EAST WEST
TRANSPORT CORRIDOR II

TASK 3C REPORT 2:

Deployment

of the Information Broker

REGION BLEKINGE
Baltic Sea Region
Part-financed by the European Union (European Regional Development Fund and European Neighbourhood and Partnership Instrument)

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Title:	Deployment of the Information Broker
Version:	1.2
Date:	2011-09-30
Publishing organisation:	NetPort.Karlshamn
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Contents

1. Introduction

Project Context

The East West Transport Corridor II project was started in 2009 and will run until 2012. It is part-financed by the European Regional Development Fund and European Neighbourhood and Partnership Instrument and brings together around 60 financial and associated partners from Sweden, Lithuania, Germany, Russia, Italy, China and Denmark. The project includes major stakeholders from both the private and public sector.

The aim of the East West Transport Corridor II is to develop a green freight transport corridor connecting northern Europe with Russia and the Far East with particular focus on the Baltic Sea countries. The goal of the corridor is to facilitate transport, improve transport system efficiency, and reduce any negative impacts on the environment.

As part of one of its activities the East West Transport Corridor II explores the potential of reaching the above mentioned goals by introducing an Information Broker: a facilitator and a point of common information exchange, supporting and promoting efficient information sharing for the stakeholders in the corridor. During 2011 the project's operating partners, NetPort.Karlshamn and Info24 will, in response to the EU ambitions for e-Freight, develop a test platform focusing on real operational benefits for the projects industrial partners. In conjunction with project and corridor stakeholders the project has defined an initial test case for implementation called On Time, which aims to improve the calculation of estimated time off arrival for shipments.

Report Scope

The scope of this report is to provide a general description of the technical implementation of the test platform. The report will describe the implementation of the various test cases as they are agreed in the project (currently the test case On Time). Particular focus is on test case functionality, Information Broker inputs and outputs. More detailed descriptions regarding technical implementation and detailed information about the business model for information sharing are outside the scope of this report.

Reading Guide

This document is divided into the following chapters.

Chapter *1. Introduction* gives a short recap of the project context and describes the scope of the report.

Chapter *2. Technical Architecture Implementation* defines the implementation of the common platform for the Information Broker System, constituting the basis and technical framework for all test cases.

Chapter *3. Test Case: On Time* presents the test cases that are to be implemented within the work package, providing a description of participating actors in the transport chain. Also provided are definitions of data types and information categories that are of significance for the test case.

Chapter *4. Appendices* contains a test case independent fact sheet for each actor participating in any of the implemented test cases, gathering information on each participant's operating status, agreements entered into, contact details as well as the data to be provided to and retrieved from the Information Broker.

This report is a dynamic document which allows for continuous edits and updates of both test cases and participants without altering the structure of the report.

2. Technical Architecture Implementation

The common technical platform that all test cases rely upon is the *Information Broker System*. The Information Broker System is the technical component of the Information Broker (which also includes non-technical aspects).

The following is a description of the final implementation based on the suggested requirements of an Information Broker System described in Task 3C Report 1 (“Potential and architecture of an Information Broker in the East West Transport Corridor”) and discussions thereafter.

The Information Broker System is presented from four perspectives:

- A Roles and processes perspective of the Information Broker environment
- A Functional perspective establishing appropriate functionality and properties to reach the expected goals
- A Physical perspective breaking the Information Broker System into conceptual high-level, sub-systems and components
- A System perspective identifying key functionality regarding system management, support and testing

Roles and Processes Perspective

The Information Broker's roles and processes are described in detail in the first report. How the three roles (User, Data Provider and Service Provider) interact through the Information Broker is depicted in *Figure 1 The Information Broker*.

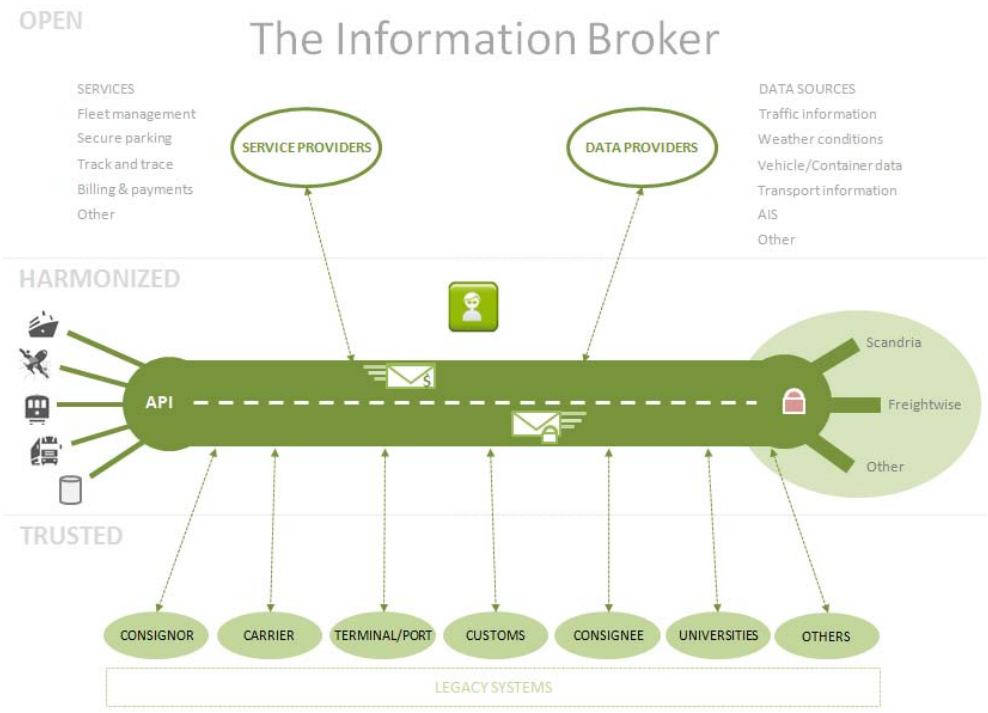


Figure 1 The Information Broker

Functional Perspective

The first report described the expectations on the Information Broker System as the intermediary between service providers, data providers and users. In order to do this, six functional requirements on the Information Broker System were defined. What follows are the details of how each of these requirements is fulfilled. Additional details regarding technical implementation can be found in the next two sections of this chapter.

1. OPEN AND STANDARDISED
   The Information Broker System facilitates the application of international standards and specifications for information exchange. The Information Broker System uses the internet, and adopts standards for information exchange (such as XML) to overcome the obstacles of incompatible IT systems and the lack of common message standards. All communication between the Information Broker System and the applications using it is channeled via a unified data source API.

2. SECURE
   The Information Broker System provides the basis for a secure environment (e.g. backup systems, IP address verification and encryption) – implemented as part of each test case – to lower the risk of unauthorised access and data loss, ensuring the appropriate level of security. Test case specific details are presented in chapter 3

3. MULTI-PURPOSE (GENERIC)
   The Information Broker System channels all in- and outgoing data between the data source specific data protocols (e.g. devices, gateways, IT systems and databases) and the gateway via generic messages formats.

   This way the Information Broker System is able to manage virtually any type of data source, is not technically constrained for use with specific application types or transport modes, and facilitates connections between the Information Broker System and other information exchanges (e.g. Scandria and Freightwise)

4. ENABLE REAL-TIME VISIBILITY
   The Information Broker System has a service-oriented architecture (SOA) design optimized for near real-time delivery. The process time of each piece of data between entering and exiting the gateway (including conversion, translation and packing of data) is below one second.

5. SCALABLE
   The Information Broker System is based on distributed computing with a grid of easily extendable number of powerful servers.

6. EXTENDABLE
   Customers can extend the Information Broker System functionality by building additional components and tools on top of the core functionality, using the Information Broker System API.

Physical Architecture

The Information Broker is, as suggested in the first report, divided into two main components. *The Information Broker System* is the technical component – the digital information exchange – and *Operations* is the organisation needed to run the concept as a whole.

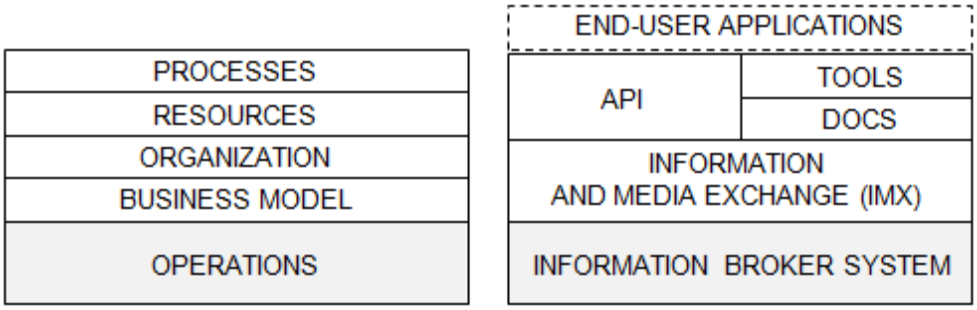


Figure 2. The organisational and technical component of the Information Broker

The Information Broker System includes the following components:

- The Information and Media eXchange (IMX). IMX is a scalable data gateway, supplied by Info24 AB, capable of exchanging real-time information between services, legacy systems, databases and physical resources enabling interaction between service providers, data providers and users

- Interfaces (open Application Programmable Interfaces, APIs, and an extendable set of data source interfaces). The individual API functions are implemented as part of each test case.

- Development and administrative tools and components. The tools and components include the device manager ISM (“Info24 Subscription Manager”) and any additional general components created as part of the test cases. The tools are described in the delivery of the final Task 3C project report (Report 5)

- Overview system documentation. The documentation will be delivered with the final Task 3C project report (Report 5)

Note that the test cases or other applications implemented using the Information Broker System as a platform are not considered part of the Information Broker System; unless it is explicitly decided later on to incorporate the functionality in question as part of the Information Broker service. The reason for this is to avoid confusion regarding expectations of functionality, support and responsibilities.

The conceptual model of the system components of the Information Broker System is a three-layered construction comprising

- a Data source connectivity layer for communication with different types of data sources
- a Core layer encompassing core services and structures such as messaging, data conversion between incoming and outgoing data, data routing and security
- a (business) Integration layer with open Application Programmable Interfaces (APIs) and interfaces to various types of data sources

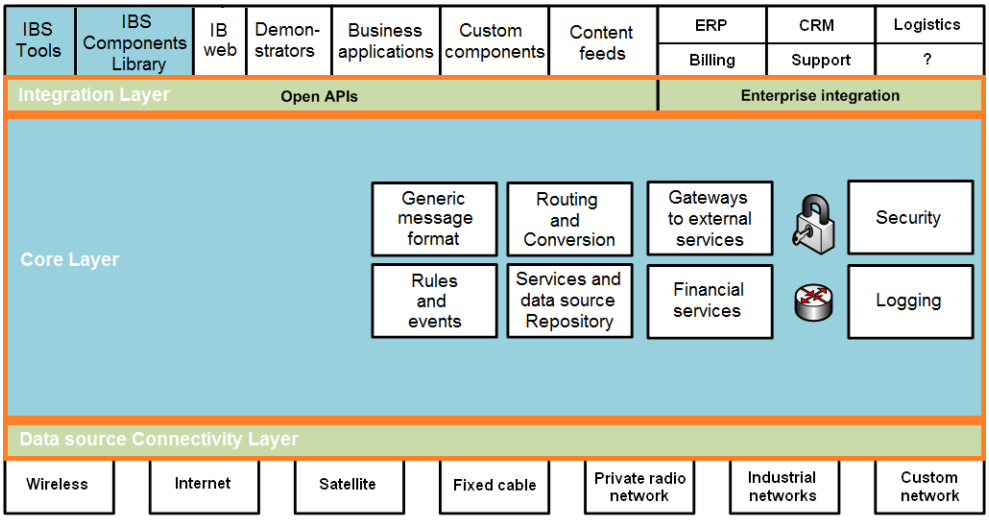


Figure 3. Information Broker System components

To achieve interoperability between different IT systems, the Information Broker System uses a loosely coupled interface with open, standardised APIs based on common standards. This strategy facilitates access to data sources and services available via the Information Broker System, and lowers development costs and time-to-market for application development. This also means that the Information Broker system will not interfere with the actors' existing IT systems. The strategy includes the following:

- Data sources and services are called via so called RESTful web services – a common and easily applicable API for application development and data access.
- eXtensible Markup Language (XML) is the default format for data delivery. XML is common and its use wide-spread.
- Each web service should have an XML service description which describes the service to users and application developers.

- All data passing between data sources and applications/users is converted into a generic message format and should be delivered in the data delivery format preferred by the receiver (XML is the default option but additional options can be implemented for each test case).

System Architecture

The Information Broker System is provided as a service. It supports system management, technical support and testing. The following functionality is available to system administrators and, in some cases, to other users:

- User management
- System performance monitoring
- Central security management
- Data source management and device configuration
- Central repository (data sources, users and other system objects)
- Search functionality (users, data sources, etc)

These and future tools provided as part of the Information Broker System that have graphical user interfaces should use web standards and support the most common web browsers to facilitate use among stakeholders.

3. Test Case: On Time

The project has evaluated several test cases for implementation and has identified one test case to be deployed, On Time, which is described in this chapter.

A major challenge in today's transport corridor is that there is a lack of reliable information regarding the status of shipments and in particular their estimated time of arrival at the final destination. The majority of information reaching transport stakeholders is based on historical rather than real-time data. In addition different actors use different IT-systems and employ varying means of communication, making it difficult to get an overview of the transport network's functional status in the corridor. In combination, these issues make it difficult to forecast an estimated time of arrival (ETA). The problem is further compounded when shipments are affected by traffic disturbances, which in turn, has implications for the rest of the value chain resulting in major business impacts.

The On Time test case will mitigate these impacts by enabling more efficient information sharing between different corridor actors. On Time will improve the distribution of information about the location of cargo carriers as well as about disturbances in the corridor. In-turn this will allow IT-system suppliers and actors in the corridor to make more accurate projections about the ETA of shipments. More specifically, the Information Broker will collect relevant tracking and disturbance information from all modes of transport in all corridor countries and combine this into a unified format so that it can be received and processed no matter what type of system the sending party is using.

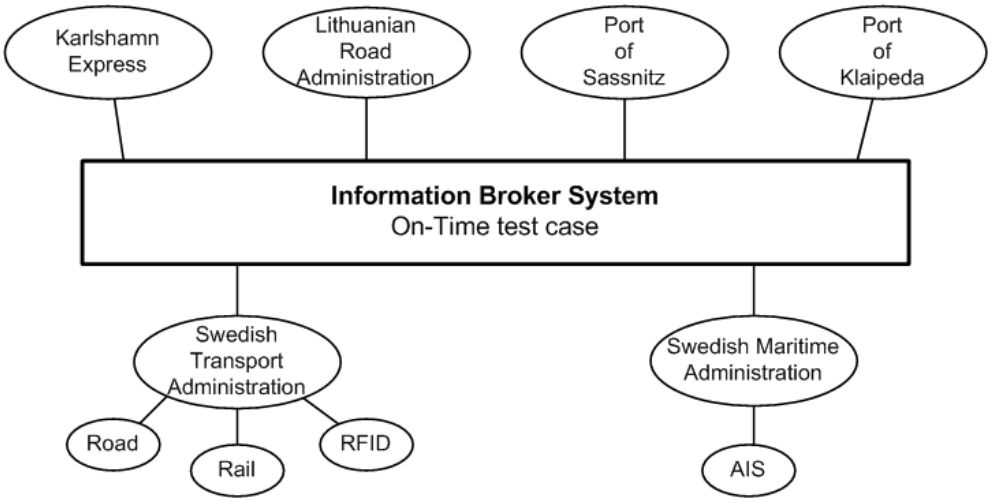


Figure 4 The Information Broker System for test case On-Time

Business Benefits

The On Time test case brings business benefits for transport actors through the possibility to make more accurate predictions of shipment arrivals. Thus, On Time makes it possible for transport stakeholders to take early action to mitigate the effects of delays and disturbances to shipments. Better ETA predictions will further increase service quality to transport buyers and make it possible for transport suppliers to optimise their use of vehicle fleets and personnel.

The data collected by the Information Broker in the On Time test case will not only benefit transporters, consigners and consignees, it will also create business opportunities for third party application developers who can develop and sell traffic forecast engines and services based on the data collected. It is also anticipated that existing logistics systems will integrate the data from the Information Broker so it can be used seamlessly in their IT-systems.

Information Categories and Data Types

The On Time test case uses information present in the transport chain, such as location information of cargo carriers and disturbance information from relevant transport networks, to calculate a more precise ETA for the whole transport chain. Information, from each of the following modes, road, rail and sea, can be divided into three different categories (that may or may not be available in different geographic areas and parts of the transport chain).

Information Category 1: Transportation Network Information

This category contains events that describe the status of the transportation network.

Data Type 1: Information about road traffic disturbances and incidents

Road transport disturbances such as accidents, road works, delays and heavy rain or snowfall, can be collected by road authorities in cooperation with dedicated commercial drivers acting as road status reporters, and even search and rescue units.

Data Type 2: Information about cargo train disturbances

Disturbances affecting rail transport can stem from malfunctioning control points or carriages, accidents or heavy snowfall. This disturbance information will constitute of information relevant for the delay paired with a quantitative time estimate (ETA).

Data Type 3: Information about traffic flow and travel times on major cargo roads

Information about the traffic flow in the road network.

Data Type 4: Information about cargo ship locations

Information about the current location of cargo ships are used to find delays i e disturbances with effect on the planned arrival of the ship. Data is retrieved from the AIS-system.

Information Category 2: Freight Transport Information

This category contains information about the vehicles and vessels that travel on the transportation network.

Data Type 5: Information about cargo train departures and arrivals

This data type carries information about the planned train departures and arrivals

Data Type 6: Information about the location of cargo trains

This data type expresses the location of a cargo train.

Data Type 7: Information about cargo ship departures and arrivals

Tracking of vessels will be carried out by employing Automatic Identification System (AIS) data, a maritime information system built on electronically broadcast information from vessels. This data will be expressed as a combination of vessel ID, location, speed, direction, port of departure, departure time, port of destination and predicted ETA.

Information Category 3: Cargo Carrier Information

This category focuses information about the container or trailer that carries the cargo. The final link to the actual cargo contents will be provided by the shipping agents and transport brokers.

Data Type 8: Information about cargo carriers (container numbers) that are loaded onto each train

Information about the cargo carrier identification numbers loaded onto each cargo train.

Data Type 9: Cargo carrier position data

Cargo carrier tracking data can be collected from road carriers in the form of container or trailer positions.

Data Type 10: Information about cargo carrier identification numbers (container numbers) that are loaded onto each ship

Port terminal information regarding the cargo carrier identification numbers (container numbers) loaded onto each vessel enables tracking of cargo carriers on-board vessels and is also included in this information category which has three data types.

Participants

The Information Broker concept and On Time test case have attracted a number of different types of stakeholders throughout the corridor to participate. The organisations listed below, have all endorsed the On Time service and confirmed their active participation. They are committed to enabling and assisting the Information Broker regarding integration with existing APIs.

JSC Lithuanian Railways

JSC Lithuanian Railways, a project partner of the East West Transport Corridor II, is responsible for the public railway infrastructure in Lithuania. The organisation operates both passenger and freight services and provides freight forwarding as well as other related services. Lithuanian Railways are currently (2011) in the process of replacing their IT systems and has due to this not been able to participate in the first phase of live integration with the Information Broker but it is anticipated that they will be integrated as soon as their new IT systems are ready.

Lithuanian Road Administration

Lithuanian Road Administration (LRA) is in charge of organising and coordinating the reconstruction, maintenance and development of the roads of national significance. Also, LRA collects weather information and monitors black spots from the Lithuanian road network and provides it to the citizens. The authority is a project partner of the East West Transport Corridor II.

Swedish Transport Administration (Rail + Road)

The Swedish Transport Administration, a project partner of the East West Transport Corridor II, is an authority responsible for all modes of traffic: road, rail, sea and air in Sweden. Among the authority's responsibilities for rail transport are traffic management, infrastructure maintenance and traffic information.

Among the Swedish Transport Administration's road commitments are provision of infrastructure, maintenance as well as a collective responsibility for information distribution regarding the traffic situation on the road network. The authority both collects and distributes road traffic information via its traffic information centres.

Port of Karlshamn

Port of Karlshamn is a project partner of the East West Transport Corridor II and one of the largest ports of Sweden, particularly when it comes to transports in the East-West direction. The port consists of six different port areas with a total area of 3000 meters of wharf. The majority of vessels allowed in the Baltic Sea are allowed to make land at the deep-water port whose approach is easily navigated and free from ice and tide all year around. Port of Karlshamn are currently (2011) in the progress of upgrading their IT systems and due to this has not been able to participate in the first phase of live integration with the Information Broker but it is anticipated that they will be integrated as soon as their IT system upgrade is ready.

Port of Klaipeda

Port of Klaipeda, who is a project partner of the East West Transport Corridor II, is the northernmost ice–free port on the Eastern coast of the Baltic Sea. The port, connecting sea, land and railway routes from East to West, is the most important and biggest transport hub in Lithuania, indirectly or directly related to 18 % of the country's GDP. Seventeen big docking companies, ship repair and ship-building yards operate within the port as well as all types of marine business and cargo handling services. The annual port cargo handling capacity is up to 40 million tons.

Port of Sassnitz

Port of Sassnitz is a project partner of the East West Transport Corridor II and is the largest rail ferry port in Germany and the only port in Europe that can handle broad-gauge Finnish and Russian rail-cars. Other advantages are its deep-water port which makes channel navigation unnecessary, its location in Western Europe and its specialisation in railway traffic.

Karlshamn Express

Karlshamn Express is a haulauge company located in Karlshamn, specialising in road transport, freight forwarding, warehousing and repacking. Karlshamn Express offers full-range solutions for all kinds of shipments, and is specialised in temperature-controlled transport, food transport and handling of products for which specific and stringent hygienic requirements apply.

Ingstad & Co

Ingstad & Co is a neutral international shipping company. It has a strong relation with Lithuania but handles shipments all over the world. Ingstad & Co participates as a reference users giving valuable input from a user perspective of international transports.

Swedish Maritime Administration

The Swedish Maritime Administration (SMA) is a public enterprise within the transport sector. SMA works to keep the sea-lanes open and safe.

The Swedish Maritime Administration offers modern and safe shipping routes with service around the clock and takes responsibility for the future of shipping.

Stora Enso & IntelliTrans

Stora Enso is a global paper, packaging and wood products company producing newsprint and book paper, magazine paper, fine paper, consumer board, industrial packaging and wood products. As a global manufacturer, accurate ETA predictions and just-in-time deliveries are of great interest to Stora Enso.

Anticipated Participants

The following organisations have not yet approved their participation in the On Time test case. Negotiations between the project and the anticipated participants are in progress, and their respective participation status is therefore pending.

Danish Road Directorate

The Danish Road Directorate, a project partner of the East West Transport Corridor II, is the authority responsible for the Danish state-owned roads. The Authority is responsible for constructions, maintenance, operations as well as traffic information of the state road network.

Participant Data Provision and Retrieval

So far the project has been focusing on data *provision* from each of the test case participants. Two participants, Karlshamn Express and Stora Enso (via IT partner IntelliTrans), with extensive activities in the transport corridor, are in discussions to also act as users by *retrieving* data from the Information Broker System.

The participants have agreed on individual data provision and retrieval as stated in the matrix below:

	Information Category 1: Transportation Network Information				Information Category 2: Freight Transport Information			Information Category 3: Cargo Carrier Information		
Data types / **Participants**	Data Type 1: Information about road traffic disturbances and incidents	Data Type 2: Information about cargo train disturbances	Data Type 3: Information about traffic flow and travel times on major cargo roads	Data Type 4: Information about cargo ships	Data Type 5: Information about cargo train departures and arrivals	Data Type 6: Information about the location of cargo trains	Data Type 7: Information about cargo ship departures and arrivals	Data Type 8: Cargo carrier information	Data Type 9: Cargo carrier position data	Data Type 10: Information about cargo carriers
Karlshamns Express	RETRIEVAL (Future)	RETRIEVAL (Future)	RETRIEVAL (Future)	RETRIEVAL (Future)	RETRIEVAL (Future)	RETRIEVAL (Future)	RETRIEVAL (Future)	RETRIEVAL (Future)	PROVISION	RETRIEVAL (Future)
JSC Lithuanian Railways		PROVISION (Future)			PROVISION (Future)					
Lithuanian Road Administration	PROVISION		PROVISION							
Swedish Transport Administration (Rail)		PROVISION (Future)			PROVISION	PROVISION				
Swedish Transport Administration (Road)	PROVISION		PROVISION							
Port of Karlshamn				PROVISION (Future)			PROVISION (Future)			
Port of Klaipeda				PROVISION			PROVISION			
Port of Sassnitz				PROVISION			PROVISION			
Swedish Maritime Administration							PROVISION			

Figure 5 Data types provided to and retrieved from the Information Broker

Test Case Implementation

The Information Broker has integrated with each partner's IT-system via its existing interfaces or new interfaces developed for the EWTCII 3C project. Each partner has agreed to participate in the project and provide the data and information needed free to the project for the duration of the project period.

For details about technical implementation for each participant, please see Appendix 1: Test Case Fact Sheet of Partners' Information Provision and Use.

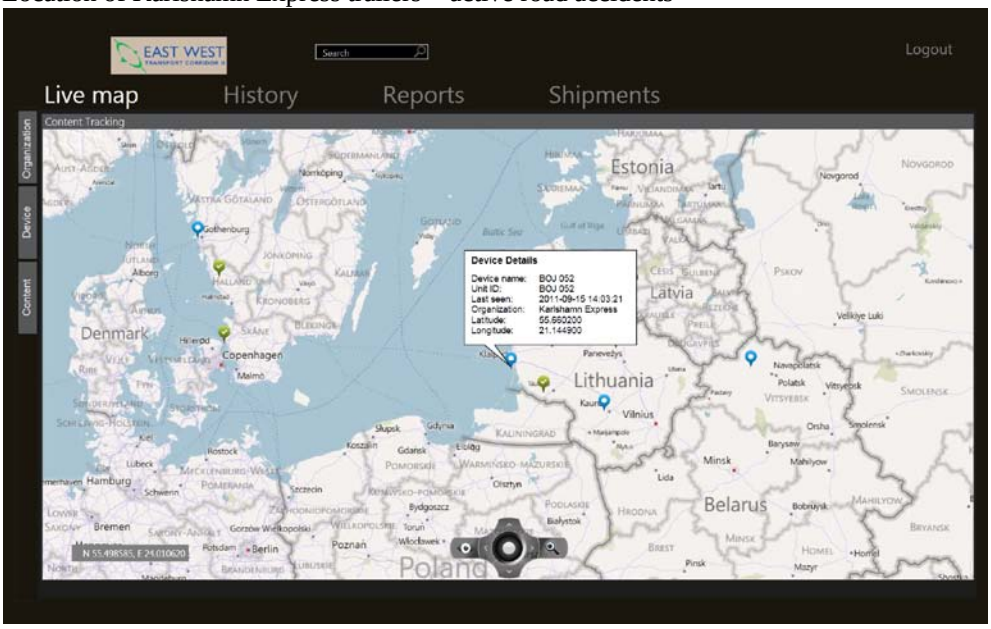
Different partners have different levels of IT support in their on-going daily business and as such the Information Broker has integrated these partners with the mind-set of let's make do with what is available. This approach also creates a financially efficient model for the future as none or very few investments need to be done at the partners IT systems.

In general the situation today is not a lack of information in the transport corridor but rather a technical and legal challenge to gain access to the information. The on-time test case demonstrates that great benefits can be achieved in the transport corridor with comparably little financial effort.

For the purpose of demonstrating the Information Broker operations the project has used a Track and Trace software from Info24 and onto this added shipment tracking presentation features. The demo program can show both the live Information Broker data (example location of Karlshamn Express trailers) as well as recorded transport scenarios that illustrate the benefits of using an Information Broker in the transport corridor.

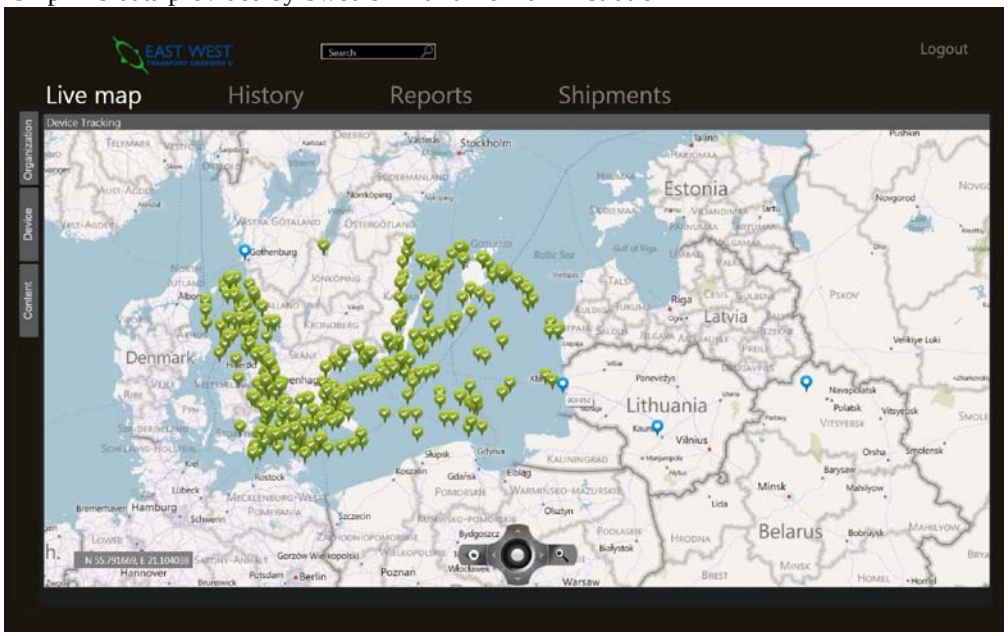
The next pages present a few screenshots from this demo program as presented at the Green Transport Corridor conference in Gothenburg on September 22, 2011. The Information Broker concept was nominated for the award best green transport corridor solution at this conference.

Live Information Broker data:
Location of Karlshamn Express trailers + active road accidents



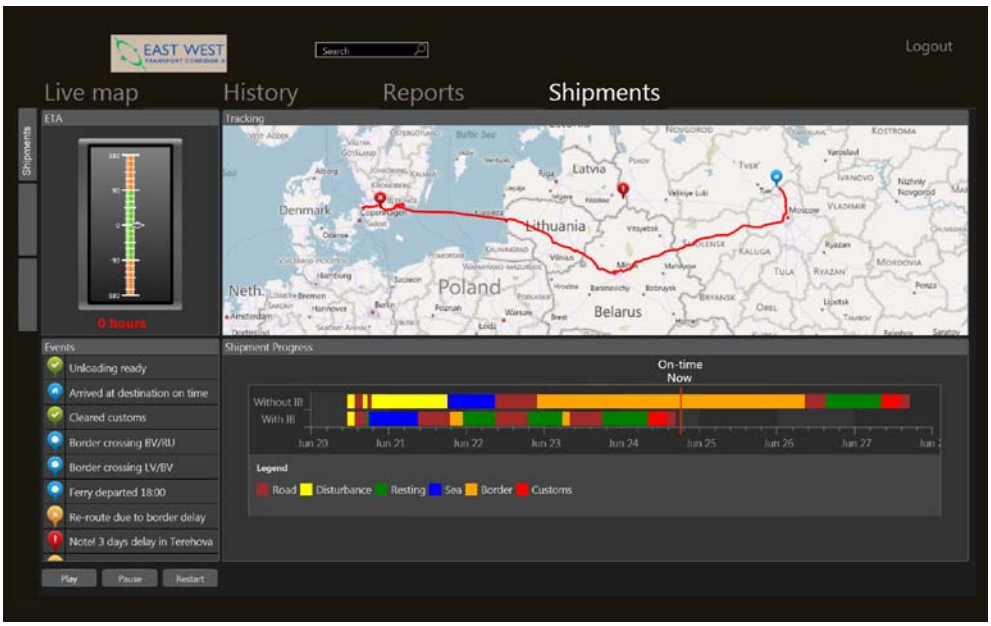
The live map shows the current location (blue map markers) of the Karlshamn Express trailers. Also presented is a content layer with live road accidents from Sweden and Lithuania.

Live Information Broker data:
Ship AIS data provided by Swedish Maritime Administration



The live map shows the current location of commercial ships in the Baltic Sea. Data (AIS) is provided by the project partner Swedish Maritime Administration and is used to keep track of the cargo ships operating in the corridor.

Recorded shipment data from Karlshamn Express illustrating the transport chain with and without the use of an Information Broker



This recorded example illustrates that a shipment with access to real-time transport corridor disturbance information is more likely to arrive on time than not having access to relevant information.

The graphical bars in the Shipment Progress part of the screen illustrate the full transport chain including disturbances, road transports, sea transports, driver sleeping time, border crossings and customs handling.

4. Appendices

Appendix 1: Test Case Fact Sheet of Partners' Information Provision and Use

Karlshamn Express

Partner Contact Information

http://www.karlshamnsexpress.se

Agreement Entered

Agreement signed to participate in the On Time test case.

Data Provided by the Partner

Cargo carrier (trailer) position data

Data Retrieved by the Partner (planned for the future)

Information about road traffic disturbances and incidents
Information about cargo train departures and arrivals
Information about the location of cargo trains
Information about cargo ship departures and arrivals

Operating Status

This partner is integrated and is currently online and exchanging data with the information broker.

How is data exchanged

Karlshamn Express sends its position data as XML messages via ftp.

JSC Lithuanian Railways

Partner Contact Information

http://www.litrail.lt

Agreement Entered

Agreement signed to participate in the On Time test case. However due to upgrades of their IT-systems during 2011 Lithuanian Railways was not able to participate in the first phase of technical integration with the Information Broker. It is anticipated that they will be integrated as soon as the IT system upgrades are finished 2012.

Data Provided by the Partner

Data to be provided is being discussed with the partner.

Operating Status

Details on the technical interface specifications are currently being discussed between the partner and the project.

Lithuanian Road Administration

Partner Contact Information

http://www.lra.lt

Agreement Entered

Agreement signed to participate in the On Time test case.

Data Provided by the Partner

Road works

Accidents (reporting of accidents commences in fall 2011)

Operating Status

This partner is integrated and is currently online and exchanging data with the information broker.

How is data exchanged

The partner sends Traffic Information via the EU standard DatexII protocol. Data delivery is done via SOAP webservices. Information Broker polls the web service for updates at regular intervals.

Swedish Transport Administration (Rail)

Partner Contact Information

www.trafikverket.se

Agreement Entered

Agreement signed to participate in the On Time test case.

Data Provided by the Partner

Estimated time of Arrival
Estimated time of Departure

Rail-cars passages detected by RFID tags

Operating Status

This partner is integrated and is currently online and exchanging data with the information broker.

How is data exchanged

The partner sends two types of data:

- Train departure data is sent via TAF/TSI protocol delivered via XML webservices
- RFID cargo location data is sent via EPCIS protocol delivered via XML webservices

Swedish Transport Administration (Road)

Partner Contact Information

www.trafikverket.se

Agreement Entered

Agreement signed to participate in the On Time test case.

Data Provided by the Partner

Accidents

Road Works

Other traffic disturbances

Operating Status

This partner is integrated and is currently online and exchanging data with the information broker.

How is data exchanged

The partner sends Traffic Information via the DatexII protocol. Data delivery is done via SOAP webservices.

Port of Karlshamn

Partner Contact Information

http://www.karlshamnshamn.se/

Agreement Entered

Port of Karlshamn has agreed to participate in the On Time test case. However due to upgrades of their IT-systems during 2011 Port of Karlshamn was not able to participate in the first phase of technical integration with the Information Broker. It is anticipated that they will be integrated as soon as the IT system upgrades are finished 2012

Data Provided by the Partner

Being discussed.

Operating Status

Details on the technical interface specifications are currently being discussed between the partner and the project.

Port of Klaipeda

Partner Contact Information

http://www.portofklaipeda.lt/

Agreement Entered

Agreement signed to participate in the On Time test case.

Data Provided by the Partner

Vessel ID

Scheduled Time of Arrival

Scheduled Time of Departure

Estimated Time of Arrival

Estimated Time of Departure

Operating Status

This partner is integrated and is currently online and exchanging data with the information broker.

How is data exchanged

The partner sends port data via XML messages using SOAP webservices as delivery method.

Port of Sassnitz

Partner Contact Information

http://www.faehrhafen-sassnitz.de/

Agreement Entered

Agreement signed to participate in the On Time test case.

Data Provided by the Partner

Vessel ID

Scheduled Time of Departure

Estimated Time of Departure

Operating Status

This partner is integrated and is currently online and exchanging data with the information broker.

How is data exchanged

The partner sends port data via XML messages using SOAP webservices as delivery method.

Data is technically provided via the Mecklenburg Vorpommern Hafen Information System (HIS) developed by firma Daten und Dienste in Rostock.