Ministry of Transport and Communications

# Interfaces, Standards and Code lists in Data Communication between Authorities

## Helsinki–St. Petersburg Smart Transport Corridor

Publications 6/2013

Ministry of Transport and Communications

Vision
Well-being and competitiveness through high-quality transport and communications networks

Mission
The Finnish Ministry of Transport and Communications seeks to promote the well-being of our people and the competitiveness of our businesses. Our mission is to ensure that people have access to well-functioning, safe and reasonably priced transport and communications networks.

Values
Courage, equity, cooperation

Liikenne- ja viestintäministeriö

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| Jari Salo, TIEKE |

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Tiivistelmä

Harmonoitujen tietosisältöjen ja yhtenäisen terminologian käyttö erityisesti viranomaisten välisessä tiedonsiirrossa ja tietojärjestelmissä edistää liikennevirran sujuvuutta ja viiveiden vähentymistä rajanylityksessä, tehokkaamman tiedonsiirron sekä virheiden, epäselvyyksien ja sekaannuksien vähenemisen seurauksena.

Hankkeen tavoitteena oli tuottaa tietoa ja suosituksia siitä, miten tietojen vaihtoa viranomaisten kesken sekä viranomaisten ja yritysten välillä voitaisiin tehostaa ja yhdenmukaistaa. Hankeraportin sisältö on painottuu erityisesti älyliikennekäytävän - Smart Transport Corridor (STC) palveluihin ja niiden tiedonsiirtoon. Lähestymistapa hankkeessa on standardien, kansainvälisten suositusten ja koodiluetteloiden hyödyntäminen tiedonsiirrossa ja ja esitystavoissa eri tarkoituksia varten.

Standardeja ja suosituksia voidaan luokitella usealla eri tavalla. Älyliikennekäytävän toimintaympäristössä on erilaisia standardeja eri tarkoituksiin ja on tehtävä ero standardeja liikenteenhallintaan suunnattujen ja liiketoimintaan suunsuunnattujen standardien ja suosituksien välillä.

Toinen keskeinen ajatus on, että vaaditut tiedot kerätään vain yhden kerran ja siirretään ja käytetään uudelleen asianomaisten viranomaisten välillä, mikäli mahdollista. Uudelleenkäytettävyys vähentää yritysten ja myös viranomaisten hallinnollista taakkaa ja parantaa tietojen laatua. Tässä esiteltyjä menetelmiä ja lähestymistapaa voidaan käyttää paitsi älyliikennekäytävässä, sitä on myös hyödynnetty globaalisti Single Window-järjestelmän toteutuksessa.

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Sammandrag

Användning av harmoniserade datainnehåll och en gemensam terminologi, i synnerhet vid datakommunikation mellan myndigheters informationssystem, kommer att resultera en flytande transportflödet och mindre förseningar i gränsövergångar på grund av effektivare datakommunikation med mindre fel, oklarheter och förvirring.

Syftet med detta projekt var att ge information och idéer om hur datakommunikation mellan myndigheter och mellan myndigheter och företag skulle kunna göras mer effektivt och harmoniserad. Innehållet är fokuserat särskilt på Smart transportkorridor (STC) service. Den grundläggande principen för denna studie är användningen av standarder, rekommendationer och kodlistor för kommunikation och representation av data för olika ändamål.

De standarder och rekommendationer som införs i detta dokument kan kategoriseras på flera olika sätt, och därför bör man komma ihåg att det finns olika standarder för olika syften och i Smart transportkorridors miljö en viss skillnad mellan standarder för trafikledningssystem och affärsliv inriktade standarder och rekommendationer bör göras.

En annan idé är att den erforderliga information samlas in endast en gång och sedan återanvändas mellan berörda myndigheter där det behövs och när det är möjligt. Återanvändbarhet minskar den administrativa bördan för företag och myndigheter samt förbättra kvaliteten på kommunikation. De verktyg som inrättats i detta dokument används inte bara i STC men tillvägagångssättet är också globalt utnyttjas i genomförandet av det Single Window-systemet.

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Abstract

The use of harmonised data contents and common terminology, in particular when exchanging data between authority information systems, will result in smooth transport flow and less delays in border crossing due to more effective data communication with less errors, ambiguities and confusion.

The aim of this project was to provide information and ideas on how data exchange among authorities and between authorities and business could be made more effective and harmonised. The content is focused especially on the Smart Transport Corridor (STC) services. The fundamental approach of this study is the utilisation of standards, recommendations and code lists for the exchange and representation of data for different purposes.

The standards and recommendations introduced in this document can be categorised in several different ways, hence, it should be borne in mind that there are different standards for different purposes and in the Smart Transport Corridor environment a distinction between standards for traffic management purposes and business oriented standards and recommendations should be made.

Another idea is that the required data is collected only once and then reused among relevant authorities where needed, whenever possible. Reusability will reduce the administrative burden for companies and agencies as well as improve the quality of data. The tools introduced in this document are not only used in STC but the approach is also been globally utilised in implementing the Single Window system.

# Foreword

Today, Intelligent Transport Systems (ITS) are at the heart of transport actions due to their ability to greatly support the development of better transport services to citizen and business. In addition, they deliver new management tools and business opportunities, which serve efforts towards better well-being and competitiveness.

Transport networks consist of nodes and corridors. Transport corridors cater for transport flows and in main corridors, they are the primary channels and connectors of different regions, cities and even countries. Major transport corridors also include different modes of transport; road, rail, maritime and air and the additional functions as border crossings, ports etc. infrastructures with related services. ITS is a major contributor in this field, as it answers the need for new and high-level services within each mode and works as an integrator between modes to form a well-functioning transport system.

In order to function in smooth and effective manner the Intelligent Transport Corridor services require information and data communication between different stakeholders, especially authorities and agencies. This study has been made in order to encourage authorities in Finland and Russia to utilise and implement international standards, recommendations and codes in information systems in their respective countries.

The project has been conducted in close co-operation with FITSRUS project, which opened the development of the cross-border Smart Transport Corridor (STC) concept between Helsinki and St. Petersburg. It was launched in 2011 by the Finnish Ministry of Transport and Communications together with the Russian Ministry of Transport. The aim is to develop a concept and then implement it in the corridor so that it will result as smooth, safe and sustainable travelling, which utilises opportunities made available by advanced technology.

This project has been managed and commissioned by the Finnish Ministry of Transport and Communications.

Helsinki January 30th 2013
Seppo Öörni,

Sisällysluettelo

## List of Abbreviations

| | |
|---|---|
| CEFACT | Centre for Trade Facilitation and Electronic Business (under the auspices of UN/ECE) |
| CEN/TC 278 | European Committee for Standardization/ Technical Committee 278 |
| CSV | Comma separated value |
| DATEX II | Set of specifications for exchanging traffic information in a standard format (XML) between disparate systems. |
| ISO/TC 204 | International Standardization Organization / Technical Committee 204 |
| ITS | Intelligent Transport Systems and Services |
| LOCODE | United Nations Codes for Locations Related to Trade and Transport |
| RFID | Radio Frequency Identification |
| STC | Smart Transport Corridor |
| UBL | Universal Business Language |
| UML | Universal Modelling Language |
| UMM | United Nations Modelling Methodology |
| UN/ECE | United Nations Economic Committee for Europe |
| UN/EDIFACT | UN syntax for Electronic Data Interchange for Administration, Commerce and Transport |
| | |

# 1. Introduction

This study has been made in order to encourage authorities in Finland and Russia to utilise and implement international standards, recommendations and codes in their information systems in respective countries.

The use of harmonized data contents and common terminology, in particular when exchanging data between authority information systems, will result smooth transport flow and less delays on border crossing due to more effective data communication with less errors, ambiguities and confusion.

The purpose of this document is also to provide information and ideas how data exchange among authorities and between authorities and business could be made more effective and harmonized. The content is focused especially for the Smart Transport Corridor (STC) services. The same tools can naturally be used in the data exchange and utilization between authorities and business where applicable.

The fundament of approach in this study is the utilisation of standards, recommendations and code lists for exchange and representation of data for different purposes.

The standards and recommendations introduced in this document can be categorised in several different ways, hence, it should be borne in mind that there are different standards for different purposes and in Smart Transport Corridor environment a distinction should be made between standards for traffic management purposes and business oriented standards and recommendations. Business oriented standards and recommendations are used e.g. in border crossing activities, like customs clearance, transport documents as well as in general data exchange between traders and administration.

Another idea is, that whenever possible, the required data is collected only once and then reused among relevant authorities where needed. This means that there could be an agreement between the authorities to collect the information from various sources and then distribute it to other authorized agencies.

The reusability will reduce the administrative burden for companies and agencies as well as improve the quality of data. The tools introduced in this document are not only used in Smart Transport Corridor but the approach is also globally utilised in implementing the Single Window system.

This document introduces a selection of the centric Intelligent Transport Systems and Services (ITS) data communication standards as well as other closely related standards developing organizations and their deliverables. However, this study is neither aiming to be a comprehensive reference to standards organizations nor ITS related standards and recommendations.

# 2. Interfaces, Standards and Code lists in Data Communication between Authorities

In order to operate smoothly, cross-border transport services require several different data sources like traffic authorities, weather services and private sector service provider's information, to be easily accessible by other relevant authorities and service providers. The access to relevant data should be as easy from both sides of the border as it is on national bases. This is important in order to effectively utilize available information and to develop innovative new services.

Among the existing Smart Transport Corridor services there is low level of general agreement on the standards and format(s) of exchanged information, as well as on interfaces to other services.
At the moment, most STC related services (even those provided by public authorities) tend to be stand-alone and operating in isolation from other services. This is slowing down the development and utilization of service portfolio among the users of the Smart Transport Corridor (eg. passenger traffic and goods transport).

The first prerequisite for interoperable services is to define and agree upon interfaces for data retrieval as well as standards and codes used for information representation and exchange. This definition and agreement is also for major importance in order to establish a solid platform for further development of Smart Transport Corridor services and innovations for creation of new services. Otherwise the burden to identify the relevant authorities, negotiate the data release contracts and create the application programming interfaces individually for each service becomes a supreme barrier.

The availability of STC services on equal level, across and in both sides of the border, is of major importance for the good overall user experience. The seamless interoperability is an important element in attracting the passengers and professional hauliers to utilise these services and encourage for further development of Smart Transport Corridor commercial and public services.

On the way to smooth Smart Transport Corridor services development and interoperability, an important proposal to define an international standard under the auspices of ISO TC204 for the use of "ITS for Transport Corridor Management" has been introduced and proposed by ITS Russia in autumn 2012.

## 2.1 Standards, Recommendations and Code lists

There are quite a number of international, regional and national organizations developing standards for data communication and even for transport specific data exchange. The deliverables of these specialized standardization bodies are in favor of development of interoperability, common interfaces and harmonised approach. Also many standards and recommendations for general data exchange are very well suitable for transport as well as Smart Transport Corridor services.

It should be clear in mind that there are different standards for different purposes and in Smart Transport Corridor environment and a distinction should be made between traffic management oriented standards and business oriented standards and recommendations.

Also several standards and recommendations can be utilised for multimodal transport purposes, however, some are especially aimed for certain mode(s) of transport.

Most of the transport modes use basically similar processes and documents, but often "tuned" to fulfil different requirements and needs of the specific mode. In electronic data exchange the defined data elements and code lists normally cover the needs of different modes.

In the following some of the organizations developing standards, recommendations and code lists, are briefly referred and introduced as well as their products and deliverables deemed most suitable for STC- purposes. Accordingly, only some directly data exchange related standards are described little bit more in detail.

### 2.1.1 Standardization organisations

#### 2.1.1.1 ISO TC204

The work of ISO/TC 204 encompasses standardization of information, communication and control systems in the field of urban and rural surface transportation, including intermodal and multimodal aspects, traveller information, traffic management, public transport, commercial transport, emergency services and commercial services, generally referred to as "Intelligent Transport Systems (ITS)."

Also some aspects of intercity rail are included in the work of ISO/TC 204 like: intermodal movement of passengers and freight, information systems relating to passenger and freight rail transport, and the use of ITS technology at the intersection of roads and rails ("grade crossings" or "level crossings").

ISO/TC 204 is responsible for the overall system and infrastructure aspects of ITS as well as the coordination of the overall ISO work programme in this field including the schedule for standards development, taking into account the work of existing international standardization bodies.

ITS enables both government and private industry to improve safety, mitigate traffic congestion and reduce fuel consumption and emissions, as well as increase traveller mobility and convenience via the use of vehicle and infrastructure probe data to provide location-based telematic services[1].
ISO/TC204 has following working groups that are developing ITS standards[2].

| | |
|---|---|
| TC 204/WG 1 | Architecture |
| TC 204/WG 3 | ITS database technology |
| TC 204/WG 4 | Automatic vehicle and equipment identification |
| TC 204/WG 5 | Fee and toll collection |
| TC 204/WG 7 | General fleet management and commercial/freight |
| TC 204/WG 8 | Public transport/emergency |
| TC 204/WG 9 | Integrated transport information, management and control |
| TC 204/WG 10 | Traveler information systems |
| TC 204/WG 11 | Route guidance and navigation systems |
| TC 204/WG 14 | Vehicle/roadway warning and control systems |
| TC 204/WG 16 | Wide area communications/protocols and interfaces |
| TC 204/WG 17 | Nomadic Devices in ITS Systems |
| TC 204/WG 18 | Cooperative systems |

Most relevant for the work of STC data exchange are: WG3, WG4, WG7, WG9, WG16 and WG18.

#### 2.1.1.2 CEN TC278

CEN has a long history of standardization in the field of Intelligent Transport Systems, through CEN/TC 278. The standardization work of CEN/TC 278 is restricted to application of telematics

[1] ISO TC204 Business Plan 2008 http://isotc.iso.org/livelink/livelink/fetch/-8846111/8847151/8847160/ISO_TC204_Draft_Business_Plan.pdf?nodeid=7999891&vernum=-2
[2] http://www.iso.org/iso/iso_technical_committee?commid=54706

for Road Transport and Traffic only. It is defined as a group of services utilizing information technology and telecommunications, in vehicles and infrastructure, to improve (mainly) road transportation from the points of view of safety, efficiency, comfort and environment.

In order to function effectively and support European transport policy, the ITS systems must operate in concert. There is a big demand for a standardization of interoperable framework, so that data and messages can be accessed, re-used and shared. The development of cross border systems and co-modality also places urgent demands for interoperability.

The main reasons for CEN TC278 standardization work in the area of ITS, is the desire to create a pan-European interoperability of the systems and to create a Europe-wide market for related equipment. Interoperability is considered an important factor in creating market acceptance and therefore a key issue to the objectives: higher safety and efficiency and less environmental consequences of traffic.

Recently there have been efforts to provide a work programme in this area that will reflect the increasing informatization of transport. This is not only concerning road traffic aspects as such, but also multimodal issues for passengers and freight, ICT standards will become even more important as building blocks for workable, user-friendly solutions that improve safety and reduce congestion.[3]

CEN TC278 has following working groups:

| | |
|---|---|
| CEN/TC 278/WG 13 | Architecture and terminology |
| CEN/TC 278/WG 12 | Automatic Vehicle Identification and Automatic Equipment Identification (AVI/AEI) |
| CEN/TC 278/WG 14 | After theft systems for the recovery of stolen vehicles |
| CEN/TC 278/WG 16 | Co-operative systems |
| CEN/TC 278/WG 15 | eSafety |
| CEN/TC 278/WG 10 | Man-machine interfaces (MMI) |
| CEN/TC 278/WG 2 | Freight, Logistics and Commercial Vehicle Operations |
| CEN/TC 278/WG 1 | Electronic fee collection and access control (EFC) |
| CEN/TC 278/WG 3 | Public transport (PT) |
| CEN/TC 278/WG 9 | Dedicated Short Range Communication (DSRC) |
| CEN/TC 278/WG 8 | Road traffic data (RTD) |

One of the major achievements by CEN TC278 in the area of ITS is DATEX II standard, which is introduced in chapter 2.1.2.2

#### 2.1.1.3 UN/ECE - Inland Transport Committee (ITC) – Intelligent Transport Systems

The UNECE Working Parties dealing with Intelligent Transport Systems are the Working Party on Road Traffic Safety (WP1), for example, is advancing on liability concerns, Variable Message Signs or safety risks related to driver distraction. The Working Party on Inland Water Transport (SC.3) resolves questions related to River Information Systems (RIS). The Working Party on the Transport of Dangerous Goods (WP.15) examines how telematics can be used to enhance safety and security and the Working Party on Road Transport (SC.1) drives e.g. the e-CMR implementation. The World Forum for Harmonization of Vehicle Regulations (WP.29) promotes ITS matters on-board of vehicles.

In 2010, driven by the commitment to further advocate the potential added value of ITS in achieving a sustainable mobility all across transport modes, the UN/ECE secretariat then launched a study on the use and best practices in ITS solutions worldwide. This forms two of

[3] http://www.cen.eu/cen/Sectors/Sectors/ISSS/Activity/Pages/Intelligent%20Transport.aspx

the main chapters of this publication and leads to the pathway of the UN/ECE publication "*Intelligent Transport Systems for sustainable mobility*[4]".

Two specific areas under UN/ECE - ITC related to STC project are Border Crossing Facilitation (e.g. TIR and eTIR) and Transport of Dangerous Goods.

#### 2.1.1.4 UN/ECE – CEFACT Centre for Trade Facilitation and Electronic Business

Within the United Nations framework of the Economic and Social Council, the United Nations Economic Commission for Europe (UN/ECE) serves as the focal point for trade facilitation recommendations and electronic business standards, covering both commercial and government business processes that can foster growth in international trade and related services.

In this context, the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) was established, as a subsidiary, intergovernmental body of the UNECE Committee on Trade, mandated to develop a programme of work of global relevance to achieve improved worldwide coordination and cooperation in these areas.5

UN/CEFACT supports activities dedicated to improving the ability of business, trade and administrative organizations, from developed, developing and transition economies, to exchange products and relevant services effectively. Its principal focus is on facilitating national and international transactions, through the simplification and harmonization of processes, procedures and information flows, and so contributing to the growth of global commerce. Securing coherence in the development of Standards and recommendations by co-operating with other international intergovernmental and non-governmental organizations, in particular for UN/CEFACT Standards, this coherence is facilitated by cooperating with the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), the International Telecommunication Union (ITU) and selected non-governmental organizations (NGOs), especially in the context of the ISO/IEC/ITU/UNECE Memorandum of Understanding (MoU). These relationships have been established and maintained in recognition of the broad application that UN/CEFACT work has in areas beyond global commerce and the key objectives of interoperability between applications and the ability to support multilingual environments.

- Trade Facilitation Recommendations
- Electronic Business Standards
- Technical Specifications

UN/CEFACT and its predecessor have developed such instruments as:

- The UN Layout Key for Trade Documents, which is the foundation for the EU's Single Administrative Document (SAD)
- The UN Trade Data Elements Directory (UN TDED) – ISO 7372 (GOST R 6/20/2-91)
- UN/EDIFACT, the international standard for electronic data interchange – ISO 9735 (GOST R 6/20/1-90)
- numerous trade facilitation recommendations (e.g. for establishing Single Window activity)
- the Core Component Library, containing syntax-neutral and technology-independent building blocks that can be used for data modeling
- XML schemas providing a series of coherent, consistent and normalised syntax solutions that are aligned with domain reference models for publication.

[4] http://www.unece.org/trans/publications/its_sustainable_mobility.html
[5] http://www.unece.org/cefact.html

#### 2.1.1.5 Finnish standardization organisations for ITS

The Finnish national standardization organization SFS is the official body representing Finland and participating the international standardization work within ISO and CEN in Europe. SFS has delegated the work under ISO TC204 to be conducted by General Industry Federation (Yleinen Teollisuusliitto). Finland has an observer status in ISO TC204. There is also some private sector participation to ITS and data communication sector standardization work.
In Finland the standards by ISO and CEN are mainly endorsed as national standards and also the technical specifications by international standardization organizations are generally acknowledged.

#### 2.1.1.6 Russian standardization organisations for ITS

The Russian state standard authority is ROSSTANDARD or GOST-R[6]. There are about 480 technical committees in Russia e.g GOST-R TC355 "Automatic identification" and GOST-R TC22 "Information Technology" to name some.
The full list of TC's on standardization can be found at http://tk.gost.ru/wps/portal/
ITS Russia has the standardization of ITS as an important component of this work. ITS - Russia and the Ministry of Transport initiated the creation of the national Technical Committee on the standardization of ITS. Finding and deploying solutions to transport problems requires enormous public funding. In addition to national standards, international standardization is key. To this end, the Technical Committee on ITS standardization will be the public body responsible for the regulation of the ITS market in Russia and represent Russia in the international standardization bodies - CEN/TC278 and ISO/TC204.

### 2.1.2 Standards

There are different needs for data exchange standards for different purposes in the area of ITS and they can be classified and categorised in different ways. For this project we can identify two main categories according to their use.
The first category is standards for information exchange between traffic management centres, traffic information centres and service providers (like DATEX II) and data exchange standards for commercial and administrative use which are suitable for more general purposes (like data presentation standards and message standards) also.

#### 2.1.2.1 ISO Standards

As already mentioned (in chapter 2.1.1.1) the body mainly responsible for international ITS related standards within ISO is TC204. The working groups developing standards within ISO TC204 was also referred in same chapter. In addition to different aspects of Intelligent Transport System, ISO TC204 standards deal with:

- Transport information and control systems,
- Road transport and traffic telematics
- Traffic and Traveller Information
- Automatic vehicle and equipment identification and,
- Electronic fee collection

The list of published ISO ITS standards is available on the ISO TC204 website [7]
Particularly related to ITS Corridor Management, the ISO TC204 meeting in Moscow (Oct, 2012) recognized the increasing need to start the standardization activities concerning this issue, including technology testing and validation. The need to develop terms of reference and scope of work for these activities and to develop first preliminary work item which should cover the standardization issues for transnational monitoring , guidance and management of intermodal transport of people and goods was noted. Hence, ISO TC204 resolved to establish a study group on standardization requirements for ITS corridor management and also invite

[6] http://gost.ru
[7] http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=54706&published=on

CEN TC278 to join the initiative. The study group will be led by representative of the Russian Federation.

#### 2.1.2.2 CEN DATEX II

DATEX standard was developed by CEN Technical Committee 278 for information exchange between traffic management centres, traffic information operators, service providers and media partners. DATEX constitutes the reference for applications that have been developed in the last 10 years. The harmonization and standardization of data structures and data exchange services are fundamental challenges for both the information society as a whole, as well as for ITS. DATEX is a specification that is meant to operate at and represent the interface between the worlds of dynamic traffic and IT.

The second generation DATEX II specification is aimed also for actors in the traffic and travel information sector. With the new generation DATEX II it has become the reference for all applications requiring access to dynamic traffic and travel related information in Europe. The coordination and harmonization of traffic
management measures between road operators is an essential part of maximizing the capacities of their road networks to reduce the effects of congestion and improving safety.

DATEX II is a multi-part Standard, maintained by CEN/TC278, (Road Transport and Traffic Telematics), The first three Parts of the CEN DATEX II series (CEN 16157) have already been approved as Technical Specifications. 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 most widely used DATEX publication for traffic information messages (called Situation publication) as Part 3.[8]

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 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 extended into the urban and logistics domain
- 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
- Road infrastructure status

A fourth Part of CEN DATEX II series, VMS publications, is currently being prepared for standardization to CEN/TC278 and a fifth part on measured and elaborated data is currently proposed as work item.
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.

### 2.1.3 Recommendations

UN/CEFACT has developed and published and endorsed through UN/ECE several international recommendations for trade facilitation purposes to be utilized in international trade transactions. The recommendations are aimed for both business and administration. Many of the recommendations are related to exchange of data between business and administration.

[8] http://www.datex2.eu/

The leading idea of trade facilitation recommendations is simplification of business processes, procedures and utilization as well as reuse of data. The same information, documents and data sets are recommended to be used both in public and private sector. This approach can reduce unnecessary alteration and modification or data and also possible errors in data exchange, as the source of information will be the party originally publishing the information for the trade transaction.
Many trade facilitation recommendations can be used in ITS area as well, maybe not directly but as an element of standardized or internationally agreed procedure, practice or information representation syntax. A good example of this kind of recommendation is Rec. 18 - "Facilitation Measures Related to International Trade Procedures" which states: "a wide range of formalities, procedures and practices create obstacles and extra cost to international trade, and therefore restrict countries and enterprises from fully benefiting from international trade [9]".

According to the Recommendation No. 18, it would be beneficial to implement following main principles:

"Procedures and data requirements

- Procedures should be kept to a minimum.
- Procedures should be commercially oriented and relate more closely to trade and transport requirements.
- Procedures should be simplified, harmonised and should comply with international standards.
- Data requirements should be kept to a minimum.
- Data requirements should be simplified, harmonised and standardised, to ease the information flow.
- Laws regulations and other information regarding procedures and data requirements should be readily accessible to all parties concerned.

Documents

- Documentary requirements should be kept to a minimum.
- Documents should be in line with UN Recommendation No. 1, UN Layout Key for Trade Documents.3
- The use of plain paper, documents produced or appearing to be produced by reprographic automated or computerised systems should be acceptable.
- The presentation of supporting documents should not be required.
- Hand-written signatures and their equivalents should be avoided as far as possible (e.g. on invoices) on paper documents.

Information technology

- Transition strategies to replace paper documents by electronic information exchange or electronic documents are common practice.
- The use of information and communication technology and the resulting electronic solutions should be encouraged.
- The use of electronic documents and standard format should be supported (UN/CEFACT Recommendation No. 31)[10].
- The requirement for authentication can be fulfilled by means of technological solutions and need not be accompanied by a signed and/or authenticated paper document (UN/CEFACT Recommendation No. 14) [11].

9 TRADE/CEFACT/2001/18, page 3 - http://unece.org/cefact/recommendations/rec18/Rec18_pub_2002_ecetr271.pdf

[10] UN/CEFACT Recommendation N° 31 "Electronic Commerce Agreement", see http://www.unece.org/cefact/recommendations/rec_index.htm

[11] UN/CEFACT Recommendation N°14 "Authentication of Trade Documents by Means Other than Signature", see. http://www.unece.org/cefact/recommendations/rec_index.htm (presently under revision)

Some of the Trade Facilitation Recommendations are aimed for transport related documents and data exchange, like Recommendation 11 - ”Facilitation of Transport Documents and Procedures "Documentary Aspects of the Transport of Dangerous Goods".

### 2.1.4 Code lists

Even the utilization of standardised code lists could provide remarkable effectiveness and uniformity for services. Furthermore the implementation of standard code lists does not necessarily require the simultaneous renewal of documents or their data contents.

The main benefits from the use of standardized code lists are results from reduced number of errors and need for interpretation of data, as well as from increased speed, timeliness and reusability of information.

The recommendations which are also international standards (most suitable for ITS) related to data representation and exchange are[12]:

| | |
|---|---|
| Rec 3. | Code for the Representation of Names of Countries,<br>ISO 3166-1-alpha-2 code elements |
| Rec 7. | Numerical Representation of Dates, Time and Periods of Time<br>ISO 8601 - Data elements and interchange formats – Information interchange – Representation of dates and times” |
| Rec 9. | Alphabetic Code for the Representation of Currencies<br>ISO 4217 – Currency names The international standards and code elements |
| Rec 25. | Use of the UN Electronic Data Interchange for Administration, Commerce and lists can be utilized in Smart Transport Standard (UN/EDIFACT)<br>ISO 7273 - Standard Data Elements |

Code lists can be utilized in Corridor services, as well as in the documents related to commercial and authority information exchange. In addition to the code lists approved for international ISO standards, UN/ECE (UN/CEFACT) has published several Trade Facilitation Recommendations that include code lists for international trade and administration purposes[13].

| | |
|---|---|
| Rec 10. | Codes for the identification of Ships |
| Rec 11. | Documentary Aspects of the Transport of Dangerous Goods |
| Rec 16. | LOCODE - Code for Trade and Transport Locations |
| Rec 19. | Code for Modes of Transport |
| Rec 20. | Codes for Units of Measure Used in International Trade |
| Rec 21. | Codes for Passengers, Types of Cargo, Packages and Packaging Materials (with Complementary Codes for Package Names) |
| Rec 24. | Trade and Transport Status Codes |
| Rec 28. | Codes for Types of Means of Transport |

The National Trade Facilitation body in Finland is FINSIPRO and the main contact for UN/ECE CEFACT Trade Facilitation Recommendations in Finland is: TIEKE Finnish Information Society Development Centre [14].

The Russian Federation has not presently National Trade Facilitation body[15], but the delegation for UN/ECE CEFACT is operated by the Mission of Russian Federation in Geneva.

[12] http://www.unece.org/cefact/recommendations/rec_index.html
[13] http://www.unece.org/cefact/recommendations/rec_index.html
[14] http://www.tieke.fi
[15] UN/CEFACT list of National TF bodies

## 2.2 Open data

In order to facilitate development of new cross-border transport services, authorities on both sides of the border are encouraged to open their relevant databases for general use without legal or technical limitations whenever possible. Both, the data release licenses as well as the application programming interfaces should allow free utilization and reuse of the data.

In the Communication "Open data: an engine for innovation, growth and transparent governance" describes the social value of "open", such as accelerating innovation in science. There is also a great financial value, since "the overall economic benefits resulting from access to this resource in the EU could reach 40 billion euros a year." (European Commission, 2011)

Very interesting guidance however, is the five star deployment scheme, added to the Linked Open Data paradigm in 2010[16]:

| | |
|---|---|
| ★ | Available on the web (whatever format) *but with an open licence, to be Open Data* |
| ★★ | Available as machine-readable structured data (e.g. excel instead of image scan of a table) |
| ★★★ | as (2) plus non-proprietary format (e.g. CSV instead of excel) |
| ★★★★ | All the above plus, Use open standards from W3C to identify things, so that other parties can point at the data |
| ★★★★★ | All the above, plus: Link data to other parties' data to provide context |

The more stars data has, the higher the chances of it being connected to other data. Note that these stars mostly refer to Linked *Open* Data. Naturally, not all information is suitable to make available to everyone (for example, due to privacy issues), however, one can also use the stars internally to format data in such a way that in-house data can easily be connected to external, *open* data.

It has been found that public authorities' own knowledge management intensifies when they become aware and get easy access to each others' data repositories. Also utilization of data, already collected once by other authorities and not to make individual data requests to companies, makes the data retrieval more effective for authorities, as well as reduces the administrative burden for business.

International studies have shown that open access to public authorities' data repositories fosters innovation and growth of particularly small and medium sized companies that can utilize this data in their service development and production. This would create new business opportunities for SME's developing products and services for companies alongside the corridor as well as for the users of the corridor.

### 2.2.1 Some Open data license issues

To be useful for third parties and in order to avoid confusion in Open data re-use based service development, data made available by authorities and other stakeholders must be published under a clear rights statement. There are various statements and licenses that can be used to publish data, ranging from restrictive to fully open. During the LOD-LAM summit that took

[16] Kalampokis, E., Tambouris, E. and Tarabanis, K. 'A classification scheme for open government data: towards linking decentralised data', *Int. J. Web Engineering and Technology,*.

place in San Francisco in 2011, a four-star classification system was proposed in which these ranges of copyright statements are incorporated[17]:

| | |
|---|---|
| **** | Public Domain: the data falls in the public domain, or the rights holder has waived all rights. The user can use the metadata for any purpose without restrictions. |
| *** | Attribution License (BY) when the licensor considers linkbacks to meet the attribution requirement. The user can use the metadata for any purpose, provided he retains the attribution link. |
| ** | Attribution License (BY) with another form of attribution: The user can use the metadata for any purpose, provided he gives attribution in the way specified by the provider. |
| * | Attribution Share-Alike License (BY-SA): the user can use the metadata for any purpose, provided he gives attribution in the way specified by the provider. Unlike the other 'star' options, the metadata can only be combined with data that allows re-distributions under the terms of this license. |

The following licenses are conformant with the principles set forth in the Open Knowledge Definition[18].

Domain = Domain of application, i.e. what type of material this license should/can be applied to.

- BY = requires attribution
- SA = require share-alike

Conformant Content Licenses

| License | Domain | By | SA | Comments |
|---|---|---|---|---|
| Creative Commons Attribution | Content | Y | N | |
| Creative Commons Attribution Share-Alike | Content | Y | Y | |
| Creative Commons CCZero | Content, Data | N | N | |
| GNU Free Documentation License | Content | Y | Y | Only conformant subject to certain provisos |
| Free Art License | Content | Y | Y | |
| MirOS License | Code, Content | Y | N | |

Conformant Data Licenses

| License | Domain | By | SA | Comments |
|---|---|---|---|---|
| Open Data Commons Public Domain Dedication and Licence (PDDL) | Data | N | N | Dedicate to the Public Domain (all rights waived) |
| Open Data Commons Attribution License | Data | Y | N | Attribution for data(bases) |

17 (from http://lod-lam.net/summit/2011/06/06/proposed-a-4-star-classification-sc...)

18 http://opendefinition.org/licenses/

| | | | | |
|---|---|---|---|---|
| Open Data Commons Open Database License (ODbL) | Data | Y | Y | Attribution-ShareAlike for data(bases) |
| Creative Commons CCZero | Content, Data | N | N | Dedicate to the Public Domain (all rights waived) |

### 2.2.2 Utilization of open data within STC

In the case of Smart Transport Corridor between Helsinki-St. Petersburg, data repositories and different databases have to be identified on both sides of the border.

- What relevant data exists?
- Who maintains it?
- What kinds of data formats and access interface standards are used?
- Which access licenses are used?

When information is correlated with a survey of Finnish and Russian traffic service developers' needs, we can deduce which data repositories should be opened first for general use.

Information on the available data repositories is to be collected on a cross-border Smart Transport Corridor data catalogue depicting the data with corresponding access licenses and technological definitions. This data catalogue provides an easy access point for companies and authorities looking for data resources they need.

## 2.3 Single Window approach

The development of Smart Transport Corridor services as well as structured data exchange between authorities enable a good starting point for development of Single Window service. One of the key ideas of Single Window concept is the reusability of the collected information. Hence, in order to fully benefit of this feature the data requirements by different authorities should be simplified, standardized and harmonized.

Single Window facility is considered first and foremost as a national (or even a local) solution. However, in order to gain a wider range of benefits it could be developed into a regional/international solution. The Single Window solution seems to be most beneficial in providing information for authorities in the importing country and also in advancing the automated and electronic processes in the border crossing.

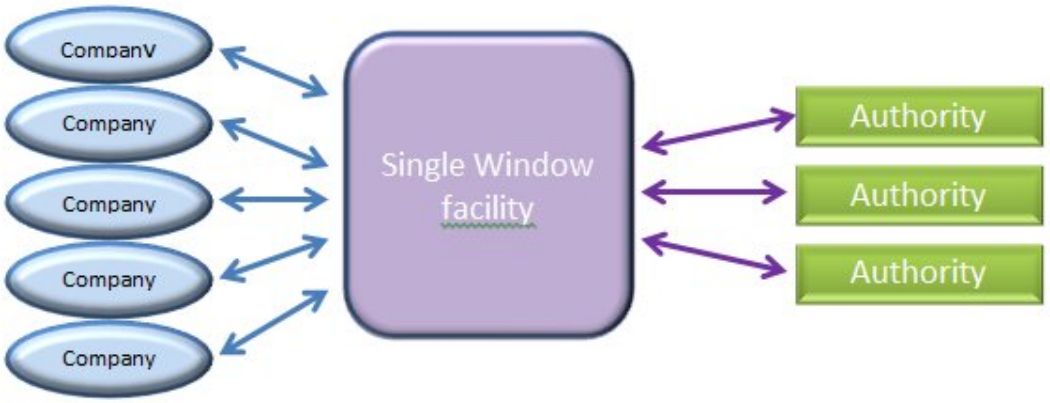



*Figure: A simplified model of Single Window principle*

The basic idea of Single Window system is that required data in the form of harmonised list of mandatory elements is collected only once and then distributed and reused among relevant authorities where needed and possible to implement. This will reduce the administrative burden companies and agencies as well as improve the quality of data.

The Single Window operational development consists of several steps. The main steps are establishing the facility, simplifying and harmonising the collected data, checking the legal framework and creating interoperability with other Single Window systems. These steps are described in UN/CEFACT Trade Facilitation Recommendations 33 to 36.[19] (Recommendation 36 - Single Window Interoperability is under development)
The topics addressed and steps introduced in this document can also be seen as logical path and preparations towards Single Window Implementation as illustrated in figure below.

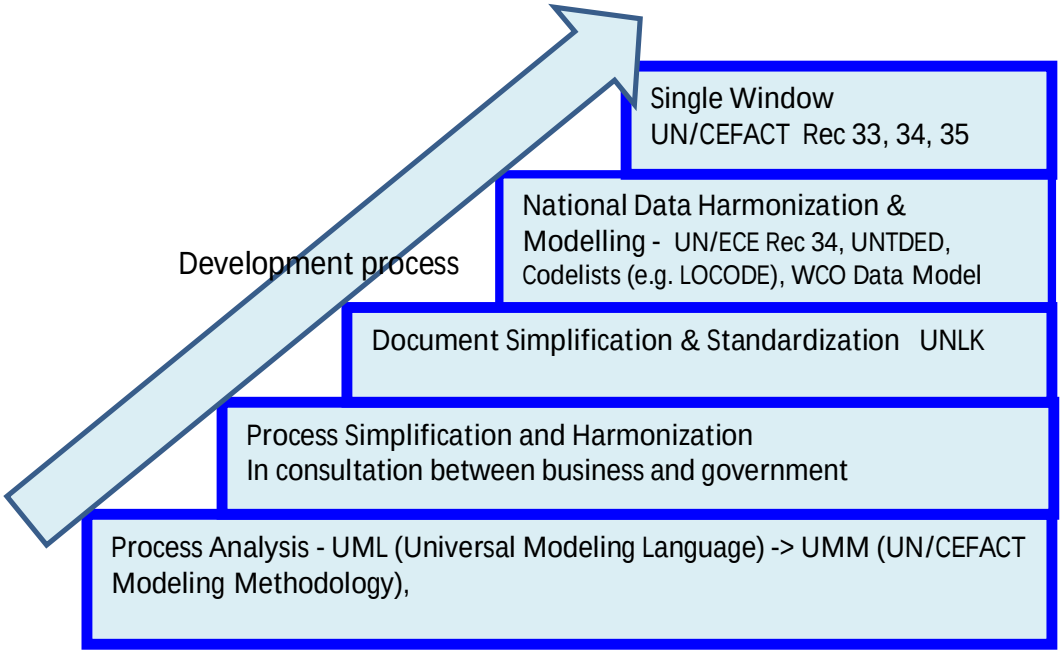



*Figure: Data standardization and harmonization steps towards Single Window implementation*

## 2.4 Data Harmonization example

As identified in the previous chapters, the availability of suitable international standards and best practices as well as other necessary elements for structured data exchange is not a problem. The main issue is the defining of the list of mandatory information requirements and implementation of the standards and recommendations and code lists in a harmonized manner among necessary authorities and agencies.

Fortunately, there is an international recommendation for that purpose too. As mentioned before in chapter 2.3 “Single Window approach”, there is UN/CEFACT recommendation 34 – “Data Simplification and Standardization for International Trade[20]” (available also in Russian language).
Even though the recommendation is mainly aimed for authorities exchanging international trade related data with business, the harmonization concept introduced in this

[19] http://www.unece.org/cefact/recommendations/rec_index.html
[20] http://www.unece.org/fileadmin/DAM/cefact/recommendations/rec34/ECE_TRADE_400_DataSimplificationand_Rec34E.pdf
http://www.unece.org/fileadmin/DAM/cefact/recommendations/rec34/ECE_TRADE_400_DataSimplificationand_Rec34R.pdf

recommendation is suitable also for STC information exchange between different systems and data sources.

“The Recommendation 34 introduces a simple, easy-to-use and cost effective 4 - stage process to achieve the objective of a simplified and standardised dataset. Following the simplification and standardization process described in the Recommendation guidelines, a government should be able to reduce the regulatory and official information requirements through the elimination or duplication of submissions and the removal of redundant data elements. The outcome of the process should be a more efficient and effective exchange of information between Trade and Government. The Recommendation and guidelines acknowledge the valuable part the trading community can play in helping reduce the data requirement by recognising business needs and realities and the ability of commercial systems and records to provide the government demanded information.”

The four steps for harmonization introduced in UN/CEFACT Recommendation 34 are (modified from original recommendation):

> a) Capture - prepare a national data inventory of current government agency data and information requirements from automated systems and documents to cover all requirements for the necessary procedures.
>
> b) Define – prepare a record giving the name, definition and representation (text, format or code) of each data element; also when the information is required and the legal base allowing the relevant agency to demand, collect, view and retain (archive) the information.
>
> c) Analyze – prepare an analysis of the information requirement and data element, establishing whether its need is essential and its use can be demonstrated. While information is identified by name, the meaning (what information is communicated by the data element) and context are more important. The process of analyzing the information consists of gathering together similar data element names and having a full understanding of the definition of each data element and the information requirements.
>
> d) Reconcile – prepare a consolidation of the defined and analyzed data inventory through the process of reconciliation. This involves the agreement to use one data element name with a common definition and (or) common coding, and messages reconciled initially with the international standards of e.g. the United Nations Trade Data Elements Directory (UNTDED ISO 7372).

In capturing phase a Business Process Analyses should be made in order to identify the necessary data corresponding the data requirements of the respective process. The process and data requirements can be described and illustrated in the form of a diagram, using e.g. UML (Universal Modeling Language) diagram.

In defining phase the results of capturing phase i.e. identified data is defined by name and representation form. After that, in the Analyse phase, the contents and requirement of the elements are justified. In the reconciliation phase the data elements will be mapped to a syntax neutral data dictionary, like UNTDED 7372, which is also a ISO standard.

Following the data harmonization and standardization process there will be need to insert and represent the harmonized data elements with a specific data syntax in order to exchange the information between the IT systems of different parties and stakeholders participating the respective (business) process. Data modelling define and specify how the harmonized data elements are represented with a specific data syntax, like UN/EDIFACT or UBL.

Another guide for data harmonization is UN/ESCAP Data Harmonization and Modelling Guide for Single Window Environment.

# 3. Experimental Section - Smart Transport Corridor Pilot case studies

## 3.1 Common issues for pilots

All services/pilots presume the use of existing information resources and opening of data sources both in Finland and Russia. It's proposed that during the pilot Finnish and Russian authorities will open the data and related interfaces only to the service provider(s) participating the pilot and to the counterpart authorities in neighbouring country (Finland / Russia).

However, at the same time it should be evaluated how and under which conditions the interfaces could be opened to any interested party so that new services utilizing the same data sources could be developed. In this evaluation things like data ownership, intellectual property rights, technical capabilities (preventing overload), and restrictions of the usage for commercial use and so on will be considered.
Interfaces should be open and in machine readable format. Data format, codes, protocols, etc. will be further specified and agreed during the pilot preparations.

## 3.2 Information sources

Digitraffic service together with Rajaliikenne.fi could be considered as the main sources for traffic situation, road weather and border crossing stations related information and guidance in Finland.

### 3.2.1 Digitraffic

Digitraffic is a service offering real time and historical information and data about the traffic on the Finnish main roads. The service is provided by the Finnish Transport Agency, and it is addressed for organisations developing information services or working with traffic management and planning.


The information service developers are provided with traffic data through web service interface, in DATEX II - format. Professional users of Finnish Transport Agency and Centres for Economic Development, Transport and the Environment (Traffic sector) are provided with a net application that can be used for traffic monitoring and creating various reports concerning real time or past traffic on certain road stretches.

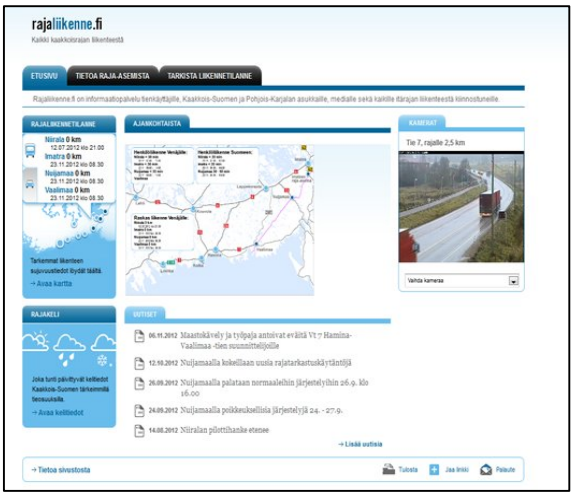
Digitraffic service is collecting information from several different sources like: Travel Time System and the automatic measuring devices (LAM) of the Finnish Transport Agency, road weather stations, road surface pictures.

The Digitraffic service provides information service developers with traffic data through web service interface. Professional users of Finnish Transport Agency and Centres for Economic Development, Transport and the Environment (Traffic sector) are provided with a net application that can be used for traffic monitoring and creating various reports concerning real time or past traffic on certain road stretches.
Digitraffic service is operated by InfoTripla OY on behalf of behalf of the Finninsh Transport Agency.

More detailed information on Digitraffic service as well as information for utilisers can be found in http://www.infotripla.fi/digitraffic/english/presentation.html

### 3.2.2 Rajaliikenne.fi

Another service providing information on E18 corridor is Rajaliikenne.fi[21]. Rajaliikenne.fi contains information especially on important border crossing issues and traffic situation, like queue lengths, waiting times on border crossing stations, border crossing arrangements and procedures as well as presentation of all the South-Eastern border crossing stations in the Finnish side of the border.




Rajaliikenne.fi is also a source for local weather information, traffic cameras, and statics about border crossing times in different stations.
Information in Rajaliikenne.fi website is provided both n Finnish and Russian Languages.
It should be evaluated whether similar service(s) exist in Russian and whether Digitraffic would be the way to make Finnish traffic information available for Russian authorities. As described in St Petersburg Traffic Management Centre should take the key role here.

In general, for each of the service, the following topics need to be clarified for data harmonization purposes (see attachment 1&2):

### 3.2.3 Interfaces for Public Transport Journey Planner in Helsinki Region

Helsinki Regional Transport Authority (HSL) offers access directly to Reittiopas (Journey Planner) interface, when application or service supports public transport usage and transport information availability[22]. There are two possible way to access timetable and route data:

- HTTP GET interface, which gives a response in XML format
- Kalkati.net formatted XML database dump file,

Use of the interfaces is free of charge. Distribution and re-use of HSL information is allowed. Due to the limited service capacity, the number of service requests is, however, limited. Documentation is available only in English and HSL takes no responsibility of possible errors or damages caused by documentation.
Access to interface can be applied by account request form or in case of need for more information, by contact form.
HSL reserves the right to validate applications and services before granting access to the interface. HSL has right to reject the access, whenever necessary, for example in case of excessive traffic to interface or misuse of the service.

Poikkeusinfo XML API is interface to exceptional traffic situation information service for Public transport. The information provided can be classified in two categories:

- Prior information
- Instant (Ad hoc) situation information

Information is provided on all modes of public transport (tram, ferry, train, metro and bus traffic). The service is provided in Finnish, Swedish and English languages.

[21] www.rajaliikenne.fi
[22] http://developer.reittiopas.fi/pages/en/home.php

Omat Lähdöt is public information service, that combines the schedule information with real – time data, information on exceptional traffic and disturbances under a single user interface. This service can be personalized, upon the passenger's own selection, for the stops and routes that the passenger is regularly using.

http://developer.reittiopas.fi/pages/en/home.php
HSL Live 1.6
HSL Live 1.52
Poikkeusinfo XML API (only in Finnish)
Omat Lähdöt API (only in Finnish)

### 3.3 Data definition for harmonization purposes

The issue of data harmonization does too often considered as technical and operational topic and ithe importance is not communicated early enough in policy makers and system planners who make the decision. Also communication between different stakeholders (authorities/agencies , authorities ánd business ) is not adequate either.

As well as a catalogue of open data interfaces and services is practical for development new services, the collection of structured "Metadata" catalogue of all collected data would be recommendable and practical in studying what data is already collected from business and other relevant parties by some authority or agency and also what kind of information is available in their existing data bases.

This information could be used in defining and developing new information services and collecting data without increasing the administrative burden to business or other authorities to provide the requested information.

The topics of "Metadata" table could be as listed below, however, paying due attention to sectoral, regional and international needs and requirements and regulations concerning data collection.

Authority Databases
Database name
Data contents (tables)
Data source(s)
- Data creation (by "owner"/maintaining authority)
- Data retrieval (from other authorities data bases/sources)
- Data collection (information requirements for other organizations, business etc)
- other (derived etc)

Data origin (from whom ) if not created by database responsible agency
Representation definition (format, length, type etc)
Interface definition (outbound)
Acessibility (Open data/available/only for authority use)
IPR's

Information details for Authority Databases
Data element name
Number (ID)
Description (type)
Representation type (A, N, AN)
Domain (value list, standard)
Mode of transport
Category of use
Process of use
Remarks

Also for analysis purposes following topics could be defined:

Bases for collection/retrieval/creation (why/mandate: law, act, regulation etc)
How (collection method)
Collection format
Inbound interface(s)
Annexed there is an example of a table that can be utilized for data analysis and harmonization purposes. The example data in the table[23] is picked up from the digitraffic message for "Up-todate Traffic fluency data". The list (columns) is based on WCO World Customs Organization's data harmonization guide topics.

# 4. Pilot case studies

## 4.1 Automated weather services

Two different user groups for automated weather services can be identified; road users (travelers) and authorities. Authorities need more detailed and accurate information than road users but typically weather information developed for professional use is used as a basis to develop services for road users.
In the first phase (priority pilots) weather services for road users are developed.

Information & data sources
In both countries there are existing road weather stations which will be used for the main source for raw data. In general, the principle is that the data is gathered for professional use by the authorities but the same data can be reused to develop services for road users. It's proposed that Finnish and Russian road authorities will collect the information from weather stations in Finland and Russia respectively and exchange the information with each other. For weather information, at least the following measures need to be exchanged between Russian and Finnish authorities:

- Weather station address
- Time
- The air temperature
- The road surface temperature
- Rain conditions
- Information about road surface slipperiness
- Forecast for weather station points

Sources in Finland
Road weather information (current and forecast) is available from Digitraffic services (see chapter 3.2.1) owned by Finnish Transport Agency. Data is available free of charge but users / service developers need to register to get a user account. More information and interface descriptions can be found on Digitraffic web pages:
http://www.infotripla.fi/digitraffic/english/index.html

Sources in Russia
It's proposed that Rosavtodor through St Petersburg Traffic Management Center will aggregate road weather from Russia information and make it available over web interfaces. In practice this work can be done by Optima on behalf of St Petersburg TMC.

## 4.2 Automated incident detection and alert system

This pilot consists of two different areas; eCall - ERA-GLONASS compatibility and incident information for road users. In both European eCall and Russian ERA-GLONASS automated emergency call systems emergency call is established automatically in case of accident and information about the location and other relevant data (Minimum Set of Data, MSD) is sent to the Public-Safety Answering Point (PSAP). The service will be taken into use in new cars in 2014 in Russia and 2015 in European Union.

[23] Annex 1

When Russian vehicle with ERA-GLONASS equipment has an accident in Finland, the emergency call is automatically established and MSD (Minimum set of Data) is successfully sent
When Finnish vehicle with eCall equipment has an accident in Russia, the emergency call is automatically established and MSD (Minimum set of Data) is successfully sent.
However, there's a clear linkage between eCall – ERA-GLONASS interoperability and incident information system e.g. through automated accident information delivery to incident information databases.

Information sources in Finland
Information about accidents is available through various channels, either directly from authorities (Rescue services) http://www.pelastustoimi.fi/tehtavat/ or through commercial providers http://www.tilannehuone.fi/halytysmap.php. It's still proposed that for the pilot the same Digitraffic service is used as for weather information services (as discussed in chapter 3.2.1). Information from Digitraffic combines both road work and accident information and accidents which have no impact on traffic have already been filtered out.

Information sources in Russia
In Russia accident information is handled by police and road work information by road authorities (Rosavtodor). There's no combined data source and just like with weather information, it's proposed that St Petersburg Traffic Management Center will take the aggregator role.

### 4.3 Real-time traffic and travel time information service

Road user will get real-time information about traffic situation, travel time, routes, border crossing, parking etc using internet or mobile devices.

Current state
In Finland rajaliikenne.fi ( www.rajaliikenne.fi ) web portal is the central place for information for travelers between Finland and Russia. The service is available in Finnish and Russian language and there's information e.g. about border stations, border crossing processes, queuing times at the border, road weather close to border, road cameras, incidents etc. Currently information is available only from Finnish side. The services is provided by Centre for Economic Development, Transport and the Environment of Southeast Finland.

In Russia Granitsa Online http://granitsa-online.com/ is a commercial service provider providing information about border queuing times, web cam pictures etc. It includes web camera pictures also from Finnish side and service is provided in Russian, Finnish and English. Radio Sputnik in Finland is already co-operating with Granitsa Online by informing about queue situation at border stations.

### 4.4 Public transport information service and schedule calculation

Travellers gets information of different public transport alternatives and related services before and during his/her trip to neighbouring country for the long-distance trip and for the connective trips (e.g. for urban travelling in Helsinki and St. Petersburg).
Route planning combining different means of transport for most important routes like:
St Petersburg – Helsinki / Helsinki Vantaa Airport (Allegro Train – Helsinki City bus network)
Helsinki – St Petersburg / Most important tourist attractions (Allegro Train – St Petersburg Metro and bus networks)
Metro and bus schedules and routes for St Petersburg and Helsinki (in Russian and Finnish)
Links to other portals providing public transport information.

Data sources / current state

Today there are various tourist information and journey planner services available in both countries but in local language. In addition, journey planners cannot typically combine border crossing public transport with national / regional public transport. Therefore, traveler between Finland and Russian cannot fully utilize public transport when visiting the neighboring country.

In both countries there are local journey planners and real-time information systems which can be linked to general information services but a new international journey planner for the cross-border travelers might not be afordable and difficult to maintain. STC project could focus on certain selected routes for which cross-border journey planner is applied.

Some links in Finland

www.vr.fi (Finnish rail operator)
www.hsl.fi (Helsinki metropolitan operator)
www.finnair.fi (Finnish flights)
www.matkapojat.fi (Bus tours to St. Petersburg from Finland)
www.pohjolanmatka.fi/ (bus, rail, ship tours to St. Petersburg)
www.ferrycenter.fi (ships for St. Petersburg)
www.matka.fi (national journey planner)
www.matkahuolto.fi (national bus information operator)

# 5. Conclusions and Recommendations

- The use of harmonized data contents and common terminology, in particular when exchanging data between authority information systems, will result smooth traffic flow and less delays in border crossing due to more effective data communication with less errors, ambiguities and confusion.

- There are different standards for different purposes and types of data in Smart Transport Corridor environment, a distinction should be made between traffic management oriented standards and business oriented standards and recommendations. For traffic management data the recommended syntax is DATEX II and for Administration, Business and Transport UN/EDIFACT or UBL.

- To enable effective use of data among necessary authorities and agencies it is important to define the list of mandatory information requirements and implementation of the standards, recommendations and code lists in a harmonized manner.

- When possible, data should be collected only once in harmonized format and then reused among relevant authorities where needed. The reusability will reduce the administrative burden for companies and agencies as well as improve the quality of data.

- Authorities are encouraged to make agreements between the each other in order to delegate the collection of information from various sources and then where possible, share and distribute to other authorised agencies.

- Many Smart Transport Corridor services are, at least to the certain extent, based on standardised technologies, like RFID. However, the technologies and standards utilized are not always used in identical manner as there are different ways to implement and interpret the standards. Hence, a survey of interpretation of used technologies and standards should be done in order to create and guarantee the interconnectivity between Smart Transport Corridor services.

- Also a proposal to define an international standard under the auspices of ISO TC204 for the use of “ITS for Transport Corridor Management” has been introduced and proposed by ITS Russia. The parties in STC project should participate in this standardization effort bringing the experiences gained from STC project for benefit of global audience and implementation.

- Information on the available data repositories is to be collected on a cross-border Smart Transport Corridor data catalogue depicting the data with corresponding access licenses and technological definitions. This data catalogue provides an easy access point for companies and authorities looking for data resources they need.

Annex 1

## Authority Databases

| Database name | Data content | Data source(s) | | | | Data Origin | Interface | Accessibility | | | IPR's |
|---|---|---|---|---|---|---|---|---|---|---|---|
| purpose | tables | create | collect | retrieve | other (derived) | if not created by database resp. agency | outbound | Open data | Available | Authority use only | |
| Trafficfluency<br>Up-todate traffic fluecy data | | | X | | X | MTP | web service WS-I Basic Profile 1.0 | Yes | | | FTA |
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## Authority Database Details

| Data Element Name<br><br>TrafficFluency | Number (ID) | Description (type) | Representation (A, N , AN) | Complex /Simple ComplexType | Length | Domain (value list, namespace, standard)<br>xsd | Mode of Transport (Road, Rail, Marine, Air)<br>Road | Category of Use what for data is reguired | Process what process data is required for<br>Traffic |
|---|---|---|---|---|---|---|---|---|---|
| TrafficFluencyRespons e | | | | ComplexType | | xsd | Road | | |
| timestamp | | ObstimeType | | ComplexType | | xsd | Road | | |
| utc | | dateTime | | | | xsd | Road | | |
| localtime | | dateTime | | | | xsd | Road | | |
| laststaticdataupdate | | dateTime | N | | | xsd | Road | | |
| linkdynamicdata | | | | ComplexType | | xsd | Road | | |
| linkstat | | LinkStatType | | ComplexType | | xsd | Road | | |
| linkno | | LinkNumberType | N, integer, > 0 | | | xsd | Road | | |
| measurementtime | | ObstimeType | | ComplexType | | xsd | Road | | |
| utc | | dateTime | | | | xsd | Road | | |
| localtime | | dateTime | | | | xsd | Road | | |
| journeytimenow | | string | | | | xsd | Road | | |
| midspeednow | | float | ≥ 0.0 | SimpleType | | xsd | Road | | |
| fluencyclassnow | | integer | N, > 0 | | | xsd | Road | | |
| nobs | | integer | N | | | xsd | Road | | |
| | | | | | | | | | |
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