EasyWay Harmonising European ITS Services and Actions

Data Exchanges
DATEX II

Supporting Guideline

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EasyWay is a trans-european project co-financed by the European Commission (DG MOVE)

www.easyway-its.eu

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Preamble

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.

Service at a glance

SERVICE DEFINITION

Exchange of road traffic information among road operators and between road operators and service providers in order to improve the traffic conditions and inform drivers on trip and also for their pre-trip planning. This exchanged information is modelled and structured in a common and standardised way, which facilitates its re-use and lowers development costs.

SERVICE OBJECTIVE

Objectives are to offer a standardised way to exchange data among road operators and between road operators and service providers. Data is:

- Road and traffic-related events (called in DATEX II "Traffic elements")
- Operator actions (like network management, road works, sign setting, …)
- Non-road event information including multimodal information
- Elaborated data (derived/computed data, e.g. travel times, traffic status)
- Measured data (direct measurement data from equipment or outstations, e.g. traffic and current weather measurements)
- Messages displayed on Variable Message Signs (VMS).

SERVICE BENEFIT RADAR

Not applicable (no end user service; benefit is determined by the actual services using the exchanged data)

EUROPEAN DIMENSION

The international dimension of traffic information data exchange can be underlined by the following figures and estimations:

- On average each national road operator in the EU-27 manages approximately 700 kilometres of Motorway, serving areas of typically 200 by 200 kilometres[1]. Due to the small area generally covered by a particular road operator, a large share of private car trips and by far most HGV trips indeed cross such boundaries;
- Road works affect approx. 5% of TEN-T at any time, resulting into usually more than 1000 distinct construction sites alone that affect road traffic;
- Assuming that TEN-T users will be affected by the combination of congestion, road works, weather phenomena or other relevant incidents every 100 Kilometres of their trip, more than 10 Million instances occur during a year and more than 1000 highly dynamic incidents are active at any time.

In addition to road network operators there are also numerous service providers across Europe. These include about 100 European companies that are members of the Traveller Information Services Association (TISA) organisation. Key service providers include broadcasters who may have coverage areas similar to or larger than those of TEN-T operators.

[1] These figures have to be seen as average but it is not unusual for a single road operator to manage more than 2 000 km of roads or motorways spreading on a territory much larger.

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List of abbreviations

CEN	Comité Européen de Normalisation (European Committee for standardisation)
DATEX II	DATa EXchange – generation 2
ESG5	Expert and Study Group #5 (dealing with DATEX II)
EU	European Union
EU-27	European Union (with 27 Members States)
EW	EasyWay
HGV	Heavy good vehicle
http	HyperText Transfer Protocol
ICT	Information and communication technologies
ITS	Intelligent transport systems
RDS-TMC-	Radio Data System - Traffic Message Channel
SOAP	Simple object access protocol
TCC	Traffic control centre
TCP/IP	Transmission Control Protocol / Internet Protocol
TEN-T	Trans-European network – Transport
TIC	Traffic information centre
TISA	Traveller Information Services Association
TMC	Traffic management centre (alternative of Traffic control centre)
TS	Technical Specification (for CEN and ISO)
UML	Unified Modeling Language, Modelling language for software development
VMS	Variable message sign
VPN	Virtual private network
XML	Extensible Markup Language
XSD	XML Schema Definition

1 Introduction

1.1 DATEX II and the concept of the EasyWay Deployment Guidelines

The EasyWay deployment guidelines aim at harmonising European ITS for the Trans-European road network and beyond. They define a set of requirements for many distinct ITS services towards the user- the traveller, the driver on the road or for example the haulier, scheduling or planning heavy goods transport. These services are either related to traffic information or traffic management and may affect personal or goods vehicles.

In that landscape, DATEX II is not seen as such a service but as enabling tool. It can and does not define the same kinds of functional requirements as when road users are addressed directly. Also DATEX II is not merely an EasyWay deployment guideline. Even if it is advanced by and in the interest of road authorities, its domain stretches well beyond the EasyWay partners' activities.

For these reasons the DATEX II Deployment Guideline is treated differently here, compared to other ITS service Guidelines.

1.1.1 Applying Deployment Guidelines – The case of DATEX II

The DATEX II Deployment Guideline follows a different rationale than most other EasyWay Deployment Guidelines. In particular it is not focusing on defining new functional and technical requirements as such but on describing the framework and the main concepts according to which DATEX II has been created. Since DATEX II owns a very complex data model and a vast application area any application needs a basic understanding of the general concepts, most relevant domains, restrictions and exchange mechanisms. Furthermore the development of DATEX II itself is an on-going process: It needs to be adapted to changes in the larger ITS landscape and it is constantly being tailored to a range of ITS services, even if technical requirements from an end user point of view towards these services might appear unchanged.

Finally, a profiling approach has been followed to foster the interoperability of ITS services in technical aspects. It is understood within EasyWay that many service descriptions in both the traffic information and the traffic management domain can benefit from such profiles being defined in cooperation between domain and DATEX II experts.

1.1.2 Reference to other DATEX II related documents

DATEX II is a technical specification published by CEN as CEN/TS 16157: The CEN documents lay down the descriptions that any system must take into account for different degrees of interoperability.

The EW Expert and Study Group runs a website (www.datex2.eu) and a help desk service where additional information is available on how to set up install and run a DATEX II-related system.

All experts dealing with actually implementing a DATEX II system should consult these documents and their content is in no way substituted by this Deployment Guideline. However it does provide orientation material and also addresses the ITS experts without particular knowledge of IT systems.

Many other EasyWay Deployment Guidelines refer to DATEX II and in various cases a real DATEX II profile has been included, e.g. as a selection and description of a sub-model from DATEX. To understand these crucial elements a sound knowledge of DATEX II as an enabling tool and technical framework is essential.

Therefore this information is regarded by EW ESG5 DATEX II as indispensable for the full comprehension of harmonisation and interoperability issues for many ITS services.

1.2 Contribution to EasyWay Objectives

The present document describes what DATEX II is and how the use of DATEX II can help implement the deployment of European ITS services and the ITS action plan.

DATEX II can be seen as a standardized formal structure to exchange road traffic information among road operators and between road operators and service providers.

The EasyWay project's overarching objectives which are expected to be achieved by 2020 are as follows:

- 25% improvement in road safety by 2020;
- 25% decrease in congestion, facilitated travel and mobility of people and goods by 2020; and
- 10% reduction in the impact on the Environment by 2020.

The contribution of DATEX II to the EasyWay objectives will not be measured directly, as for the other studies.

However, it is evident that the generalization of a common language that is well understood by all the actors for exchange information and decision making will make achievement of these objectives more efficient.

Here are just two examples:

- The use of DATEX II for exchanging data coming from automatic incident detection systems, between a TCC and a service provider may allow for a quick transmission to vehicle without time lost along the transmission chain since the translation stage between DATEX II and TPEG e.g. is stable and well documented. One can save minutes to inform drivers of dangerous situations ahead on the road. This will contribute to road safety.
- The publication of real-time levels of traffic and travel-time is now seen by many users as a good indication to support decision making concerning journeys. This contributes to decreasing congestion and reducing Environmental impact. Generalisation of DATEX II will help such an achievement.

1.3 Current status of deployment

Implementing the European Transport policy of the European Commission as it is stated now in the ITS Action Plan implies co-ordination of traffic management and development of seamless pan-European traffic information services. For developing such services, data shall be collected, integrated/processed and exchanged among the traffic centres and with service providers. With the aim of fostering sustainable mobility in Europe, the European Commission has, for several years, been supporting the development of information exchanges. Therefore, investments have been made to develop the DATEX II standard and to implement it in traffic control and information centres in order to ensure interoperability and cross-border exchange across TEN-T.

It complies with the objectives of the EasyWay programme for safer roads, reduced congestion and a better environment. The new generation DATEX II has become the reference for all applications requiring access to dynamic traffic and travel related information in Europe. Its specifications take into account the new architecture for communication (e.g. Internet) and open the door to all actors of the traffic and travel information sector.

DATEX II defines a formal data structure for the exchange of road traffic information among road operators and between road operators and service providers.

The DATEX II formal data structure is specified in a multi-part series that is currently undergoing European standardisation led by CEN TC 278, which covers Road Transport and Traffic Telematics. (See www.itsstandards.eu). The first three Parts of the DATEX II Technical Specifications (CEN/TS16157) have been approved and published. These three parts deal with the most mature and widely used parts of DATEX II: the modelling methodology (called Context and Framework) as Part 1, Location referencing as Part 2 and the DATEX II publication for traffic information messages (called Situation publication) as Part 3, which is the most shared and used part among the parts dealing with publications.

The map below provides an overview of the countries participating[2] in the EasyWay Study on DATEX II (ESG5), thus demonstrating their stake in the development and support of the standard. However there are known applications also in other countries.

[2] "Represented" means these countries do not directly participate in ESG5 work but can contribute in some cases through another active country.

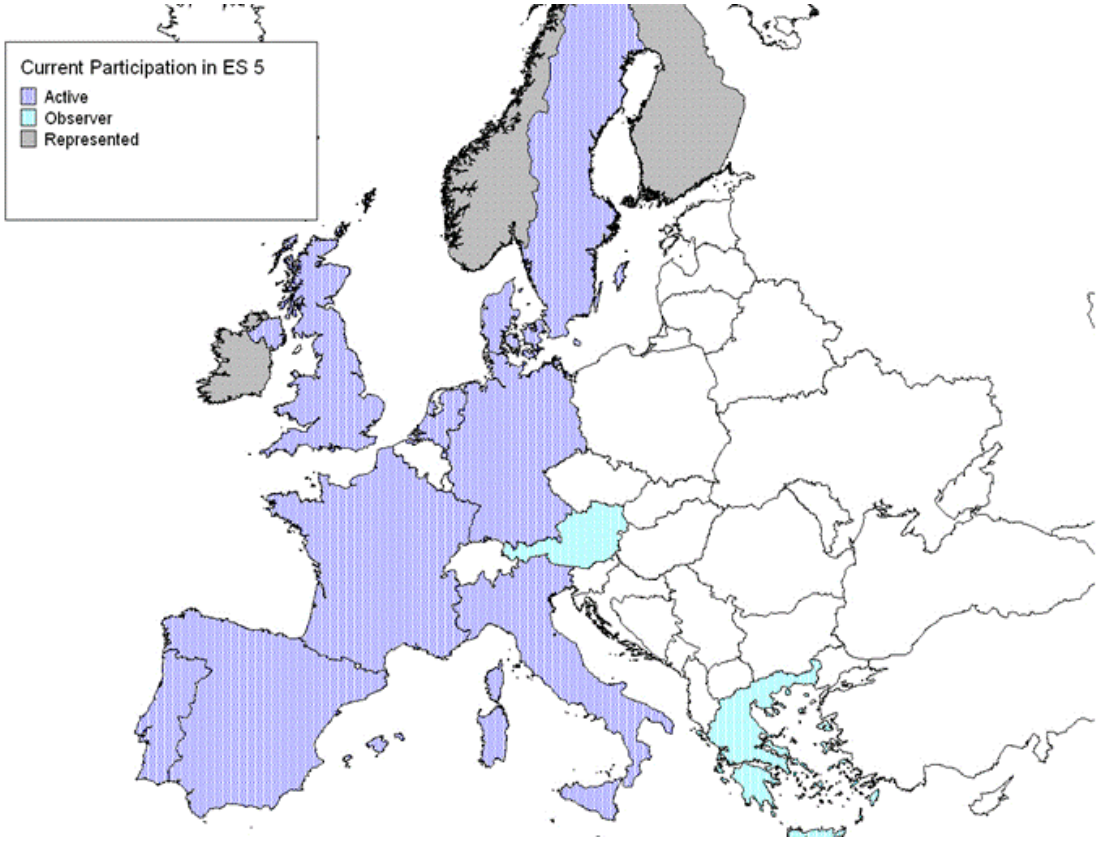

Figure 1: Map of countries involved in ESG 5

The EasyWay annual reports contain information about the progress of implementation in data exchange systems, which can be referred to in order to get a snapshot of the state of implementation achieved.

In addition DATEX II is used by non-public partners in the ITS chain, like many service providers. For a growing numbers of EW partners, information is delivered to service providers only in DATEX II.

1.4 European Dimension

The international dimension of traffic information data exchange can be underlined by the following figures and estimations:

- On average each national road operator in the EU-27 manage approximately 700 kilometres of Motorway, serving areas of typically 200 by 200 kilometres[3]; hence, a large share of private car trips and the majority of HGV trips take place cross-boundary
- Road works affect approx. 5% of TEN-T at any time, resulting into usually more than 1000 distinct construction sites alone that affect road traffic
- Assuming that TEN-T users will be affected by the combination of congestion, road works, weather phenomena or other relevant incidents every 100 Kilometres of their trip, more than 10 Million instances occur during a year and more than 1000 highly dynamic incidents are active at any time.

In addition to road network operators there are also numerous service providers across Europe. These include about 100 European companies that are members of the TISA organisation. Key service providers include broadcasters who may have coverage areas similar or larger than those of TEN-T operators.

[3] These figures have to be seen as average but it is not unusual for a single road operator to manage more than 2 000 km of roads or motorways spreading on a territory much larger.

2 Framework for Requirements

2.1 Service Definition

A DATEX II service exchanges information for road traffic which can be dynamic and is usually relevant for traffic management and traffic information. This exchanged data is modelled and structured in a common and standardised way, which facilitates its re-use and lowers development costs. Collecting information is only part of the story – in most cases data needs to be exchanged with both other centres and, in more recent developments, with those developing pan-European services provided directly to road users.

The first generation of DATEX was designed and developed during the nineties as a traffic and travel data exchange solution by a European task force set up to standardise the interface between traffic control and information centres. It has been the reference for applications that have been developed and implemented in Europe. The existing DATEX network consists of 50 to 60 operational nodes organised in different network and node types throughout Europe. The majority of nodes are used for national exchange of data, but some of them support international exchange.

2.2 Framework for Functional Requirements

2.2.1 General data description

The data is collected by a number of systems or manually entered by operators in a Traffic Control Centre (TCC), especially for road events and operator actions.

Information related to traffic and exchanged with DATEX II systems is shared out into different categories:

- Road and traffic related events (named “Traffic elements”)
- Operator actions
- Impacts
- Non-road event information
- Elaborated data (derived/computed data, e.g. travel times, traffic status)
- Measured data (direct measurement data from equipment or outstations, e.g. traffic and weather measurements)
- Messages displayed on Variable Message Signs (VMS).

In addition Predefined Locations, VMS Table and Measurement Site Table information are also exchanged. They are not directly related to traffic, but are required to ensure a receiver is able to decode the corresponding information.

2.2.2 Road and traffic related events

They are named in DATEX II “Traffic elements”. These are all events which are not initiated by the traffic operator and force him to undertake (re)actions. They are classified in 6 main categories:

- Abnormal traffic (long queues, stop and go, …)
- Accidents
- Obstructions:
  - animal presence,
  - vehicle presence,
  - obstructions due to environment (avalanches, flooding, fallen trees, rock falls, …),
  - obstructions due to infrastructure (fallen power cables, …)

- other obstructions including people

- Activities (public event, disturbance, …)
- Incidents on equipment or systems (e.g. Variable message sign out of order, tunnel ventilation not working, emergency telephone not working, …)
- Conditions: driving conditions related to weather (ice, snow, …) or not (oil, …), conditions related to environment (precipitation, wind, …), …

It also contains information on impacts on the network and/or traffic, in particular, information on lane availability and on delays (in seconds, in time range or globally).

2.2.3 Operator actions

Operator actions are classified in 4 main categories:

- Network management: road closure, alternate traffic, contraflow …
- Traffic control: rerouting, temporary limits
- Road works: resurfacing, salting, grass cutting …
- Roadside assistance: vehicle repair, helicopter rescue, food delivery …
- Sign settings: This refers to a VMS message.

2.2.4 Non-road event information

It concerns information about events that are not directly on the road: transit service information, road operator service disruption, car parks.

2.2.5 Elaborated data

These sets of data are normally derived on a periodic basis by the Traffic Control Centre systems from measured data for specified locations:

- Travel times: elaborated travel–time (free-flow travel-time, instantaneous travel-time…
- Traffic status = attribute with 5 possible values (free flow, heavy, congested, impossible, unknown)
- Traffic values (normally published as measured data, but can be derived on a periodic basis and published as elaborated data): flow, speed, headway, concentration and individual vehicle measurements.
- Weather values (normally published as measured data, but can be derived on a periodic basis and published as elaborated data): precipitation, wind, temperature, pollution, road surface condition and visibility.

They can be forecast values.

2.2.6 Measured data

These data sets are normally derived from direct inputs from outstations or equipment at specific measurement sites (e.g. loop detection sites or weather stations) which are received on a regular (normally frequent) basis:

- Traffic values: flow, speed, headway, concentration and individual vehicle measurements.
- Weather values: precipitation, wind, temperature, pollution, road surface condition and visibility.
- Travel times (normally published as elaborated data, but direct outstation values can be published as measured data): elaborated time, free flow time, normally expected time
- Traffic status (normally published as elaborated data, but direct outstation derived values can be published as measured data) = attribute with 5 possible values (see Elaborated data above).

2.2.7 VMS messages

These data sets include different possible messages according to different technologies, including textual messages, pictograms or combinations as well as allowing for full matrix VMS. They are completed by some information about equipment status and position.

2.3 Framework for Organisational Requirements

2.3.1 DATEX II Technical specifications

Implementations shall conform to CEN TS 16157 DATEX II.

The EU ITS Directive is expected to mandate a legal status for the use of these published European standards in due course.

2.3.2 The three model levels in DATEX II

DATEX II allows defining extensions according to CEN/TS 16157-1:2011. These extensions have different levels of interoperability and definition constraints. Three levels are defined.

Level A: The core model

An extensive data core model (named “level A”) is suitable for most data exchange scenarios. This model already contains a vast amount of options that users can choose from when assembling data publications. It is the minimum set that all DATEX II systems must fulfil in order to assure the interoperability.

Implementations shall either fully support Level A option or a subset according to a service-oriented profile commonly agreed by the supplier and the receiver.

Level B: The extended core model – Extension mechanisms

Nevertheless, there will be situations where data concepts required by a particular user are missing in the Data Dictionary[4], for example because they only make sense in a National context. In this case, these users are expected to provide an extension to the model (named “level B”) that provides the missing concepts. Users are allowed to apply a limited set of well-defined UML mechanisms for these level B extensions, which then still maintain technical interoperability[5] with standard DATEX II systems (Level A). It means that a level A implementation of a client is able to accept and to decode a publication sent by a provider using a level B extension (level A part only). Of course, this client cannot decode the part of the publication covered by the extension.

Implementations may support Level B extensions. They shall accept any message from a supplier having implemented a level B extension without any configuration change.

Level C: Adapt DATEX II principles to different type of contents

Level C implementations are compliant with all the DATEX II specifications (common modelling rules and common exchange protocols). Nevertheless they are considered as not compliant with the DATEX II Level A/B content models and should not be used in EasyWay exchanges.

2.3.3 Profiles in link with deployment guidelines on services

In order to ease the development for their ICT system, two partners may agree to reduce the Level A model they want to use according to their needs.

[4]The Data Dictionary contains all the data of the DATEX II model. It is another way to access information for users who do not have UML knowledge. It is a list of terms with their respective definition.

[5]Interoperability can be defined as the ability of systems to provide services to, and accept services from, other systems and to use the services so exchanged to enable them to operate effectively together (source: ISO TS 14907-1).

In this case they are defining a profile[6] which contains just the classes they need and want to use.

For the supplier, the use of profile doesn't have any collateral effect due to the fact that clients can find only what the supplier provides.

When a client uses a profile limiting the data contained, there is a need to manage the risk of error if the supplier adds something in the profile without informing his client.

Here is just one example:

- A road operator provides a service which is limited to safety-related road event information as mentioned in the ITS Directive.
- To provide this kind of service, lots of classes are not useful, like travel-time, non-road information, measured data, elaborated data, …
- Therefore, this road operator can propose a profile that limits the data model to accident, obstacle, low-protected road work, …
- Service providers who are interested in receiving such information can adopt that profile for their software development
- The limitation of the number of classes and attributes has a direct impact on the development time and cost of software.

The implementation of a profile is defined in the document DATEX_II_schema_generation_tool_guide_2.pdf (See www.datex2.eu website).

2.3.4 Interchange agreement

The interchange agreement is a document that describes bilateral agreements between a Supplier and a Client, required for the exchange of DATEX II information. The interchange agreement should deal with all the information that is needed for the data exchange to take place. The description assumes that the information exchange follows the basic principles of DATEX II. Specifically it is assumed that two parties are involved: a Supplier providing content and a Client receiving content.

The interchange agreement shall refer to a common profile in order to facilitate the development and deployment of the systems shared or just linked between the partners.

2.3.5 Conditions for service provision—Business model

DATEX II does not force business model elements on its users.

According to the ITS Action Plan, the information related to drivers' safety shall be published free of charge and in such a way that delivery delay will be minimised.

As a common standard DATEX II can serve the ITS Directive - Action Area 1: Optimal use of road, traffic and travel data and, particularly, item 1.1:

Definition of procedures for the provision of EU-wide real-time traffic and travel information services, addressing notably the following aspects:

- Guaranteed access by public authorities to safety-related information collected by private companies
- Guaranteed access by private companies to relevant public data

DATEX II will assist in the implementation of the EU ITS Action Plan, by facilitating the exchange of information.

Apart from this DATEX II can, via standard IT and E-commerce tools, be embedded in commercial as well as public environments.

[6] A profile is a (set of) stereotyped package(s) that contains model elements, which have been customized for a specific domain or purpose using extension mechanisms, such as stereotypes, tagged definitions and constraints (from ISO 24531:2007)

Data exchange agreements between partners can specify restrictions for usage of data transmitted, yet in the context of this document this is understood as an element of a “content-oriented service”, i.e., a traffic information, a traffic management or any other service along the ITS service chain.

Each message DATEX II contains an identification of the organisation that is the source of the information and of the organisation that provides this information.

,It is therefore feasible to implement at the end-user level (on-board-unit), a feature using this information to filter content and assess the level of audience of each sources and each providers. One can imagine using such an assessment to set up a system allocating IPR fees according to this audience.

2.4 Framework for Technical Requirements

2.4.1 General overview

One of the main objectives for DATEX II is to be platform independent.

The evolutions of ICT and the generalisation of Internet and its standardized protocol (HTTP and SOAP), drove the data exchange applications and was taken up by DATEX II.

The modelling of the traffic information and control domain chose UML (Unified Modelling Language), a standardised language widely used in many domains.

Using DATEX II as a service does not depend on ICT infrastructure (outside internet connection) and is totally independent of any hardware or operating systems.

However, in order to produce valuable dynamic information many application areas depend on the availability of valid information with high resolution in space and time.

From the perspective of the Data Exchange specification, quality and content must be separated from processing this data.

The DATEX II specification in itself does not limit the accuracy or reduce the overall quality of traffic information; however, certain necessities have to be taken into account.

2.4.2 Platform Independent Model

DATEX II functional architecture defines mechanisms and a functional model to exchange data. In a high level architecture, the key aspects are:

- Work in different environments. Implementations may use any technology. Each sender and receiver shall be capable of using Internet protocols and webservices[7] for data exchange.
- Based on widely used development patterns. Exchange mechanisms can be implemented based on a publish/subscribe pattern.
- Two data exchange modes are defined - pull and push. In pull mode, data is requested by a receiver from a provider, generally in a periodic way. In push mode, data is sent from a provider to a receiver, when it is available, being more suitable for scenarios where information should be available as soon as possible.
- No restriction of exchange medium or network. DATEX II does not in any way limit the kind of connection that two parties use in data exchange. This can be reached using a dedicated connection, the public Internet, a virtual private network (VPN) or other, as long as there is the possibility to communicate over TCP/IP.

[7]A "Webservice" is a software system designed to support interoperablemachine-to-machine interaction over a network (definition from the W3Chttp://www.w3.org/TR/ws-gloss/)

2.4.3 Platform Specific Model

In order to be implemented, a platform independent model needs to be transformed into one or several platform specific models. Without being exclusive, the DATEX II community has chosen to stick to the most popular Internet specifications, i.e. XML (eXtensible Markup Language), HTTP and SOAP.

These W3C recommendations are very popular in Internet usage because they allow easy system development.

In order to achieve this, a UML-based model is directly translatable in a schema (XSD or XML Schema Description) which is used to produce XML exchange files.

Webservices are widely used today, supported on almost any platform. Therefore, partners exchanging DATEX II information can use very disparate technological platforms.

2.4.4 Technical view

In an exchange system there are two roles, supplier and client. The supplier publishes information, whereas the client subscribes it and receives traffic information.

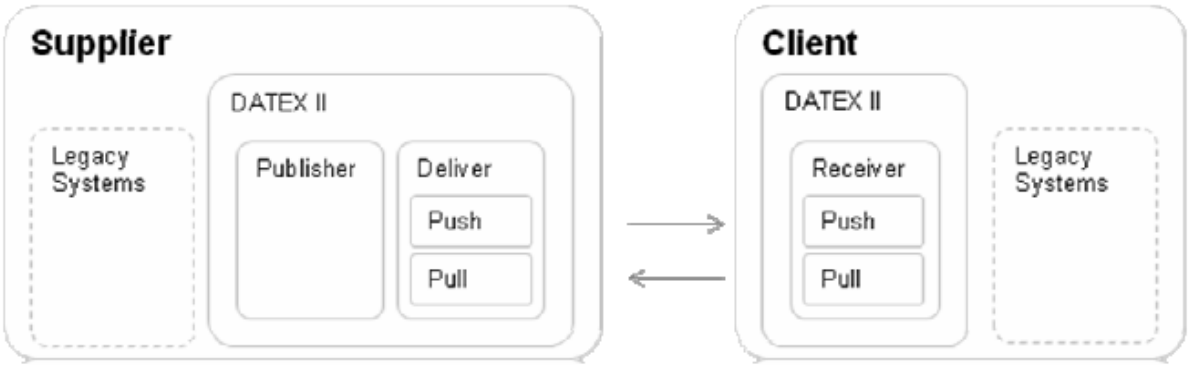

Figure 2: Component architecture of DATEX II

A supplier exchange system is composed of two main subsystems:

- A Publisher subsystem, which makes data available and creates the payload publications (Situations, Traffic View, Measured and Elaborated Data, Locations)
- A Delivery subsystem, which adds exchange specific information and performs the physical delivery, supporting pull and push methods;

A client exchange system is composed of one main subsystem:

- A Receiver subsystem, which is responsible for receiving information, either by calling the supplier services (Pull) or receiving a service call made by the supplier (Push);

Legacy systems, which can appear beside a DATEX II system in the previous figure, represent any specific system that is not DATEX II-native. Generally these systems were designed before the introduction of DATEX II. The term is widely used in DATEX II literature and beyond.

A subscription is a mechanism set up between a Client and a Supplier that specifies the payload type to be exchanged. It can be defined by the supplier or by the client. DATEX II allows users to have the freedom to develop subscriptions with the refinements they need.

There are 3 possible operating modes for data delivery:

- Publisher Push on occurrence Data delivery, each time data is changed the information is sent to the client by the supplier;
- Publisher Push periodic Data delivery, the suppliers publish data on a cycle time basis and send it to the client;
- Client Pull Data delivery is initiated by the Client and data is returned by the supplier;

At the technical level, DATEXII distinguishes two kinds of systems:

- Push systems
- Pull systems

A Push system can use both Push modes of data delivery and DATEX II proposes to make the implementation with Webservices over HTTP, implemented on both sides.

A Pull system uses the Client Pull mode and DATEXII proposes to make the implementation with:

- Webservices over HTTP,
- HTTP web server with an XML data file.

According to the adopted implementation by the supplier, the Client uses either:

- Webservices over HTTP,
- Basic HTTP requests.

2.5 Framework for Common Look & Feel

Not applicable

2.6 Framework for Level of Service Definition

2.6.1 Preliminary remark

The scope of EasyWay is to provide Core European Services to the European road users. These services are harmonized in content and functionality, but also in their availability: The road users shall be able to expect a certain services offer in a specific road environment. In order to provide a basis for the harmonization 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.

In essence, EasyWay has agreed on a set of 18 pre-defined Operating Environments (OE) 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)

For more information and details, visit http://www.easyway-its.eu/document-center/document/open/490/ and download the Guidance for Classifying the EasyWay Network into OE ver 1.0.

2.6.2 Level of Service Criteria

DATEX II exchanges in themselves do not constitute a real service, but rather a tool to provide services in the different fields: Traveller Information, Traffic Management, Freight and Logistics. Therefore it does not appear appropriate to define a level of service for DATEX II, even though their European harmonization can provide a good contribution to the level of the aforementioned different services.

However some suggestions can be given for setting up and managing such implementations and as general guidelines for road operators:

2.6.3 Framework for Level of Service Criteria related to Operating Environment

As no formal level of service exists, the relationship to the Operating Environments is not applicable and the direct correspondence to Operating Environments should be found in the Guidelines for the services making use of DATEX II.

However one can consider and suggest, in general, that the more critical the operating environment is (high traffic, truck relevance, weather problems, etc.), the more important the correct and timely data exchanges based on DATEX II and the observance of the given recommendations become.

2.7 Preparation Checklist

Here after are some questions somebody wishing to set up a DATEX II-based exchange system should check:

- Is data already available in an electronic form?
- Is it a well-known format to describe this data?
- Is the location referencing of the data well known, described and shared?
- Have I subscribed to an account on http://www.datex2.eu/user/register in order to access all updated information about DATEX II?
- Have I downloaded and read the Reference Set Document and Supporting Document available on http://www.datex2.eu/content/info?
- Have I checked whether profiles exist for the DATEX II exchange or application envisaged and does my system support those profiles?
- Have I registered my DATEX extension to the DATEX II website (if applicable)?
- Have I tested my system against other DATEX II systems to ensure interoperability?

3 Supplementary Information

EasyWay Deployment Guidelines are twofold:

- *Part A elaborates on the content of the ITS service addressed, including the entire deployment framework including Requirements and Levels of Services. For this Supporting Guidelines, this is the case in particular regarding the use of the CEN/TS 16157 series of technical specifications for data exchange ("DATEX II").*
- *Part B is an appendix of educational content. Its objective is to illustrate part A with examples and feedback from deployments in the field.*

This lively chapter is subject to continuous development and update. It consists in a database of national practices and experiences which, as cross-fertilisation material, can benefit any road operator in Europe.

Bearing in mind the cyclic nature of the elaboration of EasyWay Deployment Guidelines, one can assume that the first edition of the 2012 Guidelines will not yet include users' experience on its content. Forthcoming ITS deployments based on part A of this Support Guideline will generate more feedback which will in-turn be integrated into the next revised version of part B.

3.1 Examples of deployment

The following examples of deployment of EasyWay members have been taken from the DATEX II NODES DIRECTORY to be found at www.datex2.eu/datex-node.

3.1.1 Example of Ireland

NRA Traffic DATEX II Service

Covered network:

Republic of Ireland's national primary road and motorway network managed by the National Traffic Management Centre.

Publication:

Situation
Measured Data
Elaborated Data

Organization name:

National Roads Authority

Organization description:

The National Roads Authority (NRA) was formally established as an independent statutory body under the Roads Act, 1993 with effect from 1 January, 1994.

The Authority's primary function, under the Roads Act 1993, is to secure the provision of a safe and efficient network of National roads. For this purpose, it has overall responsibility for planning and supervision of construction and maintenance works on these roads.

The National Roads Authority (NRA) makes traffic and travel information available to other organisations (e.g. local authorities and other national roads authorities) via this web site. The data includes Events (Planned and Unplanned), Travel Times, data from Vehicle Detector Stations, Variable Message Sign settings and Weather Station readings.

The data is published in Datex II (XML) format – Datex II is a standard format for exchanging traffic and travel data between organisations. To have access to this data, you will need a user name and password.

Website:

http://datex2.nratraffic.ie

Country/Region:

Republic of Ireland

Centre type:

TMC

Location Referencing Format:

TPEG LOC

3.1.2 Example of Sweden

Swedish DATEX II node

Covered network:

The Swedish DATEX II node covers primary all national roads in Sweden.

Publication:

Situation
Measured Data
Elaborated Data

Organization name:

Swedish Transport Administration

Organization description:

Trafikverket (the Swedish Transport Administration) is a new agency responsible for all modes of traffic: traffic on roads and railways, on the sea and in flight. We will plan for all modes of traffic for a long time to come.

Trafikverket will also build, maintain, and operate all national roads and railways.

Website:

www.trafikverket.se

Country/Region:

Sweden

Centre type:

TMC

Location Referencing Format:

RDS-TMC

3.1.3 Example of the Netherlands

Nationale Databank Wegverkeersgegevens Nederland

Covered network:

Entire country, with all motorways and important urban and interurban connections.

Available are:

- travel times on trajectories
- flow and spot speed on measurement sites

Road works

Event information on traffic

Location referencing systems used are: ALERT-C and X,Y point coordinates

Publication:

Situation
Measured Data
other

Organization name:

Nationale Databank Wegverkeersgegevens Nederland

Organization description:

The objective is to have established an operational National Data Warehouse for Traffic Information on a basic network of at least 5,500 kilometres of national, provincial and municipal roads within 4 years. NDW will become the databank that will collect, process, store and distribute all relevant traffic data. This will make NDW more than just a technical structure; it will become a network organization of municipalities, urban regions, provinces, companies and the Ministry of Transport, Public Works and Water Management who will join forces for the purpose of good traffic management and good traffic information.

Website:

www.ndw.nu

Country/Region:

The Netherlands

Centre type:

other

Location Referencing Format:

RDS-TMC

3.1.4 Example of France (Département des Hautes-Alpes)

France - Département des Hautes-Alpes

Covered network:

Département (county) des Hautes-Alpes.

Site http://inforoute05.fr

Publication:

Situation

Organisation name:

Conseil Général des Hautes-Alpes

Organisation description:

Conseil général du département des Hautes-Alpes, partner of the development of the application WebInforoute www.webinforoute.fr

Website:

www.cg05.fr

Country/Region:

France

Centre type:

Other

Location Referencing Format:

Other

3.1.5 Example of Germany (Hessen)

Traffic Centre Hessen

Covered network:

Federal and state road network (freeways / inter-urban roads).

Publication:

Situation
Measured Data
Elaborated Data

Organization name:

HSVV (Hessen Roads and Traffic Authorities)

Organization description:

HSVV are responsible for planning, building and maintaining freeways and the inter-urban road network in the German state of Hessen. Traffic control and management activities include re-routing, line control, temporary hard shoulder use, road works management, traffic information and incident management. HSVV`S road network comprises about 1000 km of freeways. Total road network adds up to more than 15.000 km. Hessen is active in the field of inter-regional strategy management, planning and realising traffic management strategies in cooperation with nearby German states (Rhineland-Palatinate, North Rhine-Westphalia, Baden-Württemberg, Bavaria). Traffic information between Traffic Centre Hessen (TCH) and other stakeholders is exchanged by means of DATEX.

Website:

www.verkehr.hessen.de

Country/Region:

Germany / Hessen

Centre type:

TMC

Location Referencing Format:

RDS-TMC

3.1.6 Example of Germany (Rheinland-Pfalz)

LandesbetriebMobilitätRheinland-Pfalz

Covered network:

Motorway network Rheinland-Pfalz Germany, approx. 870 Km

Publication:

Elaborated data
Other

Organization name:

Landesbetrieb Mobilität Rheinland-Pfalz (LBM)

Organization description:

LBM plans, builds and operates the high-level road network in the Land of Rheinland-Pfalz - Germany on behalf of the ministry for transport. LBM is in charge of traffic management supported by ITS and is tasked to run a comprehensive traffic information website www.verkehr.rlp.de

Website:

www.verkehr.rlp.de

Country/Region:

Germany Rheinland-Pfalz

Centre type:

TMC

Location Referencing Format:

RDS-TMC

3.1.7 Example of Italy

Autostrade per l'Italia - Italy

Covered network:

The node is allowed to supply information from the whole motorway network managed by Autostrade per l'Italia group concessionaires described at the following link at the Autostrade website. The node is not operational at the moment as there is no agreement signed but it may be used for testing purposes under certain limitations to be agreed.

Publication:

Situation
other

Organization name:

Autostrade per l'Italia

Organization description:

Autostrade per l'Italia is the leading National and European Concessionaire for toll motorway construction and management, and for related transport services.

Website:

www.autostrade.it/en/index.html

Country/Region:

Italy

Centre type:

TIC

Location Referencing Format:

RDS-TMC

3.1.8 Example of Spain

Spanish DATEX II node

Covered network:

National Road Network (except urban roads).

Publication:

Situation

Organization name:

General Directorate of Traffic

Organization description:

General Directorate of Traffic is responsible of traffic control and management functions on interurban roads of Spain (except Basque country -DT- and Catalonia -SCT-). The country has a surface of 504.750 square kilometres and more that 330.000 kilometres of roads. Traffic information is exchanged between DGT, SCT and DT by means of DATEX II, therefore the international DATEX II server has available information from the whole country.

Website:

www.dgt.es

Country/Region:

Spain

Centre type:

TMC

Location Referencing Format:

RDS-TMC

3.1.9 Example of Portugal (Brisa)

Brisa - Auto-estradas de Portugal DATEX II node

Covered network:

Brisa currently operates a total network of 1500 Km, made up of 6 motorways concessions covering the Portugal from North to South and West to East, constituting the main Portuguese road links.

Publication:

Situation
Measured Data
Elaborated Data
Traffic Views

Organisation name:

Brisa - Auto-estradas de Portugal

Organisation description:

Brisa - Auto-estradas de Portugal was created in 1972. In 36 years it has become one of the largest tolled motorway operators in the world and the largest transport infrastructure company in Portugal. Brisa's main business area is the construction and operation of tolled motorways, both through direct investments in Portugal, as well as through its national and international subsidiaries.

Website:

www.brisa.pt

Country/Region:

Portugal

Centre type:

TMC

Location Referencing Format:

Point by Coordinates

3.1.10 Example of Portugal (EP)

EP - Estradas de Portugal DATEX II Node

Covered network:

EP - Estradas de Portugal SA is the Portuguese National Road Administration and the long term road network concessionaires. It is responsible for managing the national road network, directly or indirectly, through concessions and sub-concessions.

Publication:

Situation
Measured Data
Elaborated Data
Traffic Views

Organisation name:

EP – Estradas de Portugal SA

Organization description:

EP - Estradas de Portugal, S.A. has, along with other tasks of national road administration, the mission to provide a public service in areas such as funding, maintenance, development, requalification and extension of the Portuguese Road Network. EP – Estradas de Portugal SA holds a long-term contract of concession of the national road infrastructures in Portugal. It is a reference company with a long background which is part of the Portuguese history itself.

Website:

www.estradasdeportugal.pt

Country/Region:

Portugal

Centre type:

TMC

Location Referencing Format:

Point by Coordinates

3.1.11 Example of UK (Scotland)

Traffic Scotland Datex II Service

Covered network:

The Scottish trunk road network managed by Traffic Scotland.

Publication:

Situation
Measured Data
Elaborated Data

Organization name:

Traffic Scotland

Organization description:

Traffic Scotland is a service, delivered by Transport Scotland, which enables the collection and distribution of real-time traffic information occurring across the Scottish Trunk Road network in order to ensure that the safety and efficiency of the network is maintained. It is operated from the Traffic Scotland Control Centre (TSCC) in Glasgow.

Website:

www.trafficscotland.org/datex and transportscotland.org

Country/Region:

UK/Scotland

Centre type:

TMC

Location Referencing Format:

TPEG LOC

3.1.12 Example of UK (England)

National Traffic Control Centre (England) DATEX II Service

Covered network:

The English Strategic Road Network covering the motorway and trunk roads of England which is the responsibility of the Highways Agency to manage.

Publication:

Situation
Elaborated data

Organization name:

National Traffic Control Centre (England)

Organization description:

The National Traffic Control Centre (NTCC) is operated by Serco under a public/private partnership on behalf of the Highways Agency which manages the strategic road network in England that carries a third of all traffic and two-thirds of all freight.

Website:

www.highways.gov.uk

Country/Region:

UK / England

Centre type:

TMC

Location Referencing Format:

TPEG LOC

3.2 Business Model

3.2.1 Stakeholders in Service Provision

Vision for the future

All the actors in Europe will have DATEX II nodes covering the entire TEN-T Network.

Status of DATEX II usage in Europe

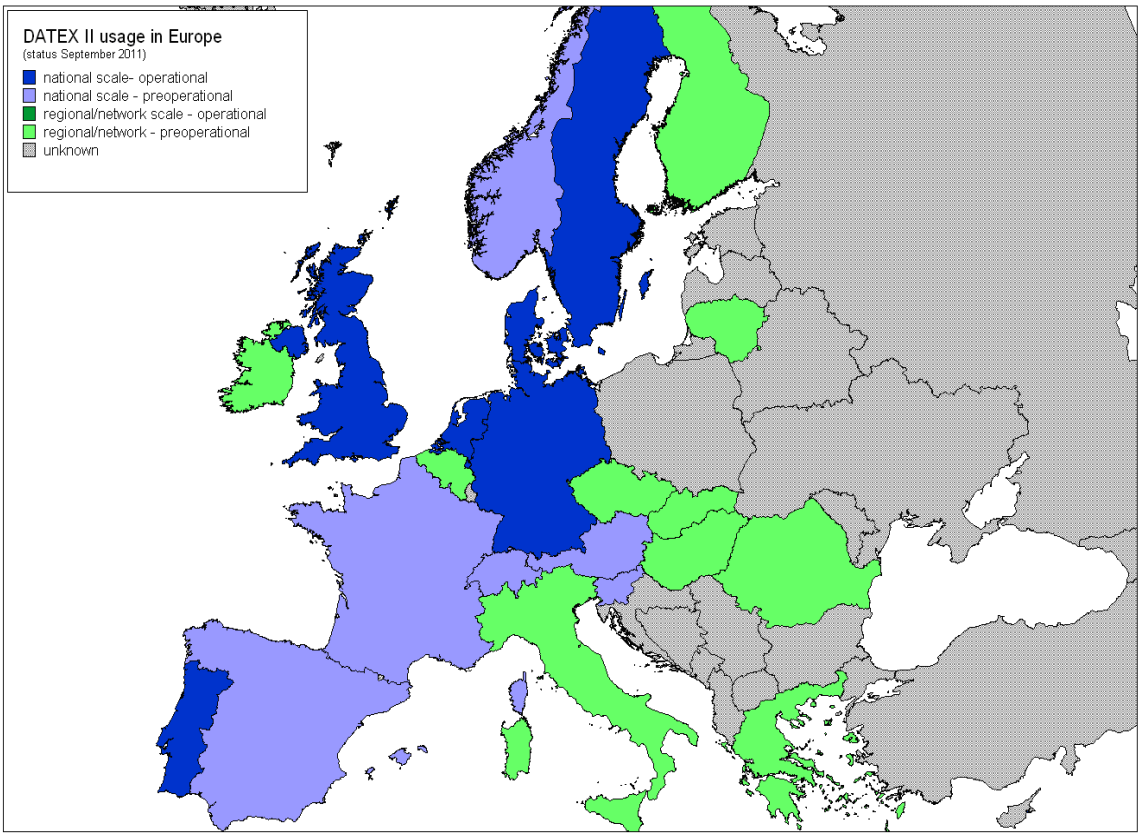

Figure 3: DATEX II usage in Europe (status September 2011)

4 Annex A: Bibliography

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