

Questionnaire

European Cities’ Perspective on cooperative Juctions

# Preface

Background

Cooperative systems refer to communication between vehicles, infrastructure and after-market devices (smartphones, SatNav, etc) for the delivery of a wide variety of services, such as in-vehicle information and floating vehicle data. Traffic system suppliers are expected to launch cooperative systems-enabled equipment in the coming years (notably traffic controllers) and therefore cooperative systems are likely to play a role in traffic management in the future.

To pave the way for cooperative systems deployment, the standards and specifications are being developed and there is also extensive reflection on applications and services. Local authorities have not been involved in this process, yet they will be using these systems in the future and their requirements should therefore be taken into account. It is also worth noting that the EC is taking action to ensure a coordinated and harmonised approach to deployment through the creation of a multi-stakeholder platform and specifications for harmonised deployment.

Through its involvement in the Amsterdam Group[[1]](#footnote-1), Polis is bringing in the voice of cities and regions to these wider developments. Polis is supported in this task by OCA (Open Traffic Systems City Association), a network of German speaking cities working on traffic management and ITS, which recently joined the Amsterdam Group on behalf of Polis. German cities in particular are starting to see the need for engagement in the cooperative systems development domain, due in part to the large-scale national deployment initiative. The UK initiative UTMC is also contributing to this process.

SPAT and MAP

One infrastructure area currently undergoing international and European standardisation relates to traffic signals. Two new services are currently being standardised: SPaT (Signal Phase and Timing) and MAP.

SPaT refers to the current settings of the signals at a junction, and their current plans to change to subsequent phases.

MAP refers to the road layout at an intersection, and which lanes may be used for which onward directions.

SPaT is inherently linked to MAP in that it indicates which movements are possible (=legal) under the current signal control settings. In context, SPaT and MAP refer to the specific services by which signal controllers send (possibly by broadcast) messages to nearby vehicles, indicating the topology of the junction they control, and what the current (and future) movement permissions are. SPaT and MAP have their origins in a US standard SAE J2735, which (as the name indicates) emerges from the Society of Automotive Engineers.

A workshop on SPaT/MAP was held in Frankfurt in October 2013 with the participation of Polis and OCA members as well as standardisation experts from traffic systems suppliers and vehicle manufacturers. This meeting provided an opportunity for the cities and other transport authorities to gain an understanding of SPaT/MAP and for the other participants to learn about the priorities of cities and to gather preliminary views on the SPaT/MAP uses cases (the service deployment scenarios). The meeting proved constructive and as a result, it was recommended that a mechanism be created through which formal input could be provided on the SPaT/MAP standardisation activities. It was agreed that Polis should coordinate this activity and that OCA would undertake the editing task.

The input-gathering exercise

The purpose of this exercise is to invite local authorities to provide input on SPaT/MAP use cases (service deployment scenario describing the vehicle, roadside infrastructure and traffic management functionality within a common context). To avoid starting with a blank sheet, it has been suggested to start with the use cases identified in the draft SPaT/MAP technical specifications drafted within ISO[[2]](#footnote-2). They cover fleet priority, safety (such as vulnerable road user avoidance and red light violation) and efficiency/emissions. There is also an electromobility application. It should be noted that these use cases are US-centric and that the message sets SSM and SRM (used for vehicle priority) will not be deployed in Europe in the near future. However, a Europe-based message set (CAM) could offer an alternative mechanism for the vehicle priority applications. These use cases are briefly summarised in this document and they can also be viewed in full in the draft ISO report in annex.

Local authorities are urged to comment on these use cases and also to propose alternative use.

# Use Cases

## Overview

The following chapters contain use case descriptions to be assessed, commented and extended by local authorities. In order to comment use cases related to ISO 19091 Part 1 (status 2013-12-05, see separate document) specific questions have been added:

* General questions regarding a thematic group of use cases within the categories priority/preemption, safety and mobility/sustainability for a quick and less technical response.
* Specific questions regarding each use case for a detailed and more technical response.

The following table gives an overview about the use cases captured from the ISO document as a first step:

| Priority/Preemption Use Cases | |
| --- | --- |
| PR1 | Localized Public Transport Signal Priority |
| PR1-a | Localized Public Transport Signal Priority – Near Side Stop |
| PR2 | Public Transport Signal Priority along an arterial (group of intersections) |
| PR3 | Localized Freight Signal Priority |
| PR3-a | Localized Freight Signal Priority with a Platoon |
| PR3-b | Arterial Freight Signal Priority for a Platoon |
| PR4 | Emergency Vehicle Single or Multiple Vehicles without PSOBE |
| PR5 | Emergency Vehicle Single or Multiple Vehicles with PSOBE |
| Safety Use Cases | |
| SA1 | Dilemma Zone Protection |
| SA2 | Red Light Violation Warning |
| SA3 | Stop Sign Violation Warning |
| SA4 | Turning Assistant – Oncoming Traffic |
| SA5 | Turning Assistant - Vulnerable Road User Avoidance |
| SA6 | Non-signalized Crossing Traffic Warning |
| SA7 | Crossing Vulnerable Road User Advisory (Non-signalized) |
| Mobility/Sustainability Use Cases | |
| MS1 | Basic Local Traffic Signal Actuation |
| MS2 | Platoon Detection for Coordinated Signals |
| MS3 | Congested Intersection Adjustment |
| MS4 | Traffic Signal Optimal Speed Advisory |
| MS5 | Signalized Corridor Eco-Driving Speed Guidance |
| MS6 | Idling Stop Support |
| MS7 | Start Delay Prevention |
| MS8 | Travel Lane Advice |
| MS9 | Inductive Charging at Signals |
| MS10 | Don’t Block the Box |

Definitions of terms and abbreviations can also be found in the ISO document provided.

If you miss a specific use case of interest feel free to describe it by using the table provided within chapter 3.3.

## Use Cases related to ISO 19091 – Part 1

### Priority/Preemption Use Cases

#### Overview

The priority/preemption use cases are related to the concept of using the connected vehicle (CV) message exchanges (V2I, I2V) for the purpose of modifying the traffic signal operation, for one or more intersections, to better serve the needs of transit, freight, and emergency service vehicles.

#### General questions

Use Case Group: Public Transport Priority (considering PR1, PR1a and PR2)

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| --- |
| Is public transport priority at traffic signals already implemented in your city/region or are their plans to do so? |
| [Yes/No, brief reason] |
| Do you consider that the availability of SPaT/MAP would usefully improve public transport priority? |
| [Yes/No, brief reason] |
| What are the perceived benefits of the SPaT/MAP approach to providing public transport priority? |
|  |
| What are the perceived challenges of the SPaT/MAP approach to providing public transport priority? |
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| If SPaT/MAP were to be adopted by your city for public transport priority, please provide details about ease or complexity of integration. |
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Use Case Group: Fleet Priority (considering PR3, PR3a and PR3b)

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| Is fleet priority at traffic signals already implemented in your city/region or are their plans to do so? |
| [Yes/No, brief reason] |
| Do you consider that the availability of SPaT/MAP would usefully improve fleet priority? |
| [Yes/No, brief reason] |
| What are the perceived benefits of the SPaT/MAP approach to providing fleet priority? |
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| What are the perceived challenges of the SPaT/MAP approach to providing fleet priority? |
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| If SPaT/MAP were to be adopted by your city for fleet priority, please provide details about ease or complexity of integration. |
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Use Case Group: Emergency Vehicle Priority (considering PR5 and PR6)

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| --- |
| Is fleet emergency vehicle priority at traffic signals already implemented in your city/region or are their plans to do so? |
| [Yes/No, brief reason] |
| Do you consider that the availability of SPaT/MAP would usefully improve emergency vehicle priority? |
| [Yes/No, brief reason] |
| What are the perceived benefits of the SPaT/MAP approach to providing emergency vehicle priority? |
|  |
| What are the perceived challenges of the SPaT/MAP approach to providing emergency vehicle priority? |
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| If SPaT/MAP were to be adopted by your city for emergency vehicle priority, please provide details about ease or complexity of integration. |
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#### Use Case PR1: Localized Public Transport Signal Priority

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| --- | --- |
| Use Case Name | Basic Scenario - Single Public Transport Vehicle at One Signalized Intersection |
| Infrastructure Role | Data Receiver, Traffic Signal Control, Data Transmitter |
| Short Description | This use case describes the basic priority control for connected Public Transport vehicles |
| Goal | Improved Public Transport efficiency and reliability |
| Geographic Scope | Localized to a specific intersection |
| Actors | Public Transport Vehicle Equipped with On-board Equipment (OBE)  Road Side Equipment (RSE) & Traffic Signal Controller (TSC)  Alternate: Traffic Management Central System (BOPC). |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
|  | |
| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case PR1-a: Localized Public Transport Signal Priority – Near Side Stop

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| Use Case Name | Basic Scenario - Single Public Transport Vehicle at One Signalized Intersection for Near Side Stop |
| Infrastructure Role | Data Receiver, Traffic Signal Control, Data Transmitter |
| Short Description | This use case describes the basic priority control for connected Public Transport vehicles for near side stops |
| Goal | Improved Public Transport efficiency and reliability |
| Geographic Scope | Localized to a specific intersection |
| Actors | Public Transport Vehicle Equipped with On-board Equipment (OBE)  Road Side Equipment (RSE) & Traffic Signal Controller (TSC)  Alternate: Traffic Management Central System (BOPC). |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
|  | |
| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case PR2: Public Transport Signal Priority along an arterial (group of intersections)

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| Use Case Name | Public Transport Signal Priority along an arterial (group of intersections) |
| Infrastructure Role | Data Receiver, Traffic Signal Control, Data Transmitter |
| Short Description | This use case describes the basic priority control for a connected Public Transport vehicle travelling through a section of signalized intersections. |
| Goal | Improved Public Transport efficiency and reliability |
| Geographic Scope | Localized to a specific intersection – however, while the vehicle will deal with a single intersection at a time (or multiple if they are tightly located), the BOPC may attempt to modify the timing pattern at a number of intersections along an arterial to provide optimal signal timing considering the location of the bus stops, vehicle speed, etc. |
| Actors | Public Transport Vehicle Equipped with On-board Equipment (OBE)  Road Side Equipment (RSE) & Traffic Signal Controller (TSC)  Alternate: Traffic Management Central System (BOPC). |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case PR3: Localized Freight Signal Priority

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| Use Case Name | Basic FSP Scenario - Single Freight Vehicle (Truck, Lorry) at One Signalized Intersection |
| Infrastructure Role | Data Receiver, Traffic Signal Control, Data Transmitter |
| Short Description | This use case describes the basic priority control for connected heavy vehicle |
| Goal | Improved freight movement efficiency and reliability |
| Geographic Scope | Localized to a specific intersection |
| Actors | Freight Vehicle Equipped with On-board Equipment (OBE)  Road Side Equipment (RSE) & Traffic Signal Controller (TSC)  Alternate: Traffic Management Central System (BOPC). |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case PR3-a: Localized Freight Signal Priority with a Platoon

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| Use Case Name | Basic FSP Scenario – Platoon of Freight Vehicles (Truck, Lorry) at One Signalized Intersection |
| Infrastructure Role | Data Receiver, Traffic Signal Control, Data Transmitter |
| Short Description | This use case describes the basic priority control for connected a heavy vehicle platoon |
| Goal | Improved Freight Transport efficiency and reliability |
| Geographic Scope | Localized to a specific intersection |
| Actors | Freight Transport Vehicle Equipped with On-board Equipment (OBE)  Road Side Equipment (RSE) & Traffic Signal Controller (TSC)  Alternate: Traffic Management Central System (BOPC). |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case PR3-b: Arterial Freight Signal Priority for a Platoon

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| Use Case Name | Arterial Freight Signal Priority for a Platoon |
| Infrastructure Role | Data Receiver, Traffic Signal Control, Data Transmitter |
| Short Description | This use case describes the basic priority control for a connected freight platoon travelling through a section of signalized intersections. |
| Goal | Improved Public Transport efficiency and reliability |
| Geographic Scope | Localized to a specific intersection |
| Actors | Freight Vehicles Equipped with On-board Equipment (OBE) forming a platoon  Road Side Equipment (RSE) & Traffic Signal Controller (TSC)  Alternate: Traffic Management Central System (BOPC). |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case PR4: Emergency Vehicle Single or Multiple Vehicles without PSOBE

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| Use Case Name | Emergency Vehicle Single or Multiple Vehicles without PSOBE |
| Infrastructure Role | Data Receiver, Traffic Signal Control, Data Transmitter |
| Short Description | This use case describes the basic emergency vehicle preemption control for connected emergency response vehicles (Police, fire, ambulance, etc.). The nature of those vehicles permitted to make such requests will depend on the region and local laws. |
| Goal | Improved Public Transport efficiency and reliability |
| Geographic Scope | Localized to a specific intersection |
| Actors | Emergency Vehicle Equipped with On-board Equipment (OBE)  Road Side Equipment (RSE) & Traffic Signal Controller (TSC)  [BOPC if route preemption is provided.] |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case PR5: Emergency Vehicle Single or Multiple Vehicles with PSOBE

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| Use Case Name | High power OBE transmitted emergency vehicle priority operation |
| Infrastructure Role | Data Receiver, Traffic Signal Control, Data Transmitter |
| Short Description | This use case differs from the previous Use case because it is based on the concept of a one-way broadcast to the intersection – such that the intersection is likely to “hear” the SRM before the vehicle (OBE) can hear the intersection SPaT message. It is anticipated that if the high power OBE (PSOBE) is supported for such vehicles (Police, fire, ambulance, etc.) the intersection can receive advance warning of the approaching vehicle and take the appropriate steps to facilitate movement through the intersection based on a specific scenario(s). The nature of those vehicles permitted to make such requests will depend on the region and local laws. Note that this use case does not deal with the vehicle based applications that warn the driver to take appropriate action to avoid the approaching (rear, front, side) |
| Goal | Improved Emergency Vehicle efficiency and reliability |
| Geographic Scope | Localized to a specific intersection |
| Actors | Emergency Vehicle Equipped with a high power On-board Equipment (PSOBE)  Road Side Equipment (RSE) & Traffic Signal Controller (TSC)  [BOPC if route preemption is provided.] |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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### Safety Use Cases

#### Overview

The safety related use cases for V2I/I2V are intended to provide vehicles with information regarding the current condition of the traffic signal it is approaching (permitted maneuver) and the time remaining for the maneuver. Using this type of information, the approaching vehicle should be able to determine the appropriate actions to avoid violating the right-of-way and a subsequent crash.

It is also possible for the traffic controller to use the information regarding impending violations of the stop-bar to alter the signal timing to reduce the probability of a crash under such circumstances.

The safety use cases are related to the concept of using the connected vehicle (CV) message exchanges (V2I, I2V) for the purpose of modifying the traffic signal operation and/or providing warning information to OBE equipped vehicles.

#### General questions

Use Case Group: Dilemma Zone Protection (considering SA1)

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| Please consider the use case specific questions. |

Use Case Group: Violation Warning (considering SA2 and SA3)

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| Do you think that the availability of violation warning would usefully improve safety on intersections? |
| [Yes/No, brief reason] |
| What are the perceived challenges of the violation warning approach? |
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| If the violation warning approach is to be adopted by your city/region, please provide details about ease or complexity of integration. |
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Use Case Group: Turning Assistance (considering SA4 and SA5)

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| Do you think that the availability of turning assistance would usefully improve safety on intersections? |
| [Yes/No, brief reason] |
| What are the perceived challenges of the turning assistance approach? |
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| If the turning assistance approach is to be adopted by your city/region, please provide details about ease or complexity of integration. |
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Use Case Group: Non Signalized Intersection Assistance (considering SA6 and SA7)

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| Do you think that the availability of non-signalized intersection assistance would usefully improve safety? |
| [Yes/No, brief reason] |
| What are the perceived challenges of the non-signalized intersection assistance approach? |
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| If the non-signalized intersection assistance approach is to be adopted by your city/region, please provide details about ease or complexity of integration. |
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#### Use Case SA1(#4): Dilemma Zone Protection

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| Use Case Name | Dilemma Zone Protection |
| Infrastructure Role | Data Receiver |
| Short Description | This use case describes detection of equipped vehicles approaching a traffic signal that, upon onset of yellow, may find it challenging to either stop before the stop bar or continue through the intersection before the signal turns red. Vehicles in this situation are termed dilemma zone vehicles though their actual location may vary. |
| Goal | Detect potential dilemma zone vehicles and pass information to signal controller to minimize occurrences |
| Geographic Scope | Local signalized intersection & approaching roadway segments |
| Actors | OBE-equipped vehicles  RSE connected to local traffic signal controller, advance warning infrastructure |
| Illustration |  |
| Do you think that the availability of a dilemma zone protection would usefully improve safety on intersections? | |
| [Yes/No, brief reason] | |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case SA2(#16): Red Light Violation Warning

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| Use Case Name | Red Light Violation Warning |
| Infrastructure Role | Data provider |
| Short Description | This use case describes provision of signal timing information to approaching vehicles to help prevent red light violations |
| Goal | Roadside equipment sends MAP and SPaT in real-time to approaching vehicles, which utilize the information to notify driver of need to stop to avoid potential red light violation |
| Geographic Scope | Local signalized intersection & approaching roadway segments |
| Actors | OBE-equipped vehicles with red light violation warning application  RSE connected to local traffic signal controller |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case SA3(#17): Stop Sign Violation Warning

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| Use Case Name | Stop Sign Violation Warning |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes provision of stop sign location information to approaching vehicles to help prevent stop sign violations (running) |
| Goal | Roadside equipment sends MAP to vehicles, which utilize the information to notify driver of need to stop to avoid running stop sign |
| Geographic Scope | Individual Stop-controlled intersections & approaching roadway segments |
| Actors | OBE-equipped vehicles with stop sign violation warning application  RSE with MAP information |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case SA4(#18): Turning Assistant – Oncoming Traffic

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| Use Case Name | Turning Assistant – Oncoming Traffic |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes the provision of information on approaching oncoming traffic to vehicle(s) waiting to turn at a signalized intersection. |
| Goal | Roadside equipment sends MAP, SPaT, and Sensor information to a vehicle waiting to turn across oncoming traffic to warn its driver of potential conflicts |
| Geographic Scope | Local signalized intersection & approaching roadway segments |
| Actors | OBE-equipped vehicles with turning assistant warning application  RSE connected to local traffic signal controller and sensor(s) |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case SA5(#19): Turning Assistant - Vulnerable Road User Avoidance

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| Use Case Name | Turning Assistant – Vulnerable Road User Avoidance |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes provision of information on vulnerable road users (e.g., cyclists, pedestrians) to turning traffic at a signalized intersection |
| Goal | Roadside equipment sends MAP, SPaT, and Sensor information to a vehicle about to turn to warn its driver of potential conflicts with vulnerable road users |
| Geographic Scope | Local signalized intersection & connected roadway segments |
| Actors | OBE-equipped vehicles with turning assistant warning application  RSE connected to local traffic signal controller and sensor(s) |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case SA6 (#29): Non-signalized Crossing Traffic Warning

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| Use Case Name | Non-signalized Crossing Traffic Warning |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes provision of information on cross traffic at a non-signalized intersection |
| Goal | Roadside equipment sends MAP and sensor information to vehicle providing information on trajectory of crossing traffic to prevent potential crossing path crashes. |
| Geographic Scope | Local non-signalized intersection & roadway approaches |
| Actors | OBE-equipped vehicles with crossing traffic warning application  RSE connected to local vehicle lane/approach sensor(s) |
| Illustration | Note, the figure above is just an example. The use case description applies to any non-signalized intersection with a stop sign. |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case SA7 (#30): Crossing Vulnerable Road User Advisory (Non-signalized)

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| Use Case Name | Crossing Vulnerable Road User Advisory (Non-signalized) |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes provision of information on vulnerable road users (e.g. cyclists, pedestrians) to traffic at a non-signalized intersection. |
| Goal | Roadside equipment sends MAP and Sensor information to a vehicle about to cross a pedestrian/vulnerable road user crossing at a non-signalized intersection in order to warn the driver of potential conflicts |
| Geographic Scope | Local non-signalized intersection & connected roadway approaches |
| Actors | OBE-equipped vehicle with crossing vulnerable road user advisory application  RSE connected to sensor(s)  Alternate: RSE equipped to accept transmissions from vulnerable users to identify their location (which may include trajectory, and speed). |
| Illustration | Note, the figure above is just an example. The use case description applies to any non-signalized intersection with a stop sign. |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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### Mobility/Sustainability Use Cases

#### Overview

The mobility/sustainability use cases are related to the concept of using the connected vehicle (CV) message exchanges (V2I, I2V) for the purpose of modifying vehicular operations to improve travel and reduce environmental impacts within a roadway network.

#### General questions on mobility/sustainability use cases (consider MS1 to MS10)

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| Do you think that the availability of SPaT/MAP would usefully improve to improve travel and reduce environmental impacts within a roadway network? |
| [Yes/No, brief reason] |
| What are the perceived challenges of the SPaT/MAP approach to providing this improvement? |
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| If SPaT/MAP were to be adopted by your city, please provide details about ease or complexity of integration. |
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#### Use Case MS1(#1): Basic Local Traffic Signal Actuation

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| Use Case Name | Basic Local Traffic Signal Actuation |
| Infrastructure Role | Data receiver |
| Short Description | This use case describes basic real-time traffic signal actuation by connected vehicles in the vicinity of a single intersection. |
| Goal | Roadside equipment utilizes real-time information on the motion and specific characteristics of approaching vehicles to provide more precise demand information to the local traffic signal controller, thereby increasing efficiency and reducing emissions for the intersection. |
| Geographic Scope | Local signalized intersection & approaching roadway segments |
| Actors | OBE-equipped vehicles  RSE (includes the local traffic signal controller)  BOPC/signal operations back-office |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
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| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case MS2(#2): Platoon Detection for Coordinated Signals

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| Use Case Name | Platoon Detection for Coordinated Signals |
| Infrastructure Role | Data receiver |
| Short Description | This use case describes provision of vehicle platoon characteristics to facilitate real-time arterial-level traffic signal timing adjustments. This case only targets timing optimization (i.e. does not send directions to drivers). |
| Goal | Roadside equipment relays vehicle platoon information to BOPC which uses information to dynamically adjust signal timing offsets |
| Geographic Scope | Roadway section with coordinated traffic signals |
| Actors | OBE-equipped vehicles  RSEs connected to local traffic signal controllers  BOPC/signal operations back-office |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
|  | |
| What are the perceived benefits? | |
|  | |
| What are the perceived challenges? | |
|  | |
| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
|  | |

#### Use Case MS3(#3): Congested Intersection Adjustment

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| --- | --- |
| Use Case Name | Congested Intersection Adjustment |
| Infrastructure Role | Data Receiver |
| Short Description | This use case describes detection of persistent traffic signal phase failures on one or more maneuvers and executing mitigating adjustments to traffic signal plans at the intersection(s). Multi-intersection adjustments involve a BOPC. |
| Goal | Reduce impacts of phase failures at a congested intersection by utilizing adjustments to traffic signal timing based on mitigation strategies. |
| Geographic Scope | Local signalized intersection, and potentially nearby intersections |
| Actors | OBE-equipped vehicles  RSE connected to local traffic signal controller  BOPC/signal operations back-office |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
|  | |
| What are the perceived benefits? | |
|  | |
| What are the perceived challenges? | |
|  | |
| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
|  | |

#### Use Case MS4(#20): Traffic Signal Optimal Speed Advisory

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| --- | --- |
| Use Case Name | Traffic Signal Optimal Speed Advisory |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes provision of traffic signal information to approaching vehicles to enable speed adjustment, and lane switching, to optimize vehicle trajectory for smooth operation of the vehicle |
| Goal | Roadside equipment sends MAP and SPaT in real-time to approaching vehicles, which utilize the information to notify driver of optimal speed to smoothly stop or traverse the intersection. |
| Geographic Scope | Local signalized intersection & approaching roadway segments |
| Actors | OBE-equipped vehicles with optimal speed application  RSE connected to local traffic signal controller |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
|  | |
| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case MS5(#21): Signalized Corridor Eco-Driving Speed Guidance

|  |  |
| --- | --- |
| Use Case Name | Signalized Corridor Eco-Driving Speed Guidance |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes the provision of traffic signal information to approaching vehicles to enable speed and lane adjustments to optimize vehicle trajectory for improved fuel efficiency in a corridor |
| Goal | Roadside equipment sends MAP and SPaT in real-time to approaching vehicles, which utilize the information to notify vehicle of optimal speed and lane use to smoothly stop or traverse the intersection using less fuel |
| Geographic Scope | Roadway section with traffic signals |
| Actors | OBE-equipped vehicles with eco-driving application  RSEs connected to local traffic signal controllers and BOPC  BOPC/signal operations back-office |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
|  | |
| What are the perceived benefits? | |
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| What are the perceived challenges? | |
|  | |
| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
|  | |

#### Use Case MS6(#22): Idling Stop Support

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| --- | --- |
| Use Case Name | Idling Stop Support |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes provision of traffic signal timing information to vehicles stopped at a signal to enable engine shutoff |
| Goal | Roadside equipment sends MAP and SPaT in real-time to vehicles stopped at the intersection to enable drivers/vehicles to turn off engines while idling (stopped). |
| Geographic Scope | Local signalized intersection & approaching roadway segments |
| Actors | OBE-equipped vehicles with Idling Stop Support application  RSE connected to local traffic signal controller |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
|  | |
| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case MS7(#23): Start Delay Prevention

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| --- | --- |
| Use Case Name | Start Delay Prevention |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes provision of traffic signal timing information to vehicles stopped at a signal to enable efficient resumption of flow |
| Goal | Roadside equipment sends MAP and SPaT in real-time to vehicles stopped at the intersection to enable drivers/vehicles to prepare for startup efficiently |
| Geographic Scope | Local signalized intersection & approaching roadway segments |
| Actors | OBE-equipped vehicles with Start Delay Prevention application  RSE connected to local traffic signal controller |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
|  | |
| What are the perceived benefits? | |
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| What are the perceived challenges? | |
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| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
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#### Use Case MS8(#24): Travel Lane Advice

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| --- | --- |
| Use Case Name | Travel Lane Advice |
| Infrastructure Role | Data receiver, Data provider |
| Short Description | This use case describes provision of optimal lane information to the drivers in OBE-equipped vehicles approaching a signalized intersection |
| Goal | Roadside equipment sends optimal lane advice to the vehicle based on queues, signal time, and other vehicles to enable more efficient flow. |
| Geographic Scope | Local signalized intersection & approaching roadway segments |
| Actors | OBE-equipped vehicles with lane advice application  RSE connected to local traffic signal controller and queue sensors |
| Illustration |  |
| What is your view on the specific use case? (Is it valuable? Would you like to modify the use case? If yes, what are your recommendations?) | |
|  | |
| What are the perceived benefits? | |
|  | |
| What are the perceived challenges? | |
|  | |
| If this use case were to be adopted by your city, please provide details about ease or complexity of integration. | |
|  | |

#### Use Case MS9(#25): Inductive Charging at Signals

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| --- | --- |
| Use Case Name | Inductive Charging at Signals |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes provision of inductive charging information to vehicle stopped at a signal. Actual charging transaction and technology is outside scope. |
| Goal | Roadside equipment sends MAP and SPaT in real-time to vehicles stopped at the intersection to enables vehicles to establish temporary charging |
| Geographic Scope | Approach of equipped intersection |
| Actors | OBE-equipped vehicles equipped with inductive charging application  RSE connected to local traffic signal controller |
| Illustration |  |

#### Use Case #26: Green Light Advance Advisory

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| --- | --- |
| Use Case Name | Don’t Block the Box |
| Infrastructure Role | Data Provider |
| Short Description | This use case describes OBE vehicles determining whether they can enter and clear an intersection or stopping until they can enter and clear. |
| Goal | Roadside equipment sends MAP and SPaT in real-time to vehicles approaching the intersection to enables vehicles to determine whether to enter the intersection or to wait. |
| Geographic Scope | Approaches and egress lanes at the intersection |
| Actors | OBE-equipped vehicle equipped with the maneuver assist application  RSE connected to local traffic signal controller |
| Illustration |  |

## Additional Use Cases of cities’ interest

### [Name of City who has added the UC]

|  |  |  |
| --- | --- | --- |
| Use Case Name | |  |
| Category | | Priority/Preemption Use Cases or Safety or Mobility/Sustainability |
| Infrastructure Role | |  |
| Short Description | |  |
| Goal | |  |
| Constraints | |  |
| Geographic Scope | |  |
| Actors | |  |
| Illustration |  | |
| Preconditions | |  |
| Main flow | |  |
| Alternate flow(s) | |  |
| Post-conditions | |  |
| Information Requirements | |  |
| Issues | |  |
| Source  docs/references | |  |

# Current Practice

## [Name of City]

Relation to Use Case No: …

[If applicable, please provide examples of deployment (not based on SPaT/MAP) related to use cases in chapter 3]

# Mapping to Suitable Technologies

## [Name of City]

Relation to Use Case No:

[What are your ideas on suitable technologies to realize the use cases mentioned?]

1. *Amsterdam Group (see also* [*https://amsterdamgroup.mett.nl*](https://amsterdamgroup.mett.nl)*): a multi-stakeholder platform for the deployment of cooperative systems made up of the umbrella organisations representing the highway authorities (CEDR), tolled motorway operators (ASECAP), the car communication consortium (C2C-CC) and Polis* [↑](#footnote-ref-1)
2. *ISO is the international standardisation body* [↑](#footnote-ref-2)