Harmonising European ITS Services

Traveller Information Services
REFERENCE DOCUMENT

TIS Deployment Guideline Annex

TIS-DG01 | VERSION 02-02-00 | DECEMBER 2015

The Deployment Guidelines have been developed in EasyWay, EIP and EIP+
Co-financed by the European Union
Trans-European Transport Network (TEN-T)

www.its-platform.eu

Support

Further information	dg.its-platform.eu	**Questions/help**	dg.its-platform.eu/user-support

Preface (2016)

After the EasyWay project ended in 2012, the Deployment Guidelines have been updated by the EIP / EIP+ projects. They focussed on updating Best Practice and did neither have the capacity nor the intention for a full revision of the text, since especially the Member State adoption of the guidelines' requirements form a huge asset of European harmonisation. In the light of recent European Delegated Regulations, the EU EIP platform will now consider a full revision of the format and the content of the whole set of Deployment Guidelines.

Preamble (2012)

EasyWay is a cooperation of road authorities and road operators from 27 European countries that have teamed up to unlock the benefits of cooperation and harmonisation in the deployment of Intelligent Transport Systems (ITS) on Europe's major road network. ITS as a technology is a known contributor to sustainable mobility in terms of improved safety, efficiency and reduced environmental impact. Nevertheless, fragmented deployment on a national level will fail to deliver seamless European services and will not contribute to a coherent European Transport network. The European Member States have consequently launched the EasyWay project together with the European Commission as a platform to harmonise their ITS deployments.

This document has been drafted by EasyWay as part of the set of documents containing the 2012 version of the EasyWay Deployment Guidelines (DG 2012). These guidelines have been developed by EasyWay experts and practitioners. They have undergone a thorough review by international domain experts in an intense peer review exercise and they have been validated by the participating Member State Partners of EasyWay in an extensive formal Member State consultation process, which finally led to their adoption as basis for all deployment activities in future EasyWay phases.

EasyWay as a project is not a standardisation body, nor does it have any power to legally constrain the Member State in their national deployment activities. It is therefore crucial to understand that these documents are neither technical standards, nor are they specifications as they would be required for such cases, e.g. as currently developed by the European Commission as their part of the implementation of the ITS Directive 2010/40/EU. But since a certain level of strictness in compliance is required to achieve the intended goal of the EasyWay Deployment Guidelines – harmonisation and interoperability in Europe – the guideline documents are written in a way that clearly defines criteria that deployments have to fulfil in order to claim overall compliance with the guideline.

Although not legally binding in any sense, compliance may be required for the eligibility of deployments in future ITS road projects co-funded by the European Commission. Deviation from compliance requirements may nevertheless be unavoidable in some cases and well justified. It is therefore expected that compliance statements may contain an explanation that justifies deviation in such cases. This is known as the "comply or explain" principle.

Although not standards themselves, the EasyWay DG2012 Deployment Guidelines in some cases do mention – and sometimes require – the use of such standards. This is the case in particular regarding the use of the CEN/TS 16157 series of technical specifications for data exchange ("DATEX II"). Although standardised data exchange interfaces are a powerful tool towards harmonised services in Europe, it must be understood that real world deployments have to fit into existing – and sometimes extensive – infrastructures and investment in these infrastructures must be protected. It is therefore important to note that the use of DATEX II mentioned below as a MUST is referred to implementation of "new" data exchange systems and not the utilisation of the existing ones, unless these latter affect harmonisation of deployments or interoperability of services.

Executive Summary

Core European ITS Services are a specific set of ITS services that have been identified by and agreed between the European road operators as key components in a package of services for the European road user.

Deployment Guidelines, including Levels of Services for each Core European ITS Service, provide the information needed for road operators to ensure that similar deployments are made in support of European cohesion and define steps in gradual improvement of the service in relation to the Operating Environments.

Traveller Information Services

Traveller Information Services (TIS) are a key element of ITS deployment. They are designed to provide the European traveller with comprehensive and credible real time traffic information allowing for well-informed travel decisions before the journey (pre-trip information) and during the journey (on-trip). They include real time information concerning the Trans European Transport (TEN-T) Network, interfaces with peri-urban networks and other transport modes, especially in urban areas. The relevance of different types of traffic information throughout a journey is shown in Figure 1.

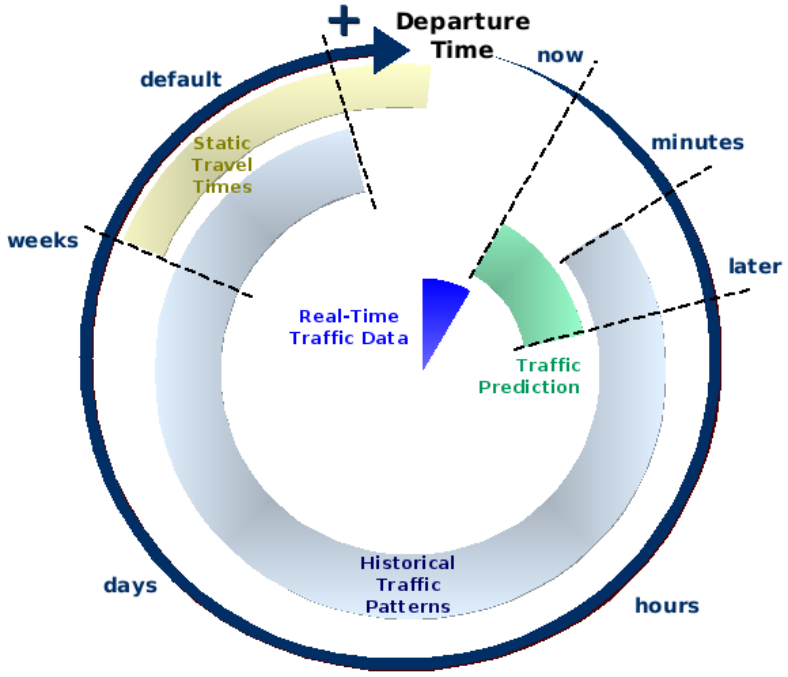


Figure 1 - Traffic Information Clock

Previous work undertaken in EasyWay[i] identified three Core Service areas for traveller information which require harmonised deployment in response to the aims and objectives outlined above. These are:

- Pre-trip traveller information services;
- On-trip traveller information services;
- Co-modal traveller information services.

Further to these Core Services, five Traveller Information Services were identified which transcend the pre-trip / on-trip boundary. These are classified by information content rather than by their position within the timeline of the traveller's journey. The relationship between the Core European Services and the content based approach adopted in the TIS Deployment Guidelines DG02-07 is shown below in Figure 2

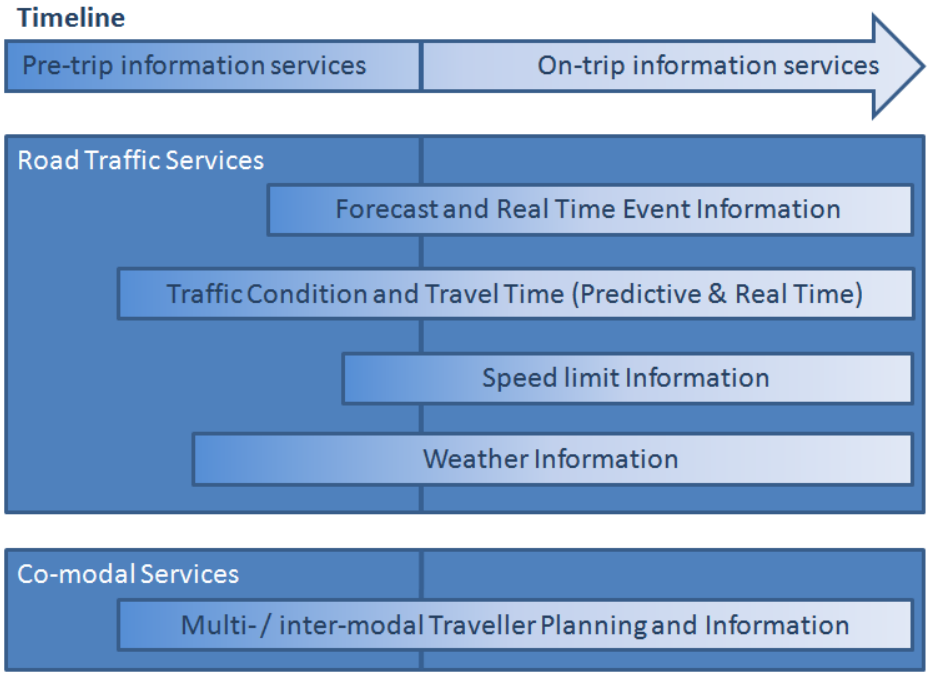


Figure 2 - Relationship between the Core European Services and content based services

The Role of the Guidelines for Traveller Information Core Services

Ideally, Traveller Information Services in the European dimension should provide continuity across neighbouring regions and between member states. However, currently they are often disjointed and fragmented. The overarching purpose of the Guidelines is to facilitate the development of existing and new services to deliver a truly pan-European dimension not just by combining the different services but also by giving travellers an assurance about expected levels of service and quality across the TEN-T road network.

The EasyWay project had developed the Deployment Guidelines shown above to promote the concept of harmonised traveller information services throughout Europe. These documents will help guide deployments on European ITS corridors. They are living documents which will evolve over time and be updated to take on board developments in key aspects of deployment such as quality assurance. As future developments allow, these documents will also give additional guidance on which standards and levels of service should be applied to different road network operating environments.

DG01 – TIS Reference Document

DG01 TIS Reference Document acts as a foundation and overview of the key issues which affect the individual traveller information services. It illustrates the issues common to all five services within traveller information and provides context for the content specific Guidelines which refer to the five traveller information services outlined in Figure 2.

This document directs readers to consider the entire information chain when implementing TIS, providing references to relevant projects and initiatives, and describes how TIS interact with other services. It is entitled DG01 and the individual technical documents referred to as Guidelines DG02 to DG07. The TIS Reference Document forms an integral part of each individual Guideline DG02 to DG07 and users should consider them jointly as one document (for example, the Guideline for Weather Information includes Guideline DG06 and the TIS Reference Document), see Figure 3.

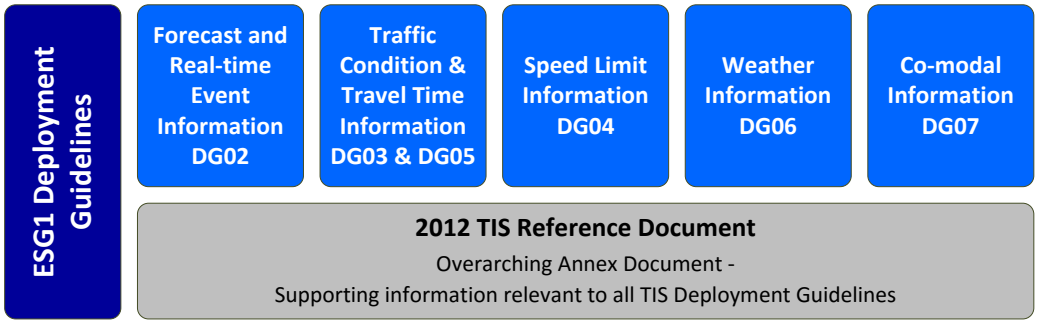


Figure 3 - Representation of TIS Guideline Documents

The Users of these Guidelines

These documents have been produced by EasyWay primarily for use by local and national road operators. There are five key roles in the traveller information value chain which are outlined by Figure 4. The roles are performed by a number of different types of stakeholders including both private commercial providers and public road operators. There are large differences between who and how these services are currently provided across the European Member States. Figure 4 below provides the basis for road operators to consider their roles within the value chain in a way which develops the Core Services towards interoperable, seamless and harmonised ITS services. For more details of this and of these actors see Section 3.1.

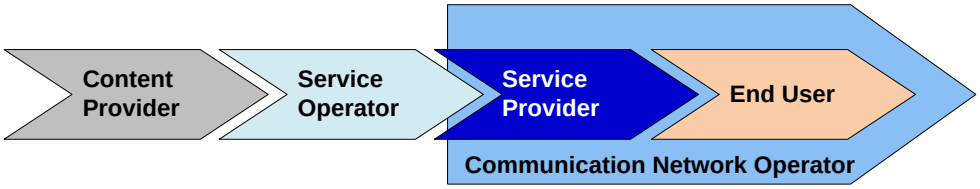


Figure 4 - Value chain for traffic information services

However, these documents also seek to provide guidance for all actors at all stages within the traveller information value chain and so are also relevant for private stakeholders. Approval and use of these documents by the European road operators supports progression towards the proposed interoperable harmonised pan-European traveller information services as outlined in EasyWay; and the establishment of a framework to support the implementation of strategies in achieving stated policy objectives. Due to the varied nature of travel information providers across Europe the probable realisation of such services will be greatly increased if private stakeholders also take due cognisance of these documents in future implementations. At present private stakeholders are not governed by the development of these Guidelines and therefore have not formally endorsed the content or committed to follow the guidance. However, road operators are developing relationships in the traveller information domain with private stakeholders, overarching representative bodies and beyond (e.g. CEDR, UITP, TISA) to establish common ground and continue working together to help realise the common needs of the traveller and help achieve wider policy goals.

The harmonisation of content for Traveller Information Services has been highly leveraged by EU Commission Delegated Regulations (885/2013, 886/2013 and 2015/962) that regulate the availability and accessibility of content for TIS in the domains of safe and secure parking places for trucks and commercial vehicles, safety-related traffic information and EU wide real-time traffic information services. Although the vast majority of the current content of the Deployment Guidelines had been developed prior to the publication of the Delegated Regulations, the guidelines are still a valuable tool for the deployment of such services and will in the future evolve to serve as a compendium and a glue layer between the regulatory requirements and the best practice in the field.

Table of Contents

1 Introduction 11
1.1 The concept of the EasyWay Deployment Guidelines 11
2 General Framework 13
2.1 General Service Description 13
2.2 Contribution to EasyWay Objectives 13
3 Functional Issues 16
3.1 Introduction to key actors in the traveller information value chain 16
3.2 Conditions for Service Provision – Business Model 23
4 Technical Issues 26
4.1 European Dimension 26
4.2 Functional and Information Architecture 26
4.3 ICT Infrastructure Requirements 28
4.4 Standard and Agreements: Existing 30
4.5 Standard and Agreements: Required 33
4.6 Need for Additional Specifications 34
5 Service Provision 37
5.1 Levels of Service and Quality 37
5.2 Operating Environments 39
5.3 TIS Roadmap 40
5.4 Interaction with other Services 41
6 Implementation Plan: Timetables, Activities and Resource Need 45
6.1 Vision for the Future 45
6.2 Overview of Foreseen Deployments 45
6.3 Implementation Organisation for EasyWay 46
6.4 Activities and Timetable 46
6.5 Timetable and Resource Need 46
7 Annex A: CEN TIS Standards 47
8 Annex B: Standards analysed by eMOTION 50
9 TIS Value Chain: Examples 52
10 Annex C: Bibliography 54

List of figures and tables

Figure 1 - Traffic Information Clock 3
Figure 2 - Relationship between the Core European Services and content based services 4
Figure 3 - Representation of ESG1 Guideline Document 5
Figure 4 - Value chain for traffic information services 5
Figure 5 - Representation of ESG1 Guideline Document 11
Figure 6 - TIS Deployment Guidelines Benefits Radar Diagrams 15
Figure 7 - Value chain for traffic information services 16
Figure 8 - Travel Time Value Chain Example 18
Figure 9 – End Users 22
Figure 10 – Structures for TIS Service Provision 24
Figure 11 - Simplified TIS model with payment 25
Figure 12 – Application of FRAME Architecture 28
Figure 13 – Requirements of ICT infrastructure for Traveller information services 30
Figure 14 - The Value Chain and Information relationships 31
Figure 15 – TISA German Value Chain 52
Figure 16 – Example Value Chain I 53
Figure 17 – Example Value Chain II 53

Table 1 - Level of Quality 38
Table 2 - Level of Service 38
Table 3 - EasyWay operating environments for Core European ITS Services 40
Table 4 - Relationships outside ESG1 42
Table 5 – Relationship between the Traveller Information Guidelines 43

List of abbreviations

2DECIDE	EC supported project with the objective to develop an "ITS Toolkit" to assist transport authorities in the deployment of ITS (http://www.2decide.eu)
2G	Second generation of cellular wireless standards
3G	Third generation of cellular wireless standards
4G	Fourth generation of cellular wireless standards
ACTIF	Architecture Cadre pour les Transports Intelligents: French national system architecture (www.its-actif.org/)
Actor	A participant in an action or process. In the case of the EasyWay DGs we are referring to an ITS service. When people are being considered as actors, it is important to understand that the people are playing roles (such as customer, maintenance worker, troubleshooting technician, installer, and manager), and they should be documented and described by those role names. It is important to think of actors as role players and not individual persons. Defining the actors by what interactions they wish to perform with the system will help separate the actors. In other words, the description of the interactions should define and substantiate the actors' existences
ARTIST	Italian national system architecture (www.its-artist.rupa.it/)
B2B	Business to Business
B2C	Business to Consumer
BS	British Standards
CEDR	Conference of European Directors of Roads (http://www.cedr.fr/home/)
CEN	European Committee for Standardization - Comitée Européen de Normalisation. (http://www.cen.eu/)
CO2	Carbon dioxide
Co-modal	The efficient use of different modes and means of transport on their own (multi-modal) and in combination (inter-modal) that will result in optimal and sustainable utilisation of resources, high level of mobility and environmental protection. Concept introduced by the EC.
DAB	Digital Audio Broadcasting
DATEX II	Standard developed for information exchange between traffic management centres, traffic information centres and service providers (www.datex2.eu/)
DG	(EasyWay) Deployment Guideline
DSRC	Dedicated Short Range Communications
EC	European Commission (http://ec.europa.eu/index_en.htm)
EEG	Expert Evaluation Group
E-FRAME	Extended project of the forerunner project FRAME (http://www.frame-online.net/)
ESG	Expert Study Group
EU	European Union (http://ec.europa.eu/index_en.htm)

EW	EasyWay
FM	Frequency Modulation (FM broadcast band)
FRAME	Framework Architecture Made for Europe (supported project by EC DG INFSO)
GPRS	General Packet Radio Service
GPS	Global Positioning Systems
GSM	Global System for Mobile communications
HGV	Heavy Goods Vehicle
I2V	Infrastructure to Vehicle
ICT	Information and Communication Technology
Inter-modal	A transport system that allows at least two different modes, and/or means of transport, to be used in an integrated manner (in combination) in a door-to-door transport chain. This necessarily involves transferring from one mode (or means) of transport to another. This usually takes place at modal interchanges. The development of a seamless web of integrated transport chains linking road, rail and waterways (and/or also linking different means of transport) leads to improved flexibility, quality, and cost effectiveness.
IP	Internet Protocol
In-Time Project	Intelligent and Efficient Travel Management for European Cities (http://www.in-time-project.eu) - ICT Policy Support Programme EC funded project
ISO	International Organization for Standardization (http://www.iso.org/)
ITS	Intelligent Transport Systems
KAREN Project	Keystone Architecture Required for European Networks - 4th Framework Programme (1998 - 2000)
LoQ	Level of Quality
LoS	Level of Service
LTE	Long Term Evolution
MMS	Multimedia Messaging Service
Multi-modal	A transport system that offers at least two different modes and/or means of transport to be used in a parallel manner in a door-to-door transport. The policy principle is not to stick to one single mode/means of transport information but also offering alternative means of travel.
Partner	Member States and organisations participating and receiving finding through the EasyWay project
PC	Personal Computer
PDA	Personal Digital Assistant
PND	Personal Navigation Device
POI	Points Of Interest
POLIS	European Cities and Regions Networking for Innovative Transport Solutions (http://www.polis-online.org/)
PSI	Public Sector Information
PT	Public Transport

QUANTIS	Quality Assessment and Assurance Methodology for Traffic Data and Information Services - supported project by EC DG TREN. (http://www.quantis-project.eu/)
R&D	Research and Development
RUC	Road User Charging
RDS-TMC	Radio Data System Traffic Message Channel
SIRI	Service Interface for Real Time Information
SMS	Short Message Service
Stakeholder	A person, group, or organisation that has direct or indirect stake in an ITS service because it can affect or be affected by the actions, objectives, and policies related to the ITS service. Actors are always stakeholders, but many stakeholders are not actors, as they do not interact directly with the service even though they have stake in it.
TEAM	Czech Republic ITS National Architecture Project (www.czech-team.eu)
TEN	Trans European Network
TEN-T	Trans European Transport Network
TIC	Traffic Information Centre
TIS	Traffic Information Service
TISA	Traveller Information Services Association (http://www.tisa.org/)
TM	Traffic Management
TMC	Traffic Message Channel
TPEG	Transport Protocol Experts Group
TTS-A	Transport Telematic System—Austria
TV	Television
UITP	International organisation for public transport authorities and operators, policy decision-makers, scientific institutes and the public transport supply and service industry. (http://www.uitp.org/)
UMTS	Universal Mobile Telecommunications System
V2I	Vehicle to Infrastructure
V2V	Vehicle to Vehicle
VMS	Variable Message Sign
WAP	Wireless Application Protocol
WWW	World Wide Web
XML	Extensible Markup Language

1 Introduction

1.1 The concept of the EasyWay Deployment Guidelines

1.1.1 EasyWay began in 2007 and has established a huge body of knowledge and consensus for harmonised deployment of ITS services. This knowledge has been captured in documents providing guidance on ITS service deployment, the EasyWay Deployment Guidelines.

1.1.2 Core European ITS Services are a specific set of ITS services that have been identified by and agreed between the EasyWay partners as key components in a package of services for the European road user, these have been developed into Deployment Guidelines.

1.1.3 The Deployment Guidelines started with their first iteration mainly capturing best practice. This supported service deployment in EasyWay very strongly by:

- making EasyWay partners in deployment cognisant of experiences made in other European deployment programmes;
- helping to avoid making mistakes others have already made; and
- reducing risk and facilitate the efficient deployment by highlighting important and critical issues for particular consideration.

1.1.4 This best practice model has already successfully contributed to ITS deployments all over Europe, and it is possible now to take the next logical step and actually start recommending those elements of service deployment that have proven their contribution to both, the success of the local deployment as well as the European added value of harmonised deployment for seamless and interoperable services.

1.1.5 Deployment Guidelines including Level of Services, for each of the Core European ITS Services, provides the information needed for road operators to ensure that implementations are made in support of European cohesion and defines steps in gradual improvement of the service in relation to the Operating Environments.

1.1.6 This summary document provides an overview of the Deployment Guidelines for traveller information services and incorporates those common issues relevant to all five content based Guidelines. These documents have been produced by EasyWay primarily for use by EasyWay partners who are themselves predominantly comprised of local and national road operators. Figure 5 outlines the relationship between the Reference Document and individual Guideline parts. The TIS Reference Document should be read with each Guideline DG02 to DG07.

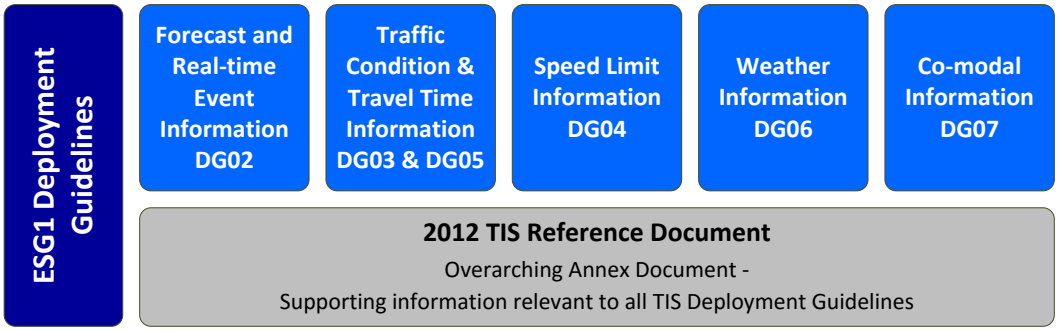


Figure 5 - Representation of ESG1 Guideline Document

1.1.7 This TIS Reference Document has been produced to reduce repetition between the individual information content based Guidelines DG02 to DG07:

- DG02 Forecast and Real-time Event Information
- DG03-05 Traffic Condition and Travel Time Information
- DG04 Speed Limit Information
- DG06 Weather information
- DG07 Co-modal Traveller Information

1.1.8 Part A of Guidelines DG02 to DG07 contains the requirements to be applied when implementing each service, Part B contains all supporting information relevant to that specific service. The issues deemed **relevant to all services** are included within this TIS Reference Document.

1.1.9 The individual traveller information services are currently at different levels of maturity; as indicated in the EasyWay II Strategy and Action Plan[ii]. As technologies evolve and as TIS standards are developed; more harmonised implementations are anticipated. This progression will lead to further evolutions of the Guidelines.

2 General Framework

2.1 General Service Description

2.1.1 It is the goal of EasyWay that partners will undertake projects to achieve harmonised deployment of its services in the fields of Traffic Management, Travel Information and Freight and Logistics. However, to achieve this, current levels of service need to be enhanced by improving existing infrastructure and systems, filling in remaining gaps in network coverage and ensuring a continuity of service on the TEN-T roads.

2.1.2 The General Service description for all Traveller Information Services is that they should provide the European traveller with comprehensive real time traffic information allowing for well-informed travel decisions before setting off (pre-trip information) as well as information during the journey (on-trip). It includes real time information concerning the TEN-T road network as well as interfaces with peri-urban networks and with other transports modes, especially in urban areas. Such interactions include the physical road interfaces i.e. key routes linking motorway and urban networks; and ICT interfaces such as DATEX II to exchange information between relevant actors.

2.1.3 This content based approach to the production of the Guidelines for traveller information requires a strong understanding of the actors and processes which govern the relationships in this field. An appreciation of the current actors in the value chain is also an important prerequisite to the development of any business models for traveller information as outlined in the corresponding section of this report.

2.1.4 The specific service descriptions for each traveller information service are outlined in the individual Guideline documents DG02 to DG07.

2.2 Contribution to EasyWay Objectives

2.2.1 The deployment of Traveller Information Services in the second EasyWay period (2010 – 2012) should contribute towards the overarching objectives for 2020. The work already undertaken by the Evaluation Expert Group (EEG) during EW I will help illustrate the benefits of traveller information service implementations in terms of the above objectives and underline their contribution to EasyWay objectives. It is acknowledged that ITS evaluation is complex; the achievement of these targets could be affected by other external factors outside the control of the EasyWay project. Currently there is no (agreed) methodology on how to measure the contribution of a single TIS service to the overalls goals set; so input from the EW EEG should be sought.

2.2.2 Overall, the initial EasyWay evaluation shows that where services have been deployed, the benefits delivered are in line with the objectives set by the project[iii]. The deployment of on-trip Traveller Information Services and warning within EasyWay (e.g. roadside and on-board information) have shown a positive impact on road safety (up to 11% reduction in injury accidents during adverse weather conditions), mobility (up to 20% reduction in travel times with roadside VMS) and environment (up to a 10% reduction in energy consumption, with commensurate impacts on CO_2 emission). When displayed pre-trip (e.g. internet, travel time predictions), the impact of Traveller Information Services on safety and congestion is lower (up to 2% reduction in congestion) but the provision of co-modal information, which aims to foster modal shift, could lead to a greater reduction in CO_2 emissions overall.

Safety

2.2.3 Traveller information has three primary impacts in increasing road safety.

2.2.4 The first is largely theoretical. It assumes that an increase in mode share for public transport can be achieved through high quality pre-trip and co-modal traveller information. The reduction in traffic levels on the road in turn has a positive impact on safety by reducing the number of accidents and managing demand on the road asset particularly at peak times. It is also generally accepted that travelling by public transport is inherently safer than travelling by car, the UITP states that the public are 10 times more likely to be involved in an accident travelling by car that by public transport[iv].

2.2.5 A more direct impact of traveller information, although still difficult to quantify, assumes the timely provision of on-trip traveller information reduces accident rates. For example, informing drivers of extreme weather conditions or current traffic conditions ahead of their travel can increase drivers' awareness and therefore reduce accident rates. For example, in San Antonio Texas, deployment of dynamic message signs combined with an incident management program, resulted in a 2.8 % decrease in crashes[v].

2.2.6 Information which principally addresses the efficiency of driving such as travel time information also has an indirect safety effect as informed travel leads to less risky driving behaviour. Past TIS studies have revealed that traveller's value timely information on the traffic conditions, and that real-time traffic information reduces travel uncertainty and the stress due to uncertainties[vi].

Network Efficiency

2.2.7 In a similar manner to safety, supporting increased modal shift toward public transport requires good quality pre-trip and co-modal traveller information. This allows for more efficient pre-trip routing decisions and/or departure times; thus increasing network efficiency and improving asset efficiency. On-trip information related to current road conditions (i.e. travel time, weather status/ warnings) should have a positive impact on network efficiency as drivers should use this information to make more effective travel decisions. In future it may be possible for well informed travellers who improve their choice of mode, route and departure time to contribute to a more even spread of traffic throughout the day. Relevant research[vii] in this area has shown that:

- making information services work well under incident conditions is likely to be cost effective
- providing travellers with information as early as possible is likely to increase its effectiveness in terms of behavioural adaptation.

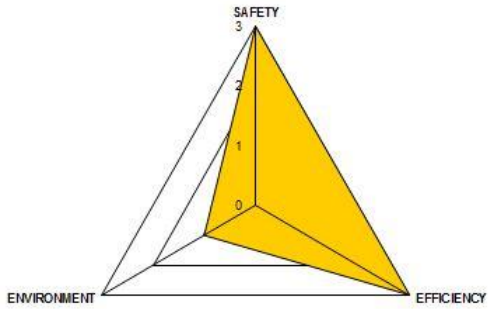
Environmental Impact

2.2.8 The positive environmental impact of traveller information is primarily tied to the increase in network efficiency noted above. So, for example, avoiding stationary or slow moving traffic will reduce congestion and therefore emissions of CO_2 and other air pollutants. More recent research also indicates that where such information is available the more environmentally conscious traveller may, by comparing the impact of their vehicle journey with public transport alternatives, opt for the most environmentally friendly journey choice[viii]. Furthermore, keeping the environmentally aware driver informed "on trip" of environmentally sensitive areas and linking this with suggested speed control may promote better compliance with the variable speed limit. In France, it is common to reduce the general speed limit by 20 or 30 km/h on a temporary basis, generally in case of high temperatures, with the aim to reduce air pollution and smog.

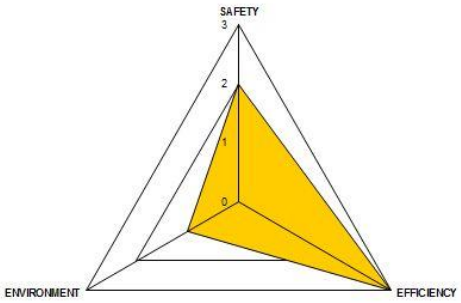
Traveller Information Services Radar Diagrams

2.2.9 The radar diagrams below, Figure 6, show the strength of the relationships between the TIS Services and the EW objectives. The applied scales for the service radars are based on an expert view and not on specific scientific analysis.

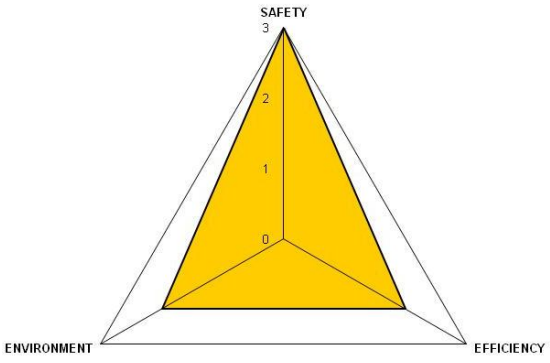
DG02 - Forecast and Real-time Event Information



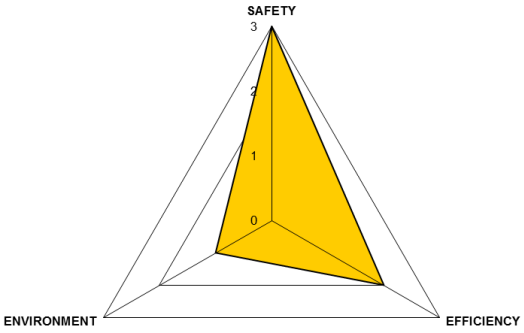
DG03 & DG05 - Traffic Condition & Travel Time Information Services



DG04 - Speed Limit Information Services



DG06 - Weather information Services



DG07 - Co-modal Traveller Information

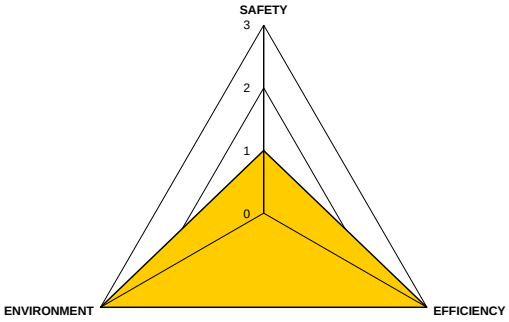


Figure 6 - TIS Deployment Guidelines Benefits Radar Diagrams

As shown in the radar diagrams, the main benefits delivered by TIS services relate to safety and efficiency; the main objectives of the majority of road operators, the EasyWay Project and the European Commission. Thus, by providing road users with high quality, accessible traveller information benefits can be gained on existing networks without deploying significant additional infrastructure.

3 Functional Issues

3.1 Introduction to key actors in the traveller information value chain[ix]

3.1.1 It should be noted that the value chain shown and described in this document is a modified version of the eMOTION value chain; this is not meant to be prescriptive as there are many other examples of TIS value chains all essentially describing similar actors and processes, but with differences in emphasis and allocation of functions reflecting national practices and other business models; for example the TISA value chain, and German chain; examples of which are provided in Annex 9.

3.1.2 There are several key actors in the value chain in providing dynamic traffic information services:

- The source of all information services is a content owner or **content provider** who owns the content (e.g. traffic data) and/or provides the content for a service application.
- A **service operator** who uses this content to generate information with added value. The information then forms part of a service and covers not only the adaptation of the original data but also the visualisation of the information (e.g. the creation of a thematic map).
- A **communication network operator** publishes the service (to a service provider) and supplies the communication network for the service (like a mobile network or an internet provider).
- The **service provider** is the interface to the customer. They publish the service and are responsible for all marketing and contractual issues with the end user.
- The **end user** is the consumer of the information service.

3.1.3 This relationships chain is illustrated in Figure 7 below. The following paragraphs give more detail on each of these players and their functions and characteristics. It should be noted that the precise roles and position of actors is not the same in all situations; this depends on national and regional TIS organisational structure and business case.

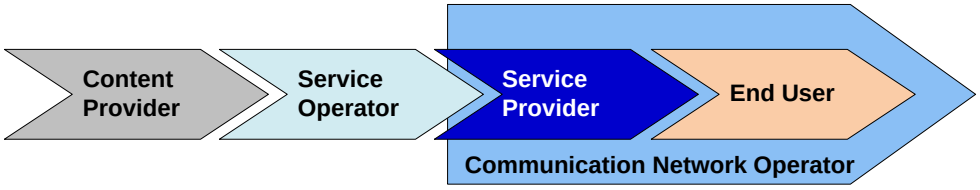


Figure 7 - Value chain for traffic information services

Content provider

3.1.4 The content provider is the origin of the data used in information services. They are the first node in the value chain and therefore in most cases also the content owner, i.e. the institution that collects the data and controls rights to use and distribute the data. The content provider collects and administers the data (e.g. traffic data on traffic volume and velocity are collected by traffic control centres not primarily for use by traffic information services but for the operation of traffic control systems). However, this data has value in traveller information systems e.g. in indicating journey time information and in traffic management.

3.1.5 It is important to distinguish between the role of public/free content providers that collect data (primarily for internal use) and who provide it for the use in public or private/commercial information services; and private/commercial content providers whose business is to collect data and to sell the data to service operators. Examples of different public and private content providers are:

- National, regional or local road authorities
- Police

- Commercial traffic data provider
- Commercial traffic information provider
- Toll system operators
- Parking facilities operators
- Public transport operators
- Automobile clubs
- Private road operators
- Private address and POI data provider
- Weather services
- Map agencies
- Commercial map enterprises
- Mobile/cellular phone operators

3.1.6 In addition to these more traditional approaches to public/private providers of content there are now also alternative models where it is the end user who is increasingly performing the role of content provider (such as the free editable map website OpenStreetMap: www.openstreetmap.org). These information sources often work on the premise of building a user generated consensus of a situation to provide information which is effectively then verified by the network users.

3.1.7 A service set to impact on the collection of traffic related data is eCall. eCall is an electronic safety system, the aim is to automatically dial 112 in the event of a serious road accident, and wirelessly send airbag deployment and impact sensor information, as well as GPS coordinates to the nearest emergency centre. On the 8th September 2011, the European Commission adopted a Recommendation addressing the EU Member States and asking them to call on the mobile network operators to set up their networks in a way that they correctly transmit automatic 112 emergency calls generated by cars (eCalls). This service will take data from the user directly to the service operators and emergency services.

3.1.8 In most cases, the data provided by the content provider is “raw data” without any data refinement (meaning without generation of additional value); and the only data processing that the content provider carries out is a basic quality check to identify errors and missing data, and replace the missing or incorrect data. The data processing carried out by the content provider is done only to ensure the usability of the data for internal purposes and for the service operators. If content providers carry out additional data processing tasks such as forecasting or the generation of a thematic map based on that raw data, the content provider can then become a service operator (even if this is a very basic service).

3.1.9 The commercial interest of the content provider is to sell and distribute the information within the relevant TIS business area (i.e. sat nav content). Public content providers are not normally motivated by commercial interest but rather because they want to drive forward domestic or European wide policy objectives in relation to reduction of congestion, improved safety, supporting modal shift or environmental objectives. They provide data to facilitate or enhance services provided by other public/private stakeholders. There may be issues on the part of the public provider to ensure that if the data has been collected at the taxpayers expense that this is not then charged for again. Rather the expectation may be that it is only the value which has been added to it by a commercial provider which can legitimately be charged for.

3.1.10 As noted above, in some cases, the content provider is also service operator or service provider. For example, regional or national traffic information centres often provide raw data as content provider to service operators and operate information services on their own. Local public transport operators are often not only content provider but also service provider to inform their passengers.

An example of a value chain in practice is shown in Figure 8 below:

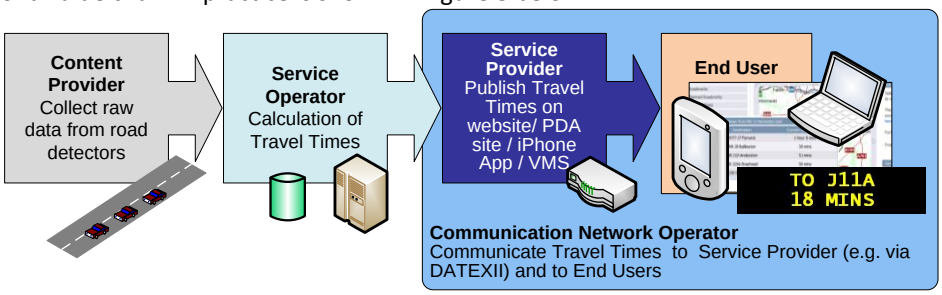


Figure 8 - Travel Time Value Chain Example

Service operator

3.1.11 Typically the service operator uses raw data from the content provider which is refined and used to generate useful traveller information. The refinement of raw data can be done by applying different methodologies such as data fusion with data from other data sources or by using an algorithm and historic data for a more refined result.

3.1.12 The generation of information consists in the integration of the data into any kind of presentation useful to the end user (e.g. generation of a thematic map, generation of animated graphic, generation travel times from traffic data etc). The raw data provided by the content provider does not have any practical use to the end user. Information is not created until the raw data is interpreted and combined to give it meaning and practical use. One example is the generation of a thematic map where traffic flow data is referenced to a road section and visualised by colouring the road section.

3.1.13 The service operator generates information services for different service providers and different end user devices; e.g. websites, PDAs, smart phones. An animation or a thematic map with the same content can be generated in different ways for different service providers (corporate identity) or different end user devices (different technology platforms). There are many different service operator models.

3.1.14 Additionally, service operators can provide clearing functionality to support interoperability of different services, i.e. a central hub for the collection and distribution of information . This functionality can also be provided by other actors of the value chain.

Communication Network Operator

3.1.15 The Communication Network Operator is the actor who provides the communication channels needed to deliver the information to the end user and to suitably interconnect the actors involved.

3.1.16 The end user typically receives information though the medium of personal computers for pre-trip information, personal mobile devices or on-board units installed in vehicles e.g. sat navs for on-trip information. In the case of personal mobile devices / on-board units the use of wireless and mobile communication technology and networks is essential for the deployment of these reference services. Nevertheless, for the service chain to work effectively, and deliver a good end user experience, requires proactive interaction between several actors in charge of collection of raw data, processing and aggregation, and preparation of contents for delivery, etc. This complex process requires the exchange of several data sources, some of which may be time-sensitive. To make this work effectively the availability of a viable fixed and mobile communication infrastructure is vital to delivering services.

3.1.17 For these reasons, the communication network operator is a key actor because they are in charge of managing a heterogeneous fixed/mobile network environment able to interconnect all the actors involved based on their specific needs. The communication network operator has to provide reliable communication channels which can seamlessly connect the end users, vehicles, road infrastructure, and service centres and which are resilient. Resilience is a key issue as it impacts on the credibility and usage of the services by end users. This is delivered by means of standard solutions able to guarantee the portability of the solutions in a pan-European environment, and allows a modular deployment of the services and solutions according to the specific local needs. Another important consideration in terms of ICT infrastructure is having back-up systems to support the resilience of the service.

3.1.18 In addition, in this specific area a new role for the network operator is also starting to emerge. Traditionally network operators provide the communication link between service providers and users. Increasingly they are becoming a more active part of the supply chain through providing telecom capabilities to external actors (typically service providers and/or service operators) in order to simplify their specific job. For example facilitating the use of mobile phone signalling data to monitor travel times and congestion; or billing for value added traffic information services through mobile phone contracts. International TIS is only effectively possible to deliver if roaming fees are kept to a minimum, if not abolished completely for V2I-communications. Some progress on this has already been made; under rules set by the European Parliament, it will be less expensive to make calls and download data abroad. New limits on making and receiving calls, and downloading data came into effect in July 2012.

3.1.19 In this way, the external actors might not need to develop, invest, deploy and maintain expensive infrastructures themselves to deliver a dedicated service but can as an alternative use network services normally available only to the communication network operator itself (e.g. network based location, presence, ad-hoc signalling/transport channels etc.). In such circumstances, the communication network operator is no longer just the company that passively provides the network access (internet, mobile phone network, radio, television) in order to increase traffic, gain market shares and attract new users, but it actually becomes one of the proactive actors in the value chain.

Additionally, communication network operators can provide clearing functionality to support interoperability on data level for legacy applications. This functionality can be part of other actors of the value chain as well.

3.1.20 ITS based on wireless technologies are enabling new strategies for relieving traffic congestion, improving road safety and enhancing productivity. IP is an open, widely available, widely used, internationally interoperable communications protocol. The use of IP enables a resilient, diversely routed, telecommunications network that can adapt and expand to take advantage of developments in traffic management technologies and traveller information provision in the future. An IP device may also be contacted remotely for maintenance purposes, reducing the need for visits to the roadside.

Service provider

3.1.21 The service provider is the institution who provides the direct interface to the end user with the purpose of providing services including traffic information. The service provider could be a private company or a public institution such as a local road administration or traffic information centres enabling and providing a service either to a narrow target group or a broad range of users. This could be done within the current business or as an extension of a current company or as a new enterprise.

3.1.22 Service providers offer the information service to their customers and have to operate all functions related to the customers such as billing, customer administration or marketing. In most cases, the service provider is acting as service operator too. This means that they use data from a content provider, process the data to generate information and provide this information to the end user. Sometimes the service provider uses a service that is operated by another service operator (e.g. many providers of internet portal services offer a routing service that is operated by a service operator such as map24: http://www.map24.com); or integrates other third party information e.g. public transport information to provide a more complete service.

3.1.23 If the information service provided to the end user is not free of charge, the service provider has to administrate customer billing, or absorb these costs. Furthermore, if the service provider uses content and external services that have commercial costs, they have to pay the charge for the use of content and services to the particular content provider or service operator.

3.1.24 The service provider may have a commercial interest in providing packaged and filtered information to a group of target users through a service. Public service providers have often the non-commercial interest in supplying information services to citizens for free to advance wider public policy objectives, i.e. supporting modal shift, managing network demand, improve safety, reducing the impact of transport emissions on the environment.

3.1.25 Often service providers use several communication channels and end user devices to publish their services. In most cases the basic services are provided over the internet via web information services (accessed by end users in pull mode). Sometimes, information services are also provided in push mode using email, after subscription by the users; this may be providing general access to information or can be personalised (configured by users to routes they use regularly). Often “mobile services” are derived from base internet services and are provided on mobile end user devices such as PDAs using mobile internet, mobile phones, smart phones, internet enabled devices, WAP or SMS/MMS and voice services. Clearly, service providers have to think carefully about the scalability and resilience of their systems particularly as user uptake of their services grows and they have an audience for their service. This is particularly so during periods of peak demand when there is an opportunity to impress to hold onto to early adopters and new entrants. Service downtime during such mission critical periods can ultimately damage the credibility of the service. It should be noted that it is illegal to use a mobile phone without hands-free equipment while driving in all EW countries; so it is important to remind drivers not to use mobile phones while driving etc. Legislation may evolve further in recognition of the proliferation of mobile devices and their use, including social networking.

3.1.26 In the future, due to the current trends in emerging standards and European R&D activities, new solutions based on the real-time interaction among vehicles (V2V communications) and vehicle-infrastructure (V2I communications) will also become available. The service providers will have to monitor this evolution and develop scalable solutions suitable for integration with the new technology as soon as they become standardised and commercially available.

End user

3.1.27 The end user is the customer of the service provider. The end user is interested in getting timely information so that they can travel safely to their destination in the shortest distance or journey time with the least obstacles or disruptions. The use of the information can be for private or business use. The role of information as defined is to:

- inform the individual of travel options;
- empower the individual to make fully informed choices; and
- assist the individual to successfully undertake and complete the journey by getting timely updates which allow them to be aware and if practical allow them to take avoiding action.

Increasingly end users are motivated to make travel choices by the option which has the least detrimental impact environmentally. By making users aware of the carbon or emissions savings of certain modes against others for individual trips users may alter their travel choices.

3.1.28 End users have a variety of needs affecting their travel which should be met to allow them to complete their journey e.g. at the lower cost, or the ability to select the most time effective/convenient journey. In order to select the lowest cost or the fastest trip, they need relevant information. When dealing with the harmonisation aspects of the service, operators should keep in mind that services (and their harmonisation) should not distract the driver.

3.1.29 Furthermore, providers should design services around user needs with information being delivered in formats and on the technology platforms which are most accessible to widest number of users.. Information provided to end users needs to deliver what the consumer wants when they want it and where they are. Unless the perceived benefits of access to information exceed the perceived costs, users will not consult or regularly use the information service. The cost of a trip is comprised of features such as:

- financial cost (i.e. fuel cost, tolls/RUC costs, public transport charges);
- time to be spent travelling;
- perceived comfort;
- perceived reliability; and
- familiarity.

Information access also has a cost including:

- time to discover;
- time to access;
- complexity of accessing;
- financial cost of access; and
- cost of distraction from other tasks.

3.1.30 Many of non-financial information access costs will be determined by the end user device, as well as the design of the information service offered by the service provider, but others will be determined by aspects of the information provided within the value chain. In most cases, the end user will take an active role by searching for information themselves (e.g. as an internet user). They expect a user friendly system with a self-explanatory interface. The end user may not always want all the rich content available from a traveller information service but may only require those elements which affect the journey they are planning to make e.g. travel time delays, road incidents etc. This requires a facility which allows the user to select the characteristics of this travel information. Regular consumers of the same service may prefer to create a personal user profile in order to reduce the input procedure; the user then receives a personalised service tailored to their needs. In the case of smart phones, the device may use its GPS functionality to identify the user's location and then provides information relevant to that location. While the user gives some personal data he expects that privacy is guaranteed.

3.1.31 In other cases, end users utilise a service providing actual information without any further action required by them (like dynamic in-car navigation). The end user expects accurate information in time that covers their needs. The willingness to pay for any service depends how worthwhile it is in meeting the end users requirements.

3.1.32 However, end users are not a homogeneous group, and their needs will be dependent on their personal requirements and the nature of their trip. User needs may be determined by User Type; Key Function, User Position/Journey Stage and Travel Type and may be based on the way travellers use information. When undertaking detailed analysis other groups with special requirements should also be considered such as the elderly, people with reduced mobility, visually impaired, young people and those travelling with children. The schematic, Figure 9, illustrates a simplified breakdown of TIS end users. There are, naturally, many different ways to categorise end users:

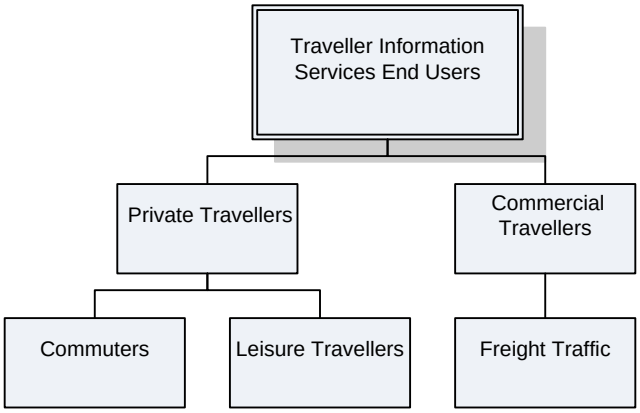


Figure 9 – End Users

- **Private Traveller**: Private travellers travel for private purpose.
- **Commuters**: Commuters travel regularly to/from their workplace. They normally take the same route and travel mode each time and the trip is mostly limited to a regional extent
- **Leisure Traveller**: A leisure traveller can be defined as somebody who travels only during leisure time and not for business purpose. These can be long distance tourists or people carrying out short day-to-day domestic trips (shopping, school run etc)
- **Commercial Traveller**: Commercial travellers travel during work hours for commercial purposes. This includes freight traffic and business travellers.
- **Freight Traffic**: The transportation of goods from one place to another. This includes local and long distance distribution.

Key function relates to the information gathering, processing and using activity in which users engage, and is basically divided into five areas:

(1) Journey creation, where a trip is planned and possibly booked;
(2) End linkages, concerned with how the destination will be reached at the end of the transport system;
(3) Verification (or tracking) where the journey is monitored to check progress is as planned;
(4) Short-term anticipation (or forestalling) which involves making adjustments to travel and avoiding disruption; and
(5) On-the-spot orientation to locate themselves on or relative to the network.

Channels of Information

Different information channels can be used for the provision of the service to the road user on end-user devices, for example:

- internet
- broadcasting facilities used by media
- analogue/digital: video, audio
- data communication: RDS, DAB
- mobile radio (2G (GPRS), 3G (UMTS), 4G (LTE)): TPEG
- roadside information infrastructure of road operators (VMS),
- I2V (infrastructure to vehicle facilities): e.g. citizen band radio, FM radio – in future cooperative systems

End user access to traffic condition information is possible by different end-user devices, for example:

- Roadside information panels (e.g. VMS)
- End user devices with internet access (PCs, tablets, mobile phones, smart phones, …)
- Navigation systems

  - by mobile radio connected PNDs (e.g. TPEG or proprietary interfaces)
  - RDS-TMC / TPEG (broadcast)
- Television, radio (spoken)
- Radio (data)

3.2 Conditions for Service Provision – Business Model

3.2.1 As described in Section 3.1; European Traveller Information can be deemed to have five main actors necessary for the entire supply chain of traveller information. These are:

- Content providers;
- Service operators;
- Service providers;
- Communication network operators; and
- End users.

3.2.2 Presently the roles outlined above (with the exception of the end user) are provided by different parties e.g. national and local authorities, either directly or through additional agreements with e.g. road operators, or by private industry when there is a business case for the development of such a service. These roles are normally governed by the following conditions:

- National authorities (or the entitled entity) provide information when:
  - There is an obligation on society to provide this information;
  - Provision contributes to policy goals;
  - There is existing market failure to be addressed.
- Private industry provide information when:
  - A successful business model exists.
  - Private, non-profit developers:
  - Groups such as students or those developing as a hobby, where they see a need.

3.2.3 Due to the diverse nature of traveller information across Europe and the large differences between national policies on traveller information, it is not possible to define within the value chain which roles industry and national authorities will perform for the whole of Europe. Expectation is that business models will evolve to reflect market conditions and the prevailing circumstances of the market in individual member states. However, it is possible to define the different roles noted above as is undertaken in the aforementioned summary (see also General Service Description 2.1). Service continuity to the users should be the primary objective.

3.2.4 Figure 10, below, provides an example of the different models that can be applied to TIS; moving from mandatory, public, free of charge services on the left to private chargeable services on the right:

- **Organisation** - these 5 categories show who is ultimately responsible for the service. For instance A.2 represents a service which is operated privately but this is not the complete picture as the private service provider acts according to the contract they have with the public body.
- **Obligation** - public administrations act according to the assigned scope of activities normally regulated by law or similar regulations.
- **Data** - TIS can consist of various different data sources. Data can be distinguished between that under public scope (C.1) which might be operated by private companies but on behalf of public, data under the public and private scope such as data collected by the private sector, commissioned by the public sector (C.2), and data under private scope (C.3)

- **Business Model** - as most services consist of providing information only it has so far proved to be difficult to create a business model for private service provision. However, it is possible that this situation might change and create a market for value-added services run by private operators. In any case, there should be a basic service available free of charge. A service such as traffic on Google maps is an example of a Free of Charge Commercial Service.

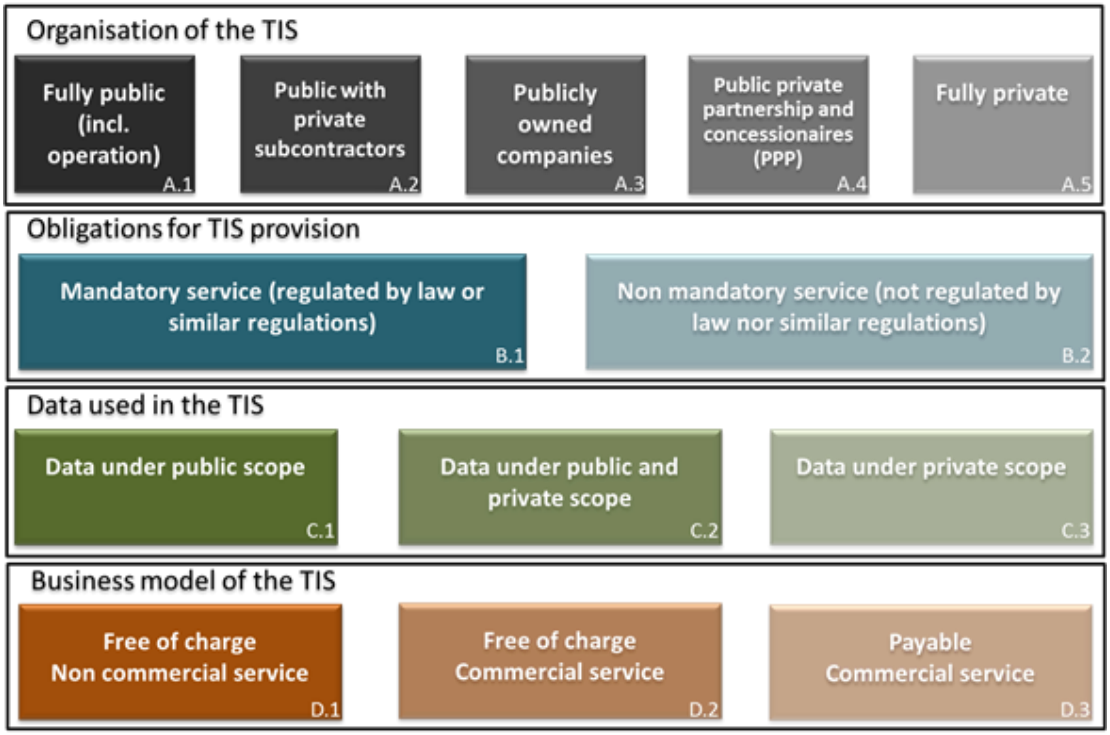


Figure 10 – Structures for TIS Service Provision

3.2.5 It is also far beyond the scope of these Guidelines to identify and outline individual business cases for every future service for the end user in traveller information and incorporate regional/ national differences in the supply and demand of this data. In some cases, there is no business case in its literal sense where traveller information services are contributing (indirectly) to broader objectives such as an efficient, safe and environmentally friendly way of travelling.

3.2.6 Therefore, it is recommended that the individual public authorities / service provider review how their existing information provision compares with the recommended service levels outlined elsewhere in the Deployment Guidelines and how that might best be organised to deliver the requirements of harmonised traveller information deployment. It will be particularly important for national authorities to undertake such a review when they are working in cooperation with neighbouring authorities to ensure interoperability is achieved to comply with the proposed pan-European element of these services.

3.2.7 It will be necessary for innovative and flexible practises and agreements to be developed which prove the business case for both national authorities and private actors. For example, data sharing agreements which look to provide the public sector with real time traffic information from in car devices may be exchanged in return for quality assured traffic management data.

3.2.8 The need to develop these business cases is paramount to the future development of pan-European traveller information services. The need to harmonise these services is also vital to ensure that regardless of whether the four key roles (content providers; service operators; service providers; communication network operators) are filled by private industry or public authorities the quality, content and timeliness of information is the same within the same operating environments across the EasyWay region and that therefore harmonised traveller information comes to be expected by end users.

3.2.9 Some private service providers have begun offering traveller information to the public (Google, BeMobile, INRIX, TomTom, etc.). In all cases, there should be a basic service available free of charge (as described in Action 1.4 of the ITS Action Plan). A public consultation has been carried out by the European Commission on the provision, where possible, of road safety related minimum universal traffic information free of charge to users under the ITS Directive 2010/40/EU.

In some countries private service providers have also proposed to sell information to road operators. Quality regulations should be taken into account and end users should not pay twice for the same service. By entering to data sharing agreements public bodies have greater control over the way their data is managed and presented to the end user.

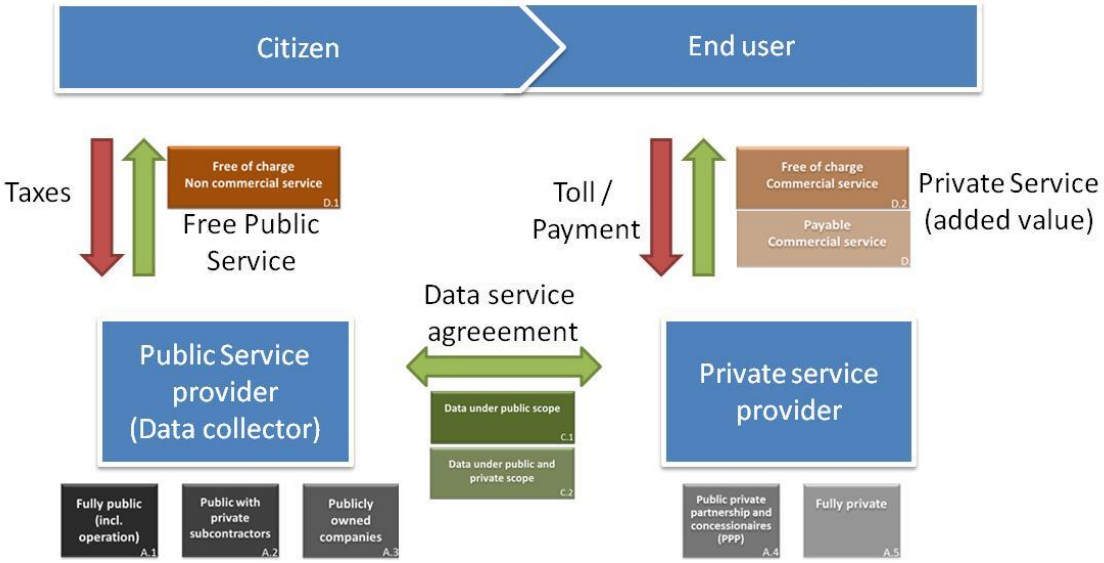


Figure 11 - Simplified TIS model with payment

4 Technical Issues

4.1 European Dimension

4.1.1 As previously outlined the purpose of these Deployment Guidelines is to facilitate the development of new and existing services to deliver traveller information services with a truly pan-European dimension. This will be realised through combining the different services and giving travellers the assurance of a reliable service quality (Level of Service) where appropriate and in due course these can be aligned with the relevant sections of the road operating environment when they have been finalised.

4.1.2 The application of these Guidelines as they develop should lead to European services in traveller information which are continuous across the TEN-T road network. Drivers by virtue of the type of road they are travelling on should be able to know what type and quality of information they can expect to receive. Through continuous deployment over the EasyWay project period, end users will increasingly come to understand that the provision of high quality travel information is having a positive impact on their journey and that receiving the right information when they need it allows them to make well informed and timely decisions about their journey choices and act accordingly.

4.1.3 For this to make a real difference on the TEN-T, this information should be capable of being presented to the traveller regardless of the language they speak, which country they are in, their proximity to the border or which mode they are travelling on. ESG1 strongly supports the use of proposals made in “VMS DG01 Variable Message Design – Principals of VMS Design”; although it should be noted that not all EW partners have signed or ratified the 1968 Convention; the individual TIS DGs contain the relevant references. In summary, traveller information should be available for all modes, routes and users across the European region.

4.1.4 The TIS Guidelines also need to take into account the regional variations which essentially alter the requirements for each traveller information service across Europe. For example, the severity of weather related problems across the EasyWay member states changes dramatically and therefore the impact with comparison to the EasyWay objectives by offering the same Level of Service for weather information also changes. It is therefore understood that regional variations in terms of weather, or any other matter, means that ITS interventions should be made to have the highest positive impact on regional issues whilst considering the need for cross border and harmonised European services. To this end EasyWay members with similar weather related problems should progress towards similar levels of service for weather information to move the whole of Europe towards harmonised traveller information services. The individual Guidelines provide the additional information which will assist users of these documents in deploying towards harmonisation.

4.1.5 The harmonisation aspects relating to “Common Look and Feel” of the TIS Core Services are included in each individual Guideline.

4.2 Functional and Information Architecture

4.2.1 The functional and information architecture describes the flow of information and processes required for provision of traveller information services. This functional architecture is a more descriptive example of the value chain outlined in Figure 7.

4.2.2 The collection of data is carried out by content providers. Historic data is also required, which is used to generate traffic situation predictions. All data must be based on a unique / compatible geographic reference model.

4.2.3 On content platforms, data from different sources is merged and aggregated. Again this process can be undertaken by both private and public sector bodies and is the responsibility of the content providers. Finally the provision of the service is managed by the service providers who complete the process through providing the B2C communication.

4.2.4 There are different requirements for the functional and information architecture within each Deployment Guideline DG02 to DG07. However, work has also been undertaken by the European ITS Framework Architecture (FRAME) project and E-FRAME extension (2008-2011). It is the recommendation of these Guidelines that these projects are referred to in the development of future functional and information architecture. These projects are summarised below:

Findings of the FRAME PROJECT[x]

Background

Following high-level recommendations, the European Commission decided to fund the KAREN project, whose aim was to develop the European ITS Framework Architecture. The first version was published in 2000. It has since been updated and extended by the FRAME projects, and is being used by a growing number of countries as the basis for their National or Regional Architectures. The European ITS Framework Architecture is designed to provide a flexible high level 'framework' that individual countries can tailor to their own requirements. National ITS Architecture projects based on the European ITS Framework Architecture, such as ACTIF (France), ARTIST (Italy), TTS-A (Austria) and TEAM (Czech Republic), therefore have a common approach and methodology, but each has been able to focus on the aspects of local importance and develop them in more detail.

FRAME focuses mainly on road-based ITS applications and covers nine major functional areas:

- Electronic Payment Facilities
- Safety and Emergency Facilities
- Traffic Management
- Public Transport Operations
- Advanced Driver Assistance Systems
- Traveller Journey Assistance
- Support for Law Enforcement
- Freight and Fleet Operations
- Support for Cooperative Systems

The European ITS Framework Architecture is a "tool-box" from which other ITS Architectures and/or systems specifications can be developed. It provides a framework for the development of National, Regional or Local ITS Architectures and Systems for ITS deployments at national, regional or local level. ITS Architecture provides a systematic mechanism for capturing the objectives and requirements of all those involved:

- User Needs
- Functional Viewpoint
- Physical Viewpoint
- Communications Viewpoint
- Deployment Study
- Cost Benefit Study
- Organisational Viewpoint
- Risk Analysis

The FRAME projects provide information, guidance, tools and practical support to help with the development of ITS Architecture.

The FRAME architecture can be used in a number of scenarios, one of which is large scale integrated ITS deployment over a number of years. Starting from a vision of what the various stakeholders, e.g. politicians, engineers, travellers, would like ITS to achieve, a sub-set of the FRAME architecture is used to provide a high-level model, or ITS architecture, of the integrated ITS that will provide it. This can then be analysed, for example for options, cost/benefit and risks. A deployment programme can be created; a high-level product specification can be produced for Calls to Tender from the various suppliers (Figure 12). Since there is no pan-European approach to implementing ITS services, FRAME has to be very flexible. The FRAME Architecture can also be used to provide a common language to describe ITS applications and services anywhere in the EU.

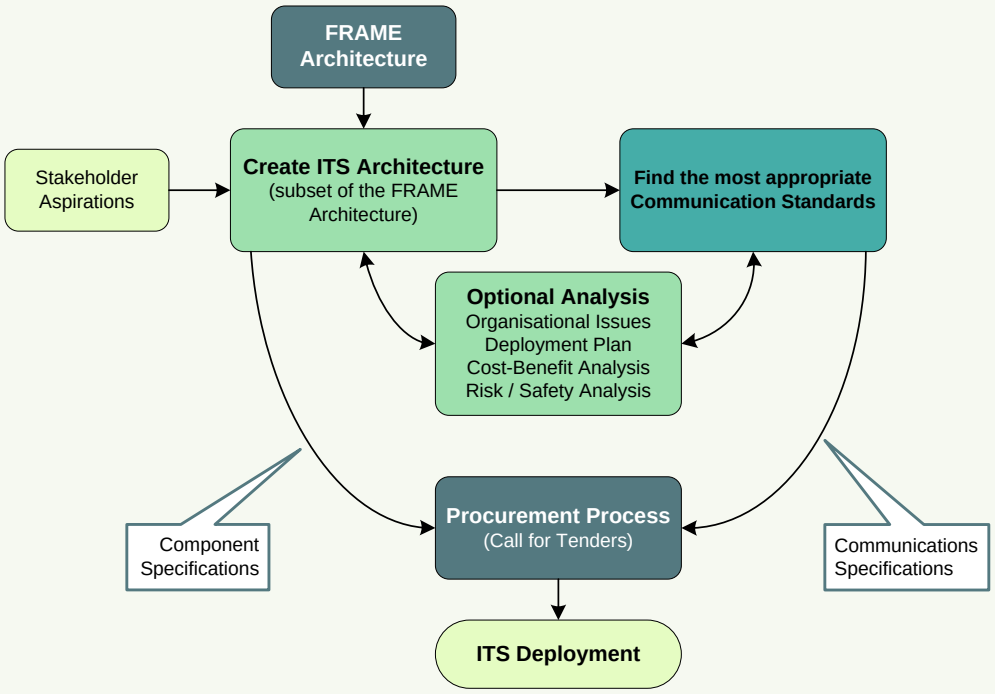


Figure 12 – Application of FRAME Architecture

Current Developments

The European ITS Framework Architecture is currently being maintained by the EC Funded Project E-FRAME (2008-11), which will extend to include inter-operable and scalable Cooperative Systems throughout the European Union. It will provide a centre of knowledge that is commercially and politically neutral, and which services everyone's long term interests.

Its main objectives are:

(1) to extend the European ITS Framework Architecture (FRAME) architecture to include new functionalities from Cooperative Systems for:

- New data from Vehicles, e.g. road conditions
- V2V communications for travel information
- Better driver information and trip planning
- Improved knowledge of road network state

(2) to show how FRAME can be used to develop and implement Cooperative Systems across EU Member States and Regions; ensuring cooperative systems will not be deployed in isolation to other ITS applications or services.

It should also be noted that the EasyWay Cooperative Systems Task Force has included the design of a functional architecture, using the E-FRAME project (Extend FRAME work architecture for cooperative systems), as a key objective.

FRAME Website - http://www.frame-online.net/

4.3 ICT Infrastructure Requirements

4.3.1 An efficient connected ICT (Information and Communication Technology) Infrastructure is a prerequisite for the deployment of Traveller Information Services, to enable the provision to the end user of relevant and high quality information from systems that monitor the road situation. A connected European ICT infrastructure should be designed to enable cross-border interoperability and continuity of services through the exchange of harmonised data.

4.3.2 A connected ICT Infrastructure consists of three dimensions[xi]:

(1) Systems for collection of data (monitoring systems) and status assessment;
(2) Systems for data fusion and processing; and
(3) Systems and protocols for communicating data (e.g. between TMC´s and to and from vehicles) and issues relating to the quality of data (accuracy, timeliness, etc following ISO / CEN etc convention)

4.3.3 ICT Infrastructure is deployed in EasyWay by ESG6. The objective of this ICT activity is to deploy monitoring infrastructure for the collection of data which is fit for purpose, and to enable traffic control centres to exchange data with the common aim of achieving an appropriate level of service throughout the TEN-T road network. Particular emphasis will be placed on congested, safety critical spots and critical weather sections of the network.

4.3.4 It should be noted that the field of cooperative systems is still undergoing great advancement. This is an ongoing task of the EasyWay Cooperative Systems Task Force. EasyWay believe that traditional TIS services will remain as a channel to the road users in the coming years. V2I interfaces will start to take over some areas (namely related to on-trip information) from around 2016 onwards. However, the database for traditional and for V2I services in the TIC/TCC might be the same, so there are synergies. Cooperative Systems (V2I, I2V, I2I, etc) is an area EW are currently exploring and close cooperation with industry actions such as Pre-DRIVE C2X is required.

4.3.5 ICT has to meet the following requirements to ensure the current and future requirements of TIS can be met:

- A Data Collection technology infrastructure
  - Traffic and road data-collection; public transport timetables
  - Monitoring of road and traffic status;
  - Monitoring of Public Transport status
  - Archive of road and traffic status
  - Databases with road and traffic and PT status
- Data fusion and processing
  - Common geographic referencing
  - Interfaces for data exchange, e.g. between operators at national level; and
  - Cross-border Protocols for data exchange
- Data Quality
  - Data quality assurances

4.3.6 The schematic below (Figure 13) illustrates a typical ICT infrastructure framework. The individual Guideline documents DG02 to DG07 illustrate any differences from this by including additional or specified requirements of the ICT infrastructure for each particular Traveller Information Service. Importantly the individual ICT infrastructure requirements over and above the basic model provided should ensure that the ICT infrastructure can meet the highest levels of both Levels of Service and Levels of Quality. However it is important to remember that the Guidelines have been written end-technology blind; concerned more with what is required to enable technologies to deliver TIS; for example:

- standards for transfer of data (i.e. DATEX II); and
- the ability to transfer information universally;

these qualities will help produce harmonised services across the TEN-T network.

4.3.7 ESG6 are considering development of a specified EasyWay Framework for ICT to support the deployment across EasyWay. The EasyWay Framework will be built in to future iterations of the Deployment Guidelines as developed.

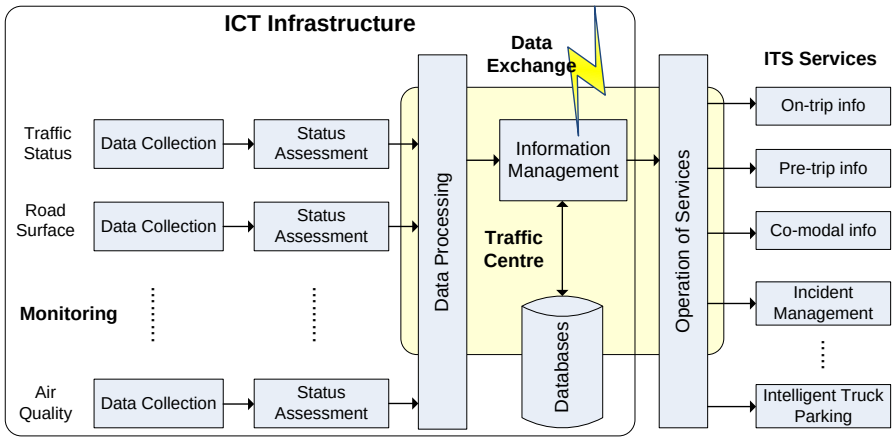


Figure 13 – Requirements of ICT infrastructure for Traveller information services

4.4 Standard and Agreements: Existing

Overview

4.4.1 There are a number of standards currently in place governing traffic information in Europe. This includes those provided by organisations such as the ISO (International Organisation for Standardizations), CEN (The European Committee for Standardization) and standards specific to national areas for example British Standards (BS).

4.4.2 CEN/TC 278 is responsible for managing the preparation of standards within the field of Intelligent Transport Systems. CEN/TC 278 has a number of Working Groups (WG) in which the actual work is carried out. WG4 is dedicated to Traffic and Travel Information. CEN Standards relating to TIS are listed in Annex A: CEN TIS Standards.

4.4.3 Regarding traffic information, perhaps the most important existing standard for data transfer is the DATEX II standard (fully published at http://www.datex2.eu/) which was developed for information exchange between traffic management centres, traffic information centres and service providers and constitutes the reference for applications that have been developed in the last 10 years. DATEX II was originally designed and developed as a data exchange mechanism by a European task force set up to standardise the interface between traffic control and information centres. The first three parts of DATEX II v2.0 has been published by CEN (TS 16157); the most important aspects of this version are:

(1) Data exchange between traffic centres on a European scale as well as bilaterally has been considerably simplified; and
(2) Data delivery to service providers is becoming more efficient and information for the end user more consistent with Traffic Management objectives. These benefits have already been demonstrated in a cooperation project with TISA for the DATEX II - TPEG chain.

4.4.4 As part of the 2012 DG enhancement process data interfaces (i.e. DATEX II profiles) have been included, where appropriate, in the DGs. Please refer to the individual TIS DGs.

4.4.5 In the field of traveller information further agreements are also in place between regional, national or international actors. Details of relevant national standards are given in eMOTION Deliverable D5 (http://srvweb01.softeco.it/emotion/Portals/_Rainbow/Documents/eMOTION_D5_Final_1_0.pdf).

Existing Exchange Scenarios

4.4.6 There are different interfaces in the value chain for the provision of traveller information services. As some members of the value chain can take over the role of different parts of the chain (e.g. a motorway operator is providing traffic information via his own website) the number of interfaces may differ from implementation to implementation and service to service. The schematic, Figure 14, describes a typical example of the value chain and the relations between actors.

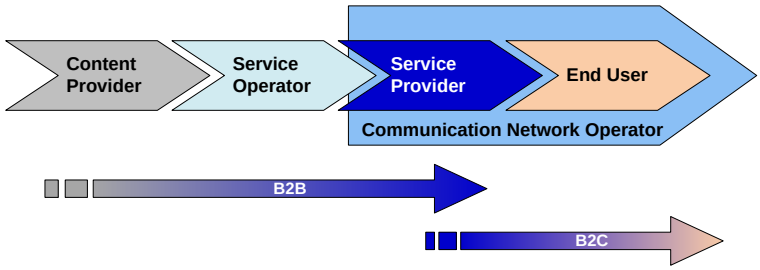


Figure 14 - The Value Chain and Information relationships

4.4.7 The largest risk regarding data/information flow processes is between Business to Business (B2B) actors due to the number of interfaces and appropriate need for specifications to produce a seamless service. The actors involved in the value chain have to manage this process with the end goal of maximising the benefit to the end user (B2C – Business to Consumer).

4.4.8 One of the key considerations is who has the ownership of data and the related questions of what the limits or restrictions are on re-using that data. Certainly, regulations are in place which governs the re-use of public sector information on the EC level. The Council and the European Parliament have adopted "The Directive on the re-use of public sector information" which deals with the way public sector bodies should enhance the re-use of their information resources[xii].

4.4.9 The Directive is built around two key pillars of the internal market: transparency and fair competition. It sets minimum rules for the re-use of PSI throughout the European Union. However, it also encourages Member States to go beyond these minimum rules and to adopt open data policies, allowing a broad use of documents held by public sector bodies. The contents of Directive 2003/98/EC of the European Parliament and of the Council are summarised below.

QUICK GUIDE FOR DIRECTIVE ON THE RE-USE OF PUBLIC SECTOR INFORMATION

It contains rules on the following aspects:

- the procedures to deal with requests for re-use;
- the availability of documents for re-use in all formats and languages in which the information exists; where possible, the material shall be made available by electronic means;
- an upper limit for charging; the upper-limit is based on costs incurred to produce the information, together with a reasonable return on investment; lower charges (or no charges at all) can certainly be applied, and public sector bodies are encouraged to do so; on request, public sector bodies have to indicate the calculation base for the charges;
- transparency of conditions applicable to re-use; charges and other conditions have to be pre-established and published; it also has to be clear where applicants can complain about decisions that affect them;
- an obligation to avoid discrimination between market players in the conditions for re-use;
- a provision to avoid cross-subsidies between the public part and the commercial part of the same public sector body, that re-uses the information;
- a prohibition of exclusive arrangements, with an exception for exclusive rights necessary for the provision of a service in the public interest;
- the availability of standard, on-line licences; in any case, licences should not unnecessarily restrict possibilities for re-use or be used to restrict competition;
- practical tools that make it easier to find the material available for re-use; this could be lists of information assets or portal sites.

(Further information on this Directive can be found by accessing the document at http://ec.europa.eu/information_society/policy/psi/actions_eu/policy_actions/index_en.htm)

4.4.10 The deployment and use of ITS applications and services will involve the processing of personal data. Such processing should be carried out in accordance with Union law, as set out, in particular, in Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data[xiii] and in Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector[xiv], among other things, the principles of purpose limitation and data minimisation should be applied to ITS applications.

4.4.11 Anonymisation as one of the principles of enhancing individuals' privacy should be encouraged. As far as data protection and privacy related issues in the field of ITS applications and services deployment are concerned, the Commission should, as appropriate, further consult the European Data Protection Supervisor and request an opinion of the Working Party on the Protection of Individuals with regard to the Processing of Personal Data established by Article 29 of Directive 95/46/EC.

4.4.12 However, it is clear when it comes to commercial data sharing the issues are much more complex. Public authorities and commercial operators should try to reach agreements which are mutually beneficial and which deliver clear added value from that collaboration. This will depend on parties having a clear vision of their respective goals and a recognition of what each is gaining from such partnerships. Such joint ventures have the potential to deliver solutions that are better than the individual actors could achieve on their own.

4.5 Standard and Agreements: Required

Background

4.5.1 eMOTION, Europe-Wide Multi-modal On-trip Traffic Information (http://www.emotion-project.eu/), co-funded by the European Commission under the thematic area Sustainable Development, Global Change and Ecosystems of the 6th Framework Programme for Research and Development (Contr. No. FP6-TREN-019939-SUSTDEV), is a co-operation between public authorities, transport service operators, telecommunication operators, IT suppliers, research centres, and transport consultancies from Austria, Belgium, Czech Republic, Germany, Italy and Spain with the aim to investigate, specify and assess multi-modal, on-trip Traffic and Travel Information Services for the European travellers. The primary aim of the eMOTION project was to investigate and specify the framework for a Europe-wide multimodal traffic information service offering real time information and special services for the road and public transport user[xv] by combining the current state of the art services. As well as looking at a range of aspects such as business planning, state of the art analysis this also included the specification of technical options of a Europe-wide service architecture, including the adoption of the relevant standards. It is the recommendation of this Guideline that the outcomes of the European Commission endorsed Deliverable[xvi] are used as a basis in the development of standards and agreements for new deployments in traveller information.

4.5.2 eMOTION incorporated investigations into the technical aspects of the service architecture, including applicable standards and their integration, and the service architecture addressing the deployment of the eMOTION service and its availability from a technology view point. The eMOTION project has undertaken a detailed review of existing standards and agreements governing the use of transport related information across Europe. eMOTION covers multi-modal traffic information services ensuring that all aspects of traveller information and therefore the five content based Guidelines are covered within this approach. The project came to an end in 2008 but activity in this area continues with projects such as In-Time (see 4.6.3).

Standards

4.5.3 Existing technical ITS standards and in-use specifications are very diverse, ranging from specific to CEN standards, some describe data models, from the abstract to concrete and from simple to complex. The more modern ones form a uniform package of data models or exchange format specifications with an integrated service interface. Today's standards usually describe data exchange encodings in XML. ISO Technical Committees, such as ISO TC204, which is responsible for the overall system aspects and infrastructure aspects of ITS; also need to be considered.

4.5.4 TISA[xvii] (Traveller Information Services Association) ensures an international framework of traffic and travel information services and products based on existing standards such as RDS-TMC and TPEG. It also works towards the development and deployment of future standards and services. Standards prepared and maintained by TISA include:

- TEC – Traffic Event Compact (complete)
- TFP – Traffic Flow Prediction (complete)
- SPI – Speed Information (almost complete)
- PKI – Parking Information (complete)
- RTM – Road Traffic Message (complete)
- PTI – Public Transport Information (complete)
- WEA – Weather Information (almost complete)
- FPI – Fuel Price Information (complete)
- RPI – Road Pricing Information (work in progress)

4.5.5 Deliverable 5 of the eMOTION Project gives an outline of collected current standards and specifications and evaluated them regarding their relevance to the eMOTION service architecture. Appendix 1 of D5 presents a much more detailed analysis which reviews the following technical domains and relevant standards:

- Road Network Data Public Transport Network Data
- Inter-modal Transport Network Data

- Location Referencing
- Traffic Flow Data
- Traffic Messages
- Parking
- Public Transport Service Data
- POI and Other Directories
- Road Weather
- Data for Routing
- Data for Public Transport Journey Planning
- Data for Inter-modal Journey Planning
- Data for Freight Traffic
- General Metadata

Agreements

4.5.6 Deployment Guidelines for travel information services must take into account existing and future relationships between different actors in the information chain. There is a need to regulate the information chain and the relationships within it to govern the systems and processes in place. There is therefore a requirement for contracts and agreements between all members of the value chain, e.g.: Content providers; Service operators; Service providers; Communication Network Operators; and End users. Contract Models and examples to rule all relations between different actors of the value chain are included within Deliverable D.4 of the eMOTION Project.

4.6 Need for Additional Specifications

4.6.1 One of the first striking results of the content analysis within eMOTION is that no standards or specifications regarding visualisation, symbolisation or styling of maps have been found. Admittedly, there appear to be some quite different national conventions in place, and it can be expected that emerging Europe-wide and international information systems will be in the future defining new de-facto international conventions.

4.6.2 Another field where there are no definitive standards is metadata. There is currently no established way to "talk" about ITS data, for example to explain its provenance, coverage and quality. The eMOTION Project selected the following ISO specifications:

- ISO 19110:2005 – Geographic Information – Methodology for feature cataloguing (eMOTION cataloguing of feature types)
- ISO 19115:2003 – Geographic Information – Metadata (eMOTION Discovery Metadata model)
- ISO 19119:2005 – Geographic Information – Services (eMOTION Services and eMOTION Applications)

4.6.3 In-Time (http://www.in-time-project.eu/) is another European Commission supported project where metadata standards will be elaborated. In-Time (Intelligent and Efficient Travel Management for European Cities) focuses on Multimodal Real Time Traffic and Travel Information services and is expected to primarily reduce delivery and distribution costs to firms, and will allow people to find best way to reach their desired destinations more efficiently. The main objective of the In-Time ICT-PSP Pilot Project is to pilot the architectural solutions investigated and specified in the FP6 eMOTION project in six European sites – Brno (Czech Republic), Bucharest (Romania), Florence (Italy), Munich (Germany), Oslo (Norway) and Vienna (Austria). The system will access a wide range of information, including public transport timetables, real time public transport information and news on accidents, road works and diversions. Deliverables are available on the In-Time website.

4.6.4 Road Weather has turned out to be an isolated area, where only little harmonisation effort needs to be spent. Surprisingly, the DATEX II model of the weather domain will need only few amendments to cover the necessary data. Also of relevance in this area is "Directive 2010/40/EU of the European Parliament and of the Council on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport"[xviii]. This sets out to define specifications for the deployment and use of ITS which includes the optimal use of road, traffic and travel data. It is necessary for these Guidelines to take due cognisance of these specifications when making Guideline recommendations.

4.6.5 On the 7 July 2010 the European Parliament voted in favour of the ITS Directive. Under this Directive the Commission has to adopt specifications within the next seven years (i.e. functional, technical, organisational or services provisions) to address the compatibility, interoperability and continuity of ITS solutions across Europe. The Commission will also establish an European ITS Advisory Group, which will bring together representatives of relevant ITS stakeholders and advise the Commission on business and technical aspects of the implementation and deployment of ITS in the Union.

4.6.6 A key pillar of the ITS Action Plan and Directive is the optimal use of travel and traffic data to foster the development of Europe-wide real-time traffic and travel information services. Within this, specifications shall include:

(1) The definition of the necessary requirements to make EU-wide multimodal travel accurate and available across borders to ITS users;
(2) The definition of the necessary requirements to make EU-wide real-time traffic information services accurate and available across borders to ITS users;
(3) The definition of the necessary requirements for the collection by relevant public authorities and/or, where relevant, by the private sector of road and traffic data (i.e. traffic circulation plans, traffic regulations and recommended routes, notably for heavy goods vehicles) and for their provisioning to ITS service providers;
(4) The definition of the necessary requirements to make road, traffic and transport services data for digital maps accurate and available, to digital map producers and providers;
(5) The definition of minimum requirements, where possible, of road safety related "universal traffic messages" free of charge to all road users, as well as their minimum content.

As a first step in addressing (5), the European Commission is conducting a study and consultation on traffic and travel data access and a possible free minimum traffic information service. The study objectives are:

- Free safety related traffic services for all travellers
- Harmonisation of a Europe wide minimum service free of charge to the user
- Establishment of suitable organisational models

Data and Service Quality

4.6.7 The QUANTIS[xix] project (July 2008 - June 2010) aimed to provide additional specifications for data and service quality. A basic prerequisite for the effective implementation of robust cross border TEN-T and co-modal services is a common understanding of data and service quality. Any quality imbalance between parties undermines the basis for harmonised European Services. QUANTIS has developed a methodology to evaluate and optimise data and service levels in terms of quality and costs in order to foster cross border data exchange and service provision according to policy objectives.

4.6.8 The QUANTIS project is strongly linked to EasyWay and has undertaken case study evaluations with EasyWay partners. The results will be taken up by a future European Study on data quality and will help to shape the development of the Deployment Guidelines in future years. Large elements of the quality objects and parameters used within the methodology are based on the ISO 21707 standard on "Data quality in ITS systems". Quality requirements can only be imposed to internal processes. In relation to external (private) partners the issue at stake is harmonised data exchange (DATEX II).

4.6.9 Published QUANTIS Deliverables are:

- Deliverable 1 – Definition of Key European ITS Services and Data Types
  - o A brief overview on the concept of data quality and its management in the context of ITS services as well as a review of existing guidelines for data quality related to various ITS services.
- Deliverable 2 – Report on Service Benefits and Costs
  - o Identifies quality requirements from the users as well as the qualitative evaluation of benefits and costs in relation to service quality.
- Deliverable 3 – Report on Detailed Data and Service Quality

  - Describes the methodology for the quality assessment and the detailed definition of the general quality objects and the quantified quality parameters which serve for the assessment of the given quality level for operational ITS.

- Deliverable 4 - Preliminary report on data and service quality assurance methodology, Methodology Guidelines Document
  - Guides the reader through each step in the methodology. Using this guidance, the user should be able to apply the methodology to any selected ITS service. It is to be used in conjunction with the QUANTIS spreadsheets to determine QUANTIS quality and the QUANTIS Optimum Quality Level Catalogue to be used to establish a Target and / or Optimum performance level.
- Deliverable 5 - Quality Assessment and Assurance Methodology for Traffic Data and Information Services, Methodology Guidelines Document
  - Updated version of Deliverable 5. Encourages a standardised approach to benchmarking ITS services across Europe.
- Deliverable 6 - Evaluation report for optimal data quality in selected European service cases
  - This document evaluates service quality in the selected European service cases using the methodology developed during the QUANTIS project and to carry out socio-economic cost-benefit evaluations to find out the optimum service quality.

These deliverables are available on the QUANTIS website (http://www.quantis-project.eu/). The QUANTIS Toolkit spreadsheet is also available from the website.

5 Service Provision

5.1 Levels of Service and Quality

5.1.1 Deployment Guidelines including Level of Services, for each of the Core European ITS Services, provides the information needed for road operators to ensure that implementations are made in support of European cohesion and defines steps in gradual improvement of the service in relation to the EasyWay Operating Environments.

5.1.2 Each of the Deployment Guidelines for traveller information have been developed using an information content based approach which lends itself to a description of the levels of service which are purely end user oriented in terms of information content. The levels of service therefore define the quality of the relationship to the user. The differences between the five information services mean that different criteria may be more important for different information services. To this end, each TIS DG includes a Level of Service table which recommends the end user orientated levels of service that should be progressed towards to assist in the realisation of interoperable, seamless and harmonised pan-European Services.

5.1.3 The data quality aspect is also vital for specification in terms of the levels of service as they are intrinsically linked. The ability for a traveller information provider to reach the levels of service recommended within Guidelines DG02 to DG07 is dependent on a level of data quality being reached. Similarly to Levels of Service due to different data requirements for all the services each Guideline DG02 to DG07 includes a data quality table with proposed levels of data quality which should be progressed towards to assist in the realisation of interoperable, seamless and harmonised pan-European Services. Some Guidelines are more advanced in this respect than others, and it is an area to be progressed in future revisions. An example of different data requirements is found when comparing the optimum level of traffic speed data packets required for travel time information which may be as small as 1 minute, with that for traffic condition information data, and that of planned events where it is unlikely data will be required to be updated as frequently.

5.1.4 The tables within Deployment Guidelines DG02 to DG07 outline the recommendations of ESG1 for the most important aspects of the Levels of Service and the Levels of Quality for the data “backbone” for each traveller information service. It is believed that progress through these levels will lead to harmonised deployment of traveller information services. The need for a requirement to progress to the next level is inherent in the philosophy of deployment towards harmonisation although progress “up” these levels towards more harmonised services should only be undertaken if deemed necessary by the implementation body. The tables within Deployment Guideline Documents DG02 to DG07 also provide the recommended levels of service which deployment should strive towards within EasyWay II. However progress beyond these levels is still important when the requirement exists.

5.1.5 Definitions of the Core Level of Service and Level of Quality Criteria for all ESG1 Deployment Guidelines are given in Table 1 and Table 2 below. DG02 to DG07 Guidelines have chosen the most relevant Core Criteria from these tables and also added service specific criteria. Service specific LoS and LoQ criteria are defined in the respective Guidelines.

LEVELS OF QUALITY	
Core Criteria	**Definition**
Accessibility *(Previously "Coverage / completeness")*	***Qualifies the users' exposure to the information service***. For instance, the number of users reached by the information on each of the technology platforms deployed in relation to the % km of the relevant area concerned
Availability	***Qualifies the period during which the availability of the service to the specified standard is defined/ guaranteed.*** Degree to which (geographic) data would be available at a certain place and at a defined time. This may be by time of day / week / month or other special periods (e.g. 24/7 excluding national holiday periods).
Timeliness	***Time delay between the event detection and the provision of the information to the end-user*** (around 10s with new technologies)
Update frequency	***Qualifies the frequency of updating information or data update interval***. For instance, on occurrence (updates are made as and when a change occurs), periodic (regular or periodic updates) or on request update etc
Quality Assurance	***Incorporates the need to undertake partial checks*** if deemed appropriate for parts of the chain (Level 1 for instance) or a full check of the service chain (Level 2) or a full check which has the additional quality assurance through application of standards
Cross verified *(Previously "Reliability /Cross verified")*	***Degree of certainty of the information***, considering whether the data value has been cross verified from one or more additional sources, confirming the data.
Accuracy	Degree of adherence of (geographic) data to the most plausible true value (can be absolute, relative, quantitative, temporal).

Table 1 - Level of Quality

LEVELS OF SERVICE	
Core Criteria	**Definition**
User interface *(Previously "Language and Provision")*	***Relates to the interface between information and the user:*** Information should be capable of being displayed through pictograms (language independent), or through a common and shared language + native language; or in the native language of the country.
Neighbouring Provision	***Addresses the issue of information exchange and availability between*** • Operators managing neighbouring network. • Service providers dealing with several different sources
Local and Secondary Network Information	***Deals with necessary traveller information about <u>non</u> TEN-T routes, provided <u>on</u> TEN-T routes***. Level 1 could include for instance the exchange and use of information for the more strategic non TEN-T routes which are likely to form parts of strategic networks. Level 2 would seeks to provide additional information on local routes which impact on the strategic network but are not deemed key routes themselves.
Level of detail (Location Reference) *(Previously "Location Reference")*	***Gives understanding on the necessary georeferencing precision required for traveller information.*** Qualifies the geographic "granularity" of the information. None means no specific location i.e. area / road
Static / Dynamic	***Notes the relevance of different types of data/ information availability with progress towards the combination of static data with all required dynamic data***.

Table 2 - Level of Service

Please note:

- *There is no hierarchy between the criteria and no additional weighting given to one with a higher level of service.*
- *All criteria are not presented in these tables, only the Core Criteria which require a harmonised definition.*
- *These Core Criteria are defined in this TIS Reference Document and will be displayed in each Guideline DG02 to DG07; when not relevant, DG02 to DG07 Guidelines state "Non relevant" and explain why.*
- *Other specific criteria can be added in each DG02 to DG07 Guideline when needed, with suitable definition.*

5.2 Operating Environments

5.2.1 The scope of EasyWay is to provide Core European Services to the European road users. These services are harmonised in content and functionality, and also in their availability: the road users shall be able to expect a certain service offer in a specific road environment. In order to provide a basis for the harmonisation process EasyWay needs a tool to define such environments in an agreed manner. This tool is the Operating Environments – a set of pre-defined road environments combining physical layout of the road and network typology with traffic characteristics.

5.2.2 EasyWay has agreed on a set of 18 pre-defined Operating Environments (OE), see Table 3 below, where each OE is a combination of three criteria:

- Physical characteristics – Motorways, other 3/4 lane roads or 2-lane roads
- Network typology – Corridor, Network, Link or Critical spot
- Traffic characteristics – Traffic flow and road safety situations (with optional additions)

5.2.3 For more information and details, visit https://dg.its-platform.eu.

OE	Explanation
C1	critical spots, local flow-related traffic impact and/or potential safety concerns
T1	motorway (link), no flow-related traffic impact and no major safety concerns
T2	motorway (link), no flow-related traffic impact, potential safety concerns
T3	motorway (link), seasonal or daily flow-related traffic impact, no major safety concerns
T4	motorway (link), seasonal or daily flow-related traffic impact, potential safety concerns
R1	two-lane road (link), no flow-related traffic impact, no major safety concerns
R2	two-lane road (link), no flow-related traffic impact, potential safety concerns
R3	two-lane road (link), seasonal or daily flow-related traffic impact, no major safety concerns
R4	two-lane road (link), seasonal or daily flow-related traffic impact, potential safety concerns
R5	three-/four-lane road (link), no flow related traffic impact, no major safety concerns
R6	three-/four-lane road (link), no flow related traffic impact, potential safety concerns
R7	three-/four-lane road (link), seasonal or daily flow related traffic impact, no major safety concerns
R8	three-/four-lane road (link), seasonal or daily flow related traffic impact, potential safety concerns
S1	motorway corridor or network, at most seasonal flow-related impact, possibly safety concerns
S2	motorway corridor or network, daily flow-related traffic impact, possibly safety concerns
N1	road corridor or network, at most seasonal flow-related traffic impact, possibly safety concerns
N2	road corridor or network, daily flow-related traffic impact, possibly safety concerns
P1	peri-urban motorway or road interfacing urban environment, possibly safety concerns

OE type	Number	Flow-related traffic impact				Potential safety concerns	
		NO	SEASONAL	DAILY		NO	YES
Critical spots							
C	1		X	X	and/or		X
Motorway links							
T	1	X			and	X	
	2	X			and		X
	3		X	X	and	X	
	4		X	X	and		X
Road links							
R 2 lanes	1	X			and	X	
	2	X			and		X
	3		X	X	and	X	
	4		X	X	and		X
R 3 or 4 lanes	5	X			and	X	
	6	X			and		X
	7		X	X	and	X	
	8		X	X	and		X
Motorway corridor or network							
S	1		X		and		(X)
	2			X	and		(X)
Road corridor or network							
N	1		X		and		(X)
	2			X	and		(X)
Peri-urban motorway or road							
P	1				and		(X)

Table 3 - EasyWay operating environments for Core European ITS Services

5.2.4 DG02 to DG07, map the EasyWay Operating Environments to **minimum** and **optimum** Levels of Service. By looking at the EW Operating Environment that the road / section belongs to, the table gives information on the expected level of service. The range between minimum and optimum LoS for a compliant service provides a well defined degree of freedom to adapt the service deployment to local conditions. It should be noted that there are cases where the optimum and minimum levels are the same, this will be indicated by OM; and where mapping to an Operating Environment is not relevant, and this is indicated by NA.

5.3 TIS Roadmap

5.3.1 As with ITS in general, a clear TIS Roadmap will assist in both decision making and providing direction to ITS policy and technical development. A TIS roadmap will help reach a consensus about a set of needs and the technologies required to satisfy those needs; it provides a mechanism to help forecast developments and it provides a framework to help plan and coordinate developments. It will also help to focus on priorities and critical developments.

5.3.2 A TIS roadmap could, for example, contain the following.

- Focus
- Work areas
- Critical requirements and targets

- Drivers and targets
- Timelines

5.4 Interaction with other Services

Relationships outside ESG1

5.4.1 The Deployment Guidelines developed by ESG1 have relationships with other EasyWay European Studies. Table 4 outlines the existing relationships between the ESG1 Deployment Guidelines and the Core services within the other EasyWay domains.

5.4.2 The relationship between Traffic Management and Traveller Information Services is complicated. It is realised that the provision of traveller information can be used by network operators as a traffic management tool. For example, the provision of travel times on different routes to the same destination can influence the percentage of vehicles who take each route.

5.4.3 However the obligatory character of traffic management is that guidance is provided in an unambiguous way to influence route choice, speed, etc. and therefore the provision of information can, in some cases, contrast with the network operators overall objectives.

5.4.4 In such instances there is a need for coordination of these actions. However this is only possible if the road operator has, either through direct control or influence through relationships, control over both aspects. Due to the different models for both traffic information and traffic management across Europe these aspects are addressed on a national, regional or even sub-regional level.

5.4.5 However the understanding of these relationships across Europe has not been developed through studies or research. For these Guidelines to properly address this question there is the need for further work in this area to be undertaken. Any work which increases the understanding will be included within the Guidelines in future revisions.

5.4.6 Therefore, at present at least, the relationship between these two domains of ITS shall be managed on a national, regional or sub-regional level and shall only be influenced by these Guidelines. It is recommended that all implementing bodies using these Guidelines follow, wherever possible, the advice provided herein. The strength of the relationships between the Core Service areas in Traffic Management and Traveller Information is addressed in Table 4.

5.4.7 For example the relationship between all traveller information services and the connected ICT infrastructure is inherent. The section within this report outlines the importance of the development of ICT capabilities for the progression of traveller information services.

5.4.8 ESG1 recommends the use of both VMS DG01 Principles Of VMS Design and DTX DG01 DATEX II for future ITS implementation. These interconnections have now begun to be explored and this is reflected in the individual Guidelines.

5.4.9 It should also be noted that across Europe there are different hierarchies / priorities for traveller information messages. These depend on local characteristics (such as weather conditions, vacation routes, seasonal wildlife) and can include safety campaign messages or current time at the lower end to journey times, event information; and with increasing priority to incident information (including specific details on delays, incident location, re-routing) and weather warnings. It is the task of the content provider to consider the most appropriate hierarchy.

Service	Domain 2 – Traffic Management			Domain 3 – F&L Services	Domain 4 – Connected ICT
	CS 1	CS 2	CS 3		
Event Information	✓✓	✓	✓✓	✓	✓✓
Traffic Condition Information	✓✓	✓	✓✓	✓	✓✓
Travel Time Information	✓✓	✓	✓✓	✓	✓✓
Speed Limit Information	✓✓	✓	✓	✓	✓✓
Weather Information	✓✓	✓	✓	✓	✓✓
Co-modal travel information	✓✓	✓	✓✓	✓	✓✓

KEY

✓✓ Strong Relationship

✓ Relationship

CS 1 - Core Service 1: Management of Sensitive Road Segments

CS 2 - Core Service 2: Strategic Traffic Management for Corridors and Networks

CS 3 – Core Service 3: Incident Management

Table 4 - Relationships outside ESG1

Relationships within ESG1

5.4.10 There are a number of overlaps which could fit into more than one of the Guidelines DG02 to DG07. For example the provision of Travel Times (DG05) to end users can be seen as an element of Traffic Condition Information (DG03) and certain Weather Conditions (DG06) may be viewed as Events to be included in DG02. However to ensure the Guidelines are clear and concise any overlaps between services have been removed wherever possible.

5.4.11 However, the strong relationships between the different Guidelines within traveller information are reflected in information provision. The different content based Guidelines information form part of a coordinated information strategy which either prioritises the information available if necessary (VMS), or combines and integrates the information (such as through RDS-TMC, navigation systems and travel planning/ traffic information portals). The strength of the relationships between the six different services is outlined in Table 5.

5.4.12 It should be acknowledged that this table is intended to provide an approximate indication of the relationship strengths between TIS services. As with many aspects of ITS services there cannot be a “one size fits all” approach and different EW countries will have alternative views on degrees of emphasis. For example Northern European regions may have more inherent relationships between Weather, Event and Travel Time services.

	Forecast and Real Time Event	Traffic Condition	Travel Time	Speed Limit	Weather	Co-modal Travel
Forecast and Real Time Event						
Traffic Condition						
Travel Time						
Speed Limit						
Weather						
Co-modal Travel						

Relationship Strength:

Inherent

Strong

Related Only

Table 5 – Relationship between the Traveller Information Guidelines

5.4.13 Further to the Traveller Information Services, ESG1 has been tasked with the development of Viability Studies and Pilot Projects which seek to develop services which have the potential to be pan-European towards a level of maturity where they themselves could be considered a Core service and require Guideline production. Included in these viability studies for example is the development of an international co-modal journey planner which is looking to combine the services from three countries into one service. By proving benefits at this level it is easy to see that such a service could be implemented for the whole of Europe.

5.4.14 Supporting Actions are also in place within ESG1 to enhance quality of the deployment guidelines in the future. By supporting the ICT Domain action to draw conclusion on the quality and value of traffic data and information services future versions of these guidelines are likely to include more detailed recommendations on the data inputs and information outputs necessary to reach a minimum level of service harmonised across Europe.

5.4.15 ESG1 are also examining the relationships between private and public actors in the field of traveller information across the EasyWay member states. As part of this study ESG1 have begun compiling a directory of Traveller Information Services across Europe and the current relationships between the private and public sectors which are in place to deliver these services. A greater understanding of these relationships across Europe is likely to lead to development of the Guidelines especially if recommendations can be made on the best type of relationships to adopt or how best to work together to achieve the best quality of traveller information provision.

Relationships outside EasyWay

5.4.16 Due to the varied nature of travel information providers across Europe the probable realisation of interoperable harmonised pan-European traveller information services will be greatly increased if private stakeholders also take due cognisance of these documents in future implementations. At present private stakeholders are not governed by the development of these Guidelines and therefore have not formally endorsed the content or committed to follow the guidance. However, EasyWay are developing relationships in the traveller information domain with private stakeholders, overarching representative bodies and beyond (e.g. CEDR, UITP, TISA) to establish common ground and continue working together to help realise the common needs of the traveller and help achieve wider policy goals. It is also important to recognise parallel projects that can contribute to the EasyWay goals and provide supplementary sources of information (e.g. 2DECIDE - http://www.2decide.eu/; Transport Research Knowledge Centre - http://www.transport-research.info/web/; POLIS http://www.polis-online.org/).

6 Implementation Plan: Timetables, Activities and Resource Need

6.1 Vision for the Future

6.1.1 The vision is that these Deployment Guidelines should guide development towards a common experience of traveller information for all European Travellers. The level and availability of service will evolve in each member state, including across borders, to deliver this. These Guidelines should provide a platform for the future evolution of traveller information with increased standardisation of data distribution, quality and timeliness. The data will be portable onto a range of developing technologies and support greater collaboration between the public and private sector providers delivering added value to the user.

6.1.2 The application of this document and the individual Guidelines DG02 to DG07 should therefore lead to European services in traveller information which are common across the European region. Drivers by virtue of the type of road they are travelling on should be able to determine what type and quality of information they expect to receive. They should be aware almost intuitively that the information should have a positive impact on their journey and by virtue of receiving information process and act accordingly.

6.1.3 All European travellers will have access to advanced traveller information at all points in their TEN-T journey via different media (e.g. internet, mobile internet, navigation systems, VMS). The traveller information services will provide the traveller with a detailed image of the forecast and real-time event information, traffic condition, travel time, speed limit, weather situations and co-modal situations. Access to these services as part of a coordinated information strategy will outline the existing restrictions on the networks (both road and otherwise) and all available travel choices supported by the necessary information to ultimately lead to the optimal choice of routes and modes.

6.1.4 The success of these Guidelines with respect to the vision will be enhanced by future updates which are necessary to reflect the most recent developments. Furthermore these Guidelines will be enhanced following external research linked to EasyWay such as the QUANTIS project and internal EasyWay findings such as the public and private sector information developments.

6.1.5 It is noted within Section 4.6.1 of this document regarding eMOTION that “no standards or specifications regarding visualisation, symbolisation or styling of maps have been found”. Future work within ESG1 may develop solutions for the harmonisation of front end user interfaces in this way. However certain specifications will require a lot of work in a similar way to the development of the working book and Guidelines for VMS harmonisation. These Guidelines concentrate on harmonising the Levels of Service and Levels of Data quality for traveller information services to ensure the required information can be supplied to the traveller. However website design and cartographic representation is done on a national or regional basis at present and these Guidelines assume that the professionals in these fields ensure comprehension of their existing end user interfaces.

6.1.6 And finally, for those services which progress from Viability Study towards a Core Service, Guidelines will be produced which will expand the coverage of these documents and increase the levels of harmonised ITS across Europe.

6.2 Overview of Foreseen Deployments

6.2.1 All deployments of traveller information services included within EasyWay Phase II shall form the anticipated deployment towards harmonisation in terms of quality of content provision. It is envisaged that any projects included within the proposed deployments for the domain of traveller information will progress in line with these Guidelines.

6.3 Implementation Organisation for EasyWay

6.3.1 ESG1 will ensure within EasyWay II programme the continuity of activities of both the former TIS EG and ES1. Main objectives of the TIS ESG for 2010-2012 are to:

- Update the current Deployment Guidelines ensuring consistent, high quality documents and to identify and coordinate the development of new Deployment Guidelines;
- Undertake reporting at an EasyWay level and contribute to Annual and Final Reports; provide strategic advice to the EW SC on TIS;
- Provide a vision and roadmap for TIS deployment within EasyWay on the TEN-T;
- Ensure the development of Supporting Actions and Viability Studies;
- Contribute to dissemination tasks; and
- Follow-up pilots in the TIS domain.

6.4 Activities and Timetable

6.4.1 Traveller information services will be deployed within the traveller information domain of EasyWay II and beyond. To be part of future workplan deployments in EasyWay it will be necessary to ensure compliance with the Guidelines and ensure progress in relation to the Levels of Service and the technical specifications noted in documents DG02 to DG07.

6.4.2 It is believed that all deployments should progress towards a higher level of service and / or technical specification than currently exists within that region or at that locale. This progression should be in line with these Guidelines and will therefore illustrate progress towards harmonisation in traveller information. The proposed end user orientated Levels of Service and “back office” orientated Levels of Quality are outlined in each DG02 to DG07 Guidelines.

6.5 Timetable and Resource Need

6.5.1 The timetables and resource requirements of national authorities will shape the deployment of information services towards harmonisation and are controlled by individual requirements.

The resource requirements for the EasyWay implementation organisation TIS ESG noted in this document are defined as part of the response to the second phase of EasyWay funding (EasyWay II).

7 Annex A: CEN TIS Standards

CEN ISO/TS 14822-1:2006	Traffic and Travel Information - General specifications for medium-range pre-information via dedicated short-range communication - Part 1: Downlink (ISO/TS 14822-1:2006)-
CEN ISO/TS 14823:2008	Traffic and travel information - Messages via media independent stationary dissemination systems - Graphic data dictionary for pre-trip and in-trip information dissemination systems (ISO/TS 14823:2008)-
CEN ISO/TS 14907-1:2010/AC:2010	Road transport and traffic telematics - Electronic fee collection - Test procedures for user and fixed equipment - Part 1: Description of test procedures (ISO/TS 14907-1:2010/Cor 1:2010)-
CEN ISO/TS 18234-1:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Expert Group (TPEG) data-streams - Part 1: Introduction, Numbering and Versions (ISO/TS 18234-1:2006)-
CEN ISO/TS 18234-2:2006	Traffic and Traveller Information (TTI) - TTI via Transport Protocol Expert Group (TPEG) data-streams - Part 2: Syntax, Semantics and Framing Structure (SSF) (ISO/TS 18234-2:2006)-
CEN ISO/TS 18234-3:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Expert Group (TPEG) data-streams - Part 3: Service and Network Information (SNI) application (ISO/TS 18234-3:2006)-
CEN ISO/TS 18234-4:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Expert Group (TPEG) data-streams - Part 4: Road Traffic Message (RTM) application (ISO/TS 18234-4:2006)-
CEN ISO/TS 18234-5:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Expert Group (TPEG) data-streams - Part 5: Public Transport Information (PTI) application (ISO/TS 18234-5:2006)-
CEN ISO/TS 18234-6:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Expert Group (TPEG) data-streams - Part 6: Location referencing applications (ISO/TS 18234-6:2006)-
CEN ISO/TS 24530-1:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) - Part 1: Introduction, common data types and tpegML (ISO/TS 24530-1:2006)-
CEN ISO/TS 24530-2:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) - Part 2: tpeg-locML (ISO/TS 24530-2:2006)-
CEN ISO/TS 24530-3:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) - Part 3: tpeg-rtmML (ISO/TS 24530-3:2006)-
CEN ISO/TS 24530-4:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) - Part 4: tpeg-ptiML (ISO/TS 24530-4:2006)-
CEN/TS 14821-1:2003	Traffic and Travel Information (TTI) - TTI messages via cellular networks - Part 1: General specifications-
CEN/TS 14821-2:2003	Traffic and Travel Information (TTI) - TTI messages via cellular networks - Part 2: Numbering and ADP message header-

CEN/TS 14821-3:2003	Traffic and Travel Information (TTI) - TTI messages via cellular networks - Part 3: Basic information elements-
CEN/TS 14821-4:2003	Traffic and Travel information (TTI) - TTI messages via cellular networks - Part 4: Service-independent protocols-
CEN/TS 14821-5:2003	Traffic and Travel Information (TTI) - TTI messages via cellular networks - Part 5: Internal services-
CEN/TS 14821-6:2003	Traffic and Travel Information (TTI) - TTI messages via cellular networks - Part 6: External services-
CEN/TS 14821-7:2003	Traffic and Travel Information (TTI) - TTI messages via cellular networks - Part 7: Performance requirements for onboard positioning-
CEN/TS 14821-8:2003	Traffic and Travel Information (TTI) - TTI messages via cellular networks - Part 8: GSM-specific parameters-
EN 12253:2004	Road transport and traffic telematics - Dedicated short-range communication - Physical layer using microwave at 5,8 GHz-
EN 12795:2003	Road transport and traffic telematics - Dedicated Short Range Communication (DSRC) - DSRC data link layer: medium access and logical link control-
EN 12834:2003	Road transport and traffic telematics - Dedicated Short Range Communication (DSRC) - DSRC application layer-
EN 12896:2006	Road transport and traffic telematics - Public transport - Reference data model-
EN 13372:2004	Road Transport and Traffic Telematics (RTTT) - Dedicated short-range communication - Profiles for RTTT applications-
EN ISO 14819-1:2003	Traffic and Travel Information (TTI) - TTI Messages via traffic message coding - Part 1: Coding protocol for Radio Data System - Traffic Message Channel (RDS-TMC) using ALERT-C (ISO 14819-1:2003)-
EN ISO 14819-1:2003/AC:2004	Traffic and Travel Information (TTI) - TTI Messages via traffic message coding - Part 1: Coding protocol for Radio Data System - Traffic Message Channel (RDS-TMC) using ALERT-C (ISO 14819-1:2003)-
EN ISO 14819-2:2003	Traffic and Traveller Information (TTI) - TTI Messages via traffic message coding - Part 2: Event and information codes for Radio Data System - Traffic Message Channel (RDS-TMC) (ISO 14819-2:2003)-
EN ISO 14819-3:2004	Traffic and Travel Information (TTI) - TTI messages via traffic message coding - Part 3: Location referencing for ALERT-C (ISO 14819-3:2004)-
EN ISO 14819-6:2006	Traffic and Traveller Information (TTI) - TTI messages via traffic message coding - Part 6: Encryption and conditional access for the Radio Data System - Traffic Message Channel ALERT C coding (ISO 14819-6:2006)-
EN ISO 14825:2011	Intelligent transport systems - Geographic Data Files (GDF) - GDF5.0 (ISO 14825:2011)-
ENV 12313-4:2000	Traffic and Traveller Information (TTI) - TTI Messages via Traffic Message Coding - Part 4: Coding Protocol for Radio Data System - Traffic Message Channel (RDS-TMC) - RDS-TMC using ALERT Plus with ALERT C-
ENV 12315-1:1996	Traffic and Traveller Information (TTI) - TTI Messages via Dedicated Short-Range Communication - Part 1: Data Specification - Downlink (Roadside to Vehicle)-
ENV 12315-2:1996	Traffic and Traveller Information (TTI) - TTI Messages via Dedicated Short-Range Communication - Part 2: Data Specification - Uplink (Vehicle to Roadside)-

ENV 13998:2001	Road transport and traffic telematics - Public transport - Non-interactive dynamic passenger information on ground-

8 Annex B: Standards analysed by eMOTION

- Road Network Data
  - ISO 14825: Geographic Data Files (GDF) - Road Network
  - ISO 19133 - Chapter 9: Network
  - EuroRoadS - Road Network Information Model
  - ISO 14819: RDS-TMC - Chapter 3: Location Table Implied Network
- Public Transport Network Data
  - ISO 14825: Geographic Data Files (GDF) - Public Transport
  - ENV 12896: Transmodel
  - Railway Markup Language (RailML®)
  - Rail Journey Information System (RJIS)
  - National Public Transport Access Node Database (NaPTAN)
  - Identification of Fixed Objects in Public Transport (IFOPT)
- Inter-modal Transport Network Data
  - ISO 19134 - Chapter 6: Multimodal Network
  - ENV 12896: Transmodel - “Connection Links”
  - Rail Journey Information System (RJIS) - Fixed Leg
- Location Referencing
  - ISO 14819: RDS-TMC - Chapter 3: Location referencing for ALERT-C
  - ISO 19133 - Section 6.6: Package Linear Reference Systems
  - ISO 19133 - Sections 6.2.2 & 8.2: Position and Address Package
  - OGC OpenLS - Core Services, Abstract Data Types (ADT)
  - ISO 18234-6 / ISO 24530-2: TPEG-LOC - Location Referencing Applications
  - ISO 17572-3: AGORA-C
- Traffic Flow Data
  - DATEX II
  - Journey Time Database (JTDB)
- Traffic Messages
  - DATEX II
  - ISO 18234-4 / ISO 24530-3: TPEG-RTM - Road Traffic Message Application
  - ISO 14819 - RDS-TMC
  - Scheduled Road Works (SRW)
- Parking
  - DATEX II
  - ISO 18234-7 / ISO 24530-5: TPEG-PKI - Parking Information

  - UTMC Standard - TS004: Car Park Monitor MIB
- Public Transport Service Data
  - ENV 12896: Transmodel
  - Service Interface for Real Time Information (SIRI)
  - Transport Exchange (TransXChange)
  - Railway Markup Language (RailML®)
  - Rail Journey Information System (RJIS)
  - ISO 18234-5 / ISO 24530-4: TPEG-PTI - Public Transport Information
  - OpenTravel Alliance (OTA) Standard and Ferry XML
- POI and Other Directories
  - ISO 14825: Geographic Data Files (GDF) - Feature Theme “Services” (POIs)
  - OGC OpenLS - Core Services, Abstract Data Types (ADT)
  - Directory Services Standards (DSML) v1.0
  - Point Of Interest eXchange Language Specification (POIX)
  - Tourism Markup Language (TourML)
  - Identification of Fixed Objects in Public Transport (IFOPT)
  - National Public Transport Gazetteer (NPTG)
- Road Weather
  - TLS Standard - Environmental Data (FG3)
  - Binary Universal Form for the Representation of meteorological data (BUFR) / Character form for the Representation and EXchange of data (CREX)
  - ISO 14819: RDS-TMC - Road Weather related ALERT-C Codes
  - DATEX II
- Data for Routing
  - ISO 19133 - Chapter 7 Navigation and Chapter 9 Network
  - OGC OpenLS - Core Services, Route Service and Abstract Data Types (ADT)
- Data for Public Transport Journey Planning
  - ENV 12896: Transmodel
  - Identification of Fixed Objects in Public Transport (IFOPT)
  - National Public Transport Gazetteer (NPTG)
- Data for Inter-modal Journey Planning
  - ISO 19134 – Multimodal Routing and Navigation
- Data for Freight Traffic
  - There were no specific standards in the area of freight traffic relevant for the eMOTION project
- General Metadata
  - ISO 19115 – Metadata

9 TIS Value Chain: Examples

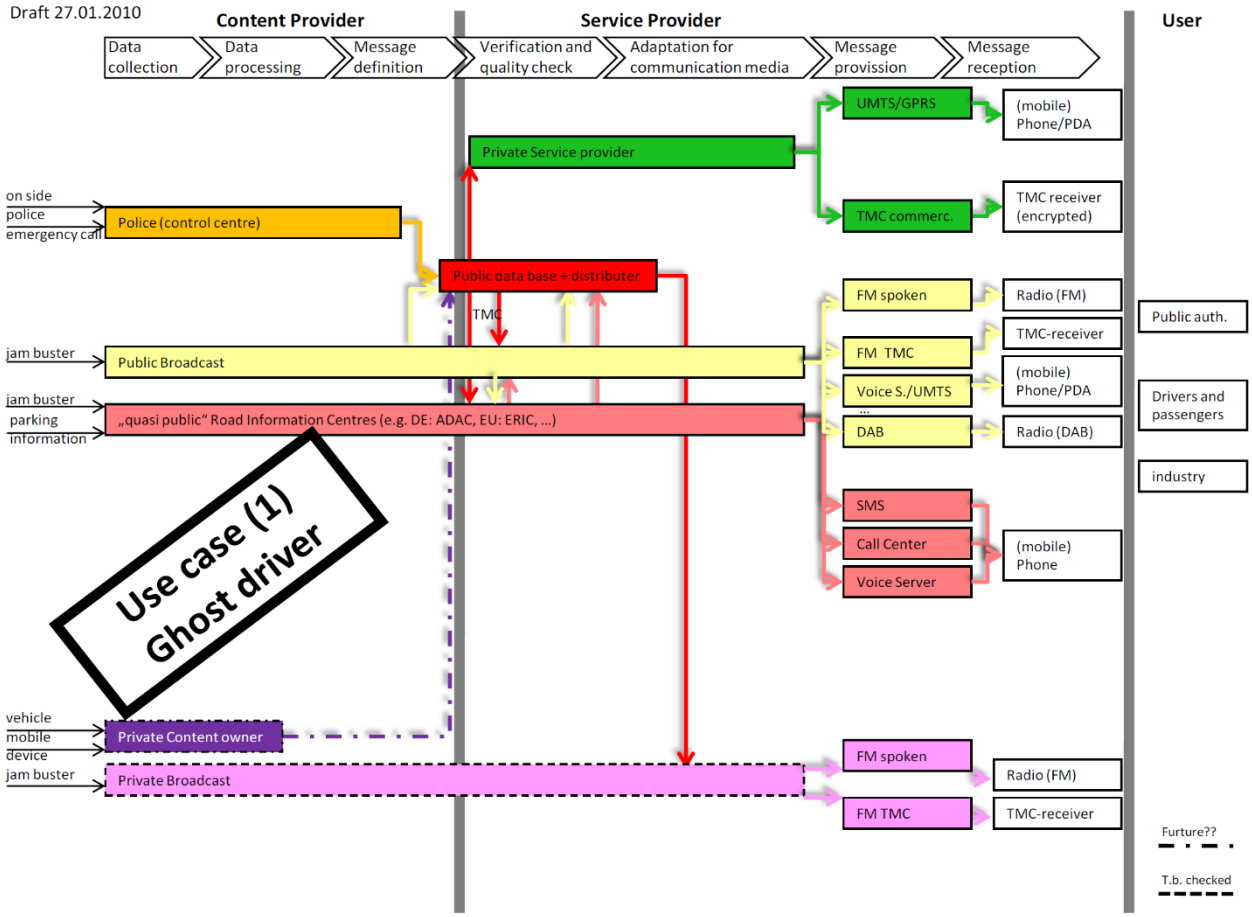


Figure 15 – TISA German Value Chain

The image above shows a TISA German Value Chain for ghost driver traffic information. Below, value chain examples are provided by the German EasyWay partners.

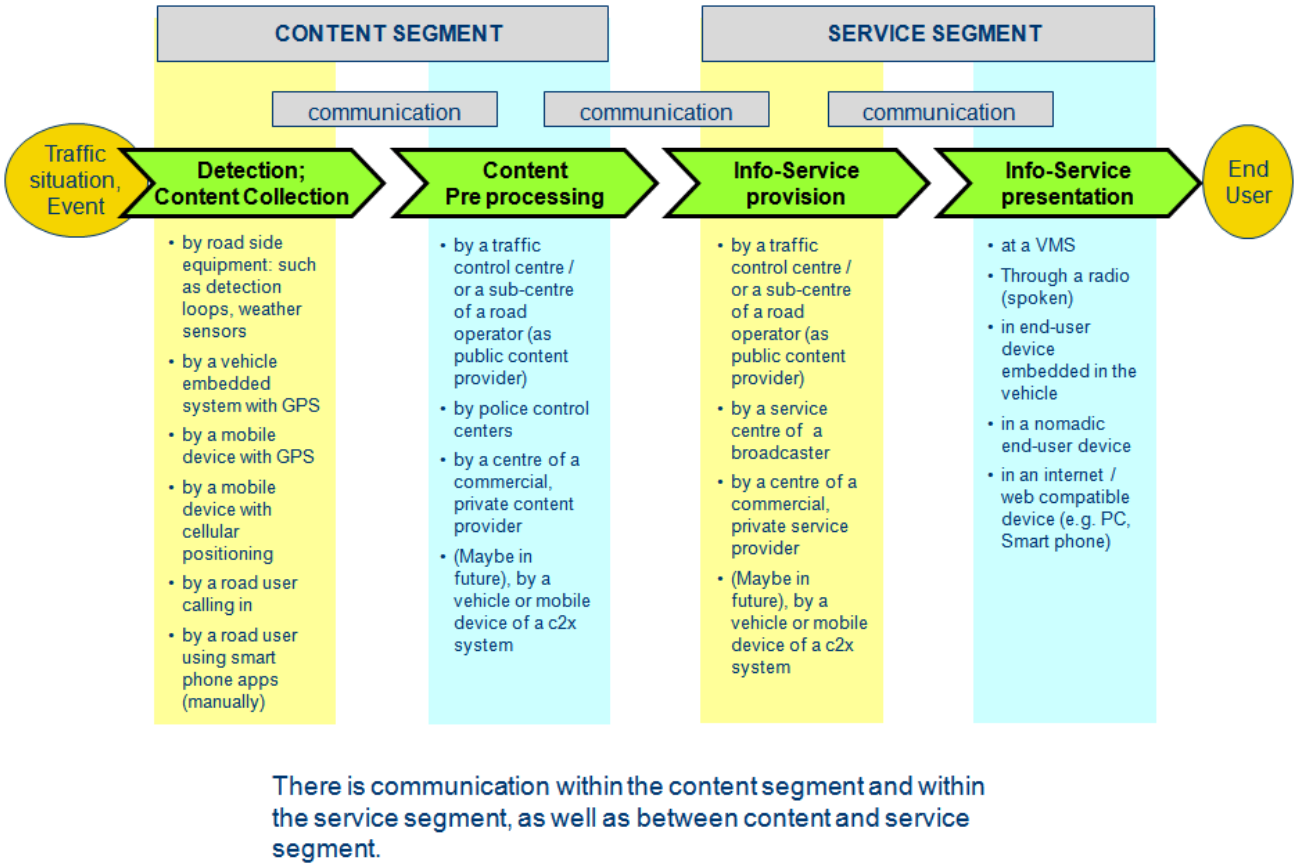


Figure 16 – Example Value Chain I

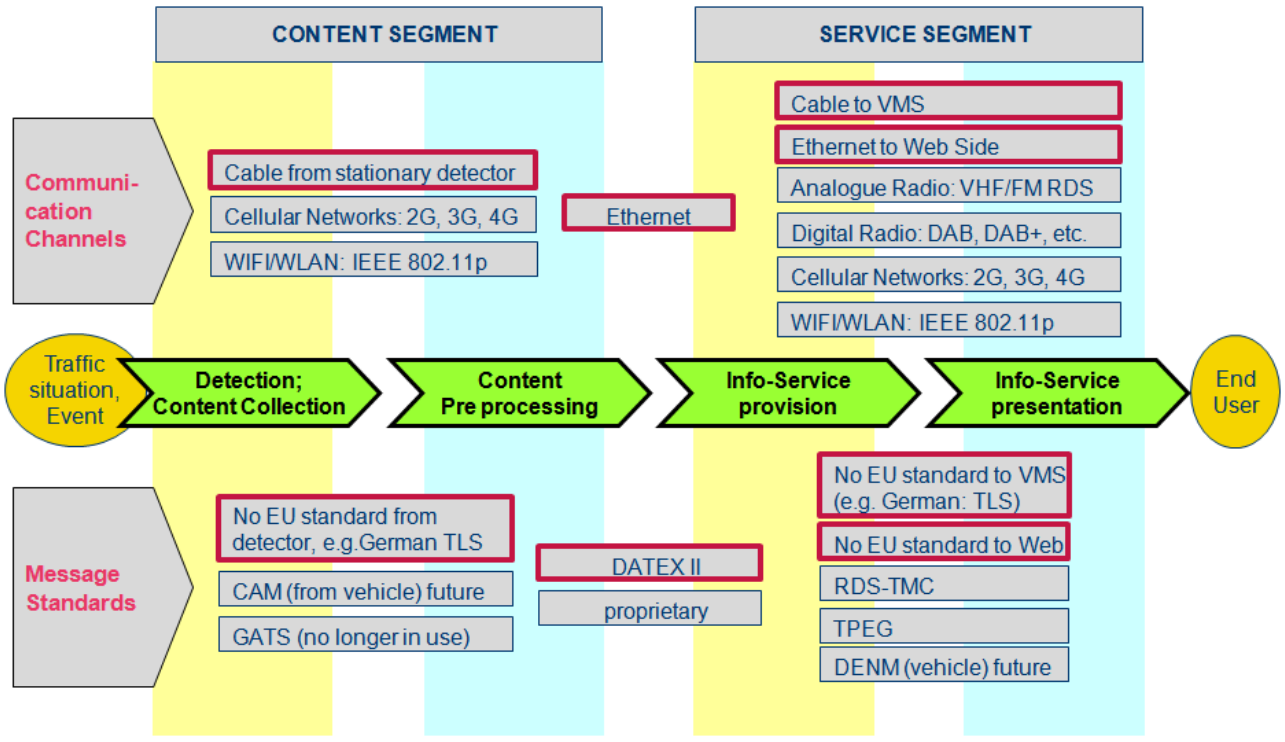


Figure 17 – Example Value Chain II

10 Annex C: Bibliography

[i] European Study 6, EasyWay, The EasyWay ITS Deployment Roadmap Version 0.91 September 2008

[ii] EasyWay Strategy & Action Plan, Issue: 1st edition, Version: 0.1, 27th of September 2010

[iii] Synthesis of Project Evaluation Results 2007-2009

[iv] http://www.uitp.org/advocacy/public_transport.cfm#read

[v] http://ops.fhwa.dot.gov/aboutus/one_pagers/traveler_info.htm

[vi] Investigation of Traveler Information and Related Travel Behavior in the San Francisco Bay Area - Asad J. Khattak, Felipe Targa, Youngbin Yim ; California PATH Working Paper, UCB-ITS-PWP-2003-6

[vii] Travel information as an instrument to change car-drivers travel choices: a literature review; C G Chorus, E J E Molin, B van Wee, 2006

[viii] CATCH (Carbon Aware Travel CHoice) project with the ultimate aim to reduce the carbon dioxide emissions of the urban transport sector by encouraging carbon-friendly travel choices http://www.carbonaware.eu

[ix] http://www.emotion-project.eu/

[x] http://www.frame-online.net/

[xi] EasyWay ICT and EC ICT definitions:

https://dg.its-platform.eu.

http://ec.europa.eu/transport/its/road/application_areas/ict_infrastructure_en.htm

[xii] http://ec.europa.eu/information_society/policy/psi/actions_eu/policy_actions/index_en.htm

[xiii] OJ L 281, 23.11.1995, p. 31

[xiv] OJ L 201, 31.7.2002, p. 37

[xv] eMOTION Project Portal accessed 13/03/09 (http://www.emotion-project.eu/).

[xvi] eMOTION Deliverable No D4, Policies – Contracts and Agreements, July 2007, European (http://srvweb01.softeco.it/emotion/Portals/_Rainbow/Documents/eMOTION_D4-Final_1_0.pdf, accessed 13/03/09).

[xvii] http://www.tisa.org/en/welcome.htm

[xviii] Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport http://register.consilium.europa.eu/pdf/en/10/pe00/pe00025.en10.pdf

[xix] http://www.quantis-project.eu/