Optimising Use of Intelligent Mobility
During preparations for the Optimising Use Follow-up Programme, Optimising Use held discussions with market parties. As a result, a number of experts from the market were asked to draft a memo on the theme of Cooperative Driving. They jointly drew up this document in May 2014 in a private capacity, based on their years of personal experience and expertise. The memo aims to give government authorities, road managers and stakeholders a clear picture and an understanding of the significance and effects of Intelligent Mobility, and the options for its application. Optimising Use has supported these efforts wholeheartedly and hopes that the dissemination of this knowledge will contribute to new, effective solutions as regards accessibility, safety and quality of life in and between cities.
Vehicle-to-vehicle and vehicle-to-infrastructure communication is becoming increasingly common. These developments are often driven by technology and described in such terms. At the same time, they offer opportunities for solving social problems arising from traffic and transport. Technological developments have already contributed to this area in recent years and there are plenty more opportunities for the smarter use of technology. This memo aims to provide a clear insight into the options available and to clarify how services can contribute to social objectives. It advocates long-term collaboration between government authorities and the business world. An important factor here is the realisation that part of the vehicle-to-vehicle communication, and consequently the services provided to road users, shows less market development than would be desirable from the perspective of social effects.

Government authorities must no longer be viewed as launching customer for this development, but rather as launching partner. While that is not difficult, it does require a little courage.

1. Introduction

‘Think Global, Act Local’
John F. Welch (Jr)
1.1. Trend

The introduction of information and communications technology into the world of traffic and transport is not new. For quite some time now we have seen road users becoming increasingly assisted in the execution of tasks while driving. This trend looks likely to continue strongly in the years to come. Vehicle-to-vehicle and vehicle-to-infrastructure communication offers opportunities for assisting road users with their driving tasks and encourages traffic flow through the network as a whole. A number of developments are running in parallel here.

The automotive industry

The international automotive industry has embraced autonomous vehicles as the Holy Grail. All leading manufacturers now claim to have the technology for autonomous vehicles, and are offering sub-functions such as self-parking, driving in traffic jams, lane keeping, platooning (‘road trains’) and obstacle avoidance, including lane changing.

“Noch in dieser Dekade werden wir in einem Mercedes autonom fahren können”
Prof. Dr. Thomas Weber, Daimler-Vorstand für Konzernforschung, 2013

This trend is marked by step-by-step, long-term development. During this transition, the focus lies on advising and assisting road users and influencing their driving behaviour so as to achieve positive effects on traffic. These developments are strongly aimed at assisting the individual road user. The automotive industry’s goal is thus

• increasing safety,
• increasing the comfort of all occupants and
• lowering emissions.
The IT industry
Over a short period of time, the emergence of smart phones and tablets has created a whole new landscape for mobility applications. Developments are following each other at a far more rapid pace than in the automotive industry, due to the services having shorter life cycles. The end of this development is still a long way off. These days, the computing power of a smart phone is sufficient for increasing numbers of applications. Mobility applications have given rise to an urgent need for adequate information on the surroundings (sensory), both about and exchanged with other road users (“V2V”: vehicle-to-vehicle) and about and exchanged with roadside infrastructure (“V2I”: vehicle-to-infrastructure). The link with roadside infrastructure will not develop without government action. As road managers, government authorities have a role in this in view of their ownership and management of the infrastructure.

1.2. Communication domains
In order to describe the vehicle-to-vehicle and vehicle-to-infrastructure communication, this memo makes use of a functional division into domains. From the road user’s perspective, a functional classification exists in relation to the distance travelled. This classification may be described, for example, by reference to trip planning up to the point where a road barrier is encountered on the route concerned. At various distances from the barrier, road users are influenced in various ways by communication between vehicle and roadside.

- At a distance of 50 km, on the basis of his agenda a road user is notified of congestion and advised to depart earlier.
- At a distance of 5 km, the road user receives a suggestion via a navigation system to take a different route due to the road barrier. The time saved by taking the advice is also indicated.
- At a distance of 500 m, the road barrier sign directly advises the car that it really must change lane without delay.
- At a distance of 50 m, the car detects the road barrier sign and brakes entirely independently, precisely on time.

For heavy and extreme transport, achieving and maintaining a constant speed is of crucial importance. The value of using ITS technology, which creates an individual green wave for this type of road user, has been proven conclusively. An evaluation of Freilot, a project completed in Helmond, demonstrated fuel savings of 13 percent in combination with travel time savings. The individual green wave is not only advantageous for the transport contractor concerned, who saves fuel and maintenance costs, but also for the living environment. The nuisance experienced in the vicinity of this transport is reduced to a minimum. Noise nuisance and particulate matter emissions are also minimised. Moreover, ITS applications can increase safety for other road users.

Beter Benutten van Intelligente Mobiliteit

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The road user experiences pre-trip and on-trip as different categories. However, ‘behind the scenes’ the first two categories use the same technology. This leads to the following subdivision, which is used as a basic premise in this memo.

<table>
<thead>
<tr>
<th>Domain:</th>
<th>Network</th>
<th>Local</th>
<th>Autonomous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target range:</td>
<td>50-5 km</td>
<td>500m</td>
<td>50-0m</td>
</tr>
<tr>
<td>Primary function domain:</td>
<td>Pre-trip and on-trip navigation</td>
<td>Position of vehicle in traffic flow</td>
<td>Direct response to surroundings</td>
</tr>
<tr>
<td>Infrastructure:</td>
<td>Long range</td>
<td>Short range</td>
<td>N/A</td>
</tr>
<tr>
<td>Examples of technology used:</td>
<td>Internet, Cellular telecom, TMC, DAB</td>
<td>Wifi-p</td>
<td>Camera, Radar</td>
</tr>
<tr>
<td>Status:</td>
<td>Many services are now being developed, stimulated by programmes and projects. The necessary long-range infrastructure is widely available.</td>
<td>Only pilot projects, no services developed as yet, due to the lack of shared short-range basic infrastructure. Consequently, many potential safety, efficiency and environmental benefits are not being utilised. This domain will not come about independently without government intervention.</td>
<td>The automotive industry is developing automated driving independently. There is presently no need for a government incentive. Government action may be necessary with regard to data ownership, level playing field, market development.</td>
</tr>
</tbody>
</table>

For the time being, development of the local domain is lagging behind.‘
2. Services and effects

Intelligent mobility will need to make use of the various domains. Depending on the service, one or more domains will be used simultaneously. The strength of intelligent mobility lies in the smart use and combination of these domains. The observation that the local domain will not get off the ground by itself gives rise to the question of what added value could be realised by services if they could also make use of a local network. This chapter describes the contributions that can be achieved for traffic in urban areas, regions and on the main road network, and what this means for road users.

Figure 2: Diverse services and communication systems are possible (Source: ETSI 2008)

2.1. Contribution to public interests

The challenges in urban areas are different in nature to those on the main roads. An indication is given below of the contribution that services can make to public interests for both categories if they can make use of the local domain.

Urban area
Urban and regional areas will benefit from a better flow of all traffic. Better traffic flow has a beneficial effect on safety and emissions. Smart solutions at busy intersections, city centres and important arterial roads result in better regulation of traffic and enable disruptions to be dealt with quickly and effectively.
A few effects that can be achieved with smart solutions at local level:

- Road maintenance is vital. Direct use of real-time data can result in a reduction in hard braking and traffic jams in cities. Traffic flows can be better regulated;
- The provision of direct safety warnings in the car at signs and beacons, such that the road user is immediately aware of the local situation and safety risk. Examples include schools, tunnels, closures, etc.;
- Increasing safety for vulnerable road users. For example, with the help of short-range communication, cyclists can become part of the local domain;
- Vehicles form a recognisable part of the infrastructure, eliminating the need for additional data collection systems to recognise them. This means that, in due course, there will no longer be any need for government property to have its own, expensive traffic sensors. This is because the local infrastructure generates comparable data for traffic management;
- Local disruptions (whether frequent or occasional) can be solved much more effectively with local intelligence, without the intervention of a (relatively expensive) traffic control centre. In the event of calamities or situations in which public order is at stake, it enables quick escape routes to be planned for;
- In-car sensors detect bad road conditions on provincial roads so that critical road maintenance can be commenced far more quickly;
- Maintaining speed is more direct in nature, because the information regarding the current traffic situation goes directly to the road user and, moreover, the way in which the road user acts on this information can be measured.

- Prioritisation at intersections can be applied to various groups;
  - Prioritisation of freight transport at intersections for better traffic flow. This results in cost savings for carriers and limits emissions of harmful substances in urban areas;
  - Prioritisation at intersections for the emergency services, allowing them to reach their destination more quickly;
  - Right of way and prioritisation at intersections for public transport;
- Efficient handling of events traffic and traffic at road works, by improved provision of information in the vehicle;
- Integration with parking facilities results in a reduction in search traffic through accurate allocation of parking spaces. This also enhances safety;
Because of these smart solutions, which make use of the local domain, road users automatically form part of the infrastructure and, as such, can be influenced. The traffic manager (public or private) has a better understanding of the current situation and thus has a more predictable scenario at his disposal. It is a single, integrated system, which means that costs can be saved on separate subsystems that are not – or barely – integrated with each other. Smart solutions can be deployed where necessary.

**Main road network**

Services that make use of the local domain offer motorway road managers the possibility of direct local interaction with the vehicle and the road user. Local disruptions can be solved with local intelligence and local measures and the (relatively expensive, as it is manned 24 hours a day) traffic control centre no longer provides all traffic management services. In addition, this creates the possibility of offering a number of services in an improved form and of developing completely new services. This will result in more effective and more efficient traffic management.

‘Local disruptions can be solved with local intelligence and local measures’

The possibility arises of making dynamic speed limits and other current orders and prohibitions available on the road user’s dashboard. The fact that the local technology allows this new form of information to always be up to date and undisputed offers the motorist comfort and clarity. This is likely to encourage follow-up. An application of the projection of dynamic speed limits in the car that is currently the subject of experiments is the option of detection and prevention of shockwave traffic jams (A58). A broad roll-out of this technology makes nationwide implementation of this service, plus other services such as the temporary imposition of lower speed limits and traffic jam ahead warnings, possible in-car on the entire main road network. This has positive effects on road safety and accessibility, and these measures can also be deployed to boost quality of life in the event of smog, for example.
Services can also provide the road manager with new data and information. Incident detection, for example, can be performed entirely automatically. A car that is involved in an incident reports itself immediately. The response times of the road manager and emergency services can be significantly reduced as a result, which, in turn, will have a positive effect on the reduction of traffic jams and will improve road safety. Another service that offers immediate improvement is the automatic, immediate reporting of a car driving against the traffic, with the possibility of notifying other vehicles of this.

‘Significant reduction in traffic sensors offers the road manager opportunities for reducing costs’

Vehicles are a potential new source of data for the traffic manager and road manager. While privacy issues have not yet been fully addressed, data from vehicles can be used for applications that utilise this large amount of data. Using data from vehicles regarding the condition of the infrastructure and the surroundings, regarding the weather and road conditions, for example, reduces the need for publicly owned traffic sensors. The resulting significant reduction in traffic sensors offers the road manager opportunities for reducing costs. It also offers a great deal of new information with as yet untapped potential. From the perspective of business, too, there are many applications for this information forming the basis for direct services to road users in their cars or on their bicycles.

Systems underlying the services described are largely comparable with systems that support the functions of autonomous vehicles. In addition to direct effects, these services and this technology offer road managers a learning environment as regards the requirements that the government must set in anticipation of a full introduction of fully or partly autonomous vehicles. Public-private partnerships are necessary for government authorities to have the opportunity to learn by doing and to choose and acquire their role in the future. Market parties will have the opportunity to strengthen their international competitive position.

Emergency vehicles

The problem for emergency vehicles is that, whilst they attract sufficient attention, fellow road users often react wrongly to the signalling. In urban areas in particular, this leads to a sort of pressure wave persisting in front of the emergency vehicle. This prevents the creation of a free lane, which is precisely what is needed for rapid deployment of the emergency services. ITS offers the possibility of sending a signal from the emergency vehicle that is received in the immediate vicinity and translated into clear advice for other road users. ITS makes it possible to inform road users at an earlier stage and to advise them about the passage of an emergency vehicle. As a result, the road user has enough time to safely make way for the passage of the emergency vehicle.
2.2. Added value for road users

In the future, road users will be able to rely on safer, more comfortable and more efficient journeys with more reliable journey times.

Better information and advice

The market for traffic-related services for consumers is expected to take off in the next few years. Both via built-in services in his car (either part of the new car or bought “after market”) and via mobile internet, the road user can obtain better information and advice regarding alternative routes, traffic conditions and choice of mobility. It gives the road user options so that he can choose the application best geared to his own use. In the future, the road user will be able to trust that he will be informed of local disruptions such as events, road works and incidents on time, provided that road managers, government authorities and service providers in the chain collaborate effectively. For example, speed limits and other current orders and prohibitions will be available on the car’s dashboard. In this way, the road user is individually informed of the current traffic situation.

More specifically, the road user acquires dynamic in-car information, which is personalised and can look not only locally but also regionally, nationally and, if so desired, internationally. The predictive value of the information available will improve, and multimodal travel advice can be added. For the individual road user, the availability and affordability of comfort and convenience are becoming better and better.

Driver assistance

In addition, the automotive industry is developing increasing numbers of driver assistance services, assisting the motorist when driving. Road users obtain advice regarding speed based on the traffic situation, taking into account the speed limit. They are also advised as to the ideal lane and are assisted in lane changes. Vehicles can assist in remaining in lane and braking on time, for example at the tail end of a traffic jam.

Comfort

The road user will notice that search traffic in the urban environment is reduced, because the road user has improved knowledge of the location of empty parking spaces and can be led there directly. Driver assistance services enhance the feeling of safety, because the driver’s own driving behaviour can be improved with a little help and because other people’s traffic behaviour becomes more predictable. In urban areas, road users will experience a green wave more frequently if they take the advice.

Logistics

In the near future, lorry drivers, too, will be able to rely on a safe, dependable, comfortable and efficient journey.

Efficiency

On top of the general added value that applies to every road user, there are additional benefits to be achieved for the logistics sector. New technology offers the logistics world options for planning more effectively and efficiently, because freight and vehicles can be followed and directed more effectively. In urban areas, the driver will notice that waiting times are reduced because loading and unloading routes can also be modified in light of the current situation (as regards traffic and otherwise). As a result, lorry traffic around local distribution centres and terminals can be modified more effectively, to the benefit of the total road traffic in urban areas.

Cost savings

Efficient distribution in the city and elsewhere and a dynamic application of slots in loading zones result in efficiency and time in the logistics world, and thus money. Driver assistance enables safety and fuel consumption to be optimised. Better information and up-to-date booking systems provide certainty and clarity regarding overnight accommodation and service areas and result in improved safety. The implementation of a green wave results in fuel savings and reduced travel time.
## 2.3. Effects

A great deal has been learned from existing projects regarding the effects of services as described in this memo. The following diagram provides an overview of the effects of these services. These figures are taken from international reports and originate from research in the Netherlands and abroad. The way in which the results are compiled in the research papers has been indicated.

<table>
<thead>
<tr>
<th>Key Performance Indicator</th>
<th>Definition</th>
<th>Source</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Overall perception of individual motorists</td>
<td>Survey (qualitative)</td>
<td>Significant improvement</td>
</tr>
<tr>
<td>Travel time</td>
<td>Search traffic: for parking, green wave, reducing congestion</td>
<td>Measurements, simulation</td>
<td>20% less</td>
</tr>
<tr>
<td>Costs</td>
<td>Fuel savings (green wave, constant speed)</td>
<td>Measurements</td>
<td>13% less</td>
</tr>
<tr>
<td>Complexity</td>
<td>Reduction of decision moments/factors for motorists per journey</td>
<td>Survey (perception) and counts (facts)</td>
<td>40% less</td>
</tr>
<tr>
<td>Congestion</td>
<td>Prevent and reduce (e.g. shockwave traffic jams)</td>
<td>Analysis, simulation</td>
<td>20% less</td>
</tr>
<tr>
<td>Safety</td>
<td>Direct warnings at signs and beacons and by other vehicles/road users</td>
<td>Measurements, simulation</td>
<td>27% fewer incidents</td>
</tr>
<tr>
<td>Flow</td>
<td>Local optimisation (traffic regulation installations (VRIs), road works, events traffic)</td>
<td>Analysis, simulation</td>
<td>25% more capacity</td>
</tr>
<tr>
<td>Enforcement</td>
<td>Speed limit also available on dashboard</td>
<td>Analysis, simulation</td>
<td>25% fewer violations</td>
</tr>
<tr>
<td>Commuting travel time</td>
<td>Variation in daily travel time</td>
<td>Measurements, simulation</td>
<td>25% less</td>
</tr>
<tr>
<td>Emergency services</td>
<td>Response times (min/km)</td>
<td>Analysis, simulation</td>
<td>20% less</td>
</tr>
<tr>
<td>City distribution</td>
<td>Slot management, environmental zones</td>
<td>Analysis, measurements</td>
<td>23% better</td>
</tr>
<tr>
<td>Air quality</td>
<td>Emissions per motorist</td>
<td>Carbon footprint analysis</td>
<td>10% less CO₂</td>
</tr>
<tr>
<td>Costs/benefits</td>
<td>The economical worthiness for the society</td>
<td>SCBA analysis</td>
<td>Positive</td>
</tr>
<tr>
<td>Quality of data</td>
<td>Continuous control of quality of data collection</td>
<td>Analysis</td>
<td>70% improvement</td>
</tr>
<tr>
<td>Costs of information</td>
<td>Information available in-car (less at roadside)</td>
<td>Analysis</td>
<td>0% to 50% less</td>
</tr>
<tr>
<td>Costs of collection</td>
<td>Cost reduction for information on the road network (car as sensor)</td>
<td>Analysis (urban and rural)</td>
<td>40% less</td>
</tr>
</tbody>
</table>
3. Perspective for action

It has already been stated in the introduction that the local domain will not get off the ground by itself. That is because infrastructure is needed in an area that is large enough to convince consumers of the added value of services. To achieve a system that can be continued, and with which the effects described can be realised, a number of things are necessary, which are described below.

3.1. Infrastructure

Developing the local domain requires short-range infrastructure, consisting of two systems: roadside infrastructure and in-car systems with working services.

Roadside
To arrive at a working system, the joint government authorities and road managers should become launching partners for the roadside infrastructure. The benefits achieved with this component also typically fit in the agendas of the organisations involved. Market parties can fulfil an initiating and perhaps an operational role. The existing roadside systems must begin to communicate with vehicles. This requires an antenna on the roadside system that can transmit the internal data flow to vehicles.

Cyclists

Cyclists form a neglected user group, but ITS applications are extremely suitable for these road users, especially with the advent of e-bikes. The green wave for cyclists is an ITS application that can be implemented without delay. Cities such as Copenhagen have been making very useful ITS applications for cyclists, which provide clear added value for the urban area. Safety is a precious commodity for this group of users; too many fatal accidents still involve cyclists. Blind spot detection is an obvious application for lorries: the technology reveals the presence of cyclists and thus makes them visible.
In-car

Market parties can capitalise on such roadside infrastructure in various ways. By removing the barrier of missing infrastructure, a number of services already in pilot form pending market launch can now actually be deployed for a target group of a size that is immediately interesting for market parties. For example, simple in-car systems can provide a number of basic services by linking relatively cheap systems with smart phones. There is also an option of adding far more value with much more complex in-car systems. The essence of the structure referred to is in fact to offer a single roadside infrastructure that can be reused by market parties in various ways for the provision of services. Ultimately, this infrastructure will also be used by the suppliers’ standard in-car systems. The costs and benefits of the in-car side of the system accrue to the market parties and the users.

Objects involved

The infrastructure is intended to link a number of elements directly with each other. This may include the following types of object:

- Passenger transport, public transport and freight transport
- Vulnerable groups such as traffic around schools
- Urban distribution of goods
- Emergency services
- Roadside systems, signs, DRIPs, traffic regulation installations (VRIs), installations giving controlled access to motorways (TDIs), cameras, sensors
- Traffic control centres and incident rooms

‘A single roadside infrastructure offers market parties several possibilities for providing services’
3.2. Scale

Market initiatives require a minimum scale before they can convince road users of the added value. Without such scale, market parties cannot develop business cases in a sustainable manner.

As has been indicated, initiatives are already taking place in the Netherlands. The desired scale can be achieved by a smart linking of the existing Optimising Use initiatives, which already make use of the new infrastructure, with each other and with the ITS corridor, the innovative traffic control centre and Compass4D (see box). By including the cities in Figure 3, too, the benefits for urban traffic become particularly notable. Consequently, projects can be extended to services available

![Figure 3: Example for implementing minimum scale for infrastructure with the building blocks already in place](image)

### Existing initiatives

**Shockwave traffic jams** – Optimising Use project on the A58 between Tilburg and Eindhoven in which solutions are sought using services in the local domain to reduce and/or prevent shockwave traffic jams.

**Brabant in-car III** – Optimising Use project in which in-car services are being developed that should result in an improvement of traffic flow and road safety on the A67 corridor, which is prone to congestion.

**ITS corridor** – Project aimed at setting up cooperative services in the Rotterdam – Frankfurt – Vienna corridor, based on vehicle-to-vehicle and vehicle-to-infrastructure wireless communication.

**Innovative traffic control centre** – Traffic control centre in which road managers monitor, guide and steer the traffic on their networks in collaboration with market parties.

**Compass4D** – European project in which cooperative services are tested and rolled out, with a focus on better traffic flow, reduced emissions and increased road safety in urban areas. This project is running in seven European cities, including Helmond.

In the market. Both around Nijmegen and around Venlo, a link can be created with the German implementation of the ITS corridor, in support of international developments. For logistical applications and to increase market opportunities, it is also desirable to strategically structure the connections between these cities with additional infrastructure. This would lead to geographical coverage as shown in Figure 3.
3.3. Costs
The costs involved in structuring the local domain strongly depend on the precise structure. Relevant issues here will include the ownership of roadside systems, stimulation of the development of services and use of existing roadside infrastructure. It is anticipated that the required impulse to be given by the government will have to cost a few tens of millions of euros in order to achieve the critical mass necessary for an autonomously developing market.

3.4. Preconditions
If intelligent mobility is to be successful, a number of preconditions must be satisfied. Eleven preconditions are described below, which will require attention if intelligent mobility is to be launched in a sustainable and efficient manner.

**Financing:** To accomplish the short-range infrastructure and accompanying services, it is important that the financing is well organised. The government can play an important role in this. On the one hand, they can help by financing the construction of the necessary infrastructure, and on the other by supplying bank guaranties or security in order to make capital available to businesses. The government can also encourage investment by, for example, hedging development risks.

**Legal framework:** Various privacy issues are involved in the monitoring (of data and otherwise) of vehicles, and with that of many individuals, and in the opening up of such data. It is important to create a sound legal framework, providing opportunities to offer services without the user’s privacy being at issue. Preparations currently underway at EU level should be considered in this respect. These legal aspects are too significant and too broad to be dealt with individually. It is imperative that these matters be centralised.

**Safeguarding open architecture and standardisation:** An open architecture with the related standardisation is important for market horizontalisation and the prevention of vendor lock-ins. From the end user’s perspective, there is no need for single solutions (verticals).
**Development of business rules and business models:** Following on from open architecture, the development of business rules and business models is important. The use of open business models with service level agreements will prevent the creation of ‘verticals’/closed business models. This enables each and every market party to develop new, innovative services.

**Human factors guidelines:** More information and the accompanying in-car interface offer many opportunities, but also entail potential risks. Guidelines in this area may help ensure that in-car human machine interfaces are developed in a safe manner.

**Communication aimed at end users:** The government can contribute to communicating these services to end users, so that they become more familiar with this new type of service and its value. This can be achieved via national campaigns, as was done previously for zip merging, for example.

**Collaboration between government and business for long-term realisation:** The joint government authorities are a launching partner instead of a launching customer. They must prevent that a government investment becomes a one-off subsidy for a project, such that once the subsidy ends the project (and therefore the service) ends too. A government authority can invest in the long term as an active shareholder, allowing the authority to share in profits. This secures a long-term digital infrastructure that contributes to economic growth.
Data collection

In Japan, a local infrastructure has been implemented that is similar to that described in this document (ITS Spots). There, the information generated by the infrastructure is used to find locations in the city where sudden braking consistently takes place. By taking a look at these locations, establishing the problem and implementing changes to signs, signalling or green areas, sudden braking in the city has been reduced by 70 percent. After the earthquake in 2011, the same local infrastructure was used to quickly identify where transport in the city was still possible.

Coordination of research, testing and implementation processes:
As promoter of the industry’s interests, the government can give shape to the research, testing and implementation processes. It is important in this respect that these dovetail with ongoing certification processes, so that end users get what they want and the requirements are satisfied.

National roadmap with details of use cases: To kick-start services that make use of short-range infrastructure, it is important that the market is supported by the government to enable a broad roll-out of the first set of services. A European body (the Amsterdam Group) has specified a number of so-called ‘day-one applications’ to this end.

Organisation of public-private knowledge partnership: The sharing of knowledge between public and private parties can help accelerate developments. This involves the sharing of knowledge between public organisations, between private organisations and between public and private organisations.

Marketplace with clearing house function: Sharing data is an important factor in successfully developing services. This can be achieved by setting up a marketplace where data are offered and purchased. Here, a clearing house function (independent broker function) offers the possibility of setting up transactions and safeguarding data quality. A marketplace inherently requires safeguarding from parties that only want to ‘take’. As a marketplace is based on supply and demand, both aspects must be safeguarded.
This memo is based on the combined knowledge and experience of Frans op de Beek (RWS), Laurens Lapré (CGI), Paul Potters (Cachelot), Pim Grol (Fourtress) and Wim Vossebelt (V-Tron), who wrote the memo, supported by Melle Vroom from Optimising Use.