model types is providing a common viewpoint from which TM2.0 information can be shared and measures can be taken, a Common Operational Picture approach. Here, different forms of information from different stakeholders are shared in a common framework, and which allows for taking measures based on a common understanding of the current situation in the road infrastructure. Such a COP approach would look like the following schematic description, with traffic management centres (TMCs) representing the left side, and service providers (SPs) representing the right side.
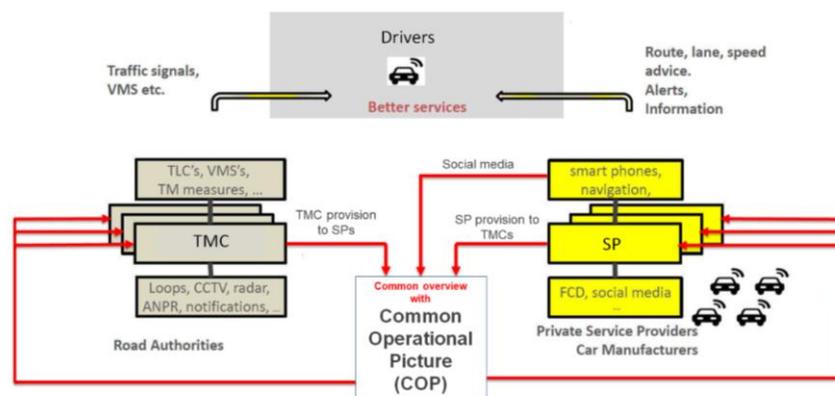
Figure 1 – Traffic management 2.0 and Common Operational Picture

In a Common Operational Picture approach a common viewpoint is established in which different stakeholders involved in a certain traffic management scheme can depart from. This allows for a common understanding of several elements such as:

- The status of the infrastructure: what are current traffic flows, incidents, oncoming traffic (and prediction), reasoning for need to take measures, consequences of measures taken, etc.
- Available Traffic Management information: What data-inputs enable our current view of the infrastructure status, what is their availability and reliability, etc.
- Available Traffic Management actuators: What are the different available actuators to perform certain traffic management measures, which target groups do they have, do they show common information to drivers, etc.

TM2.0 deployment projects

Establishing such a framework can be done in different ways and with different scopes. In order to learn how these principles are (in some cases partly) implemented in actual projects, several of these projects are described below regarding the project, which elements of such a TM2.0 were deployed (with the COP approach as an example), and how the stakeholder collaboration was formed in the light of the abovementioned vision and mission, and traffic management collaboration phases.

NAVIGAR

The German NAVIGAR project[6] – Sustainable Traffic Control with integrated routing and navigation solutions in the region of Stuttgart – aimed to connect urban traffic management and control with private service providers to harmonize recommendations and information provision to the traveller. This project ran from 2013 to 2015, and used the DATEX2 standard for information exchange between TMCs and SPs, and TPEG TEC for exchange between the SP and the navigation device in-car. The information that was shared to align information and recommendations were, among others, detour recommendations, traffic signal control information, parking guidance at event locations and reasons for measures. The scoping of the project therefore did not include a COP, but allowed for sharing context for measures from TMC to SP and its drivers, which therefore includes a changing role for the

SP. In order to increase this collaboration, three goals were set: (1) Achieve a common understanding on traffic management measures and their possible impact, (2) agree on selection of suitable test users for the demonstrator, and (3) identify legal and organisational constraints.

Dmotion

The German Dmotion project[7] aimed to develop and implement an integrated traffic management system for the city of Düsseldorf. This was based on comprehensive data, information and strategy network for regional and local authorities, as well as for private service providers. The project ran from 2005 to 2010 and aimed for (1) Enhanced traffic state analysis in the TMCs by processing FCD provided by private partners (2) continuous up-to-date information to road users which cannot be offered via collectively informing media, (3) Increase of road network efficiency by directing traffic streams through less congested areas and (4) matching objectives of individual routing services and public traffic management strategies by offering a strategy conform routing. This project therefore did provide common understanding of routing strategies, and enabled two-way communication between TMCs and SPs, and communication with the drivers. This of course means a changing role for both the road authorities and service providers involved. The establishing of the strategy conform routing showed great results: in return for the SP providing restriction in certain routing, the TMC would take increased responsibility of maintaining adequate quality for the alternative route. In the strategic framework that was developed, a base for a mutual accounting for the provided data was defined, as well as related data provision, cooperation respectively purchasing and quality control.

Socrates 2.0

The European Socrates 2.0 project[8] is a System of Coordinated Roadside and Automotive Services for Traffic Efficiency and Safety, based on a cooperation of road authorities, service providers and car manufacturers. The ongoing project is a public-private partnership of which many members are also involved in international ITS platforms such as TM2.0, C-roads and C-ITS. Pilots will be deployed in Amsterdam (NL), Copenhagen (DEN), Munich (DE) and Antwerp (BE). This project is still running and actively builds upon knowledge reaped from the TM2.0 platform, which enables strong alignment with the activities of this taskforce and the project processes. This project is largely covering the whole COP picture by emphasising three aspects: (1) Alignment of floating car data from service providers and traffic data collection by road authorities, (2) providing traffic control relevant information to involved navigation services, and (3) establishing a common operational picture by developing common traffic management strategies between road operators and service providers. This project also acknowledges the increasingly changing roles of stakeholders involved and will therefore actively facilitate this longer-term collaboration to get stakeholders aligned early in the process, involving all three phases.

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Preliminary conclusions and next steps

The framework that has been set up by the TM2.0 taskforce on guidelines for stakeholders already shows a concrete set of structures that have to be taken into account when being involved in TM2.0 collaboration such as the visions and missions of stakeholders, the collaboration phases and several collaboration architecture models. Initial results from the different TM2.0 related projects already show that these aspects are used in practice and provide valuable lessons. In order to work towards concrete guidelines that will help traffic management stakeholders to become involved, or increase their involvement in TM2.0 collaboration, and achieve the mutual benefits that can be reaped from this collaboration, the taskforce on Guidelines for Stakeholders will work on several subjects in parallel in the upcoming months. The taskforce will focus to deepen the 'theoretical framework' of earlier TM2.0 knowledge such as the different roles, visions and missions in TM2.0, the meaning of the different collaboration phases in practice and the TM2.0 collaboration model architectures. In this way, a firm framework is set on which the lessons from projects can be mapped and categorised. The taskforce will also focus on deepening and widening the scope of projects that can teach us how the abovementioned collaboration issues can best be tackled. Apart from better describing the results coming out of abovementioned projects, this taskforce will also look into other international projects where TM2.0 aspects are implemented. Eventually, the final paper will provide a structured overview of how different TM2.0 collaboration challenges and role changes are guided in different projects, and what common denominators can be taken from these different approaches. These can then again be used as a standard approach to take into account in different countries and contexts when developing TM2.0 schemes.

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