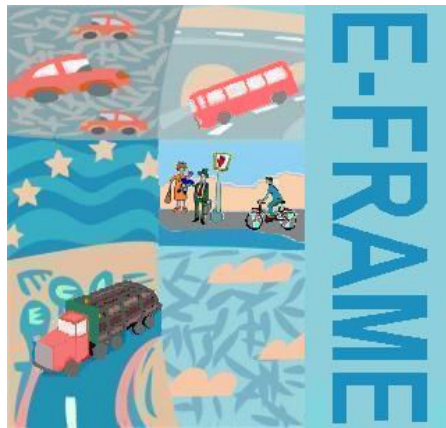


# E-FRAME

Extend FRAMEwork architecture for cooperative systems



WP300

D15 – FRAME Architecture – Part 4: Changes for the current version (4.1)

FRAME Architecture Version 4.1

Dissemination Level

Public



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## Executive Summary

This document forms part of the FRAME Architecture deliverable (D15) that has been produced by the E-FRAME project. The deliverable consists of the following parts:

- Part 1: Overview – provides an overview of the history of the FRAME Architecture, its contents and the uses that have been made of it;
- Part 2: FRAME Browsing Tool – enables the contents of the FRAME Architecture to be viewed and is only available for downloading from the FRAME website at [www.frame-online.net](http://www.frame-online.net), in the Folder named The Architecture;
- Part 3: FRAME Selection Tool Database – enables sub-set ITS architectures to be created through the use of the FRAME Selection Tool and is only available for downloading from the FRAME website at [www.frame-online.net](http://www.frame-online.net), in the Folder named The Architecture;
- Part 4: Changes for the current version of the FRAME Architecture (4.1) – this document.
- Part 5: The FRAME Methodology – describes how ITS architectures can be created using the FRAME Architecture as a starting point.
- Part 6: Function, Data Flow, Data Store and Terminator Descriptions – the Function, Data Flow, Data Store, plus Terminator and Actor descriptions taken from the Access Database used by the FRAME Selection Tool. (Note the same text will also appear in the FRAME Browsing Tool.

Parts 1, 2, 3 and 6 will be updated every time a new version of the FRAME Architecture is produced. Part 5 should remain constant with each version of the Architecture and therefore not be updated. Part 4 will be replaced with each new version of the Architecture.

Part 4 (this document) provides a fairly detailed description of the changes that have been made to Version 4 of the FRAME Architecture to produce the latest version (4.1). The descriptions of the changes have been organised into chapters, one for the User Needs, one for each Functional Area, and finally one for the Terminators and Actors.





# 1 Introduction

## 1.1 The Aim of this Document

The aim of this document is to provide details of the changes that have been made to Version 4 of the FRAME Architecture to produce Version 4.1. It is intended that this shall be an aid to Architecture users who have already had experience of using Version 4, which was a major change from the previous version (3.2).

## 1.2 Assumptions behind this Document

It is assumed that readers will have some knowledge of the FRAME Architecture itself and the methodology behind it. A more detailed description of Architecture and this methodology is available in Parts 1 and 5 respectively of this deliverable.

Readers who want to explore the FRAME Architecture in more detail to see the changes should use the FRAME Browsing Tool, which is available from the FRAME website at: <http://www.frame-online.net/>. To actually use the FRAME Architecture, a copy of the FRAME Selection Tool and its database are needed. Both of these together with instructions for their use are again available from the FRAME website.

## 1.3 Document Plan

The details of the changes provided in the rest of this document are arranged in the following order:

Chapter 2: User Needs

Chapter 3: General, i.e. applies to all functionality in the Architecture

Chapters 4 to 12: Details of the changes to each of the 9 Functional Areas in the Functional Viewpoint.

Chapter 13: Terminators and Actors

All of these changes will be reflected in the contents of the FRAME Browsing Tool and in what is available through the FRAME Selection Tool. However changes to the Selection Tool itself will be documented separately.

## 1.4 Why is D15 in separate parts?

This E-FRAME project deliverable document (D15) has been divided into five parts, which are as follows:



- Part 1: Overview – provides an overview of the history of the FRAME Architecture, its contents and the uses that have been made of it;
- Part 2: FRAME Browsing Tool – enables the contents of the FRAME Architecture to be viewed and is only available for downloading from the FRAME website;
- Part 3: FRAME Selection Tool Database – enables sub-set ITS architectures to be created through the use of the FRAME Selection Tool and is only available for downloading from the FRAME website;
- Part 4: Changes for the current version of the FRAME Architecture (4.1) – this document.
- Part 5: The FRAME Methodology – describes how ITS architectures can be created using the FRAME Architecture as a starting point.

Parts 1, 2 and 3 will be updated every time a new version of the FRAME Architecture is produced. Part 5 should remain constant with each version of the Architecture and therefore not be updated.

The alternative of providing completely separate deliverable documents was rejected because of the close linkage between what is in the Architecture and the methodology behind its use.

## **1.5 Configuration Management**

All of the changes described in this document have been made taking into account the Configuration Management "rules" set up by the FRAME-S project in April 2003. These "rules" will be found in the Configuration Management document, which can be downloaded from the "Library" page of the FRAME website at: <http://www.frame-online.net/>.



## 2 User Needs

### 2.1 Introduction

The details of the rationale behind the changes to the User Needs for Version 4.1 are described in detail by the E-FRAME project deliverable D13, "Consolidated User Needs for Cooperative Systems – Part 2" that is available from the FRAME website at: <http://www.frame-online.net/>. In this chapter the effect of the changes on the FRAME Architecture is described, plus any other changes that have been made to such things as the allocation of User Needs to Functions.

### 2.2 Changes to the allocation of User Needs to Functions

It has been found that the following User Need had not been allocated to any of the Functions. This has now been corrected and the changes are as shown below.

User Need Number (D13):

Previous User Need Number (D2): 8.CV.9.3

User Need description: The system shall be able to provide the type, speed, turn indicator status, current location and planned waypoints of the host vehicle to an RSU without any intervention from the driver.

Allocation to Functions: F3.1.1.8, "Collect Urban Data from Vehicles"  
F3.1.2.8, "Collect Inter-urban Data from Vehicles"  
F5.12.7, "Communicate with In-vehicle Systems"  
F5.13.7, "Prepare Extended Floating Car Data"  
F5.14.6, "Monitor Vehicle Trip Plan Implementation"

### 2.3 Results of the changes to the User Needs for version 4.1

The scope of the changes to the User Needs has been limited to those that describe how services for cooperative systems shall be provided. This means that in the previous version of the Architecture only the User Needs with identifications numbers in the ranges, 8.CO.x.y, 8.CV.a.b and 8.SP.c.d have been affected. The changes involve re-numbering these User Needs, plus in some cases merging or splitting of particular User Needs, or modification of some User Need descriptions. As a result the allocation of Functions to the new versions of the User Needs has had to be changed particularly where the original User Needs have been merged or split. These changes are shown in Table 1 on the following pages.



**Table 1 – Changes to the numbering, description and allocation to Functions of User Needs for cooperative systems services**

Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.SP.1.28	The system shall be able to maintain a database of the road network.	3.1.1.6	Manage Urban Static Road Data	7.4.1.1	(X)FCD – The system shall be able to maintain a database of the road network.
		3.1.2.6	Manage Inter-urban Static Road Data		
8.SP.1.1	The system shall be able to determine the intended route of the host vehicle.	5.14.2	Create and Revise Vehicle Trip Plan	7.4.1.2	(X)FCD – The system shall be able to determine the intended route of the host vehicle.
8.SP.1.2	The system shall be able to determine the relative position of the host vehicle on a road (e.g. lane, distance from a datum point) at all times (urban, inter-urban, tunnels etc.).	5.13.6	Determine Vehicle Position	7.4.1.3	(X)FCD – The system shall be able to determine the relative position of the host vehicle on a road (e.g. lane, distance from a datum point) at all times (urban, inter-urban, tunnels etc.).
		5.12.7	Communicate with In-vehicle Systems		
8.SP.1.4	The system shall be able to obtain information (values and status) from the host vehicle's systems (e.g. ABS, ESP, Longitudinal and Lateral Acceleration, Speed, Wipers) without affecting the safe functioning of those systems.	5.12.7	Communicate with In-vehicle Systems	7.4.1.4	(X)FCD – The system shall be able to obtain information (values and status) from the host vehicle's systems (e.g. ABS, ESP, Longitudinal and Lateral Acceleration, Speed, Wipers) without affecting the safe functioning of those systems.
8.CO.2.6	The system shall be able to collect information about the vehicle (e.g. speed, fog lamp condition, wiper activity) and its environment for other organisations to use, i.e. extended floating car data.	5.13.7	Prepare Extended Floating Car Data		
		5.12.7	Communicate with In-vehicle Systems		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.CO.6.5	The system shall be able to collect information about the vehicle (e.g. speed, fog lamp condition, wiper activity) and its environment for other organisations to use, i.e. floating car data.	5.13.7	Prepare Extended Floating Car Data			
		3.1.2.8	Collect Inter-urban Data from Vehicles			
		3.1.1.8	Collect Urban Data from Vehicles			
8.SP.1.8	The system shall be able to determine the environmental conditions in the vicinity of the host vehicle.	5.15.5	Collect & forward local Host Vehicle conditions	7.4.1.5	(X)FCD – The system shall be able to determine the environmental conditions in the vicinity of the host vehicle.	
		5.15.1.4	Detect Atmospheric Conditions near Host Vehicle			
8.SP.1.9	The system shall be able to determine the visibility in the vicinity of the host vehicle, and classify the cause of reduction, e.g. fog, rain, darkness.	5.15.1.5	Detect Visibility in Host Vehicle vicinity	7.4.1.6	(X)FCD – The system shall be able to determine the visibility in the vicinity of the host vehicle, and classify the cause of the reduction, e.g. fog, rain, darkness.	
		5.15.5	Collect & forward local Host Vehicle conditions			
8.CV.1.2	The system shall be able to infer XFCD, i.e. the road conditions (e.g. reduced friction, aquaplaning) and traffic conditions (e.g. vehicle breakdown, traffic incident), from the state of the host vehicle systems' data (e.g. speed, acceleration, brakes, lights).	5.13.7	Prepare Extended Floating Car Data	7.4.1.7	(X)FCD – The system shall be able to infer XFCD, i.e. the road conditions (e.g. reduced friction, aquaplaning) and traffic conditions (e.g. vehicle breakdown, traffic incident), from the state of the host vehicle systems' data (e.g. speed, acceleration, brakes, lights).	
8.SP.1.10	The system shall be able to estimate the condition of the road surface in the	5.15.1.6	Detect Road Surface State in Host Vehicle vicinity			



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
	vicinity of the host vehicle.	5.15.5	Collect & forward local Host Vehicle conditions			
8.SP.1.27	The system shall be able to maintain a database of dynamic fused data from the host vehicle's systems and sensors.	5.15.5	Collect & forward local Host Vehicle conditions	7.4.1.8	(X)FCD – The system shall be able to maintain a database of dynamic fused XFCD from the host vehicle's systems and sensors.	
8.SP.1.5	The system shall be able to sent XFCD from the host vehicle to an RSU, together with its intended route (from navigation system).	3.1.1.8	Collect Urban Data from Vehicles	7.4.1.9	(X)FCD – The system shall be able to send XFCD from the host vehicle to a road-side device.	
		5.13.7	Prepare Extended Floating Car Data			
		3.1.2.8	Collect Inter-urban Data from Vehicles			
		5.14.10	Freight Vehicle Rest Area Use Management			
8.CV.1.1	The system shall be able to send FCD (e.g. speed, location, identifier) to an RSU whilst the host vehicle is within the section covered by that RSU.	5.13.7	Prepare Extended Floating Car Data			
		3.1.1.8	Collect Urban Data from Vehicles			
		5.13.6	Determine Vehicle Position			
		3.1.2.8	Collect Inter-urban Data from Vehicles			
8.CV.1.3	The system shall be able to send XFCD from a vehicle to the RSU that covers that section in which the vehicle is currently travelling.	3.1.2.8	Collect Inter-urban Data from Vehicles			
		3.1.1.8	Collect Urban Data from Vehicles			



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		5.13.7	Prepare Extended Floating Car Data		
8.CV.9.3	The system shall be able to provide the type, speed, turn indicator status, current location and planned waypoints of the host vehicle to an RSU without any intervention from the driver.	3.1.1.8	Collect Urban Data from Vehicles		
		3.1.2.8	Collect Inter-urban Data from Vehicles		
		5.12.7	Communicate with In-vehicle Systems		
		5.13.7	Prepare Extended Floating Car Data		
		5.14.6	Monitor Vehicle Trip Plan Implementation		
8.SP.1.14	The system shall enable data received from vehicles by an RSU to be integrated, analysed and fused.	3.1.2.8	Collect Inter-urban Data from Vehicles	7.4.1.10	(X)FCD – The system shall enable data received from vehicles by a road-side device to be integrated, analysed and fused.
		3.1.1.8	Collect Urban Data from Vehicles		
8.CV.1.5	The system shall be able to fuse FCD and XFCD data from vehicles within the section covered by the host RSU.	3.1.2.8	Collect Inter-urban Data from Vehicles		
		3.1.1.8	Collect Urban Data from Vehicles		
8.SP.1.15	The system shall enable an RSU to send	3.1.1.14	Manage Urban Traffic Data	7.4.1.11	(X)FCD – The system shall enable a



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	fused traffic data to the TCC.	3.1.2.8	Collect Inter-urban Data from Vehicles		road-side device to send fused traffic data to the TCC.
		3.1.2.16	Manage Inter-urban Traffic Data		
		3.1.2.16	Manage Inter-urban Traffic Data		
8.CV.1.9	The system shall be able to send weather and environmental conditions to the TCC from the host RSU.	3.4.8	Manage Environmental Conditions Data Store	7.4.1.12	(X)FCD – The system shall enable a road-side device to send weather and environmental conditions to the TCC road-side device.
		3.4.1	Monitor Weather Conditions		
8.CV.1.6	The system shall be able to fuse the XFCD data from a number of vehicles with the host vehicle data to create a more accurate view of the road and traffic conditions in that area.	5.13.11	Fuse Extended Floating Car Data	7.4.1.13	(X)FCD – The system shall be able to fuse the XFCD data from a number of vehicles with the host vehicle data to create a more accurate view of the road and traffic conditions in that area.
		3.1.2.8	Collect Inter-urban Data from Vehicles		
		3.1.1.8	Collect Urban Data from Vehicles		
8.CV.1.4	The system shall be able to send (fused) FCD and (fused) XFCD to the TCC from either a vehicle or an RSU.	3.1.1.14	Manage Urban Traffic Data	7.4.1.14	(X)FCD – The system shall be able to send fused FCD to the TCC from a road-side device.
		3.1.1.8	Collect Urban Data from Vehicles		
		3.1.2.16	Manage Inter-urban Traffic Data		





Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.1.2.16	Manage Inter-urban Traffic Data	7.4.1.15	(X)FCD – The system shall be able to send XFCD to the TCC from the host vehicle.
		3.1.1.14	Manage Urban Traffic Data		
		3.1.1.8	Collect Urban Data from Vehicles		
		3.1.2.16	Manage Inter-urban Traffic Data		
		3.1.2.8	Collect Inter-urban Data from Vehicles		
		5.13.7	Prepare Extended Floating Car Data		
8.CV.1.7	The system shall be able to add traffic data from the infrastructure (e.g. induction loops, radar) to the fused XFCD data.	3.1.2.16	Manage Inter-urban Traffic Data	7.4.1.16	(X)FCD – The system shall be able to add traffic data from the infrastructure (e.g. induction loops, radar) to the fused XFCD data of the road-side device.
		3.1.2.8	Collect Inter-urban Data from Vehicles		
		3.1.1.8	Collect Urban Data from Vehicles		
		3.1.1.14	Manage Urban Traffic Data		
8.CV.1.12	The system shall be able to communicate with another vehicle either directly, or via an RSU.	3.2.6	Assess Incidents and Devise Responses	7.4.1.17	(X)FCD – The system shall be able to communicate with another vehicle either directly, or via an road-side device. (Communications).
		3.2.14	Send Incident Details to Vehicles		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.2.8	Send Incident Details to Others		
8.CV.1.8	The system shall be able to match a radar image with the identity of a vehicle providing FCD and/or XFCD.	3.1.1.12	Monitor Urban FCD/XFCD Source Vehicles	7.4.1.18	(X)FCD – The system shall be able to match a visual image of a vehicle with the (un-attributable – for privacy protection) identity of a vehicle that is providing FCD and/or XFCD.
		7.3.5	Sort Fraud Notifications		
		3.1.2.8	Collect Inter-urban Data from Vehicles		
		3.1.1.8	Collect Urban Data from Vehicles		
		3.1.2.12	Monitor Inter-urban FCD/XFCD Source Vehicles		
8.SP.1.29	The system shall be able to determine the existence of a sharp curve from the road network database.	5.15.5	Collect & forward local Host Vehicle conditions	7.4.1.19	<i>Hazard Detection</i> – The system shall be able to determine the existence of a sharp curve from the road network database.
8.SP.1.3	The system shall be able to determine that the host vehicle is partially occupying an adjacent lane for a short time, e.g. due to manoeuvre round a sharp bend, lane width reductions.	5.12.7	Communicate with In-vehicle Systems	7.4.1.20	<i>Hazard Detection</i> – The system shall be able to determine that the host vehicle is partially occupying an adjacent lane for a short time, e.g. due to manoeuvre round a sharp bend, or lane width reductions.
		5.13.6	Determine Vehicle Position		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.SP.1.7	The system shall be able to detect the presence of fire or smoke on the host vehicle.	5.12.7	Communicate with In-vehicle Systems	7.4.1.21	<i>Hazard Detection</i> – The system shall be able to detect the presence of fire or smoke on the host vehicle.
8.CV.1.14	The system shall enable the host vehicle to send information about its own safety behaviour to the RSU that covers that section in which the vehicle is currently travelling.	3.1.1.8	Collect Urban Data from Vehicles	7.4.1.22	<i>Hazard Detection</i> – The system shall enable the host vehicle to send information about its own safety behaviour (i.e. whether or not the vehicle was being driven in an unsafe manner, e.g. excessive speeding, swapping of lanes, overtaking, driver inattention) to a road-side device.
		5.13.10	Display Current Road Information to Driver		
		3.1.2.8	Collect Inter-urban Data from Vehicles		
8.SP.1.17	The system shall enable an RSU to determine whether an incident has occurred, or the behaviour of a vehicle is not consistent with the current regulations and/or signals.	3.1.1.5.8	Detect Urban Traffic Violations		
		3.2.12	Detect Incidents from Data		
8.SP.1.22	The system shall be able to predict the path of the host system and classify the behaviour, e.g. safe, lane change, overtaking, driver inattention.	5.15.3.3	Classify Host Vehicle Driver Behaviour		
		5.12.7	Communicate with In-vehicle Systems		
		5.15.3.1	Predict Host Vehicle Trajectory		
		5.11.11	Monitor Status of Driver		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.SP.1.21	The system shall be able to detect presence of other vehicles in the vicinity of the host vehicle, and determine its type, e.g. car, lorry, emergency, maintenance.	5.15.1.1	Detect Other Vehicles near to Host Vehicle	7.4.1.23	<i>Hazard Detection</i> – The system shall be able to detect presence of other vehicles and traffic participants in the vicinity of the host vehicle, and determine its type, e.g. car, lorry, emergency, maintenance, cycle, pedestrian.
8.SP.1.6	The system shall be able to detect and track objects (e.g. vehicles, bikes, pedestrians) in the area surrounding the host vehicle.	5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.1.3	Detect Pedestrians near to Host Vehicle		
		5.15.1.2	Detect Other Road Users in nearby geographic area		
		5.15.1.1	Detect Other Vehicles near to Host Vehicle		
8.SP.1.26	The system shall be able to determine the status of the traffic in the vicinity of the host vehicle, e.g. congestion, stationary vehicle(s).	5.15.1.1	Detect Other Vehicles near to Host Vehicle	7.4.1.24	<i>Hazard Detection</i> – The system shall be able to determine the status of the traffic in the vicinity of the host vehicle, e.g. congestion, stationary vehicle(s).
8.SP.1.11	The system shall be able to detect the presence of stationary objects (seen or deduced) in the carriageway ahead of the host vehicle, and to warn the driver via an in-vehicle device.	5.15.5	Collect & forward local Host Vehicle conditions	7.4.1.25	<i>Hazard Detection</i> – The system shall be able to detect the presence of stationary objects (seen or deduced) in the carriageway ahead of the host vehicle, and to warn the driver via an in-vehicle device.
		5.15.1.7	Detect Stationary Objects in Host Vehicle vicinity		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.SP.1.12	The system shall be able to detect the presence of stationary objects (seen or deduced) in the opposite carriageway to that of the host vehicle, and to send a warning to other vehicles.	5.15.1.7	Detect Stationary Objects in Host Vehicle vicinity	7.4.1.26	<i>Hazard Detection</i> – The system shall be able to detect the presence of stationary objects (seen or deduced) in the opposite carriageway to that of the host vehicle, and to send a warning to other vehicles.
		5.15.5	Collect & forward local Host Vehicle conditions		
8.SP.1.16	The system shall enable TCC to determine whether an incident has occurred.	3.2.12	Detect Incidents from Data	7.4.1.27	<i>Hazard Detection</i> – The system shall enable the TCC to determine whether an incident has occurred.
8.SP.1.17	The system shall enable an RSU to determine whether an incident has occurred, or the behaviour of a vehicle is not consistent with the current regulations and/or signals.	3.1.1.5.8	Detect Urban Traffic Violations	7.4.1.28	<i>Hazard Detection</i> – The system shall enable an road-side device to determine whether an incident has occurred.
		3.2.12	Detect Incidents from Data		
8.SP.1.25	The system shall be able to detect that a motorcycle has fallen onto the road pavement, and send this information to other vehicles and an RSU.	5.12.8	Manage Vehicle Communication to Driver	7.4.1.29	<i>Motorcycle Warning</i> – The system shall be able to detect that the host motorcycle has fallen onto the road pavement, and send this information to other vehicles.
		5.12.9	Output Commands and Dynamic Warnings		
		5.12.10	Provide V2V Communications		
		5.15.1.8	Detect Vehicle Attitude Status		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		5.15.5	Collect & forward local Host Vehicle conditions			
8.SP.1.25	The system shall be able to detect that a motorcycle has fallen onto the road pavement, and send this information to other vehicles and an RSU.	3.1.1.5.20	Output c&i to Drivers using Urban Roads	7.4.1.30	<i>Motorcycle Warning</i> – The system shall be able to detect that the host motorcycle has fallen onto the road pavement, and send this information to a road-side device.	
		3.1.2.14.2	Output Messages & Commands to Inter-urban Roads			
		5.15.1.8	Detect Vehicle Attitude Status			
		5.15.5	Collect & forward local Host Vehicle conditions			
8.CO.2.4	The system shall be able to warn drivers in a timely manner of moving incidents (e.g. road/winter maintenance vehicles, long/wide loads, self-reporting ghost drivers) via an in-vehicle display.	3.2.6	Assess Incidents and Devise Responses	7.4.1.31	<i>Traffic Condition Warning</i> – The system shall be able to warn drivers in a timely manner of moving incidents (e.g. road/winter maintenance vehicles, long/wide loads) via an in-vehicle display.	
		5.12.8	Manage Vehicle Communication to Driver			
		5.12.9	Output Commands and Dynamic Warnings			
		3.2.8	Send Incident Details to Others			
8.CO.3.1	The system shall be able to warn drivers in a timely manner of moving incidents	3.2.6	Assess Incidents and Devise Responses			



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	(e.g. road/winter maintenance vehicles, long/wide loads, self-reporting ghost drivers) via an in-vehicle display.	3.2.8	Send Incident Details to Others		
		5.12.9	Output Commands and Dynamic Warnings		
		5.12.8	Manage Vehicle Communication to Driver		
8.CO.1.4	The system shall be able to send to following vehicles "copies" of the traffic signs, or information about the local traffic (e.g. sudden congestion), that it may be useful to receive in advance.	5.12.10	Provide V2V Communications	7.4.1.32	<i>Traffic Condition Warning</i> –The system shall be able to send to vehicles following the host vehicle information about the traffic conditions, or the traffic signs, near the host vehicle, that it may be useful to receive in advance.
8.CO.2.5	The system shall be able to locate the tail end of a traffic queue and estimate its speed of propagation.	5.12.8	Manage Vehicle Communication to Driver	7.4.1.33	<i>Traffic Queue Detection</i> – The system shall be able to locate the tail end of a traffic queue and estimate its speed of propagation.
		5.12.9	Output Commands and Dynamic Warnings		
		3.1.1.9	Output Urban Traffic Data		
		3.1.2.9	Output Inter-urban Traffic Data		
		3.1.2.8	Collect Inter-urban Data from Vehicles		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.1.1.8	Collect Urban Data from Vehicles		
8.SP.3.4	The system shall be able to inform drivers, via in-vehicle and road-side devices, of slow moving obstacles (e.g. person, animal, slow vehicle) and advise on the appropriate action (e.g. speed and lane).	5.15.1.2	Detect Other Road Users in nearby geographic area	7.4.1.34	<i>Traffic Queue Detection</i> – The system shall be able to inform drivers, via in-vehicle and road-side devices, of slow moving obstacles (e.g. person, animal, slow vehicle) and advise on the appropriate action (e.g. speed and lane).
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.1.3	Detect Pedestrians near to Host Vehicle		
		5.15.4	Provide Vehicle Trajectory Information to Driver		
		5.15.1.1	Detect Other Vehicles near to Host Vehicle		
		3.1.1.5.20	Output c&i to Drivers using Urban Roads		
8.CO.1.1	The system shall be able to warn drivers in a timely manner of incidents ahead (e.g. road works, accident, traffic queue) via an in-vehicle display. Where available and relevant this information shall include lane(s)/road section(s) affected and expected delay.	5.12.8	Manage Vehicle Communication to Driver	7.4.1.35	<i>Hazardous Location Notification</i> – The system shall be able to warn drivers in a timely manner of incidents ahead (e.g. road works, accident, traffic queue) via an in-vehicle display. Where available and relevant this information shall include lane(s)/road section(s) affected and expected delay.
		5.12.9	Output Commands and Dynamic Warnings		
		3.2.7	Provide Incident Mitigations to Traffic Management		





Old User Need		Function			New User Need
No.	Description	No.	Name	No.	Description
8.CO.2.1	The system shall be able to warn drivers in a timely manner of incidents ahead (e.g. road works, accident, traffic queue) via an in-vehicle display. Where available and relevant this information shall include lane(s)/road section(s) affected and expected delay.	5.12.8	Manage Vehicle Communication to Driver		
		5.12.9	Output Commands and Dynamic Warnings		
		3.2.8	Send Incident Details to Others		
8.CV.5.1	The system shall be able to warn drivers in a timely manner of incidents ahead (e.g. road works, accident, traffic queue) via an in-vehicle display.	3.2.6	Assess Incidents and Devise Responses		
		5.12.9	Output Commands and Dynamic Warnings		
		5.12.8	Manage Vehicle Communication to Driver		
		3.2.14	Send Incident Details to Vehicles		
8.CV.5.2	The system shall be able to warn drivers in a timely manner of adverse road surfaces and weather conditions along the planned route via an in-vehicle display.	3.2.6	Assess Incidents and Devise Responses	7.4.1.36	<i>Hazardous Location Notification</i> – The system shall be able to warn the driver in a timely manner, via an in-vehicle display, of adverse road surfaces and weather conditions along the planned route.
		5.12.9	Output Commands and Dynamic Warnings		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.5.10	Evaluate Need for Long Term Maintenance		
		5.12.8	Manage Vehicle Communication to Driver		
		3.5.9	Evaluate Needs for Short Term Maintenance		
		3.2.14	Send Incident Details to Vehicles		
8.CO.2.3	The system shall be able to warn drivers in a timely manner of adverse weather conditions via an in-vehicle display.	5.12.8	Manage Vehicle Communication to Driver		
		3.2.6	Assess Incidents and Devise Responses		
		3.2.9	Send Incident Details to Information Providers		
		3.2.8	Send Incident Details to Others		
		5.12.9	Output Commands and Dynamic Warnings		
8.SP.3.5	The system shall be able to warn drivers, via in-vehicle and road-side devices, of	3.1.1.5.20	Output c&i to Drivers using Urban Roads	7.4.1.37	<i>Hazardous Location Notification</i> – The system shall be able to warn



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	adverse driving conditions ahead (e.g. slippery road, low visibility, queuing traffic) and advise on the appropriate action (e.g. speed).	5.15.5	Collect & forward local Host Vehicle conditions		driver, via an in-vehicle device, of adverse driving conditions ahead (e.g. slippery road, low visibility, queuing traffic) and advise on the appropriate action (e.g. speed).
		5.15.1.6	Detect Road Surface State in Host Vehicle vicinity		
		5.15.4	Provide Vehicle Trajectory Information to Driver		
		5.15.1.1	Detect Other Vehicles near to Host Vehicle		
		5.15.1.5	Detect Visibility in Host Vehicle vicinity		
		5.12.10	Provide V2V Communications		
8.SP.3.5	The system shall be able to warn drivers, via in-vehicle and road-side devices, of adverse driving conditions ahead (e.g. slippery road, low visibility, queuing traffic) and advise on the appropriate action (e.g. speed).	3.1.1.5.20	Output c&i to Drivers using Urban Roads	7.4.1.38	<i>Hazardous Location Notification</i> – The system shall be able to warn drivers, via a road-side device, of adverse driving conditions ahead (e.g. slippery road, low visibility, queuing traffic) and advise on the appropriate action (e.g. speed).
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.1.6	Detect Road Surface State in Host Vehicle vicinity		
		5.15.2	Determine and store local Host Vehicle conditions		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		5.15.1.1	Detect Other Vehicles near to Host Vehicle		
		5.15.1.5	Detect Visibility in Host Vehicle vicinity		
		3.1.2.14.2	Output Messages & Commands to Inter-urban Roads		
8.SP.3.2	The system shall be able to warn the driver, via an in-vehicle device, that the host vehicle is about to enter a curve that has been classified as a black spot for that category of vehicle, and recommend a suitable speed and trajectory.	5.15.3.1	Predict Host Vehicle Trajectory	7.4.1.39	<i>Hazardous Location Notification –</i> The system shall be able to warn the driver, via an in-vehicle device, that the host vehicle is about to enter a curve that has been classified as a black spot for that category of vehicle, and recommend a suitable speed and trajectory.
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.4	Provide Vehicle Trajectory Information to Driver		
8.SP.3.1	The system shall be able to warn the driver, via an in-vehicle device, that the host vehicle is about to enter a section of road whose surface has less grip than normal (low $\mu$ ).	5.15.5	Collect & forward local Host Vehicle conditions	7.4.1.40	<i>Hazardous Location Notification –</i> The system shall be able to warn the driver, via an in-vehicle device, that the host vehicle is about to enter a section of road whose surface has less grip than normal (low $\mu$ ).
		5.12.10	Provide V2V Communications		
		5.15.1.6	Detect Road Surface State in Host Vehicle vicinity		
		5.15.4	Provide Vehicle Trajectory Information to Driver		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.SP.3.3	The system shall be able to inform drivers, via in-vehicle and road-side devices, of obstacles in the carriageway and advise on the appropriate action (e.g. speed and lane).	5.15.5	Collect & forward local Host Vehicle conditions	7.4.1.41	<i>Hazardous Location Notification –</i> The system shall be able to inform drivers, via an in-vehicle device, of obstacles in the carriageway and advise on the appropriate action (e.g. speed and lane).
		3.1.1.5.20	Output c&i to Drivers using Urban Roads		
		5.15.1.7	Detect Stationary Objects in Host Vehicle vicinity		
		5.15.4	Provide Vehicle Trajectory Information to Driver		
8.SP.3.3	The system shall be able to inform drivers, via in-vehicle and road-side devices, of obstacles in the carriageway and advise on the appropriate action (e.g. speed and lane).	3.1.1.5.20	Output c&i to Drivers using Urban Roads	7.4.1.42	<i>Hazardous Location Notification –</i> The system shall be able to inform drivers, via road-side devices, of obstacles in the carriageway and advise on the appropriate action (e.g. speed and lane).
		3.1.1.5.21	Send Messages to Approaching Urban Vehicles		
		3.1.2.14.2	Output Messages & Commands to Inter-urban Roads		
		3.1.2.14.6	Send Messages to Approaching Inter-urban Vehicles		
		5.15.5	Collect & forward local Host Vehicle conditions		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		5.15.1.7	Detect Stationary Objects in Host Vehicle vicinity			
8.SP.1.18	The system shall enable an RSU to select and activate a traffic management strategy in the event of an incident (including poor driving conditions).	3.2.6	Assess Incidents and Devise Responses	7.4.1.43	<i>Hazardous Location Notification –</i> The system shall enable a road-side device to select and activate a traffic management strategy in the event of an incident (including poor driving conditions).	
		3.2.13	Classify and Identify Incidents			
		3.2.10	Manage Store of Incident Data			
8.CV.1.11	The system shall be able to send information about incidents upstream in the next section from an RSU to drivers via an in-vehicle device.	5.12.9	Output Commands and Dynamic Warnings	7.4.1.44	<i>Hazardous Location Notification –</i> The system shall be able to send information about incidents ahead in the next section from a road-side device to drivers via an in-vehicle device.	
		5.12.8	Manage Vehicle Communication to Driver			
		3.2.6	Assess Incidents and Devise Responses			
		3.2.14	Send Incident Details to Vehicles			
8.SP.1.13	The system shall be able to send warnings on the condition of the road surface in the vicinity of the host vehicle to other vehicles and/or an RSU.	5.12.10	Provide V2V Communications	7.4.1.45	<i>Hazardous Location Notification –</i> The system shall be able to estimate the condition of the road surface in the vicinity of the host vehicle and send warnings to other vehicles.	
		5.15.5	Collect & forward local Host Vehicle conditions			
		5.15.1.6	Detect Road Surface State in Host Vehicle vicinity			



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.SP.1.13	The system shall be able to send warnings on the condition of the road surface in the vicinity of the host vehicle to other vehicles and/or an RSU.	5.15.1.6	Detect Road Surface State in Host Vehicle vicinity	7.4.1.46	<i>Hazardous Location Notification –</i> The system shall be able to estimate the condition of the road surface in the vicinity of the host vehicle and send warnings to a road-side device.	
		5.15.5	Collect & forward local Host Vehicle conditions			
		3.1.1.5.20	Output c&i to Drivers using Urban Roads			
		3.1.1.5.21	Send Messages to Approaching Urban Vehicles			
		3.1.2.14.2	Output Messages & Commands to Inter-urban Roads			
		3.1.2.14.6	Send Messages to Approaching Inter-urban Vehicles			
8.CV.1.10	The system shall be able to send information about incidents upstream on the road network from the TCC to drivers via an in-vehicle device.	5.12.8	Manage Vehicle Communication to Driver	7.4.1.47	<i>Hazardous Location Notification –</i> The system shall be able to send information about incidents on the road network ahead from the TCC to drivers via an in-vehicle device.	
		3.2.6	Assess Incidents and Devise Responses			
		5.12.9	Output Commands and Dynamic Warnings			
		3.2.8	Send Incident Details to Others			



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.CO.1.3	The system shall provide "copies" of the traffic signs that are relevant to the current section of the road (e.g. speed limit, road hazards, junctions) to the driver at all times via an in-vehicle display.	5.12.9	Output Commands and Dynamic Warnings	7.4.1.48	<i>Hazardous Location Notification –</i> The system shall provide "copies" of the traffic signs that are relevant to the current section of the road (e.g. speed limit, road hazards, junctions) to the driver at all times via an in-vehicle display.
		5.12.8	Manage Vehicle Communication to Driver		
8.CO.2.9	The system shall provide "copies" of the traffic signs that are relevant to the current section of the road (e.g. speed limit, road hazards, junctions) to the driver at all times via an in-vehicle display.	3.2.8	Send Incident Details to Others		
		5.12.8	Manage Vehicle Communication to Driver		
		5.12.9	Output Commands and Dynamic Warnings		
		5.13.10	Display Current Road Information to Driver		
		3.2.6	Assess Incidents and Devise Responses		
5.13.9	Determine Applicable Road Information				
8.CO.2.10	The system shall be able to send to following vehicles "copies" of the traffic signs, or information about the local traffic (e.g. sudden congestion), that it may be useful to receive in advance.	5.12.8	Manage Vehicle Communication to Driver	7.4.1.49	<i>Hazardous Location Notification –</i> The system shall be able to send to following vehicles "copies" of the traffic signs, or information about the local traffic (e.g. sudden congestion), that it may be useful to receive in
		5.13.9	Determine Applicable Road Information		





	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
		5.12.10	Provide V2V Communications		advance.
8.SP.7.1	The system shall be able to detect that a (non-equipped) vehicle is travelling in the wrong direction along a “one-way” road (i.e. a ghost driver), and warn other vehicles “ahead” of that vehicle.	5.15.1.2	Detect Other Road Users in nearby geographic area	7.4.2.1	The system shall be able to detect that a (non-self-reporting) vehicle is travelling in the wrong direction along a “one-way” road (i.e. a ghost driver), and warn other vehicles “ahead” of that vehicle.
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.4	Provide Vehicle Trajectory Information to Driver		
		5.12.10	Provide V2V Communications		
8.CO.3.1	The system shall be able to warn drivers in a timely manner of moving incidents (e.g. road/winter maintenance vehicles, long/wide loads, self-reporting ghost drivers) via an in-vehicle display.	3.2.6	Assess Incidents and Devise Responses	7.4.2.2	The system shall be able to warn drivers in a timely manner of self-reporting ghost drivers via an in-vehicle display.
		3.2.8	Send Incident Details to Others		
		5.12.9	Output Commands and Dynamic Warnings		
		5.12.8	Manage Vehicle Communication to Driver		
8.CO.2.4	The system shall be able to warn drivers in a timely manner of moving incidents	3.2.6	Assess Incidents and Devise Responses		



Old User Need		Function			New User Need
No.	Description	No.	Name	No.	Description
	(e.g. road/winter maintenance vehicles, long/wide loads, self-reporting ghost drivers) via an in-vehicle display.	5.12.8	Manage Vehicle Communication to Driver		
		5.12.9	Output Commands and Dynamic Warnings		
		3.2.8	Send Incident Details to Others		
		5.12.7	Communicate with In-vehicle Systems		
		5.12.8	Manage Vehicle Communication to Driver		
		5.12.9	Output Commands and Dynamic Warnings		
		5.15.3.1	Predict Host Vehicle Trajectory		
		5.15.5	Collect & forward local Host Vehicle conditions		
8.SP.7.2	The system shall be able to detect that the host vehicle is travelling in the wrong direction along a “one-way” road (i.e. a ghost driver), and warn/advise that driver to correct the situation.	5.15.5	Collect & forward local Host Vehicle conditions	7.4.2.3	The system shall be able to detect that the host vehicle is travelling in the wrong direction along a “one-way” road (i.e. a ghost driver), and warn/advise that driver to correct the situation.
		5.12.7	Communicate with In-vehicle Systems		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		5.15.3.1	Predict Host Vehicle Trajectory		The system shall be able to detect that a vehicle is overtaking (i.e. in the wrong lane) on a two-lane road and that there is another vehicle approaching in that lane, and provide a warning to the drivers of both vehicles via their in-vehicle devices.	
		5.15.4	Provide Vehicle Trajectory Information to Driver			
8.SP.7.3	The system shall be able to detect that a vehicle is overtaking (i.e. in the wrong lane) on a two-lane road and that there is another vehicle approaching in that lane, and provide a warning to the drivers of both vehicles via their in-vehicle devices.	5.15.1.2	Detect Other Road Users in nearby geographic area	7.4.2.4		
		5.12.10	Provide V2V Communications			
		5.15.4	Provide Vehicle Trajectory Information to Driver			
		5.12.9	Output Commands and Dynamic Warnings			
		5.12.8	Manage Vehicle Communication to Driver			
		5.15.3.1	Predict Host Vehicle Trajectory			
		5.15.5	Collect & forward local Host Vehicle conditions			
8.CO.3.3	The system shall provide "copies" of the traffic signs that are relevant to the	5.12.9	Output Commands and Dynamic Warnings	7.4.2.5		The system shall provide "copies" of the traffic signs that are relevant to



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	current section of the road (e.g. speed limit, road hazards, junctions) to the driver at all times via an in-vehicle display.	5.13.9	Determine Applicable Road Information		the current section of the road (e.g. speed limit, road hazards, junctions) to the driver at all times via an in-vehicle display.
		5.13.10	Display Current Road Information to Driver		
		5.12.8	Manage Vehicle Communication to Driver		
		3.2.6	Assess Incidents and Devise Responses		
		3.2.8	Send Incident Details to Others		
8.CO.3.4	The system shall be able to send to following vehicles "copies" of the traffic signs, or information about the local traffic (e.g. sudden congestion), that it may be useful to receive in advance.	5.12.8	Manage Vehicle Communication to Driver	7.4.2.6	The system shall be able to send to following vehicles "copies" of the traffic signs, or information about the local traffic (e.g. sudden congestion), that it may be useful to receive in advance.
		5.13.9	Determine Applicable Road Information		
		5.12.10	Provide V2V Communications		
8.CO.4.1	The system shall be able to provide lane usage information to the driver via an in-vehicle display. This information shall only be provided for as long as it applies, and a suitable message should be provided if the service provision cannot	5.12.9	Output Commands and Dynamic Warnings	7.4.3.1	The system shall be able to provide lane usage information to the driver via an in-vehicle display.
		3.1.2.13.6	Manage Lanes in the Inter-urban Road Network		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	be guaranteed.	5.12.8	Manage Vehicle Communication to Driver		
8.CV.12.1	The system shall be able to advise the driver, via an in-vehicle device, which lane, exit etc to use.	5.12.8	Manage Vehicle Communication to Driver		
		3.1.1.5.19	Manage Urban Road Network Lanes		
		3.1.2.5.17	Manage Inter-urban Road Network Lanes		
		5.12.9	Output Commands and Dynamic Warnings		
8.CO.4.2	The system shall be able to provide lane restriction information (e.g. HGV, HOV) from outside the vehicle, and to verify that it has been communicated correctly to each vehicle.	5.12.8	Manage Vehicle Communication to Driver	7.4.3.2	The system shall be able to provide lane restriction information (e.g. HGV, HOV) from outside the vehicle and to confirm that it is consistent with the information that has been sent directly to that vehicle.
		3.1.2.13.6	Manage Lanes in the Inter-urban Road Network		
		5.12.9	Output Commands and Dynamic Warnings		
		5.12.11	Assess Dynamic Command & Warning Indications		
8.CO.4.3	The system shall be able to provide instructions not to change lanes to the	5.12.9	Output Commands and Dynamic Warnings	7.4.3.3	The system shall be able to provide instructions not to change lanes to



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
	driver via an in-vehicle device in order to stabilise the total traffic flow. These instructions may either apply to all types of vehicle, or to sub-sets.	3.1.1.5.19	Manage Urban Road Network Lanes		the driver via an in-vehicle device in order to stabilise the total traffic flow. These instructions may either apply to all types of vehicle, or to sub-sets.
		3.1.2.13.6	Manage Lanes in the Inter-urban Road Network		
		5.12.8	Manage Vehicle Communication to Driver		
8.CO.4.4	The system shall provide information to the driver via an in-vehicle display when auxiliary lanes are now available for use by that type of vehicle (e.g. hard shoulder running).	5.12.8	Manage Vehicle Communication to Driver	7.4.3.4	The system shall provide information to the driver via an in-vehicle display when auxiliary lanes are now available for use by that type of vehicle (e.g. hard shoulder running).
		3.1.2.13.6	Manage Lanes in the Inter-urban Road Network		
		5.12.9	Output Commands and Dynamic Warnings		
8.CO.4.5	The system shall ensure that the auxiliary lane is free from obstacles before it is released for use.	3.1.2.5.17	Manage Inter-urban Road Network Lanes	7.4.3.5	The system shall ensure that the auxiliary lane is free from obstacles before it is released for use.
		3.1.2.13.1	Provide Inter-urban Road Operator Mgt Interface		
		3.1.2.14.1	Provide Inter-urban Road Operator Cmd Interface		
8.CO.4.6	The system shall be able to provide lane usage information to the driver via an in-	5.12.9	Output Commands and Dynamic Warnings	7.4.3.6	The system shall be able to provide lane usage information to the driver



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	vehicle display when there are temporary restrictions to lane usage (e.g. at road works).	5.12.8	Manage Vehicle Communication to Driver		via an in-vehicle display when there are temporary restrictions to lane usage (e.g. at road works).
		3.1.2.13.6	Manage Lanes in the Inter-urban Road Network		
8.CV.5.3	The system shall be able to advise a driver, via an in-vehicle device, which lane to use when passing an incident/accident.	5.12.8	Manage Vehicle Communication to Driver	7.4.3.7	The system shall be able to advise a driver, via an in-vehicle device, which lane to use when passing an incident/accident.
		3.1.1.5.19	Manage Urban Road Network Lanes		
		3.2.6	Assess Incidents and Devise Responses		
		3.1.1.5.17	Implement Urban Traffic Commands		
		3.1.2.13.6	Manage Lanes in the Inter-urban Road Network		
		5.12.9	Output Commands and Dynamic Warnings		
		3.2.7	Provide Incident Mitigations to Traffic Management		
		3.1.2.14.4	Output Inter-urban Traffic Commands & Messages		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.CV.5.4	The system shall be able to advise a driver, via an in-vehicle device, where to stop safely (e.g. an appropriate exit lane, hard shoulder).	5.12.8	Manage Vehicle Communication to Driver	7.4.3.8	The system shall be able to advise a driver, via an in-vehicle device, where to stop safely (e.g. an appropriate exit lane, hard shoulder).	
		5.12.9	Output Commands and Dynamic Warnings			
		3.1.2.14.4	Output Inter-urban Traffic Commands & Messages			
		3.2.6	Assess Incidents and Devise Responses			
		3.1.1.5.19	Manage Urban Road Network Lanes			
		3.1.2.13.6	Manage Lanes in the Inter-urban Road Network			
		3.1.1.5.17	Implement Urban Traffic Commands			
		3.2.7	Provide Incident Mitigations to Traffic Management			
8.CO.4.7	The system shall provide "copies" of the traffic signs that are relevant to the current section of the road (e.g. speed limit, road hazards, junctions) to the driver at all times via an in-vehicle display.	3.1.1.5.18	Manage Urban Traffic Speeds and Headways	7.4.3.9	The system shall provide "copies" of the traffic signs that are relevant to the current section of the road (e.g. speed limit, road hazards, junctions) to the driver at all times via an in-vehicle display.	
		3.1.1.5.20	Output c&i to Drivers using Urban Roads			





Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.1.1.5.22	Output s&g Commands to Urban Roads		
		5.12.8	Manage Vehicle Communication to Driver		
		5.12.9	Output Commands and Dynamic Warnings		
		5.13.10	Display Current Road Information to Driver		
		5.13.9	Determine Applicable Road Information		
8.CO.4.8	The system shall be able to send to following vehicles "copies" of the traffic signs, or information about the local traffic (e.g. sudden congestion), that it may be useful to receive in advance.	3.1.1.5.20	Output c&i to Drivers using Urban Roads	7.4.3.10	The system shall be able to send to following vehicles "copies" of the traffic signs, or information about the local traffic (e.g. sudden congestion), that it may be useful to receive in advance.
		5.12.8	Manage Vehicle Communication to Driver		
		5.12.9	Output Commands and Dynamic Warnings		



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
8.CO.5.3	The system shall be able to recommend a safe speed limit according to the prevailing traffic, weather and road conditions based on the current legal speed limit.	5.13.8	Provide Suggested Speeds and Headways for ISA	7.4.4.1	The system shall be able to recommend a safe speed limit according to the prevailing traffic, weather and road conditions based on the current legal speed limit.
8.CV.6.1	The system shall enable the TCC to calculate recommended speed limits for the current traffic and environment conditions.	3.1.2.13.4	Manage Inter-urban Road Network Speeds & Headways		
		3.1.1.5.18	Manage Urban Traffic Speeds and Headways		
8.CV.6.3	The system shall be able to recommend a safe speed limit according to the prevailing traffic, weather and road conditions.	5.13.8	Provide Suggested Speeds and Headways for ISA		
		5.13.10	Display Current Road Information to Driver		
8.CO.2.2	The system shall be able to warn drivers of different legal speed limits as a result of particular weather conditions via an in-vehicle display.	5.13.9	Determine Applicable Road Information	7.4.4.2	The system shall be able to warn drivers, via an in-vehicle display, of different legal speed limits as a result of particular weather conditions.
		5.13.10	Display Current Road Information to Driver		
8.CO.5.1	The system shall provide legal speed limits continuously to the driver via an in-vehicle display according to the type of the host vehicle and the lane in which it	5.13.10	Display Current Road Information to Driver	7.4.4.3	The system shall provide legal speed limits continuously to the driver, via an in-vehicle display, according to the type of the host vehicle and the



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	is travelling (Intelligent Speed Adaptation - ISA). A suitable message should be provided if the service provision cannot be guaranteed.	5.13.9	Determine Applicable Road Information		lane in which it is travelling (Intelligent Speed Adaptation – ISA). A suitable message should be provided if the service provision cannot be guaranteed.
8.CV.6.2	The system shall provide the current speed limit, and its cause, continuously to the driver via an in-vehicle display (Intelligent Speed Adaptation - ISA).	5.13.8	Provide Suggested Speeds and Headways for ISA		
		5.13.9	Determine Applicable Road Information		
		5.13.10	Display Current Road Information to Driver		
8.CO.5.2	The system shall provide recommended speed limits continuously to the driver via an in-vehicle display according to the type of the host vehicle and the lane in which it is travelling (Intelligent Speed Adaptation - ISA). A suitable message should be provided if the service provision cannot be guaranteed.	5.13.10	Display Current Road Information to Driver	7.4.4.4	The system shall be able to provide recommended speed limits continuously to the driver, via an in-vehicle display, according to the type of the host vehicle and the lane in which it is travelling (Intelligent Speed Adaptation – ISA). A suitable message should be provided if the service provision cannot be guaranteed.
		5.13.8	Provide Suggested Speeds and Headways for ISA		
8.CV.6.2	The system shall provide the current speed limit, and its cause, continuously to the driver via an in-vehicle display (Intelligent Speed Adaptation - ISA).	5.13.8	Provide Suggested Speeds and Headways for ISA		
		5.13.9	Determine Applicable Road Information		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		5.13.10	Display Current Road Information to Driver			
8.SP.1.19	The system shall enable the driver of the host vehicle, via an in-vehicle device, to receive safety-related information (e.g. legal speed limit, recommended speed limit) from other vehicles, an RSU and/or a TCC.	5.12.7	Provide V2V Communications	7.4.4.5	The system shall enable the driver of the host vehicle, via an in-vehicle device, to receive safety-related information (e.g. legal speed limit, recommended speed limit) from other vehicles in the vicinity.	
		5.12.8	Manage Vehicle Communication to Driver			
		5.12.9	Output Commands and Dynamic Warnings			
8.SP.1.19	The system shall enable the driver of the host vehicle, via an in-vehicle device, to receive safety-related information (e.g. legal speed limit, recommended speed limit) from other vehicles, an RSU and/or a TCC.	3.1.1.5.15	Output Lane & Speed Commands to Urban Roads	7.4.4.6	The system shall enable the driver of the host vehicle, via an in-vehicle device, to receive safety-related information (e.g. legal speed limit, recommended speed limit) from a road-side device.	
		3.1.1.5.18	Manage Urban Traffic Speeds and Headways			
		3.1.2.13.4	Manage Inter-urban Road Network Speeds & Headways			
		3.1.2.14.3	Output Lane & Speed Messages to Inter-urban Roads			
8.SP.1.19	The system shall enable the driver of the host vehicle, via an in-vehicle device, to receive safety-related information (e.g. legal speed limit, recommended speed limit) from other vehicles, an RSU and/or a TCC.	3.1.1.5.22	Output s&g Commands to Urban Roads	7.4.4.7	The system shall enable the driver of the host vehicle, via an in-vehicle device, to receive safety-related information (e.g. legal speed limit, recommended speed limit) from the TCC.	
		3.1.2.5.15	Manage Inter-urban Traffic Speeds and Headways			



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.1.2.13.4	Manage Inter-urban Road Network Speeds & Headways		
8.CO.5.5	The system shall be able provide recommended speed limits from outside the vehicle, and to verify that each limit has been communicated correctly to each vehicle.	5.12.9	Output Commands and Dynamic Warnings	7.4.4.8	The system shall be able provide recommended speed limits from outside the vehicle, and to confirm that they are consistent with the limits that have been sent directly to that vehicle.
		3.1.1.5.18	Manage Urban Traffic Speeds and Headways		
		3.1.2.13.4	Manage Inter-urban Road Network Speeds & Headways		
		3.1.1.5.15	Output Lane & Speed Commands to Urban Roads		
		3.1.2.14.3	Output Lane & Speed Messages to Inter-urban Roads		
		5.12.11	Assess Dynamic Command & Warning Indications		
8.SP.1.20	The system shall enable an RSU and/or a TCC to display safety-related information (e.g. legal speed limit, recommended speed limit) to drivers (not using an in-vehicle device).	3.1.2.14.3	Output Lane & Speed Messages to Inter-urban Roads	7.4.4.9	The system shall enable a road-side device to display safety-related information (e.g. legal speed limit, recommended speed limit) to drivers via a road-side device.
		3.1.1.5.15	Output Lane & Speed Commands to Urban Roads		



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
8.SP.1.20	The system shall enable an RSU and/or a TCC to display safety-related information (e.g. legal speed limit, recommended speed limit) to drivers (not using an in-vehicle device).	3.1.2.14.3	Output Lane & Speed Messages to Inter-urban Roads	7.4.4.10	The system shall enable the TCC to display safety-related information (e.g. legal speed limit, recommended speed limit) to drivers via a road-side device.
		3.1.1.5.15	Output Lane & Speed Commands to Urban Roads		
8.SP.5.1	The system shall be able to compare the reported speed of a vehicle with the current speed limit and send a warning to that vehicle for display to the driver, via an in-vehicle device, that its current speed is greater than the legal speed limit.	3.1.1.5.18	Manage Urban Traffic Speeds and Headways	7.4.4.11	The system shall be able to compare the reported speed of a vehicle with the current legal speed limit and send a warning to that vehicle for display to the driver, via an in-vehicle device, if its current speed is greater than the legal speed limit.
		3.1.2.13.4	Manage Inter-urban Road Network Speeds & Headways		
		5.13.9	Determine Applicable Road Information		
		5.13.10	Display Current Road Information to Driver		
8.SP.5.2	The system shall be able to compare the reported speed of a vehicle with the current speed limit and display a warning to the driver, via a road-side device, that its current speed is greater than the legal speed limit.	5.13.10	Display Current Road Information to Driver	7.4.4.12	The system shall be able to compare the reported speed of a vehicle with the current legal speed limit and display a warning to the driver, via a road-side device, if its current speed is greater than the legal speed limit.
		5.13.9	Determine Applicable Road Information		
		3.1.2.14.3	Output Lane & Speed Messages to Inter-urban Roads		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		3.1.1.5.15	Output Lane & Speed Commands to Urban Roads			
		5.12.7	Communicate with In-vehicle Systems			
8.CO.5.4	The system shall be able provide legal speed limits from outside the vehicle, and to verify that each limit has been communicated correctly to each vehicle.	3.1.2.5.14	Output Lane & Speed Commands to Inter-urban Roads			
		5.12.9	Output Commands and Dynamic Warnings			
		3.1.1.5.15	Output Lane & Speed Commands to Urban Roads			
		3.1.2.13.4	Manage Inter-urban Road Network Speeds & Headways			
		3.1.1.5.18	Manage Urban Traffic Speeds and Headways			
8.SP.5.3	The system shall be able to compare the reported speed of a vehicle with the current speed limit and send a warning to that vehicle for display to the driver, via an in-vehicle device, that its current speed is greater than the recommended	5.13.9	Determine Applicable Road Information	7.4.4.13	The system shall be able to compare the reported speed of a vehicle with the current recommended speed limit and send a warning to that vehicle for display to the driver, via an in-vehicle device, if its current speed is	
		5.13.10	Display Current Road Information to Driver			



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
	speed limit.	5.12.7	Communicate with In-vehicle Systems		greater than the recommended speed limit.	
8.SP.5.4	The system shall be able to compare the reported speed of a vehicle with the current speed limit and display a warning to the driver, via a road-side device, that its current speed is greater than the recommended speed limit.	3.1.1.5.15	Output Lane & Speed Commands to Urban Roads	7.4.4.14	The system shall be able to compare the reported speed of a vehicle with the current recommended speed limit and display a warning to the driver, via a road-side device, if its current speed is greater than the recommended speed limit.	
		5.13.10	Display Current Road Information to Driver			
		5.12.7	Communicate with In-vehicle Systems			
		3.1.2.14.3	Output Lane & Speed Messages to Inter-urban Roads			
8.CV.6.5	The system shall be able to warn the driver, via an in-vehicle device, that the host vehicle is exceeding the maximum speed limit.	5.13.12	Monitor Vehicle Safety Behaviour	7.4.4.15	The system shall be able to warn the driver, via an in-vehicle device, that the host vehicle is exceeding the maximum speed limit.	
		5.13.10	Display Current Road Information to Driver			
8.CV.6.4	The system shall inform the driver, via an in-vehicle display, that there is a modification to the speed limit ahead, and the reason for it.	5.13.9	Determine Applicable Road Information	7.4.4.16	The system shall inform the driver, via an in-vehicle display, that there is a modification to the speed limit ahead, and the reason for it.	
		5.13.10	Display Current Road Information to Driver			





Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.CO.5.6	The system shall provide "copies" of the traffic signs that are relevant to the current section of the road (e.g. speed limit, road hazards, junctions) to the driver at all times via an in-vehicle display.	5.13.10	Display Current Road Information to Driver	7.4.4.17	The system shall provide "copies" of the traffic signs that are relevant to the current section of the road (e.g. speed limit, road hazards, junctions) to the driver at all times via an in-vehicle display.	
		5.13.9	Determine Applicable Road Information			
8.CO.5.7	The system shall be able to send to following vehicles "copies" of the traffic signs, or information about the local traffic (e.g. sudden congestion), that it may be useful to receive in advance.	5.12.10	Provide V2V Communications	7.4.4.18	The system shall be able to send to following vehicles "copies" of the traffic signs, or information about the local traffic (e.g. sudden congestion), that it may be useful to receive in advance.	
8.CV.2.1	The system shall enable the TCC to calculate recommended headways for the current traffic and environment conditions.	3.2.7	Provide Incident Mitigations to Traffic Management	7.4.5.1	The system shall enable the TCC to calculate recommended headways for the current traffic and environment conditions.	
		3.1.1.5.17	Implement Urban Traffic Commands			
		3.1.2.13.4	Manage Inter-urban Road Network Speeds & Headways			
		3.4.11	Analyse Environmental Data and Implement Actions			
		3.2.6	Assess Incidents and Devise Responses			
		3.1.2.13.5	Manage Inter-urban Traffic Commands & Messages			



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.1.1.5.18	Manage Urban Traffic Speeds and Headways		
8.CV.2.2	The system shall provide the current minimum headway for the current speed limit to the driver via an in-vehicle device.	5.13.10	Display Current Road Information to Driver	7.4.5.2	The system shall provide the current minimum headway for the current speed limit to the driver via an in-vehicle device.
8.CV.2.3	The system shall be able to recommend a safe minimum headway according to the current speed limit, traffic, weather and road conditions to the driver via an in-vehicle device.	5.13.10	Display Current Road Information to Driver	7.4.5.3	The system shall be able to recommend a safe minimum headway according to the current speed limit, traffic, weather and road conditions to the driver via an in-vehicle device.
		5.13.8	Provide Suggested Speeds and Headways for ISA		
8.CV.2.4	The system shall inform the driver, via an in-vehicle display, that there is a modification to the recommended headway ahead, and the reason for it.	5.13.8	Provide Suggested Speeds and Headways for ISA	7.4.5.4	The system shall inform the driver, via an in-vehicle display, that there is a modification to the recommended headway ahead, and the reason for it.
		5.13.10	Display Current Road Information to Driver		
8.CV.2.5	The system shall be able to warn the driver, via an in-vehicle device, that the host vehicle is violating the minimum headway.	5.13.12	Monitor Vehicle Safety Behaviour	7.4.5.5	The system shall be able to warn the driver, via an in-vehicle device, that the host vehicle is violating the minimum headway.
		5.13.10	Display Current Road Information to Driver		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.SP.1.23	The system shall be able to determine the type and current position of other vehicle(s) in the vicinity of the host vehicle, and to predict their future path(s).	5.15.1.1	Detect Other Vehicles near to Host Vehicle	7.4.6.1	The system shall be able to determine the type and current position of other vehicle(s) in the vicinity of the host vehicle, and to predict their future path(s).
8.SP.1.24	The system shall be able to determine that there is a high probability of a collision between the host vehicle and another vehicle.	5.15.3.2	Analyse Road Situation around Host Vehicle	7.4.6.2	The system shall be able to determine that there is a high probability of a collision between the host vehicle and another vehicle.
		5.15.4	Provide Vehicle Trajectory Information to Driver		
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.3.1	Predict Host Vehicle Trajectory		
8.SP.2.3	The system shall be able to warn the driver approaching a junction, via an in-vehicle device, of other equipped vehicles approaching that junction.	5.15.1.1	Detect Other Vehicles near to Host Vehicle	7.4.6.3	The system shall be able to warn the driver approaching a junction, via an in-vehicle device, of other equipped vehicles approaching that junction.
		5.15.3.2	Analyse Road Situation around Host Vehicle		
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.3.1	Predict Host Vehicle Trajectory		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		5.15.4	Provide Vehicle Trajectory Information to Driver			
8.SP.2.4	The system shall be able to warn the driver approaching a junction, via an in-vehicle device, of an equipped emergency vehicle that is approaching that junction.	2.1.7	Manage use of Emergency Vehicle	7.4.6.4	The system shall be able to warn the driver approaching a junction, via an in-vehicle device, of an equipped emergency vehicle that is approaching that junction.	
		5.12.8	Manage Vehicle Communication to Driver			
		5.12.9	Output Commands and Dynamic Warnings			
8.SP.2.5	The system shall be able to determine that the host vehicle is (about to) changing lanes and warns the driver, via and in-vehicle device, if there are other equipped vehicles on potential collision path (e.g. motor-cycle in a blind spot).	5.15.3.2	Analyse Road Situation around Host Vehicle	7.4.6.5	The system shall be able to determine that the host vehicle is (about to) change lanes and warns the driver, via and in-vehicle device, if there are other equipped vehicles on potential collision path (e.g. motor-cycle in a blind spot).	
		5.15.4	Provide Vehicle Trajectory Information to Driver			
		5.15.5	Collect & forward local Host Vehicle conditions			
		5.15.3.1	Predict Host Vehicle Trajectory			
		5.15.1.1	Detect Other Vehicles near to Host Vehicle			
8.SP.2.6	The system shall be able to determine that the host vehicle is (about to)	5.15.2	Determine and store local Host Vehicle conditions	7.4.6.6	The system shall be able to determine that the host vehicle is	



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
	overtake, or turn across the road, and warns the driver, via and in-vehicle device, if there are other equipped vehicles on potential collision path (e.g. motor-cycle in a blind spot).	5.15.5	Collect & forward local Host Vehicle conditions		(about to) overtake, or turn across the road, and warns the driver, via and in-vehicle device, if there are other equipped vehicles on potential collision path (e.g. motor-cycle in a blind spot).
		5.15.1.1	Detect Other Vehicles near to Host Vehicle		
		5.15.3.2	Analyse Road Situation around Host Vehicle		
		5.15.3.1	Predict Host Vehicle Trajectory		
8.SP.2.7	The system shall be able to compare the current trajectory of a vehicle with the road geometry and send a warning to that vehicle for display to the driver, via an in-vehicle device, that it is about to depart its lane.	5.15.4	Provide Vehicle Trajectory Information to Driver	7.4.6.7	The system shall be able to compare the current trajectory of a vehicle with the road geometry and send a warning to that vehicle for display to the driver, via an in-vehicle device, that it is about to depart its lane.
		5.15.3.1	Predict Host Vehicle Trajectory		
8.SP.2.8	The system shall be able to compare the current trajectory of a vehicle with the road geometry and send a warning to the driver, via a road-side device, that it is about to depart its lane.	3.1.1.5.20	Output c&i to Drivers using Urban Roads	7.4.6.8	The system shall be able to compare the current trajectory of a vehicle with the road geometry and send a warning to the driver, via a road-side device, that it is about to depart its lane.
		5.15.3.1	Predict Host Vehicle Trajectory		
8.SP.2.9	The system shall be able to compare the current trajectory of a vehicle with the	5.15.3.2	Analyse Road Situation around Host Vehicle	7.4.6.9	The system shall be able to compare the current trajectory of a vehicle



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
	road geometry and send a warning to the drivers of other vehicles that might be affected, via an in-vehicle device, that an oncoming vehicle lane departure into their lane is imminent.	5.15.3.1	Predict Host Vehicle Trajectory		with the road geometry and send a warning to the drivers of other vehicles that might be affected, via an in-vehicle device, that an oncoming vehicle lane departure into their lane is imminent.
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.4	Provide Vehicle Trajectory Information to Driver		
8.SP.2.10	The system shall be able to compare the current trajectory of a vehicle with the road geometry and send a warning to the drivers of other vehicles that might be affected, via a road-side device, that an oncoming vehicle lane departure into their lane is imminent.	5.12.10	Provide V2V Communications	7.4.6.10	The system shall be able to compare the current trajectory of a vehicle with the road geometry and send a warning to the drivers of other vehicles that might be affected, via a road-side device, that an oncoming vehicle lane departure into their lane is imminent.
		5.15.3.1	Predict Host Vehicle Trajectory		
		3.1.1.5.20	Output c&i to Drivers using Urban Roads		
8.SP.2.11	The system shall be able to warn the driver, via an in-vehicle device, that another equipped vehicle is approaching the host vehicle from the front and in the same (partial) lane.	5.15.1.1	Detect Other Vehicles near to Host Vehicle	7.4.6.11	The system shall be able to warn the driver, via an in-vehicle device, that another equipped vehicle is approaching the host vehicle from the front and in the same (partial) lane.
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.3.2	Analyse Road Situation around Host Vehicle		
		5.15.3.1	Predict Host Vehicle Trajectory		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		5.15.4	Provide Vehicle Trajectory Information to Driver		
8.SP.2.12	The system shall be able to warn the driver, via an in-vehicle device, that another equipped vehicle is approaching the host vehicle from the rear in the same (partial) lane and, when possible, provide advice, e.g. change to a safe adjacent lane, and accelerate.	5.15.4	Provide Vehicle Trajectory Information to Driver	7.4.6.12	The system shall be able to warn the driver, via an in-vehicle device, that another equipped vehicle is approaching the host vehicle from the rear in the same (partial) lane and, when possible, provide advice, e.g. change to a safe adjacent lane, accelerate.
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.3.2	Analyse Road Situation around Host Vehicle		
		5.15.3.1	Predict Host Vehicle Trajectory		
		5.15.1.1	Detect Other Vehicles near to Host Vehicle		
8.SP.2.13	The system shall be able to warn the driver, via an in-vehicle device, that a slower equipped vehicle is ahead of the host vehicle and in the same (partial) lane and, when possible, provide advice, e.g. change to a safe adjacent lane, decelerate, and brake.	5.15.3.2	Analyse Road Situation around Host Vehicle	7.4.6.13	The system shall be able to warn the driver, via an in-vehicle device, that a slower equipped vehicle is ahead of the host vehicle and in the same (partial) lane and, when possible, provide advice, e.g. change to a safe adjacent lane, decelerate, brake.
		5.15.4	Provide Vehicle Trajectory Information to Driver		
		5.15.3.1	Predict Host Vehicle Trajectory		
		5.15.1.1	Detect Other Vehicles near to Host Vehicle		



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
		5.15.5	Collect & forward local Host Vehicle conditions		
8.SP.2.14	The system shall be able to warn the driver, via an in-vehicle device, that there is a stationary object ahead of the host vehicle and in the same (partial) lane and, when possible, provide advice, e.g. change to a safe adjacent lane, brake.	5.15.3.1	Predict Host Vehicle Trajectory	7.4.6.14	The system shall be able to warn the driver, via an in-vehicle device, that there is a stationary object ahead of the host vehicle and in the same (partial) lane and, when possible, provide advice, e.g. change to a safe adjacent lane, brake.
		5.15.4	Provide Vehicle Trajectory Information to Driver		
		5.15.1.7	Detect Stationary Objects in Host Vehicle vicinity		
		5.15.3.2	Analyse Road Situation around Host Vehicle		
		5.15.5	Collect & forward local Host Vehicle conditions		
8.SP.2.15	The system shall be able to advise the driver, via an in-vehicle device, of a recommended speed and distance from the vehicle ahead, based on the speed and characteristics (e.g. mass, load being carried) of the host vehicle and of the vehicle ahead.	5.12.7	Communicate with In-vehicle Systems	7.4.6.15	The system shall be able to advise the driver, via an in-vehicle device, of a recommended speed and distance from the vehicle ahead, based on the speed and characteristics (e.g. mass, load being carried) of the host vehicle and of the vehicle ahead.
		5.13.10	Display Current Road Information to Driver		
		5.13.8	Provide Suggested Speeds and Headways for ISA		
8.SP.2.16	The system shall be able to calculate the trajectory of each vehicles and VRU	5.15.1.1	Detect Other Vehicles near to Host Vehicle	7.4.6.16	The system shall be able to calculate the current and future trajectories of





Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	approaching and at an urban intersection, predict their future trajectories, assess potential conflicts and warn the corresponding drivers using in-vehicle and roadside devices.	5.15.1.2	Detect Other Road Users in nearby geographic area		each vehicle and VRU approaching the host vehicle at an urban intersection and assess the potential for collisions with the host vehicle.
		5.15.1.3	Detect Pedestrians near to Host Vehicle		
		5.15.3.1	Predict Host Vehicle Trajectory		
		5.15.3.2	Analyse Road Situation around Host Vehicle		
		5.15.5	Collect & forward local Host Vehicle conditions		
8.SP.2.16	The system shall be able to calculate the trajectory of each vehicles and VRU approaching and at an urban intersection, predict their future trajectories, assess potential conflicts and warn the corresponding drivers using in-vehicle and roadside devices.	3.1.1.5.14	Output Commands & Information to Urban Roads	7.4.6.17	The system shall be able to warn the driver of the host vehicle, via an in-vehicle device, of any collisions that could occur with other vehicles and/or VRU that are approaching an urban intersection.
		5.15.1.2	Detect Other Road Users in nearby geographic area		
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.3.1	Predict Host Vehicle Trajectory		
		5.15.3.2	Analyse Road Situation around Host Vehicle		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		5.15.1.1	Detect Other Vehicles near to Host Vehicle		
		5.15.4	Provide Vehicle Trajectory Information to Driver		
8.SP.2.16	The system shall be able to calculate the trajectory of each vehicles and VRU approaching and at an urban intersection, predict their future trajectories, assess potential conflicts and warn the corresponding drivers using in-vehicle and roadside devices.	3.1.1.5.20	Output c&i to Drivers using Urban Roads	7.4.6.18	The system shall be able to use a road-side device to warn drivers of any collisions that could occur with other vehicles and/or VRU that are approaching an urban intersection.
		3.1.2.14.4	Output Inter-urban Traffic Commands & Messages		
		5.15.1.2	Detect Other Road Users in nearby geographic area		
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.3.1	Predict Host Vehicle Trajectory		
		5.15.3.2	Analyse Road Situation around Host Vehicle		
		5.15.1.1	Detect Other Vehicles near to Host Vehicle		
		5.15.1.3	Detect Pedestrians near to Host Vehicle		



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
8.SP.2.17	The system shall be able to calculate the trajectory of each vehicles and VRU approaching a T-junction, predict their future trajectories, assess potential conflicts and advise the driver on the minor road when to exit and join the main road.	5.15.3.1	Predict Host Vehicle Trajectory	7.4.6.19	The system shall be able to calculate the trajectory of each vehicles and VRU approaching a T-junction, predict their future trajectories, assess potential conflicts and advise the driver on the minor road when to exit and join the main road.
		5.15.4	Provide Vehicle Trajectory Information to Driver		
		5.15.3.2	Analyse Road Situation around Host Vehicle		
		5.15.5	Collect & forward local Host Vehicle conditions		
8.SP.2.1	The system shall be able to receive the status of traffic signals/signs that the host vehicle is approaching.	5.15.3.1	Predict Host Vehicle Trajectory	7.4.6.20	The system shall be able to receive the status of traffic signals/signs that the host vehicle is approaching.
		3.1.1.5.22	Output s&g Commands to Urban Roads		
8.SP.2.2	The system shall be able to provide advice to the driver approaching a junction, via an in-vehicle device, recommendations in terms of lane, speed, when traffic signal will change.	5.15.3.1	Predict Host Vehicle Trajectory	7.4.6.21	The system shall be able to provide advice to the driver approaching a junction, via an in-vehicle device, recommendations in terms of lane, speed, when traffic signal will change.
		5.15.4	Provide Vehicle Trajectory Information to Driver		
8.SP.2.18	The system shall be able to advise a driver, via an in-vehicle device, how to approach a complex urban junction, e.g. speed required to go through green phase, imminent red phase warning,	5.15.4	Provide Vehicle Trajectory Information to Driver	7.4.6.22	The system shall be able to advise a driver, via an in-vehicle device, how to approach a complex urban junction, e.g. speed required to go through green phase, imminent red
		5.15.3.1	Predict Host Vehicle Trajectory		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	reduce speed to avoid queuing traffic, another vehicle or VRU, recommended lane choice.	5.15.3.2	Analyse Road Situation around Host Vehicle		phase warning, reduce speed to avoid queuing traffic, another vehicle or VRU, recommended lane choice.
		5.15.5	Collect & forward local Host Vehicle conditions		
8.CV.3.2	The system shall be able to provide a warning to the driver, via an in-vehicle display, that other drivers ahead are performing an emergency brake manoeuvre.	5.12.8	Manage Vehicle Communication to Driver	7.4.6.23	The system shall be able to provide a warning to the driver, via an in-vehicle display, that other drivers ahead are performing an emergency brake manoeuvre.
		5.12.9	Output Commands and Dynamic Warnings		
		5.12.10	Provide V2V Communications		
8.CV.3.3	The system shall be able to inform vehicles behind the host vehicle that it is performing an emergency brake manoeuvre.	5.12.10	Provide V2V Communications	7.4.6.24	The system shall be able to inform vehicles behind the host vehicle that it is performing an emergency brake manoeuvre.
8.CV.3.4	The system shall be able to provide a warning to the driver, via an in-vehicle display, that other vehicles behind are behaving in a dangerous manner (e.g. over speed limit, below minimum headway).	5.12.9	Output Commands and Dynamic Warnings	7.4.6.25	The system shall be able to provide a warning to the driver, via an in-vehicle display, that other vehicles behind are behaving in a dangerous manner (e.g. over speed limit, below minimum headway).
		5.12.10	Provide V2V Communications		
		5.12.8	Manage Vehicle Communication to Driver		
		5.13.12	Monitor Vehicle Safety Behaviour		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.SP.4.1	The system shall be able to warn the driver, via an in-vehicle device, that a VRU has been detected in a dangerous location by a system at the roadside.	5.15.1.2	Detect Other Road Users in nearby geographic area	7.4.7.1	The system shall be able to warn the driver, via an in-vehicle device, that a VRU has been detected in a dangerous location by a system at the road side.
		5.15.1.3	Detect Pedestrians near to Host Vehicle		
		5.15.4	Provide Vehicle Trajectory Information to Driver		
		5.15.5	Collect & forward local Host Vehicle conditions		
8.SP.4.2	The system shall be able to warn the driver, via an in-vehicle device, that a VRU has been detected in a dangerous location by a system on the host vehicle.	5.15.1.2	Detect Other Road Users in nearby geographic area	7.4.7.2	The system shall be able to warn the driver, via an in-vehicle device, that a VRU has been detected in a dangerous location by a system on the host vehicle.
		3.1.1.5.20	Output c&i to Drivers using Urban Roads		
		5.15.1.3	Detect Pedestrians near to Host Vehicle		
		5.15.5	Collect & forward local Host Vehicle conditions		
8.SP.6.1	The system shall enable drivers to be warned, via an in-vehicle device, that	5.15.4	Provide Vehicle Trajectory Information to Driver	7.4.8.1	The system shall enable drivers to be warned, via an in-vehicle device,



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	there are one, or more, stationary assistance/emergency vehicles ahead of them.	5.15.5	Collect & forward local Host Vehicle conditions		that there are one, or more, stationary assistance/emergency vehicles ahead of them.
		5.15.1.7	Detect Stationary Objects in Host Vehicle vicinity		
8.SP.6.2	The system shall enable drivers to be warned, via a road-side device, that there are one, or more, stationary assistance/emergency vehicles ahead of them.	3.1.1.5.20	Output c&i to Drivers using Urban Roads	7.4.8.2	The system shall enable drivers to be warned, via a road-side device, that there are one, or more, stationary assistance/emergency vehicles ahead of them.
		5.15.5	Collect & forward local Host Vehicle conditions		
		5.15.1.7	Detect Stationary Objects in Host Vehicle vicinity		
8.SP.1.36	The system shall enable an emergency vehicle to request a “blue wave” from those other vehicles that are in its path.	5.12.8	Manage Vehicle Communication to Driver	7.4.8.3	The system shall enable an emergency vehicle to request a “blue wave” from those other vehicles that are in its path.
		5.12.9	Output Commands and Dynamic Warnings		
		2.1.7	Manage use of Emergency Vehicle		
8.SP.6.3	The system shall enable an emergency vehicle to request a green signal for when that vehicle passes a controlled intersection.	2.1.7	Manage use of Emergency Vehicle	7.4.8.4	The system shall enable an emergency vehicle to request a green signal for when that vehicle passes a controlled intersection.
		3.1.1.5.22	Output s&g Commands to Urban Roads		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.SP.6.4	The system shall enable the trajectory of an emergency vehicle to be predicted and compared with the trajectories of other vehicles in the vicinity, and to warn the drivers of those other vehicles with a potential conflict, via an in-vehicle device.	5.12.10	Provide V2V Communications	7.4.8.5	The system shall enable the trajectory of an emergency vehicle to be predicted and compared with the trajectories of other vehicles in the vicinity, and to warn the drivers of those other vehicles with a potential conflict, via an in-vehicle device.	
		5.12.8	Manage Vehicle Communication to Driver			
		5.12.9	Output Commands and Dynamic Warnings			
		5.15.1.1	Detect Other Vehicles near to Host Vehicle			
		5.15.1.2	Detect Other Road Users in nearby geographic area			
		5.15.3.1	Predict Host Vehicle Trajectory			
		5.15.3.2	Analyse Road Situation around Host Vehicle			
		5.15.5	Collect & forward local Host Vehicle conditions			
8.CV.12.2	The system shall be able to inform the driver of the host vehicle, via an in-vehicle device, that an emergency vehicle is approaching, and in sufficient time to enable a “blue corridor” to be created by all equipped vehicles.	5.12.9	Output Commands and Dynamic Warnings	7.4.8.6	The system shall be able to inform the driver of the host vehicle, via an in-vehicle device, that an emergency vehicle is approaching, and in sufficient time to enable a “blue corridor” to be created by all	
		5.12.8	Manage Vehicle Communication to Driver			



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		2.1.7	Manage use of Emergency Vehicle		equipped vehicles.	
8.CV.12.3	The system shall be able to advise the driver, via an in-vehicle device, of an appropriate lane to use to create a "blue corridor".	3.1.1.5.17	Implement Urban Traffic Commands	7.4.8.7	The system shall be able to advise the driver, via an in-vehicle device, of an appropriate lane to use to create a "blue corridor".	
		3.1.2.13.6	Manage Lanes in the Inter-urban Road Network			
		2.1.2.3	Plan Emergency Intervention			
		5.12.9	Output Commands and Dynamic Warnings			
		3.1.2.14.4	Output Inter-urban Traffic Commands & Messages			
		5.12.8	Manage Vehicle Communication to Driver			
		3.1.1.5.19	Manage Urban Road Network Lanes			
8.CV.12.4	The system shall enable the host emergency vehicle to "place" virtual cones around the site of an accident.	3.1.2.14.4	Output Inter-urban Traffic Commands & Messages	7.4.8.8	The system shall enable the host emergency vehicle to "place" virtual cones around the site of an accident.	
		2.1.7	Manage use of Emergency Vehicle			
		3.1.1.5.17	Implement Urban Traffic Commands			





Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.CV.12.5	The system shall enable the driver of the host vehicle to be advised, via an in-vehicle device, not to enter a zone defined by virtual cones.	3.1.2.13.4	Manage Inter-urban Road Network Speeds & Headways	7.4.8.9	The system shall enable the driver of the host vehicle to be advised, via an in-vehicle device, not to enter a zone defined by virtual cones.	
		3.1.1.5.15	Output Lane & Speed Commands to Urban Roads			
		3.1.2.13.6	Manage Lanes in the Inter-urban Road Network			
		3.1.1.5.20	Output c&i to Drivers using Urban Roads			
		3.1.1.5.17	Implement Urban Traffic Commands			
		3.1.1.5.22	Output s&g Commands to Urban Roads			
		3.1.1.5.19	Manage Urban Road Network Lanes			
		3.1.2.14.2	Output Messages & Commands to Inter-urban Roads			
		3.1.2.14.3	Output Lane & Speed Messages to Inter-urban Roads			
		3.1.2.14.4	Output Inter-urban Traffic Commands & Messages			



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.1.1.5.18	Manage Urban Traffic Speeds and Headways		
8.CV.11.1	The system shall enable a traveller to request and receive journey plans in advance, assess different plans according to certain criteria (e.g. vehicle type, travel time, cost, expected traffic density, planned events, facilities en route, parking), and to save one for future use.	6.5.10	Provide Traveller Trip Planning Interface	7.5.1.1	The system shall enable a traveller to request and receive journey plans in advance, assess different plans according to certain criteria (e.g. vehicle type, travel time, cost, expected traffic density, planned events, facilities en route, parking), and to save one for future use.
8.SP.1.5	The system shall be able to sent XFCD from the host vehicle to an RSU, together with its intended route (from navigation system).	3.1.1.8	Collect Urban Data from Vehicles	7.5.1.2	(X)FCD – The system shall be able to send the intended route of the host vehicle (e.g. from a navigation system) to a road-side device.
		5.13.7	Prepare Extended Floating Car Data		
		3.1.2.8	Collect Inter-urban Data from Vehicles		
8.CV.11.2	The system shall enable the TCC to monitor the current inter-urban traffic and weather/environmental conditions, identify incidents, make short term predictions, and select and initiate an appropriate strategy	3.2.6	Assess Incidents and Devise Responses	7.5.1.3	The system shall be able to monitor the current inter-urban traffic and weather/environmental conditions, identify incidents, assess their impact, make short term predictions, and select and initiate an appropriate mitigation strategy.
		3.1.2.8	Collect Inter-urban Data from Vehicles		
		3.4.11	Analyse Environmental Data and Implement Actions		
		3.2.13	Classify and Identify Incidents		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.4.8	Manage Environmental Conditions Data Store		
		3.1.2.16	Manage Inter-urban Traffic Data		
		3.4.1	Monitor Weather Conditions		
		3.2.12	Detect Incidents from Data		
8.CV.9.1	The system shall be able monitor the current local traffic conditions from static detectors and floating car data, detect and locate an incident or congestion, and assign a severity classification to that incident or congestion.	3.1.2.8	Collect Inter-urban Data from Vehicles		
		3.2.13	Classify and Identify Incidents		
		3.1.2.10	Collect Inter-urban Traffic Data		
		3.2.12	Detect Incidents from Data		
		3.1.1.10	Collect Urban Traffic Data		
		3.1.1.8	Collect Urban Data from Vehicles		
8.CV.9.2	The system shall be able to recommend and/or set a traffic management strategy according to the current traffic and weather/environmental conditions.	3.1.2.10	Collect Inter-urban Traffic Data	7.5.1.4	The system shall be able to monitor the current inter-urban traffic and weather/environmental conditions for the road network and recommend and/or set an appropriate traffic management strategy.
		3.4.1	Monitor Weather Conditions		
		3.4.2	Monitor Atmospheric Pollution		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		3.4.8	Manage Environmental Conditions Data Store		
		3.4.11	Analyse Environmental Data and Implement Actions		
		3.1.2.16	Manage Inter-urban Traffic Data		
		3.1.2.13.5	Manage Inter-urban Traffic Commands & Messages		
		3.1.2.14.4	Output Inter-urban Traffic Commands & Messages		
8.CV.10.8	The system shall be able to manage the traffic in an area using a number of local semi-autonomous traffic management units, whose rules can be modified when required.	3.1.1.5.17	Implement Urban Traffic Commands	7.5.1.5	The system shall be able to manage the traffic in an area using a number of local semi-autonomous traffic management units, whose rules can be modified when required.
		3.1.2.13.5	Manage Inter-urban Traffic Commands & Messages		
		3.1.1.5.20	Output c&i to Drivers using Urban Roads		
		3.1.2.14.2	Output Messages & Commands to Inter-urban Roads		
		3.1.1.5.22	Output s&g Commands to Urban Roads		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		3.1.2.14.3	Output Lane & Speed Messages to Inter-urban Roads			
		3.1.2.14.4	Output Inter-urban Traffic Commands & Messages			
		3.1.1.5.15	Output Lane & Speed Commands to Urban Roads			
8.CV.11.3	The system shall enable the TCC to receive information about emergencies, e.g. eCall, ghost drivers.	3.2.13	Classify and Identify Incidents	7.5.1.6	The system shall enable the TCC to receive information about emergencies, e.g. eCall, ghost drivers.	
8.CV.11.4	The system shall enable the TCC to obtain travel times from cellular telephone service providers.	3.1.2.16	Manage Inter-urban Traffic Data	7.5.1.7	The system shall enable the TCC to obtain travel times from cellular telephone service providers.	
		3.1.1.14	Manage Urban Traffic Data			
8.CV.11.6	The system shall enable the TCC to inform drivers, via an in-vehicle device, about (foreseen and unexpected) incidents on the driver's planned route.	5.12.8	Manage Vehicle Communication to Driver	7.5.1.8	The system shall enable the TCC to inform drivers, via an in-vehicle device, about (foreseen and unexpected) incidents on the driver's planned route.	
		3.2.6	Assess Incidents and Devise Responses			
		5.12.9	Output Commands and Dynamic Warnings			
		3.2.14	Send Incident Details to Vehicles			



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
8.CV.10.10	The system shall be able to warn the driver via an in-vehicle device of incidents in the urban road network as they are detected.	3.2.8	Send Incident Details to Others	7.5.1.9	The system shall be able to warn the driver, via an in-vehicle device, of incidents in the urban road network as they are detected.
		5.12.8	Manage Vehicle Communication to Driver		
		5.12.9	Output Commands and Dynamic Warnings		
		3.2.6	Assess Incidents and Devise Responses		
8.CV.11.8	The system shall be able to enable the service provided to the traveller to be passed from one TCC to another as the traveller changes areas of coverage.	3.1.1.5.17	Implement Urban Traffic Commands	7.5.1.10	The system shall enable the service provided to the traveller to be passed from one TCC to another as the traveller moves from one area of coverage to another.
		3.1.2.13.5	Manage Inter-urban Traffic Commands & Messages		
		3.1.2.14.4	Output Inter-urban Traffic Commands & Messages		
8.CV.10.1	The system shall be able to provide the driver via an in-vehicle device, and on request, details of the (predicted) traffic situation in a defined area of interest, and for a time horizon, that have been selected by the driver. This information shall be updated at (selected) intervals.	5.12.8	Manage Vehicle Communication to Driver	7.5.1.11	The system shall be able to provide the driver, via an in-vehicle device, and on request, details of the (predicted) traffic situation in a defined area of interest, and for a time horizon, that has been selected by the driver. This information shall be updated at (selected) intervals.
		5.12.9	Output Commands and Dynamic Warnings		
		3.1.6.6	Process Traffic Prediction Results		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.SP.1.33	The system shall enable the driver to store data relating to the characteristics of the host vehicle for that trip (e.g. loaded weight, hazardous goods, (trailer) dimensions).	5.14.2	Create and Revise Vehicle Trip Plan	7.5.1.12	The system shall enable the driver to store data relating to the characteristics of the host vehicle for that trip (e.g. loaded weight, hazardous goods, (trailer) dimensions).	
		5.12.7	Communicate with In-vehicle Systems			
8.SP.1.34	The system shall be able to determine the characteristics of the host vehicle (e.g. Type, (Total) weight, Width, Length (including trailer)).	5.12.7	Communicate with In-vehicle Systems	7.5.1.13	The system shall be able to determine the characteristics of the host vehicle (e.g. Type, (Total) weight, Width, Length (including trailer)).	
8.SP.1.35	The system shall enable the host vehicle to receive information from other vehicles about the goods being carried by those vehicles.	5.12.7	Communicate with In-vehicle Systems	7.5.1.14	The system shall enable the host vehicle to receive information from other vehicles about the goods being carried by those vehicles.	
		5.12.10	Provide V2V Communications			
8.CV.10.2	The system shall be able to provide the driver via an in-vehicle device with a route to a selected destination that takes account of the vehicle type, the state of the traffic on the road network and any incidents/congestion (route options may be offered and one selected by the driver).	5.14.2	Create and Revise Vehicle Trip Plan	7.5.1.15	The system shall be able to provide the driver via an in-vehicle device with a route to a selected destination that takes account of the vehicle type, the state of the traffic on the road network and any incidents/congestion (route options may be offered and one selected by the driver).	
		5.14.1	Provide Driver Interface for Trip Planning			



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.CV.1.15	The system shall be able to calculate an optimal speed for each vehicle through a section of road.	5.13.8	Provide Suggested Speeds and Headways for ISA	7.5.1.16	The system shall be able to calculate an optimal speed for each type of vehicle through designated sections of the road network and provide that information to drivers via an in-vehicle device.
8.CV.1.16	The system shall be able to send a recommended behaviour (e.g. speed) to the driver via an in-vehicle device.	5.13.8	Provide Suggested Speeds and Headways for ISA		
		5.13.10	Display Current Road Information to Driver		
8.CV.9.4	The system shall be able to compute an alternative local route for vehicles approaching a location to be avoided (e.g. one where there is a traffic incident or congestion above a given severity), and does not create congestion downstream. The alternative route computed may depend upon the vehicle type, and may need to be changed as the incident or congestion to be avoided evolves over time.	5.14.6	Monitor Vehicle Trip Plan Implementation	7.5.1.17	The system shall be able to compute an alternative local route for vehicles approaching a location to be avoided (e.g. one where there is a traffic incident or congestion above a given severity), and does not create congestion downstream. The alternative route computed may depend upon the vehicle type, and may need to be changed as the incident or congestion to be avoided evolves over time.
		5.14.2	Create and Revise Vehicle Trip Plan		
		6.5.3.9	Plan Trip Details		
8.CV.10.5	The system shall inform the driver via an in-vehicle device that an incident has	5.14.6	Monitor Vehicle Trip Plan Implementation	7.5.1.18	The system shall be able to inform the driver, via an in-vehicle device,





Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	been detected ahead on the selected route and provide a revised route.	5.14.5	Provide Driver Trip Guidance Interface		that an incident has been detected ahead on the selected route and provide a revised route.
8.CV.9.5	The system shall be able to present an alternative route that avoids an incident or congestion to the driver via an in-vehicle device, and to update that route if necessary.	5.14.2	Create and Revise Vehicle Trip Plan	7.5.1.19	The system shall be able to present an alternative route that avoids an incident or congestion to the driver via an in-vehicle device, and to update that route if necessary.
		5.14.1	Provide Driver Interface for Trip Planning		
8.CV.11.7	The system shall enable the TCC to instruct drivers, via an in-vehicle device, of an alternative route that should be followed (to avoid an incident).	5.12.8	Manage Vehicle Communication to Driver	7.5.1.20	The system shall enable the TCC to instruct drivers, via an in-vehicle device, of an alternative route that should be followed (to avoid an incident).
		3.2.14	Send Incident Details to Vehicles		
		5.12.9	Output Commands and Dynamic Warnings		
		3.2.6	Assess Incidents and Devise Responses		
8.CV.10.6	The system shall be able to “follow” those vehicles that have been provide with individual routes and to prove the effectiveness of those suggested routes, making changes to the algorithms that will be used in the future if necessary.	5.14.6	Monitor Vehicle Trip Plan Implementation	7.5.1.21	The system shall be able to “follow” those vehicles that have been provide with individual routes and to prove the effectiveness of those suggested routes, making changes to the algorithms that will be used in the future if necessary.
		6.5.3.9	Plan Trip Details		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.CV.10.3	The system shall be able to inform the driver via an in-vehicle device that part(s) of the selected route include one or more Flexible Lane Allocation sections.	5.14.1	Provide Driver Interface for Trip Planning	7.5.1.22	The system shall be able to inform the driver via an in-vehicle device that part(s) of the selected route include one or more Flexible Lane Allocation sections.
8.CV.10.4	The system shall inform the driver via an in-vehicle device that the vehicle has departed from the selected route and a revised route has been requested.	5.14.5	Provide Driver Trip Guidance Interface	7.5.1.23	The system shall inform the driver via an in-vehicle device that the vehicle has departed from the selected route and a revised route has been requested.
		5.14.6	Monitor Vehicle Trip Plan Implementation		
8.CO.6.1	The system shall be able to calculate a predicted time for a total journey made up from separate links. The predicted time shall be updated regularly as the time for each link changes.	6.5.3.8	Collect Data About Road Traffic	7.5.1.24	The system shall be able to calculate a predicted time for a total journey made up from separate links. The predicted time shall be updated regularly as the time for each link changes.
		3.1.6.6	Process Traffic Prediction Results		
		3.1.6.3	Create Traffic Predictions with Simulation Methods		
		3.1.6.4	Manage Traffic Prediction Data Store		
8.CO.6.3	The system shall enable the TCC to recommend the use of alternative routes for different types of vehicle.	3.1.1.5.18	Manage Urban Traffic Speeds and Headways	7.5.1.25	The system shall enable the TCC to recommend the use of alternative routes for different types of vehicle.
		3.1.1.5.17	Implement Urban Traffic Commands		
		6.5.3.9	Plan Trip Details		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.CO.6.4	The system shall enable the TCC to command the use of alternative routes for different types of vehicle.	6.5.3.9	Plan Trip Details	7.5.1.26	The system shall enable the TCC to command the use of alternative routes for different types of vehicle.	
		3.1.1.5.17	Implement Urban Traffic Commands			
		3.1.1.5.18	Manage Urban Traffic Speeds and Headways			
8.CO.6.2	The system shall be able to provide current and predicted journey times to another navigation device via an open interface (to enable dynamic navigation on the other device).	6.5.3.8	Collect Data About Road Traffic	7.5.1.27	The system shall be able to provide current and predicted journey times to another navigation device via an open interface (to enable dynamic navigation on the other device).	
8.CV.11.5	The system shall enable the TCC to inform traveller information service providers of the current traffic management strategy.	3.1.1.9	Output Urban Traffic Data	7.5.1.28	The system shall enable the TCC to inform traveller information service providers of the current traffic management strategy.	
		3.1.2.9	Output Inter-urban Traffic Data			
8.CV.10.7	The system shall be able to analyse traffic data using an off-line simulation tool.	3.1.6.3	Create Traffic Predictions with Simulation Methods	7.5.1.29	The system shall be able to analyse traffic data using an off-line simulation tool.	
8.CV.10.9	The system shall be able to use a simulation model for predicting the effects of implementing a given cooperative traffic management scenario.	3.1.6.3	Create Traffic Predictions with Simulation Methods	7.5.1.30	The system shall be able to use a simulation model for predicting the effects of implementing a given cooperative traffic management scenario.	



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.SP.1.30	The system shall enable the RSU to receive information on the status of traffic signals.	3.1.1.5.22	Output s&g Commands to Urban Roads	7.5.2.1	The system shall enable a road-side device to receive information on the status of traffic signals.
8.CV.7.1	The system shall enable the driver of host vehicles to request a series of green phases from traffic signals (i.e. a green wave) for the route that is about to be taken.	9.1.1	Provide Driver Interface for Vehicle Priority	7.5.2.2	The system shall enable the driver of a host vehicle to request a series of green phases from traffic signals (i.e. a green wave) for the route that is about to be taken.
		9.1.2	Process Priority Request		
8.CV.7.2	The system shall enable a traffic signal controller to receive a request for a green phase from an approaching vehicle; in the event that more than one conflicting request is received at the same time they shall be prioritised (e.g. emergency vehicles before private vehicles), possibly by the TCC operator.	3.1.1.5.22	Output s&g Commands to Urban Roads	7.5.2.3	The system shall enable a traffic signal controller to receive a request for a green phase from an approaching vehicle; in the event that more than one conflicting request is received at the same time they shall be prioritised (e.g. emergency vehicles before private vehicles), possibly by the TCC operator.
		9.1.2	Process Priority Request		
		3.1.1.5.10	Provide Urban Traffic Operator Interface		
		2.1.2.3	Plan Emergency Intervention		
8.CV.1.13	The system shall be able to receive data from vehicles, and calculate optimum green phases for the traffic signals.	3.1.1.5.22	Output s&g Commands to Urban Roads		
		3.1.1.5.17	Implement Urban Traffic Commands		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.CV.1.23	The system shall be able to determine the queue length in front of traffic signals in urban areas.	3.1.1.5.17	Implement Urban Traffic Commands	7.5.2.4	The system shall be able to determine the queue length in front of traffic signals in urban areas.
		3.1.1.5.22	Output s&g Commands to Urban Roads		
8.CV.7.3	The system shall enable the traffic signal controller to determine the expected arrival time of a vehicle at the junction using data received from that vehicle (e.g. current location and speed profile, estimated time of arrival).	3.1.1.5.22	Output s&g Commands to Urban Roads	7.5.2.5	The system shall enable the traffic signal controller to determine the expected arrival time of a vehicle at the junction using data received from that vehicle (e.g. current location and speed profile, estimated time of arrival).
8.CV.7.4	The system shall enable the traffic signal controller to inform the driver via an in-vehicle display that a green phase will be available when the host vehicle arrives at that junction; this includes the ability to warn that a green phase is not possible.	3.1.1.5.22	Output s&g Commands to Urban Roads	7.5.2.6	The system shall enable the traffic signal controller to inform the driver, via an in-vehicle display, that a green phase will be available when the host vehicle arrives at that junction; this includes the ability to warn that a green phase is not possible.
		9.1.2	Process Priority Request		
		9.1.1	Provide Driver Interface for Vehicle Priority		
8.CV.7.5	The system shall enable the traffic signal controller to recommend to drivers, via an in-vehicle display, of host vehicles a recommended speed profile that will provide them with a virtual green wave.	9.1.1	Provide Driver Interface for Vehicle Priority	7.5.2.6	The system shall enable the traffic signal controller to inform the driver, via an in-vehicle display, that a green phase will be available when the host vehicle arrives at that junction; this includes the ability to warn that a green phase is not possible.
		3.1.1.5.22	Output s&g Commands to Urban Roads		
		9.1.2	Process Priority Request		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.CV.1.15	The system shall be able to calculate an optimal speed for each vehicle through a section of road.	5.13.8	Provide Suggested Speeds and Headways for ISA	7.5.2.7	The system shall be able to calculate an optimal speed for each vehicle through a section of road.	
8.CV.7.6	The system shall enable a traffic signal controller that has received a green phase request to inform downstream controllers that a green wave vehicle is approaching.	3.1.1.5.22	Output s&g Commands to Urban Roads	7.5.2.8	The system shall enable a traffic signal controller that has received a green phase request to inform downstream controllers that a green wave vehicle is approaching.	
8.CV.7.7	The system shall be able to keep track of the speed profiles of green wave vehicles between signalised junctions.	3.1.1.5.22	Output s&g Commands to Urban Roads	7.5.2.9	The system shall be able to keep track of the speed profiles of green wave vehicles between signalised junctions.	
8.CV.7.8	The system shall be able to warn other vehicles that a green wave is in operation.	3.1.1.5.22	Output s&g Commands to Urban Roads	7.5.2.10	The system shall be able to warn other vehicles that a green wave is in operation.	
		9.1.2	Process Priority Request			
		9.1.1	Provide Driver Interface for Vehicle Priority			
8.SP.1.31	The system shall be able to determine that the host vehicle is about to go through a red traffic signal, and to broadcast a warning to vehicles in the vicinity.	5.15.5	Collect & forward local Host Vehicle conditions	7.5.2.11	The system shall be able to determine that the host vehicle is about to go through a red traffic signal, and to broadcast a warning to vehicles in the vicinity.	
		5.15.3.1	Predict Host Vehicle Trajectory			
		5.12.10	Provide V2V Communications			



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
8.SP.1.32	The system shall enable the host vehicle to receive a message that another vehicle is about to go through a red traffic signal, and to provide a warning to the driver via an in-vehicle device.	5.12.8	Manage Vehicle Communication to Driver	7.5.2.12	The system shall enable the host vehicle to receive a message that another vehicle is about to go through a red traffic signal, and to provide a warning to the driver, via an in-vehicle device.
		5.12.9	Output Commands and Dynamic Warnings		
		5.12.10	Provide V2V Communications		
8.CV.8.1	The system shall permit approved vehicles to use a section of a bus lane when it is not being used by PT or other specific vehicles (e.g. taxis and emergency services).	9.2.5	Manage use of Bus Lanes	7.5.3.1	The system shall permit approved vehicles to use a section of a bus lane when it is not being used by PT or other specific vehicles (e.g. taxis and emergency services).
		9.2.2	Manage Vehicles using Bus Lanes		
8.CV.8.2	The system shall be able to predict the usage of a particular section of a bus lane for a short time into the future (e.g.15 minutes).	9.2.3	Manage Bus Lane Use Data	7.5.3.2	The system shall be able to predict the usage of a particular section of a bus lane for a short time into the future (e.g.15 minutes).
		9.2.5	Manage use of Bus Lanes		
8.CV.8.3	The system shall enable an approved vehicle that wishes to use a section of bus lane to provide its characteristics, destination and speed.	9.2.2	Manage Vehicles using Bus Lanes	7.5.3.3	The system shall enable an approved vehicle that wishes to use a section of bus lane to provide its characteristics, destination and speed for lane use management.
8.CV.8.4	The system shall enable the driver to set	9.2.2	Manage Vehicles using Bus Lanes	7.5.3.4	The system shall enable the driver to



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	the destination of the host vehicle, if this cannot be provided by the navigation system.	5.14.4	Implement Vehicle Trip Plan and Track Vehicle		set the destination of the host vehicle that wishes to use a bus lane, if this cannot be provided by the navigation system for lane use management.
		9.2.1	Provide Driver Interface for Bus Lanes		
8.CV.8.5	The system shall be able to determine whether there is congestion on the normal road and, if so, whether a temporary licence should be given to the approved vehicle that is making a request to use a corresponding section of a bus lane without causing delays to scheduled PT vehicles.	9.2.5	Manage use of Bus Lanes	7.5.3.5	The system shall be able to determine whether there is congestion on the normal road and, if so, whether a temporary licence should be given to the approved vehicle that is making a request to use a corresponding section of a bus lane without causing delays to scheduled PT vehicles.
		9.2.3	Manage Bus Lane Use Data		
8.CV.8.6	The system shall inform the driver whether a licence has been granted to become an approved vehicle and, if so, for how long it will remain valid.	9.2.1	Provide Driver Interface for Bus Lanes	7.5.3.6	The system shall inform the driver whether a licence has been granted to become an approved vehicle and, if so, for how long it will remain valid.
		9.2.2	Manage Vehicles using Bus Lanes		
8.CV.8.7	The system shall monitor the approved vehicles on the bus lanes and, if its licence has expired, that vehicle will be ordered to leave the bus lane at the end of that section.	9.2.2	Manage Vehicles using Bus Lanes	7.5.3.7	The system shall monitor the approved vehicles on the bus lanes and, if its licence has expired, that vehicle will be ordered to leave the bus lane at the end of that section.
		9.2.5	Manage use of Bus Lanes		
		9.2.6	Monitor Bus Lane Use		
		9.2.1	Provide Driver Interface for Bus Lanes		





Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
8.CV.8.8	The system will monitor the usage of the bus lanes, and if a green wave cannot be sustained for a PT vehicle, then approved vehicles are ordered to leave the bus lane at the end of that section, and no further licences will be granted until suitable condi	9.2.5	Manage use of Bus Lanes	7.5.3.8	The system shall monitor the usage of the bus lanes, and if a green wave cannot be sustained for a PT vehicle, then approved vehicles shall be ordered to leave the bus lane at the end of that section, and no further licences will be granted until suitable conditions are resumed.
		9.2.1	Provide Driver Interface for Bus Lanes		
		9.2.2	Manage Vehicles using Bus Lanes		
8.CV.8.9	The system shall monitor the congestion in each section and if a “critical/emergency” situation arises then approved vehicles are ordered to leave the up-stream section(s).	9.2.5	Manage use of Bus Lanes	7.5.3.9	The system shall monitor the congestion in each section of a bus lane and if a “critical/emergency” situation arises then approved vehicles shall be ordered to leave that section and the up-stream section(s) of bus lanes.
		9.2.2	Manage Vehicles using Bus Lanes		
		9.2.1	Provide Driver Interface for Bus Lanes		
8.CV.8.10	The system shall monitor the usage of the bus lanes and record the identification, time and location of any vehicle that does not have permission to use it, for further processing by an enforcement agency.	9.2.6	Monitor Bus Lane Use	7.5.3.10	The system shall monitor the usage of the bus lanes and record the identification, time and location of any vehicle that does not have permission to use it, for further processing by an enforcement agency.
8.CV.8.11	The system shall collect traffic information (e.g. number of vehicles, speeds, queue lengths, violation details)	9.2.5	Manage use of Bus Lanes	7.5.3.11	The system shall collect traffic information (e.g. number of vehicles, speeds, queue lengths, violation



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	on the roads covered by flexible bus lane allocation for statistical purposes, and to improve the algorithms used to decide when non-PT vehicles can use the bus lane.	9.2.3	Manage Bus Lane Use Data		details) on the roads covered by flexible bus lane allocation for statistical purposes, and to improve the algorithms used to decide when non-PT vehicles can use the bus lane.
8.SP.1.33	The system shall enable the driver to store data relating to the characteristics of the host vehicle for that trip (e.g. loaded weight, hazardous goods, (trailer) dimensions).	5.14.2	Create and Revise Vehicle Trip Plan	9.5.7.1	The system shall enable the driver to store data relating to the characteristics of the host vehicle for that trip (e.g. loaded weight, hazardous goods, (trailer) dimensions).
		5.12.7	Communicate with In-vehicle Systems		
8.SP.1.34	The system shall be able to determine the characteristics of the host vehicle (e.g. Type, (Total) weight, Width, Length (including trailer)).	5.12.7	Communicate with In-vehicle Systems	9.5.7.2	The system shall be able to determine the characteristics of the host vehicle (e.g. Type, (Total) weight, Width, Length (including trailer)).
8.SP.1.35	The system shall enable the host vehicle to receive information from other vehicles about the goods being carried by those vehicles.	5.12.7	Communicate with In-vehicle Systems	9.5.7.3	The system shall enable the host vehicle to receive information from other vehicles about the goods being carried by those vehicles.
		5.12.10	Provide V2V Communications		
8.CV.13.1	The system shall enable the fleet operator, or driver, to request a reservation from a parking operator for rest zone parking place. The request will	3.1.5.8	Rest Area Booking Management	9.5.7.4	The system shall enable the freight vehicle driver, to request a reservation for a rest area parking place. The request will include the



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
	include the planned route, estimated time, required duration, potential flexibility, possible hazardous goods and vehicle type.	5.14.10	Freight Vehicle Rest Area Use Management		planned route, estimated time, required duration, potential flexibility, possible hazardous goods and vehicle type.
8.CV.13.2	The system shall enable the parking operator to make a rest zone parking reservation based on the request that has been received, or to state that one is not available and/or propose and alternative booking, and to send the details to the fleet operator,	3.1.5.8	Rest Area Booking Management	9.5.7.5	The system shall enable a rest area parking reservation to be made based on the request that has been received, or to state that one is not available and/or propose and alternative booking, and to send the details to the freight vehicle driver and the fleet operator.
		3.1.5.4	Provide Operator interface to manage Service Areas		
8.CV.13.3	The system shall enable the fleet operator to pass rest zone parking reservation details to the vehicle driver.	5.14.10	Freight Vehicle Rest Area Use Management		
8.CV.13.5	The system shall enable the driver to accept or reject alternative proposals for a rest zone parking place.	5.14.10	Freight Vehicle Rest Area Use Management	9.5.7.6	The system shall enable the driver to accept or reject alternative proposals for a rest area parking place.
8.CV.13.4	The system shall enable the host vehicle that is approaching a rest zone parking place to send an ETA to the rest zone parking supervisor, based on current traffic conditions, and to receive confirmation to the driver that the reserved parking place is still available	3.1.5.8	Rest Area Booking Management	9.5.7.7	The system shall be able to receive an ETA from a vehicle that is approaching a rest area, based on current traffic conditions, and to send confirmation to the driver that the reserved parking place is still available together with information
		5.14.6	Monitor Vehicle Trip Plan Implementation		



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
	together with information about the other services that are available.	5.14.10	Freight Vehicle Rest Area Use Management		about the other services that are available.
8.CV.13.6	The system shall enable the driver to determine the ETA to the booked rest zone parking place, based on current traffic information, and to confirm/modify/cancel details of the booking.	3.1.5.8	Rest Area Booking Management	9.5.7.8	The system shall enable the driver to determine the ETA to the booked rest area parking place, based on current traffic information, and to confirm/modify/cancel details of the booking.
		5.14.10	Freight Vehicle Rest Area Use Management		
		5.14.6	Monitor Vehicle Trip Plan Implementation		
8.CV.13.7	The system shall be able to identify the vehicle that arrives at a rest zone, and to inform the driver which parking slot to use and how to get there.	3.1.5.8	Rest Area Booking Management	9.5.7.9	The system shall be able to identify the vehicle that arrives at a rest area, and to inform the driver which parking slot to use and how to get there.
		3.1.5.7	Detect Vehicle Approaching Rest Zone		
		5.14.10	Freight Vehicle Rest Area Use Management		
8.CV.13.8	The system shall enable the host vehicle to inform the rest zone parking operator that the host vehicle is leaving the rest zone.	5.14.6	Monitor Vehicle Trip Plan Implementation	9.5.7.10	The system shall be able to receive a message that a vehicle is leaving the rest area.
		3.1.5.8	Rest Area Booking Management		
8.CV.15.1	The system shall enable the relevant authority to plan and manage routes that	9.4.1	Provide Manage Hazardous Goods Operator Interface	9.5.6.1	The system shall enable the relevant authority to plan and manage routes



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	are suitable for use by vehicles carrying hazards goods.	9.4.2	Manage and Monitor Hazardous Goods Vehicle Routes		that are suitable for use by vehicles carrying hazards goods.
8.CV.15.2	The system shall enable a driver of a vehicle carrying hazardous goods to request from the relevant authority, via an on-board device, an approved route from the current position of the host vehicle to a stated destination.	6.5.3.13	Provide Data & Routes to Fleet Operators & Drivers	9.5.6.2	The system shall enable a driver of a vehicle carrying hazardous goods to request from the relevant authority, via an on-board device, an approved route from the current position of the host vehicle to a stated destination.
		9.4.3	Provide Hazardous Goods Vehicle Driver Interface		
		9.4.2	Manage and Monitor Hazardous Goods Vehicle Routes		
8.CV.15.3	The system shall enable the driver of a vehicle carrying hazardous good to be monitored and guided, via an in-vehicle device, along an approved route by the relevant authority.	9.4.4	Provide Hazardous Goods Vehicle Route Management	9.5.6.3	The system shall enable the driver of a vehicle carrying hazardous goods to be guided, via an in-vehicle device, along an approved route by the relevant authority.
		9.4.3	Provide Hazardous Goods Vehicle Driver Interface		
		9.4.2	Manage and Monitor Hazardous Goods Vehicle Routes	9.5.6.4	The system shall enable a vehicle carrying hazardous goods to be monitored, via an in-vehicle device, by the relevant authority.
		9.4.3	Provide Hazardous Goods Vehicle Driver Interface		
8.CV.15.4	The system shall enable the relevant authority to detect incidents within its area and to re-route any vehicle carrying hazardous goods that will be affected by the consequences of that incident.	3.2.12	Detect Incidents from Data	9.5.6.5	The system shall enable the relevant authority to detect incidents within its area and to re-route any vehicle carrying hazardous goods that will be affected by the consequences of that
		3.2.6	Assess Incidents and Devise Responses		



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
		3.2.13	Classify and Identify Incidents		incident.
		9.4.2	Manage and Monitor Hazardous Goods Vehicle Routes		
		3.2.10	Manage Store of Incident Data		
		3.2.8	Send Incident Details to Others		
8.CV.15.5	The system shall enable the relevant authority to monitor all vehicles carrying hazardous goods within its area of responsibility, to confirm that they are proceeding as planned, and to contact any vehicle that is not behaving correctly.	9.4.4	Provide Hazardous Goods Vehicle Route Management	9.5.6.6	The system shall enable the relevant authority to monitor all vehicles carrying hazardous goods within its area of responsibility, to confirm that they are proceeding as planned, and to contact the driver of any vehicle that is not behaving correctly.
		9.4.3	Provide Hazardous Goods Vehicle Driver Interface		
		9.4.2	Manage and Monitor Hazardous Goods Vehicle Routes		
8.CV.15.6	The system shall enable vehicles carrying hazardous goods to be transferred from one authority to another as they pass from one area of responsibility to another.	9.4.2	Manage and Monitor Hazardous Goods Vehicle Routes	9.5.6.7	The system shall enable vehicles carrying hazardous goods to be transferred from one authority to another as they pass from one area of responsibility to another.
8.CV.15.8	The system shall enable a vehicle carrying hazardous goods to request appropriate assistance in the case of an incident or accident (eCall).	2.1.2.5	Manage Incident and Emergency Data	9.5.6.8	The system shall enable a vehicle carrying hazardous goods to request appropriate assistance in the case of an incident or accident (eCall).
		2.1.2.1	Identify and Classify Emergencies		



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		8.2.2.2.2	Manage Incident			
		2.1.2.3	Plan Emergency Intervention			
		8.2.2.2.1	Prepare/Process information to/from board			
8.CV.16.1	The system shall enable the fleet operator, or driver, to request a reservation from an urban parking operator for an urban parking place to enable un/loading. The request will include the desired location, time, duration, potential flexibility, possible hazardous goods and vehicle type.	9.5.1	Manage Loading or Unloading Zone Bookings	9.5.8.1	The system shall enable the freight vehicle driver, to request a reservation for an urban parking place to enable un/loading. The request will include the desired location, time, duration, potential flexibility, possible hazardous goods and vehicle type.	
		9.5.3	Manage Store of Loading or Unloading Zone Use			
		5.14.9	Manage Freight Vehicle Loading/Unloading Zone Use			
		9.5.2	Provide Loading/Unloading Zone Operator Interface			
8.CV.16.2	The system shall enable the urban parking operator to make a parking allocation based on the request that has been received, or to state that one is not available and/or propose an alternative booking, and to send the details to the fleet operator, or driver.	9.5.1	Manage Loading or Unloading Zone Bookings	9.5.8.2	The system shall enable an un/loading zone parking allocation to be made based on the request that has been received, or to state that one is not available and/or propose an alternative booking, and to send the details to the freight vehicle driver and the fleet operator.	
		9.5.2	Provide Loading/Unloading Zone Operator Interface			
		5.14.11	Freight Vehicle Loading/Unloading Zone Use Management			



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
		9.5.3	Manage Store of Loading or Unloading Zone Use			
8.CV.16.3	The system shall enable the fleet operator to pass parking allocation details to the vehicle driver.	9.5.7	Provide Un/loading Zone Fleet Operator Interface			
8.CV.16.5	The system shall enable the driver to accept or reject alternative proposals for an urban parking place.	5.14.9	Manage Freight Vehicle Loading/Unloading Zone Use	9.5.8.3	The system shall enable the driver to accept or reject alternative proposals for an urban parking place.	
8.CV.16.4	The system shall enable the host vehicle that is approaching a booked parking place (or holding zone) to send an ETA to the urban parking operator, and to receive confirmation that the urban parking place (or holding zone) is still/now available and/or receive updates to the booking together with any up-to-date micro-routing information that may be needed.	9.5.1	Manage Loading or Unloading Zone Bookings	9.5.8.4	The system shall be able to receive an ETA from a vehicle that is approaching an urban parking place, and to receive confirmation that the urban parking place (or holding zone) is still/now available and/or receive updates to the booking.	
		9.5.3	Manage Store of Loading or Unloading Zone Use			
		5.14.9	Manage Freight Vehicle Loading/Unloading Zone Use			
8.CV.16.6	The system shall be able to inform the driver, via an in-vehicle device, of a holding zone that may be used in the event that a suitable urban parking place is not available, or the booked urban parking place is no longer available, at the desired time.	5.14.9	Manage Freight Vehicle Loading/Unloading Zone Use	9.5.8.5	The system shall be able to inform the driver, via an in-vehicle device, of a holding zone that may be used in the event that a suitable urban parking place is not available, or the booked urban parking place is no longer available, at the desired time.	
		9.5.1	Manage Loading or Unloading Zone Bookings			





Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.CV.16.7	The system shall enable the urban parking zone to be monitored and to report to the urban parking operator any vehicle that is parked with or without permission, including overstaying.	9.5.2	Provide Loading/Unloading Zone Operator Interface	9.5.8.6	The system shall enable the urban parking zone to be monitored for any vehicle that is parked with or without permission, including overstaying.	
		9.5.1	Manage Loading or Unloading Zone Bookings			
		9.5.4	Detect Vehicle Using Loading or Unloading Zone			
		9.5.5	Detect Vehicle Using Holding Zone			
8.CV.16.4	The system shall enable the host vehicle that is approaching a booked parking place (or holding zone) to send an ETA to the urban parking operator, and to receive confirmation that the urban parking place (or holding zone) is still/now available and/or receive updates to the booking together with any up-to-date micro-routing information that may be needed.	9.5.1	Manage Loading or Unloading Zone Bookings	9.5.8.7	The system shall be able to provide up-to-date micro-routing information to a booked parking place (or holding zone).	
		9.5.4	Detect Vehicle Using Loading or Unloading Zone			
		5.14.9	Manage Freight Vehicle Loading/Unloading Zone Use			
8.CV.16.8	The system shall enable the host vehicle to inform the urban parking operator that the host vehicle is leaving the urban parking place.	5.14.6	Monitor Vehicle Trip Plan Implementation	9.5.8.8	The system shall be able to receive a message that a vehicle is leaving the urban parking place.	
		9.5.1	Manage Loading or Unloading Zone Bookings			



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.CO.8.1	The system shall be able to provide data to add to, or replace, that used to form a digital map.	3.1.2.6	Manage Inter-urban Static Road Data	7.6.2.1	The system shall be able to provide data to add to, or to replace, that used to form a digital map.	
		3.1.1.6	Manage Urban Static Traffic Data			
8.CV.1.17	The system shall enable the driver of the host vehicle to provide the destination and personal settings for the journey (e.g. desired route, way points, special needs).	6.5.10	Provide Traveller Trip Planning Interface	7.6.2.2	The system shall enable the driver of the host vehicle to provide the destination and personal settings for the journey (e.g. desired route, way points, special needs).	
8.CV.17.3	The system shall enable a traveller to request and receive personalised journey plans in advance, assess different plans according to certain criteria (e.g. vehicle type, travel time, cost, expected traffic density, planned events, facilities en route, parking), and to save one for future use.	6.7.1	Define Traveller's General Trip Preferences	7.6.2.3	The system shall enable a traveller to request and receive personalised journey plans in advance, assess different plans according to certain criteria (e.g. vehicle type, travel time, cost, expected traffic density, planned events, facilities en route, parking), and to save one for future use.	
		6.5.8	Enable Final Approval of Trip Plan			
		6.5.10	Provide Traveller Trip Planning Interface			
		6.8.1	Manage Store of Trip Plan Data			
		6.5.3.9	Plan Trip Details			
8.CV.17.1	The system shall enable the traveller information service provider to receive current inter-urban traffic management, and weather, conditions and planned events from the TCC.	6.3.10	Implement Trip Plan and Track Traveller	7.6.2.4	The system shall enable the traveller information service provider to receive current inter-urban traffic management, and weather, conditions and planned events.	
		3.2.9	Send Incident Details to Information Providers			



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
		3.1.2.9	Output Inter-urban Traffic Data		
		3.1.2.16	Manage Inter-urban Traffic Data		
		3.4.11	Analyse Environmental Data and Implement Actions		
		3.2.6	Assess Incidents and Devise Responses		
8.CV.17.2	The system shall enable the traveller information service provider to monitor current inter-urban traffic management conditions, and to maintain a model of the current and anticipated traffic conditions.	3.1.2.9	Output Inter-urban Traffic Data	7.6.2.5	The system shall enable the traveller information service provider to be provided with current an predicted inter-urban traffic conditions.
		3.1.2.16	Manage Inter-urban Traffic Data		
		3.1.6.6	Process Traffic Prediction Results		
		3.1.6.4	Manage Traffic Prediction Data Store		
8.CV.17.4	The system shall enable the traveller to request and receive (anticipated) weather/environmental conditions on, or before, a planned trip.	3.4.11	Analyse Environmental Data and Implement Actions	7.6.2.6	The system shall enable the traveller to request and receive (anticipated) weather/environmental conditions on, or before, a planned trip.
		3.4.10	Output Environmental Information		
8.CV.1.18	The system shall be able to calculate the expected time of arrival at a destination or way point based on the driver's profile and the anticipated traffic conditions.	6.3.11	Monitor Trip Plan Implementation for Traveller	7.6.2.7	The system shall be able to calculate the expected time of arrival at a destination or way point based on the driver's profile and the anticipated traffic conditions.



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
8.CV.1.19	The system shall be able to provide the driver, via an in-vehicle device, with a personalised route.	6.5.7	Provide Traveller with Trip Planning Interface	7.6.2.8	The system shall be able to provide the driver, via an in-vehicle device, with a personalised route.
8.CV.1.20	The system shall be able to provide the driver, via an in-vehicle device, with an estimated time of arrival which is updated at regular intervals.	5.14.6	Monitor Vehicle Trip Plan Implementation	7.6.2.9	The system shall be able to provide the driver, via an in-vehicle device, with an estimated time of arrival which is updated at regular intervals.
		5.14.5	Provide Driver Trip Guidance Interface		
8.CV.17.5	The system shall enable the driver to (request and) receive, via an in-vehicle device, personalised on-trip information about incidents that may affect the planned journey.	5.12.8	Manage Vehicle Communication to Driver	7.6.2.10	The system shall enable the driver to (request and) receive, via an in-vehicle device, personalised on-trip information about incidents that may affect the planned journey.
		3.2.8	Send Incident Details to Others		
		5.12.9	Output Commands and Dynamic Warnings		
8.CV.17.6	The system shall enable a traveller to request and receive, via an in-vehicle device, personalised on-trip alternative journey plans (to avoid an incident) and to accept/reject the proposal(s).	6.3.13	Provide Traveller Trip Interface	7.6.2.11	The system shall enable a traveller to request and receive, via an in-vehicle device, personalised on-trip alternative journey plans (to avoid an incident) and to accept/reject the proposal(s).
8.CV.1.21	The system shall be able to provide the driver, via an in-vehicle device, with suggested alternative routes.	6.5.7	Provide Traveller with Trip Planning Interface	7.6.2.12	The system shall be able to provide the pre-trip driver, via an in-vehicle device, with suggested alternative routes.



Old User Need		Function			New User Need	
No.	Description	No.	Name	No.	Description	
8.CV.17.7	The system shall enable a traveller to request and receive, via an in-vehicle device, on-trip information about facilities on, or near, the planned route (e.g. fuel stations, refreshment areas).	6.6.1	Provide Traveller Information Interface	7.6.2.13	The system shall enable a traveller to request and receive, via an in-vehicle device, on-trip information about facilities on, or near, the planned route (e.g. fuel stations, refreshment areas).	
8.CV.1.22	The system shall be able to send O-D data, from the navigation system, and current location data from the host vehicle to the TCC to enable geo-referenced travel times to be produced.	3.1.1.8	Collect Urban Data from Vehicles	7.6.2.14	The system shall be able to send O-D data, from the navigation system, and current location data from the host vehicle to the TCC to enable geo-referenced travel times to be produced.	
		5.13.7	Prepare Extended Floating Car Data			
		6.3.11	Monitor Trip Plan Implementation for Traveller			
		3.1.1.14	Manage Urban Traffic Data			
		3.1.2.16	Manage Inter-urban Traffic Data			
		3.1.2.8	Collect Inter-urban Data from Vehicles			
8.CV.17.8	The system shall be able to enable the service provided to the traveller to be passed from one Service Provide to another as the traveller changes areas of coverage.	6.3.10	Implement Trip Plan and Track Traveller	7.6.2.15	The system shall enable the service provided to the traveller to be passed from one Service Provide to another as the traveller changes areas of coverage.	
		6.3.13	Provide Traveller Trip Interface			
		6.3.11	Monitor Trip Plan Implementation for Traveller			



	Old User Need		Function		New User Need
No.	Description	No.	Name	No.	Description
		6.3.12	Manage Revised Trip Plan Creation for Traveller		
8.CV.14.1	The system shall enable the host vehicle to receive the information from an RSU that it is about to enter a “sensitive area”, and then to contact the relevant Access Control Centre.	3.1.2.13.2	Check Access to Inter-urban Zones	7.6.3.1	The system shall enable the host vehicle to receive the information from a road-side device that it is about to enter a “sensitive are”, and then to contact the relevant Access Control Centre.
		9.3.1	Provide Vehicle Support for Sensitive Areas Access		
		3.1.1.5.11	Monitor Access to Urban Zones		
8.CV.14.2	The system shall enable the host vehicle to detect (e.g. using map matching) that it is about to enter a “sensitive area” and to contact the relevant Access Control Centre.	9.3.1	Provide Vehicle Support for Sensitive Areas Access	7.6.3.2	The system shall enable the host vehicle to detect (e.g. using map matching) that it is about to enter a “sensitive area” and to contact the relevant Access Control Centre.
8.CV.14.3	The system shall enable the Access Control Centre to give, or deny, permission for an equipped vehicle to enter a “sensitive area”.	9.3.3	Provide Operator Interface for Sensitive Area Use	7.6.3.3	The system shall enable the Access Control Centre to give, or deny, permission for an equipped vehicle to enter a “sensitive area”.
		9.3.2	Manage Data about Vehicle use of Sensitive Areas		
		9.3.1	Provide Vehicle Support for Sensitive Areas Access		
8.CV.14.4	The system shall enable the Access Control Centre to monitor all equipped	9.3.1	Provide Vehicle Support for Sensitive Areas Access	7.6.3.4	The system shall enable the Access Control Centre to monitor all



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
	vehicles, and the traffic, within a “sensitive area” and to send instructions to the drivers of the equipped vehicles.	5.12.9	Output Commands and Dynamic Warnings		equipped vehicles, and the traffic, within a “sensitive area” and to send instructions to the drivers of the equipped vehicles.
		9.3.2	Manage Data about Vehicle use of Sensitive Areas		
8.CV.14.5	The system shall enable the Access Control Centre to store information about each equipped vehicle.	9.3.2	Manage Data about Vehicle use of Sensitive Areas	7.6.3.5	The system shall enable the Access Control Centre to store information about each equipped vehicle.
8.CV.14.6	The system shall enable the host vehicle to close the contact with the Access Control Centre when it leaves the “sensitive area” and to create a report for the driver and/or fleet operator.	5.12.9	Output Commands and Dynamic Warnings	7.6.3.6	The system shall enable the host vehicle to close the contact with the Access Control Centre when it leaves the “sensitive area” and to create a report for the freight vehicle driver.
		9.3.1	Provide Vehicle Support for Sensitive Areas Access		
8.CV.4.1	The system shall be able to detect that the host vehicle has been involved in an incident/accident and to call the emergency services either automatically or on command of the driver/passenger (eCall)	2.1.8	Accept eCall input from outside the Vehicle	7.6.1.1	The system shall be able to detect that the host vehicle has been involved in an incident/accident and to call the emergency services either automatically or on command of the driver/passenger (eCall).
		5.12.7	Communicate with In-vehicle Systems		
		2.1.2.4	Process Emergency Progress Reports		
		5.11.7	Provide In-vehicle eCall Facilities		



Old User Need		Function		New User Need	
No.	Description	No.	Name	No.	Description
		2.1.2.1	Identify and Classify Emergencies		
8.SP.1.37	The system shall be able to send an eCall message to a Safety Centre either directly or via an RSU.	5.11.7	Provide In-vehicle eCall Facilities		
		2.1.8	Accept eCall input from outside the Vehicle		
		2.1.2.1	Identify and Classify Emergencies		
8.SP.1.37	The system shall be able to send an eCall message to a Safety Centre either directly or via an RSU.	5.11.7	Provide In-vehicle eCall Facilities	7.6.1.2	The system shall be able to send a request for assistance (eCall) message to the emergency services from a road-side device.
		2.1.8	Accept eCall input from outside the Vehicle		
		2.1.2.1	Identify and Classify Emergencies		
8.CO.7.1	The system shall be able to exchange relevant information between adjacent TCCs and TICs to ensure the continuity of services for travellers.	3.1.2.16	Manage Inter-urban Traffic Data	7.6.4.1	The system shall be able to exchange relevant information between adjacent TCCs and TICs to ensure the continuity of services for travellers.
		3.1.1.14	Manage Urban Traffic Data		





Table 1 needs to be read very carefully as it has not been possible to avoid some of the cells breaking across page boundaries. So where a cell appears blank on a page, the following or preceding page must be consulted to find the relevant old or new User Need.

Note that the Function numbers and names that are used in the Table 1 are those that result from the changes shown elsewhere in this deliverable document. This is because using the original names and numbers would not have any relevance to version 4.1 of the FRAME Architecture, which is what people will be using.

Functions that appear to be faint (light grey) are the original allocation to the old User Need and have not been carried through to the new User Need. In many cases this is where two or more of the old User Needs have been merged into one new User Need, or because an old User Need has been split into two or more new User Needs. In both cases the original allocation of Functions is not relevant to the new User Need.

## **2.4 Changes to the allocation of functionality for UN 8.5.0.1**

The allocation of Functions to User Need 8.5.0.1 has been changed to include Function F5.12.7, "Communicate with In-vehicle Systems". This will enable the Vehicle Systems to be made aware of the inability of the Driver to properly control it. What action is taken will be up to the Vehicle Systems and outside of the FRAME Architecture.



## 3 General changes to functionality

### 3.1 Introduction

The changes described in this chapter apply to all relevant parts of the functionality in the Architecture. Details of any exclusions are shown individually.

### 3.2 Function Overview Descriptions

The Overview Descriptions of each low-level Function have been modified to convert them from a "free" text format, to a series of "bulleted" points. The following is an example:

Function F3.1.1.5.14, "Output Commands & Information to Urban Roads"

Original Overview Description:

This Function is for outputs that may provide information and/or commands to Drivers using the urban road network. These outputs have a variety of uses ranging from providing journey time information to providing Drivers with commands for unexpected speed or lane use and may use several different technologies to provide the outputs. However the outputs are not provided in the vehicle, as this type of output will be provided separately. Any differentiation between the way that information and commands are provided to Drivers will be up to the particular implementation and will not be part of the functionality. However the Function shall ensure that all outputs are consistent and coherent.

Revised format Overview Description:

This Function shall be capable of providing the following facilities:

- (1) The output of consistent and coherent information and/or commands to Drivers using the urban road network;
- (2) The outputs may be used provide such things as, journey time information, commands for unexpected speed or lane use, weather conditions warnings, etc.;
- (3) The output of warning messages about the activity of a particular Vehicle will include its identity;
- (4) The outputs may make use of different display technologies;
- (5) The monitoring of its operation and the reporting of any abnormalities to Maintenance Management functionality;
- (6) The reporting of a fault to the Maintenance Management facility if a Vehicle reports that what is being output by the Function is not the same as what is being received in the Vehicle.

The purpose of this change is to provide an Overview Description that is easier to include in Sub-system and/or Module descriptions. All that should be needed is to copy the numbered points into the description, adding any required introductory text. Where two or



more Functions are included in a Sub-system or Module, the second and subsequent sets of numbered points will need to be re-numbered so that they follow on in sequence.

Note that as this work has progressed, the opportunity has been taken to review the contents of the Overview Descriptions to ensure that they provide a true and accurate representation of what the Functions are expected to do. Any changes other than minor corrections to the contents of the Overview Descriptions and/or the Functional Requirements are described in the following chapters on the individual Functional Areas.

### **3.3 Functional Area Descriptions**

All of the Functional Area descriptions have been reviewed for their style and content. A few changes have been made to the texts in the descriptions for Areas 6 and 9 to bring them up to the same standard as the others. The content of the description of Area 9 has also been expanded so that it has a similar level of detail to the other Area descriptions.

### **3.4 Modification of Existing Functions**

In accordance with the configuration "rules" – see section 1.5, if an existing Function is modified by the addition of extra functionality (usually signified by the addition of new Data Flows – see below), its number and name will be changed.

### **3.5 Modification of Data Flows**

Any new Data Flows that have been added since the creation of Version 4 are shown with a blue colour throughout, i.e. both before and after their names. If all the Data Flows for a particular Function are shown in blue, then this is probably a new Function and not a modified version of an existing Function – see section 3.4 above.

If any Data Flows are shown partly in black and partly in blue, then this means that they were not shown correctly in the previous version of the DFD.

### **3.6 Changes to Data Flow Diagrams**

As part of this update, the layouts of several of the Data Flow Diagrams (DFD's) have been modified. The intention has been to make them easier to understand. Unless any are shown in blue – see section 3.5 above, no changes have been made to the content of the Data Flows as a result of changes to the layout.

### **3.7 Changes to the Context Diagram**

The name in the central box has been changed from "ITS" to "System". This is intended to remove the possible (incorrect) impression that the Architecture covers all of ITS.



### 3.8 Statistics for the changes

The following statistics apply to the changes that have been made to the FRAME Architecture to update it from Version 3.2 to Version 4.1.

**Table 2 – Statistics for changes to the FRAME Architecture**

	Version 3.2	Version 4	% change from Version 3.2	Version 4.1	% change from Version 3.2
Functions	177	296	67%	312	76%
Functional Sub-areas	32	43	34%	44	38%
Functional Areas	8	9	13%	9	13%
Total of all Functionality	217	348	60%	365	68%
Modified Functionality	-	100	-	20	
Data Flows	1083	2035	88%	2142	98%
Data Stores	33	50	52%	50	52%
User Needs	454	697	54%	681	50%
Actors	41	73	78%	73	78%
Terminators	20	22	10%	22	10%

The figures shown above are taken from the Access Database used by the FRAME Selection Tool. As this only uses the lowest level of functionality, the numbers for "Total for all Functionality", "Modified Functionality" and "Data Flows" are conservative estimates.

The reduction in the number of User Needs from Version 4 to Version 4.1 is due to the rationalisation within the initial set of new User Needs for cooperative systems. What is not shown is that every one of the 227 cooperative systems User Needs included in Version 4.1 had to be re-numbered and in some cases the allocations to Functions changed. The result of this work is shown in Table 1 on the previous pages.

The changes from Version 3.2 to Version 4 were the addition of support for cooperative systems services and several improvements to other parts of the Architecture. The changes from Version 4 to Version 4.1 are described in the remaining chapters of this deliverable document.



## 4 Changes to Functional Area 1 – Provide Electronic Payment Facilities

In addition to the changes described in chapter 3, the following changes have been made to individual Function 1.5.4, "Block Access" in high-level Function F1.5 "Access and Credit Control" within this Functional Area.

A new Data Flow, "tt.st-eCall\_acknowledgement" has been added to provide an output to Travellers when access to the requested service has been blocked. It has also been added to DFD 1, as an output Data Flow from high-level Function F1.5.

As a result of the addition of this Data Flow, the Function has been re-numbered to be F1.5.5 and its name changed to be "Block Access to Service". The content of the Overview Description and Functional Requirements have been altered to reflect these changes.



## 5 Changes to Functional Area 2 – Provide Safety and Emergency Facilities

### 5.1 Introduction

In addition to the changes described in chapter 3, the following changes have been made to individual Functions, Data Flows and Data Stores within this Functional Area.

### 5.2 Changes to High-level Function F2.1 "Manage Emergencies"

The following changes have been made to this high-level Function to make the operation of the eCall facility more explicit when it is used outside the Vehicle and to improve the way that the Emergency Operator requests statistical reports about the occurrence of incidents and the responses to them.

(1) Function F2.1.1, "Acquire eCall from outside the Vehicle":

A new Data Flow, "tt.st-eCall\_acknowledgement" has been added to provide a return path for the acknowledgement of the previous eCall message to the Traveller who made the original eCall from outside the Vehicle. It uses a modified version of description for Data Flow "td-eCall\_acknowledgement" – see below. This Data Flow has also been added to DFD2 and is a component of Data Flow, "tt-psef\_outputs".

The description of Data Flow "td-eCall\_acknowledgement" has been modified slightly so that it is the output to the Driver of the acknowledgement of the eCall message made by a Traveller from outside the Vehicle. Also the original times of 15 and 5 minutes have been changed to 'X' and 'Y'.

The name of Data Flow "ft.st-e-Call\_message" has been changed to "ft.st-eCall\_message".

As a result of the above, the Function has been re-numbered to be F2.1.8 and its name changed to be "Accept eCall input from outside the Vehicle". The content of the Overview Description and Functional Requirements have been altered to reflect these changes.

(2) Function F2.1.4, "Provide Emergency Control to the Operator":

The following four New Data Flows have been added to explicitly enable the Emergency Operator to request statistical reports about the occurrence of incidents and the responses to them – User Need 7.2.3.1.



"psef\_emergency\_response\_statistics\_response"  
"fo.eo-request\_statistical\_report"  
"psef\_request\_emergency\_response\_statistics"  
"to.eo-statistical\_report\_response"

The new "psef..." Data Flows also appear in DFD2.1.2 (see below) and the "fo.eo..." and "to.eo" Data Flows also appear in DFD2 and are additional components of "fo-psef\_inputs" and "to.eo-psef\_outputs" respectively.

As a result of the above, the Function has been re-numbered to be Function F2.1.9 and its name changed to "Provide Emergency Operator Interface". The content of its Overview Description and Functional Requirements have been altered to reflect these changes.

### 5.3 Changes to High-level Function F2.1.2 "Manage Emergency Intervention"

The following changes have been made to this high-level Function and its Data Flow Diagram to improve the way that the Emergency Operator requests statistical reports about the occurrence of incidents and the responses to them. They support the changes already described in section 5.2.

- (1) Function F2.1.2.2, "Manage Incident and Emergency Information":

The following two New Data Flows have been added to explicitly enable a response to be provided to the request from the Emergency Operator for statistical reports about the occurrence of incidents and the responses to them – User Need 7.2.3.1 and see changes to Function F2.1.4 above.

"psef\_emergency\_response\_statistics\_response"  
"psef\_request\_emergency\_response\_statistics"

Both of the new Data Flow also appear in DFD2.1 – also see above.

As a result of the above, the Function has been re-numbered to be Function F2.1.2.5 and its name changed to "Manage Incident and Emergency Data". The content of its Overview Description and Functional Requirements have been altered to reflect these changes.

- (2) DFD2.1: this has been re-drawn as some of the Data Flows were not shown to be providing links between Function F2.1.4 (now F2.1.9 – see above) and high-level Function F2.1.2. The Data Flows have to be shown individually because Function F2.1.9 is a low-level Function and combining them would create Data Flows with no source or target.



## 6 Changes to Functional Area 3 – Manage Traffic

### 6.1 Introduction

In addition to the changes described in chapter 3, the following changes have been made to individual Functions, Data Flows and Data Stores within this Functional Area.

### 6.2 Changes to High-level Function F3.1.2 "Provide Inter-urban Traffic Management"

#### 6.2.1 Introduction

The changes are needed to this High-level Function to provide greater flexibility for its use in Physical Viewpoints in the form of a distributed form of traffic management. They should enable the functionality to be split in any desired way between possible generic locations such as the "roadside" and the "centre". So for example, it should be possible to implement regional control centres as well as national control centres.

#### 6.2.2 Details of the changes

Originally the functionality for the implementation of traffic management strategies in the inter-urban road network was managed by a single High-level Function F3.1.2.5, "Provide Inter-urban Traffic Management Facilities". This has now been split into two High-level Functions, comprising:

F3.1.2.13, "Manage Inter-urban Traffic Strategies", and

F3.1.2.14, "Implement Inter-urban Management Traffic Strategy".

The Low-level Functions that were originally constituents of High-level Function F3.1.2.5 have been either been replaced by new Low-level Functions, or re-used with their numbers and names changed. They have been re-allocated to one of the two new High-level Functions. The detail of how this has been done is shown in Table 3 on the next page.

As can be seen F3.1.2.5.10 has been split into two new Functions, F3.1.2.13.1 and F3.1.2.14.1. Similarly F3.1.2.5.16 has been split into two new Functions, F3.1.2.13.5 and F3.1.2.14.4. All other Functions in High-level Function F3.1.2.5 have been re-numbered and re-named and moved to F3.1.2.13 or F3.1.2.14.





**Table 3 - Changes to High-level Function F3.1.2.5 to create High-level Functions F3.1.2.3 and F3.1.2.14**

	Original		New Number/Name – F3.1.2.13		New Number/Name – F3.1.2.14
Number	Name	Number	Name	Number	Name
F3.1.2.5	Provide Inter-urban Traffic Management Facilities	F3.1.2.13	Manage Inter-urban Traffic Strategies	F3.1.2.14	Implement Inter-urban Management Traffic Strategy
F3.1.2.5.10	Provide Inter-urban Traffic Operator Interface	F3.1.2.13.1 (NF)	Provide Inter-urban Road Operator Mgt Interface	F3.1.2.14.1 (NF)	Provide Inter-urban Road Operator Cmd Interface
F3.1.2.5.11	Monitor Access to Inter-urban Zones	F3.1.2.13.2	Check Access to Inter-urban Zones		
F3.1.2.5.12	Prevent Access to Inter-urban Zones	F3.1.2.13.3	Restrict Access to Inter-urban Zones		
F3.1.2.5.13	Output Commands & Information to inter-urban roads			F3.1.2.14.2	Output c&i to Drivers using Inter-urban Roads
F3.1.2.5.14	Output Lane & Speed Commands to Inter-urban Roads			F3.1.2.14.3	Output Lane & Speed Messages to Inter-urban Roads
F3.1.2.5.15	Manage Inter-urban Traffic Speeds and Headways	F3.1.2.13.4	Manage Inter-urban Road Network Speeds & Headways		
F3.1.2.5.16	Implement Inter-urban Traffic Commands	F3.1.2.13.5 (NF)	Manage Inter-urban Traffic Commands & Messages	F3.1.2.14.4 (NF)	Output Inter-urban Traffic Commands & Messages
F3.1.2.5.17	Manage Inter-urban Road Network Lanes	F3.1.2.13.6	Manage Lanes in the Inter-urban Road Network		
F3.1.2.5.2	Provide Planned Inter-urban Traffic Management	F3.1.2.13.7	Manage Planned Inter-urban Traffic Strategy Change		
F3.1.2.5.8	Detect Inter-urban Traffic Violations			F3.1.2.14.5	Detect Violations on Inter-urban Roads



Almost all of the original input and output Data Flows to and from High-level Function F3.1.2.5 and its constituent Low-level Functions have been re-used. Other Data Flows have had minor changes made to the names and/or descriptions to improve their comprehension but this has not affected the connections that they provide between the various items of functionality.

Because F3.1.2.5 has been split into two new High-level Functions, the following new Data Flows have been added to enable communications between them:

mt\_inter-urban\_lane\_l&s\_commands  
mt\_inter-urban\_speed\_l&s\_commands  
mt\_inter-urban\_lane\_status  
mt\_inter-urban\_data\_for\_ramp\_metering  
mt\_selected\_inter-urban\_strategy\_details  
mt\_inter-urban\_strategy\_command\_response\_failure

In addition, the Functions marked "(NF)" in Table 3 are new and therefore will have several new Data Flows, apart from those identified above.

An additional Data Flow, "mt\_inter-urban\_strategy\_command\_output\_failure" has been created to report failure to output strategies correctly to the Maintenance Management Function, F3.5.12, "Evaluate Need for Equipment Maintenance". This Function has not been changed as its Functional Requirements remain the same.

### 6.3 Explicit functionality for ramp metering

In the original version of high-level Function F3.1.2, the functionality for ramp metering was "buried" in F3.1.2.5.16, "Implement Inter-urban Traffic Commands". As shown in Table 3, this has now been split into two Functions as part of the changed to high-level Function F3.1.2.5. Included in this change is the creation of the following new low-level Function to make the ramp metering functionality more explicit.

F3.1.2.13.8, "Provide Inter-urban Ramp Metering"

As a result of the addition of this new Function, the following new Data Flows have been created:

ftrfc-inter-urban\_local\_data\_for\_ramp\_metering  
mt.padas\_inter-urban\_ramp\_metering\_outputs  
mt\_inter-urban\_ramp\_metering\_strategy\_details  
td\_inter-urban\_ramp\_metering\_output  
mt\_inter-urban\_strategy\_details\_for\_ramp\_metering



mt\_inter-urban\_traffic\_data\_for\_ramp\_metering

This has also led to a modification to Function F5.12.8 "Manage Vehicle Communication to Driver", which now has an additional input Data Flow "mt.padas\_inter-urban\_ramp\_metering\_outputs" (see above), which provides commands for output to Drivers via an in-vehicle device.

## 6.4 Change of name for "rest zones"

Following an analysis of the published ITS Action Plan it has been found that the accepted term of the place where trucks can stop is called a "rest area" and not a "rest zone". Thus all the instances of the term "rest zone" whether in Data Flow names and descriptions or Function names and descriptions have been replaced with "rest area". This affects some of the low-level Functions in High-level Function F3.1.5, "Provide Management of Service Areas".

This replacement of the term "rest zone" with "rest area" has also caused changes to Functions and Data Flows in Functional Area 5 (Provide Advanced Driver Assistance Systems) – see section 8.3.

## 6.5 Output of Bridge and Tunnel Status messages in the Vehicle

Now that the functionality for cooperative systems is included, it would seem logical for other functionality to be included so that messages about the status of bridges and tunnels can be output in the Vehicle, rather than just at the roadside. In order for this to be achieved, the following modifications have been made.

### (1) F3.1.7.2 Output Tunnel Information to Drivers

This has been changed to be F3.1.7.4 "Tunnel Information Output to Drivers", and the following new Data Flow has been added to this new version of the Function.

mt.padas\_tunnel\_status\_for\_drivers

### (2) F3.1.8.2 Output Bridge Information

This has been changed to be F3.1.8.4 "Bridge Information Output to Drivers" and the following new Data Flow has been added to this new version of the Function.

mt.padas\_bridge\_status\_for\_drivers

Neither of these new Data Flows requires any change to their destination Function F5.12.8, "Manage Vehicle Communication to Driver" because its functional requirements remain unaltered.



## 6.6 Output of parking information to Drivers

The new functionality for cooperative systems enables other functionality to be included so that messages about the status of car parks can be output in the Vehicle, rather than just at the roadside. In order for this to be achieved, the following modifications have been made.

### (1) F3.1.4.5 Output Car Park Status

This Function has been changed to be F3.1.4.9 "Output Car Park Information to Drivers", and the following new Data Flow has been added to this new version of the Function.

mt.padas\_carpark\_information

This new Data Flow does not require any change to its destination Function F5.12.8, "Manage Vehicle Communication to Driver" because its functional requirements remain unaltered.

## 6.7 Predictions of future traffic conditions

### 6.7.1 Introduction

In Version 4, the functionality to represent traffic simulation systems was introduced and it was linked to both inter-urban and urban traffic management functionality. This was in response to the growing use of these systems as a tool to determine what traffic management strategies should be used in the future. However it has become apparent that there is a need to include functionality that provides a simpler mechanism for producing at least short term and medium term predictions of traffic conditions. With this version of the Architecture this "simple" functionality has been included as separate Functions for inter-urban and urban traffic management.

### 6.7.2 Inter-urban Traffic Management

A new Function F3.1.2.15 "Predict Short & Medium Term Inter-urban Conditions" has been created to provide the functionality for the prediction of short and medium term traffic conditions in the inter-urban road network. It is linked to a modified version of Function F3.1.2.7 "Provide Inter-urban Traffic Data Management", which as a result has now become Function F3.1.2.16 "Manage Inter-urban Traffic Data".

As a result, the following new Data Flows have been created to provide the link between Functions F3.1.2.15 and F3.1.2.16:

mt\_request\_current\_inter-urban\_traffic\_data

mt\_requested\_current\_inter-urban\_traffic\_data

mt\_short\_&\_medium\_predicted\_inter-urban\_traffic



In order to differentiate between the long-term prediction results for inter-urban traffic conditions produced by the simulator and the results of the new Function, several existing Data Flows have had their names changed as shown in Table 4.

**Table 4 – Inter-urban Data Flow name changes for the output from the Simulator functionality**

Original Data Flow Name	New Data Flow Name
mt_inter-urban_strategies	mt_inter-urban_strategies_for_long-term
mt_inter-urban_traffic_prediction_data	mt_inter-urban_traffic_long-term_prediction_data
mt_predicted_inter-urban_network_data	mt_inter-urban_network_long-term_prediction_data

### 6.7.3 Urban Traffic Management

A new Function F3.1.1.13 "Predict Short & Medium Term Urban Conditions" has been created to provide the functionality for the prediction of short and medium term traffic conditions in the urban road network. It is linked to a modified version of Function F3.1.1.7, which as a result has now become Function F3.1.1.14 "Manage Urban Traffic Data".

As a result, the following new Data Flows have been created to provide the link between Functions F3.1.1.13 and F3.1.1.14:

- mt\_request\_current\_urban\_traffic\_data
- mt\_requested\_current\_urban\_traffic\_data
- mt\_short\_&\_medium\_predicted\_urban\_traffic

In order to differentiate between the long-term prediction results for urban traffic conditions produced by the simulator and the results of the new Function, several existing Data Flows have had their names changed as shown in Table 5.

**Table 5 - Urban Data Flow name changes for the output from the Simulator functionality**

Original Data Flow Name	New Data Flow Name
mt_urban_traffic_prediction_data	mt_urban_traffic_long-term_prediction_data
mt_predicted_urban_network_data	mt_urban_network_long-term_prediction_data
mt_urban_strategies	mt_urban_strategies_for_long-term



## 6.8 Relay data for Driver messages to approaching Vehicles

The facility to store and relay messages provided by Vehicles to following Vehicles as they approach a particular point in the inter-urban and urban road networks needs to be provided. For this purpose the following two new Functions have been created:

F3.1.1.5.21, "Send Messages to Approaching Urban Vehicles"

F3.1.2.14.6, "Send Messages to Approaching Inter-urban Vehicles".

As a result the new Data Flows shown in Table 6 have been created for use by each of these Functions.

**Table 6 - New Data Flows for the output data to approaching Vehicles Functions**

Function	New Data Flow
F3.1.2.14.6	ftrfc-inter-urban_vehicle_presence_for_messages
F3.1.2.14.6	mt_inter-urban_data_for_approaching_vehicles
F3.1.2.14.6	mt.padas_approaching_vehicles_inter-urban_messages
F3.1.1.5.21	ftrfc-urban_vehicle_presence_for_messages
F3.1.1.5.21	mt_urban_data_for_approaching_vehicles
F3.1.1.5.21	mt.padas_approaching_vehicles_urban_messages

## 6.9 Output of road conditions information from the roadside

As noted in section 8.4 Function F3.1.1.5.14 "Output Commands & Information to Urban Roads" has been re-numbered to be F3.1.1.5.20 and re-named to be "Output c&i to Drivers using Urban Roads".

## 6.10 Display of "traffic signal" outputs in the Vehicle

The current functionality does not enable this to happen, although other things such as speed and lane departure messages are provided by in-Vehicle functionality. Therefore Function F3.1.1.5.13, "Output Stop&Go Commands to Urban Roads" has been modified by the addition of the following new Data Flow and becomes Function F3.1.1.5.22, "Output s&g Commands to Urban Roads".

mt.padas\_s&g\_state\_for\_driver\_display

This Data Flow terminates in Function F5.12.8 "Manage Vehicle Communications" where its contents join all the other data for output to the Driver through in-Vehicle functionality.



## 6.11 Urban Speed Commands not sent to Host Vehicle for display

During the work described in section 6.13 – see below, it was discovered that although urban lane commands were sent to the Host Vehicle for output by In-vehicle displays, the speed commands were not. This has been corrected by the addition of a new output Data Flow, "mt.padas\_urban\_speed\_commands" which is sent to F5.12.8 "Manage Vehicle Communication to Driver". As a result, Function F3.1.1.5.15 "Output Lane & Speed Commands to Urban Roads" has become F3.1.1.5.23 "Output Urban Lane & Speed Commands".

## 6.12 Inter-urban Lane and Speed Commands not sent to Host Vehicle for display

Again during the work described in section 6.13 – see below, it was discovered that although inter-urban lane, and speed and headway commands are sent to the Host Vehicle for output by In-vehicle displays, the more general commands and information messages were not. This has been corrected by the addition of the following two new output Data Flows:

mt.padas\_inter-urban\_c&i\_messages" – which is sent from F3.1.2.14.2 "Output c&i to Drivers using Inter-urban Roads";

mt.padas\_inter-urban\_speed\_commands – which is sent from F3.1.2.14.3 "Output Lane & Speed Messages to Inter-urban Roads".

Both of these new Data Flows are sent to F5.12.8 "Manage Vehicle Communication to Driver" and contain data that is for use in the output of messages to the Driver using some form of In-vehicle display mechanism.

## 6.13 Output of Urban Traffic Management messages directly to the Vehicle

At the moment, all traffic management messages to the Vehicle are output from the following Functions in the urban domain:

F3.1.1.5.19 Manage Urban Road Network Lanes

F3.1.1.5.20 "Output c&i to Drivers using Urban Roads"

F3.1.1.5.22 "Output s&g Commands to Urban Roads"

F3.1.1.5.23 "Output Urban Lane & Speed Commands"

However it should be possible for the outputs from F3.1.1.5.20 and F3.1.1.5.22 to come directly from Function F3.1.1.5.17 "Implement Urban Traffic Commands". This will enable the outputs to be sent directly from to the Vehicle without having to go through what are



potential roadside based Functions. In order for this to be possible, the following new Data Flows have been added to that Function:

mt.padas\_s&g\_outputs\_for\_driver\_display

mt.padas\_c&i\_outputs\_for\_driver\_display

Both of these new Data Flows go to Function F5.12.8, "Manage Vehicle Communications to Driver". This Function does not need to be changed as it is generic for the large number of outputs to the Driver that use some form of In-vehicle display equipment.

The consequence of the two new Data Flows identified above is that the Function F3.1.1.5.17 "Implement Urban Traffic Commands" has been re-numbered and re-named to be, F3.1.1.5.24 "Implement Urban Traffic Strategies". The outputs from the other two Functions (F3.1.1.5.19 and F3.1.1.5.20) containing data for display to the Driver via the In-vehicle equipment do not need to be treated in the same way as they can be physically located anywhere.





## 7 Changes to Functional Area 4 – Manage Public Transport Operations

### 7.1 Introduction

In addition to the changes described in chapter 3, the following changes have been made to individual Functions, Data Flows and Data Stores within this Functional Area.

### 7.2 Changes to High-level Function F4.1 "Monitor PT Fleet"

The following changes have been made to the functionality in the high-level Function F4.1 "Monitor PT Fleet". They will remove the Function F4.1.7 "Monitor PT Vehicles" and split it into three Functions so that the interfaces to the PT Vehicle Driver and the PT Passenger are in separate Functions. This should make the creation of Physical Viewpoints and the subsequent preparation of component specifications easier and more consistent, thus promoting inter-operability.

The first new Function is F4.1.14, "Provide PT Passenger Alarm Facility", to which the "ft.ptp-passenger\_emergency" Data Flow has been transferred. As a result the following three new Data Flows have been created to enable the Passenger alarm to be notified to the "monitor" Function, for the "monitor" Function to provide the acknowledgement it receives, and for the new Function to output this acknowledgement to Passengers.

mpto\_passenger\_alarm\_raised  
mpto\_passenger\_alarm\_acknowledgement  
tt.ptp-passenger\_emergency\_response

Function F4.1.14 has had the following User Needs allocated to it: 10.5.0.1.

The second new Function is F4.1.15, "Provide PT Driver Interface", to which the following Data Flows have been transferred:

fd.ptd-messages  
fd.ptd-assign\_vehicle\_to\_service  
mpto\_request\_fares\_for\_vehicle  
mpto\_request\_schedule\_for\_vehicle  
mpto\_requested\_fares\_for\_vehicle  
mpto\_requested\_schedule\_for\_vehicle  
td.ptd-messages



As a result the following two new Data Flows have been created to enable the PT Vehicle Driver to be provided with the output of Vehicle data.

mpto\_vehicle\_data\_and\_alarms\_for\_driver

td.ptd-data\_and\_alarm\_outputs

In addition the following two Data Flows have been re-routed away from Function F4.1.7 and now link to the new Function F4.1.15.

mpto\_message\_to\_driver

mpto\_message\_from\_driver

Function F4.1.15 has had the following User Needs allocated to it: 10.1.5.1 and 10.2.4.1.

As a result of the above, Function F4.1.7 has been re-numbered to be Function F4.1.16 and its name changed to "Monitor PT Vehicle Status". The content of its Overview Description and Functional Requirements have been altered to reflect these changes. The following User Needs have been de-allocated from this Function: 5.1.0.1, 5.1.0.2, 5.1.0.4, 5.1.0.5 and 10.2.1.6. The following User Needs have been allocated to this Function: 10.1.0.1, 10.1.2.1, 10.1.2.3, 10.1.3.1, 10.5.0.1 and 10.5.0.3.

### **7.3 Changes to High-level Function F4.2 "Provide PT Management"**

The following changes have been made to this high-level Function to make it clearer what its functionality does and to avoid confusion with functionality in other Functional Areas.

(1) Function F4.3.2, "Provide Maintenance Co-ordination"

The name of this Function has been changed to "Provide PT Maintenance Co-ordination" to prevent any confusion with maintenance functionality in other Functional Areas.

(2) Function F4.3.7, "PT Driver Management"

The Function has been split into three Functions so that the interfaces to the PT Vehicle Driver and the PT Operator are in separate Functions. This should make the creation of Physical Viewpoints and the subsequent preparation of component specifications easier and more consistent, thus promoting interoperability.

The first new Function is F4.3.8, "Provide PT Driver management PT Operator interface", to which the following four Data Flows have been transferred:

"fo.pto-request\_driver\_statistics"



"fo.pto-update\_driver\_details"  
to.pto-driver\_scheduling\_failed"  
"to.pto-driver\_statistics"

As a result the following four new Data Flows have been created to enable the PT Operator to provide, request and receive information about the PT Drivers, and be advised of a failure to create a new work schedule for a Driver.

mpto\_current\_driver\_statistics  
mpto\_driver\_scheduling\_failed  
mpto\_driver\_statistics\_request  
mpto\_updated\_driver\_details

The following User Need has been allocated to this Function: 10.1.0.3.

The second new Function is F4.3.9, "Provide PT Driver interface for management", to which the following two Data Flows have been transferred:

fd.ptd-driver\_status  
td.ptd-scheduling

As a result the following two new Data Flows have been created to enable the PT Vehicle Drivers to receive details of their new work schedules and provide an update of their current status.

mpto\_new\_driver\_schedule  
mpto\_updated\_driver\_status

The following User Need has been allocated to this Function: 10.1.0.3.

A consequence of the addition of these new Functions is that Function F4.3.7 has been re-numbered to be Function F4.3.10 and its name changed to "Provide PT Driver Management". The content of its Overview Description and Functional Requirements have been altered to reflect these changes. The following User Needs have been allocated to this Function: 10.1.0.3, 10.1.1.2.

## 7.4 Improvements to the PT Operator Interface for Fleet Management

The following changes have been made to the functionality in the high-level Function F4.4 "Control PT Fleet". They will replace Function F4.4.9 "Provide PT Operator Interface for Fleet Control" by Function F4.4.10 "Provide PT Operator Fleet Control Interface".



The following new Data Flows have been added to this Function:

- fo.pto-PT\_vehicle\_static\_data
- mpto\_PT\_vehicle\_static\_data\_for\_real\_time\_use
- mpto\_PT\_vehicle\_static\_data\_for\_historic\_use

The Overview description and Functional Requirements have been updated to reflect the addition of these new Data Flows. No change has been made to the allocation of User Needs

These changes enable the PT Vehicle static data to be loaded into the system. Without them there was no source for this data.



## 8 Changes to Functional Area 5 – Provide Advanced Driver Assistance Systems

### 8.1 Introduction

In addition to the changes described in chapter 3, the following changes have been made to individual Functions, Data Flows and Data Stores within this Functional Area.

### 8.2 Additional outputs for Drivers

The Function F5.12.8 "Manage Vehicle Communication to Driver" has an additional input Data Flow "mt.padas\_inter-urban\_ramp\_metering\_outputs" – see section 6.3. This Data Flow provides commands for output to Drivers via an in-vehicle device, for which F5.12.8 provides part of the functionality. As this is just another input Data Flow the Function has not had its name changed, as there are no changes to the Overview description or the Functional Requirements.

### 8.3 Change of name for "rest zones"

Following an analysis of the published ITS Action Plan it has been found that the accepted term of the place where trucks can stop is called a "rest area" and not a "rest zone". Thus all the instances of the term "rest zone" whether in Data Flow names and descriptions or Function names and descriptions have been replaced with "rest area". This affects some of the low-level Functions in High-level Function F5.12, "Provide In-vehicle Trip Planning & Implementation".

One Data Flow, "padas\_trip\_plan\_with\_zone\_or\_parking\_needed" has had to have its name changed to "padas\_trip\_plan\_with\_rest\_area\_or\_un/loading\_need".

This replacement of the term "rest zone" with "rest area" has also caused changes to Functions and Data Flows in Functional Area 3 (Manage Traffic) – see section 6.4.

### 8.4 Output of road conditions information from the roadside

Messages about road conditions that have been determined by Vehicles are currently not being output to the roadside. This has been corrected by modifying Function F5.15.2, "Determine and store local Host Vehicle conditions" to become Function F5.15.5, "Collect & forward local Host Vehicle conditions" with the addition of the following new Data Flow, "padas.mt\_urban\_road\_surface\_state\_message". This provides the data to Function F3.1.1.5.14 "Output Commands & Information to Urban Roads", which has been modified to receive it. As a result the Function has been re-numbered to be F3.1.1.5.20 and re-named to be "Output c&i to Drivers using Urban Roads".



In addition, it has been found that the warnings and advice are only passed to the urban road functionality for output at the roadside. This has now been changed to enable the output to be passed to the inter-urban functionality. As a result the names of the Data Flows used to transfer the data to the urban road functionality have been changed as shown in Table 7 below. There have also been some very minor changes to each new Data Flow description.

**Table 7 - Name changes for output of information to Drivers using the urban road network**

Old Name	New Name
padas.mt_stationary_emergency_vehicle_ahead	padas.mt_urban_stationary_emergency_vehicle
padas.mt_traffic_queue_ahead_warning_and_advice	padas.mt_traffic_urban_queue_ahead_message
padas.mt_stationary_objects_warning_and_advice	padas.mt_urban_stationary_objects_message
padas.mt_slow_objects_warning_and_advice	padas.mt_urban_slow_objects_message
padas.mt_low_visibility_warning_and_advice	padas.mt_urban_low_visibility_message

In addition to the above changes, the following data flows have been created to transfer the data to the inter-urban road functionality.

- padas.mt\_inter-urban\_stationary\_emergency\_vehicle
- padas.mt\_traffic\_inter-urban\_queue\_ahead\_message
- padas.mt\_inter-urban\_stationary\_objects\_message
- padas.mt\_inter-urban\_slow\_objects\_message
- padas.mt\_inter-urban\_low\_visibility\_message
- padas.mt\_inter-urban\_road\_surface\_state\_message

All of them originate from Function F5.15.5, "Collect & forward local Host Vehicle conditions" and terminate at Function F3.1.2.14.2. "Output Messages & Commands to Inter-urban Roads" – see Table 3 in section 6.2.

## 8.5 Additional functionality to detect and respond to Vehicle instability

Two new User Needs have been introduced that require that when the Host Vehicle is a motorcycle it should be able to detect that it has fallen over and send warnings to other Vehicles, either through in-Vehicle or roadside displays. New functionality is needed to detect that this and it makes sense to implicitly extend it so that the type of Vehicle is not



specified. This will enable other Vehicle situations to be included, such as a four wheeled Vehicle that is on its side, or upside down.

In order to provide the required functionality the following new Function has been created: F5.15.1.8, "". In order for this Function to operate, it is provided with the following new Data Flows:

flds-vehicle\_location\_for\_attitude  
padas\_vehicle\_data\_for\_attitude\_determination  
padas\_data\_for\_incorrect\_vehicle\_attitude\_warning

The last of these Data Flows sends data for the warning messages to Function F5.15.5, "Collect & forward local Host Vehicle conditions" – see section 8.4. This will in turn be modified to accommodate this additional Data Flow and to pass it on to the Other Vehicle and roadside functionality for the output of the actual message.

The functionality that displays the messages at the roadside (Function F3.1.2.14.2 "Output Messages & Commands to Inter-urban Roads" for inter-urban road networks and Function F3.1.1.5.20 "Output c&i to Drivers using Urban Roads" for urban road networks) and in Other Vehicles (Functions F5.12.8 "Manage Vehicle Communication to Driver" and Function F5.12.9 "Output Commands and Dynamic Warnings") will not need to be modified as this is simply an expansion of what already exists.

## 8.6 Involvement of the Fleet Operator in rest area bookings

User Need 8.CV.13.3 has never been properly fulfilled by the appropriate functionality. In particular no provision was made to either inform the Fleet Operator about rest area bookings that the Freight Vehicle Driver has made or for the Fleet Operator to inform the Freight Vehicle Driver about a rest area booking that has been made on their behalf. The second of these facilities would actually enable the Fleet Operator to make rest area bookings outside the System and then communicate them to the Freight Vehicle Driver. This has now been corrected with modifications to the following two Functions.

Function F3.1.5.6 "Mange Service Area Rest Area Booking" has been modified with the addition of a new Data Flow "mt\_rest\_area\_booking\_for\_fleet\_manager". The Function has thus become F3.1.5.8, "Rest Area Booking Management". Both User Need 8.CV.13.2 and 8.CV.13.3 have been added to the list of those served by this Function – please see chapter 2 for details of the changes to the numbering of these User Needs.

This new Data Flow sends information about the rest area bookings to a new Function F3.1.5.9, "Provide Rest Area Fleet Operator Interface". This function provides the interface to for the Fleet Operator and also enables the Operator to specify the identities of the Heavy Goods Vehicles for which information about rest area bookings are to be provided. It uses the following two new Data Flows:



fo.flo-hgv\_identity\_for\_rest\_area\_parking  
to.flo-rest\_area\_booking\_details

Function F5.14.8, "Mange Freight Vehicle Rest Area Use" has been modified with the addition of the following Data Flow:

fo.flo-rest\_area\_booking\_details  
td.fvd-fleet\_operator\_rest\_area\_bookings

As a result, the Function has become F5.14.10, "Freight Vehicle Rest Area Use Management". Both User Need 8.CV.13.2 and 8.CV.13.3 have been added to the list of those served by this Function – please see chapter 2 for details of the changes to the numbering of these User Needs.

Note that the introduction of the Fleet Operator input into F5.14.10 has necessitated the creation of a new Data Flow, "fo-padas\_inputs" to act as its parent at higher levels in the functional hierarchy. This new Data Flow has been added as an input into Functional Area 5 in the highest level Data Flow Diagram (DFD0).

## 8.7 Involvement of the Fleet Operator in un/loading zone bookings

User Need 8.CV.16.3 has never been properly fulfilled by the appropriate functionality. In particular no provision was made to either inform the Fleet Operator about un/loading zone bookings that the Freight Vehicle Driver has made or for the Fleet Operator to inform the Freight Vehicle Driver about a un/loading zone booking that has been made on their behalf. The second of these facilities would actually enable the Fleet Operator to make un/loading zone bookings outside the System and then communicate them to the Freight Vehicle Driver. This has now been corrected with modifications to the following two Functions.

Function F9.5.1 "Manage Loading or Unloading Zone Bookings" has been modified with the addition of a new Data Flow "pacs\_un/loading\_zone\_booking\_for\_fleet\_manager". The Function has thus become F9.5.6, "Loading or Unloading Zone Booking Management". Both User Need 8.CV.16.2 and 8.CV.16.3 have been added to the list of those served by this Function – please see chapter 2 for details of the changes to the numbering of these User Needs.

This new Data Flow sends information about the un/loading zone bookings to a new Function F9.5.7, "Provide Un/loading Zone Fleet Operator Interface". This function provides the interface to for the Fleet Operator and also enables the Operator to specify the identities of the Heavy Goods Vehicles for which information about un/loading zone bookings are to be provided. It uses the following two new Data Flows:

fo.flo-hgv\_identity\_for\_un/loading\_zone\_booking





to.flo-un/loading\_zone\_booking\_details

Function F5.14.9, "Mange Freight Vehicle Un/loading Zone Use" has been modified with the addition of the following Data Flow:

fo.flo-un/loading\_zone\_booking\_details

td.fvd-fleet\_operator\_un/loading\_zone\_bookings

As a result, the Function has become F5.14.10, "Freight Vehicle Un/loading Zone Use Management". Both User Need 8.CV.16.2 and 8.CV.16.3 have been added to the list of those served by this Function – please see chapter 2 for details of the changes to the numbering of these User Needs.

## 8.8 Changes to High-level Function F5.12, "Provide Vehicle Communications Interfaces"

The DFD for High-level Function F5.12, "Provide Vehicle Communications Interfaces" has become too crowded and complicated. In order to simplify it, Functions F5.12.8, F5.12.9 and F5.12.10 have been moved into a new high-level Function, F5.16. This has resulted in the following changes of Function number:

F5.12.8	"Manage Communication from Vehicle to Driver"	F5.16.1
F5.12.9	"Output Commands and Dynamic Warnings"	F5.16.1
F5.12.10	"Assess Dynamic Command & Warning Indications"	F5.16.1

In all other respects each of the Functions remains the same, apart from any changes to them that are described elsewhere in this document. Note that as a result, the DFD for the parent Functional Area (D5) has also been changed to accommodate the new High-level Function.

## 8.9 Change of Name for this Functional Area

It has become apparent that the current name of this Functional Area (5), "Provide Advanced Driver Assistance Services", is causing confusion for those familiar with the ADAS project and the concept of advanced driving assistance that it promotes. Therefore the Functional Area name is being changed to "Provide Support for Host Vehicle Services". As a result the acronyms for Data Flows in and to/from this Functional Area have been changed from "padas" to "pshvs".



## 9 Changes to Functional Area 6 – Provide Traveller Journey Assistance

### 9.1 Introduction

In addition to the changes described in chapter 3, the following changes have been made to individual Functions, Data Flows and Data Stores within this Functional Area.

### 9.2 Changes to High-level Function F6.5 "Prepare Trip Plan"

The following changes have been made to the low-level Functions in this high-level Function. They will concentrate all of the Data Flows to/from the Pre-Trip Traveller into one Function.

#### (1) Function F6.5.6 "Make Bookings and Payments for Trip"

The following six Data Flows that provided the interface with the Pre-Trip Traveller have been disconnected and moved to what was Function F6.5.7 – see (2) below:

ft.ptt-booking\_approval  
ft.ptt-trip\_planning\_payment  
ft.ptt-revised\_booking\_choices  
tt.ptt-advanced\_payment\_needed\_by\_trip\_plan  
tt.ptt-booking\_mishap  
tt.ptt-request\_trip\_planning\_payment

In addition the two Data Flows "ptja\_full\_trip\_description\_with\_bookings" and "ptja\_cancel\_bookings\_for\_trip" have also been disconnected and moved to provide links with what was Function F6.5.7 – see (2) below. However the Data Flows that provide the interfaces to the Financial Clearinghouse remain with this Function.

As a result of these changes the Function has been re-numbered and re-named to be F6.5.9 "Make Trip Bookings and Payments" and has had its Overview Description and Functional Requirements updated.

#### (2) Function F6.5.7 "Provide Traveller with Trip Planning Interface"

The eight Data Flows identified in (1) above have been added to this Function and the two Data Flows "ptja\_full\_trip\_description\_no\_bookings" and



"ptja\_trip\_plan\_rejected" have been disconnected from this Function. The Data Flow "ptja\_trip\_plan\_ready\_for\_implementation" has been moved from Function F6.5.8 "Enable Final Approval of Trip Plan" – see (3) below, to this Function.

As a result of these changes the Function has been re-numbered and re-named to be F6.5.10 "Provide Traveller Trip Planning Interface" and has had its Overview Description and Functional Requirements updated.

(3) Function F6.5.8 "Enable Final Approval of Trip Plan"

As a result of the above changes, this Function has been deleted. Its User Needs have been transferred to the Function F6.5.9 – see (2) above.



## 10 Changes to Functional Area 7 – Provide Support for Law Enforcement

### 10.1 Introduction

In addition to the changes described in chapter 3, the following changes have been made to individual Functions, Data Flows and Data Stores within this Functional Area.

### 10.2 Changes to the use of the term "fraud"

The term "fraud" is used throughout this Functional Area and in its true "native English" meaning this is appropriate when the misdemeanour involves a financial transaction. But it is not appropriate for other forms of misdemeanour, such as traffic rule violations. So the names and descriptions of the Data Flows shown in have been changed.

**Table 8 - List of Data Flows in which "fraud" has been changed to "violation"**

Original Name	New Name
mffo.psle_fraud_notification	mffo.psle_violation_notification
mt.psle_fraud_notifications	mt.psle_violation_notifications
mt.psle_fraud_data	mt.psle_violation_data
mt.psle_inter-urban_fraud_data	mt.psle_inter-urban_violation_data
mt.psle_urban_fraud_data	mt.psle_urban_violation_data
mt.psle_urban_fraud_notifications	mt.psle_urban_violation_notifications
mt.psle_urban_fraud_vehicle_identity	mt.psle_urban_violating_vehicle_identity
mt.psle_urban_enforcement_guidelines	mt.psle_urban_enforcement_compliance_guidelines
mt.psle_urban_enforcement_guidelines_PF	mt.psle_urban_enforcement_guidelines
psle_fraud_type_from_image_analysis	psle_violation_type_from_image_analysis
psle_fraud_type_from_violator_determination	psle_violation_type_from_violator_determination
psle_fraud_type_from_compliance_check	psle_violation_type_from_compliance_check
psle.mffo_fraud_notification	psle.mffo_violation_notification

The names of Functions shown in have also been changed to reflect that fact that "fraud" only applies to financial transactions and not to other forms of violation.



**Table 9 - List of Function for "Violation" has been added to their names**

Original Function		New Function	
No.	Name	No.	Name
F7.1	Detect Fraud	F7.1	Detect Fraud or Violation
F7.3	Process Fraud Notifications	F7.3	Process Fraud and Violation Notifications
F7.3.5	Sort Fraud Notifications	F7.3.5	Sort Fraud and Violation Notifications



## 11 Changes to Functional Area 8 – Manage Freight and Fleet Operations

### 11.1 Introduction

In addition to the changes described in chapter 3, the following changes have been made to individual Functions, Data Flows and Data Stores within this Functional Area.

### 11.2 Changes to High-level Function 8.1 "Manage Logistics and Freight"

#### 11.2.1 Introduction

Within this high-level Function there are a whole set of Data Flows with the generic name "fo.fro-input\_data\_XX" and "to.fro-output\_data\_XX", where "XX" is either not present, or takes a numerical value from 1 to 10 and which provide inputs from and outputs to the Freight Operator<sup>1</sup>. The definitions of each of these Data Flows are the same and therefore give no clue as to what they contain. The following changes to high-level Functions will replace these Data Flows with new ones having more unique names and individual descriptions, plus make other improvements.

#### 11.2.2 Changes to High-level Function F8.1.1 "Manage Freight Business Transactions"

In order to achieve the objectives described in section 11.2.1 the following changes have been made to this high-level Function.

(1) Function F8.1.1.1, "Negotiate Principal Requests"

The Data Flows, "to.fro-output\_data" and "fo.fro-input\_data" have been moved to new Function F8.1.1.7, "Provide Freight Contract Set-up Operator Interface" and replaced by new Data Flows – see below. Also the Data Flows, "tcc.p-constraints\_change\_request", "tcc.p-principal\_notice\_of\_delivery", "tcc.p-contract\_for\_principal", "fcc.p-transport\_opportunity", and "fcc.p-order\_from\_principal\_for\_goods\_transport" have been moved to new Function F8.1.1.8, "Provide Initial Interface with Principal" – see below.

As a result of these changes the Function has been re-numbered and re-named to be, F8.1.1.4, "Negotiate Requests for Freight Transport".

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<sup>1</sup> See chapter 13 for details of the change of name for this Actor within the Operator Terminator



(2) Function F8.1.1.2, "Choose a Fleet Supplier"

The Data Flows, "to.fro-output\_data\_2" and "fo.fro-input\_data\_2" have been moved to new Function F8.1.1.7, "Provide Freight Contract Set-up Operator Interface" and replaced by new Data Flows – see below.

As a result of these changes the Function has been re-numbered and re-named to be, F8.1.1.5, "Select a Fleet Operator".

(3) Function F8.1.1.3, "Administrate Freight Transactions"

The Data Flows, "fcc.p-payment" and "tcc.p-invoice\_for\_principal" have been moved to new Function F8.1.1.8, "Provide Initial Interface with Principal" – see below. The Data Flow "fcc.p-payment\_" had had its name changed to "fcc.p-payment\_acknowledgement" but its contents remain the same. Also the Data Flows, "to.fro-output\_data\_3" and "fo.fro-input\_data\_3" have been moved to new Function F8.1.1.7, "Provide Freight Contract Set-up Operator Interface" and replaced by new Data Flows – see below.

As a result of these changes the Function has been re-numbered and re-named to be, F8.1.1.6, "Administer Transactions for Freight Shipment".

(4) Function F8.1.1.7, "Provide Freight Contract Set-up Operator Interface"

This is a new Function that has been created to concentrate all of the Data Flows to and from the Freight Management Operator into one Function. This will enable a single combined Operator HMI Sub-system or Module to be provided in a Physical Viewpoint.

It has the following new Data Flows:

fo.fro-input\_data

fo.fro-freight\_transport\_management\_data

fo.fro-data\_for\_fleet\_operator\_selection

All of which are new components of the Data Flow "fo-mffo\_inputs" which appears in the Context Diagram.

to.fro-output\_data

to.fro-freight\_transport\_management\_data

to.fro-fleet\_operator\_data

All of which are new components of a new Data Flow "to.fro-fleet\_operator\_contract\_outputs" that now appears in DFD 8 and DFD 8.1.



New Data Flows have also been added to link this Function to Functions F8.1.1.4, F8.1.1.5 and F8.1.1.6 – see above.

(5) Function F8.1.1.8, "Provide Initial Interface with Principal"

This is a new Function that has been created to concentrate all of the Data Flows to and from the Principal actor in the Consignee / Consignor terminator into one Function. This will enable a single combined interface Sub-system or Module to be provided in a Physical Viewpoint.

It has the following new Data Flows:

fcc.p-payment\_acknowledgement

fcc.p-order\_from\_principal\_for\_goods\_transport

fcc.p-transport\_opportunity

All of which are new components of the Data Flow "fcc.p-freight\_transaction\_data" which appears in the Context Diagram.

fcc.p-transport\_opportunity

tcc.p-constraints\_change\_request

tcc.p-principal\_notice\_of\_delivery

tcc.p-contract\_for\_principal

All of which are new components of the Data Flow "tcc.p-freight\_transaction\_data" in the Context Diagram.

New Data Flows have also been added to link this Function to Functions F8.1.1.4 and F8.1.1.6 – see above.

### 11.2.3 Changes to High-level Function F8.1.2 "Prepare Freight Operations"

In order to achieve the objectives described in section 11.2.1 the following changes have been made to this high-level Function.

(1) Function F8.1.2.1, "Handle Customs Declaration"

The Data Flows, "fo.fro-input\_data\_4" and "to.fro-output\_data\_4" have been removed. Their replacements are as follows:

fo.fro-input\_data\_4 – is replaced by a new input Data Flow "mffo\_customs\_declaration\_requested" to the new Function F8.1.2.7 – see below.





to.fro-output\_data\_4 – is replaced by a new output Data Flow "mffo\_customs\_declaration\_submittal\_approved" from the new Function F8.1.2.7 – see below.

As a result of these changes the Function has been re-numbered and re-named to be, F8.1.2.4, "Process Customs Declaration".

(2) Function F8.1.2.2, "Prepare and Deliver Official Transport Documents"

The Data Flows, "fo.fro-input\_data\_6" and "to.fro-output\_data\_6" have been removed. Their replacements are as follows:

fo.fro-input\_data\_6 – is replaced by a new input Data Flow "mffo\_prepare\_freight\_operations\_document\_approval" to the new Function F8.1.2.7 – see below.

to.fro-output\_data\_6 – is replaced by a new output Data Flow "mffo\_prepare\_freight\_operations\_document\_request" from the new Function F8.1.2.7 – see below.

As a result of these changes the Function has been re-numbered and re-named to be, F8.1.2.5, "Create and Deliver Official Transport Documents".

(3) Function F8.1.2.3, "Handle Hazardous Goods Transport Declaration"

The Data Flows, "fo.fro-input\_data\_5" and "to.fro-output\_data\_5" have been removed. Their replacements are as follows:

fo.fro-input\_data\_5 – is replaced by a new input Data Flow "mffo\_hazardous\_goods\_transport\_request\_approval" to the new Function F8.1.2.7 – see below.

to.fro-output\_data\_5 – is replaced by a new output Data Flow "mffo\_approve\_hazardous\_goods\_transport\_request" from the new Function F8.1.2.7 – see below.

As a result of these changes the Function has been re-numbered and re-named to be, F8.1.2.6, "Process Hazardous Goods Transport Declaration".

(4) Function F8.1.2.7, "Provide Setup Freight Operation Operator Interface"

This is a new Function that has been created to concentrate all of the Data Flows to and from the Freight Management Operator into one Function. This will enable a single combined Operator HMI Sub-system or Module to be provided in a Physical Viewpoint.

It has the following new Data Flows:



fo.fro-customs\_declaration\_request\_proceed

fo.fro-freight\_operation\_document\_approval

fo.fro-hazardous\_goods\_transport\_request\_approval

All of which are new components of the Data Flow "fo-mffo\_inputs" which appears in the Context Diagram.

to.fro-freight\_operation\_document\_request

to.fro-approve\_hazardous\_goods\_transport\_request

Both of which are new components of Data Flow "to-mffo\_outputs" in the Context Diagram.

to.fro-customs\_declaration\_request\_response – a component of new Data Flow "to.fro-customs\_declaration\_data", which is itself a new component of Data Flow "to-mffo\_outputs" in the Context Diagram.

to.fro-customs\_declaration\_requested – a component of new Data Flow "to.fro-customs\_declaration\_data", which is itself a new component of Data Flow "to-mffo\_outputs" in the Context Diagram.

#### 11.2.4 Changes within High-level Function 8.1 "Manage Logistics and Freight" itself

In order to achieve the objectives described in section 11.2.1 the following changes have been made to the low-level Functions within high-level Function 8.1 itself.

(1) Function F8.1.3, "Control Freight/Cargo Operations"

The Data Flows, "fo.fro-input\_data\_7" and "to.fro-output\_data\_7" have been removed and replaced by the following new Data Flows:

fo.fro-cargo\_status\_request – a new component of the Data Flow "fo.fro-evaluation\_and\_control\_input\_data" which appears in DFD8.

to.fro-requested\_cargo\_status – a new component of the Data Flow "to.fro-evaluation\_and\_control\_output\_data" which appears in DFD8.

As the contents of both Data Flows are the same as those that they have replaced, the number and name of the Function have been left unchanged. The content of its Overview Description and Functional Requirements have been altered to reflect these changes.

(2) Function F8.1.4, "Evaluate Freight Operations Performance"



The Data Flow "fo.fro-input\_data\_8" has been removed from DFD8.1 and its name changed to "fo.fro-evaluation\_and\_control\_input\_data". It now only appears in DFD8 as input to High-level Function F8.1 because it has been given the following component Data Flows.

fo.fro-additional\_evaluation\_data

fo.fro-request\_performance\_evaluation

The Data Flow "to.fro-output\_data\_8" has been removed from DFD8.1 and its name changed to "to.fro-evaluation\_and\_control\_output\_data". It now only appears in DFD8 as input to High-level Function F8.1 because it has been given the following component Data Flows.

to.fro-additional\_data\_needed\_for\_evaluation

to.fro-performance\_evaluation\_result

As a result of these changes, the Function has been renumbered to be F8.1.6 and its name changed to "Freight Operations Performance Evaluation". The content of its Overview Description and Functional Requirements have been altered to reflect these changes.

### 11.2.5 Changes to High-level Function F8.1.5 "Manage Inter-modal Transport Synchronisation"

In order to achieve the objectives described in section 11.2.1 the following changes have been made to this high-level Function.

#### (1) Function F8.1.5.1 "Identify Possible Transport Optimisations"

The Data Flows, "fo.fro-input\_data\_9" and "to.fro-output\_data\_9" have been removed. Their replacements are as follows:

fo.fro-input\_data\_9 – is replaced by a new input Data Flow "mffo\_data\_for\_freight\_optimisation" to the new Function F8.1.5.5 – see below.

to.fro-output\_data\_9 – is replaced by a new output Data Flow "mffo\_freight\_transport\_optimisation\_results" from the new Function F8.1.5.5 – see below.

As a result of these changes the Function has been re-numbered and re-named to be, F8.1.5.3, "Find Possible Transport Optimisations".

#### (2) Function F8.1.5.2 "Book Storage Places"

The Data Flows, "fo.fro-input\_data\_10" and "to.fro-output\_data\_10" have been removed. Their replacements are as follows:



fo.fro-input\_data\_10 – is replaced by a new input Data Flow "mffo\_storage\_area\_request\_data" to the new Function F8.1.5.5 – see below.

to.fro-output\_data\_10 – is replaced by a new output Data Flow "mffo\_storage\_area\_request\_results" from the new Function F8.1.5.5 – see below.

As a result of these changes the Function has been re-numbered and re-named to be, F8.1.5.3, "Find Possible Transport Optimisations".

(3) Function F8.1.5.5 "Provide Transport Operation Operator"

This is a new Function that has been created to concentrate all of the Data Flows to and from the Freight Management Operator into one Function. This will enable a single combined Operator HMI Sub-system or Module to be provided in a Physical Viewpoint.

It has the following new Data Flows:

fo.fro-request\_storage\_area\_use

fo.fro-freigh\_transport\_optimiation\_data

Both of which are new components of the Data Flow "fo-mffo\_inputs" which appears in the Context Diagram.

to.fro-storage\_area\_request\_results

to.fro-freight\_transport\_optimisation\_results

Both of which are new components of Data Flow "to-mffo\_outputs" in the Context Diagram.

New Data Flows have also been added to link this Function to Functions F8.1.5.3 and F8.1.5.4 – see above.

### 11.3 Changes to High-level Function 8.2.2.2 "Control and Monitor Fleet Operations"

The following changes have been made to the low-level Functions within this high-level Function to improve the correspondence between their Functional Requirements and the Data Flows that are actually included.

(1) Function F8.2.2.2.3 "Process on-board Payments"

A new Data Flow, "mffo\_load\_resources\_on\_board\_payments\_data" has been added to this Function in order that data can be transferred in the way that is described in the Functional Requirements. Also the Data Flows



"mffo\_request\_for\_safety\_evaluation and "mffo\_safety\_problem\_PP" have been moved to the replacement for Function F8.2.2.2.4 – see below. The Function name and number have not been changed, because this new Data Flow was actually missing and the Functional Requirements do not mention the two removed Data Flows.

(2) Function F8.2.2.2.4 "Evaluate Transport Conditions"

The two Data Flows removed from Function F 8.2.2.2.3 (see above) "mffo\_request\_for\_safety\_evaluation and "mffo\_safety\_problem\_PP" have been added to this Function. The Overview Description and Functional Requirements have been altered accordingly.

As a result of these changes the Function has been re-numbered and re-named to be, F8.2.2.2.6 "Evaluate Freight Transport Operating Conditions".

(3) Function F8.2.2.2.5 "Evaluate and Record Safety Status"

This Function has been removed and its functionality included in the revised version of Function F8.2.2.2.4 "Evaluate Transport Conditions" – see above.

## **11.4 Changes to High-level Function 8.3 "Manage vehicle/driver/cargo/equipment"**

The DFD for this high-level Function has been modified so that the number of instances of the data store D8.3, "On-board Data" is reduced from 2 to 1. There is no change to the functionality in this DFD.



## 12 Changes to Functional Area 9 – Provide Support for Cooperative Systems

### 12.1 Introduction

In addition to the changes described in chapter 3, the following changes have been made to individual Functions, Data Flows and Data Stores within this Functional Area.

### 12.2 Function F9.5.2 "Provide Loading/Unloading Zone Operator Interface"

The name of the Actor for which the Function provides the HMI has been changed from "Parking Zone Operator" to "Un/Loading Zone Operator". There is no change to the functionality so the Function name and number remain unchanged.

As a result of this change, the mnemonic used for the Data Flows to/from the re-named Actor have also been changed. These changes are shown in Table 10 below.

**Table 10 - Changes to the Data Flows connected to F9.2.5**

Original Name	Revised Name
fo.pzo-current_un/loading_zone_data_update	fo.ulzo-current_un/loading_zone_data_update
fo.pzo-request_current_ul/loading_zone_data	fo.ulzo-request_current_ul/loading_zone_data
fo.pzo-un/loading_zone_use_response	fo.ulzo-un/loading_zone_use_response
to.pzo-current_un/loading_zone_data	to.ulzo-current_un/loading_zone_data
to.pzo-incorrect_vehicle_in_un/loading_zone	to.ulzo-incorrect_vehicle_in_un/loading_zone
to.pzo-un/loading_zone_use_request	to.ulzo-un/loading_zone_use_request

The contents of these Data Flows remain unchanged. For the reason behind the change to the name of the Actor, please see item (11) in chapter 14.



## 13 General changes to Data Stores

In addition to any changes to individual Data Store that are described in the previous chapters, all Data Store descriptions have been modified to be of the same format. This format means that the description of each Store opens with the following phrase:

"This Data Store shall be used within the XXXX Area. It shall contain....", where XXXX is the name of the Functional Area in which the Store is located. The identity of this Functional Area will also be apparent from the first digit of the Data Store number.

The part of the Data Store description that provides details of the data that it contains will always begin with the following phrase: "The data in the Store shall be structured in the following way:" There then follows a list of each item of data that the Store contains.

The definition of each item of data in the Store is followed by an indication of whether it is expected to be characters or numbers. However the following definitions have been used universally used for specific types of data:

area covered	characters, e.g. nation, region, city, state, area names(s)
date	date string
flow	number in vehicles per hour
headway	number in seconds
humidity	number as a percentage
ID	number
location	characters and/or numbers, e.g. GPS/Galileo data
periods	time and date string
queue presence	number or character indicating YES or NO
road occupancy	number as a percentage
road network data	data for a digital roadmap using a standard format, e.g. GDF
route	data for a digital roadmap using a standard format, e.g. GDF, plus characters and/or numbers, e.g. GPS/Galileo data
service ID	number
speed	number in kph or mph
tariff	number – in currency
temperature	number - in degrees Centigrade
time	numbers defining hours, minutes and seconds
user ID	number



vehicle count	number
wind direction	up to five characters indicating compass points
wind speed	number in kph or mph
YES/NO	number or character indicating YES or NO

Some of the data definitions may be split into two or more parts and supporting supplemental information may also be added where necessary and appropriate.





## 14 Changes to Terminators and Actors

The following changes have been made to the identified Terminators and Actors.

(1) Bridge/Tunnel Infrastructure:

The description of this Terminator has been changed from:

"This terminator shall represent the systems that can detect physical conditions of bridges and tunnels. The conditions shall comprise such things as the status of the bridge or tunnel infrastructure, atmospheric pollution levels on the bridge or in the tunnel, smoke (tunnels only) and weather conditions (bridges only) and be provided as data inputs from other systems. These inputs shall be used by the source systems to indicate that something exceptional has occurred about which the Tunnel Operator needs to know, or take action."

to be:

"This terminator shall represent the entities that can detect physical conditions of bridges and tunnels. It shall consist of the following two Actors:

Bridge Structures

Tunnel Management System

The conditions that these Actors can detect shall comprise such things as the status of the bridge or tunnel infrastructure, atmospheric pollution levels on the bridge or in the tunnel, smoke (tunnels only) and weather conditions (bridges only) and be provided as data inputs to the System."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(2) Consignor/Consignee:

The description of this Terminator has been changed from:

"This terminator shall represent human or physical entities that need freight (goods) to be transported from one place to place. When the transport is being arranged, the freight (goods) may be referred to as a "consignment". "

to be:

"This terminator shall represent human or physical entities that need freight (goods) to be transported from one place to place. It shall consist of the following two Actors:

Freight Shipper

Principal



When the transport is being arranged, it shall be possible for the freight (goods) to be referred to as a “consignment”.”

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(3) Driver:

The description of this Terminator has been changed from:

"This terminator shall represent the human entity that operates a licensed vehicle anywhere on the road network. Operators of Private, Freight, Public Transport and Emergency Services vehicles shall be included. The terminator shall originate Driver requests to, and receives driver information from the System."

to be:

"This terminator shall represent the human entity that operates a licensed vehicle anywhere on the road network. It shall consist of the following Actors, each of which shall represent the human entity that drives a particular type of Vehicle:

- Emergency Vehicle Driver
- Freight Vehicle Driver
- Hazardous Goods Vehicle Driver
- On-Demand Service Driver
- Private Driver
- Public Transport Driver
- Public Transport Touring Vehicle Driver
- Trip Planning Driver

Each Actor shall be the originator of Driver requests to the System, and shall be able to receive from the System information and commands for Drivers."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(4) External Service Provider:

The description of this Terminator has been changed from:

"This terminator shall include two types of actors who interface with the System. They shall be responsible for providing two different types of information. The first type of actor shall comprise the providers of information used by the System. It shall include information provided as a result of requests from the System."

to be:



"This terminator shall represent entities that interface with the System in different ways. It shall be consist of the following Actors:

- Bookable Service Provider
- Broadcaster
- Cellular Communications Provider
- Driver and Vehicle Information Provider
- Freight Storage Renting Agency
- General Information Provider
- Geographic Information Provider
- Multi-Modal Travel Information Provider
- Planned Event Organiser
- Traffic and Travel Information Provider
- Vehicle Renting Agency

Some of these Actors shall simply provide information to the System, e.g. map data, information about points of interest. Other Actors shall interact with the System for the provision of services, e.g. output of traffic and travel information by broadcast radio, rental of freight storage facilities."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(5) Freight Operator:

As it is considered likely that the name of this Actor could be confused with an organisation that operates freight services, its name has been changed to be "Freight Management Operator". This is intended to strengthen the idea that this is a human entity. The abbreviation "fro" has been retained to avoid confusion with an Operator that might be connected with "maintenance".

(6) Maintenance Organisation:

The description of this Terminator has been changed from:

"This terminator shall represent human entities or Systems that are part of organisations able to carry out work to build and/or maintain a road network, can carry out maintenance on equipment that is part of the System, or carry out maintenance on Public Transport related equipment that is used by the System. The terminator shall have two actors, one for road maintenance and the other for Public Transport maintenance."

to be:



"This terminator shall represent human entities or systems that are capable of carrying out maintenance activities. It shall consist of the following Actors:

Public Transport Maintenance Organisation

Road Maintenance Organisation

These Actors shall be capable of being part of organisations able to carry out work to build and/or maintain a road network, carry out maintenance on equipment that is part of the System, or carry out maintenance on Public Transport related equipment that is used by the System."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(7) Multi-Modal System:

The description of this Terminator has been changed from:

"This terminator shall represent the links with systems that manage the transportation of Travellers and Freight by modes that are other than those that are road based."

to be:

"This terminator shall represent entities that are the links with systems that manage the transportation of Travellers and Freight by modes that are other than those that are road based. These links shall be represented by the following Actors:

Multi-Modal Crossing

Multi-Modal Management System

Other Mode Freight System

These Actors shall be able to exchange data with the System to enable multi-modal trips to be planned and implemented for both Travellers and Freight. In some instances the other modes shall be able to exchange "control" information so that for example, a bridge can be left open to road traffic for the passage of an Emergency Vehicle."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(8) On-Demand Service Operator

The description of this Terminator has been changed from:

"This actor within the Operator terminator shall represent a human entity that manages the provision of On-Demand Services to Travellers."



to be:

"This Actor within the Operator Terminator shall represent a human entity that manages the provision of On-Demand Transport Services to Travellers. It shall be possible for these Services to be provided by a passenger carrying Vehicle that covers a route and to a schedule that is dictated by the requests from the Travellers using it. The route shall be able to differ for each Vehicle and for each time that Vehicle is used for a Service."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(9) Operator:

The description of the Operator Terminator contains a reference to a "diagram" which is clearly inappropriate for the way that it will be viewed using the FRAME Browsing and/or Selection Tools. For this and other reasons, the description of this Terminator has been changed from:

"This terminator shall comprise a diverse set of human entities that can perform privileged interactions with the System, thereby contributing to the way in which it operates. It shall be possible for this contribution to include the planning, monitoring, controlling and the evaluation of the System operation. The scope of the human entities (actors) included in this terminator is wide and covers all types of management of the way that the System operates. It shall be possible for some or all of them to be combined into a lesser number of entities for particular System implementations. Thus for example, it shall be possible for the Freight Operator and the Fleet Operator to be the same human entity if required by a particular implementation."

to be:

"This terminator shall comprise a diverse set of human entities that can perform privileged interactions with the System, thereby contributing to the way in which it operates. It shall consist of the following Actors:

- Bridge Operator
- Emergency Operator
- Fleet Operator
- Freight Management Operator
- On-Demand Service Operator
- Parking Operator
- Public Transport Operator
- Road Maintenance Operator
- Road Network Operator



Toll Operator  
Traveller Information Operator  
Tunnel Operator  
Un/Loading Zone Operator

It shall be possible for the contribution to the operation of the System from each of these Actors to include the planning, monitoring, controlling and the evaluation of the System operation. These Actors shall be capable of carrying out all types of management of the way that the System operates. It shall be possible for some or all of them to be combined into a lesser number of entities for particular System implementations. Thus for example, it shall be possible for the Freight Operator and the Fleet Operator to be the same human entity if required by a particular implementation."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(10) Other Related System:

The description of this Terminator has been changed from:

"This terminator and its actors shall represent a link to other instances of Systems that have been produced using the European ITS Framework Architecture. Typically these Systems shall be located in centres managing traffic, Public Transport, incidents, emergency services, or the impact of road transport on the environment. They may either serve other geographic areas, or are part of other organisations serving the same geographic area. The systems may also be other instances of such things as roadside equipment. This terminator shall enable traffic and travel information, plus details about traffic flows, control strategies, Public Transport services, and vehicle characteristics to be exchanged with these other Systems. It shall be possible for data to and from these other Systems to be requested by either System, or for it to be exchanged between the Systems at regular intervals."

to be:

"This Terminator and its Actors shall represent a link to other instances of Systems that have been produced using the European ITS Framework Architecture. It shall consist of the following Actors:

Emergency Management System  
Environmental Traffic Management System  
Hazardous Goods Vehicle Route Monitoring  
Incident Traffic Management System  
Inter-urban Traffic Management System



Other Navigation Device  
Public Transport Management System  
Public Transport Stop  
Traffic Signal Controller  
Traffic Simulation System  
Traffic Simulation System

Typically these Systems shall be located in centres managing traffic, Public Transport, incidents, emergency services, or the impact of road transport on the environment. They may either serve other geographic areas, or are part of other organisations serving the same geographic area. The systems may also be other instances of such things as roadside equipment. This terminator shall enable traffic and travel information, plus details about traffic flows, control strategies, Public Transport services, and vehicle characteristics to be exchanged with these other Systems. It shall be possible for data to and from these other Systems to be requested by either System, or for it to be exchanged between the Systems at regular intervals."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

#### (11) Parking Zone Operator

The name of this Actor within the Operator Terminator has been changed to be "Un/Loading Zone Operator". This is to avoid confusing with the "parking" functionality and with the "Parking Operator" Actor. The consequent changes to the names of the Data Flows to/from this Actor are described in section 12.2.

"This actor within the Operator terminator shall represent a human entity that uses the facilities of the system to manage the use of parking zones for Freight Vehicles that are loading or unloading goods. The system may be in communication with more than one human entity that is a Parking Zone Operator. Each entity may belong to the same organisation that owns and/or operates loading or unloading zones, or to different organisations."

to be:

"This Actor within the Operator Terminator shall represent a human entity that uses the facilities of the System to manage the use of Un/Loading Zones for Freight Vehicles. The System may be in communication with more than one human entity that is a Un/Loading Zone Operator. Each entity may belong to the same organisation that owns and/or operates loading or unloading zones, or to different organisations."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.



(12) Road Pavement:

This is incorrectly shown as an Actor. It is in fact a Terminator and its description has been amended from:

"This actor within the Vehicle Environment terminator shall represent road-surfacing material whose status is monitored by the System. The data that is collected shall enable the System to decide what maintenance operations are necessary to ensure that the surface causes no hazard to vehicles, pedestrians, as well as those in wheelchairs, or have imperfect sight. The different status of the road surfacing that can be measured shall include but not be limited to conditions such as ice, flood water, landslides, etc."

to be:

"This Terminator shall represent the material that makes up the surface of the road. The data that is collected shall enable the System to decide what maintenance operations are necessary to ensure that the surface causes no hazard to vehicles, pedestrians, as well as those in wheelchairs, or have imperfect sight. The different status of the road surfacing that can be measured shall include but not be limited to conditions such as ice, flood water, landslides, etc."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(13) Traveller:

The description of this Terminator has been changed from:

"This Terminator shall represent a human entity uses (or is about to use) transportation services provided by the System. These services shall comprise but not be limited to the provision of travel information and the ability to plan a trip, either before the trip has started, or as a "re-planning" exercise during a previously prepared trip that is now being implemented. It shall be possible for the services to be available through modes such as Public Transport, private car, cycling and walking. Travellers shall also be able to use other non-road based modes of transport through the interfaces provided by other terminators. Prior to a trip, the Pre-Trip Traveller Actor is used. Once Travellers embark on a trip they may become a Cyclist, a Driver, a Passenger or a Pedestrian depending on the mode(s) used between the origin and destination of the trip. When waiting at a Public Transport Stop, the Static Traveller Actor is used."

to be:

"This Terminator shall represent a human entity that uses (or is about to use) transportation services provided by the System. These services shall comprise but not be limited to the provision of travel information and the ability to plan a trip, either before the trip has started, or as a "re-planning" exercise during a





previously prepared trip that is now being implemented. This Terminator shall consist of the following Actors:

- Car-Pooler
- Cyclist
- On-Demand Service Passenger
- Pedestrian
- Pre-Trip Traveller
- Public Transport Passenger
- Static Traveller
- Vehicle Driver

It shall be possible for the services to be available to these Actors through modes such as Public Transport, private car, cycling and walking. Travellers shall also be able to use other non-road based modes of transport through the interfaces provided by other terminators. Prior to a trip, the Pre-Trip Traveller Actor is used. Once Travellers embark on a trip they may become a Cyclist, a Driver, a Passenger or a Pedestrian depending on the mode(s) used between the origin and destination of the trip. When waiting at a Public Transport Stop, the Static Traveller Actor is used."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(14) Vehicle:

The description of this Terminator has been changed from:

"This Terminator shall represent the Vehicle in terms of any functionality that it might contain whose only purpose is the provision of ITS services. This includes interfaces to ITS related functionality in other areas and the collection and/or creation of ITS related data. The data shall be collected by sensors within the system and shall be limited to those that sense data about the road network in which the Vehicle is operating and those that monitor the condition of the Driver."

to be:

"This Terminator shall represent the Vehicle in terms of any functionality that it might contain the main purpose of which is the provision of ITS services. It consists of the following Actors which represent the different types of Vehicle that can use the road network managed by the System:

- Emergency Vehicle
- Freight Vehicle
- Hazardous Goods Vehicle



Hazardous Goods Vehicle  
On-Demand Service Vehicle  
Other Vehicle  
Private Vehicle  
Public Transport Touring Vehicle  
Public Transport Vehicle  
Vehicle Systems

Each of these Actors shall have interfaces to ITS related functionality in other areas and be able to collect and/or create ITS related data. The data shall be collected by sensors within the system and shall be limited to those that sense data about the road network in which the Vehicle is operating and those that monitor the condition of the Driver. The "Vehicle Systems" Actor shall have read only access to data provided by the Vehicle systems". It and the other Actors shall not be able to control the Vehicle."

This is simply an expansion of the original description and thus no changes in the associated functionality are needed.

(15) Vehicle Environment:

The description of this Terminator has been changed from:

"This Terminator shall represent the status of the environment in the geographic area that surrounds the vehicle at any time. The status shall relate to the surface of the roadway on which the vehicle is moving and/or objects present in the surrounding geographic area. It shall be possible for some of these objects to be other vehicles, as well as other road users (e.g. cyclists and motor cyclists), pedestrians crossing (or otherwise using the roadway) and pedestrians using their own designated parts of the geographic area, i.e. pedestrian pavements."

to be:

"This Terminator shall represent the status of the environment in the geographic area that surrounds the Host Vehicle at any time. It shall consist of the following Actors, each of which represents a different type of object:

Other Nearby Vehicles  
Other Road Users  
Stationary Object

The status provided by each Actor shall relate to the surface of the roadway on which the Host Vehicle is moving and/or objects present in the surrounding geographic area. It shall be possible for some of these Actors to be using the



road and/or their own designated parts of the geographic area, e.g. pedestrian pavements, cycle lanes and bus lanes."

Also the name of the highest level Data Flow from this Terminator has been corrected to be "From Vehicle Environment". It was formerly, "From Vehicle Equipment" and appears in the Context Diagram, which has changed accordingly.

Otherwise this is simply an expansion of the original description and thus no changes in the associated functionality are needed.