

Final report activity 5.4 for **NECL II** **<WP 5: Logistic ICT solution for operative transport matching>**

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Introduction

A logistic ICT solution (a *portal*) for matching of intermodal transports was pointed out in the former NECL I as one of the most important issues for further development in the transport sector of the Mid Nordic Corridor. Since the end of the NECL I project a prototype of such portal was developed and managed by NECLA and the Mid Sweden University (MIUN). Further development of this portal started in this project in January 2011 as work package 5 and the activity 5.4 has ended during March 2013 according to the plan. This activity's focus was on the development of the GUI and the connection to databases and the optimization module to make a fully operational demo. of the portal

Purpose

The overall purpose was to further develop the ICT system through case studies with cargo owners and shippers in the mid Nordic corridor. The purpose with activity 5.4 is a fully operational portal.

Goal

The goal with the activity 5.4 is a portal that can be used through internet access to demonstrate the usage of the ICT system

Deliverables

In the project plan the following activities was stated to be performed during activity 5.4.

- Further develop the GUI in the existing prototype
- Documentation and reporting of this activity

The above described activities have been delivered in time and the system documentation is presented as a separate activity report for the interested reader that will be available on the homepage in April 2013 [1].

Result

System documentation

This part is a short summary of the system documentation [1]. The system that now can be viewed and demonstrated through log in at the homepage of the project consists of three parts. One part is for shippers holding transport capacity, one for suppliers needing transport capacity and one for the administrator (Figure 1).

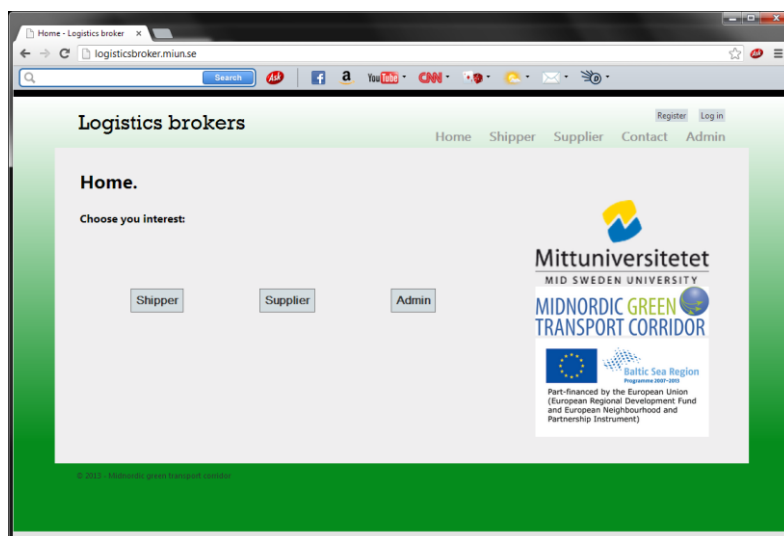


Fig. 1: The front page of the portal consisting of distinct log in for different users.

The shipper holding all available transports is depicted for one user at Figure 2 where on small part of the real world data used for the test is seen. In current version transports can be added manually to this part. This will be extended to automatic handling later on.

Id	From	To	Carrier	Type	Start time	Transport time	Transport cost	Emissions	MaxTransport	MinTransport
1	Al	Aln	L	B	10	0.75	1742	0.025	67	20
2	Al	Aln	L	B	22	0.75	1040	0.015	40	20
3	Al	Aln	L	B	15	0.75	1742	0.025	67	20
4	Al	Aln	L	B	23	0.75	1378	0.02	53	20
5	Al	Aln	L	B	12	0.75	1742	0.025	67	20
6	Al	Aln	L	B	10	0.75	1378	0.02	53	20
7	Al	Aln	L	B	86	0.75	1378	0.02	53	20
8	Al	Aln	L	B	24	0.77	702	0.0099	27	20
9	Al	Aln	L	B	30	0.75	1378	0.02	53	20
10	Al	Aln	L	B	14	0.75	520	0.0073	20	20
11	Al	Aln	L	B	21	0.75	702	0.0099	27	20
12	Al	Aln	L	B	28	0.82	650	0.0097	25	20
13	Al	Aln	L	B	12	0.75	1534	0.018	59	20
14	Al	Aln	L	B	10	0.75	1040	0.015	40	20
15	Al	Aln	L	B	20	0.75	1378	0.02	53	20
16	Al	Arj	L	B	32	7.43	3160	0.16	40	20
17	Al	Arj	L	B	20	7.43	4187	0.21	53	20
18	Al	Arj	L	B	38	7.62	7189	0.143	91	20
19	Al	Arj	L	B	30	7.62	8769	0.37	111	20
20	Al	Arj	L	B	12	7.62	3792	0.076	48	20
21	Al	Arj	L	B	48	7.43	9243	0.19	117	20

Fig. 2: The shipper part of the portal

The supplier part of the portal is depicted in Figure 3 for the case when one supplier chooses to put in two needed transports in the portal. Note that the supplier can choose how many transports that will be automatically searched for in the portal.

Supplier. Search for transports

2

From: Al To: Aln

Shipping time: 1 Delivery time: 16 Amount: 40 Select the type of transport: M3

From: Al To: Pit

Shipping time: 2 Delivery time: 50 Amount: 40 Select the type of transport: M3

Fig. 3: The supplier part of the portal. In this case the supplier has choose to search for two distinct transports

After the supplier has put in transport needs he puts the search button and he get solutions as presented in Figure 4. These solutions are generated using the optimization routine developed in activity 5.2 and 5.3. Currently, we working in activity 5.5 to include automatic weighting between the cost, time and emission criteria and the portal will after that be updated with this feature.

Search results.

Cost Optimised over lowered emission

Cost	Time	Emission	
29130	155,58	0,582	▼
29162	155,58	0,582	▼
31415	134,58	0,633	▼

Emission Optimised over lowered time

Cost	Time	Emission	
29898	163,58	0,576	▼
29930	163,58	0,576	▲

Id: 14
 AI - Aln
 Carrier: L Comtype: B

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Fig. 4: The presentation of the optimal transports. In this figure there are three parts, Optimizing cost, time and emissions to give different suggestions to the supplier.

The result when minimizing the cost is depicted in Figure 5. In this case time is reduced making an increasing cost to give different suggestions to the supplier. This can be easy changed to suit many different types of transports. If a transport can't be performed, or only partially performed, this is indicated in the system for the supplier and currently this is implemented for shippers, as well, to notify if more transport capacity is required.

Cost	Time	Emission	
29130	155,58	0,582	▼
29162	155,58	0,582	▼
31415	134,58	0,633	▼

Fig. 5: Presentation of the results when we minimizing the cost. It is possible to see all details of the transport if pushing the arrows to the right.

In this case we have selected that the system should present three transports each. This is only an example and can be easy changed due to the supplier's preferences. The actual functionality of the portal is depicted in Figure 6. However, shortly Lingo is the software used for calculations. Details of this are further described in the system documentation [1] and the underlying mathematical models was developed during activity 5.2 and 5.3 and has been scientifically published in [2],[3] and [4].

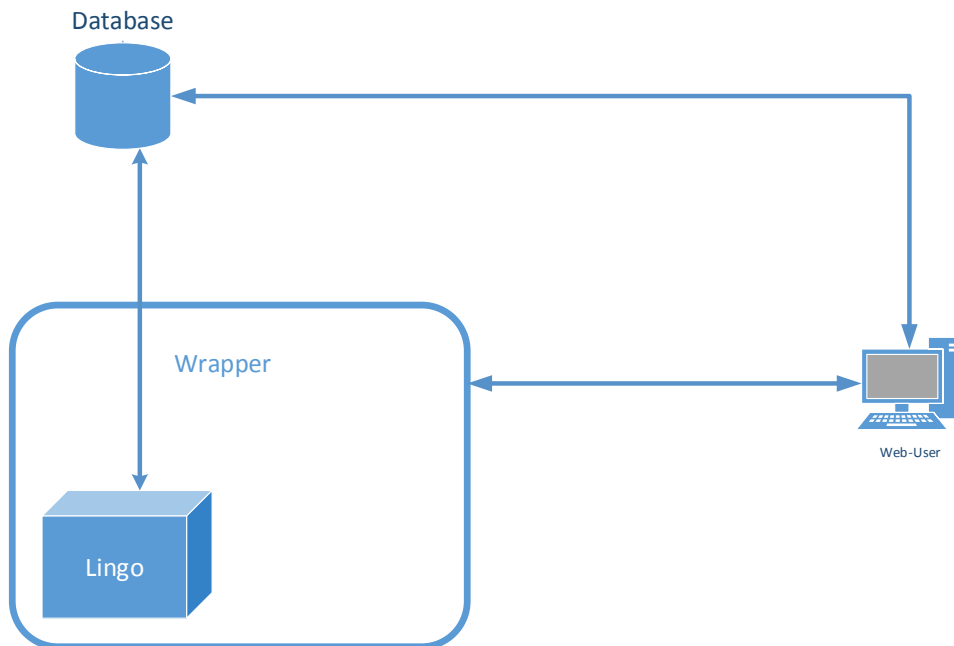


Fig. 6: The functionality of the portal

Documentation and reporting

Documentation has been performed

- On regular monthly basis in status reports to the project manager
- As short summary in this report.
- At the system documentation in [1] that should be viewed as an more comprehensive report on the above described development.

Discussion

According to the project plan and the purpose and goal for the activity 5.4 we feel that all parts, has been accomplished well in time. Activity 5.4 has therefore fulfilled the purpose to make the portal presentable and fully operational. We have in the example used real world data extracted during the ongoing activity 5.5. Furthermore the test indicates that the early developed model is very general and can be extended in many directions. Further improvements will be a part of the activity 5.5.

During this activity no real problems have occurred.

References

- [1] Vesterlund.E., Olsson.L, *Technical documentation of the first version of the ICT portal*, Activity report for Workpackage 5.4, Necl II, 2013.
- [2] Kalinina.M., A.Larsson. and L.Olsson."Generating of Ordering of Transport Alternatives in Intermodal Logistics in the Presence of Cost, time and Emission Conflicts" *in the IEEE International Conference on Industrial Engineering and Engineering management*, Hong Kong 2012.
- [3] Kalinina.M, Larsson. A and Olsson. L. 2013. "Easy-Interactive Ordering of the Pareto Optimal Set with Incomplete Preference Information," *accepted at the International Conference on Operations Research*, France, 2013.

- [4] Olsson.L, Larsson.A., Matching of Intermodal Freight Transports using optimization in a decision support system, *in the IEEE International Conference on Industrial Engineering and Engineering management*, Hong Kong 2012.

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