

DATEX II – the key to successful information exchange

DATEX II has been developed to provide a standardised way of communicating and exchanging traffic information between traffic centres, service providers, other 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.

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 whole, as well as for ITS. DATEX II is a specification that is meant

to operate at and represent the interface between the worlds of dynamic traffic and IT.

Today there are over 100 road operators active on the Trans-European Road Network (TERN). Whilst the road infrastructure itself with its general layout, physical properties and signing have considerably converged, this is not necessarily true for ITS applications. Wherever a road operator must adapt his actions to a region beyond his own area of control, they will rely on the availability of comprehensive, relevant and accurate information from others.

The coordination and harmonisation of traffic management measures between road operators on the TERN is an essential part of maximising the capacities of their road networks to reduce the negative effects of congestion, whilst improving safety.

List & Description of main uses

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.

2

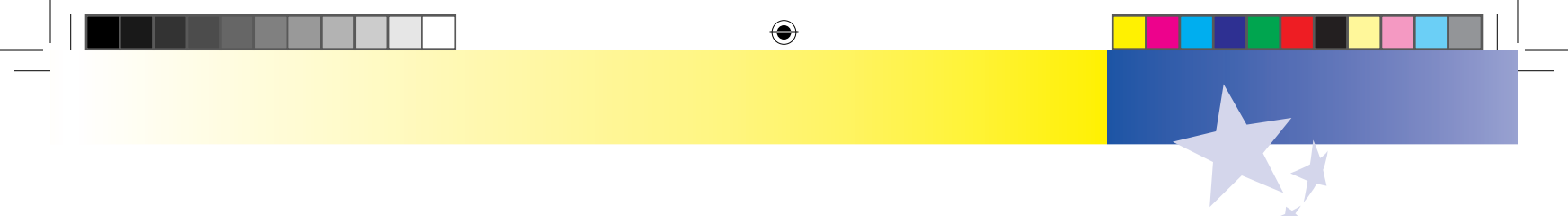
Within the framework of EasyWay many new VMS are being installed on the TERN (here at the A1 in Germany). DATEX II provides the tools for handling cross-border traffic data and traffic information needed to use VMS efficiently.



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 efficiencies.

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 ever

increasing 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.

Brief history

DATEX has its roots in the first cross-border ITS applications like TMC, and to this day it supports many features of these early approaches. From the beginning it has been widely used as a basis for numerous traffic centre software developments. In 2000 two European Pre-norms were established through CEN.

Following the development of the Internet as a general information exchange platform DATEX has been migrated to use standard IT approaches and tools. The result was the publishing of the first DATEX II specifications in 2006 with first small and then large scale applications following suit.

ITS action plan

The European Commission has launched an ITS action plan focussing on a range of common European ITS services for the benefit of travellers and road users. These services cover both traffic management and traffic information domains with several potentially being regulated by European directives. In this respect DATEX II is one of the fundamental steps in harmonisation

Since the very start, DATEX has been supported by the European Commission. From the European perspective traffic management has been seen as crucial for economic development, so a high priority has been assigned to ITS as a tool to improve the performance of the TERN. Without a harmonised approach on data modelling and data exchange, ITS will fail to meet these expectations. When considering the European ITS industry perspective harmonisation is also seen as a pre-requisite to develop and succeed on a global scale.

that must be done to reach the action plan's ambitious goals. The DATEX II Deployment guideline has been designed to describe the specific tasks of DATEX II in the framework of the ITS action plan. The Guideline can be obtained from www.easyway-its.eu.

DATEX II – Testimonials from users

Testimonial 1:

Info24 a neutral, digital information broker delivering business solutions for automated and secure collection, trading and exchange of information. We operate the open and neutral marketplace for ITS related information, www.its-exchange.com, and we have been using Datex/Datex II for many years. It is a great benefit that there is a common standard for exchanging traffic information as this enables us to ultimately provide travelers or motorists with relevant and accurate information that is based on a unified „language“ even as travelers pass through different geographic regions.

4

As an information exchange we have implemented many technical formats and protocols. The implementation of the Datex II standard was relatively easy and today it represents an important and cost effective way for us to obtain data from organisations. The implementation of Datex II is primarily used to exchange information between the Road Administrators in the Nordic region. This means that it is used to both retrieve information as well as send raw traffic data to the Road Administrators.



Hans Nottehed
Chief Technology Officer
Info24 AB
hans.nottehed@info24.se

Testimonial 2:

The German “Mobility Data Marketplace” project aims at significantly improving the availability of real time traffic data. Private and public mobility service providers will be able to create and offer innovative, high quality services, to road users.

Beyond information on what real time traffic data is actually available, the provision of the data itself via easy-to-use interfaces is essential for the success of the “Mobility Data Marketplace” (MDM). Due to its modern concept and its maturity – as well as the European scope – we have chosen DATEX II as the standard interface for the MDM. Nothing is as important for data exchange as a common ‘language’, and DATEX II today is the obvious choice for this purpose in the domain of real time traffic data.

Dr. Lutz Rittershaus
Federal Highway Research
Institute - BASt Germany
rittershaus@bast.de



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 road transport in 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 and street 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

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 different operational

Traffic Control Centres (here in Cologne) rely on comprehensive and integrated data. They define the requirements for performance, flexibility and speed of any data modelling and exchange protocol.

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.

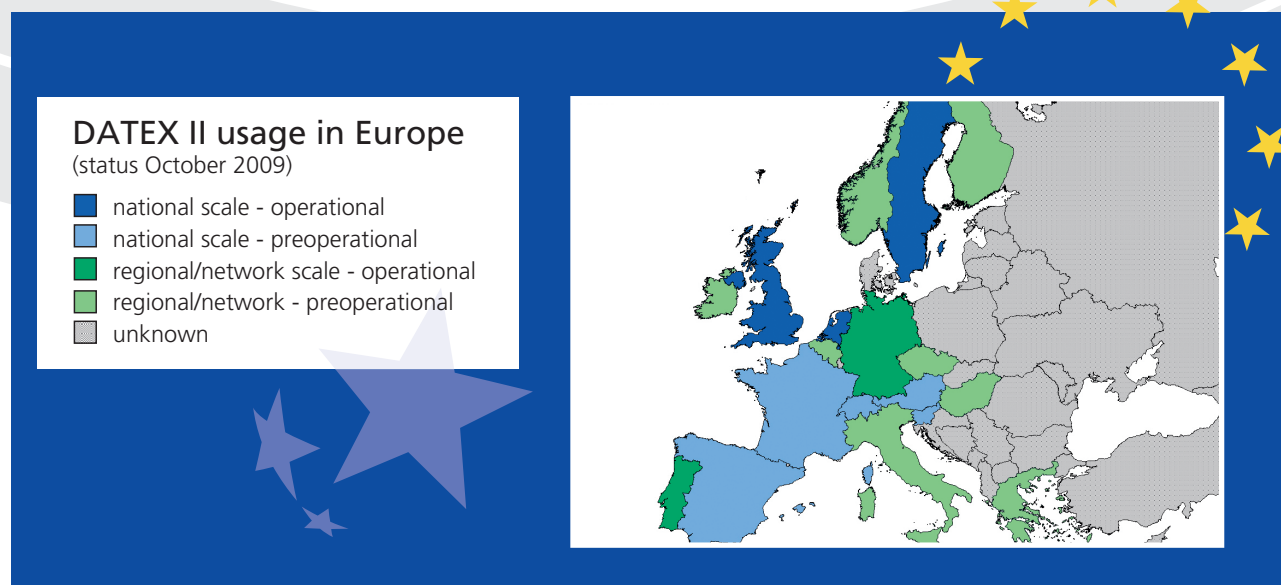
All these features together create a data exchange environment that can be adapted to a vast range of user needs and scenarios, provides users with exactly the data exchange options they need, which allows for a smooth migration path for those that intend to migrate legacy systems into a DATEX II environment.

6

DATEX II – the applications

The first pre-release of the DATEX II specifications became available at the end of 2006, where content of first 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, more operational deployments have been reported from Austria, Denmark, Hungary, Ireland, the Netherlands, Portugal, Slovenia, the

United Kingdom (separate implementations in England, Scotland and Northern Ireland) and Eire. 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

The DATEX II modelling approach is based on the *Unified Modelling Language* www.uml.org 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 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 monitoring its uptake in the scope of the EasyWay initiative.

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 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 was supported by the European Commission in the 2007-2009 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

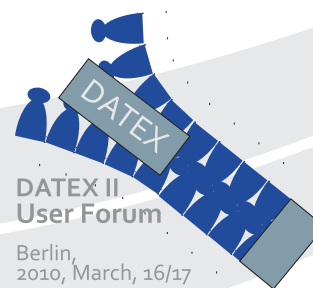
The European Study is embedded into the overall EasyWay structure which ensures involvement of all partners in the final technical decision procedure.

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.

Contact: Reiner.Doelger@mwvlw.rlp.de



EasyWay is project co-financed by the European Commission (DG TREN)



Photographs by courtesy of Landesbetrieb Straßen, Nordrhein-Westfalen