

# HA EU WATCH

## ITS in Europe – Identifying Opportunities for the HA DATEX II Fact Sheet

### ■ SUMMARY

DATEX II is the successor to DATEX, a widely implemented pre-standard for the exchange of traffic information and traffic data in Europe. DATEX has become out-of-date as recent developments in data exchange technology between businesses have focused increasingly on use of the Internet. In addition, new requirements for information have emerged which are not supported by the DATEX pre-standard. DATEX II aims to offer a standard and reliable solution for the exchange of traffic information between Traffic Control Centres (TCC), Traffic information Centres (TIC) and Service Providers which is modern, future proof and language independent.

The DATEX II specifications provide an extensible framework to allow for a robust and reliable data exchange to support current requirements and market standards. The DATEX II platform-independent content model builds on the content of the DATEX pre-standard, and includes many new data structures, such as travel times and meteorological data, according to the requirements defined by the EU Member States. Also, importantly, it now includes data structures to support the urban data domain which now falls within the scope of DATEX II.

DATEX II evolved through a study funded by the European Commission in the 'D2' project and the OTAP (Open Travel data Access Protocol) initiative led by CENTRICO. From OTAP a Low Cost Profile has evolved for DATEX II which is an interface that provides access to the full range of DATEX II content, but which is as easy to set up as a website. A regular profile for DATEX II has also been developed for situations where sophisticated data interchanges are needed. Interoperability between the two profiles has been demonstrated. Version 1.0 of the DATEX II set of specifications was released in December 2006; this will enable organisations to start implementing DATEX II compliant systems. The Euro-Regional Projects are developing a community of users to ensure that future developments in DATEX II reflect their needs and an appropriate organisational structure that will give support to organisations implementing DATEX II.

This Fact Sheet is intended as a high level overview of DATEX II which highlights the potential benefits it offers to traffic centre operators and information service providers, and summarises European policy and activities, including details on standards and an outline of the UK position.

### ■ KEY WORDS

Traffic Centre; Standard; Traffic Management; Communications; Monitoring.

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## ■ WHAT ARE DATEX AND DATEX II?

DATEX is the predecessor of DATEX II. It is a facilitator for the electronic exchange of traffic and travel related data between traffic centres including cross-border exchange. It acts as the “market place” between organisations in the information chain. A set of specifications was developed within an R&D project co-funded by the European Commission. Two documents, the DATEX Data Dictionary (CEN ENV13106:2000) and the DATEX NET Specification (CEN ENV13777:2000), were submitted to the CEN and defined as a pre-standard.

The DATEX Data Dictionary defines the terms used for data and information in the fields of traffic and travel. The standard is applicable to traffic and transport engineering in general, and particularly data and information exchange, although public transport information is deemed to be outside the remit of DATEX. The DATEX NET Specification defines the methodology, functions and message structures for the exchange of data between traffic and travel information centres.

### **Updating DATEX**

The main problems with DATEX were related to its age. Ten years ago DATEX technological solutions were up-to-date, but due to the increasing speed of the IT revolution the technological prerequisites changed and a widely used data exchange interface needed to respond to these developments.

Over time various flaws with DATEX became evident while it was being used for data exchange within Europe. Persistent interoperability issues between different vendors’ implementations meant DATEX was not well suited for simple standardised data exchanges between countries. The CENTRICO projects sought a solution developing OTAP (Open Travel data Access Protocol) which facilitated a simple data exchange interface. The STREETWISE Euro-Regional Project joined CENTRICO in this initiative.

On the organisational side, the DATEX MoU organisation and the CEN TC278 WG8 were managing DATEX without substantial resources for constant development. As a consequence the European Commission DG TREN decided to launch a project known as the ‘D2’ study to drive the evolution of the DATEX specifications to meet new technical and user needs and as a contribution to delivering transport policy.

### **Improvements with DATEX II**

DATEX II provides a rich and deeply structured data model specified using the Unified Modelling Language (UML). This features a platform independent model that can be mapped to multiple possible implementation platforms, which makes the modelling itself future-proof. At present, the model is mapped to information encoded in XML (eXtensible Markup Language) by automatically creating an XML schema definition. XML and XML schema are the most widely used data definition technology, and XML is sometimes referred to as the ‘lingua franca’ of today’s data exchange. This choice ensures that DATEX II interfaces can easily be integrated in as many implementation technologies as possible for traffic centres and service provider systems.

In addition, DATEX II now features a high level of flexibility through an extensibility option. This allows individual users to exchange data content beyond that which is in the current DATEX II content model, but which is relevant to their special needs, and yet still remain DATEX II compliant. DATEX II enables this by offering a methodology for user extensibility of the data content model. This methodology guarantees that a traffic centre which applies any extensions according to the defined methodology will still be able to communicate with any other DATEX II compliant system at the basic model level without any special processing.

Similar to these improvements on the content side, DATEX II introduces the same split between abstract specifications and concrete implementation mappings on the exchange side. The abstract

exchange specification again uses UML notation, and concrete mappings to widespread standard Internet technologies are specified, namely the HTTP protocol for simple exchange systems with low entry threshold and the Web Services' protocols (WSDL & SOAP) for exchanges with higher functional requirements.

DATEX II allows the paradigm of data exchange to be upgraded from one of exchange between fixed nodes (point to point) which was used in DATEX to one where data is available at any location across the Internet by using a DATEX II compliant client.

### **DATEX Migration Issues**

Although DATEX II takes a significant step forward in technology, openness, accuracy and reliability it has the drawback of not being fully compatible with DATEX. This means that the existing DATEX nodes will not be able to "just set up a connection" with a new DATEX II node; more needs to be done to enable them to communicate with each other.

Future work will seek to facilitate decisions in traffic centres on the migration from DATEX to DATEX II. It is also anticipated that proposals will be developed for ways in which existing DATEX nodes can take part in a heterogeneous network of DATEX and DATEX II systems, for example by applying restrictions to the range of the information to be transmitted. However, this does not mean that DATEX nodes will be fully compatible with all the functions of a DATEX II system. Migration from DATEX to DATEX II should be strongly considered once the demand appears for new functionalities offered by DATEX II.

CENTRICO has developed an XSLT based conversion tool for OTAP services that will be modified to work with DATEX II version 1.0 early in 2007; this will allow existing OTAP service providers to migrate to the DATEX II Low Cost Profile with minimum cost.

### **■ BENEFITS OF DATEX II**

The DATEX II specifications comprise:

1. Platform Independent Models (PIMs):
  - a. Content PIM
  - b. Exchange PIM;
2. Exchange Platform Specific Model (PSM) specification comprising two parts:
  - a. Exchange Low Cost Profile PSM
  - b. Exchange Regular Profile PSM;
3. Content XML Schema
4. XML Schema Generation Tool

The DATEX II specifications provide an extensible framework allowing for a robust and reliable data exchange to fulfil current requirements and support market standards. The DATEX II platform independent content model aims to be precise and logical, minimising ambiguities in the semantics of the published data. It includes a wide variety of data structures covering the needs of traffic information and control centres derived from the DATEX pre-standard plus a set of new data structures. These new structures support the exchange of travel times and meteorological data along with urban data such as car park information, in accordance with requirements provided by the Member States.

There are two exchange profiles defined within DATEX II, the Low Cost Profile (LCP) and the Regular Profile (RP). The LCP, as its name implies, has been developed to keep the complexities of implementing the interface to a minimum whilst maximising functionality. It is a direct

derivative of the OTAP specifications which implement a simple client pull of XML publications using HTTP in a fixed SOAP envelope (for compatibility with Web Services). Most OTAP feeds can in fact be easily transformed into DATEX II feeds using XSLT technology.

The RP is intended for data interfaces where sophisticated exchanges are required using a publish-subscribe paradigm. Such interfaces will be able to employ a catalogue service with client requested filtering implemented on the supplier side (although catalogue and filtering is not included in DATEX II v1.0). The DATEX User Forum on 20 January 2005 resulted in the choice of "web services over http" as the technology for the RP, but also stipulated that the RP and LCP must be able to interoperate.

The CENTRICO and SERTI Euro-Regional Projects built two demonstrators; CENTRICO building an LCP (supplier and client) system and SERTI building an RP (supplier and client) system. These were successfully demonstrated at the ITS Euro-Regional Conference in Barcelona in June 2006 and demonstrated interoperability between the two profiles. Work on standardising DATEX II with CEN will take place in 2007.

## ■ EUROPEAN POLICY OBJECTIVES

Delivering European Transport Policy in line with the White Paper issued by the European Commission requires co-ordination of traffic management and development of seamless pan-European services. With the aim of supporting sustainable mobility in Europe, the European Commission has been supporting the development of information exchange (mainly between those involved in the road traffic management domain) for a number of years. In the road sector, the DATEX standard was developed for information exchange between traffic control centres and has been the reference for applications that have been developed in the last 10 years. With DATEX II, the European Commission now looks to open up greater opportunity for the traffic and travel information sector including service providers and the urban domain.

Over the past decade much investment has been made in Europe both in traffic control and information centres and in monitoring systems on the Trans European Network. To make the most of this investment, the data collected needs to be exchanged both with other centres and, in a more recent development, with those developing pan-European services provided directly to road users. Organisations involved in the Urban traffic domain will be encouraged to implement DATEX II compliant systems to facilitate seamless Urban-Interurban Traffic Information Services and Traffic Management.

## ■ EUROPEAN ACTIVITIES

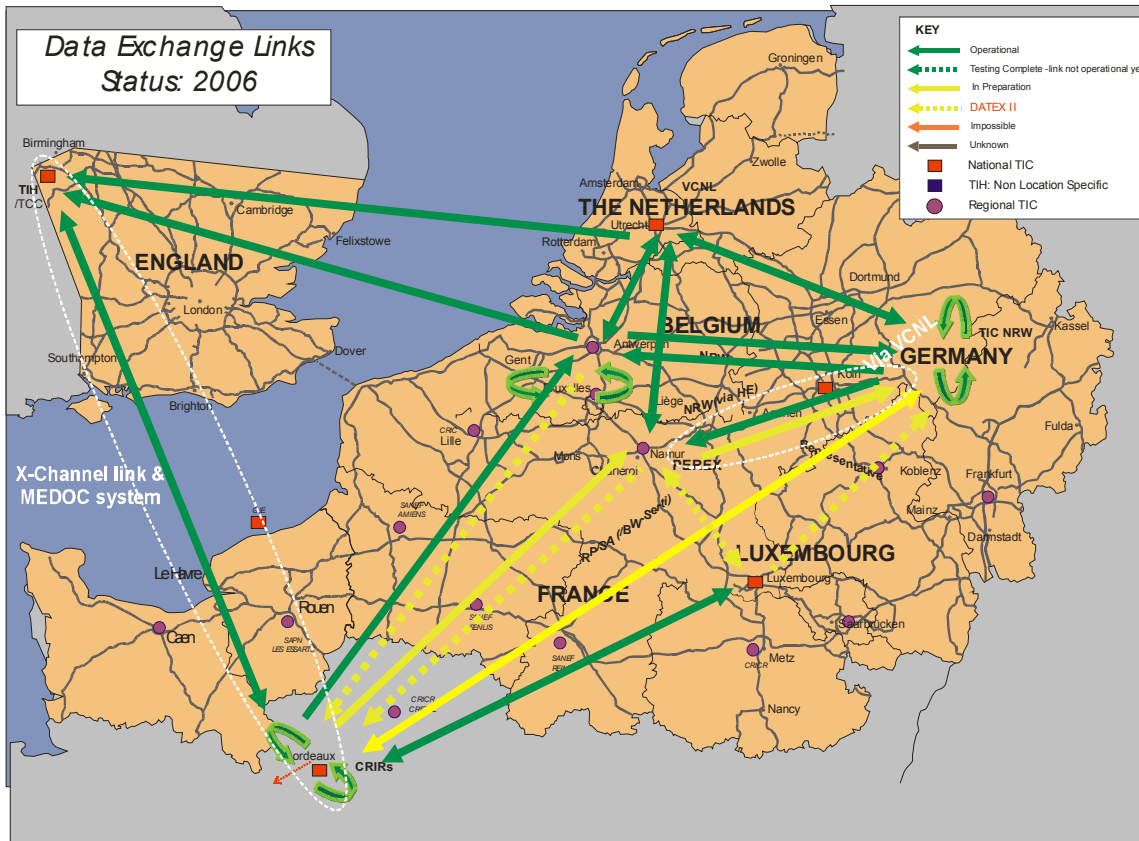
### **Memorandum of Understanding (MoU)**

Alongside the DATEX pre-standards, a Data Exchange Memorandum of Understanding (DATEX MoU) covering international exchange of traffic data was formally established in October 1997. The MoU confirmed in a formal manner that the development of international traffic data exchange would be based on the DATEX technical specifications, and it established an organisational framework that enabled users to influence and participate in the developments. Different organisations were created under the umbrella of this MoU.

- a **Supervisory Management Committee** (SMC) in charge of the strategic orientation of the deployment of DATEX,
- a **Technical Committee** (TC) in charge of providing technical support to the SMC.

The signatories of the current DATEX MoU have decided to work on a revised MoU which is more focused on the availability of traffic and travel data to third parties.

### Status of DATEX links in the CENTRICO area of Europe: end 2006



Map courtesy of CENTRICO

### Standards

The standardisation of DATEX in CEN was considered to be essential for successful deployment at the time it was set up. The rationale for this still holds: that adoption by CEN demonstrates the stability and acceptance of a specification, which stimulates stakeholders to invest in its implementation. As opposed to the CEN periods of 2-5 years for fixing (pre)standards and its rather lengthy procedures for consensus building (enquiries, formal voting etc), it is believed that DATEX II may benefit from a more flexible and dynamic process for reviewing the specifications. Concepts for such a process exist and will be further explored.

The standardisation of DATEX II is now a more complex process than in the past. DATEX II consists of numerous and complex specifications, compared to the two rather straightforward DATEX pre-standards (ENVs).

Prior to standardisation of DATEX II some basic questions will need to be addressed.

- What are the expected benefits of DATEX II standardisation in CEN, i.e. is there still a need for standardisation?
- And if yes, what parts of DATEX II are eligible for standardisation, and at what level should DATEX II be standardised?

Issues such as the scope and position of DATEX II in the context of other ITS standards may have legal consequences and will need to be resolved. As for the level of standardisation, DATEX was fixed at a detailed level where each data element, model, and message was prescribed. The

structure of DATEX II leaves a possible option to standardise at a higher level where just the methodologies, constraints and rules for extension would be fixed in standards.

The path to DATEX II standardisation is fully open. There are several ways to continue, but the options have yet to be explored and agreed. It is expected that during 2007 the issue of standardisation and maintenance of the DATEX II specifications will be reviewed in TC278 WG8 in liaison with members of DATEX TC.

## ■ TIMETABLE

The following milestones summarise the development stages for DATEX II

- DATEX European pre-standards adopted 2000
- D2 Project November 2003-February 2005
- CENTRICO & SERTI demonstrated interoperability of DATEX II profiles at the i2tern conference 26-28 June 2006, Barcelona
- CORVETTE & ARTS developed migration specifications, draft released December 2005
- Version 1.0 of the DATEX II Reference Set of specifications released 22<sup>nd</sup> December 2006
- CEN TC278 WG8 due to launch new work items in 2007 aiming at making DATEX II a multi-part European standard

## ■ DATEX IN THE UK

For several years now, the Highways Agency (England) has been exchanging traffic information with France via a DATEX link between Bristol and Bordeaux. Bordeaux is the location of the French international data exchange node operated by the French Ministry. Originally this link was via a fixed ISDN line, but has recently been replaced by a VPN connection over the Internet. Standard commercial DATEX nodes are used at both ends of this link. English data sent over this link to France is derived from the National Traffic Control Centre. Originally this data was derived from the QMISS Situations from Signals (SfS) system. Received French Ministry data is republished by the HA in OTAP format available over the Internet. This republication service is currently used by Belgian authorities to access the French data.

This DATEX link operating over a VPN connection between Bristol and Bordeaux is planned to be phased out during 2007 and replaced by DATEX II services from the National Traffic Control Centre (NTCC) in England and the French International Data Exchange System in Bordeaux.

Data feeds conforming to the OTAP specifications have also been developed in the UK to provide DATEX formatted real time information from Traffic Control Centres via the Internet. These are from the NTCC in England, the Welsh Traffic Control Centre in Cardiff and the Scottish NADICS system.

Now with the development of the DATEX II specifications, the HA, in collaboration with CENTRICO, has developed an OTAP to DATEX II LCP translation service, based on XSLT technology. This service was developed against a draft version of the DATEX II Content PIM. This service is hosted in Bristol and allows users to access a real time translation in DATEX II format of most OTAP feeds (those not using Alert-C or TPEG-Loc location referencing can not use this service at present – the Welsh OTAP feed can not be translated due to this limitation). This service will be further developed to be compatible with the DATEX II version 1.0 specifications and is seen as a key part of the migration strategy from OTAP to DATEX II LCP.

At the current time NTCC have developed experimental DATEX II LCP feeds. These feeds provide real time event information, travel times and message signs data (VMS and matrix signs) and are due to be updated to meet the requirements of the DATEX II version 1.0 specifications.

Other experimental feeds that have been developed include those from the Northern Ireland Roads Service, TfL, MATTISSE (West Midlands) and ELGIN (for Leicester), the latter three providing urban event information.

Service providers in the UK are now also showing a keen interest in making their systems DATEX II LCP capable.

Further applications of DATEX II feeds will be developed and implemented throughout 2007 as the focus moves from development of the DATEX II specifications to implementations. DATEX II is seen as a key tool to facilitate the successful exchange of traffic information across jurisdictional boundaries at all levels, that is between road authorities and administrations, service provider organisations, and across national and international borders.

#### ■ FURTHER INFORMATION

Further information on DATEX can be found from:

- HA contact: Alan Raines [alan.raines@highways.gsi.gov.uk](mailto:alan.raines@highways.gsi.gov.uk)
- DATEX website: <http://datex2.eu/>
- i2tern conference website - including demonstration of profiles: [www.i2tern.info](http://www.i2tern.info)
- UK ITS metadata registry - browse DATEX II online and compare with other ITS models: [www.itsregistry.org.uk](http://www.itsregistry.org.uk)
- Download a free DATEX II client providing access to real-time TTI from DATEX II feeds in Europe: [www.streetwise-otap.org](http://www.streetwise-otap.org) (note this is due to be updated to be compliant with DATEX II v1.0 specifications in 2007 as compliant feeds become available).

#### ■ BIBLIOGRAPHY

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**CENTRICO**, DATEX Briefing Note and update:

[http://www.centrico.ten-t.com/documents/briefing%20notes/16\\_DATEX.pdf](http://www.centrico.ten-t.com/documents/briefing%20notes/16_DATEX.pdf)

#### ■ ACKNOWLEDGMENTS

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#### ■ GLOSSARY

ARTS	Advanced Road Traffic in South-west EuroRegional project
CEN	Comité Européen de Normalisation
CENTRICO	Central European region transport telematics implementation co-ordination euroregional project
CORVETTE	Co-ordination and validation of the deployment of advanced transport telematic systems in the Alpine area EuroRegional project
ELGIN	Electronic Local Government Information Network
LCP	DATEX II Exchange Low Cost Profile



MATTISSE	Real-time management system for the urban and inter-urban transport network in Birmingham and the West Midlands.
MoU	Memorandum of Understanding
OTAP	Open Travel data Access Protocol
PIM	Platform Independent Model
PSM	Platform Specific Model
RP	DATEX II Exchange Regular Profile
SERTI	Southern European Road Telematic Implementations EuroRegional project
SOAP	Protocol for exchanging XML-based messages over a computer network
STREETWISE	Euro-regional project: Seamless Travel Environment for Efficient Transport in the Western ISles of Europe
TCC	Traffic Control Centre
TfL	Transport for London
TIC	Traffic Information Centre
UML	Unified Modelling Language
XML	Extensible Mark-up Language
XSLT	Extensible Stylesheet Language Transformation