EAST WEST
TRANSPORT CORRIDOR II

TASK 3C REPORT 3:

Operations Monitoring

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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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 project 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 has, in response to the EU ambitions for e-Freight, developed a test platform focusing on real operational benefits for the project's 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

This document contains report 3 and 4 (Operations monitoring 1 and 2) of the East West Transport Corridor II project Task 3C presented in one merged report. *The scope of the report is to report on use performance and to test the Information Broker System*, based on an evaluation template formulated for the Information Broker System as implemented.

Reading Guide

The report is divided into the following chapters.

Chapter *1. Introduction* provides a short recapitulation of the project context and defines the scope of the report.

Chapter *2. Implementation* sums up the implementation process of the Information Broker System and the *On Time* test-case, and the lessons learned.

Chapter *3. Evaluation method* presents the evaluation method and an evaluation template for monitoring use performance data and evaluating the Information Broker System.

Chapter *4. Data* presents information about the data retrieved for monitoring the use

performance of the Information Broker System as implemented. Some data examples are also included.

Chapter *5. Evaluation* presents the results of the evaluation of the Information Broker System.

Chapter *6. Conclusions* sums up the report in a series of overall conclusions about the use performance of the Information Broker. The purpose of the chapter is to provide guidance for a future full-scale implementation of an Information Broker.

Chapter *7. Appendices* contains the evaluation template used for the evaluation process.

2. Implementation

The implementation of the Information Broker System and the *On Time* test-case was executed as planned in *Report 2 Deployment*. The Information Broker System is provided as a service by Info24 including information exchange functionality, programmable interfaces, tools, system documentation. functionality and technical support. More information about the Information Broker System can be found in *Report 1 Interfaces and architecture* and in *Report 2 Deployment*.

For the sake of the *On Time* test-case the Information Broker System was integrated with concerned parties' IT systems via either existing interfaces or new interfaces developed for the EWTCII 3C project. *Report 2 Deployment* contains details about the technical implementation for each test-case participant.

Report 2 Deployment also included a list of data types and information sources to be connected to the Information Broker System. The evaluation template (Appendix A) contains information about which of these data types and information sources that were/were not connected as planned.

A general note on connecting information sources to the Information Broker System is that such integrations are much less resource-demanding in the cases where the information provider has a tradition of digitally sharing information with external parties and the public *and* previous experience of doing so. Organizations that share information via the internet for the first time often struggle a bit initially in regards to strategy and technical setup. Consequently road traffic, which has a much longer tradition than shipping and railroad traffic of public information sharing, was therefore much less resource-consuming to integrate with than other information providers.

3. Evaluation method

This chapter presents the evaluation method and an evaluation template for monitoring use performance and evaluating the Information Broker System.

The requirements of the Information Broker System were defined in *Report 2 Deployment*. The requirements were grouped in three different categories: Functional requirements, technical requirements and *On Time* test-case requirements. The On Time test-case served as a tool for both demonstrating the use performance of the Information Broker *and* for testing the Information Broker System as a technical solution. The focus for the evaluation is to answer the following questions:

1. Does the Information Broker System deliver the *functionality* as promised in *Report 2 Deployment*?

2. Have the *technical requirements* of the Information Broker System been fulfilled as promised in *Report 2 Deployment*?

3. Could the data types and required integrations between the Information Broker System and actors' IT systems needed for the *On Time* test-case (as defined in *Report 2 Deployment*) be successfully implemented (from a technical and performance perspective respectively)?

The evaluation is based on the following material:

1. The functional and technical properties of the Information Broker System – as promised in *Report 2 Deployment*

2. Data types and related real-time data processed and accumulated by the Information Broker System during the monitoring period (November 1, 2011 - December 12, 2011) – as defined in *Report 2 Deployment*

3. An interview with a representative of Karlshamn Express, a commercial actor in the corridor that contributed with real-time data for the On Time test-case

The evaluation is mainly qualitative in nature but where needed supported by Information Broker System use performance statistics processed by the Information Broker System during the monitoring period. To facilitate the evaluation process an evaluation template has been created. The evaluation template includes all aspects to be evaluated based on the scope for the Information Broker System and the *On Time* test-case defined in *Report 2 Deployment*. The evalution template also contains the results of the actual assessments. The evaluation template can be studied in Appendix A. The results of the evaluation and some related aspects are discussed in *Chapter 5. Evaluation*.

4. Data

In order to monitor use performance and test the Information Broker System, data passing through the Information Broker System was collected during a monitoring period between November 1, 2011 and December 12, 2011. This chapter presents some facts about the data retrieved. Some data examples are also included.

The Information Broker System has a service-oriented architecture (SOA) design optimized for near real-time delivery. The Information Broker System is based on distributed computing with a grid of an easily extendable number of powerful servers. The process time of each piece of data (data record) between entering and exiting the Information Broker (including conversion, translation and packing of data) is below one second.

During the monitoring period a total number of 11,533,362 data records (8 gigabytes of data in terms of storage) were stored by the Information Broker System on behalf of the *On Time* test-case. However, the number of data records *passing through* the Information Broker System during the monitoring period on behalf of the *On Time* test-case was almost 40 times that. AIS data passed through the Information Broker System but was not collected because of the enormous amount of data it constitutes and the little use of storing this information for the tests that needed to be performed. In other words, during the monitoring period the Information Broker System withstood the test of processing almost half a billion data records (124 data records per second) on behalf of the *On Time* test-case.

Presented below are some examples of data collected during the monitoring period. Important to note for readability is that often multiple data records concern the same information entity. For example, for one single road accident there are usually many more than just one single data record sent about it.

Message flow

The graph below illustrates the distribution of incoming collected data records per day during the monitoring period.

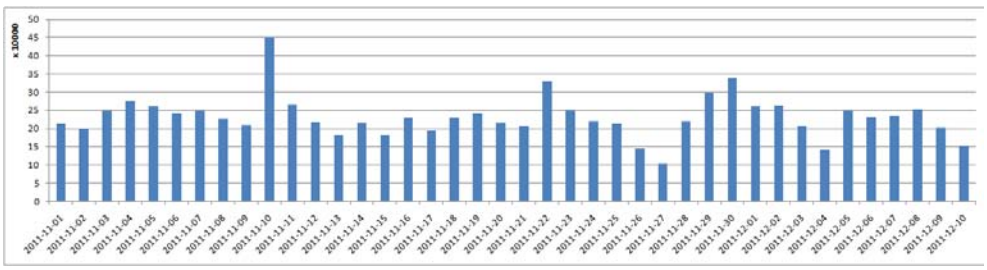

Figure 1. Incoming collected data records per day

Port and road traffic data

The number of data records relating to port and road traffic amounted to 11,533,362. Excluding records that were obvious duplicates 2,485,674 data records remained. Based on the remaining data records, the graph below illustrates which countries delivered the most information.

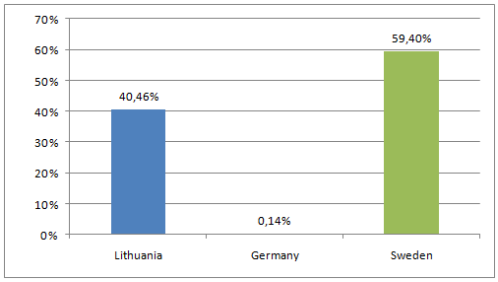

Figure 2. Port and traffic data

Two storms occurred during the monitoring period: One that occurred 27-28 November, 2011 and another one 8-9/12. The bad weather conditions were indicated by data records reporting delayed departures and arrival from and to ports.

Road traffic information

1,476,542 data records were related to road traffic. Below is a graph illustrating how the road traffic data was distributed among the most common types of road traffic information categories.

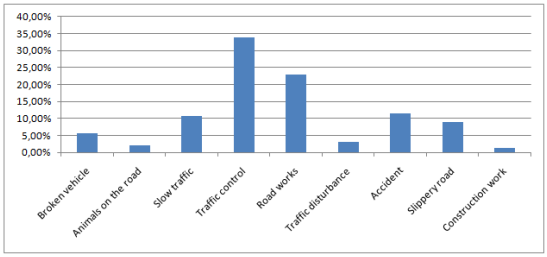

Figure 3. Road traffic data per category

The next graph below shows the distribution of traffic information in regards to the impact that the incidents reported on had on traffic

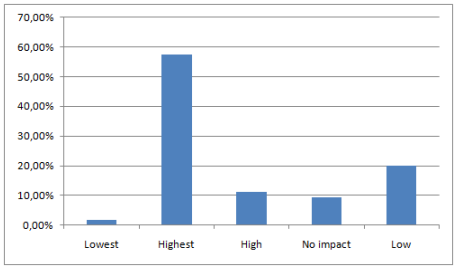

Figure 4. Impact on traffic

Trailer data

38,221 data records with cargo positions were collected from seven trailers. Typically each trailer reported its position once every 15 minutes, but only while moving. The graph below illustrates how trailer data was distributed among the trailers.

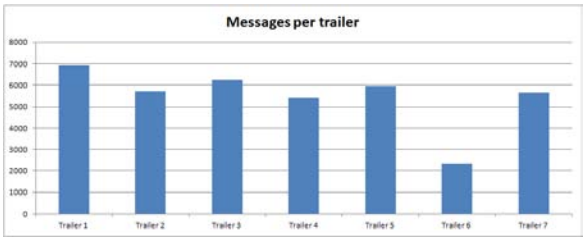

Figure 5. Incoming data records per trailer

The next graph below shows the distribution of trailer data per day.

Figure 6. Incoming trailer data records per day

5. Evaluation

The result of the evaluation process (see evaluation results in Appendix A. Evaluation template) concluded that:

1. Yes, the Information Broker System DOES deliver the *functionality* as promised in *Report 2 Deployment*

2. Yes, the *technical requirements* of the Information Broker System HAVE been fulfilled as promised in *Report 2 Deployment*

3. Yes, the data types and required integrations between the Information Broker System and actors' IT systems needed for the *On Time* test-case (as defined in *Report 2 Deployment*) WERE successfully implemented (from a technical and performance perspective respectively)

Two conclusions can be drawn from the evaluation:

1. The capability of the Information Broker System has been assured

2. The *On Time* test-case was implemented as promised from a technical and performance perspective. Some data types were not fully supplied as planned but that were due to circumstances not related to the Information Broker in any way

A next step in bringing operational benefits for the project's industrial partners could be to either involve a few commercial actors in an extension of the *On Time* test-case, or to build a new business case involving the Information Broker and one or more commercial actors.

An interview was carried out with a representative from haulage company Karlshamn Express and it came to revolve around incentives for commercial actors to make use of the Information Broker System. The representative expressed the firm belief that the business potential of the Information Broker is considerable but to make commercial actors start making use it, there are a number of challenges to overcome. He suggested the following as effective measures in making Karlshamn Express and other commercial actors make use of the Information Broker more quickly:

1. PRESENT STRONG BUSINESS CASES. Commercial actors like Karlshamn Express avoid uncertainty and have neither the incentives nor the resources to try out unproven solutions. Strong business cases including clear cost/benefit analyses are needed to create an interest

2. PACKAGE SOLUTIONS THAT MAKE IT EASY TO SAY "YES!". Most of the time the Information Broker is only one of a number of key-components that are needed to solve the specific problems that commercial actors face. New hardware, new user interfaces and integration with existing business systems and other legacy systems are a few examples that the commercial actors also might need to spend resources on to get the results they are looking for. The more time, money and other resources that needs to be spent, the less likely a commercial actor is to start using the Information Broker. However, if there were ready-to-use solutions with clear, fixed prices *and* if there was also integrations between the Information Broker and the most popular business systems already on the market (which would keep integration costs down) *then* that would get the attention of many commercial actors

3. MAKE IT CHEAP TO GET STARTED. Regardless of whether a strong business case is presented or not, a commercial actor might still not act – if there is a need for a substantial investment. Most commercial actors in the transport sector are cautious about larger investments. If their customers are not asking for a specific service and are not willing to pay for it in the short run, or if the value of an investment is too uncertain, a commercial actor has very weak incentives for implementing the service – even if the commercial actor thinks the change would have value for them. *Unless* the price is low enough

4. GET FINANCIAL SUPPORT FROM AUTHORITIES AND NGOs (Non-Governmental Organizations). Although green transports are important, commercial actors are primarily interested in profitability. So, to realize the Information Broker's green potential , especially in the short term, it is probably a good idea if concerned authorities and NGOs could support the Information Broker in order to create stronger incentives for commercial actors to make use of it early on

6. Conclusions

This report has reported on the monitoring of use performance and evaluated the Information Broker System.

It was concluded that the Information Broker System fulfils the requirements defined in *Report 2 Deployment*.

As for the *On Time* test-case it too was successfully implemented as planned (see *Report 2 Deployment*). The data types that have been made available via the Information Broker System can now be accessed by transport corridor actors and third party developers via the Information Broker System's open programming interfaces (APIs) – to be used for integration with existing applications or as the starting point for totally new applications.

As promised in *Report 2 Deployment* using the Information Broker System and putting it to use in the *On Time* test-case has demonstrated how real-time information with great benefits can be made available in the transport corridor with comparably little financial effort.

A next step in bringing operational benefits for the project's industrial partners could be to either involve a few commercial actors in an extension of the On Time test-case, or build a new business case involving the Information Broker and one or more commercial actors. However, an interview with a representative from haulage company Karlshamn Express indicated that at least some commercial actors will need more incentives to start using the Information Broker System. Not because they do not see the potential of the Information Broker but because the threshold of turning potential into real business value is perceived as too high. Thus, it should be further explored what is needed for commercial actors to perceive they have strong enough incentives for using the Information Broker.

7. Appendices

Appendix A. Evaluation template

The evaluation template lists the requirements from *Report 2 Deployment* and assessments of to which extent these requirements have been fulfilled.

EVALUATION AREA 1: Information Broker System FUNCTIONALITY

Requirement/Evaluation	Source	Fulfilled?
Open and standardised The fulfilment of the prerequisites have been verified by testing information access and other functionality - via the Information Broker API – as needed by the *On Time* test-case	Report 2, page 8	Yes
Secure Information Broker security has been thoroughly field tested – in regards to backup systems, IP address verification and encryption works. The security requirements defined for the *On Time* test-case are fulfilled.	Report 2, page 8	Yes
Multi-purpose (Generic) During the monitoring period the Information Broker has processed data from totally different information sources and meanwhile, for other projects than EWTC, processed data from and to thousands of hardware devices. This has been verified.	Report 2, page 8	Yes
Enable real-time visibility In automated tests time of entry in the Information Broker System and time of exit of approximately half a billion data records (traffic incidents, positions and other data accumulated during the testing period) have been monitored and the process-time was found always to be below one second	Report 2, page 8	Yes
Scalable Info24 has verified that the configuration is as promised	Report 2, page 8	Yes
Extendable Yes, the existence of the Information Broker System API ensures the extendability of the Information Broker System	Report 2, page 8	Yes

Administrative functionality Includes: 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) It has been verified that this functionality exists and it has been thoroughly field-tested	Report 2, page 12	Yes

EVALUATION AREA 2: Information Broker System <u>TECHNICAL REQUIREMENTS</u>

Requirement/Evaluation	Source	Fulfilled?
System components Information and Media eXchange (IMX) Interfaces (open API) Development and administrative tools and components Overview system documentation Info24 confirms that the Information Broker System does include the promised components and the implementation of the *On Time* test-case verifies that it is so	Report 2, page 10	Yes
3 layered architecture Data source connectivity layer Core layer Integration layer Info24 confirms that the Information Broker System does include the promised architecture and the implementation of the *On Time* test-case verifies that it is so	Report 2, page 11	Yes
Interoperability through open APIs RESTful services Default data delivery format (XML) XML service descriptions A generic data format Info24 confirms that the Information Broker System does include the interoperability as promised and the implementation of the *On Time* test-case verifies that it is so	Report 2, page 11-12	Yes

EVALUATION AREA 3: Fulfilment of requirements for the *On Time* test-case implementation

Requirement/Evaluation	Source	Fulfilled?
Data provisioning The scope of the *On Time* test-case was to make 8 different data types accessible via the Information Broker System. All technical integrations between the Information Broker System and the respective actors providing information were performed – except in the cases where the actors did end up not supplying the information as planned. The reasons for them doing so had nothing to do with the capabilities or performance of the Information Broker System. From a performance perspective the processing of each data type (i.e. data from each integrated system) has been acceptable (i.e. below one second of processing time per data record from entering the Information Broker System to exiting ready for retrieval by a third party). Here are the information/data types that were *not* delivered as planned according to Report 2 (all other data types were provided as planned): Lithuanian Road administration only provided information about road works. In 2012 they will add more position data and also include other traffic events such as accidents (Data type 1) No train data was supplied by any actor. Technically the Information Broker System, was, all the same, set up for retrieval of train information from the Swedish Transport Administration (Data type 2, 5, 6) Lithuanian Road administration did not supply information about traffic flow and travel times on major cargo roads (Data type 3) Port of Karlshamn did not supply	Report 2, page 18-19	Yes

information about cargo ships, but instead the Swedish Maritime Administration did so (Data type 4)		