Automated vehicles and urban traffic management

MAVEN stakeholder consultation workshop organised in cooperation with CoEXist and TransAID

24 October 2018 - Greenwich (London)

Workshop note

1. Scope and aims of workshop

Like MAVEN, the H2020 projects associated with this workshop, CoEXist and TransAID, are exploring the implications of increasing vehicle automation on urban roads. They are mainly considering the traffic management and infrastructure aspects of connected and automated vehicles (CAVs). CoEXist is also exploring the transport planning and policy dimensions.

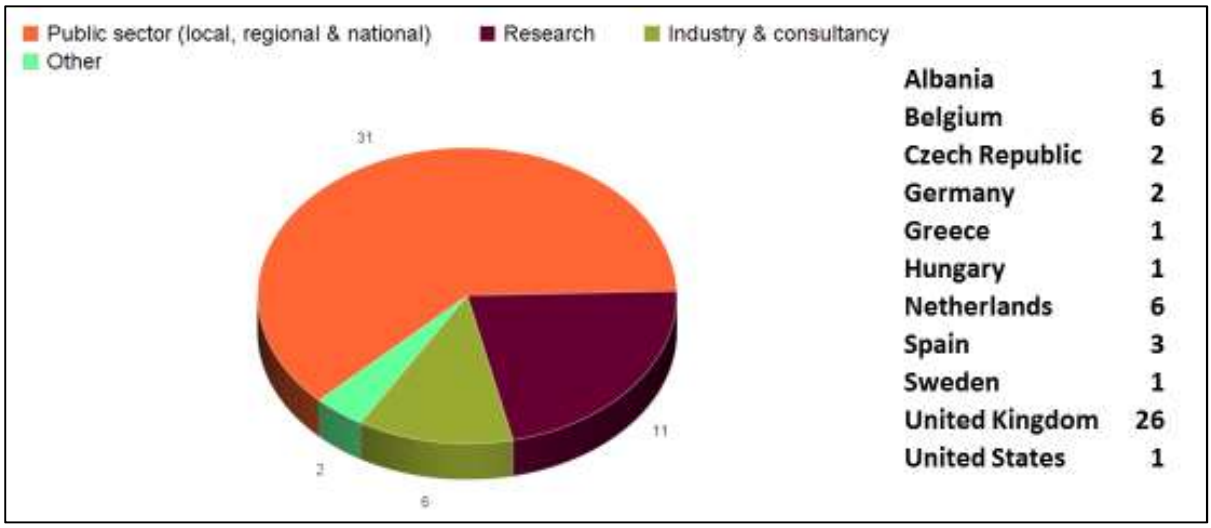
Consultation with, and outreach, to local/regional authorities, especially city authorities and traffic managers, is important for each of these projects. This workshop follows a successful workshop for local authorities organised jointly by MAVEN, CoEXist and TransAID in October 2017 and a MAVEN-only workshop in Barcelona in November 2016.

The stated aims of the workshop were to:

- explore in more detail how increasingly instrumented vehicles are likely to behave on city roads and how this may affect the traffic management task and wider transport goals
- provide insight to the role that communication technology can play in the shorter-term of connected transport and the longer-term of automated transport
- promote reflection among local authorities on their role and responsibility as CCAV evolves.

2. Workshop participants

The audience was targeted at urban transport stakeholders, with a particular emphasis on representatives of local and regional government. The following charts provide a breakdown of attendance by sector and by country. Given the high number of representatives from transport authority, the workshop met its target audience goal. The full list of participants can be found in the annex.

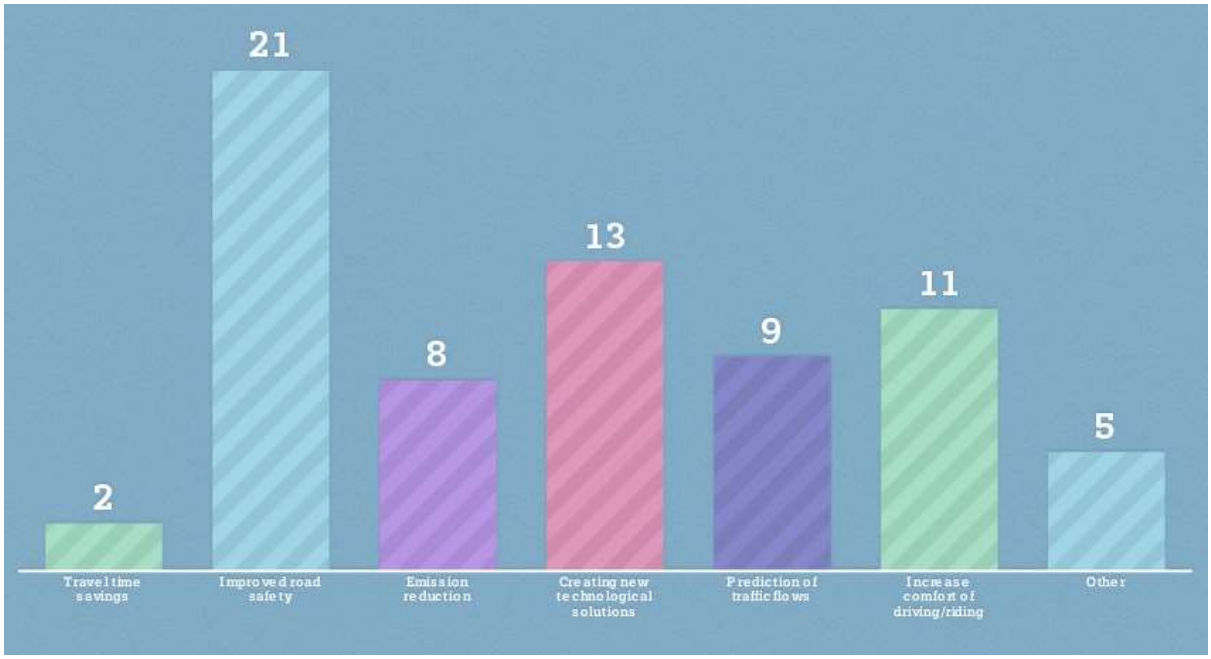


Albania	1
Belgium	6
Czech Republic	2
Germany	2
Greece	1
Hungary	1
Netherlands	6
Spain	3
Sweden	1
United Kingdom	26
United States	1

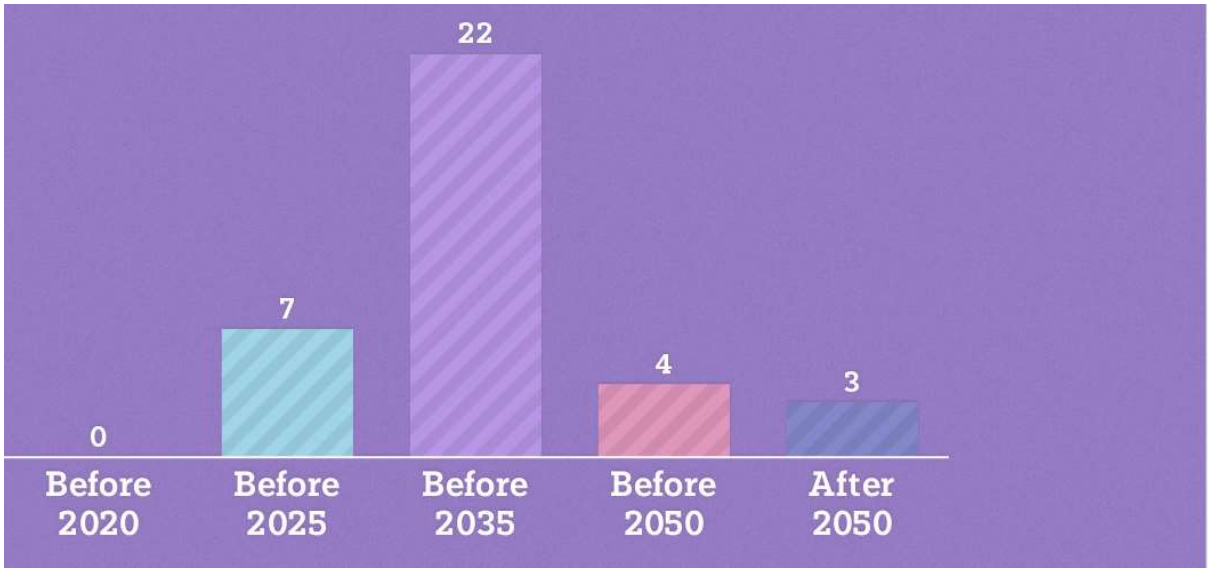
3. Plenary session

Following a welcome by the workshop host and an introduction to the MAVEN project and the workshop by project partners, the live poll was introduced and first questions were put to the audience.

Mentimeter Q2. What are the most important benefits you expect automation to deliver?



Mentimeter Q3. When do you expect automated vehicles will noticeable affect the roads of your city?



Greenwich in the spotlight, Trevor Dorling, Digital Greenwich

Trevor's talk covered the Greenwich context and its expectations from the various CAV projects that the London borough is involved in. Greenwich is home to around 2000 manufacturing jobs, down from 150 000 around 100 years ago. Most jobs are now low-skilled service jobs (tourism, hospitality, care and logistics) which are the most likely to be affected by automation. The main pressure in Greenwich is residential development – the population of London as a whole is expected to grow by 1 million in the next decade and the population is ageing. These challenges require an integrated approach if transport isn't to worsen. By way of example, London's inner ringroad was intended to decongest other roads; however, new functions have been brought to this road thereby creating more traffic and congestion.

Regarding CAVs, the need for automated shuttles to connect seamlessly with other modes and not compete with them was underlined. Greenwich is home to one of two UK smart mobility living labs. The borough's interest is not in how the technology will work but rather how it will affect planning and the design of cities and what sort of services it can deliver. It is important to understand how CAVs will work on a challenging road such as the Blackwall tunnel crossing the Thames, which is often not the typical CAV trial site. Greenwich is currently in the build phase of the trial, then there will be the operation phase and ultimately a commercial phase through the selling of services. Three potential income sources have been identified: companies paying for using test bed; selling services, eg, data; and shared research programmes. Given the proliferation of living labs, there is concern that competition may led to less cooperation. It is therefore important to ensure sharing of data.

Key insights from Matthew Barth, University of California and Jaap Vreeswijk, MapTM

Matthew explained that transport forms a big part of the Smart city competition in the US and connectivity plays a big role therein. Many of the benefits of the GLOSA-type apps have mainly been shown through modelling but these need to be tested in a real-world setting, and the real-life cost of setting up and operating C-ITS need to be known. It's for this reason that an innovation corridor has been set up in California town of Riverside to run different C-ITS applications. A lot of work has been put into working with the various public agencies, technology companies and the university in order to set up this corridor.

Jaap's gave a broad overview of recent CAV developments and studies and their relevance to cities. Key messages from the presentation included: CAVs are reaching the end of the hype cycle, at least if measured in terms of economic and research activity (Waymo is adding 1 million miles per month); safety should not be taken for granted (in view of the Uber fatality); and cities have a key role to play as mobility managers to ensure that CAVs deliver societal benefit and should consider how they can work with the private sector in a constructive way to deliver this societal benefit.

Tomas Horak, Czech Technical University

- Most respondents coming from the public sector
- Agreement that platooned vehicles should get priority at lights.
- Would not break a platoon

Mentimeter Q: What is the most significant AV development of the past year?

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On the road to Connected and Automated Mobility, Chris Farrugia, DG MOVE, European Commission

Prefer step approach, based on experience (piloting, etc)

- Considers connectivity as an enabler of automation, not a precondition. Expects all vehicles to be connected by 2022.
- 3 key areas
    - **Technology:** wants technology to be developed in Europe. Need investments – EC initiatives such as R&I (103 million for large scale demos for HAV) 50 million call for testing 5G. Support from CEF for digitizing road infrastructure across EU. Being ready for AVs also means being digitally ready.
    - Actions: 1 EU action to consolidate disparate activities to ensure investment is directed in right place. Will issue a call for creation of platform.
    - Galileo will be free of charge from 2019
    - **Safe automated mobility and future proof legal framework**
    - Coordination of MS traffic rules, ensure interoperability and security of road safety measures (C-ITS delegated act to be adopted this year – currently interservice consultation with adoption by end of year)
    - Access to vehicle data for public authorities + possibly legislation for vehicle data of public interest
    - **Societal concerns: jobs & ethics**
    - EC knows that many uncertainties and messy but cannot do nothing – need to protect our industry
    - Reskilling, how to take over an AV, how can AV recognize a policeman.
    - Ethical: AI alliance set up.
    - AV vision is long but an idea as to how to get there.

4. Small group discussions (afternoon)

A. Strategic planning for automated and connected vehicles

Steps towards the deployment of connected and automated vehicles (CAVs) in cities are progressing fast. From a local authority perspective, the success of the transition towards higher penetration levels of CAVs will largely be determined by integrating them into existing sustainable urban mobility planning processes (i.e. SUMPs). However, today there are hardly any strategic transport plans in Europe that properly address the technology and the resulting impacts. Introducing CAVs into a strategic planning process will ensure that:

- the introduction of CAVs aligns with the overall mobility vision and goals of a city;
- all relevant stakeholders are identified and can cooperate in order to ensure that CAVs are deployed in a manner that benefits all;
- potential problems are highlighted early on and mitigating measures are identified;
- the deployment is monitored and evaluated in a structured manner.

The aim of the 'planning for automation' break-out session is to discuss and share experiences of introducing CAVs into a structured strategic transport planning process. The following questions will be discussed:

1. How do CAVs align with the vision and mobility goals in your city? Are there any potential conflicts with existing mobility goals (e.g. increase modal share of walking and cycling)?

2. How can you raise the awareness of CAVs with stakeholders that have limited experience with the technology? How do you deal with the high level of technological uncertainties when discussing the topic with citizens?

3. What are the biggest uncertainties about CAVs that you and your organisation are currently facing? How could these uncertainties be reduced in a structured manner?

4. How can the successful introduction of CAVs be measured? What sort of indicators could be used?

Summary of discussion

From the discussion it became clear that cities across the EU have very different approaches on how to deal with CAVs in their strategic transport planning. Different approaches include the following:

- Some cities are developing comprehensive transport strategies that specifically consider the role of CAVs and their impacts on the mobility system. They are aware of the potential positve and negative impacts of the deployment CAVs and what to ensure that the deployment of CAVs aligns with existing mobility goals.
- Other cities are see CAVs more as a threat rather than an opportunity, which results in that the issue is not tackeld proactively.
- The role of CAVs in public transport is actively being investigated by some cities as it is seen in some cases as a "low-hanging fruit". Further, the role of CAVs for school transport and social care is also being explored.
- As there are only limited use cases available, it is important that cities are learning by doing.

- Cities are development more and more ITS, smart city and digital strategies, which can act as a foundation for CAV strategies and policies. Cities should focus more in "digital-readiness" rather than "automation-readiness".
- Some cities questions the need to include CAVs in the transport strategies, because CAVs are "just" a technology and the focus should always be on the humans. Further, there is the concern that CAVs are still an unproven technology and cities should not overreact on hypothetical impacts.
- Cities need to think strategically about their role as data providers and managers.

Input from the discussion fed into the development of the following definition of automation-readiness:

"The capability of making structured and informed decisions about the comprehensive deployment of CAVs in a mixed road environment. This capability requires:

- A clear awareness of the technology underpinning CAVs, the different functional uses and business models for CAVs and a high-level understanding of the impacts different deployment scenarios can have on traffic, quality of life and stakeholders involved in local transport planning.

- The institutional capacity to plan for a future with CAVs by using tools that accurately represent CAV behaviour in order to identify the impacts of different CAV deployment scenarios.

- A strategic approach in planning a wide range of measures that will ensure a deployment of CAVs, which supports higher level mobility goals."

The following uncertainties for cities were identified during the discussion:

- The role of decision makers and politicians in deployment of CAVs.
- The impact of CAVs on spatial planning and the ability to influence logistics.
- The varying roles of cities during the extended transition periode towards higher penetration rates of CAVs.
- The user and non-user behaviour. The impact on the mobility impaired, how can a system be created that benefits all?
- The role of cities in be promoting rules and regulations.

B. Traffic management in an increasingly connected and automated transport system

The role and influence of the traffic manager has changed over the last 10 years, partly influenced by the growth in Sat Nav and app-based traffic information and routing services. This trend is likely to continue given the momentum to open up public sector transport data, including traffic data, and a growing acknowledgement that vehicle manufacturers and driver information service providers often have a better picture of the traffic situation than traffic managers. The rise of connected, cooperative and automated transport systems will no doubt accelerate this shift in role and influence of the traffic manager. This was acknowledged at the first MAVEN local authority stakeholder workshop in November 2016. Some parts of the traffic industry are already preparing for an automated future of 'decentralised traffic control' whereby automated vehicles coordinate their movements bilaterally, in some cases supervised by a fleet management system. Others are talking about 'remote management of AVs' whereby the movement of automated vehicles is influenced or even overruled by some central managing agent. There is debate whether or not these processes will or should interface with traffic management operations, while at the same time digital and physical infrastructure is considered to be an important facilitator of automated driving.

1. What is your view on vehicles organising and manoeuvring themselves on the road?
2. How do you see your role as traffic manager changing in the future? Where do you see opportunity and what are the potential risks? How can these be managed?
3. What is your view on the MAVEN use cases? Would you envisage this as part of traffic management in the future?
4. What actions are needed to make the transition to the MAVEN use cases? What is feasible in the short, medium (and long) term?

Summary of discussion

Today, cities see themselves as traffic programmers who are deeply involved in operating traffic systems on the traffic network. A possible new role, whether it is a supplement or complement to existing roles, is to set rules and constraints to those that provide mobility / operate (automated) vehicle fleets. While it offers new opportunities for traffic management, it was seen that new tools will be required. Traffic management and traffic control might exploit the higher compliance of AVs and be extended with tactical (direct) interventions in the vehicle behaviour. Interventions may include: vehicle routing and traffic distribution on the system level and speed control measures on the vehicle level. What is considered acceptable in terms of interventions should be determined through a dialogue with OEMs and users. However, it was agreed that authority interventions are justifiable in case of conditions and events that affect traffic safety or system performance.

There was a fear among cities that TNCs will dominate the roads, with negative effects on modal split, number of kilometres driven and eventually congestion. It was seen that rules and regulation should provide clear boundaries, but not kill innovation and competition. Incentivisation of favourable development/behaviour and pricing of unfavourable developments/behaviour was discussed and could be further explored, also in the broader context of managing travel demand with scarce space and capacity. Concrete examples are the definition of geofences to prescribe where AV functionality is/isn't allowed or to cap the total fleet size.

To understand what level of freedom vehicles might have, air traffic control was used as an example. Air traffic control is highly regulated and has zero freedom. A recurring question related to this subject was 'who owns the system?', and thereby has the power and authority to decide? Clearly there are issues of equity, fairness and accessibility to all at play. Contrary to full authority control the perspective 'what if we do nothing?' was discussed. As it was seen, the challenges to regulate and operate a system as an authority are massive. It was agreed that a more suitable role for cities is to design and deliver a scheme for their situation, which then may be implemented and operated by others.

Data and information was agreed to become an important instrument to facilitate and influence AV development. Cities could provide open data portals, focus less on operation but more on planning and publishing data and information. Data and information could involve policy data as well. Managing considerable amounts of data requires new skills and expertise, as well as standards to ensure harmonisation. With such a role, the importance of data quality, accuracy and maintenance increases, which is in contrast with today's reality that many cities haven't digitised their data and information yet, simply because there is no budget for it.

It was also discussed that the AV development should not be seen independently from other developments such as MaaS. Both developments are expected to converge, eventually merge, and together will enable to efficiently guide the movement of people and goods in cities. In addition, the sharing economy is clearly challenging the old system. Who owns the vehicle will become an important factor for the eventual role of the traffic manager.

The following actions were seen as important to move forward in the field of AV R&D:

- Continue evidence research, focussed on problems/priorities cities are trying to solve.
- Transparency of OEMs to better understand capabilities of AVs.
- Common use cases, contributing to city objectives, finding the low hanging fruit.
- Better data sharing, enabling data exchange and better standards.
- Research user behaviour, which is often neglected.

C. Do cities and regions need a traffic technology/ITS strategy?

The use of technology for managing traffic and providing information (ITS) is widespread in cities and regions. However, its deployment has not typically been part of a city/region-wide strategy. Indeed, given the array of agencies dealing with different facets of transport management in a city or region and the different levels of road authorities, there is rarely a coordinated approach to the deployment of traffic technology. This can lead to missed opportunities in terms of efficient use of and investment in technology. A key issue in smaller cities, where systems implementation is less common, is the lack of expertise on traffic management and ITS matters.

Most of today's infrastructure-based traffic and ITS systems either observe or inform road users, such as inductive loops for traffic detection or variable message signs to inform about incidents or provide travel time. The growth in cooperative and connected systems provides an opportunity for direct interaction – through data sharing - between the infrastructure and the vehicle. Such interaction could eventually make some of today's technologies redundant. For instance, positioning data from the C-ITS-enabled vehicle (the 'cooperative awareness message') could gradually replace the inductive loop or other traffic detection systems. An increased penetration of connected and cooperative systems is considered crucial to deliver certain automated driving functions in the most efficient and safest manner possible, such as the platooning use cases that MAVEN is working on.

1. Is the above introduction a fair reflection of traffic management systems and ITS implementation in cities? How does your organisation decide on which technology to implement in your city or region?
2. Is there value in having an integrated city/regional-wide approach to investing in and operating technology? What are the barriers and enablers?
3. Is your organisation reviewing its traffic technology approach in light of the advances in vehicle and communication technology?
4. What is your view on the MAVEN use cases? Would you envisage this as part of traffic management in the future?

Summary of discussion

Cities were clear that while there is widespread deployment of basic ITS equipment and capabilities, such as traffic counting, variable message signing and traffic control systems at junctions, that the capabilities are predominantly tactical and reflect the above. Larger cities, such as London have a significantly greater and more integrated ITS capability which enables corridor management and greater ability to proactively and reactively manage traffic around known events, such as large concerts and football matches, but unplanned events still pose issues for such ITS systems.

There was discussion related to technology implementation decisions and how these are often led by previous investments which lead to incremental additions that work with existing systems. This led to broad discussion about the flexibility and interoperability of ITS, with varying response between cities. Some cities have been able to secure 'innovation' budgets and have procurement processes that enable testing and piloting of new systems and capabilities but most still struggle to procure the latest

systems and technologies, driven by a combination of the prohibitive cost of upgrading underlying infrastructure and inflexible procurement policies. This creates a significant barrier to adoption of new approaches, such as MAVEN, and is particularly acute for smaller cities with more limited resources. Austerity and budget pressures were also felt acutely by cities in terms of their ability to invest in ITS to the level they desired.

Views differed on the need for, or ability to, have wider city and regional-led approaches to traffic management. Some authorities were moving in the direction of fully outsourcing traffic management to private contracts using outcome led procurements where the city/authority specifies the cities goals in terms of reduction in traffic jams, delays, journey time reliability and reduced emissions for example. Other cities were keen to maintain their in-house capability for managing traffic and acknowledged the need to keep using their existing systems to maximise their previous investments. Cities were also vocal about their desire to utilise advancements in terms of in-vehicle and communications technologies but had concerns that citizens would rather follow their own existing knowledge when driving in the city, or follow their own navigation provider, limiting the ability of the city to influence driving decisions and behaviour.

There was broad agreement among cities that Connected Autonomous Vehicles and related enabling technologies such as V2I communications were both not well understood or yet forming part of any wider strategies being developed by cities as a way to improve societal outcomes. A few cities have identified the need for building this knowledge and have been able to secure research and government funding to collaborate on projects with academia and the private sector but these examples were few and far between. These cities also acknowledged that disseminating the findings of these projects to influence policy and strategy is not yet as comprehensively embedded as they would like within their respective organisations.

Cities agreed:

- Technology innovations, such as CAV and supporting communications infrastructure could bring benefits to how traffic is managed in cities
- That new procurement and financial approaches would be needed to invest in new and more open infrastructure and systems
- That an outcome-based and systems-agnostic approach would be preferred in the long term to support either in-house or outsourced traffic operations
- That cities need more help and resourcing to fully understand and be able to take advantage of CAVs and supporting technologies

Automated vehicles and urban traffic management

MAVEN stakeholder consultation workshop organised in cooperation with CoEXist and TransAID

24 October 2018, Greenwich (London) 10.30-17.00hrs

Final agenda

10.30: Welcome by host, *Kim Smith, Digital Greenwich*

10.40: Introduction to the MAVEN project and workshop, *Meng Lu, Dynniq and Suzanne Hoadley, Polis*

11.00: Greenwich in the spotlight: Living Lab and MOVE-UK project, *Trevor Dorling, Digital Greenwich*

11.30: Key insights from *Matthew Barth, University of California* and *Jaap Vreeswijk, MAPtm:*

- Traffic management through C-ITS and automation
- Deploying new digital infrastructure – why, how and what if I don't?
- How automation may change the shape & form of a city

12.30: Lunch

13.30: Preliminary results from the MAVEN user impacts survey, *Ondrej Pribyl, Czech Technical University, Prague*

14.00: Breakout sessions

- Strategic planning for automated and connected vehicles
- The role of the traffic manager in an increasingly connected and automated transport system
- Do cities and regions need a traffic technology/ITS strategy?

15:45: Refreshments

16.15: Reporting back from breakout sessions

16.30: EC communication on automated mobility, *Christopher Farrugia*, *DG MOVE, European Commission*

17.00: Workshop close

Venue: Digital Greenwich, 11th Floor, 6 Mitre Passage, Greenwich Peninsula, London SE10 0ER

Participants list

Last Name	First Name	Organisation
Anderson	Ruth	Oxfordshire County Council
Anwar	Ammar	University of Cambridge
Barth	Matthew	UCR CE-CERT
Blom	Gert	City of Helmond
Boelhouwers	Judith	City of Rotterdam
Boschetti	Florinda	Polis
Budhdeo	Sunil	Coventry City Council
Capes	Darren	Department for Transport
Cartwright	Mark	Centaur Consulting Ltd
Connell	Andrew	Manchester City Council
Cooper	John	Department for Transport
Copping	Paul	Digital Greenwich
Craciun	Anna	Transport for Greater Manchester
Darlow	Paul	Portsmouth City Council
de Hevia Mendez	Noemi	DG Cities
de Veer	Chris	Province Noord-Holland / Metro region Amsterdam
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Ivari	Mikael	City of Gothenburg
Kerényi	László Sándor	BKK Centre for Budapest Transport
Larrañaga	Urrotz	Bilbao City Council
Lu	Meng	Dynniq
Maerivoet	Sven	Transport & Mobility Leuven
Miles	John	University of Cambridge Dept of Engineering
Morris	Ben	DG Cities
O'Connor	Karen	DG Cities
Papageorgiou	Markos	Technical University of Crete
Pooke	Marcel	Transport Systems Catapult
Pou	Cristina	Catalan Traffic Service
Pribyl	Ondrej	Czech Technical University in Prague
Radford	Andrew	Birmingham City Council
Rondinone	Michele	Hyundai Motor Europe Technical Center
Ryan	Lucy	Transport for London
Schindler	Julian	German Aerospace Center (DLR)
Shiko	Vera	Institute of Transport

Smith	Eraina	Stockport MBC
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Steiger	Helen	DG Cities
Tong	William	Ealing Council
Treacher	Clive	London Borough of Newham
Tune	Hannah	Transport for Greater Manchester
Tusting	Richard	Transport Systems Catapult
van Dijck	Gerard	Province of Utrecht
Vreeswijk	Jaap	MAP traffic management
Wyatt	David	University of Cambridge