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Environmental Zone information in the Amsterdam Region

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Abstract

In the European project SOCRATES[2.0], a consortium consisting of eleven public and private organisations has been challenged to try different ways of working together to realise smart traffic and navigation services. The partners have selected and developed multiple services in the regions of Amsterdam, Copenhagen, Munich and Antwerp. One of the services is tested in the use case Environmental Zone information in the Amsterdam Region. The service has started in October 2019 and aims for better Environmental Zone information for truck- and coach drivers. It is expected to lead to more business opportunities for the private partners, less violations and better service for road users and an improved air quality for the community. Further deployment on European scale and adoption by the DATEX II community is expected.

Keywords: Public-private partnership, environmental zone, freight traffic

The SOCRATES[2.0] project

The SOCRATES[2.0] project consists of 9 activities and follows a V-model approach (figure 1). First, a cooperation framework was defined (Activity 2), which was then specified for deployment in the four pilots (Activity 3). The designs are validated in the pilots (Activity 4-7), evaluated (Activity 8) and the results will be used to update the cooperation framework (Activity 9).

SOCRATES[2.0] partners, international service providers, car manufacturers, ITS companies and road authorities, believe that new and better traffic information and navigation services for road users can be realized by more cooperation and sharing of information. The partners in SOCRATES[2.0] are defining and experiencing sustainable public-private cooperation and business cases in traffic management. This is an important step in the direction of implementation of smart mobility services. The collaboration makes SOCRATES[2.0] a unique and valuable project, from which lessons can be drawn for all stakeholders in the traffic management chain. It is expected that SOCRATES[2.0] will learn from different approaches.

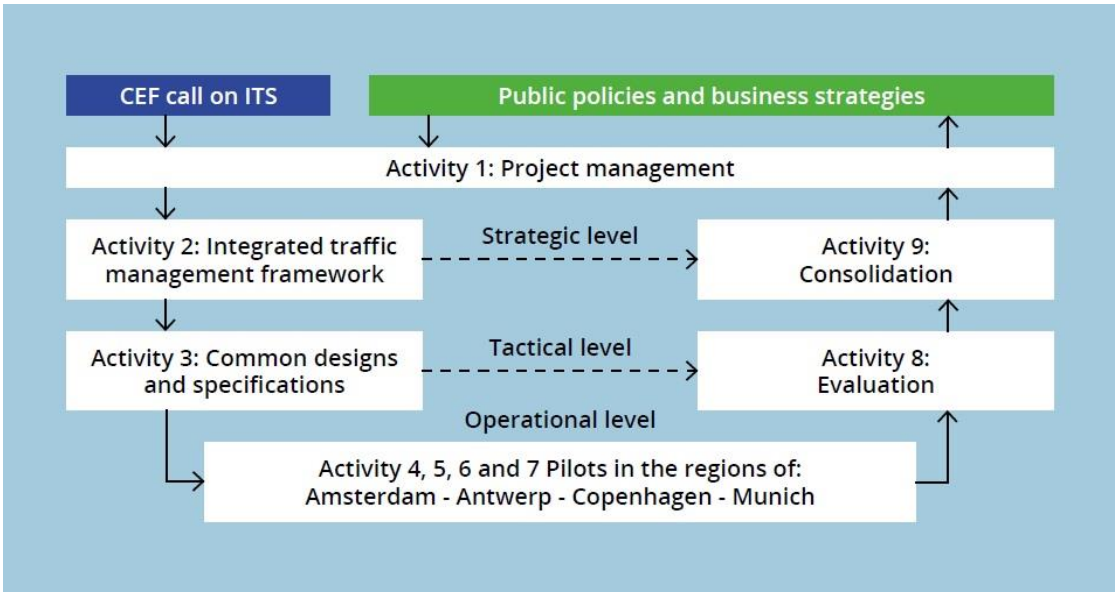

Figure 1 – The SOCRATES$^{2.0}$ activities model

The needs and interests, both for the commercial parties as well as authorities are evident. They are in some extent overlapping but are different on other aspects, and it may be a challenge to find a cooperation model that is attractive for all. Although there is research on cooperation within the Traffic Management domain (Heygi et al, 2001; Hoogendoorn et al, 2003; Kammouna, 2014), it predominantly handles joint control strategies, e.g. by means of scenario deployment. Models suitable for cooperation between several public and private organisations with the goal to come to one common strategic, tactical and operational framework are scarce or not well described. That is why the SOCRATES$^{2.0}$ partners started with defining a common ground for cooperation, the so-called SOCRATES$^{2.0}$ cooperation framework on public-private traffic management. This framework builds upon the TM2.0 concept (Rehrl et al, 2016; Vlemmings et al, 2017).

The SOCRATES$^{2.0}$ Cooperation Framework

All SOCRATES$^{2.0}$ partners believe that by cooperating more business opportunities for private partners can be developed, more cost effective traffic management for public authorities achieved, and, maybe most importantly, better services for road users and communities provided, thus creating a so called “Win-Win-Win” for all stakeholders. The goal of SOCRATES$^{2.0}$ is to test if this added value is actually created by a closer cooperation and find out how this can lead to a sustainable business cases for all stakeholders.

To facilitate this, the SOCRATES[2.0] partners created a Cooperation Framework consisting of a set of cooperation models and enabling "Intermediary roles" to support these cooperation models. The cooperation models are based on the level of communality of the collaboration (figure 2). The first level comprises of agreements for sharing public and private traffic data, based on agreed data exchange formats ("Exchanged data"). Bringing the cooperation a step further, partners can create a common view of current and/or predicted traffic situations on a network, based on the exchanged data ("Shared view"). The most elaborate level of cooperation arises when based on the created shared view, partners develop and implement coordinated actions and services towards communities of travelers ("Coordinated approach").

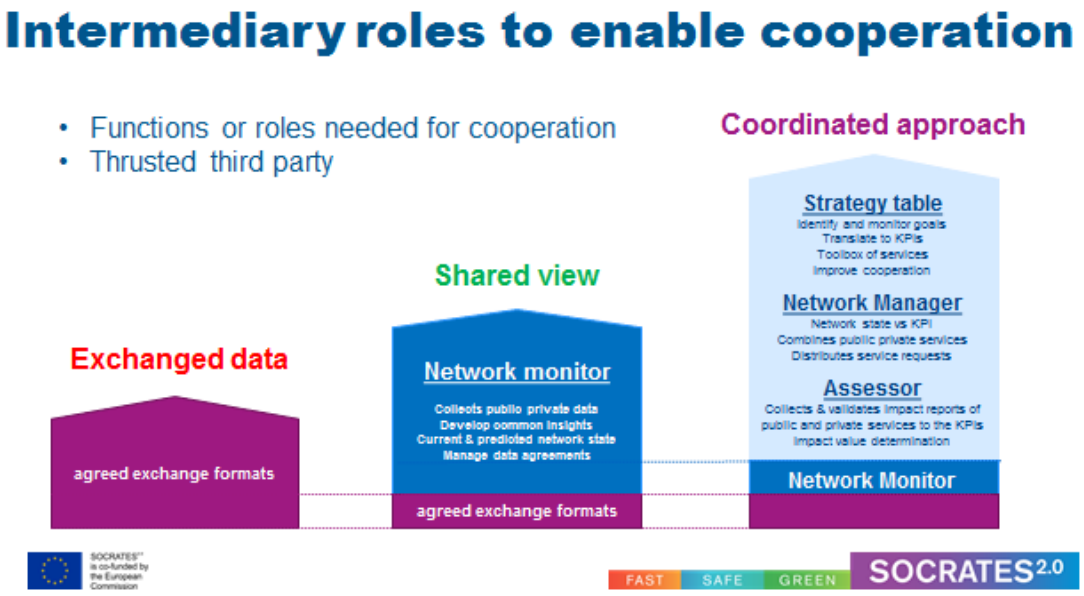

Figure 2 – The SOCRATES[2.0] Cooperation models & Intermediary roles

In order to enable the cooperation, SOCRATES[2.0] partners developed four "Intermediary Roles": Strategy Table, Network Monitor, Network Manager and Assessor. Dependant on the level of cooperation, none, one or four intermediary roles are needed. By example, to enable the cooperation model "Shared view" only a Network Monitor intermediary role is needed (Figure 2).

For the use case Environmental Zone Amsterdam (next chapter) cooperation model "Shared view" was chosen and implemented. The intermediary "Network Monitor" was assigned to one of the partners and an exchange format for Environmental Zone data was agreed.

Use case Environmental Zone Amsterdam

Since 2008, an 'environmental zone' for freight traffic is active in Amsterdam within which heavy trucks (above 3.5 tons) running on diesel engines of emission class 0, 1, 2 or 3 are not allowed. Some special vehicles (like vehicles for exceptional transport, crane trucks, concrete mixers / concrete mixers and fire engines) are allowed if they not older than 13 years. Buses and coaches, with the exception of scheduled bus services, are also prohibited in the environmental zone (Expertise Centrum Milieuzones website).

There is also a 'dynamic' component to the environmental zone, as the Kennedylaan (normally part of the environmental zone) can be opened to diesel trucks. This occurs under a specified set of circumstances, related to severe traffic delays towards and from the southern section of the A10 highway during the start and end of events in the RAI area. Typically, the Kennedylaan will be opened to diesel trucks for around 60 days per year. In most cases the dynamic exemptions duration is several days. This is due to building up events in the RAI venue. In other cases the duration is 1 to 2 hours due to severe congestion.

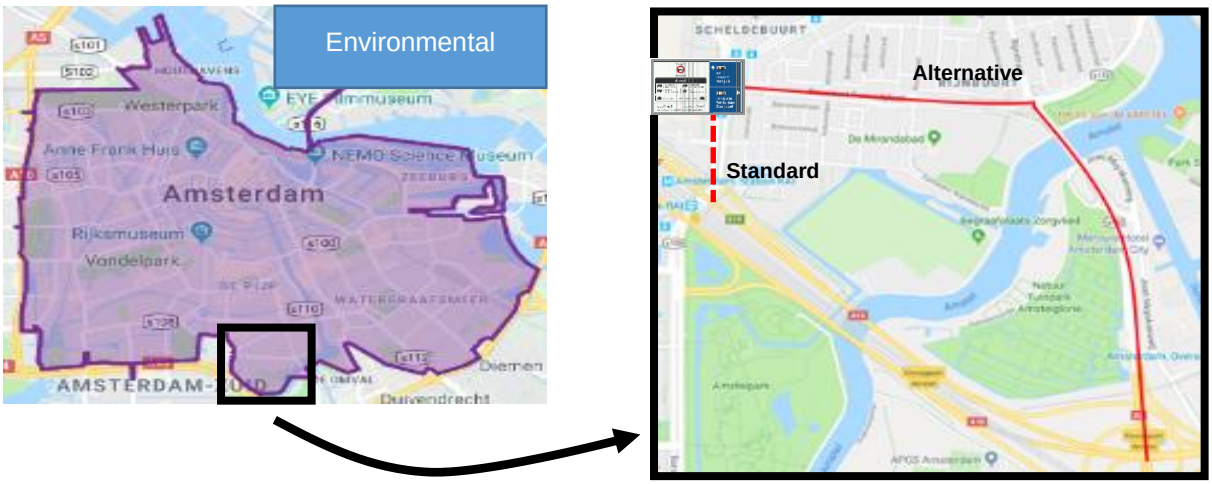

Figure 3 – Area Environmental Zone Amsterdam

Problem state and Objective

Many road users don't know there is an environmental zone before they see a sign. Or they don't know in advance that their route is through an environmental zone. In addition, it is not clear to everyone what requirements apply and whether their vehicle can enter the zone. With the result: vehicles with Dutch number plates are fined, which leads to unhappy travelers and vehicles with

non-Dutch number plates are not recognized and not fined, which leads to unfair penalizing and ignoring of the environmental zone.

For the dynamic part of the zone the communication about the availability of the route is complicated; not for everyone this prism sign is clear. This leads to little use of the road, which does not help to reduce the delay on the standard route. The objective of the use case is create business opportunities for the private partners, less violations and better services for road users and an improved air quality for the community. The Environmental Zone service is delivered in 3 consecutive versions:

(1) End user service with static information about the existence and limitations of the environmental zone enable by a standard exchange format (DATEX II RAZ).
(2) Improved end user service with navigation and real-time updates enabled by the Shared view of the Network Monitor.
(3) Update version is expected after 1st of November 2020 due to the enlargement of the zone.

Partners and Roles

Four SOCRATES2.0 partners are active in the Environmental Zone use case Amsterdam. And they all have their own reasons to cooperate and take on one of the three roles: data provider, network monitor and end user service provider. Each role is responsible for one or more tasks in the use case.

The city of Amsterdam wants to be a good host for inhabitants and visitors alike. As a public data provider and road authority they want to provide reliable data about their environmental zone to road users. The city of Amsterdam wants to achieve less environmental zone violations and an increase in usage for the dynamic part when the zone is deactivated. Above all, the use case should contribute to improve the air quality.

The National Data Warehouse (NDW) in the Netherlands wants to receive environmental zone data from multiple Dutch cities. In this case only from Amsterdam. Thereafter NDW enriches the data flow and makes this information public available in standard European formats. NDW wants to improve the availability, quality and accessibility of public data. In this use case they take on the role as Network Monitor.

Service providers Be-Mobile and TomTom want to receive up-to-date and accurate data on environmental zones in standard formats from one data access point. These private service providers want to provide the most accurate information on environmental zones to their users, so that they experience a satisfying journey.

End user services

The first version (launched in January 2020) of the service is about informing road users (in this case drivers of trucks, buses and coaches) who have planned a destination in the environmental zone or users who have a route through the environmental zone. These users are informed about the environmental zone with information on the geographical limitations (using a geofence). This service does not yet use the navigation function or vehicle specifications. So, the user doesn't receive an updated route advice. However, changes on the environmental zone itself is included in this first end user service.

The second version (will be launched in March 2020) includes more features. First and foremost the navigation function is added. Road users receive an alternative route in case their vehicle is prohibited and not exempt in the environmental zone. In case the dynamic environmental zone near the RAI Convention Centre is turned off, a route through that zone will be possible and will be presented if quicker.

Be-Mobile will launch the environmental zones functionality as a new feature in its Truckmeister-app, which is a driver companion app specifically developed for truck drivers, available in multiple languages. TomTom will also launch a new app for Environmental Zone Amsterdam.

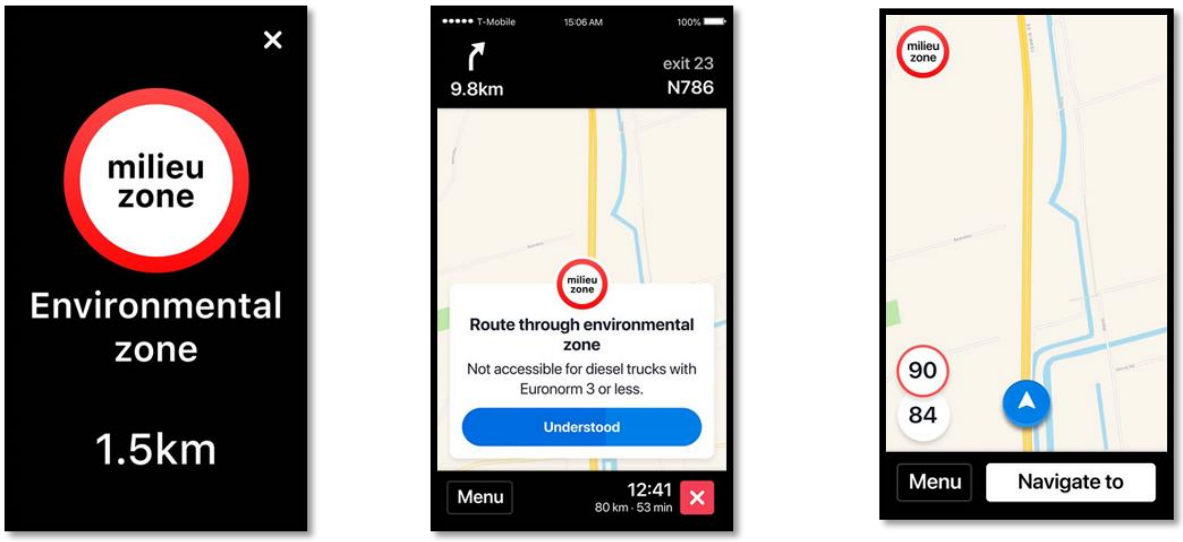

Figure 4 – Truckmeister-screenshots

Functional design

The next chapter explains the functional process and structure behind the end user services. The functional process starts with step 1 (update static EZ zone) and continues all the way to step 12 (provide service). The steps are tasks for specific roles (…) in sequential order. Key data flows can be identified:

- Step 1 to 4: distribution chain of the **static** information to Service providers.
- Step 5 to 9: triggering and activation of legal measure on the street; distribution chain of the **dynamic** information to Service providers
- Step 10 to 12: **activation** of individual info/routing.

Plateau 1 support version 1 of the service. Plateau 2 supports version 2.

Figure 5 – High-level information architecture EZ Use Case Amsterdam

Step 1: Update static Environmental Zone (AMS). The exact and current location of environmental zone in Amsterdam is documented as a GeoJSON format. This is considered the source data of the environmental zone. Possibly changes of the zone can be expected in October 2020. So, for the duration of the project this is not an issue. In general changes occur not very often.

Step 2: Distribute static info (AMS). At the moment the geographical data of the Environmental Zone is publicly available on the Amsterdam website. The main purpose of this data is sharing the geographical zone information as static information. This original source data is not suited for (more advanced) navigation services. Therefor we had to improve the information by adding more details to the polygons during step 3.

Step 3: Translate to DATEX II (NDW). NDW incorporates the static data (polygons) from Amsterdam to DATEX II RAZ (restricted access zone). The DATEX II RAZ profile is developed in cooperation with the SOCRATES$^{2.0}$ TMex group (cross pilot site working group). The RAZ profile can also be used for other similar purposes (e.g. bridge heights, tonnage allowance, etc). Exceptions are written in OpenLR.

Step 4: Distribute static info via DATEX II (NDW). The Network Monitor publishes the static EZ information. This occurs one or two times during the project. The receiving partners (TomTom and Be-Mobile) configure this in their own systems. Note that the official NDW publication of RAZ (static and dynamic) will be part of plateau 2. For plateau 1 the RAZ consists of static data only. Publication via email.

Step 5: Trigger dynamic EZ (AMS). For some events in the RAI venue or based on congestion, the Amsterdam Traffic Management Centre (TMC) can decide to reroute trucks and buses via an alternative route towards the highway A10. Up to 60 times a year this trigger will be activated.

Step 6: Rotation Prism sign, turning off EZ (AMS). By activating the prism signs, this new route becomes a legal (or non-restricted) route for trucks, buses and coaches. The environmental zone becomes a bit smaller.

Step 7: Distribute dynamic info (AMS). A DVM-exchange message is sent from the TMC to NDW. DVM-exchange is a Dutch standard for requesting predefined services between two TMC's. The message should be interpreted as an activated DVM-service (e.g. TalkingTraffic project on sharing DVM-services).

Step 8: Translate to DATEX II RAZ (NDW). The Network Monitor translates this DVM-exchange message to a DATEX II RAZ dynamic trigger.

Step 9: Distribute dynamic info via DATEX II (NDW). A "small" dynamic DATEX RAZ message is

sent to notify the service providers that an alternative route is available for trucks and buses due to congestion and or events in the RAI venue. A second message is sent to indicate the service should be terminated.

Step 10: Original routes are chosen by road users. Road users (trucks, buses/coaches) choose routes that might include this Amsterdam environmental zone.

Step 11: Monitor traffic, calculate route (SP). Check RAZ changes. Internal process of service providers to provide the best solution for their clients based on road conditions, environmental zones and personal preferences.

Step 12: Providing service / type of service (SP). Service providers provide services to road users (see chapter on end user services).

Systems and interfaces

An overview of the identified interfaces is shown in the overview below. In this picture internal (black) and external (orange) interfaces are shown; numbers 1, 2, 3, 4a and 4b. The internal black interfaces are not described in detail. Partners are responsible for own internal interfaces. Dotted lines represent manual processes, full lines represent automated processes.

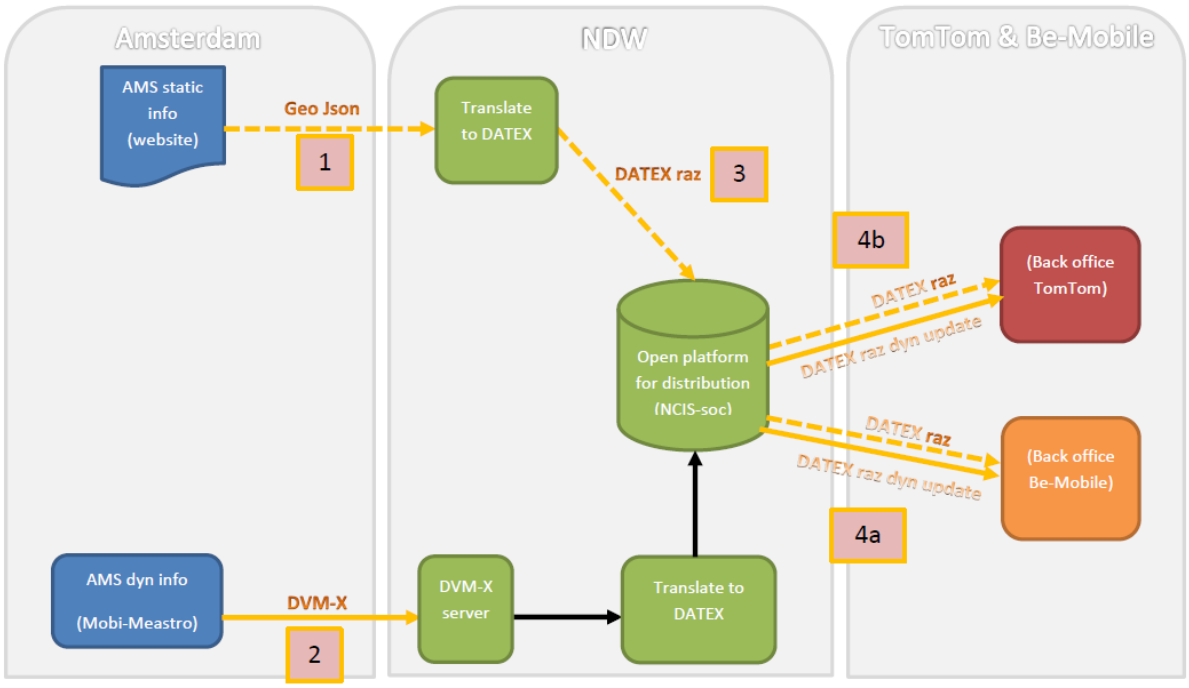

Figure 6 – Systems and interfaces overview EZ Use Case Amsterdam

More to come

During the presentation at the 14th ITS European Congress, we will enlighten the public of the latest results of the pilot.

Acknowledgements

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References

1. Hegyi, A., B. De Schutter, S. Hoogendoorn, R. Babuška, H. van Zuylen, H. Schuurman (2001). A fuzzy decision support system for traffic control centers. In IEEE Intelligent Transportation Systems. Proceedings. IEEE, pp. 358–363.
2. Hoogendoorn, S.P., H. Schuurman, B. De Schutter (2003). Real-Time Traffic Management Scenario Evaluation. IFAC Proceedings Volumes, 36(14), pp. 305–310.
3. Kammouna, H.M., I. Kallel, J. Casillas, A. Abraham, A.M. Alimi (2014). Adapt-Traf: An adaptive multiagent road traffic management system based on hybrid ant-hierarchical fuzzy model. Transportation Research Part C: Emerging Technologies, 42, pp. 147–167.
4. Rehrl, K., J.M. Salanova Grau, J. Laborda, J. Tzanidaki, F. van Waes (2016). Traffic Management 2.0 – The Win-Win. In Proceedings *11th European Congress on ITS*, Glasgow. ERTICO (ITS Europe).
5. Vlemmings, T., O. Vroom, J. Tzanidaki, J. Vreeswijk, P. Hofman, J. Spoelstra, N. Rodrigues (2017). Contractual Agreements in Interactive Traffic Management – looking for the optimal cooperation of stakeholders within the TM 2.0 concept. In Proceedings *12th European Congress on ITS*, Strasbourg. ERTICO (ITS Europe).
6. Expertise Centrum Milieuzones - website