On October 5, DATEX II TS 16157 1-3 has been published. With this milestone reached there is now an acknowledged European Technical Specification for modelling and exchanging ITS-related information between many partners.

DATEX II has been developed to provide a standardised way of communicating and exchanging traffic information between traffic centres, service providers, traffic operators and media partners. The specification provides for a harmonised way of exchanging data across boundaries, at a system level, to enable better management of the European road network.

DATEX II will play a strong role for the implementation of integrated ITS in Europe. This brochure has been produced to describe the remit of DATEX II, its basic design principles, its ownership and the state of development.

DATEX II is at this time developed and maintained under the umbrella of the EasyWay project and is supported by the European Commission.

DATEX II – The standard for ITS on European Roads

DATEX II – CEN TS 16157
The key to successful information exchange

A tool to meet the ITS interface challenge

Allowing the exchange of traffic information to take place directly between control room operating systems considerably increases the safety and performance of transportation networks. With any exchange taking place at the system level, information is transferred instantaneously and does not involve the intervention of the operator, allowing for faster more responsive management of road networks. This ‘dynamic system state’ lies at the heart of the concept of Intelligent Transport Systems (ITS). When considering the volume, availability and accuracy of data, combined with the many descriptors of traffic state or situations, the importance of the concept becomes obvious.

The harmonisation and standardisation of data structures and data exchange services are fundamental challenges for both the information society as a
DATEX II is of relevance for all applications where dynamic information on the transport systems and notably the road system is concerned. The main usage areas are:

- Rerouting, network management and traffic management planning. Motorway networks and urban networks are regarded as closely connected here
- Lane or line control systems and related applications like ramp metering, dynamic speed limits and overtaking control
- Linking traffic management and traffic information systems
- Applications where information exchange between individual vehicles and traffic management is crucial, like for Car-to-infrastructure systems
- Applications where information exchange between management systems for different modes is crucial, like multi-modal information systems
- Applications where the exchange of measured data is important
- Provision of services in the framework of road management with a strong link to network safety or performance like Truck Parking

For all these domains DATEX II pays special attention to interoperability issues resulting from the need for multiple operator cooperation and the unhindered exchange of data or information. However DATEX II is also designed to be used within single operator systems.

Hundreds of Variable Message Signs per year are installed all over Europe. DATEX II provides the tools for a harmonised modelling and exchange of the information displayed.
Exchange between traffic centres and to service providers

Traffic centres are at the heart of many ITS applications. They are needed to supervise the traffic situation as a complete picture with human understanding seen as indispensable background for management activities. Centres will in most cases be responsible for dealing with cross boundary traffic management so the usage of a harmonised and, as much as possible standardised exchange specification, will obviously ensure operational and management efficiency. Yet traffic centres also have to deal with service providers as well. With information technology ever more present in cars and at home, traffic information has become in itself a traffic management tool. With this continuous availability of traffic information, contradiction between traffic centres and service provider must not be allowed to happen. Thus data exchange is seen as a content provision which in turn should follow international standards to overcome the fragmented or piecemeal information landscape of the past.

European ITS directive and ITS action plan

The European ITS directive (2010/40/EU) has created an international legal fundament for the technical specifications of road side ITS and telematics systems. Many of the priority areas and services mentioned in the directive are covered by DATEX II. These services include both traffic management and traffic information as well as services addressing the hauling industry (Intelligent Truck Parking). In this respect DATEX II is one of the fundamental steps in harmonisation that must be made to reach the directive’s ambitious goals. The DATEX II Deployment Guideline has been designed to describe the specific tasks of DATEX II in the framework of the EasyWay Deployment program and the ITS directive. Other EasyWay Deployment Guidelines refer to DATEX II as a standard to be used and include information of the subset of data elements or classes to be used in a specific service (so called profiles). All together the guidelines form a comprehensive registry of the state of ITS development in Europe. All guidelines can be obtained from www.easyway-its.eu.
DATEX II – Testimonials from users

**Testimonial I**

The Norwegian Public Roads Administration (NPRA) owns road and traffic data and data collection equipment along the national road network. With an increasing demand for real-time road and traffic data and strong focus on availability, NPRA needs to efficiently carry out its role as data provider. As a result of a feasibility study carried out in 2009-2010, the strategic decision to use DATEX II as a common standard for all types of dynamic road and traffic data from NPRA was made. The European perspective was an important reason for NPRA to implement DATEX II as well as the fact that DATEX II is based on modern technology and a well-structured data model. Another important aspect for the decision makers was also that DATEX II can be used not only for exchanging data between Traffic Information Centres, but also between the NPRA and service providers. Implementing DATEX II as standard format on all dynamic road and traffic data, and introducing a service layer in the data provision chain, will in turn improve NPRA’s role as data provider.

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**Testimonial II**

The National Datawarehouse for Traffic Information (NDW) collects and distributes traffic data in the Netherlands. National government, provinces, city regions and municipalities participate in this initiative that aims to improve traffic flow on existing roads. The NDW database provides an insight into the current traffic situation on motorways, secondary roads and urban throughways of the participating authorities. NDW uses DATEX II for all its communication. This means that data providers, the Central NDW System (CNS) and the customers all ‘speak’ DATEX II. It is a great benefit to have one common language with which ITS related information can be conveyed, especially when using multiple data providers. DATEX II makes cross (EU) border services possible, as is the aim of the ITS action plan. In NDW DATEX II is used to exchange information with both government (data providers) and service providers. Products that are delivered in DATEX II include real time traffic data (every minute) and status data (such as roadworks).

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DATEX II – the content

DATEX II already covers a wide range of content in the road traffic and transport domain. It is one of DATEX II’s main achievements to establish a logical model for this domain that is widely supported by users all over Europe. The initiative was started by trunk road operators in the past but now has been extended into the urban and logistics domain. The flexible approach and the built-in extensibility make it likely that coverage will extend even further in the future and that DATEX II will become the leading reference model for information exchange in road transport all over Europe.

The model already covers:
- Level of service on the network, both in terms of messages for specific situations or as an overall status on the network
- Travel times, be it on short network links or for long distance travel itineraries
- All types of incidents and accidents
- Road works
- Road infrastructure status
- Closures, blockages and obstructions
- Road weather, again as events as well as status / measurements
- All kinds of traffic related measurements (speed, flow, occupancy)
- Public events with impact on traffic
- Current settings of variable message signs

DATEX II – the options

DATEX II aims at providing interoperability, so as such, strives to be as formal and prescriptive as possible. Nevertheless, DATEX II also appreciates stakeholders needs and is built with the understanding that the “one size fits all” principle is not going to work on the level of European harmonisation. To cope with different user needs, DATEX II has built-in flexibility that allows its use in a way that best suits the local application needs.

The overall approach already shows consideration for flexibility by choosing the OMG’s Model Driven Architecture www.omg.org/MDA to separate abstract domain modelling from technology and implementation. This allows the high level concepts of DATEX II to be mapped to different implementation platforms at the same time, where the abstract model ensures interoperable semantics. As an example, the data model is currently mapped to XML schema as the exchange message syntax but may in future, or for ITS for truck parking facilities can increase safety on the TERN. It must be supported by standardised background data processing.
The first pre-release of the DATEX II specifications became available at the end of 2006, where content of early-adopters was shown during the i2tern conference in Barcelona. Implementations during, or following this event, included the National Traffic Control Centre in England, implementations from the French Ministry of Transport, Swedish Road Administration, the Spanish Ministry of Transport (DGT) and two traffic centres in Germany (Frankfurt and Koblenz). Based on the first official release of DATEX II, published in December 2006, different operational environments, be mapped to other platforms (e.g. ASN.1) in exactly the same way, without losing the interoperability of the applications behind the exchange.

The data model, although already covering a wide range of applications, may be extended following a well defined set of rules. One set of rules, covering the so called “level B” extensions, actually ensures interoperability down to the XML messaging level. The exchange regulations also offer a range of modes to choose from. Different applications have different needs regarding issues like transmission latency, volume of data and security requirements.

DATEX II offers the most widely used patterns of data exchange, in particular the users can choose which partner should initiate communications (client-pull versus server-push), which Internet protocols to use (HTTP or WSDL/SOAP) and whether updates should be on occurrence or periodic. All these features together create a data exchange environment that can be adapted to a vast range of user needs and scenarios, provides users with exactly the data exchange options they need, which allows for a smooth migration path for those that intend to migrate legacy systems into a DATEX II environment.

DATEX II – the applications

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The DATEX II modelling approach is based on the Unified Modelling Language (UML) which provides an ideal environment to capture the DATEX II domain model. Since the second half of the last decade, the UML is a widely used, well established and a stable environment for system specification. Harmonising ITS concepts on the European level takes a long time to achieve and it would be unsuitable to capture the results from this effort in a short lived, technology dependent way. The UML offers exactly the required stability, with the concrete mapping to exchange artefacts specified through using the Model Driven Architecture (MDA) principles.

The current implementation platform for messaging is the W3C standard for XML schema definition (www.w3.org/XML/Schema). The mapping is well defined in the specifications and has been implemented in a tool that users can download (together with the model itself, the whole specification and further supporting material) from www.datex2.eu. Users are able, if they want, to extend the model according to application specific needs, but they are also able to select those elements for schema creation that are actually used in their services. Thus, slim services can still work with slim schemas without having to carry the full burden of the huge DATEX II model.

Users that have created extensions that they feel could be of wider use can submit them in a dedicated section on the DATEX II website. Here they can be downloaded by other users and then discussed for future integration into the main standard. The DATEX II organisation has defined an approval process that deals with these user community provided inputs as well as with all other user feedback (forum discussions, issue reports) via the website.

The DATEX II organisation not only supports DATEX II users and maintains the standard, it also monitors and supports the deployment of DATEX II on the European level. A Deployment Guideline has been produced that aims at steering the use of DATEX II, and of monitoring its uptake, in the scope of the EasyWay initiative.

2006, more operational deployments have been reported from Austria, Denmark, Hungary, Ireland, the Netherlands, Portugal, Slovenia and the United Kingdom (separate implementations in England, Scotland and Northern Ireland). Current large scale deployment projects include the Nationaal Databank Wegverkeersgegevens in the Netherlands, the TIPI system in France and the Mobility Data Marketplace project in Germany.

**DATEX II – the description**

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**DATEX II – the organisation**

The DATEX II organisation has been set up to maintain and develop the specification to the benefit of all users and stakeholders. The governing body is the DATEX II European Study and Expert Group as part of the EasyWay consortium. EasyWay in turn is the largest cooperation of road operators in Europe and represents a yearly investment of well over €300 Million. EasyWay is supported by the European Commission in the 2010-2012 period. However DATEX II is in no way restricted to being used in a European Union jurisdiction or scope. Currently partners from 11 countries form the European Study Strategic group. This body decides
about all major issues, in particular dealing with
★ standardisation procedures
★ the taking up of working items or amendments
★ liaison activities
★ the DATEX II Deployment Guideline as part of a set
  of common European ITS application guidelines
The European Study is embedded into the overall
EasyWay structure which ensures involvement of all
partners in the final technical decision procedure.
Comprehensive technical expertise is provided by the
DATEX II Technical Group that focuses on
★ recurrent tasks like bug fixes and the handling of
  user requests
★ proposing and preparation of release planning
★ technical advice to the Strategic group
Although the DATEX II European Study is part of
EasyWay consortium it is open to cooperation with all
partners and bodies interested in the development of
harmonised data exchange in the ITS domain.
As an example for mutually beneficial cooperation,
EasyWay Expert and Study Group 5 (ESG 5 – DATEX II)
has teamed up with TISA (Traveller Information Services
Organisation, www.tisa.org) in order to demonstrate
the end-to-end connectivity of the traffic information
value chain. The first visible output of the EasyWay-
TISA collaboration was the well-received common
demonstrator on DATEX-TPEG interoperability at the
ITS in Europe Congress (June 2011, Lyon). At this
classification, a Memorandum of Understanding (MoU)
was signed by the current EasyWay Chairman Ronald
Adams and the TISA President Jonathan Burr. It paves
the way and provides the framework for a fruitful
cooperation for the benefits of European road users.

**DATEX II highlights**

★ CEN/TS 16157 “Intelligent transport systems -
  DATEX II data exchange specifications for traffic
  management and information” has been
  approved by CEN

★ DATEX II v2.0 is released by the EasyWay Expert
  and Study Group 5 (ESG5 - DATEX II) and
  available for download on DATEX II website
  www.datex2.eu

★ The second DATEX II User Forum will be held in

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EasyWay is a project co-financed by the European Commission (DG MOVE)
Photographs by courtesy of Hessisches Landesamt für Straßen- und Verkehrswesen, Landesbetrieb Mobilität Rhein-
land-Pfalz, The National Datawarehouse for Traffic Information (NDW) and Norwegian Public Roads Administration