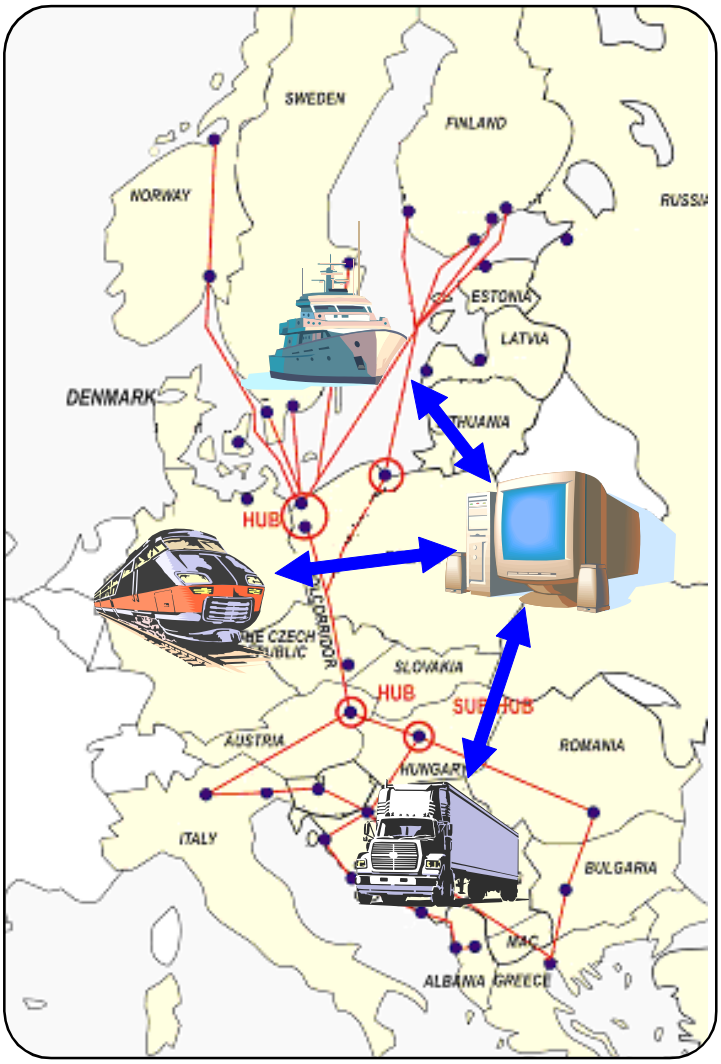

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PoI-Corridor

IT Systems

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VTT Building and Transport

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Abstract

This report describes how generic freight architecture has been applied to international intermodal logistics process on a freight transport corridor (Pol-Corridor) between Nordic countries and the South-Eastern part of Europe. The objective has been to give approximative guidelines for the implementation of information systems, information exchange flows, and interfaces required by the overall Pol-Corridor concept. It covers the results of work package 6 in Pol-Corridor project – Design and Laboratory Implementation of Info-system for Pol-Corridor.

The first task has been to define the business process of international intermodal transport on Pol-Corridor. The business process model covers transport planning and booking model as well as road, sea, and railway transport process models. Business model forms the basis for conceptual architecture, which has been used further in defining the Service Architecture for Pol-Corridor.

The Service Architecture contains the information services, their relation to the process components of the conceptual architecture, and the actual systems providing the services. Commercial, available in-house or off-the-shelf IT systems that can serve the business processes are mapped to the business processes of conceptual architecture.

Finally, it has been assessed what kind of organisation and financing would be the most suitable for the information services of Pol-Corridor. The option where a common information centre provides information to logistics operators and customers by collecting data from the parties along the transport chain was considered the most suitable for Pol-Corridor.

Already today there are IT systems, which can provide necessary information services for Pol-Corridor. The challenge is to integrate different systems and make them inter-operable between different countries and operators. The last, and certainly not least, challenge is to find ways of co-operation between operators along Pol-Corridor.

Preface

Pol-Corridor is a EUREKA project and a part of EUREKA's LOGCHAIN programme. The financing of Pol-Corridor is arranged within each participant's home country. In Finland the main financier is Tekes, The Finnish Technology Agency, through its ELO programme (Electronic Commerce in Logistics). Other financiers are The Ministry of Transport and Communications Finland, harbours of Turku, Helsinki, Kotka, and Hamina. These organisations nominated the Finnish steering committee for the project which was chaired by Senior Adviser, Mr Jari Gröhn from the Ministry. Other members of the steering group were Finance Director, Mr Reijo Toivonen (Turku Harbour); Managing Director, Mr Kimmo Naski (Kotka Harbour); Deputy Director, Ms Eve Tuomola-Oinonen (Helsinki Harbour); Managing Director, Mr Seppo Herrala (Hamina Harbour); Managing Director, Mr Jari Kaitera (Stockway Ltd); Managing Director, Mr Petri Salonen (AtBusiness Communications Ltd); Technology Manager, Mr Sauli Tujunen (AtBusiness Communications Ltd); Sales Manager, Ms Sanna Peltomaa (Procomp Solutions Ltd); and Technology Adviser, Ms Heidi Lindroth (Tekes). Mr Kari Ruutu from Tekes has been the Finnish EUREKA Co-ordinator for the project. We wish to express our gratitude to these persons for their contribution and guidance.

VTT, The Technical Research Centre of Finland, has been the co-ordinator of Work Package 6. The co-ordination team included Senior Research Scientist, Mr Pekka Leviäkangas; Research Scientist, Ms Anna-Maija Alaruikka; Senior Research Scientist, Mr Jarkko Lehtinen; Research Scientist, Mr Jyrki Haajanen; Research Scientist, Mr Jussi Huotari; Senior Research Scientist, Mr Robin Berglund; and Research Scientist trainee, Ms Jenni Kanniainen. The team was assisted by Senior Research Scientist, Mr Antti Permala (VTT); Management Consultant, Mr Jukka Lähesmaa (SysOpen Plc); Senior Consultant, Ms Ina Mickelsson (Oy EDI Management Finland Ltd); and by Management Consultant, Mr Pekka Rautiainen (Oy EDI Management Finland Ltd). The internal quality controllers for this report at VTT were Research Manager, Mr Heikki Kanner and Researcher, Mr Mikko Lehtonen.

We also thank our colleagues in Pol-Corridor consortium and the companies who actively took part in Pol-Corridor IT work: Stockway Ltd (FI), AtBusiness Communications Ltd (FI), Procomp Solutions Ltd (FI), Institute of Transport Economics TØI (NO), CD Telematika (CZ), CD Czech Railways, CTL Logistics (PL), PKP Cargo (PL), PKP Infrastructure (PL), JERID (CZ), Czech Railways Research Institute, Trade Trans (PL), AXIT (PL/GER), and Component Creator (PL).

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Anna-Maija Alaruikka, Pekka Leviäkangas, Jyrki Haajanen, Jussi Huotari &
Jenni Kanniainen

Contents

Abbreviations and Acronyms

AtBusiness Communications	A Finnish company, which provides enterprise relationship management solutions.
AXIT	A Polish/German company, which offers services and products for information logistics through its own logistics platform AX4.
AX4	AXIT's IT system for logistics information management.
BizTalk	Integration platform over the Internet for various purposes.
CD	České dráhy; Czech state-owned railway operating company.
ČD-Telematika, a.s.	A subsidiary of CD; a company providing services in the telecommunications and informatics field. The company's most important customer is České dráhy, a.s. (Czech Railways).
CEVIS	ČD-Telematika's IT system module that contains several IT applications.
CroBIT	Cross-Border Information Technology. Demonstration of solutions for improved service reliability and data exchange for cross-border freight trains in a corridor of the Trans-European Rail Freight Network; A 5th Framework Research and Demonstration Project of the European Commission.
EAI	Enterprise Application Integration. Company's internal information systems are integrated with each other based on different topologies.
ebXML	Electronic Business XML. A standard for exchanging business messages over the

	Internet. Of special interest for business related portals and services, including Web Services.
EDI	Electronic Data Interchange. It can mean any form of electronic communication but usually means the structured, formatted messages sent between companies to order goods, send forecasts, and invoices over private communication networks (VAN Value Added Network suppliers).
EDIFACT	EDIFACT standard is one of the international EDI standards.
EIB	European Investment Bank.
EJB	Enterprise JavaBeans The framework for application servers in the Java environment.
ELO	Elektronisen liiketoiminnan logistiikka. “Program for electronic business”.
ERIC	JERID’s IT system; suitable for presentation of location and map-based information.
EU	European Union.
EUREKA	EUREKA is a pan-European network for market-oriented, industrial R&D. It aims to enhance European competitiveness through its support to businesses, research centres and universities.
HTTP	Hyper Text Transfer Protocol; the WWW protocol that performs the request and retrieve functions of a server. Commonly seen as the first part of a website address.
IS	Information System.
IT	Information Technology.

J2EE	Java 2 Platform, Enterprise Edition (J2EE) – a version of Java for developing and deploying enterprise applications.
JERID	A Czech company, providing applications that process and present information concerning rail cargo operations.
JSP	Java Server Pages (JSP) are normal HTML with Java code pieces embedded in them.
MeriArkki	Maritime ITS architecture. Architecture for core processes of maritime transport and vessel traffic control.
NSB	Norske Statsbaner; Norwegian state-owned rail operating and transportation company.
PDA	Personal Digital Assistant, a handheld device that combines computing, telephone/fax, Internet and networking features.
PIC	Pol-Corridor Information Centre.
PKP	Polskie Koleje Panstwowe. Polish state-owned railway company.
Pol-Corridor	Pol-Corridor is a EUREKA project, the objective of which is to investigate the prospects for new freight transport corridor between Nordic countries and the South-Eastern part of Europe.
PortNet	AtBusiness Communication's IT system; designed for commercial maritime operations data exchange.
Procomp Solutions	A Finnish software company, which supplies solutions for several business branches.
R&D	Research and Development.

Rahti	Procomp Solutions' IT system; designed for transport information management.
RailTrace	Tracking and tracing system developed by Finnish Railways and demonstrated in CroBIT project.
RosettaNet	Non-profit consortium dedicated to the development and deployment of standard electronic commerce interfaces to align the processes between supply chain partners.
SCM	Supply chain management: A broader concept than logistics; extends the concept of logistics beyond the firm to all firms in the supply chain, including vendors, customers, carriers, facilitators, and channel intermediaries.
SOA	Service Oriented Architecture. SOA is based on the concept of isolating the information systems behind an interface supporting the business demands with services.
SOAP	Simple Object Access Protocol (SOAP) is a XML based protocol for information exchange in decentralized and distributed environments.
SSL	Secured Sockets Layer; SSL uses a complex system of key exchanges between browser and the server in communications in order to encrypt the data.
Stockway	A Finnish company, which combines the expertise of RFID technology, software development and supply chain management.
TAF	Telematic Applications for Freight; a sub-set of Technical Specifications for Interoperability.
TARKKI	Freight Transport Telematics Architecture. The architecture describes open interfaces between

	the actors without binding them to specific technologies and without intervening in the internal systems of companies.
TelemArk	The Finnish National Architecture for Transport Telematics. Architecture is divided into two main parts: TelemArk Architecture and TelemArk Development Plan.
TEN	Trans-European Networks.
Trackway	Stockway Oy's IT system; designed for supply chain management.
TSI	Technical Specifications of Interoperability for European rail systems.
TSI/TAF	Technical Specifications for Interoperability / Telematics Applications for Freight.
TÖI	Transport Ökoenomiska Institut; Institute of Transportation Economics, Norway.
VTT	Technical Research Centre of Finland.
WP	Work Package.

1. Introduction

Pol-Corridor is a EUREKA project, the objective of which is to investigate the prospects for new freight transport corridor between Nordic countries and the South-Eastern part of Europe (Figure 1). The corridor will rely on a fast rail freight connection, “Blue Shuttle Train”, a shuttle train transporting cargo regularly between Pol-Corridor’s logistical nodes or hubs. The project’s homepage can be found through http://www.toi.no/. The project began in year 2002 and will be finished in 2005.

The whole research and piloting project will be conducted in the following sequences /12/:

Figure 1. Pol-Corridor.

(1) Phase 1 – Market Assessment (work package 1) and Technical/Operational Feasibility (work package 2).

(2) Phase 2 – Evaluation of Results from work packages 1 and 2, and Go/Do Not Go Decision (work packages 3 and 4).

(3) Phase 3 – Economic and Financial Assessment (work package 5) and IT Service Provision System (work package 6).

(4) Phase 4 – Evaluation of Results from work packages 5 and 6. Conclusions/Verdict for industrial exploitation based on results of the entire research study (work packages 7 and 8). Publication of results is in work package 9.

1.1 Tasks of Work Package 6

This report covers the Pol-Corridor work package six (WP6) and summarises the main results. The objective of WP6 – the Information Technology – part (IT) of Pol-Corridor – is to outline an IT architecture that gives approximative guidelines for the implementation of information systems, the exchange of information between PolCorridor stakeholders and management of functional interfaces. The reference architecture also helps supplying IT-companies to position their products for supply chain management (SCM): they can position their products in the overall concept and identify gaps and development paths.

WP6 objective: **Define the business process related to management of freight movement through intermodal Pol-Corridor system and find out the state-of-the–art IT systems capable to support the freight movement.**

The WP6 sub-tasks are defined in Pol-Corridor Master Plan /12/. These sub-tasks were integrated into three main tasks as illustrated in Figure 2. These tasks include defining of operational environment of the logistics corridor, defining which information services are required, and creating an IT architecture that specifies how the information systems relate to each other and to the (logistics) operations. The reference IT architecture is derived from these tasks. The Laboratory Testing of IT Systems sub-task was not carried out as part of this study because the physical test runs of the Blue Shuttle Train /12/ did not take place as required in the Master Plan.

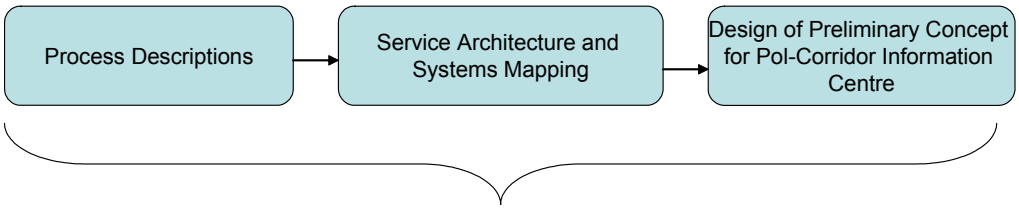

Figure 2. Elements of Pol-Corridor reference architecture.

Task 1: Process Descriptions

The first task consists of determining the roles of companies participating in the logistics chain. It is also required to find out which roles are essential and in which phases of the chain they are active. For example, a consignor is active in the contracting phase while a terminal operator is active in the operational phase.

The processes are modelled in a similar syntax that is used in the TelemArk /11/, the Finnish national transport telematics information systems architecture and TARKKI /4/, the Finnish national telematics architecture for freight, architectures (for reference see http://www.vtt.fi/rte/projects/fits/ for the relevant publications). The process model contains the actors, their tasks, and the information flows between the actors. There are five process models for Pol-Corridor, which form the business process for Pol-Corridor:

1) upper-level Pol-Corridor process model (Appendix A)

2) transport planning and booking model (Appendix B)

3) road transport model (Appendix C/1)

4) sea transport model (Appendix C/2)

5) railway transport model (Appendix C/3).

The result of the first task is the conceptual architecture of Pol-Corridor.

Task 2: Service Architecture and Systems Mapping

The second task is to devise a Service Architecture fulfilling the requirements determined and modelled in the conceptual architecture. The Service Architecture consists of (1) a list of information systems services required by the Pol-Corridor freight movement pipeline, (2) a linking of actual information systems with the services provided, and (3) producing a service distribution map of these services provided.

Systems mapping depicts in a visual way, how IT systems can serve the intermodal business process, for example if there are any information gaps etc. IT systems are mapped to the business processes (the conceptual architecture). Finally, technical specifications and capabilities are discussed and evaluated.

Task 3: Design of Preliminary Concept for Pol-Corridor Information Centre (PIC)

The last task consists of assessing and giving recommendations, what kind of information service package alternative would be the most suitable for Pol-Corridor. The choice is made based on four different alternatives presented in IT workshop in 8–10 December 2004. One possible option is Pol-Corridor Information Centre (PIC) proposed in the Master Plan /12/.

1.2 Transparency in Intermodal Transport Process

"Seamless transport truly exists when one mode of transport terminates and the next mode can immediately take over the shipment /16/." In order to make the seamless transport happen, intermodal transport process needs to be transparent. In other words, the status of the delivery is known during the entire delivery process. Information must be shared between different parties; inside the organisations but also between the organisations. Mutual trust between the parties is a prerequisite for seamless transport. Organisational interfaces and interfaces caused by the different IT systems that are used should not deteriorate the information flow. /8/

Interfaces for information flow must be eliminated not only inside the organisation but also between the organisations, which is a challenging process. Communication throughout the whole delivery chain is needed to make the process transparent /17/. According to Jahnukainen et al. /9/, in order to make the process transparent, the data, which is transferred between different parties, need to be specifically defined. The following phase of the process should be able to use the data received from the previous phase of the process without first needing to reinterpret that data. Communication and the methods to communicate should be standardized across the board in order to use the data more efficiently.

Intermodal transport process consists of several different transport modes and actors. The challenge is how to make this kind of complex environment and process work transparently. There are several factors, which can deteriorate the transparency of international intermodal transport process.

The first factor when we consider an international process should be to confront the administrative and organisational restrictions. Different countries have different systems and methods in use, for example, some countries or organisations cannot share the information as some others can, thus hindering transparency significantly. National borders are always critical and without exceptions deteriorate the transparency and also the efficiency of the logistics processes. For example, logistics provider may be able to track and trace the wagon when the train stays in one country on the responsibility of that national operator, but after moving to another country, the wagon "disappears". The information concerning the train, wagon and consignment is not available anymore. However, the European Union has recently been enlarged by 10 new member states. Some of these countries lay on the prospective Pol-Corridor route. This has resulted in a reduction of transport barriers. Most of the customs procedures have been removed and thus the crucial bottlenecks rest mostly now in the transportation and transhipment processes.

The second factor which deteriorates the transparency of the intermodal process are interfaces between different modes of transport. Although information and processes could be shared between the trucking companies and the actors involved into road transport, the sharing between different modes, such as between the trucking company and the shipping company, is much more challenging. Information systems are not usually compatible with each other, and the interfaces of the systems form boundaries, which make information sharing and seamless transport impossible.

2. Business Process Description

2.1 Phases of the logistics process

The logistics process in general can be divided into a support process and three phases along the timeline as shown in Figure 3. The supporting process, which contains the supportive activities required by the phases, influence through the whole process. This division helps in enumerating the actors and information system services occurring in the overall process.

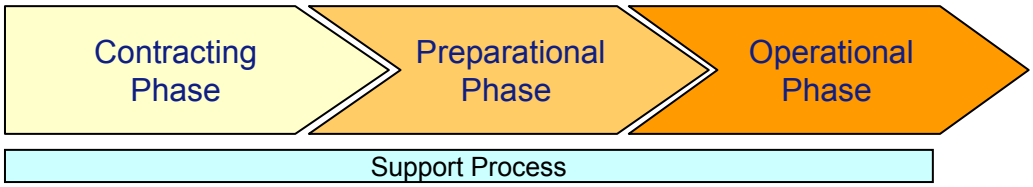

Figure 3. The three phases of the logistics process /5/.

Based on the above mentioned division of the logistics process, the actors relevant for the intermodal processes can be positioned under each phase (Table 1). Common roles are independent on the transport mode whereas transport related actors have been separated based on road, rail, and water transport. Actor division below is also used as a basis for defining the relevant actors for Pol-Corridor's logistics process. However, some generalisations and consolidation of actors have been made.

Table 1. Actors concerned at each phase of logistics process.

Support Process	Contracting Phase	Preparational Phase	Operational Phase	
Infrastructure manager Customs	Shipper Consigner Consignee Logistics integrator	Logistics integrator	Customs Weather info services Info exchange provider	Common roles
		Fleet manager Container manager Logistics operator	Terminal operator Fleet manager Trucking company	Road transport
		Fleet manager Intermodal operator Haulier Railway undertaking	Terminal operator Railway undertaking Fleet manager	Rail transport
Sea transport ctrl Maritime authority Navy / military Sea rescue service Environment authority	Shipper's representative	Broker Harbour authority	Broker Ice breaker provider Border gueard Fareway fee collector Harbour authority Harbour operator Piloting service provider Sea carrier Vessel	Water transport

The contracting phase consists of negotiating long-term logistic agreements. The agreements cover issues such as tariffs, quality, quota, and responsibility. This phase can be passive for substantial time as the agreements are likely to be effective for long periods. The roles active in the contracting phase are consignor, consignee, and logistics service provider. The logistics service provider may be a logistics integrator that does not actually transfer the cargo, but instead uses logistics operators and/or separate fleet managers.

The preparation phase includes the tasks when the framework agreement made in the contracting phase is about to be realised in the form of a single business transaction. In other words, the actors transporting the cargo are being reserved for the task, for example, a timetable for the transport is agreed on. Roles active in the preparational phase include fleet manager, logistics integrator, intermodal operator, and container manager.

The operational phase covers the physical transport process. During this phase the cargo is transported from the consignor to the consignee by the actors reserved in the preparation phase. The transport is managed in practise by optimising routes, overcoming exceptions, and for example by tracking and tracing the delivery. The active roles in this phase include trucking companies, railway undertakings, harbours, terminal operators, authorities, etc.

2.2 Process map for PoI-Corridor

2.2.1 TelemArk Approach and Generic Freight Architecture TARKKI

Today a growing number of IT applications for managing logistic activities are available and there is a challenge of integrating these separate applications. Therefore system implementation must be based on a strategic framework – System Architecture. Architecture can function as a basis for choices concerning design, deployment, and investment decisions on IT applications /9/. IT Architecture normally includes /15/

– An overview (Conceptual model) – a top-level diagram showing the whole system and how it works

– A Functional Architecture (Service) – specifications for processes which are needed to satisfy the user's need

– A Physical Architecture – specifications for physical components and their locations for a particular deployment

– A Communications Architecture – an analysis of requirements for the links needed between the locations shown in the Physical architecture.

In Pol-Corridor, the process descriptions and the conceptual architecture are done by using TelemArk /11/. TelemArk (Figure 4) is the Finnish national transport telematics information systems architecture. The objective of TelemArk is to integrate functionality, information, and information systems. This objective is much aligned with Pol-Corridor WP6, so TelemArk can be utilised in the work. Originally, TelemArk focus has been on road transport, but the architecture has been extended with modules of freight architecture (TARKKI) /4/ and maritime architecture (MeriArkki) /14/. These can be regarded as part of TelemArk.

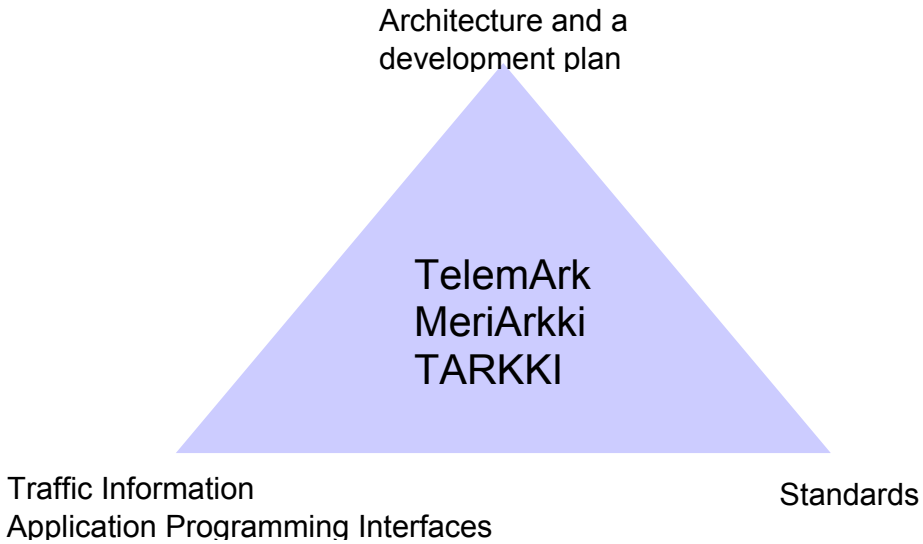

Figure 4. The modules of TelemArk – TelemArk also includes TARKKI and MeriArkki architectures.

The other architecture elements are:

– The Development Plans, which analyse the differences between the state-of-the-world now and the ideal architecture descriptions. The analyses are supplemented with development needs and actions.

– Traffic Information Application Programming Interfaces, which is a kind of "Library" of examples as to the kind of interfaces which have been used in various transport IT application development projects.

– Standards, which are in fact a list of international and national standards that should be utilised as far as possible when building transport IT systems.

Generic Freight Architecture TARKKI is a key component in TelemArk focusing on conceptual architecture on multimodal freight. TARKKI was assumed to represent the future desired state-of-the-world with regard to IT and international intermodal supply chain. It describes the IT required for production, processing and distribution of information in shipment, transport, terminal and receipt operations. It also considers the planning and management of these operations which utilise information and data transfer technology /4/.

The objective of the architecture is to provide organisations with the opportunity to improve their competitiveness through more efficient operations, a wider range of services or better compatibility. The architecture describes open interfaces between the actors without binding them to specific technologies and without interfering with the internal systems of companies. /4/

TARKKI focuses on processes that are directly related to the transport of goods and on the data flows of these processes. Architecture includes both the movement of goods and the associated information from the consigner to the consignee through the logistics chain. Process descriptions in TARKKI are independent from the transport mode, so that the process components can be combined in different ways to form intermodal transport chains. /4/

TARKKI freight telematics architecture was chosen as a fundamental tool for WP6. It provided the means for flowcharting the process of intermodal transport and also for mapping the information systems. One of the main objectives was to test the applicability of generic architectures to serve commercial product planning and strategic marketing decision making (whom to market the system, which markets, what parts of value chain).

TARKKI was supplemented by MeriArkki for some parts of the intermodal process and by CroBIT project business process descriptions on rail transport. CroBIT is a 5th Framework Project under the supervision of European Commission (www.crobit.org). However, TARKKI remained the main tool for modeling the Pol-Corridor process and information services.

Suitability of TARKKI as a main tool was validated in the early stages of the work package by the experts from VTT, Edi Management Ltd and Sysopen Ltd.

There are other generic architectures in addition to the abovementioned, like for example Norway's ARKTRANS (see www.sintef.no/units/informatics/projects/arktrans/arktransweb/) and the European Framework Architecture (FRAME, see www.frame-online.net). The Finnish architectures along with the supplementary elements were selected as a basis for Pol-

Corridor architecture because the authors were already familiar with them and they had been tested in numerous other projects.

2.2.2 Process flow

The final outcome of the conceptual architecture is shown in Figure 5 (only a clip of the process can be shown; this is a part of rail transport process model).

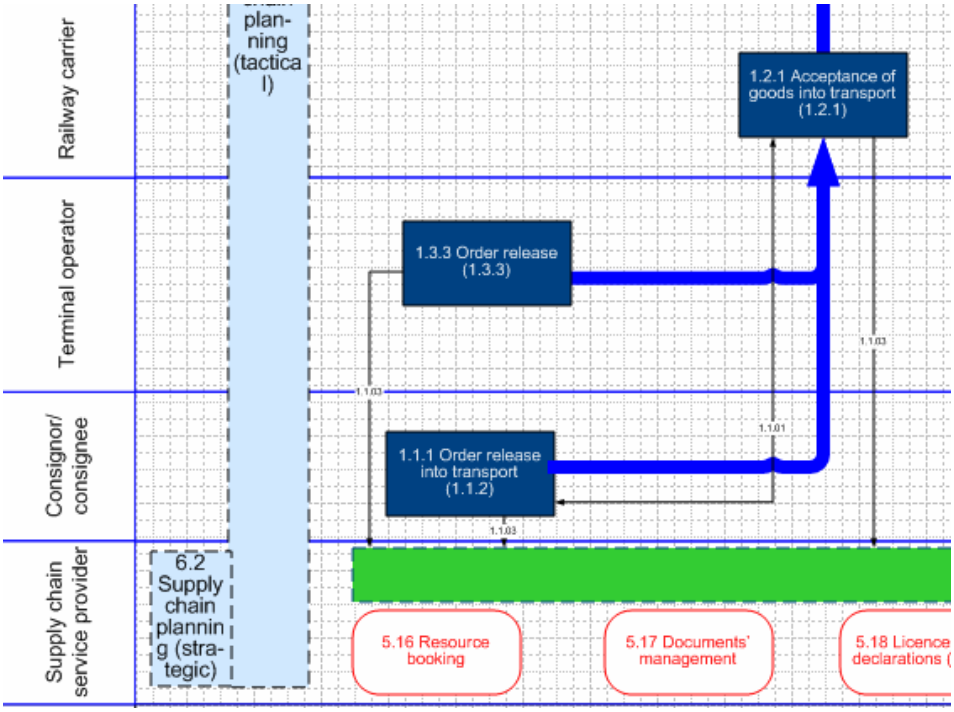

Figure 5. A clip from rail transport process model (conceptual architecture).

Business process models are divided into three main models based on the features and structures they have. The first business process model, an upper-level Pol-Corridor process model, gives an overview of the business process as a whole (Appendix A). It is a top-level diagram, which shows the whole system and how it is anticipated to function in general. It includes the following sub-processes: planning, management, delivery, tracking and tracing, and external processes. Also supportive actions are included in the architecture. The second business process model, transport planning and booking model (Appendix B), describes transport planning and booking process in a detailed way. It concerns all the transport modes in use. Finally, conceptual architecture includes the process models concerning road, sea and rail transport, which form the third part of the conceptual architecture (Appendix C). The transport related process models are modular, which means that the transport modes can be in any order as required. The process may, for example, start with the road transport process and continue by rail or

alternatively by sea transport. Modularity and transport mode specific process models differentiate Pol-Corridor business process from the generic freight architecture TARKKI, where the process is independent of transport mode. Transport models are distinguished from each other because there are built-in differences between transport models; for example terminal processes are different for rail transport and road transport models. However, the differences between the transport process models are by and large insubstantial.

The modelled transport processes of Pol-Corridor describe the future in the preferred state-of-the-world, not the current processes.

2.2.3 Actors and roles

The actors for the international Pol-Corridor business process (including all process models) are based on actor analysis of TARKKI, MeriArkki and CroBIT (see Table 1). Only the most crucial actors were included in the process maps, the idea was to use the same roles within each process.

Polish actors were provided by Cracow University of Technology /2/. These actors were by and large consistent with more generic architecture actors.

The description and definitions of actors can be found in Appendix D.

2.2.4 Process components

Pol-Corridor business process, which includes all five process models described earlier, is based on the following freight transport sub-processes: planning, management, delivery, tracking and tracing, external processes, and supportive actions. These sub-processes are centered around physical goods and their transport from a starting point to a destination using different means of transport /4/.

The delivery process describes the operations associated with the transport of goods within the shipment-transport-transshipment-receipt chain. The management and delivery processes are very closely connected to each other, and both use the same process component division. The planning and tracking and tracing processes describe the processes of both the logistics service provider (transport operator or terminal operator) and the operator responsible for the whole supply chain. /4/

Sub-processes are used in every process model; they are marked with special colours on the models:

- planning: 2.1 (blue)
- management: 3.1–3.5 (orange)
- delivery: 1.1–1.4 (dark blue)
- tracking and tracing: 4.1 (green)
- external processes: 5.1–5.21 (white)
- supportive actions: 6.1–6.2 (light blue).

All the sub-processes are depicted on the upper-level Pol-Corridor process model in the conceptual architecture (Appendix A). Every sub-process has its own number to describe its process components: for example process components related to planning-process are marked as 2.x.x. and process components related to delivery-process are marked as 1.x.x. Planning process (2.1) is described more detailed in the transport planning and booking model (Appendix B),. Delivery- (1.1–1.4) and management-processes (3.1–3.5) are described in more detail in road, sea, and rail transport process models (Appendix C). The remainder of the sub-processes are included in the business process as connective processes, which are marked on the maps with a dash line; those processes were not centres of focus this time.

Each sub-process includes several process components. In Table 2, a few process components are described as an example. The remainder of the descriptions can be found from Appendix E. Components are numbered, and the same numbers are also used in the process maps. Most of the process components are taken from the freight architecture TARKKI. Some process components are from Maritime ITS Architecture (MeriArkki). Slight modifications also came from CroBIT project /3/. A few components are also defined by the research group, for example, by combining some components presented in TARKKI and MeriArkki. On the table, the second column depicts the number of process components which are used in TARKKI to describe the same process component. The third column depicts the number used in MeriArkki.

Table 2. Description of process components (full table is in Appendix E).

General level

ID	Tarkki	MeriArkki	Component	Description
1.1.	1.1.		Shipment	Preparing goods for transport and releasing them to the transport operator.
1.2.	1.2.		Transport	Transporting goods by a means of transport from the departure point to the destination.
1.3.	1.3.		Transhipment	The handling of a shipment is unloaded from a vehicle and loaded onto another for the next leg. Transhipment may include other activities associated with the handling of a shipment and goods, such as storage, terminal handling or other value added services.
1.4.	1.4.		Receipt	Receiving a shipment, checking and unloading parcels, checking the goods and their condition, and preparing the goods for the next stage of the consignee's production process.
2.1.			Transport planning and booking	Consists of actions such as handling transport orders, resource booking, processing and managing the licences and declarations needed.
3.1.			Fleet planning and management	Planning the fleet usage of logistics service providers. The goal is the management of the fleet and the optimisation of costs and e.g. environmental impacts.
3.2.			Infrastructure and traffic planning	
3.3.	3.2.		Transport operations management	Managing transport means and personnel, and managing transports.
3.4.	3.3.		Transhipment operations management	Managing transhipment resources and operations.
3.5.	3.4.		Reception operations management	Managing consignee's production.
4.1.			Supply chain and transport tracking and tracing	Shipment tracking and tracing within the supply chain. Tracking data is primarily collected on individual shipments/parcels/goods.
6.1.			Supply chain planning (tactical)	The main products of the process are the contracts between the customer and supply chain service provider and supply chain service provider and other service providers.
6.2.			Supply chain planning (strategic)	Plans concerning transports and their realisation are the main tasks of strategic supply chain planning. Planning the use of resources and planning the fleet usage of logistics service providers.

2.2.5 Data flows

In addition to the material flow, the information flows have also been considered in the conceptual architecture. The data flows are based on the definitions of TARKKI, they are used in this work as they were originally defined. Although, only the data flows which relate to the material flow, are being considered and marked in the conceptual architecture.

Data flows relevant for Pol-Corridor are listed in Appendix F. The first column indicates the number, which is used to describe the data flow in the architecture. The arrow shows which way the data flows. Data flows leaving a process component tend to be illustrated moving down and to the right, while data flows coming to a process component come from the upper left side /4/.

Some data flows are bi-directional, marked in the table with symbols “O” and “I”. “O” means that the data flows “backward” in the process, to the upper left side. “I” means that data flows “downwards”, from the upper left side. Data flow may have two meanings based on the direction it flows. For example, data flow between process components 1.1.1. Order release into transport and 1.2.1. Acceptance of goods into transport includes two different data types: proof of release and proof of delivery based on who is the sender of the data.

Polish data flows between actors were provided by Cracow University of Technology /2/. These were mostly consistent with generic architecture data flows.

3. Service Architecture and Systems Mapping

The Service Architecture contains the information services, their relation to the process components of the conceptual architecture, and the actual systems providing the services. IT systems included in the analysis are mapped against the conceptual architecture presented in Chapter 2. Figure 6 shows the actors from a different perspective than the process diagrams.

From the logistics perspective, the model in Figure 6 is a 3PL (third party logistics) model. 3PL means that the customer of the logistics chain has outsourced the logistic process to a logistics integrator who assumes responsibility on transport arrangements. Consignor and consignee may use either the same integrator or different ones. The integrator does high-level scheduling and assigns the logistics chain with suitable logistics operators who plan the routes and lower level timetables.

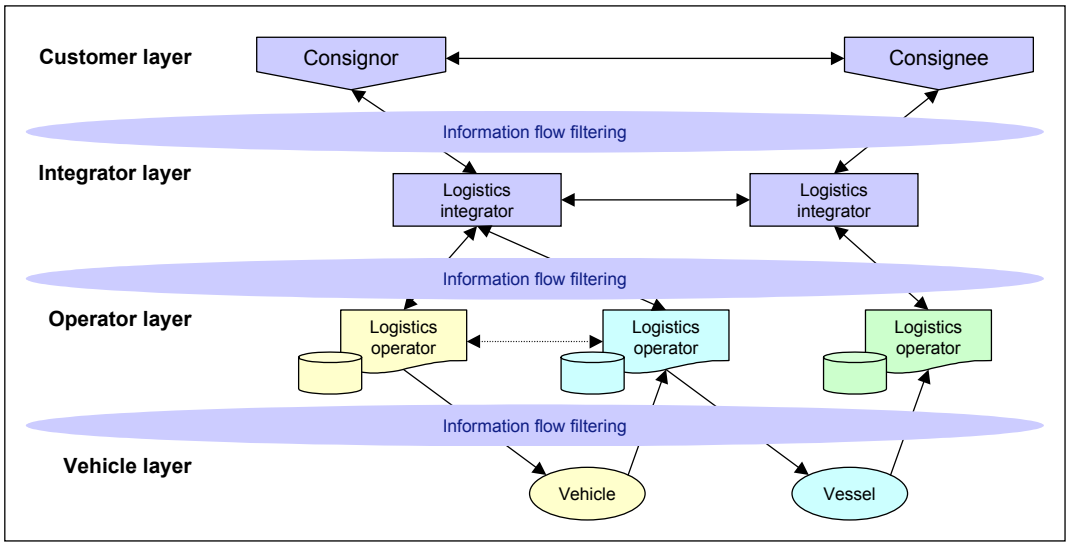

Figure 6. A layered architecture diagram /5/.

Several different companies providing commercial in-house or off-the-shelf systems are reflected, mapped, against the Pol-Corridor conceptual architecture, which was the object of the second task; to draft a service architecture and map the systems involved in the project. The following systems were included in the mapping process:

- Trackway (Stockway Oy, Finland; Appendix G/1)
- Portnet (AtBusiness Communications Oyj, Finland; Appendix G/2)
- Rahti® (Procomp Solutions Oy, Finland; Appendix G/3)
- several systems owned by Jernbaneverket, Cargonet and NSB (Norway)

- several systems owned by CD, e.g. CEVIS (CD Telematika, Czech Republic; Appendix G/4)
- ERIC (JERID, Czech Republic; Appendix G/5)
- AX4 (AXIT, Poland/Germany; Appendix G/6).

As expected, IT systems are far from being interoperable especially when taking a wider view of the whole supply chain. On the other hand, it was assumed that existing systems and off-the-shelf systems are already developed which could solve part of the problems encountered in seamless data flow from one actor to another. For this purpose it was necessary to map how these systems covered different parts of the chain and what information services these systems could provide. /10/

The number of information services that are produced within the whole intermodal process is quite extensive. Information services are defined and used almost as they are originally defined in TARKKI. Only Wireless Channel and Wireless Device have been combined into Wireless IT service. In Table 3, the information services have been allocated under the four different phases of the logistics process.

Table 3. Information system services.

Support Process	Contracting Phase	Preparational Phase	Operational Phase	
EnvDataMgmt	LicenceMgmt	TimetableMgmt	TimetableMgmt	
MapServ	ContractMgmt	TransportPlanMgmt	GoodsAcceptanceMgmt	
TrafficData	ResponsibilityMgmt	LogisticsOperatorMgmt	VehiclePositioning	
RoadMaintTasks		RouteMgmt	VehicleMonitoring	
RiskTrLicenseMgmt		ResourceMgmt	VehicleIdentification	
RiskTrTracking		OrderMgmt	HandlingInstructionsMgmt	
VehRegisterServ		OrderReceipt	*WirelessChannel*	WirelessIT
			WirelessDevice	
			LoadingMgmt	
			VAServicesMgmt	
			GoodsReleaseMgmt	
			ShipmentMgmt	
			PartyIdentityMgmt	
			ExceptionMgmt	
			ExceptionReceipt	
			UnloadingMgmt	
			ReclamationMgmt	
			TrackingTargetCreation	
			TrackingDataMgmt	
			TrackingDataMonitoring	
			ParcelHierarchyMgmt	
			SupplyChainMgmt	
			ProductionMgmt	
			ProductIdentification	
			ProductListMgmt	
			WarehouseMgmt	
			TransshipmentMgmt	

The Service Architecture and systems mapping procedure consist of several sub-tasks described in Figure 7. The first sub-task was to collect information concerning the IT systems chosen for the study. The systems were chosen on a voluntary basis by asking the companies to participate in Pol-Corridor. Companies providing the systems were asked to define what services their systems were able to produce. The services produced within the process are based on the TARKKI (see Table 3). The companies were also asked to describe more detailed functional characteristics of their systems.

The list of services each system provides and systems' functional descriptions are in Appendix H (IT Services List).

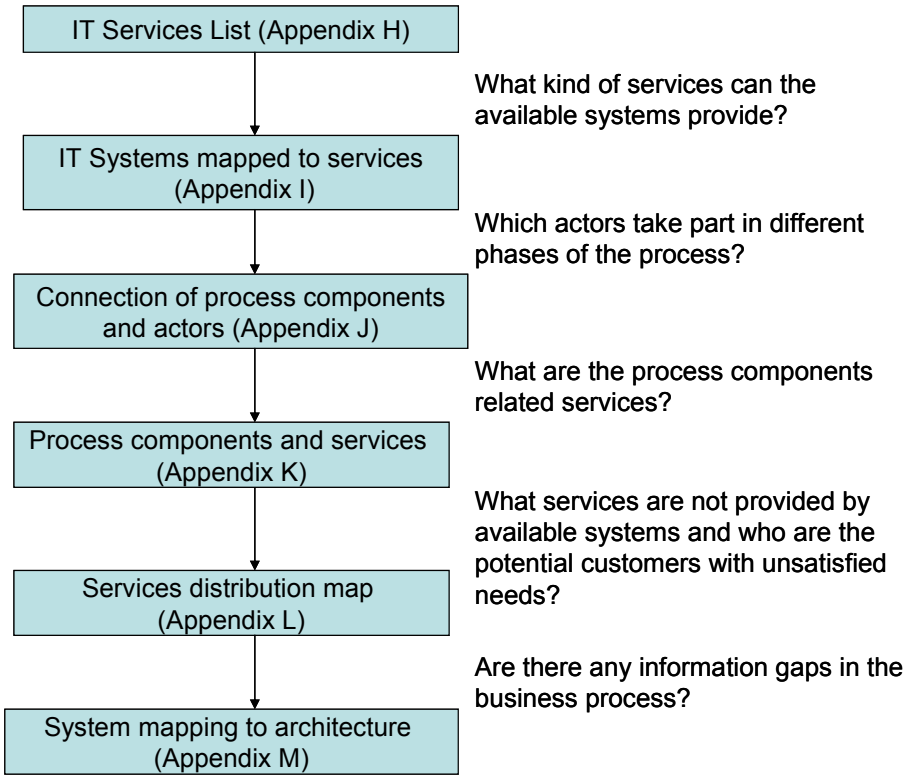

Figure 7. Sub-tasks of Service Architecture and systems mapping procedure.

IT systems and the services they provide are also collected on one matrix to show in a visualized way, how many and what kind of services each company provides. Matrix is in Appendix I (IT Systems mapped to services).

The relation between the actors and the process components was identified in order to be able to define what services actors require (Appendix J: Connection of process components and actors). In TARKKI, the service requirements have been defined for every process component. This information was also used in the mapping procedure, but because process flows also include some parts from MeriArkki, the service requirements were defined for these process components by the research team

(Appendix K: Process components and services). Based on collected information, the matrix defining the relation between the actors and the services was drafted (Appendix L: Services Distribution map). Matrix shows system by system, to whom and what services the IT systems provide.

The services that actors need are marked on the Services distribution map as letter "X". The services, which are not relevant for Pol-Corridor project, are blank. The IT systems are marked on the matrix with specific letter codes if they are able to provide the service in question:

- X = no systems available
- T = Trackway
- R = Rahti®
- P = PortNet
- C = CD Telematika's several systems (e.g. CEVIS)
- A = AX4
- J = JERID's several systems (e.g. ERIC)
- N = Norway's several systems.

As to the Polish systems, no individual system descriptions were available for this report. However, the information provided by Polish consortium partners clearly showed that there are challenges, especially when it comes to automated data exchange between functions, systems and actors /2/. Today, most of the data exchange is done by telephone, fax and e-mail. There appears to be great potential to enhance automation and productivity.

The main idea of the Services Distribution Map is to find those services that none of the available IT system can currently provide. This will also indicate the potential customers (actors), whose service requirements are not at present fulfilled.

After collecting all the information needed from the participating companies and from the research consortium, the information systems were mapped on the conceptual architecture. Each system was mapped separately by combining the information from the Appendix K (Process Components and Services) and from Appendix I (IT Systems Mapped to Services). If the system was able to provide a service or services related to a process component, the component is painted by a pink color indicating what parts of the process could be covered by the system. The ability of the system was defined by using the following classification, based on the research team's assessment:

- **Totally** = system provides all the services related to the process component.
- **Mostly** = system provides more than 50 % of the services related to the process component.
- **Partly** = system provides 50 % or less of the services related to the process component.

These classifications are shown in the pink parts of processes as well as the system in question. Not all the systems provide services for every transport mode. There are for example, systems which provide services only for rail transport.

The final outcome of the systems mapping is shown in Figure 8 (only a clip of the process can be shown; this is a part of rail transport process). Systems mapping as a whole can be found from Appendix M (Systems Mapping to Architecture).

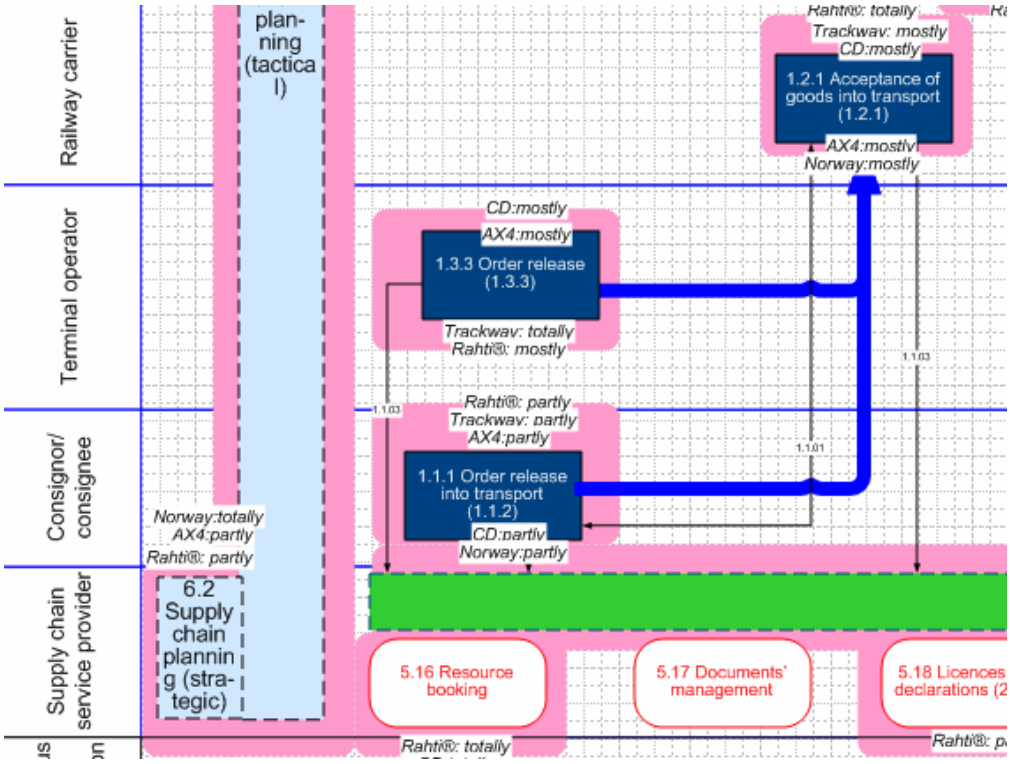

Figure 8. A clip from rail transport process (systems mapping).

4. Pol-Corridor Information Centre (PIC)

4.1 Preliminary Concept

The third task of WP6 was to define the preliminary concept for Pol-Corridor. This task consists of assessing and giving recommendations, what kind of information service package alternative would be the most suitable for Pol-Corridor. Preliminary concept was considered during the WP6 workshop 8.–10.12.2004 participated by IT companies, railways and research institutes. Workshop participants are listed in Appendix N. Four different business alternatives were introduced to participants and the most suitable one for Pol-Corridor was chosen /13/.

1. Pol-Corridor joint supply chain management (Figure 9)

- Selling total services over the Pol-Corridor supply chain; taking care of the supply chain planning and resource bookings.
- Provides tracking info and takes care of the customer relations at the exception situations; collects tracking and incident data; taking care of the exception management between partners.
- Invoices the customers for the total service; takes care of the clearing; transfers the payments to the partners.

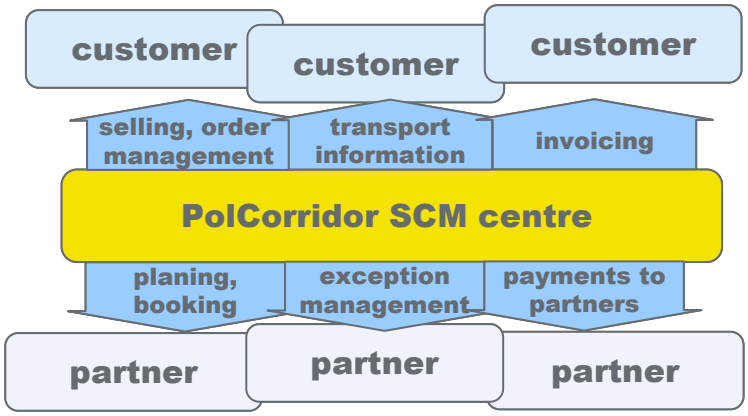

Figure 9. Joint Pol-Corridor management centre.

2. Pol-Corridor information services (Figure 10)

- Provides customers with the information on the services of each partner at Pol-Corridor supply chain; collects information from the partners by using unified operating models and interfaces.
- Provides tracking and exception situation information to the customers; collects tracking and incident data using unified methods and interfaces.
- Each partner is individually taking care of
  - selling and order management, transport planning
  - exception situation management
  - invoicing.

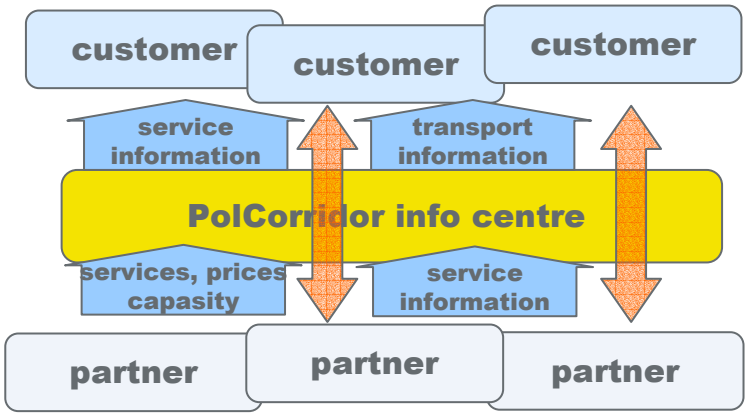

Figure 10. Pol-Corridor information centre.

3. Harmonized processes and information flows (Figure 11)

- Plans and agrees on the co-operation between partners; seeks for common business opportunities in co-operation; creates processes and operational models how the business opportunities will be realized in co-operation; ”standardises” the information flows and interfaces: partners to customers and partners to partners.
- Provides information and support to the partners on the co-operation models and harmonised interfaces.
- Maintains the processes and interfaces.

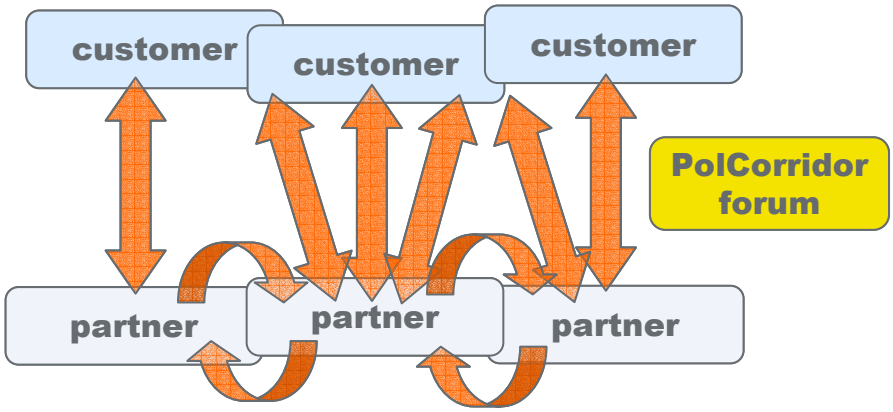

Figure 11. Pol-Corridor co-operation forum.

4. Independent services to the customers and bilateral co-operation (Figure 12)

- Each partner has their own services to the customers.
- Co-operation between partners are based on bilateral agreements.
- This is the "continuing the present way" alternative.

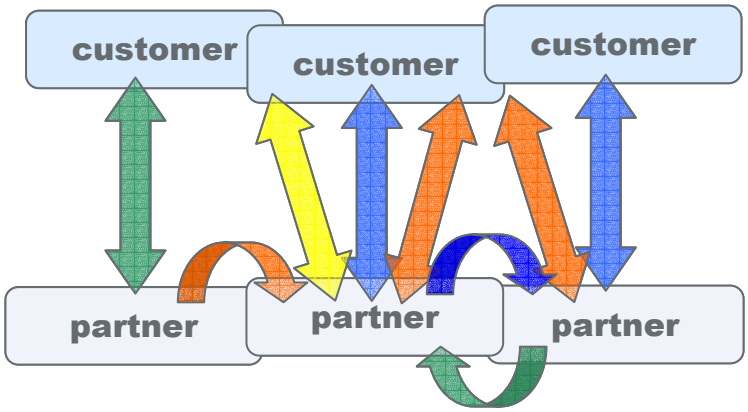

Figure 12. NO co-ordination over the Pol-Corridor SC.

The second alternative, "Pol-Corridor information services", was considered the most suitable option for Pol-Corridor today. In the future, the first alternative should be possible, however, the fourth alternative would not change the current situation at all.

The important question is how the Pol-Corridor information centre concept could and should be organised. Several proposals were brought forth during the workshop:

- Form a joint venture with light organisation that would include several operators from each transport mode and in order to get hold of information, organisations should use bilateral agreements.
- A consortium of companies should make a joint stock information centre company, where members have legal agreement plus a joint holding. The participants would be key logistic service providers.
- An entity is selected or built by the shareholders to take care of the information centre. Information centre could also serve other customers other than the customers of Pol-Corridor.

Another important issue to consider is how to finance the Pol-Corridor information centre. EU and other public funding sources are able to contribute some start-up capital for this kind of project, for example from Marco Polo. The help from national governments, participating companies and operators as well as from the customers is most probably required.

In addition to the financing problems, there are other problems. A major issue concerns the information sharing. Not all parties can share the information to equal extent. Another problem is how to divide the cost of the information centre between the partners.

4.2 Organisational models and financing of PIC

The CroBIT project analysed organisational models and financing alternatives for multiple stakeholder or owner IT systems. In one of the project's working reports three alternative main types to organise the services were identified /19/:

- EU-centric Model, where some EU agencies (or some other public-driven body) will take charge of CroBIT service provision and its costs based on EU budget (or other public funds source).
- Private Operator Model, where a privately owned company takes charge of the service provision and its costs based on charges from users of the services and infrastructure.
- Community Model, where a community of, for example, allied RU's will jointly agree upon the service provision and mandate an operating party to implement it. The financing may come from the community and/or from users.

The Pol-Corridor Information Services model implicitly points to the direction of Community Model. This will most probably mean /19/ relatively low investment costs

and thus relatively low user fees but also relatively slow time-to-market implementation. “Users” should here be understood as the pool of operators transporting the goods and offering the information to their customers. The end customers are unlikely to be willing to pay for the information services. Finally, the question remains whether there is a willing community.

EU-centric Model combined with features from Community Model and Pol-Corridor Information Services would probably yield the best result in terms of financing and time-to-market aspects. In plain language this means that the Community (whatever the form or content would be) should quickly apply for public funds in establishing the Pol-Corridor Information Services. Based on experiences from other projects and systems, such as CroBIT and PortNet, PIC realisation will be most challenging and will require a separate development and implementation project.

The CroBIT project focused on cross-border rail-rail freight information management. However, the intermodal aspects were also included into CroBIT, because CroBIT demo system was capable of managing all kinds of consignment event information. Pol-Corridor focuses entirely on intermodal freight. From maritime freight the best example of functioning multi-stakeholder IT in the vicinity is the PortNet system hosted by Finnish Maritime Administration. PortNet is a pure application of Community Model and performs relatively well /7/. Thus this part of Pol-Corridor might benefit best from such an application and organisation model.

CroBIT demonstration system consists basically of two existing tracking and tracing systems, RailTrace of Finnish Railways and Intelligator of StarTrac Ltd. These systems were not included in the mapping.

5. Technical Issues

5.1 Business environment requirements

The logistics industry as are all industries, are facing a radical shift from traditional closed (national) environments to global environment. The paradox in this new situation means that technology, as one of the drivers of this development, has in itself become one of the most important subjects of change in our business environment. This is mainly due to the relatively long life cycle of information systems in comparison to the rate of change in new technological opportunities gained from academic research and commercial R&D.

Traditional business networking has applied EDI (Electronic Data Interchange) for decades. However, EDIFACT standard (one of the international EDI standards) has not been successfully adopted by SMEs because it has some impractical features. It is fairly expensive to implement and requires special expertise.

The rapid development and business introduction of the Internet based technologies provides a new sortiment of low cost modular technologies for e-business. Figure 13 shows the development waves of Internet based business networking. It should be noted that different industries and companies within them enter the waves at different times.

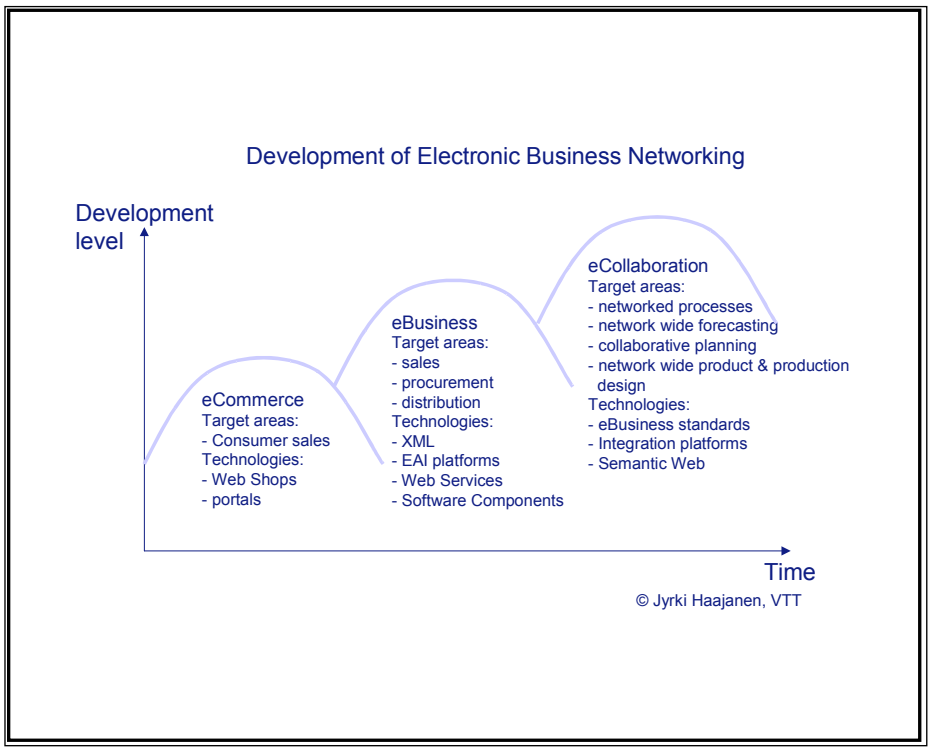

Figure 13. Development of electronic business networking /6/.

The dominant technology in new deployments today is Web Services. It establishes a solid technology implementation for the new information system architecture model, Service Oriented Architecture (SOA) /18/. SOA is based on the concept of isolating the information systems behind an interface supporting the business demands with services (Figure 14). The Information System resources are combined and provided as a single service for each identified business process demand. Thus it is easier to update business processes and provide support for them by changing the service level interfaces. Furthermore, it is easier to update the information systems behind the service interface without disturbing the running business processes since the interface remains the same. The architecture can be applied to legacy systems. The services provided in the business interface can be updated and complemented with new service modules and in the long run these modules are likely to replace the legacy systems. This development leads to a shift in the granularity of the systems providing information services to business processes and significantly improves the responsiveness to changes in business requirements.

The technology development trend combined with the need of infrastructure investments in most of the Pol-Corridor participants gives an excellent opportunity for leaping over the "EDI technology" generation. Furthermore, since the SOA supports the connectivity and execution of parallel business process protocols for same tasks (with different parties) it is strongly recommended that a Service Oriented solution is selected as the basis for the reference architecture.

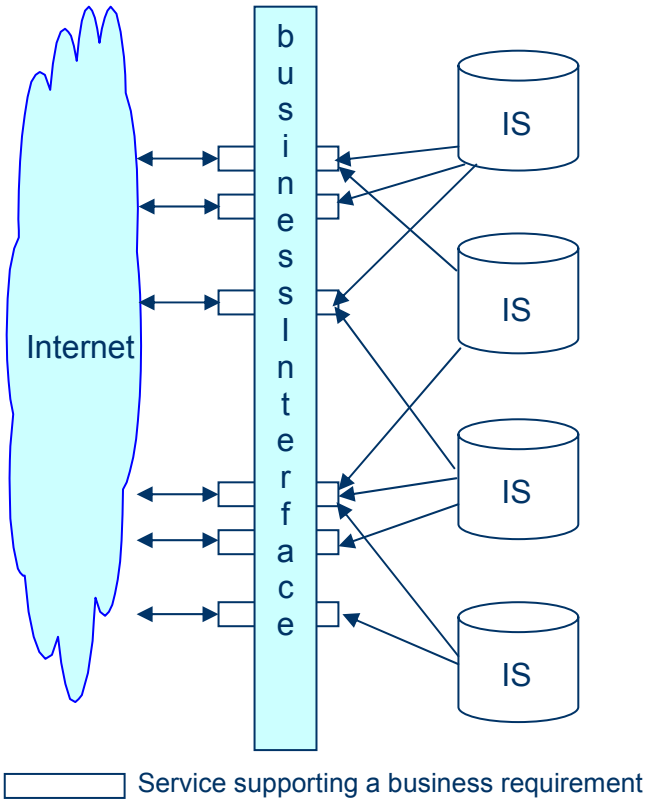

Figure 14. Business service interface.

5.2 Internal/External IT Architecture

In order to successfully utilise the reference architecture and join in the logistics chain, a company should have the capability to transmit relevant information in electronic form. The capability often includes tools and architectures similar to those used in electronic business, and require that the company's internal information systems are integrated with each other. This is called enterprise application integration (EAI). There are three basic EAI topologies, as presented in Figure 15.

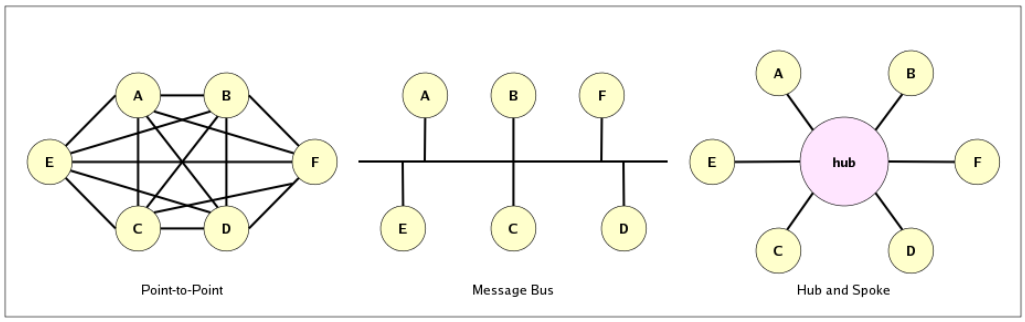

Figure 15. The main topologies used in enterprise application integration /6/.

The Point-to-Point topology means establishing a point to point communication channel between the participating systems. This kind of topology will result in a huge number of connections and a lot of work when the enterprise grows. However, this is often the first starting point for application integration in many practical situations and must not be ignored. Small companies with (very) limited amount of systems can cope with the point-to-point topology /6/.

The Message Bus is a topology where each participating system is connected to a common messaging media. The participants have the role of publisher who creates events or messages and the subscribers who receive the events and messages. The integration functionality is distributed among applications: when a publisher publishes a message, the message is translated into a format that subscribers understand; the subscribers then translate the message further to their own internal representation. Another name for the message bus topology is "publish/subscribe" /6/.

The Hub and Spoke topology is the most generalised one. It employs a common hub or a broker in the middle having a communication channel with every system that participates in the integration. The hub receives messages from applications and translates them into the format expected by the recipients. The translated messages are then routed forward according to the defined business rules. The hub contains most of the messaging functionality itself and leaves the participating applications with only

simple requirements on the integration aspect. This topology requires much less channels and programming work in large systems than the point-to-point solution /6/.

5.3 Miscellaneous IT Issues

As mentioned earlier, enterprises are integrating applications which share information. There are some technical issues that need to be considered for this to be possible. In order to work together the applications must be interoperable and they must be able to communicate with one another.

The same existing systems that were mapped against the Pol-Corridor architecture were examined to gain information about their IT Issues. An IT Issues Questionnaire was defined to examine the systems. The questionnaire included questions about platforms, interfaces and information security.

Platforms

The programs always require some kind of platform. The platform consists of an operating system, hardware and supporting software requirements. The hardware requirements define what kind of hardware is required or can be used: for example servers, desktops, laptops, mobile phones etc. Software requirements define what kind of software is needed: for example J2EE, databases etc. The operating system requirements define which operating systems are supported (Windows, Linux).

Interfaces

Interfaces define how the applications are accessed. Therefore if the application doesn't provide an interface, it can not be integrated or a dedicated interface has to be developed. We examined what kind of interfaces the systems provide to other applications and which standard interface technologies (e.g. SOAP), integration standards (e.g. ebXML, RosettaNet) or integration platforms (e.g. BizTalk) are supported.

Information security

The applications and the shared information must be secured. We examined how the applications and exchanged messages are secured (e.g. fire wall, passwords, SSL). The information can also be secured on different levels. Not all the parties involved have access to all the information exchanged. For example, a customer cannot have access to order confirmation between dealer and manufacturer.

Properties of secure Information Systems:

- **Authentication**: reliable identification of the ser/communication partner.
- **Authorization**: ensures that the communicating party is allowed to access the service.
- **Confidentiality**: ensures that other parties cannot access the information during the transfer.
- **Integrity**: ensures that the information is not corrupted or forged en-route.
- **Non-repudiation**: verifies that the communication has actually happened and that neither party can deny it thereafter.
- **Accessibility**: protection of the service from malicious attacks.
- **Auditing**: logging that ensures that problems and disputes can be resolved.

The results of the IT Issues Questionnaire are summarized in Table 4.

Table 4. Results of IT issues.

	IT Solution	Summarized results from all Systems
Platforms	Hardware and Software platforms (OS, Computer/device type, desktop, PDA, ...), operating system	• **Static OS & platforms**: Windows, Linux • **Mobile OS & platforms**: Aplicomtech, mobile phone, series 60, Xplore, customer specific solutions for PDA's, wireless computers • **Other**: server +computers +identification equipment
Interfaces	Interfaces to other Systems, Standards, Integration platforms, etc.	• **Standardized Technologies**: SOAP, EJB, HTTP, JSP • **Global e-Business Standards**: EDI • **National Standards**: e-invoice (XML) (Finland) • **Solution Provider Standards & Methods**: Basware, SQL Server, SAP, tycoon, mintime sonet • **Integration Service Providers**: ELMA • **Other**: Customer specific, application specific, own interface, Web Interface
Information Security	Applied standards and methodology for security issues	User accounts, passwds, generic access features of platform disabled, fire wall, exchanged messages are secured using SSL

The matching of applied security technologies to the requirements are shown in Table 5. It should be noted that not all the applications covered all of the features. Moreover, the Non-repudiation and Auditing features are very important in inter-enterprise collaboration and should be emphasized in the final Pol-Corridor Information Centre specifications.

Table 5. Information security features issued in the replies.

	User Accounts + Passwords	Identification Equipment	SSL Encryption	Fire Walls	Closed Environment
Authentication:	X	X			
Authorization:	X	X			
Confidentiality:			X		
Integrity:			X		
Non-repudiation:					
Accessibility:				X	X
Auditing:					

As a conclusion from the questionnaire we can state that:

- The applications typically provide support for most common OS platforms.
- The range of platforms supported is vast. This should not present problems if the interface to the Pol-Corridor Information Centre is defined with technology providing layer of isolation (e.g. SOA).
- In some cases the support for the most common communications technologies such as SOAP, e-invoice, etc. is good. Some applications do not support integration and rely mostly on third-party solutions in integration or do not integrate without further work on interfaces.
- Information security is issued at some level in most of the solutions. However, the inter-organizational requirements for Information Security should be emphasized in the implementation of the Pol-Corridor Information Centre.

These conclusions should be related to the limited set of systems analyzed.

5.4 Technical Specifications for Interoperability, Telematic Applications for Freight

The European Union is promoting and after preparatory phase enforcing the Technical Specifications for Interoperability (TSI) for the rail industry. TSI are "operationalising" the European directives on interoperability.

Mainly these Specifications concern manufacturers and suppliers but yield to some extent to operators. TSI are in force for high-speed lines but forthcoming for conventional network /1/. TSI/TAF is a part of TSI framework, TAF for Telematic Applications for Freight. TSI/TAF will inevitably influence the prospective PIC concept and should be noted from the start.

CroBIT demonstration system (RailTrace + Intelligator) is in line with TSI/TAF and in fact seems to be highly compatible with the Specifications. Since TSI/TAF works mainly at functional levels, there is little reason to expect that the mapped systems presented in this report are any less compatible with TSI/TAF. The mapped systems only provide tools to perform certain functionalities. Data definitions and messages are quite thoroughly covered by TSI/TAF.

However, it already seems to be the case that the TSI process is slowing down the decisions on investments in IT and this is a threat to the PIC concept.

5.5 Conclusion of Technical Issues

Apparently the Pol-Corridor Information Centre shall apply the Hub and Spoke approach as discussed in "5.2. Internal/External IT Architecture". The interfaces between the Information Centre and the business participants should be based on Service Oriented Architecture. This architecture shall deploy a related technology. The interfaces should be published in limited set of platforms to simplify the development work and enable reuse. It is also recommended for each participant to consider the Enterprise Application Integration and solve the routing of information and Information System resources within their organization to the dedicated interfaces.

Recommended actions:

– Internal Systems: Improve the interconnectivity of the systems within your company. Root out all overlapping and minimize the amount of systems to absolute minimum. For those systems that are left, consider the need for integration (information copying, replication, cross-referencing). Among them, identify bottlenecks and eliminate them. Establish an integration strategy aligned with IT

investment policy of your company and implement that strategy. Implement as much of the integration with Service Oriented Architecture as possible because loose-coupling will make the future adaptations to the integrated systems easier. Minimize manual copying of information, since it is slow and error prone. Focus on areas, where automation can improve through-put in your key business processes – do not try to tackle everything with a single effort. Concentrate on targets with the higher potential for gains and savings.

- Company Borders: Establish clear interfaces at the company border. Negotiate them with your partners and IT vendors. Consider also the development of your businesses in the future (keep in mind that many of the participants have an opportunity for technology leap). Do not implement a solution for yesterday but for tomorrow. Identify the most critical bottlenecks (e.g. border formalities and manually copying information). Use standardised presentation and communication formats. Enfavor Service Oriented Architecture, since it increases the modularity and manageability of your Information Systems interfaces. However, web-based technologies and standard software enable more efficient utilisation of older systems, regardless of the basic architectures within each partner organisation, if extensive investments in completely new IT proves too costly.

- National Borders: Adopt the experiences of the CroBIT project and make use of them by creating bilateral information exchange. Following the functional requirements of TSI/TAF there are no risks involved on investments in actual systems with regard to TSI compatibility. For example, any of the systems mapped or mentioned in this report can be utilised. Ensure that information content defined by TSI/TAF is followed, but there is no need to be excessively concerned about data formats or adopted technologies.

- Transport Mode Borders: Utilise Pol-Corridor Architecture Models presented in this report as a starting point in developing the systems, their interfaces and data exchange between systems and between partners in the supply chain.

- Topologies & Technologies: Try to implement Hub&Spoke type of topology whenever possible. Use easily accessible web-based solutions.

- Before technical issues, solve business partner questions and establish Pol-Corridor Community with strong agreements and genuine commitment (see Chapter 7).

6. Analysis

6.1 Information gaps

The idea of Service Architecture and System Mapping was to indicate how IT systems (existing or prospective for Pol-Corridor) covered different parts of the chain and what information services these systems could provide. The mapping procedure was regarded successful in the sense that there were no major difficulties in drafting the system maps. Also the research team was able to recognise the few information gaps.

The first conclusion is that many good IT systems, which can provide services relevant for Pol-Corridor, are available. By looking at the Services Distribution map (Appendix L), it can be seen that almost all the service requirements are covered by some system. Only few services (marked as letter "X" in the matrix) are lacking information services, even with this small sample of systems. Matrix indicates the potential customers, whose service needs are not fulfilled yet, and also gives an idea to companies, what kind of new services could improve their systems in regards of Pol-Corridor. The services concerning rail transport are covered better than services concerning road and sea transport. This was due to the fact that the study involved systems that provided only services for rail transport (Czech Railways, JERID's, Norway's IT systems). There was only one dedicated sea transport system (PortNet) and there were no road transport specific systems in the analysis. Three systems were generic in nature, suitable for all modes of transport (Trackway, Rahti®, and AX4).

It is visible from the system mapping that almost all the process components are covered by some IT system (either in place or on-the-shelf) to some extent. The delivery-process, which in the end is the most crucial issue, has been well covered by many different systems. Some of the systems can provide the process component related services better than some others, but the main point, is that major information gaps do not exist. There are only two process component related services, which are not covered in the delivery process by any IT system: warehouse management, and traffic data (road transport). Naturally, there are systems for these components as well, but they were not included in the mapping. Thus it can be stated that the delivery process can be managed electronically with the existing systems. The challenge is more how to integrate different systems and make them inter-operable between different countries and operators. The fact that on many occasions these actors have varying incentives and motives does not make this task any easier.

6.2 Assessment of IT Systems

The mapping of the existing information systems over the whole transport process shows no significant gaps in the information systems coverage. However, it is important to note that this is the situation if all the systems of all the participants would be in use. Furthermore, the marked systems per sub-process themselves do not provide full coverage to all the requirements of that process. It is not realistic to assume that all the mapped systems would be used, nor is it realistic to integrate all of them as they are. Therefore the system providers should take note on the requirements identified within this study and implement these within their systems. Also the integrability of the systems shall be a key issue in the future.

There is reason to expect advancement in IT issues since we have many good providers and active clients in the industry that can together address the challenges uncovered by this study.

6.3 Experience on the Use of TelemArk

One task of WP6 was also to assess, how generic architecture and TelemArk can be used as a tool when studying international intermodal processes. Experiences were overall very positive. Architecture can be used for commercial system "benchmarking" or comparison. Systems may be mapped and positioned in the architecture. This is invaluable information to IT companies and system designers who can benefit from architectures in strategic ways /10/:

- Who are the potential users or beneficiaries of the system.
- How well the system satisfies different parts of the value chain and business process.
- Extension or focus requirements in the functionality of their system.
- Co-operation requirements or possibilities when other system providers offer supplementary systems.

Freight architecture TARKKI provided almost all the necessary components needed in WP6. TARKKI was the "skeleton" on this work. Only some additions were needed from MeriArkki concerning the process components and data flows. Some detailed information was also augmented by the research group. Pol-Corridor showed that architecture can be utilized in ways that were not foreseen when, for example, TARKKI was built.

Our overall conclusion underlines the managerial role of architectures. Architectures are not only the tools for “bit-wizards” and “IT-freaks” but rather the contrary. IT architectures are the tools to enhance deterministic behaviour patterns for operational actors and they may be used in managerial target setting and performance evaluation processes. Service Architecture and systems mapping for Pol-Corridor particularly demonstrates the usefulness of architecture to the “commercial IT manager” working in or providing services to international intermodal logistics. /10/

Service Architecture and systems mapping makes the IT policy and strategy implementation easier. Strategic investments in system and IT projects should be based on recognized needs for particular applications and how they are able to contribute to the value chain in a pioneering manner. Pol-Corridor implicitly highlights this. /10/

7. Recommendations

Based on our research group's experience, architectures have a clear instrumental function and value for commercial system providers as well as information service providers along intermodal chains. However, it seems that the public bodies in many cases (but not necessarily in all cases) should assume the responsibility of building the architectures, because commercial actors are not benefiting from them very fast and the mandatory nature of architectures would not be emphasized if they were provided by commercial actors /10/. Commercial actors also have the problem of manageability when it comes to large and complex architectures which often fall beyond their control.

As we have concluded, the problem is not with the technical issues, but the question is more **how** information services are implemented and even more than that, **who** implements the information centre. The implementation of the architecture requires a strong champion to lead the work. Someone has to be persistent and get people involved to work seriously. It is important that partners share mutual trust in order to make an international process work transparently. To reach this goal requires hard work, but it is possible. Commercial actors seldom do this work by themselves, particularly when it comes to multiple actor IT problems /10/.

There needs to be a trusted party who is willing to take a look at the Pol-Corridor supply chain as a whole. The greatest interest of having Pol-Corridor IT operational falls of course to the shuttle train operator between Polish ports and Vienna. Whether this is a private operator or a joint effort of transit countries (Poland, Czech, Austria) national operators makes no difference. These parties should work strongly together to establish Pol-Corridor Information Centre. Several possibilities are available, but the most logical would probably be to build a joint marketing and service organisation for Pol-Corridor which also assumes responsibility for Information Centre.

The system providers, for example the IT companies involved in this project, should seek close contact to the abovementioned marketing and service organisation and *vice versa*. It is clear that technical issues can be solved if the will is there. A tremendous market opportunity is there for system providers but the "market", for instance, the customer field, is very challenging and fragmented in many ways – not least in the sense of lack of co-operation and agreements on common IT platforms. The "market" is not very aware of, or keen on, the possibilities they have.

Ports and terminal operators can support these activities and become members of suggested joint effort. The risks of involvement are fairly low and possible gains can be considerable.

The funding of Pol-Corridor Information Centre can be arranged as part of a larger "Pol-Corridor funding package", utilising the institutional funding sources like TEN-budgets or EIB. Again, extensive co-operation is needed to wrap this package up.

The starting point for implementing the architecture could be to agree what information is common throughout the chain, and what information is needed in order to be able to track and trace the delivery. This information, for example, shipment ID, could work as a reference number for the whole process. By using the reference number, partners could get information needed from other parties' systems throughout the information centre platform. Parties could define by themselves, what information they want to share with partners, which makes the joining of information platform easier for all parties.

Support from IT is crucial when considering such an intermodal product like Pol-Corridor. It is known and understood that co-operation of different transportation modes can be cheaper and environmentally friendly, but without the support from IT, Pol-Corridor cannot compete, for example, with road transportation. Pol-Corridor needs to work perfectly in order to be competitive.

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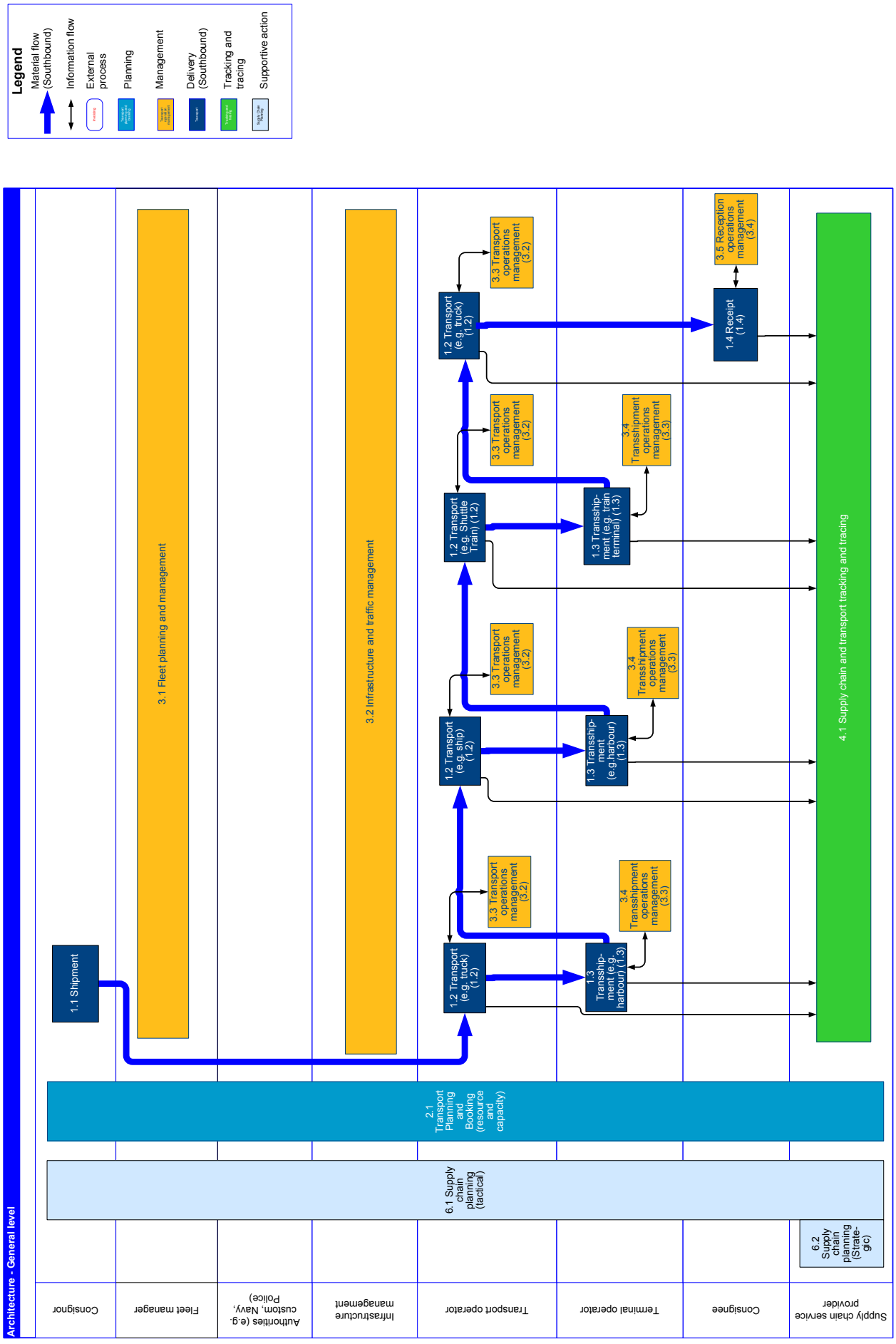
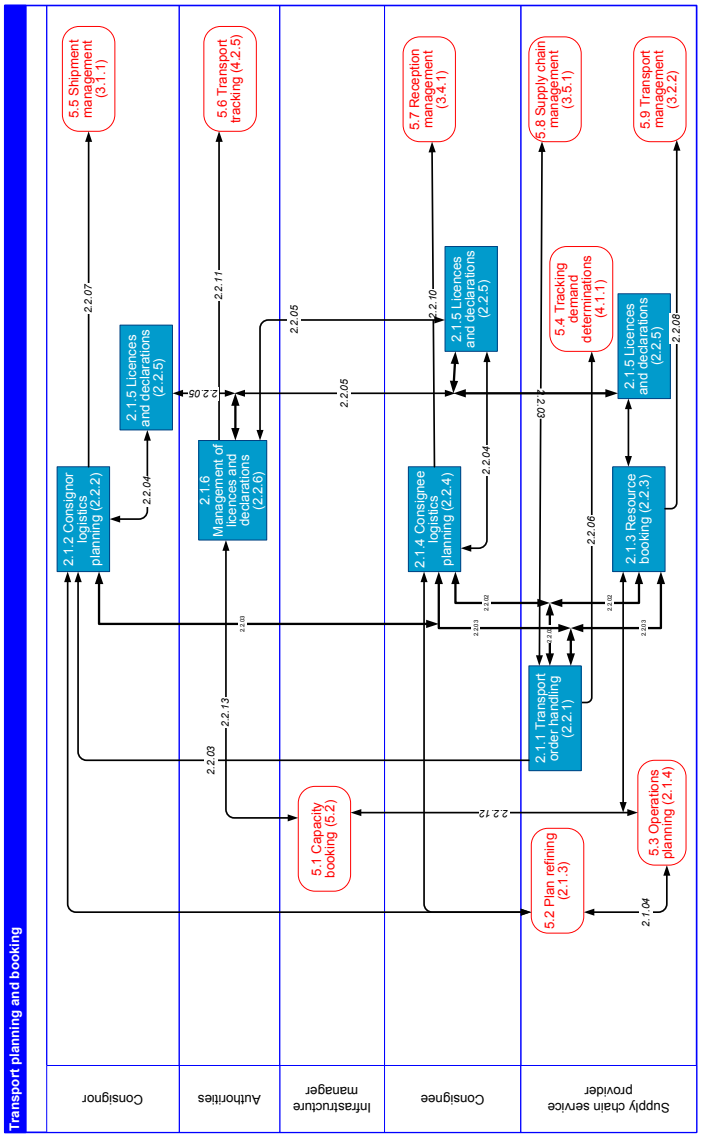
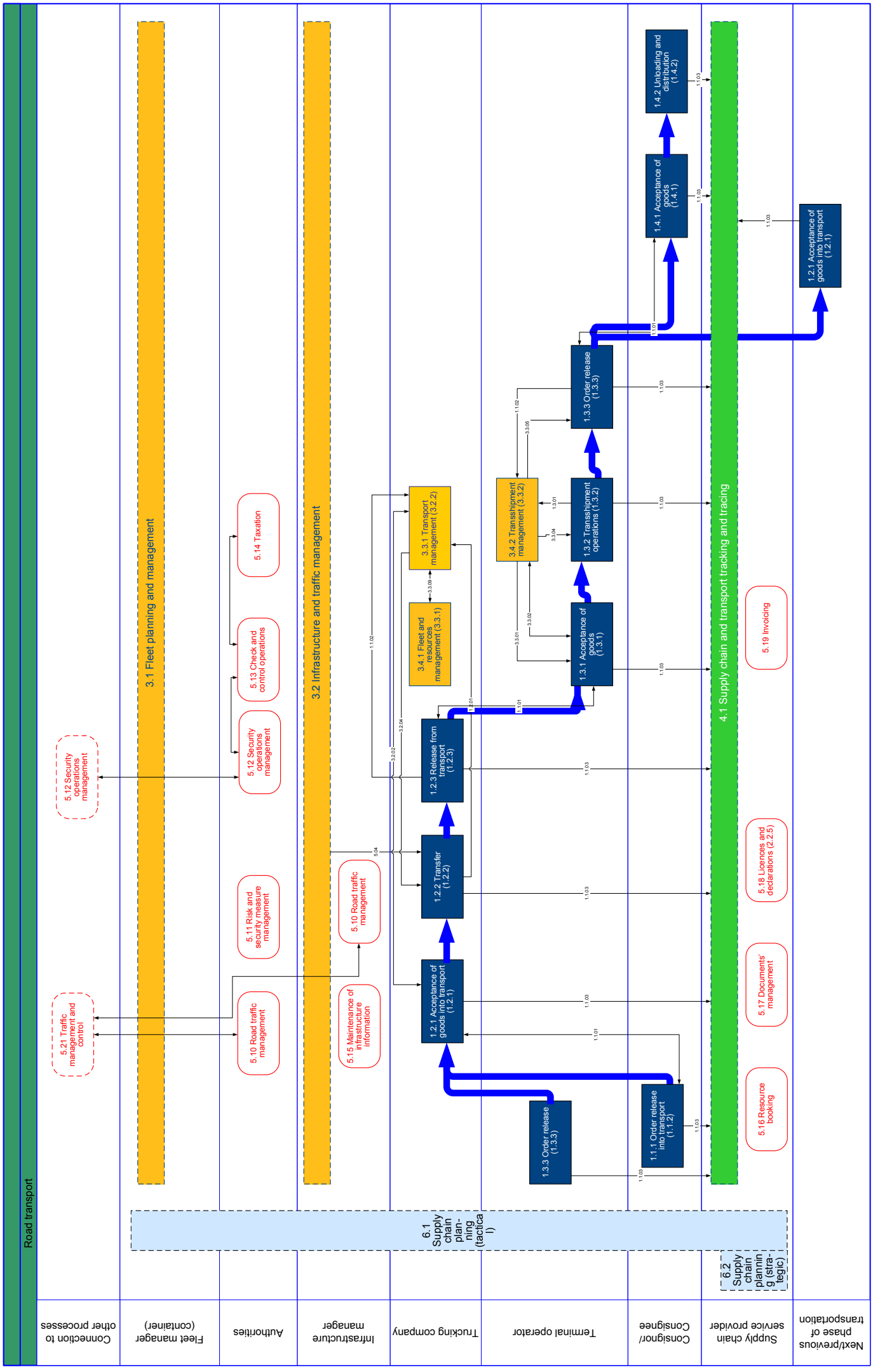
Appendix A: Upper-level PoI-Corridor Process Model



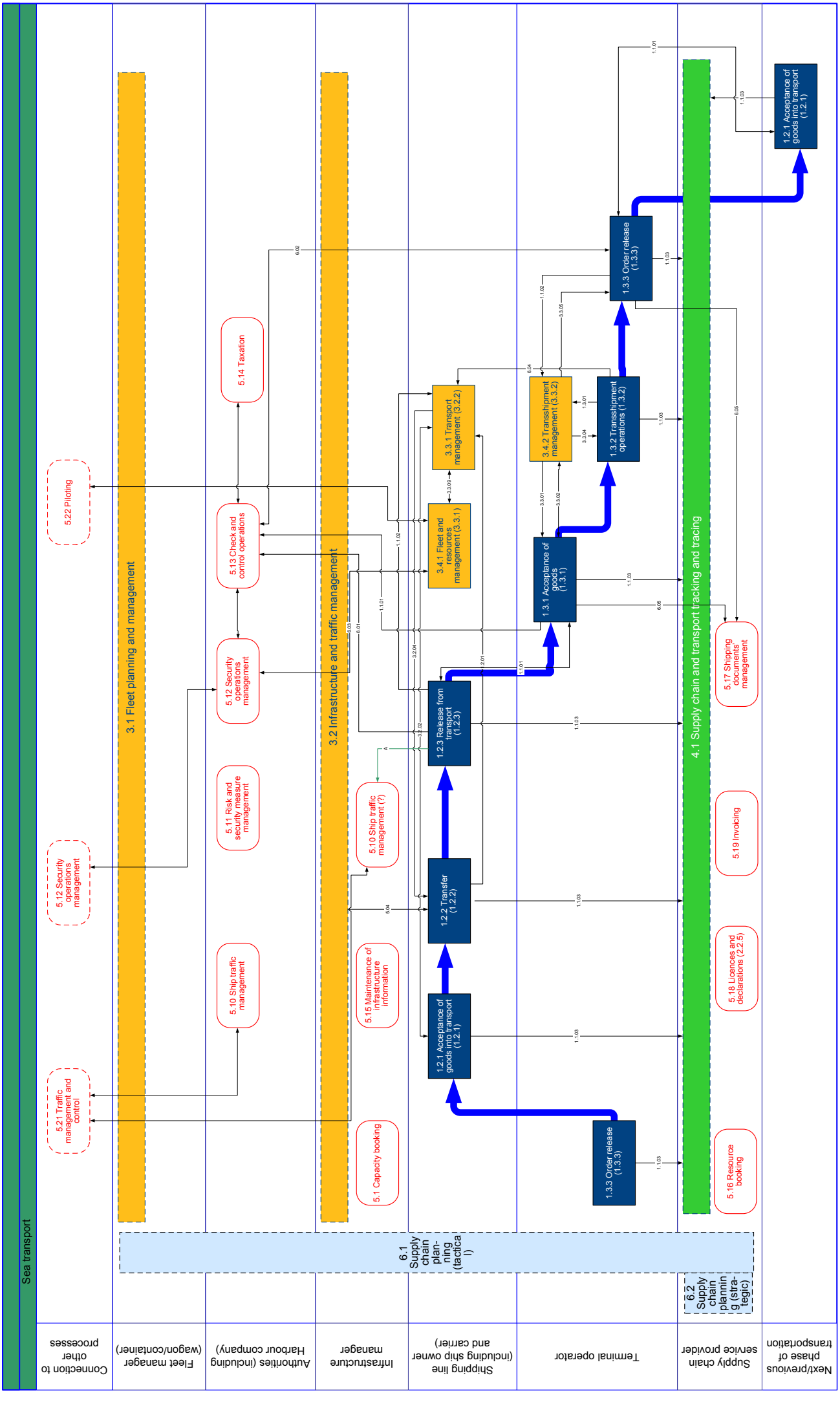
Appendix B: Transport Planning and Booking



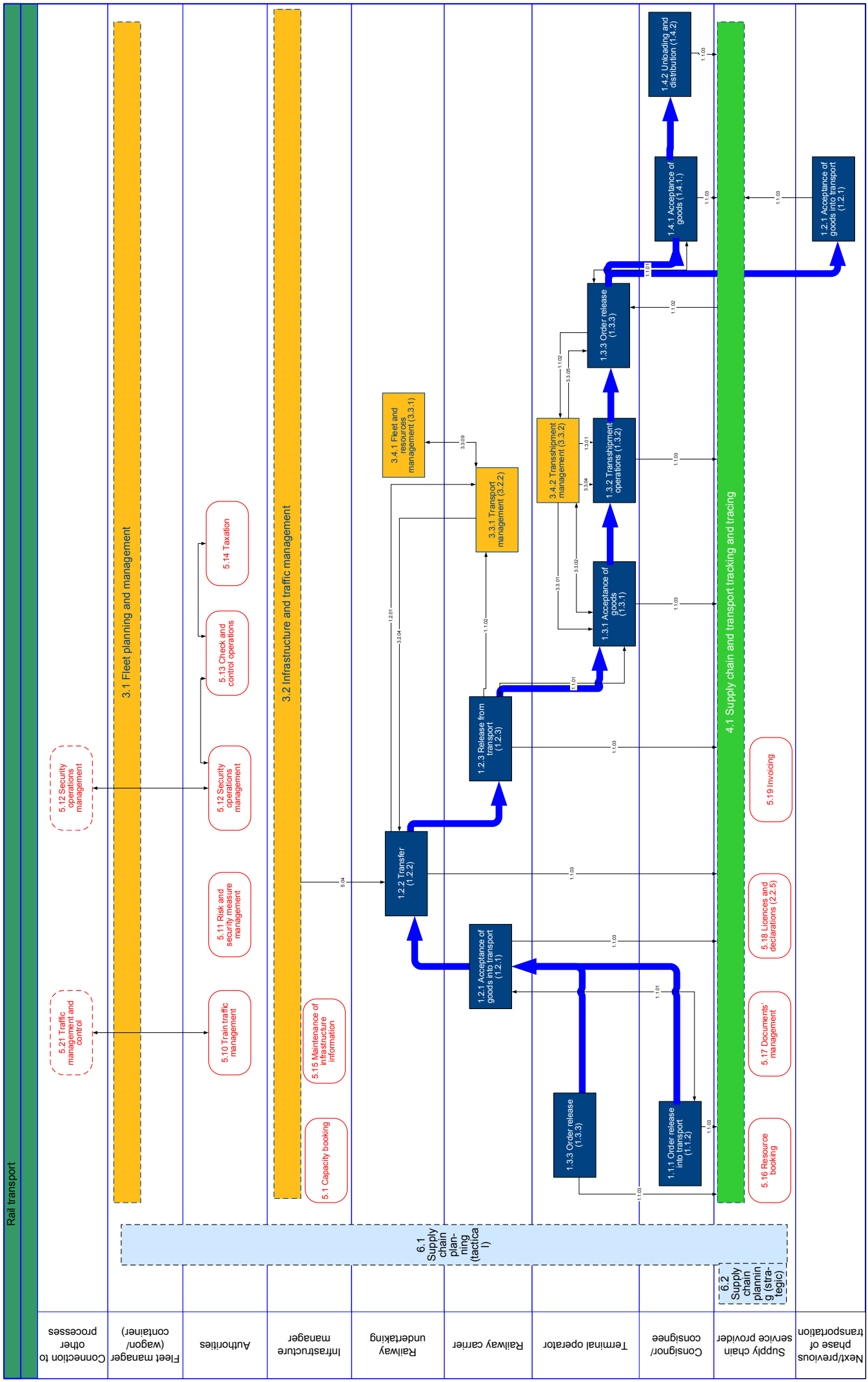
Appendix C/1: Transport Models (road transport)



Appendix C/2: Transport Models (sea transport)



Appendix C/3: Transport Models (rail transport)



Appendix D: Role Descriptions

Name	*Description*	*Road*	*Sea*	*Rail (Blue Shuttle Train)*
Consignor	Sends the goods (e.g. shipper)	**Consignor**	**Consignor**	**Consignor**
Transport operator	The transport operator is responsible for providing the transport service and integrating the transport chain. Operator receives the transport order from the shipper/consignee, receives the money from the shipper and pays the transport costs to the subcontractors. Operator also prepares the transport documents and informs the consignee.	**Trucking company** (Transports the empty container from container depot (empty) to the shipper. After loading transports the full container to the next operator).	**Shipping company** (includes both the ship owner and the carrier).	Divided into **Railway carrier** and **Railway undertaking**. (Any private or public undertaking whose main business is to provide rail transport services for goods and/or passengers. It is also the company to whom the haulier releases the full container.)
Fleet manager	Rents or leases wagon and/or containers.	**Fleet manager**	**Fleet manager**	**Fleet manager**
Authorities	Receives transport declarations and issues licences and permits. The authority can also carry out transport control and enforcement operations and collect the statistics of the shipments.	**Authority.** Includes e.g. authorities related to dangerous goods, Customs, Police, Military.	Includes authorities such as Customs, Border Guard, Maritime transport authority, Navy and Sea Rescue service, Harbour company (when performing administrative tasks). **Authority**	**Authority.** Includes e.g. authorities related to dangerous goods and licensing, Customs.
Supply chain service provider	The supply chain service provider is responsible for the entire supply chain, i.e. for a transport from its departure point to its destination. Supply chain service provider is also responsible for collecting, storing and managing tracking data throughout the supply chain. Supply chain service may be divided into several independent parties.	**Supply chain service provider**	**Supply chain service provider**	**Supply chain service provider**

Terminal operator	The terminal operator is responsible for the provision of transhipment logistics services e.g. warehousing, port operations. Terminal operator books the terminal, creates loading instructions and takes care of loading the wagons.	**Terminal operator**	**Terminal operator**	**Terminal operator**
Infrastructure manager	The infrastructure manager is in charge of the maintenance, use and enforcement of the transport infrastructure, e.g. roads, railroads and waterways as well as for operating the control and safety systems. The infrastructure manager may also issue transport licences for licensed transports. The responsibilities of the infrastructure manager can be divided among several actors, e.g. enforcement operations can be carried out by a different actor from the one responsible for all other route network maintenance tasks.	**Infrastructure management**	**Infrastructure management**	**Infrastructure management**
Consignee	Receives the goods	**Consignee**	**Consignee**	**Consignee**

General level

ID	Tarkki	MeriArkki	Component	Description
1.1.	1.1.		Shipment	Preparing goods for transport and releasing them to the transport operator.
1.2.	1.2.		Transport	Transporting goods by a means of transport from the departure point to the destination.
1.3.	1.3.		Transhipment	The handling of a shipment is unloaded from a vehicle and loaded onto another for the next leg. Transhipment may include other activities associated with the handling of a shipment and goods, such as storage, terminal handling or other value added services.
1.4.	1.4.		Receipt	Receiving a shipment, checking and unloading parcels, checking the goods and their condition, and preparing the goods for the next stage of the consignee's production process.
2.1.			Transport planning and booking	Consists of actions such as handling transport orders, resource booking, processing and managing the licences and declarations needed.
3.1.			Fleet planning and management	Planning the fleet usage of logistics service providers. The goal is the management of the fleet and the optimisation of costs and e.g. environmental impacts.
3.2.			Infrastructure and traffic planning	
3.3.	3.2.		Transport operations management	Managing transport means and personnel, and managing transports.
3.4.	3.3.		Transhipment operations management	Managing transhipment resources and operations.
3.5.	3.4.		Reception operations management	Managing consignee's production.
4.1.			Supply chain and transport tracking and tracing	Shipment tracking and tracing within the supply chain. Tracking data is primarily collected on individual shipments/parcels/goods.
6.1.			Supply chain planning (tactical)	The main products of the process are the contracts between the customer and supply chain service provider and supply chain service provider and other service providers.
6.2.			Supply chain planning (strategic)	Plans concerning transports and their realisation are the main tasks of strategic supply chain planning. Planning the use of resources and planning the fleet usage of logistics service providers.

Transport planning and booking

ID	Tarkki	MeriArkki	Component	Description
2.1.1.	2.2.1.		Transport order handling	Receiving a transport order, drawing up a transport plan, booking supply chain resources from transport and terminal operators, and relaying the transport plan to all parties in the supply chain.
2.1.2.	2.2.2.		Consignor logistics planning	Planning consignor production.
2.1.3.	2.2.3.		Resource booking	Receiving a transport order for a leg, and booking resources for providing logistics services. Giving an order confirmation to the supply chain service provider.
2.1.4.	2.2.4.		Consignee logistics planning	Planning consignee production.
2.1.5.	2.2.5.		Licences and declarations	Processing and managing the licenses and declarations needed to provide a logistics service.
2.1.6.	2.2.6.		Management of licences and declarations	Receiving, processing and managing licences and declarations. Maintaining licence registers.
5.1.	5.2.		Capacity booking	Booking transport infrastructure capacity, planning the use of transport infrastructure.
5.2.	2.1.3.		Plan refining	Receiving a pre-order (preliminary transport order). Drawing up a preliminary transport plan, relaying the pre-order to the supply chain service providers, the consignor and consignee.
5.3.	2.1.4.		Operations planning	Planning of transport or transhipment according to the pre-order. The goal is to optimise transport as transhipment operations.
5.4.	4.1.1.		Tracking demand determinations	Determining the demand for tracking and the level of tracking needed on the basis of the transport order (and other contracts). Creating a tracking ID. Making tracking requests to supply chain service providers.
5.5.	3.1.1.		Shipment management	Managing consignor operations. Managing packing and consigning, aligning the consignor's parts of the loading plan and shipment plan.
5.6.	4.2.5.		Transport tracking	
5.7.	3.4.1.		Reception management	Managing the receiving process (see 1.4).
5.8.	3.5.1.		Supply chain management	Relaying the transport plan to the other actors within the supply chain. Receiving information on the carrying out of transports from other actors within the supply chain. Observing exceptions and relaying the information to Exception management.
5.9.	3.2.2.		Transport management	Managing a single transport leg. Managing loading and unloading processes. Aligning the consignment plan and loading plan. Receiving exception and event data, and managing incidents and other exceptions.

Transport vehicles

ID	Tarkki	MeriArkki	Component	Description
1.1.1.	1.1.2.		Order release into transport	All tasks involving the loading of parcels that the actor is responsible for. The transfer of goods and responsibility to the next actor within the supply chain. The identification of the next actor and getting the proof of delivery from them.
1.2.1.	1.2.1.		Acceptance of goods into transport	All tasks involving the loading of parcels that the transport operator is responsible for. The receipt of goods and responsibility, signing the proof of delivery. Forming delivery lot shipments, and making a record of the means of transport and the content of the transport units.
1.2.2.	1.2.2.		Transfer	The transfer of the means of transport (and the shipments/parcels/goods being transported in it) from the departure point to the destination, the management of events and exceptions during transport, informing other parties of these events and exceptions, and giving an ETA for the transport.
1.2.3.	1.2.3.		Release from transport	All tasks involving the unloading of cargo that the transport operator is responsible for. The release of goods and responsibility, and receipt of the proof of delivery.
1.3.1.	1.3.1.		Acceptance of goods	All tasks involving the unloading of parcels from the vehicle/transport unit that are the responsibility of the actor. The checking of parcels, the acceptance of the shipment and possible transport reclamations. The acceptance of goods and responsibility, and signing the proof of delivery.
1.3.2.	1.3.2.		Transhipment operations	The handling of goods and parcels within the transhipment process. At the minimum, transhipment operations consist of the moving and preparation of shipment parcels for loading. Transhipment operations can also include terminal handling (cross-docking), storage or other value added services.
1.3.3.	1.3.3.		Order release	All tasks involving the unloading of parcels that are the responsibility of the actor. The release of goods and responsibility to the next actor within the supply chain. Identifying the next actor and receiving the proof of delivery.
1.4.1.	1.4.1.		Acceptance of goods	All tasks involving the unloading of parcels from the vehicle/transport unit that are the responsibility of the actor. The checking of parcels, the acceptance of the shipment and possible transport reclamations. The acceptance of goods and responsibility, and signing the proof of delivery.
1.4.2.	1.4.2.		Unloading and distribution	Unloading goods from parcels. Checking the goods and accepting the delivery lot. Making possible goods reclamations. Transferring goods to the consignee for use in the production process.
3.3.1.	3.2.2.		Transport management	Managing a single transport leg and loading and unloading processes. Aligning the consignment plan and loading plan. Receiving exception and event data, and managing incidents and other exceptions.
3.4.2.	3.3.2.		Transhipment management	Managing a single transport during transhipment. Managing the acceptance and release of transports. Aligning the transhipment plan and unloading plan. Receiving exception and event data, and managing incidents and other exceptions.
3.4.1.	3.3.1.		Fleet and resources management	Managing the means of transport (and personnel and other necessary resources). The focus is on managing the means of transport and optimizing their use.

5.1.			Capacity booking	Booking the infrastructure.
5.10.		2.1.6.	Road/Sea/Rail traffic management	Traffic management by authorities and/or infrastructure manager.
5.11.		2.1.5.	Risk and security measure management	Managing the security as a whole.
5.12.		2.1.9.	Security operations management	Managing the concrete security operations, such as guarding.
5.13.		2.1.14.	Check and control operations	Includes operations such as checking the cargo at the borders.
5.14.		2.1.16.	Taxation	Collecting taxes and tax related fees by the Customs.
5.15.			Maintenance of infrastructure information	Maintaining information on the transport infrastructure and individual transport facilities.
5.16.			Resource booking	Includes booking resources such as vehicle, human, warehouse etc. (all the other resources but the infrastructure).
5.17.		2.1.2.	Documents' management	Preparing documents necessary, such as transport documents.
5.18.	2.2.5.		Licences and declarations	Processing and managing the licences and declarations needed to provide a logistics service.
5.19.		2.1.22.	Invoicing	Invoicing vessels and merchandises.
5.20.			Traffic management and control	
5.21.			Piloting	Concerns only sea traffic.

Connective processes

ID	Tarkki	MeriArkki	Component	Description
3.1.			Fleet planning and management	Planning the fleet usage of logistics service providers. The goal is the management of the fleet and the optimisation of costs and e.g. environmental impacts.
3.2.			Infrastructure and traffic management	Infrastructure and traffic management by authorities and/or infrastructure manager.
4.1.			Supply chain and transport tracking and tracing	Shipment tracking and tracing within the supply chain. Tracking data is primarily collected on individual shipments/parcels/goods.
6.1.			Supply chain planning (tactical)	The main products of the process are the contracts between the customer and supply chain service provider and other service providers.
6.2.			Supply chain planning (strategic)	Plans concerning transports and their realisation are the main tasks of strategic supply chain planning. Planning the use of resources and planning the fleet usage of logistics service providers.

Appendix F: Data Flows

Based on TARKKI

ID (TARKKI)	Direction	Name	Description	Notes
1.1.01	I	Proof of release	Releaser ID and information on release.	
1.1.01	O	Proof of delivery, POD	Consignee ID and information on the acceptance of the transport.	
1.1.02		Order release information	Information on the release and acceptance of the transport, and the transfer of responsibility.	Consignee signs off.
1.1.03		Tracking data	Tracking data collected during all stages of the supply chain (includes arrival note).	The tracking data can include content, condition and location information. The desired information is defined while making the tracking order.
1.2.01		Transport realisation information	Information on the carrying out and events of a transport.	
1.3.01		Transshipment realisation information	Information on the carrying out of and events during transshipment.	
2.1.04		Advance order for transport and transshipment services	Logistics service providers transmit information on the transport or service plan for a transport leg to the supply chain service provider.	
2.2.02	I	Transport order for a leg	Transport order information for the transport and terminal operators.	The transport order contains information on the necessary transports and other services (e.g. transit storage services).
2.2.02	O	Transport order confirmation for a leg	Transport order information and the transport plan for a leg.	The transport order contains information on the necessary transports and other services (e.g. transit storage services).
2.2.03		Transport plan	Planning information for supply chain management.	The transport plan can be transmitted as a whole or in sections for reasons of information security.
2.2.04	I	Transport order information	Transport order information for use in the licensing and declaration processes.	
2.2.04	O	Transport licence	Information on a transport licence issued by an authority.	
2.2.05	I	Transport licence application/declaration	Information on a transport licence application or transport declaration handed in to an authority as required.	
2.2.05	O	Transport licence	Information on a transport licence issued by an authority.	
2.2.06		Tracking specifications	Transport order and other contract information used to determine the level and amount of tracking required.	The tracking service can include content, condition and location information.
2.2.07		Shipment plan	Shipment planning information used to carry out the picking, packing and release of goods.	
2.2.08		Transport plan	Transport planning information used to carry out the loading, transport and unloading of goods.	

2.2.10		Receipt plan	Receipt planning information used to carry out the acceptance, unloading and distribution of goods.	
2.2.11		Licence information	Licence information for the authorities.	Carries out transport tracking, e.g. during hazardous goods transports.
2.2.12	I	Capacity booking (infrastructure)	A request to obtain transport infrastructure capacity for use.	The request can concern either repeated (regular scheduled traffic) or one-time needs for infrastructure capacity.
2.2.12	O	Capacity booking confirmation	Declaration made to a licensing authority about the booking of infrastructure capacity for a transport that requires a licence.	
2.2.13	I	Licence information	Declaration on the issuing of a required licence to the infrastructure manager.	
2.2.13	O	Capacity booking confirmation	Declaration made to a licensing authority about the booking of infrastructure capacity for a transport that requires a licence.	
3.2.02	I	Consignment note	Consignment note for use in verifying the accuracy of the shipment.	The term Consignment note here refers to an extensive shipment data set. It does not refer to the information content of the consignment note (usually on paper) being used. The content is more like the one presented in the study Logistics Chain EDI Project.
3.2.02	O	Loading list	Verified consignment note supplemented with information from the loading list.	
3.2.04		Transport instructions	Management information for transport.	More precise information e.g. on the time frame for the terminal.
3.3.01		Receipt and unloading instructions	Management information for receipt of goods.	
3.3.02	I	Loading list	Consignment note with loading list to verify the accuracy of the shipment.	
3.3.02	O	Information on the acceptance of goods	Verified consignment note and shipment acceptance data.	
3.3.04		Transshipment instructions	Instructions for agreed transshipment operations.	
3.3.05		Order release instructions	Instructions for releasing orders.	
3.3.09	I	Transshipment operations management information	Information on transshipment resource management for use in the management of transshipment operations.	
3.3.09	O	Transshipment resource management information	Information on transshipment operations management for use in the management of transshipment resources.	
5.04		Traffic control information	Traffic control data for means of transport.	

Based on MERIARKKI (maritime transport)

ID	Direction	Name	Description	Notes
6.01		Unloading permission	Permission granted by Customs that consignment or transport unit can be unloaded from the ship.	
6.02		Loading permission	Permission granted by Customs that consignment or transport unit can be embarked.	
6.03.		Declaration of security	Declaration (according to IMO ISPS – instructions), which has to be made if security people in vessel or in harbour demand it.	
6.04.		Cargo status	Information declared to shipping company by terminal concerning the received consignment. Loading list is made based on this information.	
6.05.		Terminal report	Terminal report given to person responsible for terminal announcement. Report is given after the transport unit has been received or assigned.	

Appendix G/1: IT Company Profiles and System Descriptions (Stockway Oy)

Stockway combines the expertise of RFID technology, software development and supply chain management.

Established in 2001, the company provides Trackway software products which enable automated information delivery between different players in the industrial- and retail- logistics supply chain. Products are identified using RFID or barcodes.

With Trackway, companies create virtual networks where product information moves securely, in real time, between the different players in the supply chain, regardless of the ERP system in use by each company.

Stockway delivers competitive advantage by enabling the creation of more efficient, more transparent and error free supply chains whilst offering concrete savings and benefits.

Information Logistics for International Freight Tracking

Stockway's innovative platform Trackway, enables the tracking of millions of individual items anywhere in real-time, whether at item- or at SSCC- level. Trackway can be used both with Barcode technology and RFID.

- Inter enterprise
- Automated item-level tracking
- Distributed event management

Trackway is designed to intelligently connect different enterprise systems for relevant, real-time **information sharing**.

Built upon Stockway's core competences in wireless mobility and RFID, Trackway provides a critical software infrastructure layer that resides between data-collection devices and back-end systems to manage the continuous information flow between enterprises. Trackway manages alerts, decision support and real-time response within the supply chain, securely and efficiently.

Our mission is to simplify the development, deployment and management of solutions on the periphery of the enterprise, enabling the smart network of connected items.

Stockway solutions and tools ensure extremely **rapid implementation** with minimum integration effort.

Trackway Enterprise improves the enterprise’s ability to capture accurate information about the location and status of any product, or asset, creating exciting new ways to manufacture, track and validate authenticity of products.

Trackway enables fully automatic product related information sharing within the company and with partners, regardless of organisational or geographic boundaries.

We break the barriers restricting information flow inside organisations and between them. We enable companies to trade and communicate electronically through the products they manufacture, handle or sell throughout the value chain.

Trackway solutions are easy to install and cost efficient, providing innovate opportunities to improve existing operations or rapidly create new business processes to retain competitive edge.

Being fully distributed by WWAI protocol, Trackway requires no heavy central server configuration and operate within wide hard- and software parameters.

Trackway Enterprise and RFID

Embedding physical products with RFID smart labels allows the product to communicate individual specific requirements to the various members of the production value chain in real time with events or settings being automatically triggered.

Once the RFID label is read and the product is identified, Trackway utilises the WWAI protocol to instantly create a dynamic network of all involved parties, across organisations when needed. Trackway is EPC Compatible.

The network enables sharing product information in a secure and controlled way. This information can be the product's current location, stage of manufacturing, electronic process information or how many times it has gone through a certain process. Additionally it can be electronic information about the product itself, such as certificates, manuals, specific manufacturing data, invoices or service records.

Trackway Enterprise includes:

- Real-time asset tracking
- Real-time events, alerts and messages
- Product attachments (documents, pictures, sheets, etc.)
- Product information management and delivery
- Proven security; confidentiality, integrity and availability
- Proven scalability
- Supports RFID, barcode, and other identification methods
- Supports existing barcode and RFID coding standards
- Supports hardware from all major RFID hardware manufacturers
- Supports any JDBC compatible relational database
- WWAI Server (WWAI certified)
- Available for Windows and UNIX environments

For further information:

www.stockway.fi or contact stockway@stockway.fi

Appendix G/2: IT Company Profiles and System Descriptions (AtBusiness Communications Oyj)

atbusiness

atbusiness

Improving Enterprise Relationships

Overview

atbusiness provides flexible Enterprise Relationship Management solutions for customer-driven organisations. A proven track record of satisfied clients together with experienced global partners ensure successful solution deployment.

Key data

Founded:	12/1996	Ownership:	Private
Turnover 2002:	€ 8.3 million	Personnel:	130

Why with **at**business?

- **Improved Enterprise Relationships** – comprehensive multichannel view to customers, partners & competitors enabling knowledge sharing - essential for efficiency.
- **One step ahead** – innovations and proven results in secure and leading-edge solutions
- **Keeping the promises** – proven business results with skilled and experienced partners and personnel. **at**business Rapid Deployment Method and Solutions Framework ensures high quality results and essentially shorter project lead times.
- **Best added value** – industry knowledge, best practices and flexible solutions guarantee easy and efficient usability with a long life-cycle and lower costs.

contd...

Clients

Examples of atbusiness clients and industry sectors:

Telecoms & IT:	Nokia, ElisaCom, Tellabs, Radiolinja, Honeywell
Energy:	Fortum, Espoon Sähkö & several other electricity companies
Insurance & Banking:	Verdandi Group, Octel, Finance Data, LEL Pension Fund, CapMan, Certall
Manufacturing:	Ahlstrom, Martela, Myllykoski, Mellano, Colombier, Vaasan & Vaasan
Media & Publishing:	Acta Print, Otava, YLE
Public authorities:	SM, OPM, YM, KTM & other ministries, Customs, Frontier Guard, RAY
Transport & logistics:	Finland Post, Finnish and Lithuanian Maritime Administations, Steveco, Finnlines,
Wholesale & Retail:	Kesko, Tradeka Group, Trading House Hansel
Pharmaceutical:	Novartis, Tamro

Products

atbusiness has developed a highly adaptable and rapidly deployable product family for Enterprise Relationship Management with a web-centric Solutions Framework that provide the usability and robustness needed for business-critical solutions.

- **atbusiness CRM Suite™** is a new generation web-centric CRM solution that enhances marketing, sales, customer service and employee productivity by effective use of information and organisational knowledge. Product's flexibiliy, customisability and scalability enables iterative CRM process and low life cycle cost. The technology platform is based on **at**business Solutions Framework.
- **atbusiness Solutions Framework™** makes enterprise solution deployment easier and more rapid by providing the tools, components, deployment methodology and services needed to develop component-based applications and business-critical solutions. The Solutions Framework is an integratable, scalable, secure and robust J2EE/XML technology platform that can be combined with leading application servers, databases, analytical tools, contact centers and EAI solutions.

atbusiness

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Appendix G/3: IT Company Profiles and System Descriptions (Procomp Solutions Oy)

Procomp Solutions Oy is a Finnish software house, founded in 1995. The company operates on a solid base, which is proved by a Dunn & Bradstreet credit classification in class AAA. In addition to Finland, the products of the company are used by international customers in several countries, for instance, in Estonia, Sweden and Spain.

Procomp Solutions Oy supplies demanding software solutions for increasing the competitive edge of the customers in several business branches. In addition to the software products, the company also makes tailored data systems for customer needs and designs mobile systems connected to the operative systems of companies. Our business idea is to intensify the customer's business processes through latest information technology solutions and to release resources for developing the operations and for better customer services. The strong points of the operations of Procomp Solutions Oy are the high quality products, customer orientation, high degree of services, and functional project management.

The fields of expertise of our company are the data systems of logistics and shift planning, Lotus Notes solutions, mobile systems and integration of data systems.

PROCOMP solutions

Procomp Solutions Oy, Elektroniikkatie 8, 90570 Oulu. Tel. +358 8 551 3100, telefax +358 8 551 3110
Email: procomp@procomp.fi, **www.procomp.fi**

Products:

RAHTI

The Rahti® operation control system makes transporting more efficient and streamlines day-to-day office routines

The Rahti® operation control system is suitable for different types of transport companies and goods suppliers. Rahti® is designed to meet the challenges of transport: it makes transports more efficient, improves customer service and saves money in office, phone and fuel expenses. With the Rahti® application you can make better use of your personnel resources.

AIKAJANA®

Aikajana® is a tool for planning and controlling working hours, saving time in overlapping and routine tasks

Aikajana® is an excellent tool for planning of shifts and controlling working time. With the help of Aikajana®, the shifts of even a large company with several shifts operate accurately to the schedule, and the rotation of the shifts of a large number of employees runs without friction. Aikajana® is at its best when the work is done with a large group of people and in several shifts.

Working Mobile® Software Combines the Company's Operation Control Systems, Moving Units and Co-Operation Network into One Whole.

Working Mobile® software is a communication system boosting the company's internal data transmission as well as that between the co-operation partners; it supports wireless data transfer, Internet based communication methods, and different kinds of terminals. The core idea of the system is to support moving work by reducing the manual noting down of tasks and operating on the basis of memory.

Storage Hotel software is designed for the needs of companies engaged in storage, terminal and expedition activities.

With the help of this software, it is possible to monitor the goods flow in real time from the arrival to the dispatch, and to invoice the customer on the agreed basis. The individual needs of the user can be taken into consideration by tailoring the program: it is possible, among other things, to add bar code reading equipment.

PALASET®

PalaSet® Product Family Is a Flexible Tool for Demanding Needs

PalaSet® product family programs are independent of business branch and offer solutions for the use of sales, production support, personnel management and project management, for example. PalaSet® products combine the communication between people and the data systems of the company into a functional whole. All the parts of the product family can be tailored to suit special needs.

Appendix G/4: IT Company Profiles and System Descriptions (CD Telematika)

COMPANY PROFILE

Czech Railways, joint stock company, Telematika, branch organization

Brief history

2004 – Integration of DATIS with the Railway Telecommunications Administration into the branch organization TELEMATIKA, o.z.
1997 – Restructuring of Czech Railways, concentration of Informatics into the branch organization Data and Information Services (DATIS), detachment of the branch organization the Railway Telecommunications Administration
1994 – Consolidation of regional computing centres into the Centre of Information Technologies
1993 – Division of Czechoslovak State Railways into Czech Railways and Slovak Railways
1950 – Origin of individual regional computing centres of Czechoslovak Railways

Informatics on Czech Railways

TELEMATIKA, o.z., is the leading supplier of information systems and services to the Czech railway industry. The history of its constituents counts more than 50 years of experience in development, operation and implementation of information systems.

Considering certain railway specifications, TELEMATIKA, o.z., is a team of specialists, which besides creating and developing information systems used for managing and operating on railways, know the expectation of their customers and offer appropriate information technologies.

Our great advantages are long-term experience and the ability to offer complete outsourcing for development and implementation of information technologies in the transport sector.

This is to mention the biggest customer of TELEMATIKA, o.z., namely the joint stock company of Czech Railways, as the reference.

Activities of our organization

- Solving, programming, development and implementation of information technologies and information systems in railway transportation as well as other information technology tasks in the custom way.
- Outsourcing of information systems operation on the client's premises.
- Provision of the international data exchange.
- Participation in designation and implementation of workgroups within the UIC, OSZD, AEIF and other European bodies.
- Consultancy in the field of choice of hardware in the domain of information systems.
- Provision of complete services during the implementation process for HW, SW, operating the networks and hot-line services.
- Training, recommendation and consulting services in computer technology and in the area of information systems.
- Creating, administration and updating of WWW pages on the INTERNET and INTRANET.
- Web hosting.

- Business activities and other services, e.g.: copying, scanning, and renting of equipments, training and seminar bureau rooms.
- Development and operating of E-business for railway transportation.
- Provision of system integrator services.
- Solution of large IS/IT projects on the railway network level.
- Supply of complete computing systems.
- Complex servicing for HW and SW including networks (maintenance and running).
- Connection to the Internet and training in its exploitation.
- Schooling and consultancy.
- Complex activities concerning railway freight traffic and transportation.
- Administration of the Czech Railways' data.

Key information systems of TELEMATIKA, o.z.

Crucial running and operating information systems for our customers are above all:

- ARES – nationwide and international reservation system for passenger traffic.
- IDOS – electronic timetable.
- SAP/R3 – complex economic information system providing information about all factors influencing the business activity of Czech Railways.
- CEVIS – Central Wagon Information System covering the whole network of Czech Railways.
- CDZ – Central Database of Consignments travelling on the CD network.
- ISOC – Information System of Commercial Activity involving realized transactions and observance of carriage contracts.
- IS KMZP – information system for clearing and auditing of international railway transports in which the CD have participated.
- IS KPT – information system for auditing of domestic railway transports
- IS UZV – information system of the Central Clearing Department of Wagons, which calculates the wagon toll.
- TRIS – a comprehensive database of annotations on paper articles about traffic.

TELEMATIKA, o.z., works with a variety of software platforms, mostly UNIX based systems, further LINUX, Microsoft Servers and clients OS.

With assistance of these information systems, TELEMATIKA, o.z., is provides among others services:

For passengers: Information about train connection, ticketing, couchette and electronic timetable IDOS and its updating.

For transport operators: Information about movement of wagons, trains, shipments, and search for wagons, price of shipments.

For firms and organizations – counselling and consulting services with design and creating of information systems, development and administration of WWW pages, hardware service of computer equipments, operating of geodetics maps, training services.

Appendix G/5: IT Company Profiles and System Descriptions (JERID)

JERID is the leading European supplier in the field of professional processing and provision of rail freight information. Currently, JERID is actively engaged in the development and the offer of railway software and freight forwarding information systems, as well as services in the field of document preparation and organizing workshops for rail cargo specialists. JERID has more than 700 users in 18 countries including major forwarders, railway operators as well as shippers. Headquartered in Olomouc (Czech Republic), the company is directly represented in Germany and Poland.

JERID Main Products:

- **ERIC** – European Rail Information Centre
- **FORWARDING SOFTWARE**
- **RailMap** – The First Electronic Rail Map of Europe

ERIC

ERIC is a modular and continuously updated system of information from railway freight transportation area. The system comprises data on a vast range of tariffs, calculations, information, forms, documentation and maps modules. Actual information is provided from the processing centre in electronic form, in different shapes depending on the customers needs and in several languages.

A well-functioning centre for data collection forms the core of an electronic information system. Information is received from several sources all over Europe and parts of Asia – from different rail freight transportation information sources. The original version of the data is transformed into electronic form, followed by translation into the processing languages and only then is the information duly dispatched or made available to ERIC users.

Transformation of tariffs into computing algorithms is made possible to make series of optimising functions. This vital function permits access to a very powerful tool for searching the lowest freight tariff between two arbitrary stations in Europe. It is not necessary for the user to know how to use tariff combinations.

Possible forms of data providing are:

- Local or network applications intended for installation from CD-ROM on user's PC's
- Internet applications operating on a web page
- Dynamic linked libraries (DLL) used for implementation onto the customer's own logistic system
- Library of tariffs and regulations in original version in electronic form
- Web services for sending requests to the centre from users applications via the Internet

FORWARDING SOFTWARE

Forwarding services represent one of the most important of all services in cargo transport domain. Forwarding software provided by JERID has been significantly assisting its users to speed-up and specifies their forwarding activities for many years. The same forwarding software also ensures information transfers between each subject of the transportation process.

JERID's forwarding software can offer its users:

- Assistance with the technological activities of the freight forwarder regardless of the transport means used
- A powerful tool applicable in every company that is covering its materials or goods transportation
- Better assistance with railway transportation – interconnection with ERIC products
- Electronic data interchange – incoming and outgoing invoices, advice notes and data exchange with railways accounting department
- Branch management – data exchange between the centre and branches
- Communication with economical information systems, rendering direct links with the accounting system
- Incoming invoice verification with expected transportation expenses
- Ensuring against users mistakes
- Operation system selection
- Compiling statistics from realised or even planned orders
- Proven, user friendly and individually applicable software
- Safe Internet database applications for direct data exchange

RailMap

Main Features

- Highlighted railway net
- Railway stations for rail freight transport
- Information on stations
- Search for the nearest stations
- Schematic transport route display
- Possibility of link to railways systems for wagon monitoring
- Possibility of link to GPS/GSM systems
- Consignment position display
- History of wagon or trains position display
- User's markings (branches, logistic places)
- 28 European countries

RailMap Content

- High-quality general map of Europe
- Geographical information: railways, roads, relief, forests, parks, waters, settlements, industrial zones, state/regional borders
- Railway lines – emphasis on railway net
- Unique database of locations (accurate geographical coordinates) of more than 15 000 railway stations for rail freight transport in 28 European countries
- Information on stations from CIM, LIF, DIUM lists

RailMap User's Environment

- Detailed mapping with high precision
- Tools for working with the map: zooming, arbitrary scale, hot keys…
- Save and restore for default settings (scale and cutout)
- Geographical layers display on or off
- Adjustable scale of railway layer display
- Continuous display of current geographical coordinates of cursor
- Save and display of favorite sites

RailMap Main Functions

- Location of geographical points (settlements) in entire Europe
- Selection and display of railway stations, including name and code-number
- Search and display of specific number of stations with specific distance in relation to a selected point
- Schematic transport route display
- Save map to a file (BMP, JPG, GIF)

User's Marks in RailMap

- Definition of user's markings: rail wagon, road vehicle, consignment, container, rail point, logistics point, user-defined marking – company branch, customers, partners, loading places, warehouses, etc.
- Simplified working with list of displayed markings
- Export and import of markings (mutual exchange of information on positions)

Wagon/consignment Display in RailMap

- Display of arbitrary point by type in geographical coordinates
- Display of consignments positions via electronic upload from a file
- Automatic and continuous updating of arbitrary objects positions
- Display of transport route (history of movements) of wagons or trains

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Appendix G/6: IT Company Profiles and System Descriptions (AXIT)

AXIT
connecting logistics

AXIT organizes and optimizes the flow of information between all partners of the logistics chain. To achieve this, AXIT offers value-adding services for information logistics in the supply chain through its own logistics platform AX4. In addition AXIT is operating one of the leading internet logistics portals, www.myLogistics.net. The offer is comprised of numerous free services such as daily news concerning logistics.

Unique logistics platform AX4

Through the logistics platform AX4 enterprises can exchange logistics data and use applications for order processing on a worldwide basis. A universal interface is capable of linking the most different ERP systems of the parties involved without enforcing amendments in the respective programs. At the same time AX4 offers access to various applications ranging from order management via shipment tracing up to freight invoicing and vast reporting functions. The AX4 applications support all parties involved in the supply chain with their tasks and extend their options in controlling logistics processes.

Ready-made or individual software development

The AX4 platform´s applications are flexibly adaptable to the single customers´ demands. With highly qualified own software development staff AXIT also programs completely individual software solutions for the support of their customers´ logistics processes.

Logistics and IT know how

AXIT, founded in 1999, is currently employing a total of 60 staff. The logistics team in the Frankenthal near Mannheim is comprised of experienced experts providing well-founded logistics know how, thus guaranteeing the offered services´ proximity to practice. With AXIT Polska in Wroclaw the company provides a highly qualified software development team, specialised in web-based applications and object-oriented technologies.

Awards and References

Lastly AXIT has won the special-award of “Innovative Dienstleistungen des Landes Rheinland-Pfalz 2003”, in the year 2002 the “Cooperation-Award Transport & Logistik” and has been nominated for the “elogistics@ward”.

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Top References among the leading players in logistics, industry and trade, e.g. Schenker, Wincanton, DHL, Uni-Data, Fiege, Pierburg, Schmitz Cargobull (automotive industry), BASF, Merck, Dystar (chemical industry) or Gerry Weber (textile industry).

We will be pleased to inform you about all details of our company and services - contact us any time:

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Phone: +48 (71) 3467930 or sales@axit.de.

Service	Description	Information systems providing the service		Information systems providing the service	
		Stockway	Functional description	Procomp	Functional description
ContractMgmt	Management of contracts for logistics services.	Trackway	Reference documents to contracts can be picked up from Trackway (decentralized) system.	Rahti®	Basic Registers include Contract Management, which handles both the buying and selling contracts.
EnvDataMgmt	Maintenance of information on the condition of the route network.	Trackway	Maintenance of routeinformation. Data can be received and forwarded.		
ExceptionMgmt	Management of exception data, assessment of the effects of the exceptions.	Trackway	Data can be forwarded and distributed.	Rahti®	Exception data is reported for example through the route coordination application and reports.
ExceptionReceipt	Receipt of exception data. Combining exception data with transport data.	Trackway	Data can be forwarded and distributed. Data cannot be interpreted but it can be compared to the reference data existing.		
GoodsAcceptanceMgmt	The service implements procedures for handling information related to the acceptance of goods. Combines shipment data and exception data. Handles condition information for goods. Delivers exception data to ExceptionMgmt and ReclamationMgmt. Production planning and management for receipt of goods.	Trackway	Data can be forwarded and distributed. Data cannot be interpreted but it can be compared to the reference data existing.		
GoodsReleaseMgmt	Management of goods release data.	Trackway	Data can be forwarded and distributed. Data cannot be interpreted but it can be compared to the reference data existing.		
HandlingInstructionsMgmt	The service manages handling instructions for goods.	Trackway	Handling instructions can be linked to product data.	Rahti®	Handling instructions can be written to the Goods Register and are there transferred to other applications. Handling instructions can also be attached directly to order in Order Management.
InfraMaintTasks	Management of up-to-date information on road transport network maintenance operations.				
LicenceMgmt	The Service manages licences for transport operations. The licences can be for the operator or for a single transport.				
LoadingMgmt	Management of loading data. Manages vehicle loading plans.			Rahti®	Route Coordination -application manages the loading data and the vehicle loading plans can also be done there. With the help of Rahti® Mobile, this data can be transferred between the vehicle and the office.

LogisticsOperatorMgmt	Manages a pool of logistics operators. Handles contacts with the operators. Supply chain break-up between the operators and information delivery to operators.	Trackway	Data can be received, linked to other information, forwarded and distributed.	Rahti®	The application for managing the information of subcontractors of logistics operators. Information can be delivered for example with e-mail or RahtiWeb solution.
MapServ	Management of digital maps.			Rahti®	Digital maps can be utilized in Route Coordination.
OrderMgmt	The service manages transport orders.			Rahti®	Transport order can be done and managed in Order Management -application. These can be directly transferred from another system or come through RahtiWeb or Rahti® Mobile solutions.
OrderReceipt	Receipt of transport orders and advance orders.			Rahti®	Order Management -application can receive orders froma other systems, from the applications run in vehicles or through RahtiWeb -solution.
ParcelHierarchyMgmt	A general purpose service for the management contents. Handles contents of parcels, shipments and vehicles so that transported goods can be identified at each instance.	Trackway	Data can be received, linked to other information, forwarded and distributed.		
PartyIdentityMgmt	The service implements the identification of parties involved in the transport event.	Trackway	Data can be received, linked to other information, forwarded and distributed. Digital signing.	Rahti®	The subcontracting services manages the pool of other parties involved. This identificates the used subcontracter or other parties in the other applications of the system.
ProductIdentification	The product identification service produces product id's. This can be e.g. a RFID or a bar code in the product.	Trackway	Data can be received, linked to other information, forwarded and distributed.		
ProductionMgmt	Management of production.			Rahti®	Is operation control system for transport and logistics companies. Manages the production of the service.
ProductListMgmt	Management of product lists.			Rahti®	Basic Registers include product application, which manages the information given from a product and lists the products inside the register.
ProductMgmt	Management of product data.	Trackway	Data can be forwarded and distributed.	Rahti®	Basic Registers include product application, which manages the information given from a product.
ReclamationMgmt	Management of reclamations. The service receives information from GoodsAcceptanceMgmt to create reclamations.	Trackway	Data can be forwarded and distributed.	Rahti®	Management of Reclamations is included in the system. It identifies and attaches the reclamation to a service handled in the system.

ResourceMgmt	The service manages data about resources needed in the production of logistics services. The resources include vehicles, personnel, locations etc.			Rahti®	Basich Registers include applications for handling the information about vehicles, personnel, locations, customers etc.
ResponsibilityMgmt	Verification of the transfer of responsibility over the shipment between two parties. Identifies the parties and registers the transfer of responsibility.	Trackway	Data can be forwarded and distributed. System identifies the parties, acknowledge receipt and delivery of shipment.	Rahti®	The service can be divided in different partial shipments, which are handled by different parties. These parties are identified and registered as handlers of the certain service in the supply chain.
RiskTrLicenseMgmt	Transport licence register service organised according to operator and vehicle type.			Rahti®	Products can have special requirements for handling or because of the legal issues. These requirements are compared to the features of the vehicle and if there is a mismatch, the user is notified.
RiskTrTracking	Risk transport tracking system. Offers risk transport identification and tracking services and data transfer services.	Trackway	System can report about a risky transport.		
RouteMgmt	Management of routes and route information. Route information contains data about logistics services offered for a leg and other data relevant for planning.			Rahti®	Management of routes makes it possible to store the constantly driven routes as plans in the system.
ShipmentMgmt	Management of shipments.	Trackway	Data can be forwarded and distributed.	Rahti®	Order Management, Route Coordination and Freight Booking all take care of the management of shipments in the different stages of the service delivered to the customers.
SupplyChainMgmt	Management of the supply chain including planning of the whole supply chain, legs, operators, time tables. This service is responsible for adjusting the transport plan during the transport if exception events disrupt the plan.				
TimetableMgmt	The service manages timetables for different logistics services.			Rahti®	Basic Registers have an application for handling the informaton and timetables of the logistics services.
TrackingDataMgmt	Receipt, handling and delivery of tracking data.	Trackway	Data can be received, linked to other information, forwarded and distributed.	Rahti®	Route Coordination receives the tracking data from the vehicle application Rahti® Mobile. The user can utilize the information in an office solution or in the vehicle. The tracking data can be delivered in a map format or as text information.

TrackingDataMonitoring	In-vehicle tracking data monitoring, data collection and delivery.	Trackway	Data can be received, linked to other information, forwarded and distributed.	Rahti®	Route Coordination receives the tracking data from the vehicle application Rahti® Mobile. The user can utilize the information in an office solution or in the vehicle. The tracking data can be delivered in a map format or as text information.
TrackingTargetCreation	The service handles tracking requests. Receives control data required for tracking and creates a tracking object.	Trackway	Data can be received, linked to other information, forwarded and distributed.	Rahti®	Through Route Coordination and Rahti® Mobile, the tracking requests can be made.
TrafficData	Management of up-to-date traffic situation data.				
TransportPlanMgmt	The transport plan management service gathers information about products offered by logistics service providers and builds the supply chain for the transport. It creates orders for logistics services.				
TransshipmentMgmt	Management of transshipment data. Handling of shipment positional and environmental data during transshipment, management transshipment activities.				
UnloadingMgmt	Management and planning of unloading activities.			Rahti®	Route Coordination is the application, in which the user can manage and plan of unloading activities.
WarehouseMgmt	Management of warehousing data. Handling of shipment positioning and environmental data during storage, management of activities in the warehouse.				
VAServicesMgmt	The service manages data about value-added services of goods. Keeps track of goods and services applied to them. Controls and manages the production of value-added services.				
VehicleIdentification	The service provides vehicle identification services. This service can be situated for instance in a wireless device in the vehicle.	Trackway	Data can be received, linked to other information, forwarded and distributed.	Rahti®	Mobile includes the identification of the vehicle.
VehicleMonitoring	A service for the monitoring and identification of vehicles.			Rahti®	Rahti® and Rahti® Mobile identify the vehicles. Rahti® receives the messages from the vehicle and identifies the vehicle.

VehiclePositioning	Positioning service for vehicles. Combines positioning data from the vehicle with digital map information.			Rahti®	Rahti® Mobile includes the positioning services. It collects the positioning data from the vehicle and this data is utilized either in the office map solution or directly in the vehicle device.
VehRegisterServ	Official vehicle register services offered by the authorities. Vehicle register data transport classifications etc.				
WirelessChannel (Wireless IT)	The wireless channel transfers data produced by wireless devices.			Rahti®	Works as a service, which transfers the data produces by the device in the vehicle. The data is transferred to the service of the service provider and from there to the office system.
WirelessDevice (Wireless IT)	A wireless device in the vehicle. Can send out vehicle positioning data.			Rahti®	Rahti® Mobile can be used in several different devices. It is a software solution which is not dependent on a certain device.

Service	**Description**	**Information systems providing the service**		**Information systems providing the service**	
		AtBusiness	**Functional description**	**Norway**	**Functional description**
ContractMgmt	Management of contracts for logistics services.			Various unidentified shipper-specific systems	Contracts for goods delivery is managed by the shippers.
EnvDataMgmt	Maintenance of information on the condition of the route network.			(No system: Banedatabanken (developed by CN))	JBV is responsible. Information is updated by regional offices and stored centrally in Banedatabanken (check the Network Statement at www.jernbaneverket.no).
ExceptionMgmt	Management of exception data, assessment of the effects of the exceptions.			TTS, Togtelegramsystemet, developed by CN (NSB and CN have terminals)	Reports with a receipt and operational order (exception) of the train data are sent by NSB, CargoNet or local JBV units to JBV.
ExceptionReceipt	Receipt of exception data. Combining exception data with transport data.			TTS, Togtelegramsystemet, developed by CN (NSB and CN have terminals)	Reports with a receipt and operational order (exception) of the train data are sent by NSB, CargoNet or local JBV units to JBV.

GoodsAcceptanceMgmt	The service implements procedures for handling information related to the acceptance of goods. Combines shipment data and exception data. Handles condition information for goods. Delivers exception data to ExceptionMgmt and ReclamationMgmt. Production planning and management for receipt of goods.			Paper and data entry to CN's own system – GTS, Gods Transport System	Transport still uses paper and fax. Many small companies.
GoodsReleaseMgmt	Management of goods release data.	PortNet	Terminal declaration (Maritime)	GTS, Gods Transport System (developed by CN) and KSD, Kallin Seterberg Data	GTS sends consignment notes to KSD for registration with customs.
HandlingInstructionsMgmt	The service manages handling instructions for goods.	PortNet	Can be described as freeform text per consignment (Maritime)	GTS, Gods Transport System (developed by CN), paper	Dangerous goods must be reported. Otherwise CN can only handle complete containers or trucks.
InfraMaintTasks	Management of up-to-date information on road transport network maintenance operations.			Autoroute, developed by Microsoft	For truck distribution.
LicenceMgmt	The Service manages licences for transport operations. The licences can be for the operator or for a single transport.			(No system: Paper documents of track access agreements (sportilgansavtaler))	Regulates access to the rail network. Track access agreement or special permission is given by JBV for high-risk transport or transportation of goods exceeding size or weight limits.
LoadingMgmt	Management of loading data. Manages vehicle loading plans.	PortNet	Vessel Cargo manifest (Maritime). No detailed loading plan.	GTS, Gods Transport System (developed by CN)	Necessary with manual control in addition.
LogisticsOperatorMgmt	Manages a pool of logistics operators. Handles contacts with the operators. Supply chain break-up between the operators and information delivery to operators.			(No system: CESAR)	EU project for the UIRR, see www.cesar-online.com.
MapServ	Management of digital maps.			GTPS, Goods Transport Positioning System (developed by CN)	GTPS is GPS positioning for locomotives (can be seen on www.cargonet.no).
OrderMgmt	The service manages transport orders.			Many systems for speditors	Too much competition for one portal. Each company offers a complete service using partners.
OrderReceipt	Receipt of transport orders and advance orders.			EDI, paper contracts, GTS, Gods Transport System (developed by CN) and FAKTA (invoicing system)	Longterm agreements registered in advance 6 months at a time. Otherwise entered in CN's own production system.
ParcelHierarchyMgmt	A general purpose service for the management contents. Handles contents of parcels, shipments and vehicles so that transported goods can be identified at each instance.	PortNet	Contents of transport unit (e.g. container) is seen. No identifcation of consignor's/consignee's order-/batch number. Transport unit is the most detail level the PortNet identifies.	GTS, Gods Transport System (developed by CN)	No partloads registered. Customers are responsible for this.

PartyIdentityMgmt	The service implements the identification of parties involved in the transport event.	PortNet	Vessel Cargo manifest (Maritime) consignor and consignee per consignment as freeform text. No reqister of parties.	GTS, Gods Transport System (developed by CN) and GTPS, Goods Transport Positioning System (developed by CN)	
ProductIdentification	The product identification service produces product id's. This can be e.g. a RFID or a bar code in the product.			GTS, Gods Transport System (developed by CN)	List of contents created by shippers.
ProductionMgmt	Management of production.			GTS, Gods Transport System (developed by CN)	TOCs administer freight train production, shippers administer goods delivery.
ProductListMgmt	Management of product lists.			(No system: Maintenance of registers)	
ProductMgmt	Management of product data.			(No system: Maintenance of registers)	
ReclamationMgmt	Management of reclamations. The service receives information from GoodsAcceptanceMgmt to create reclamations.			(No system: Manually registered)	Damaged and lost shipments – no system yet found.
ResourceMgmt	The service manages data about resources needed in the production of logistics services. The resources include vehicles, personnel, locations etc.			Excel, GTPS, Goods Transport Positioning System (developed by CN)	Driver info in Excel. Locomotives in GTPS.
ResponsibilityMgmt	Verification of the transfer of responsibility over the shipment between two parties. Identifies the parties and registers the transfer of responsibility.			(No system: Ubergabeschein (UIRR document))	
RiskTrLicenseMgmt	Transport licence register service organised according to operator and vehicle type.			Internal system at the JBT	
RiskTrTracking	Risk transport tracking system. Offers risk transport identification and tracking services and data transfer services.			TTS, Togtelegramsystemet, developed by CN (NSB and CN have terminals)	Reports with relevant information are sent by NSB, CN or local JBV units to JBV.
RouteMgmt	Management of routes and route information. Route information contains data about logistics services offered for a leg and other data relevant for planning.	PortNet	Maritime voyage	Trainplan, GTS, Gods Transport System (developed by CN) and GTPS, Goods Transport Positioning System (developed by CN)	Trainplan from JBV is reworked for our routes. Paper from other countries. Trainplan is transferred electronically to CN's own systems.
ShipmentMgmt	Management of shipments.			GTS, Gods Transport System (developed by CN) and GTPS, Goods Transport Positioning System (developed by CN)	Tracking and recording.

SupplyChainMgmt	Management of the supply chain including planning of the whole supply chain, legs, operators, time tables. This service is responsible for adjusting the transport plan during the transport if exception events disrupt the plan.			Manual for truck distribution and out of Norway. Railroutes in GTS, Gods Transport System (developed by CN).	
TimetableMgmt	The service manages timetables for different logistics services.	PortNet	Vessel time schedules at the port and passing times at fixpoints on sea. ETA, ATA, ETD, ATD, ATP.	System is called RutePlanSystemet and the software is called TrainPlan.	Software is provided by Vossloh IT (York, UK).
TrackingDataMgmt	Receipt, handling and delivery of tracking data.			CN tracks whole trains in GTPS, Goods Transport Positioning System (developed by CN).	GTPS is GPS positioning for locomotives (can be seen on www.cargonet.no).
TrackingDataMonitoring	In-vehicle tracking data monitoring, data collection and delivery.				
TrackingTargetCreation	The service handles tracking requests. Receives control data required for tracking and creates a tracking object.				
TrafficData	Management of up-to-date traffic situation data.	PortNet	Maritime voyage	TIOS (TogInformasjon og OppfølgingsSystem), developed by JBV.	This is an internal system. It is similar to Landets Puls at www.bane.dk.
TransportPlanMgmt	The transport plan management service gathers information about products offered by logistics service providers and builds the supply chain for the transport. It creates orders for logistics services.				CN relies on partners.
TransshipmentMgmt	Management of transshipment data. Handling of shipment positional and environmental data during transshipment, management transshipment activities.				
UnloadingMgmt	Management and planning of unloading activities.			Norwegian terminals in GTS, Gods Transport System (developed by CN).	International terminals by agreement (can be difficult).
WarehouseMgmt	Management of warehousing data. Handling of shipment positioning and environmental data during storage, management of activities in the warehouse.			(No system: CN have depots, reporting dangerous goods, customs depots for release.)	
VAServicesMgmt	The service manages data about value-added services of goods. Keeps track of goods and services applied to them. Controls and manages the production of value-added services.			(No system: No central register or specific information line exists.)	

VehicleIdentification	The service provides vehicle identification services. This service can be situated for instance in a wireless device in the vehicle.	PortNet	Identification of vessels by name, callsign, imo-lloyd, mmsi. Automatical connection to VTS and AIS systems.	GTPS, Goods Transport Positioning System (developed by CN)	GTPS is GPS positioning for locomotives (can be seen on www.cargonet.no).
VehicleMonitoring	A service for the monitoring and identification of vehicles.	PortNet	Identification of vessels by name, callsign, imo-lloyd, mmsi. Automatical connection to VTS and AIS systems.	TIOS (TogInformasjon og OppfølgingsSystem), developed by JBV	This is an internal system. It is similar to Landets Puls at www.bane.dk.
VehiclePositioning	Positioning service for vehicles. Combines positioning data from the vehicle with digital map information.			GTPS, Goods Transport Positioning System (developed by CN)	GTPS is GPS positioning for locomotives (can be seen on www.cargonet.no).
VehRegisterServ	Official vehicle register services offered by the authorities. Vehicle register data transport classifications etc.	PortNet	Vessels	(No system: No central register exists)	There are plans to create a vehicle register and it will most likely be administered by the JBT.
WirelessChannel (Wireless IT)	The wireless channel transfers data produced by wireless devices.	PortNet	Wireless vessel time schedule service	(No system: Check the Network Statement at www.jernbaneverket.no.)	The network was built and is is maintained by BaneTele, a public company. The agreement with BaneTele is adminstered by the Ministry of Trade and Industry.
WirelessDevice (Wireless IT)	A wireless device in the vehicle. Can send out vehicle positioning data.	PortNet	Automatical connection to VTS and AIS systems	GTPS, Goods Transport Positioning System (developed by CN)	GTPS is GPS positioning for locomotives (can be seen on www.cargonet.no).

Service	**Description**	**Information systems providing the service**		**Information systems providing the service**		**Information systems providing the service**	
		Czech Railways (CEVIS)	**Functional description**	**AXIT**	**Functional description**	**JERID**	**Functional description**
ContractMgmt	Management of contracts for logistics services.	ISOC	Information System of Commercial Activity involving realized transactions and observance of carriage contracts.	AX4	Recording contracts, management of the contract database (supplier, customer, logistics service provider) counting partial agreements (call off) in proportion to framework agreements.	JBOX (Componenet: ERIC/prices; OPTIM)	Management of the process of direct and general requirements for freight transport. Price optimisation mechanism. JBOX connects forwarders and customers. Request for quota.
EnvDataMgmt	Maintenance of information on the condition of the route network.					(Component: ERIC/Stations, Distances, LineCategories)	Information on railway network. Railway stations database. International and domestic distances in rail transport. Enabled weight on axle and on standard wagon meter.
ExceptionMgmt	Management of exception data, assessment of the effects			AX4	The system follows the schedule and alerts the exceptions; full SCEM		

	of the exceptions.				functionality.		
ExceptionReceipt	Receipt of exception data. Combining exception data with transport data.			AX4	Support for the process of monitoring if the process is correct and confirmation of particular stages in implementation of the accepted scenario, support for electronic backup of accompanying documents.		
GoodsAcceptanceMgmt	The service implements procedures for handling information related to the acceptance of goods. Combines shipment data and exception data. Handles condition information for goods. Delivers exception data to ExceptionMgmt and ReclamationMgmt. Production planning and management for receipt of goods.	CDZ	Central Consignment Information System; information on goods accepted are put in the system and the information is distributed to other systems, e.g. accounting systems; there plans to automise the consignment note handling.	AX4	Support for the process of placing orders and tracking data related to products in the order – in particular, availability of the products at the time of placing the order, detailed descriptions of the products in the order, delivery data – dates and detailed transport conditions for hazardous goods Customers are informed automaticly.	ERIC	Consignment Data Management. Consignment notes data and forms filling, printing, archieving and e-sending (import, export). Checking of loading restrictions in the destination station at the acceptance of goods. ERIC/ConsignmentNote; LoadingRestrictions. Works between systems that have agreed the format.
GoodsReleaseMgmt	Management of goods release data.	CDZ	Central Consignment Information System; information on goods accepted are put in the system and the information is distibuted to otehr systems, e.g. accounting systems; there plans to automise the consignment note handling.	AX4	Support for the process of releasing data on products in the process and in transportation, aggregation and depositing of data concerning particular product lines. Check the status of the transporation and inform consignee.		
HandlingInstructionsMgmt	The service manages handling instructions for goods.	CEVIS	Central Wagon Information System CEVIS cointains information how to load wagons; this is mainly static information.	AX4	Support for full exchange of information concerning the deliverables, option of tracking data on particular product lines and presenting data on particular product lines. Client can send a request to the system. System automaticly informs all partners.	ERIC/RID	Direct data relation to the list of goods and list of dangerous goods with information on handling instructions. ERIC/RID, ConsignmentNote. Works between systems that have agreed the format.
InfraMaintTasks	Management of up-to-date information on road transport network maintenance operations.						

LicenceMgmt	The Service manages licences for transport operations. The licences can be for the operator or for a single transport.						
LoadingMgmt	Management of loading data. Manages vehicle loading plans.	UDIV	Central Wagon Management System for optimizing of the fleet utilization. System contains loading information.	AX4	Support for the process of organizing the loading, management of data on forwarding orders, printout of lading documents, distance tables, compiling orders and transferring them to operators, based e.g. on zip codes.		
LogisticsOperatorMgmt	Manages a pool of logistics operators. Handles contacts with the operators. Supply chain break-up between the operators and information delivery to operators.			AX4	Support for logistic operators in taking orders, routing them, cooperation with carriers (Leadl Logistic Provider), support for the process of transferring tracking data and printing all the documents related to transportation. Operator can send a request to system. Helps finding the capacity.		
MapServ	Management of digital maps.					RailMap	European electronic map (geographic relief, settlements, roads, railways etc.). Accurate location of all railway stations open for freight transport. Advanced searching mechanism.
OrderMgmt	The service manages transport orders.	UDIV	UDIV; wagons are ordered through the website and wagons are reserved from wagon management systems.	AX4	Full support for the process of placing forwarding orders, attaching tracking information and printing all the transportation documents, support of bar codes, creating logistic labels, routing of dispatches. All documents and labels can be printed automaticly.	JBOX (Componenet: ERIC/prices; OPTIM)	Management of the process of direct and general requirements for freight transport. Price optimisation mechanism. JBOX connects forwarders and customers. Request for quota.
OrderReceipt	Receipt of transport orders and advance orders.	UDIV	UDIV; wagons are ordered through the website and wagons are reserved from wagon management systems.	AX4	Full support for the process of creating and transferring the forwarding order.	JBOX (Componenet: ERIC/prices; OPTIM)	Management of the process of direct and general requirements for freight transport. Price optimisation mechanism. JBOX connects forwarders and customers. Request for quota.

ParcelHierarchyMgmt	A general purpose service for the management contents. Handles contents of parcels, shipments and vehicles so that transported goods can be identified at each instance.	CDZ	CDZ; the system is able to relate consignment information to wagons and trains.	AX4	Support for the process of collecting, aggregating and presenting information characteristic of particular dispatches. System can send SCM info as a part of e-documents and printed on labels.		
PartyIdentityMgmt	The service implements the identification of parties involved in the transport event.	CDZ	Central Consignment Information Systems CDZ contains information about connecting rail operators.	AX4	Monitoring of all the milestones of processes in the supply chain, support for SCEM mechanism. Client can know which company is in process of the transport.		
ProductIdentification	The product identification service produces product id's. This can be e.g. a RFID or a bar code in the product.	CDZ	CDZ contains information on goods inside transport unit according UIC coding NHM.				
ProductionMgmt	Management of production.						
ProductListMgmt	Management of product lists.			AX4	Support for the process of management and presentation of data concerning products. It is possible to create a list of products/contract, which can be put into the system.	(Component: ERIC/NHM)	Harmonised nomenclature of goods in the international transport including the code and full name in 10 European languages. Searching and translating mechanism.
ProductMgmt	Management of product data.			AX4	Support for the process of management and presentation of data concerning products. System can follow up; it requires a subsystem, which sends the data to the system.	(Component: ERIC/NHM, ConsignmentNote)	Harmonised nomenclature of goods connected with data and information on the product in the consignment note.
ReclamationMgmt	Management of reclamations. The service receives information from GoodsAcceptanceMgmt to create reclamations.	CDZ	CDZ is communicating with information systems of accounting department automatically to take into account reclamations; the reclamation is feed manually to accounting.	AX4	Presentation and storing of information used as the basis of service-related complaints. Directly send to the operator.		
ResourceMgmt	The service manages data about resources needed in the production of logistics services. The resources include vehicles, personnel, locations etc.	UDIV	Central wagon Information System of Czech Railways. UDIV manages wagon resources.			(Component: ERIC/Stations, Wagons)	Huge databases about resources needed in the production of logistics services includes locations (railway stations) and railway wagons.

ResponsibilityMgmt	Verification of the transfer of responsibility over the shipment between two parties. Identifies the parties and registers the transfer of responsibility.						
RiskTrLicenseMgmt	Transport licence register service organised according to operator and vehicle type.					(Component: ERIC/RID)	Transport and loading conditions and list of dangerous goods in rail (RID) and road (ADR) transports in German, Polish and Czech languages.
RiskTrTracking	Risk transport tracking system. Offers risk transport identification and tracking services and data transfer services.	CEVIS	Contains the information how to handle and load dangerous goods.				
RouteMgmt	Management of routes and route information. Route information contains data about logistics services offered for a leg and other data relevant for planning.	SENA	Contains information about tracks and rail routes and planned timetables.			(Component: ERIC/Stations, LineCategories)	Information on railway network. Railway stations database with logistic services and restrictions. Railway routes categories in the international transport.
ShipmentMgmt	Management of shipments.	CDZ	Central Consignment Information Systems CDZ contains all information about consignments including relations to wagons.	AX4	Full support for management of orders, support for the process of placing orders, conversion and further transfers. Possible to organize transport and combine the operators separately and together.		
SupplyChainMgmt	Management of the supply chain including planning of the whole supply chain, legs, operators, time tables. This service is responsible for adjusting the transport plan during the transport if exception events disrupt the plan.			AX4	Full support for the process of management of the complex supply chain. Supports from the ordering point to the delivery.		
TimetableMgmt	The service manages timetables for different logistics services.						

TrackingDataMgmt	Receipt, handling and delivery of tracking data.	CEVIS	Follows the consignment movements.	AX4	Full support for the process of monitoring deliveries from the moment when the order is placed, its completion by submitting a forwarding order, until the moment of delivery to the final customer, including intermodal transport. System collects checking info, makes the comparison, and the infor to partners.		
TrackingDataMonitoring	In-vehicle tracking data monitoring, data collection and delivery.			AX4	Extension of the function of tracking information management with the function of proactive monitoring of the process and the function of informing about anomalies. System collects checking info, makes the comparison, and the infor to partners.		
TrackingTargetCreation	The service handles tracking requests. Receives control data required for tracking and creates a tracking object.	CEVIS	Follows the consignment movements.	AX4	Support for the process of deliveries in terms of critical points of the chain and monitoring if particular stages are performed correctly. Possible to organize supply chain as a "mile stones" and automatically checking for correct realization. Sends automaticly rapports to partners.		
TrafficData	Management of up-to-date traffic situation data.	ISOR	Train traffic management; connects to CEVIS system and uses CEVIS information.				
TransportPlanMgmt	The transport plan management service gathers information about products offered by logistics service providers and builds the supply chain for the transport. It creates orders for logistics services.			AX4	Scheduling forwarding orders, accompanying documentation, records of available logistic services offered by operators. Info about product; not support totally to make the route totally.		
TransshipmentMgmt	Management of transshipment data. Handling of shipment positional and environmental data during transshipment, management	CDZ and CEVIS	CDZ and CEVIS contain information about the location of transshipment.	AX4	Support for the process of exchanging data on forwarding orders for the whole duration of the process, exchange, aggregation and presentation of data. Supports as a part of		

	transshipment activities.				the shipment.		
UnloadingMgmt	Management and planning of unloading activities.			AX4	Support for processes of unloading, tracking if the process is implemented correctly in terms of time and quality of deliveries. Client is informed immediately when the info is put into system.		
WarehouseMgmt	Management of warehousing data. Handling of shipment positioning and environmental data during storage, management of activities in the warehouse.	DTNP	Freight Transportation Data Market (not mapped on conceptual architecture)				
VAServicesMgmt	The service manages data about value-added services of goods. Keeps track of goods and services applied to them. Controls and manages the production of value-added services.						
VehicleIdentification	The service provides vehicle identification services. This service can be situated for instance in a wireless device in the vehicle.	IS UZV	Information system of the Central Clearing Department of Wagons calculating the wagon toll				
VehicleMonitoring	A service for the monitoring and identification of vehicles.	CEVIS	Central wagon Information System of Czech Railways. CEVIS communicates with train control systems.				
VehiclePositioning	Positioning service for vehicles. Combines positioning data from the vehicle with digital map information.	CEVIS	Central wagon Information System of Czech Railways. CEVIS communicates with train control systems.			ERIC/Railmap	Display of the wagon/consignment position in the electronic map. Received information on the position could be either the railway station number or coordinate from GPS (system S42 or WGS84).
VehRegisterServ	Official vehicle register services offered by the authorities. Vehicle register data transport classifications etc.	KNV	Wagon Database. System communicates with CEVIS and CD and accounting system and system of			(Component: ERIC/Wagons)	Railway wagon catalogue (type, code, description, construction, weight, length, loading parameters, photo, picture, etc.).

			maintenance. System does changes automatically.				
WirelessChannel (Wireless IT)	The wireless channel transfers data produced by wireless devices.						
WirelessDevice (Wireless IT)	A wireless device in the vehicle. Can send out vehicle positioning data.						

Appendix I: IT Systems Mapped to Services

IS Services \ IT Systems	Trackway (Stockway)	Rahti® (Procomp)	PortNet (AtBusiness)	Norway	Czech Railways CD	AXIT (Poland)	JERID
TransshipmentMgmt					X	X	
WarehouseMgmt							
ProductMgmt	X	X				X	
ProductListMgmt		X				X	
ProductIdentification	X			X	X		
ProductionMgmt		X		X			
SupplyChainMgmt				X		X	
ParcelHierarchyMgmt	X		X	X	X	X	
TrackingTargetCreation	X	X			X	X	
TrackingDataMonitoring	X	X				X	
TrackingDataMgmt	X	X		X	X	X	
ReclamationMgmt	X	X			X	X	
UnloadingMgmt		X		X		X	
ExceptionReceipt	X			X		X	
ExceptionMgmt	X	X		X		X	
PartyIdentityMgmt	X	X	X	X	X	X	
ShipmentMgmt	X	X		X	X	X	
GoodsReleaseMgmt	X		X	X	X	X	
VAServicesMgmt							
LoadingMgmt		X	X	X	X	X	
WirelessIT		X	X				
HandlingInstructionsMgmt	X	X	X	X	X	X	X
VehicleIdentification	X	X	X	X	X		
VehicleMonitoring		X	X	X	X		
VehiclePositioning		X		X	X		X
GoodsAcceptanceMgmt	X			X	X	X	X
TimetableMgmt				X			
OrderReceipt		X		X	X	X	X
OrderMgmt		X		X	X	X	X
ResourceMgmt		X		X	X		
RouteMgmt		X	X	X	X		
LogisticsOperatorMgmt	X	X				X	
TransportPlanMgmt						X	
TimetableMgmt		X	X	X			
ResponsibilityMgmt	X	X					
ContractMgmt	X	X		X	X	X	X
LicenceMgmt							
VehRegisterServ			X		X		
RiskTrTracking	X			X	X		
RiskTrLicenseMgmt		X		X			
InfrastructureMaintTasks				X			
TrafficData			X	X	X		
MapServ		X		X			X
EnvDataMgmt	X						

Appendix J: Connection of Process Components and Actors

ID	Tarkki	MeriArk	Component	Consignee	Consignor	Authorities	Infrastructure manager (road)	Terminal operator (truck)	Trucking company	Fleet manager (container)	Supply chain service provider (road)	Infrastructure manager (rail)	Terminal operator (rail)	Railway carrier	Railway undertaking	Fleet manager (wagon)	Supply chain service provider (rail)	Infrastructure manager (water)	Terminal operator (water)	Shipping line	Fleet manager (water)	Supply chain service provider(water)
1.1.	1.1.		Shipment		X																	
1.2.	1.2.		Transport						X					X	X					X		
1.3.	1.3.		Transshipment					X					X						X			
1.4.	1.4.		Receipt	X																		
2.1.			Transport planning and booking	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
3.1.			Fleet planning and management							X						X					X	
3.2.			Infrastructure and traffic management				X					X						X				
3.3.	3.2.		Transport operations management						X					X						X		
3.4.	3.3.		Transshipment operations management					X					X						X			
3.5.	3.4.		Reception operations management	X																		
4.1.			Supply chain and transport tracking and tracing								X						X					X
6.1.			Supply chain planning (tactical)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6.2.			Supply chain planning (strategical)								X						X					X

Transport planning and booking

ID	Tarkki		Component	Consignee	Consignor	Authorities	Infrastructure manager (road)	Terminal operator (truck)	Trucking company	Fleet manager (container)	Supply chain service provider (road)	Infrastructure manager (rail)	Terminal operator (rail)	Railway carrier	Railway undertaking	Fleet manager (wagon)	Supply chain service provider (rail)	Infrastructure manager (water)	Terminal operator (water)	Shipping line	Fleet manager (water)	Supply chain service provider(water)
2.1.1.	2.2.1.		Transport order handling								X						X					X
2.1.2.	2.2.2.		Consignor logistics planning		X																	
2.1.3.	2.2.3.		Resource booking								X						X					X
2.1.4.	2.2.4.		Consignee logistics planning	X																		
2.1.5.	2.2.5.		Licences and declarations	X	X						X						X					X
2.1.6.	2.2.6.		Management of licences and declarations			X																
5.1.	5.2.		Capacity booking				X					X						X				
5.2.	2.1.3.		Plan refining								X						X					X
5.3.	2.1.4.		Operations planning								X						X					X
5.4.	4.1.1.		Tracking demand determinations								X						X					X
5.5.	3.1.1.		Shipment management		X																	
5.6.	4.2.5.		Transport tracking			X																
5.7.	3.4.1.		Reception management	X																		
5.8.	3.5.1.		Supply chain management								X						X					X
5.9.	3.2.2.		Transport management								X						X					X

Transport vehicles

ID	Tarkki		Component	Consignee	Consignor	Authorities	Infrastructure manager (road)	Terminal operator (truck)	Trucking company	Fleet manager (container)	Supply chain service provider (road)	Infrastructure manager (rail)	Terminal operator (rail)	Railway carrier	Railway undertaking	Fleet manager (wagon)	Supply chain service provider (rail)	Infrastructure manager (water)	Terminal operator (water)	Shipping line	Fleet manager (water)	Supply chain service provider(water)
1.1.1.	1.1.2.		Order release into transport	X	X																	
1.2.1.	1.2.1.		Acceptance of goods into transport						X					X						X		
1.2.2.	1.2.2.		Transfer						X						X					X		
1.2.3.	1.2.3.		Release from transport						X					X						X		
1.3.1.	1.3.1.		Acceptance of goods					X					X						X			
1.3.2.	1.3.2.		Transshipment operations					X					X						X			
1.3.3.	1.3.3.		Order release					X					X						X			
1.4.1.	1.4.1.		Acceptance of goods	X	X																	
1.4.2.	1.4.2.		Unloading and distribution	X	X																	
3.3.1.	3.2.2.		Transport management						X					X						X		
3.4.2.	3.3.2.		Transshipment management					X					X						X			
3.4.1.	3.3.1.		Fleet and resources management						X						X					X		
5.1.			Capacity booking									X						X				
5.10.		2.1.6.	Road/Ship/Train traffic management			X	X											X				
5.11.		2.1.5.	Risk and security measure management			X										X						
5.12.		2.1.9.	Security operations management			X										X						
5.13.		2.1.14.	Check and control operations			X										X						
5.14.		2.1.16.	Taxation			X										X						
5.15.			Maintenance of infrastructure information				X					X						X				
5.16.			Resource booking								X						X					X
5.17.		2.1.2.	Documents' management								X						X					X
5.18.	2.2.5.		Licences and declarations								X						X					X
5.19.		2.1.22.	Invoicing								X						X					X
5.20.			Traffic management and control																			
5.21.			Piloting																			

Connective processes

ID	Tarkki		Component																			
3.1.			Fleet planning and management							X						X					X	
3.2.			Infrastructure and traffic management				X					X						X				
4.1.			Supply chain and transport tracking and tracing								X						X					X
6.1.			Supply chain planning (tactical)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6.2.			Supply chain planning (strategic)								X						X					X

Appendix K: Process Components and Services

ID	Tarkki	Meri-Arkki	Process component	IS Services: EnvDataMgmt	MapServ	TrafficData	InfratsructureMaintTasks	RiskTrLicenseMgmt	RiskTrTracking	VehRegisterServ	LicenceMgmt	ContractMgmt	ResponsibilityMgmt	TimetableMgmt	TransportPlanMgmt	LogisticsOperatorMgmt	RouteMgmt	ResourceMgmt	OrderMgmt	OrderReceipt	TimetableMgmt	GoodsAcceptanceMgmt	VehiclePositioning	VehicleMonitoring	VehicleMgmt	VehicleIdentification	HandlingInstructionsMgmt	WirelessIT	LoadingMgmt	VAServicesMgmt	GoodsReleaseMgmt	ShipmentMgmt	PartyIdentityMgmt	ExceptionMgmt	ExceptionReceipt	UnloadingMgmt	ReclamationMgmt	TrackingDataMgmt	TrackingDataMonitoring	TrackingTargetCreation	ParcelHierarchyMgmt	SupplyChainMgmt	ProductionMgmt	ProductIdentification	ProductListMgmt	ProductMgmt	WarehouseMgmt	TransshipmentMgmt
1.1.	1.1.		Shipment																																														
1.1.1.	1.1.2.		Order release into transport																													X																X	
1.2.	1.2.		Transport																											X																		
1.2.1.	1.2.1.		Acceptance of goods into transport										X																X			X																
1.2.2.	1.2.2.		Transfer			X																	X	X		X													X								
1.2.3.	1.2.3.		Release from transport										X																		X					X												
1.3.	1.3.		Transshipment																			X																									X	
1.3.1.	1.3.1.		Acceptance of goods										X									X												X			X										
1.3.2.	1.3.2.		Transshipment operations																																							X					X	
1.3.3.	1.3.3.		Order release										X																		X			X													
1.4.	1.4.		Receipt																			X												X														
1.4.1.	1.4.1.		Acceptance of goods										X									X												X			X										
1.4.2.	1.4.2.		Unloading and distribution										X									X												X			X										
2.1.			Transport planning and booking											X			X																										X					
2.1.1.	2.2.1.		Transport order handling	X	X		X								X			X	X	X																												
2.1.2.	2.2.2.		Consignor logistics planning	X	X		X																																					X				
2.1.3.	2.2.3.		Resource booking															X	X	X																												
2.1.4.	2.2.4.		Consignee logistics planning															X																											X				
2.1.5.	2.2.5.		Licences and declarations							X	X																																					
2.1.6.	2.2.6.		Management of licences and declarations					X		X	X																																					
3.1.			Fleet planning and management							X						X		X					X	X		X														X	X							X
3.2.			Infrastructure and traffic management			X	X																																									
3.3.	3.2.		Transport operations management															X	X																														
3.3.1.	3.2.2.		Transport management																										X			X			X	X												
3.4.	3.3.		Transshipment operations management															X																														
3.4.2.	3.3.2.		Transshipment management										X									X												X													X
3.4.1.	3.3.1.		Fleet and resources management															X																														
3.5.	3.4.		Reception operations management																																										X			
4.1.			Supply chain and transport tracking and tracing						X				X	X														X		X		X	X					X		X	X	X					
5.1.	5.2.		Capacity booking			X																																										
5.2.	2.1.3.		Plan refining												X				X	X																												
5.3.	2.1.4.		Operations planning												X																																	
5.4.	4.1.1.		Tracking demand determinations																																							X						
5.5.	3.1.1.		Shipment management																													X																
5.6.	4.2.5.		Transport tracking						X														X	X		X		X																				
5.7.	3.4.1.		Reception management																			X					X							X			X										
5.8.	3.5.1.		Supply chain management												X																															X	X	X		
5.9.	3.2.2.		Transport management										X									X												X													X
5.10.		2.1.6.	Road/Ship/Train traffic management			X																	X			X																					
5.11.		2.1.5.	Risk and security measure management					X	X																																							
5.12.		2.1.9.	Security operations management																																												
5.13.		2.1.14.	Check and control operations																																										X		
5.14.		2.1.16.	Taxation																																												
5.15.			Maintenance of infrastructure information				X																																									
5.16.			Resource booking															X																														
5.17.		2.1.2.	Documents' management																																												
5.18.	2.2.5.		Licences and declarations							X	X																																				
5.19.		2.2.22.	Invoicing																																									X			
5.20.			Traffic management and control			X																																									
5.21.			Piloting																																												
6.1.			Supply chain planning (tactical)									X		X		X		X														X					X				X	X			
6.2.			Supply chain planning (strategical)																																									X	X			

Appendix L: Services Distribution Map

IS Services

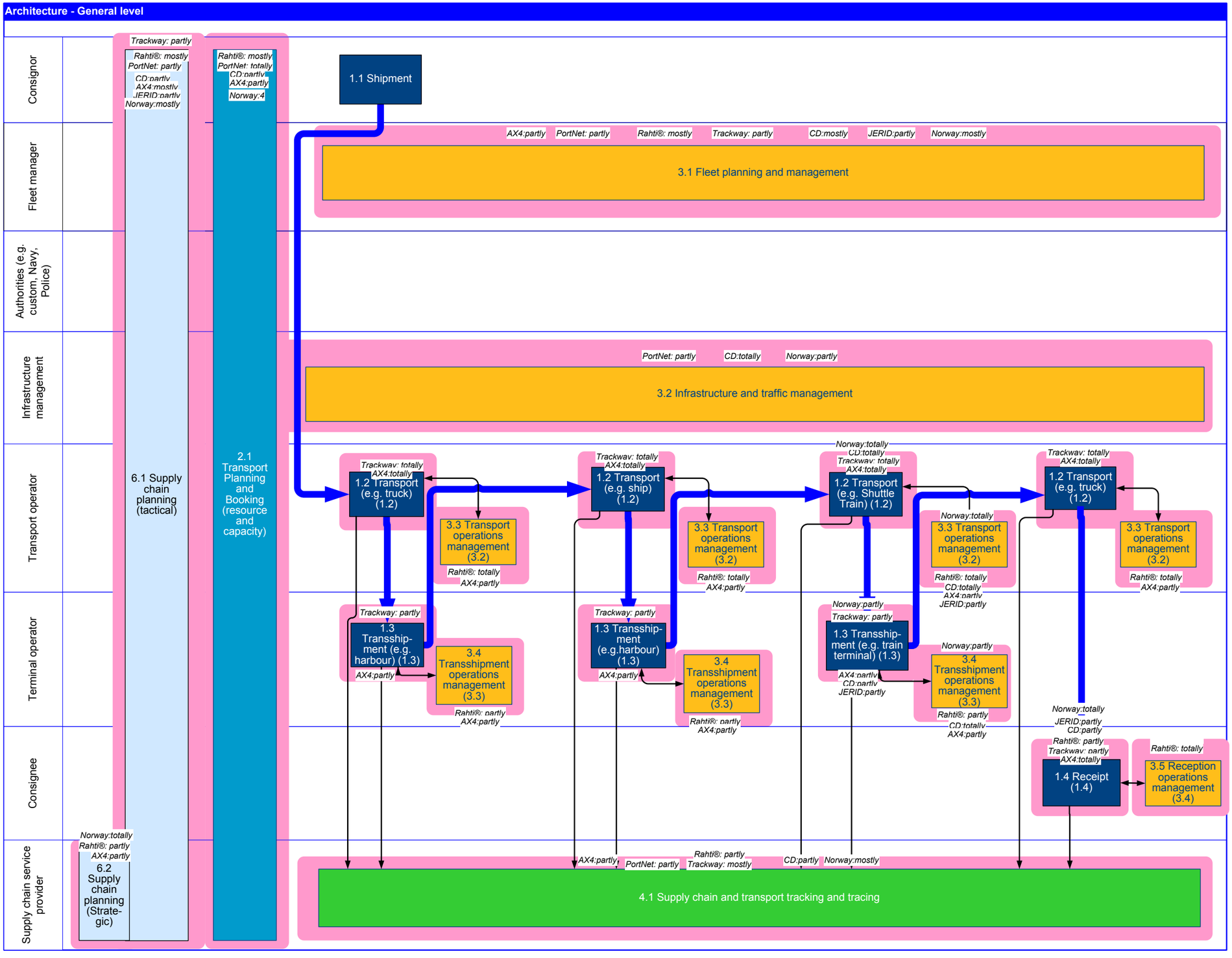
Roles	EnvDataMgmt	MapServ	TrafficData	InfratsructureMaintTasks	RiskTrLicenseMgmt	RiskTrTracking	VehRegisterServ	LicenceMgmt	ContractMgmt	ResponsibilityMgmt	TimetableMgmt	TransportPlanMgmt	LogisticsOperatorMgmt	RouteMgmt	ResourceMgmt	OrderMgmt	OrderReceipt	TimetableMgmt	GoodsAcceptanceMgmt	VehiclePositioning	VehicleMonitoring	VehicleIdentification	HandlingInstructionsMgmt	WirelessIT	LoadingMgmt	YAServicesMgmt	GoodsReleaseMgmt	ShipmentMgmt	PartyIdentityMgmt	ExceptionMgmt	ExceptionReceipt	UnloadingMgmt	ReclamationMgmt	TrackingDataMgmt	TrackingDataMonitoring	TrackingTargetCreation	ParcelHierarchyMgmt	SupplyChainMgmt	ProductionMgmt	ProductIdentification	ProductListMgmt	ProductMgmt	WarehouseMgmt	TransshipmentMgmt
Consignee							PC	X	TRCAJN	TR	RPN		TRA	RPCN	RCN			N	TACJN				TRPACJN					TRACN	TPRACN	TRAN		RAN	TRAC						AN	RN				X	
Consignor	T	RJN		N			PC	X	TRCAJN	TR	RPN		TRA	RPCN	RCN			N	TACJN									TRACN	TPRACN	TRAN			TRAC						AN	RN				X	
Authorities			PCN		RN	TCN	PC	X	TRCAJN		RPN		TRA	RPCN	RCN			N		RCJN	RPCN	TRPCN		RP				TRACN					TRAC						AN	RN		RA			
Infrastructure manager (road)			X	X				X	TRA		R		TRA	R	R			X		R		TR						TRA					TRA						A	R					
Terminal operator (truck)									TRA	TR	R		TRA	R	R			X	TA								TAN	TRA	TRA	TRA			TRA				TA		A	R			X	A	
Trucking company									TRA	TR	R		TRA	R	R	RA		X		R	R	TR			RA		TAN	TRA			TA	RA	TRA		TRA				A	R					
Fleet manager (container)							X		TRA		R		TRA	R	R			X		R	R	TR						TRA					TRA	TRA	TRA				A	R				A	
Supply chain service provider (road)	T	R		X		T	X	X	TRA	TR	R	A	TRA	R	R	RA	RA	X						R	RA	X		TRA	TRA		TA	RA	TRA	TRA		TRA	TA	A	R	T	RA	TRA			
Infrastructure manager (rail)			CN	N				X	TRCAJN		RN		TRA	RCN	RCN			N							RCAN		TACN	TRACN			TAN	RAN	TRAC				TACN	AN	RN					
Terminal operator (rail)									TRCAJN	TR	RN		TRA	RCN	RCN			N	TACJN								TACN	TRACN	TRACN	TRAN			TRAC				TACN	AN	RN				X	AC
Railway carrier									TRCAJN	TR	RN		TRA	RCN	RCN	RACJN		N							RCAN		TACN	TRACN			TAN	RAN	TRAC					AN	RN					
Railway undertaking			CN						TRCAJN		RN		TRA	RCN	RCN			N		RCJN	RCN	TRC					TACN	TRACN					TRAC		TRA			AN	RN					
Fleet manager (wagon)					RN	TCN	C		TRCAJN		RN		TRA	RCN	RCN			N		RCJN	RCN	TRC						TRACN					TRAC	TRCAN	TRA			AN	RN		RA			AC
Supply chain service provider (rail)	T	RJN		N		TCN	C	X	TRCAJN	TR	RN	A	TRA	RCN	RCN	RACJN	RACJN	N						R	RCAN	X		TRACN	TRACN		TAN	RAN	TRAC	TRCAN		TRCA	TACN	AN	RN	TCN	RA	TRA			

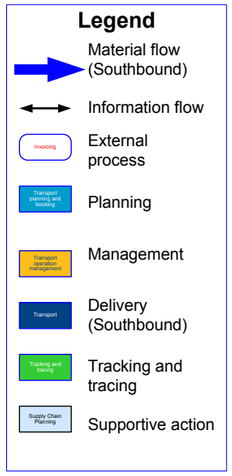
IS Services

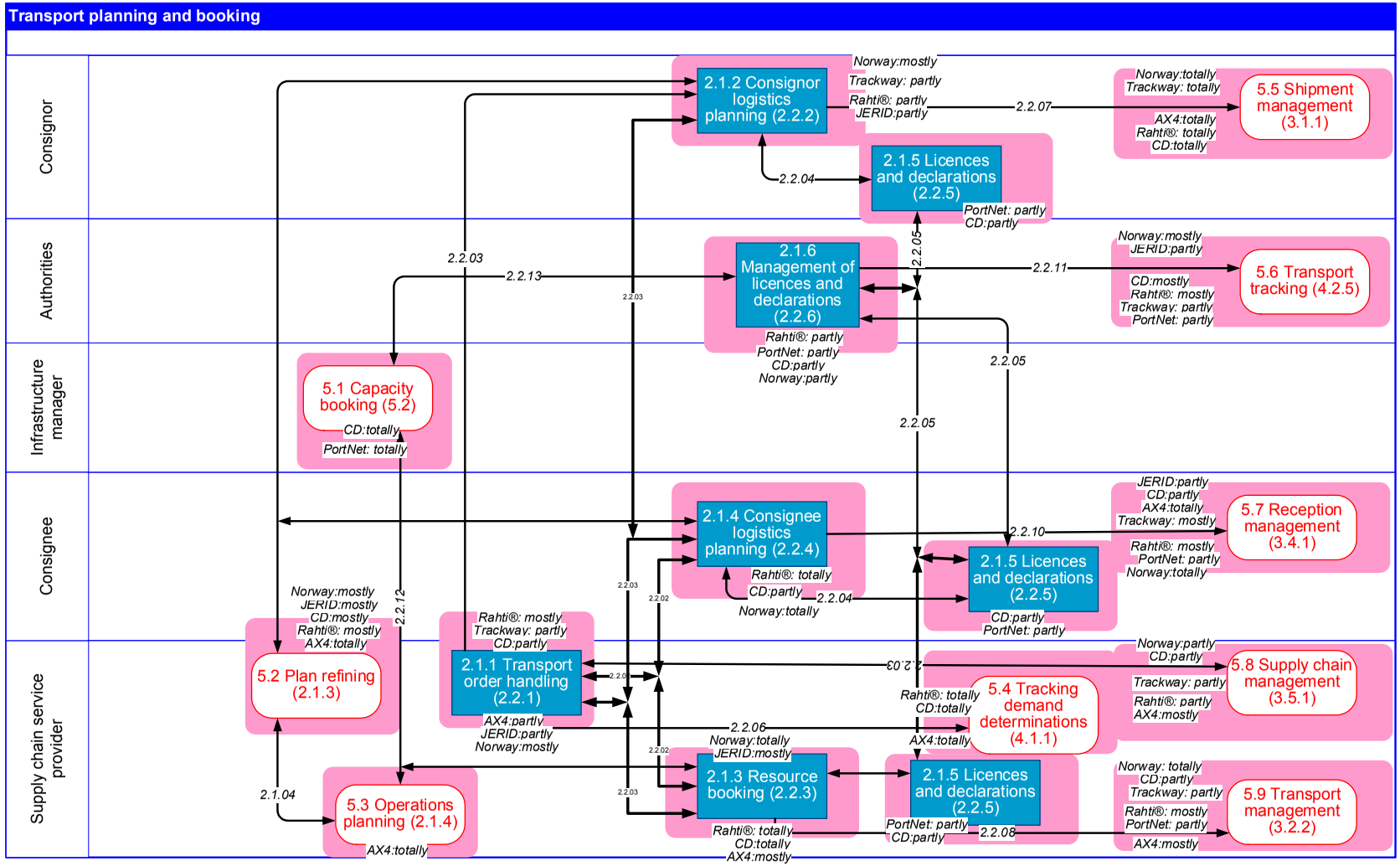
Roles	EnvDataMgmt	MapServ	TrafficData	InfratsnuctureMaintTasks	RiskTrLicenseMgmt	RiskTrTracking	VehRegisterServ	LicenceMgmt	ContractMgmt	ResponsibilityMgmt	TimetableMgmt	TransportPlanMgmt	LogisticsOperatorMgmt	RouteMgmt	ResourceMgmt	OrderMgmt	OrderReceipt	TimetableMgmt	GoodsAcceptanceMgmt	VehiclePositioning	VehicleMonitoring	VehicleIdentification	HandlingInstructionsMgmt	WirelessIT	LoadingMgmt	VAServicesMgmt	GoodsReleaseMgmt	ShipmentMgmt	PartyIdentityMgmt	ExceptionMgmt	ExceptionReceipt	UnloadingMgmt	ReclamationMgmt	TrackingDataMgmt	TrackingDataMonitoring	TrackingTargetCreation	ParcelHierarchyMgmt	SupplyChainMgmt	ProductionMgmt	ProductIdentification	ProductListMgmt	ProductMgmt	WarehouseMgmt	TransshipmentMgmt
Infrastructure manager (water)			P	**X**				**X**	T R A		R P		T R A	R P	R			**X**		R		T R P						T R A					T R A					A	R					
Terminal operator (water)									T R A	T R	R P		T R A	R P	R			**X**	T A								T P A	T R A	T P R A	T R A			T R A				T P A	A	R				**X**	A
Shipping line			P						T R A	T R	R P		T R A	R P	R	R A		**X**		R	R P	T R P			R P A		T P A	T R A			T A	R A	T R A		T R A			A	R					
Fleet manager (water)							P		T R A		R P		T R A	R P	R			**X**		R	R P	T R P						T R A					T R A	T R A	T R A			A	R					A
Supply chain service provider (water)	T	R		**X**		T	P	**X**	T R A	T R	R P	A	T R A	R P	R	R A	R A	**X**						R P	R P A	**X**		T R A	T P R A		T A	R A	T R A	T R A		T R A	T P A	A	R	T	R A	T R A		

X No systems
T Trackway
R Rahti®
P PortNet
C CD
A AX4
J JERID's system
N Norway´s several systems

Appendix M: System Mapping to Architecture






Transport planning and booking
Consignor
Authorities
Infrastructure manager
Consignee
Supply chain service provider
2.1.2 Consignor logistics planning (2.2.2)
Norway:mostly
Trackway: partly
Rahti®: partly
JERID:partly
2.2.07
Norway:totally
Trackway: totally
AX4:totally
Rahti®: totally
CD:totally
5.5 Shipment management (3.1.1)
2.2.04
2.1.5 Licences and declarations (2.2.5)
PortNet: partly
CD:partly
2.2.05
2.2.03
2.2.13
2.1.6 Management of licences and declarations (2.2.6)
Rahti®: partly
PortNet: partly
CD:partly
Norway:partly
2.2.11
Norway:mostly
JERID:partly
CD:mostly
Rahti®: mostly
Trackway: partly
PortNet: partly
5.6 Transport tracking (4.2.5)
5.1 Capacity booking (5.2)
CD:totally
PortNet: totally
2.2.05
2.1.4 Consignee logistics planning (2.2.4)
Rahti®: totally
CD:partly
Norway:totally
2.2.04
2.2.10
2.1.5 Licences and declarations (2.2.5)
CD:partly
PortNet: partly
JERID:partly
CD:partly
AX4:totally
Trackway: mostly
Rahti®: mostly
PortNet: partly
Norway:totally
5.7 Reception management (3.4.1)
Norway:mostly
JERID:mostly
CD:mostly
Rahti®: mostly
AX4:totally
2.2.12
5.2 Plan refining (2.1.3)
Rahti®: mostly
Trackway: partly
CD:partly
2.1.1 Transport order handling (2.2.1)
AX4:partly
JERID:partly
Norway:mostly
2.2.06
Norway:totally
JERID:mostly
2.1.3 Resource booking (2.2.3)
Rahti®: totally
CD:totally
AX4:mostly
2.2.03
Rahti®: totally
CD:totally
5.4 Tracking demand determinations (4.1.1)
AX4:totally
Norway:partly
CD:partly
Trackway: partly
Rahti®: partly
AX4:mostly
5.8 Supply chain management (3.5.1)
2.1.5 Licences and declarations (2.2.5)
PortNet: partly
CD:partly
2.2.08
Norway: totally
CD:partly
Trackway: partly
Rahti®: mostly
PortNet: partly
AX4:mostly
5.9 Transport management (3.2.2)
2.1.04
5.3 Operations planning (2.1.4)
AX4:totally

Road transport

Connection to other processes

Fleet manager (container)

Authorities

Infrastructure manager

Trucking company

Terminal operator

Consignor/ Consignee

Supply chain service provider

Next/previous phase of transportation

5.20 Traffic management and control

5.12 Security operations management

Trackway: partly
Rahti®: mostly
AX4:mostly

6.1 Supply chain plan-ning (tactical)

3.1 Fleet planning and management
AX4:partly Rahti®: mostly Trackway: partly

Trackway: partly
Rahti®: mostly
5.10 Road traffic management

Trackway: partly
Rahti®: partly
5.11 Risk and security measure management

5.12 Security operations management

AX4:totally
5.13 Check and control operations
Rahti®: totally

5.14 Taxation

3.2 Infrastructure and traffic management

5.15 Maintenance of infrastructure information

Trackway: partly
5.10 Road traffic management
Rahti®: mostly

5.04

1.1.02

3.2.02

3.2.04

Trackway: mostly
Rahti®: totally
1.2.1 Acceptance of goods into transport (1.2.1)
AX4:mostly

Trackway: partly
Rahti®: mostly
1.2.2 Transfer (1.2.2)
AX4:partly

Trackway: partly
Rahti®: partly
1.2.3 Release from transport (1.2.3)
AX4:mostly

1.2.01

3.4.1 Fleet and resources management (3.3.1)
Rahti®: totally

3.3.09

3.3.1 Transport management (3.2.2)
Rahti®: totallv
Trackwav: partly
AX4:partly

Rahti®: partly
Trackwav: partly
AX4:mostly
3.4.2 Transshipment management (3.3.2)

3.3.01
3.3.02
3.3.04
3.3.05
1.3.01
1.1.02

1.1.01

1.3.3 Order release (1.3.3)
Rahti®: mostly
Trackwav: totally
AX4:mostly

Trackwav: partly
Rahti®: mostly
AX4:mostly
1.3.1 Acceptance of goods (1.3.1)

AX4:partly
Trackway: partly
1.3.2 Transshipment operations (1.3.2)

Rahti®: mostly
Trackwav: totally
AX4:mostly
1.3.3 Order release (1.3.3)

Rahti®: partly
Trackwav: partly
AX4:partly
1.1.1 Order release into transport (1.1.2)

1.1.03

Rahti®: mostly
Trackwav: partly
AX4:mostly
1.4.1 Acceptance of goods (1.4.1)

Rahti®: mostly
Trackwav: partly
AX4:mostly
1.4.2 Unloading and distribution (1.4.2)

AX4:partly
Rahti®: partly
6.2 Supply chain planning (strategic)

Rahti®: partly
Trackway: mostly
AX4:partly
4.1 Supply chain and transport tracking and tracing

5.16 Resource booking
Rahti®: totally

5.17 Documents' management

5.18 Licences and declarations (2.2.5)
Rahti®: partly

5.19 Invoicing
AX4:totally

Rahti®: totally
Trackwav: mostly
AX4:mostly
1.2.1 Acceptance of goods into transport (1.2.1)

Sea transport

Connection to other processes

Fleet manager (wagon/container)

Authorities (including Harbour company)

Infrastructure manager

Shipping line (including ship owner and carrier)

Terminal operator

Supply chain service provider

Next/previous phase of transportation

5.20 Traffic management and control
PortNet: totally

5.12 Security operations management

5.21 Piloting

3.1 Fleet planning and management
Trackway: partly
Rahti®: mostly
PortNet: partly
AX4:mostly
PortNet: partly
AX4:partly
Trackway: partly
Rahti®: mostly

5.10 Ship traffic management
PortNet: mostly
Trackway: partly
Rahti®: mostly

5.11 Risk and security measure management
Trackway: partly
Rahti®: partly

5.12 Security operations management

AX4:totally
5.13 Check and control operations
Rahti®: totally

5.14 Taxation

6.02

PortNet: partly

3.2 Infrastructure and traffic management

6.03
6.01

5.1 Capacity booking (5.2)
PortNet: totally

5.15 Maintenance of infrastructure information

5.10 Ship traffic management
PortNet: mostly
Rahti®: mostly
Trackway: partly

5.04
A
1.1.01
1.1.02
3.2.04
3.2.02

6.1 Supply chain plan-ning (tactical)

1.2.1 Acceptance of goods into transport (1.2.1)
PortNet: partly
Trackway: mostly
Rahti®: totally
AX4:mostly

1.2.2 Transfer (1.2.2)
PortNet: mostly
Trackway: partly
Rahti®: mostly
AX4:partly

1.2.3 Release from transport (1.2.3)
Trackway: partly
Rahti®: partly
PortNet: partly
AX4:mostly

1.2.01

3.4.1 Fleet and resources management (3.3.1)
Rahti®: totally

3.3.09

3.3.1 Transport management (3.2.2)
Rahti®: totally
Trackwav: partly
PortNet: partly
AX4:partly

Rahti®: partly
Trackwav: partly
AX4:mostly

3.4.2 Transshipment management (3.3.2)

6.04

1.1.01

1.3.1 Acceptance of goods (1.3.1)
Trackway: partly
Rahti®: mostly
AX4:mostly

3.3.01
3.3.02
3.3.04
1.3.01
3.3.05
1.1.02

1.3.2 Transshipment operations (1.3.2)
PortNet: partly
AX4:partly
Trackway: partly

Rahti®: mostly
Trackwav: totallv
PortNet: mostly

1.3.3 Order release (1.3.3)
AX4:mostly

1.1.03

PortNet: mostly
Rahti®: mostly
Trackway: totally

1.3.3 Order release (1.3.3)
AX4:mostly

AX4:partly
Rahti®: partly

6.2 Supply chain plannin g (stra-tegic)

AX4:partly
PortNet: partly

Rahti®: partly
Trackway: mostly

6.05

4.1 Supply chain and transport tracking and tracing

5.16 Resource booking
Rahti®: totally

5.18 Licences and declarations (2.2.5)
Rahti®: partly

5.19 Invoicing
AX4:totally

5.17 Shipping documents' management

1.2.1 Acceptance of goods into transport (1.2.1)
PortNet: partly
Trackwav: mostly
Rahti®: totally

AX4:mostly

Rail transport

Connection to other processes

Fleet manager (wagon/ container)

Authorities

Infrastructure manager

Railway undertaking

Railway carrier

Terminal operator

Consignor/ consignee

Supply chain service provider

Next/previous phase of transportation

5.20 Traffic management and control

CD:totallv
Norway:totally

5.12 Security operations management

Trackway: partly
Rahti®: mostly
CD:partlv
AX4:mostlv
JERID:partlv
Norway:mostly

3.1 Fleet planning and management

Norway:mostly AX4:partly Trackway: partly Rahti®: mostly CD:mostly JERID:partly

Rahti®: mostly
Trackway: partly
CD:totally

5.10 Train traffic management

JERID:partlv
Norway:totally

CD:partly
Trackway: partly
Rahti®: partly

5.11 Risk and security measure management

Norway:totally

5.12 Security operations management

Rahti®: totally

5.13 Check and control operations

AX4:totally

5.14 Taxation

3.2 Infrastructure and traffic management

Norway:partly CD:totally

5.1 Capacity booking (5.2)

CD:totallv
Norway:totally

5.15 Maintenance of infrastructure information

Norway:totally

5.04

AX4:partlv
JERID:partlv
Norway:mostly

1.2.2 Transfer (1.2.2)

Trackway: partly
Rahti®: mostly
CD:mostly

1.2.01

3.2.04

Norway:totally
CD:totally
Rahti®: totally

3.4.1 Fleet and resources management (3.3.1)

Rahti®: totally
Trackway: mostly
CD:mostly

1.2.1 Acceptance of goods into transport (1.2.1)

AX4:mostlv
Norway:mostly

Rahti®: partly
Trackway: partly
AX4:mostly

1.2.3 Release from transport (1.2.3)

CD:partlv
Norway:mostly

1.1.02

3.3.09

3.3.1 Transport management (3.2.2)

Rahti®: totallv
Trackway: partly
CD:partlv
AX4:partly

CD:mostly
AX4:mostly

1.3.3 Order release (1.3.3)

Trackway: totally
Rahti®: mostly

1.1.03

Rahti®: partly
Trackway: partly
AX4:partly

1.1.1 Order release into transport (1.1.2)

CD:partlv
Norway:partly

1.1.01

Trackway: partly
Rahti®: partly

3.4.2 Transshipment management (3.3.2)

CD:partly JERID:partly

3.3.01

3.3.02

3.3.04

3.3.05

Norway:partly
JERID:partly

1.3.1 Acceptance of goods (1.3.1)

AX4:mostly
Trackway: partly
Rahti®: mostly
CD:partly

1.3.2 Transshipment operations (1.3.2)

AX4:partly
Trackway: partly
CD:partlv
Norway:partly

1.3.3 Order release (1.3.3)

Rahti®:
Trackway: totally
AX4:mostlv
CD:mostlv
Norway:mostly

Norway:partly
JERID:partly
CD:partly
Trackway: partly
Rahti®: mostly
AX4:mostly

1.4.1 Acceptance of goods (1.4.1.)

1.4.2 Unloading and distribution (1.4.2)

Norway:totally
AX4:partly
Rahti®: partly

6.1 Supply chain plan-ning (tactical)

6.2 Supply chainplanning (strategic)

Rahti®: partly
Trackway: mostly
CD:mostly

Norway:mostly AX4:partly

4.1 Supply chain and transport tracking and tracing

5.16 Resource booking

Rahti®: totally
CD:totallv
Norway:totally

5.17 Documents' management

5.18 Licences and declarations (2.2.5)

Rahti®: partly

5.19 Invoicing

AX4:totallv
Norway:totally

Rahti®: totally
Trackway: mostly

1.2.1 Acceptance of goods into transport (1.2.1)

AX4:mostlv
CD:mostly

Appendix N: IT Workshop Participants 8.–10.12.2004

Jari Gröhn, Ministry of Transport and Communications Finland (only opening of the seminar)

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Title
Pol-Corridor – IT systems

Abstract
This report describes how generic freight architecture has been applied to international intermodal logistics process on a freight transport corridor (Pol-Corridor) between Nordic countries and the South-Eastern part of Europe. The objective has been to give approximative guidelines for the implementation of information systems, information exchange flows, and interfaces required by the overall Pol-Corridor concept. It covers the results of work package 6 in Pol-Corridor project – Design and Laboratory Implementation of Info-system for Pol-Corridor.

The first task has been to define the business process of international intermodal transport on Pol-Corridor. The business process model covers transport planning and booking model as well as road, sea, and railway transport process models. Business model forms the basis for conceptual architecture, which has been used further in defining the Service Architecture for Pol-Corridor.

The Service Architecture contains the information services, their relation to the process components of the conceptual architecture, and the actual systems providing the services. Commercial, available in-house or off-the-shelf IT systems that can serve the business processes are mapped to the business processes of conceptual architecture.

Finally, it has been assessed what kind of organisation and financing would be the most suitable for the information services of Pol-Corridor. The option where a common information centre provides information to logistics operators and customers by collecting data from the parties along the transport chain was considered the most suitable for Pol-Corridor.

Already today there are IT systems, which can provide necessary information services for Pol-Corridor. The challenge is to integrate different systems and make them inter-operable between different countries and operators. The last, and certainly not least, challenge is to find ways of co-operation between operators along Pol-Corridor.

Keywords
polcorridor, logistics, information systems, information exchange, IT architecture, freight transport, transport corridors, Nordic countries, South-Eastern Europe, requirementse

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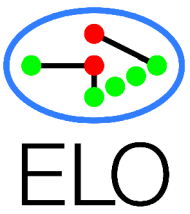
This report describes how a generic freight architecture has been applied to international intermodal logistics process concerning freight transport corridor between Nordic countries and the South-Eastern part of Europe, PoI-Corridor. The objective has been to give guidelines for implementing the information systems, information exchange flows, and interfaces required by the overall PoI-Corridor logistics concept. It covers results of work package 6 in PoI-Corridor project – Design and Laboratory Implementation of Info-system for PoI-Corridor.

The Service architecture contains the information systems services, their relation to the process components of the Conceptual Architecture, and the actual systems providing the services. A System Mapping procedure was carried out in order to find how commercial, available in-house or off-the-shelf IT systems (existing or prospective for PoI-Corridor) can serve the business processes. IT systems were mapped to the business processes of Conceptual Architecture as well as to Service Architecture.



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