BOPCom Final Report for Publication

Baltic/Basic Open Port Communication

A project in the Transport RTD Programme
of the European Commission, Directorate General for Transport

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1 Partnership

The BOPCom consortium consists of a set of software developers and service providers (supporting mainly their „home“ regions) as well as several users from different European countries covering different professions around the transport area:

- Port Authorities
- Port Operators
- Freight Forwarders
- Shipping Agents
- Shippers/Producers
- Port Groups

Company	**Country**	**Role**	**Status**
TZL Technikzentrum Lübeck	D	Project Manager	C
ISL Institute of Shipping Economics and Logistics	D	Technical Coordinator, Developer	P
EDI Management Finland Ltd.	FIN	Developer, Service Provider	P
Syseca GmbH	D	Developer, Service Provider	P
TraDaV Travemünder Datenverbund	D	Developer, Service Provider	P
ACEM	F	Representing a User Group	A
Administracao dos Portos do Douro e Leixões	P	User	A
ASG (Deutschland) GmbH	D	User	A
AUTOCONTEX Automobil Container Express	D	User	A
Bruhn Spedition GmbH	D	User	A
ENSO Group Oy	FIN	User	A
ENSO Nord Transportgesellschaft GmbH	D	User	A
Finnish Port Association	FIN	Association	A
Fr. Meyer´s Sohn GmbH & Co.	D	User	A
Gesellschaft für Logistische Systeme LS GmbH	D	Developer	A
Lübecker Hafen-Gesellschaft mbH	D	User	A

Lüders&Stange Kommanditgesellschaft	D	User	A
MDS Transmodal	GB/F	Representing a User Group	A
Municipality of Piraeus	GR	User	A
PLATO GmbH	D	Developer	A
Port Authority of Barcelona	E	User	A
Port Authority of Trieste	I	User	A
Port of Stockholm	S	User	A
Port of Turku	FIN	User	A
Poseidon Schiffahrt AG	D	User	A
Provveditorato al Porto di Venezia	I	User	A
Scansped Nord GmbH	D	User	A
Seehafen Rostock Umschlagsgesellschaft mbH	D	User	A

2 Executive Summary

BOPCom supports communication and cooperation in transport.

When starting the project in the beginning of 1996, some actual trends and requirements as well as some gaps for coping with them were apparent and should be closed by BOPCom:

- Maritime transport is not isolated but embedded in intermodal transport chains
- Transport chains need information chains
- SMEs have to cope with this requirement to stay competitive
- The importance of classical Port Community Systems is decreasing

So, the necessity for flexible low-cost tools for communication in transport was obvious.

At that time EDI was rarely used in the transport business, especially when looking at small and medium-sized companies and ports. In the same period the success story of the Internet began. BOPCom took the opportunity to develop tools in order to integrate the EDI approach („BOPCom Direct“) and the Internet/World Wide Web (Web-EDI) technologies („BOPCom Online“) into one concept thus offering solutions for EDI users and those which were not able to communicate electronically up to that time.

It is clear that the full benefits of electronic communication can be achieved only if the communication will be integrated with the own application systems. However, some reasons may require a Web-EDI approach:

- SMEs can be forced to report electronically by the market (e.g. if involved in intermodal transport chains)
- Companies can be forced to report electronically by regulations, e.g. for dangerous goods declarations in the German ports
- Status Monitoring.

For using Web-EDI, the users do only require a PC, communication link (Modem, ISDN) and an Internet browser, so the capability to become „communicative“ can be achieved quite easily.

So, within BOPCom general tools for implementing this concept as well as application specific viewers for the BOPCom Online concept have been designed, implemented and tested. Users of the „home areas“ (mainly in Finland, Germany) have been involved in all phases from discussing the user requirements up to the final testing.

Furthermore, added value to the project could be achieved by investigating the possible transferability of the tools and systems to ports in the Mediterranean and Atlantic Arc. In total, tests were performed in 17 ports in 9 European countries.

These majority of these tests show positive results. The BOPCom tools were considered to be useful for supporting the communication within the Port Communities; some ports even built own systems on the basis of the BOPCom approach.

However, it appeared also that the function, data, procedures and responsibilities in the Mediterranean and Atlantic Arc ports differ from those of the Baltic region. Therefore, whereas the communication tools are really general, the applications have to be customised before being ready for commercial use. Furthermore, the requirement for local support is evident, because it will be not realistic to maintain and support a tool installed e.g. in Portugal or Greece from Finland or Germany.

The usefulness of the BOPCom concept was proven by the fact that it has been and will be used in other projects as well - in the reserach and development area as well as in the commercial environment.

The services established based on the BOPCom tools (e.g. by TraDaV in Lüeck and EDI Management in Finland) will remain operational after the end of the BOPCom project. The users declared that they want to keep on using the systems. The developers want to improve the solutions and to offer new services in the future.

3 Objectives of the Project

In the transport sector, many problems arise from the fact that the lack of Electronic Data Interchange (EDI) is preventing intermodal transport, including short sea shipping, from being a competitive alternative to other modes of transport.

Therefore, BOPCom´s main objective is to raise the efficiency of sea transport in Europe by developing a new telematics concept for the port and transport sector including the support of small and medium-sized companies (SMEs) offering low-cost solutions.

Global objective is to support European Short Sea Shipping by enhancing interconnectivity and interoperability in and between ports.

Sub-objectives were:

- Development of generic port-related software solutions
- Low cost solutions for small and medium-sized ports
- Integration of computerised users and users without appropriate application systems
- Innovative Open Telematics System Architecture which can be used also
    - worldwide
    - for other applications
    - for other transport modes

4 Means used to achieve these Objectives

BOPCom started with the determination of the user requirements for the functions which should be supported by the BOPCom modules. These functions had been described in the Deliverable „Functional Description of the BOPCom Modules“ using the Structured Analysis method.

In parallel, the concept for the common system architecture had been developed. The core of this concept is the „Communications Database“, a relational database with a generic structure which is capable to store any kind of data related to communication in transport. This concept had been described in the Deliverable „Data Model Approach“.

Within BOPCom new tools for communication have been developed. Their objective is to link existing application systems in the transport area AND to include users without appropriate application systems (e.g. small and medium-sized ports and companies) in EDI using Internet/WWW technology. This concept called Interconnectivity Manager (IM) can be used for any transport related application and is already in use in several other projects. One part of the toolbox is a communication product already in the market for some years whcih had to be configured for the BOPCom tests; the other parts - especially the link between the Internet/WWW world and the relational database technology - have been developed by BOPCom. Local communication nodes including a communication database with a generic transport-related structure can be installed in any company or authority or - alternatively - offered by a service provider. The whole concept is detailed in Deliverable „System/Telematics Architecture“.

For nine port-related application modules realisations of the IM concept have been implemented in close contact with the users in the „home areas“ of the developers, i.e. in Lübeck (TraDaV), Rostock (Syseca) and Finland/Sweden (EDI Management). The Deliverables „Module Specification“ and „Final Module Description“ contain detailed descriptions of the user interfaces and functions of these modules which were developed using ASP/ADO (Active Server Pages/Active Data Objects) resp. Java technologies enabling the entry and retrieval of data to and from the Communications Database.

The test phase for these „BOPCom Online“ pilots ran in ports in the Baltic area, the Mediterranean and the Atlantic Arc. Furthermore, „BOPCom Direct“ tests, i.e. links to existing systems, have been performed in Lübeck and Finland (Portnet).

5 Scientific and technical Description of the Project

5.1 The development approach

The BOPCom project started mainly on two action lines:

- with the identification of the user requirements in the „home areas“
- with considerations and specifications about a general telematics architecture to be used for implementation.

In parallel presentations to the Mediterranean and Atlantic Arc partners were made asking them also for revieweing the functional specifications.

After having achieved the results of these two action lines the developments started according to the specifications in close cooperation with the identified users in the „home areas“ of the developers, i.e. in Finland, Lübeck and Rostock.

The general communication tools (OSIS, MeGa, Communications Database) were developed resp. configured. They have been called furtheron „Interconnectivity Manager“ (IM) and were represented with an own logo.

5.2 The basic philosophy

The basic philosophy of the BOPCom System Architecture is an innovative approach in order

- to enable the exchange of information between existing application systems
- to enable also users without appropriate application systems to participate in electronic information exchange.

5.2.1 The background

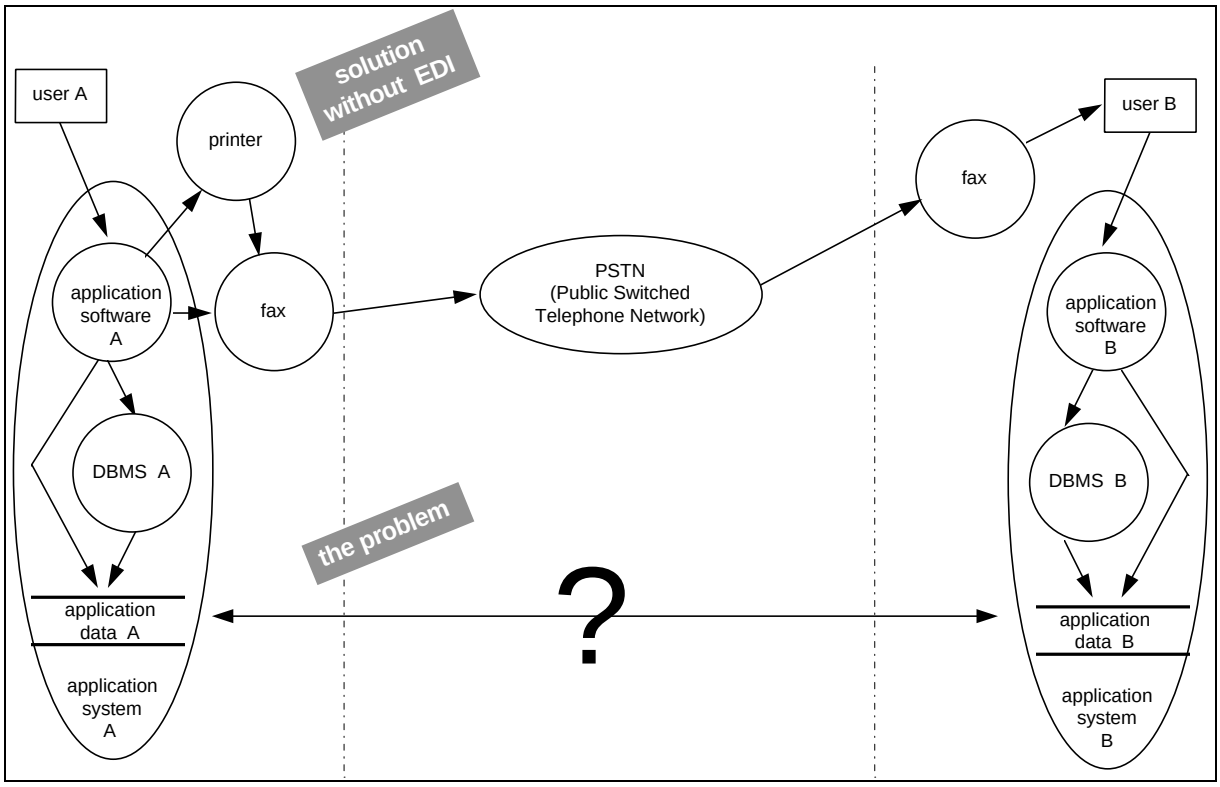


Fig. 5-1: Data exchange between application systems by paper transmission and re-keying

An „application system“ is a combination of hardware, secondary devices, operating system, communication links and software which helps the user to execute his every day business. The main components of an application system, which are relevant for our investigations are

the application software,	which runs on a stand-alone or networked computer and offers the user screens for information in-and output;
a DBMS,	(Data Base Management System) like Oracle, Sybase, Informix, MS-SQL-Server or any other commercial product, which may be used by the application software to store and retrieve information;
the application data,	like bookings, invoices, order lists, ... which are used by the application software - either directly (= flat files or software specific formats, like Excel sheets) or via the services of a DBMS (= data base tables).

Each business requires the exchange of information with customers, business partners and authorities - but unfortunately current application systems were not developed for direct contact to other application systems. Therefore, the usual way of exchanging business information is still „printing -> faxing -> re-keying“ (Fig. 5-1) - with all the well-known disadvantages: slow transmission, no up-to-date information, re-keying errors, ... and so on.

One well-known remedial action against these disadvantages is, that a company, which operates an application system, installs a terminal connection to their communication partners (Fig. 5-2).

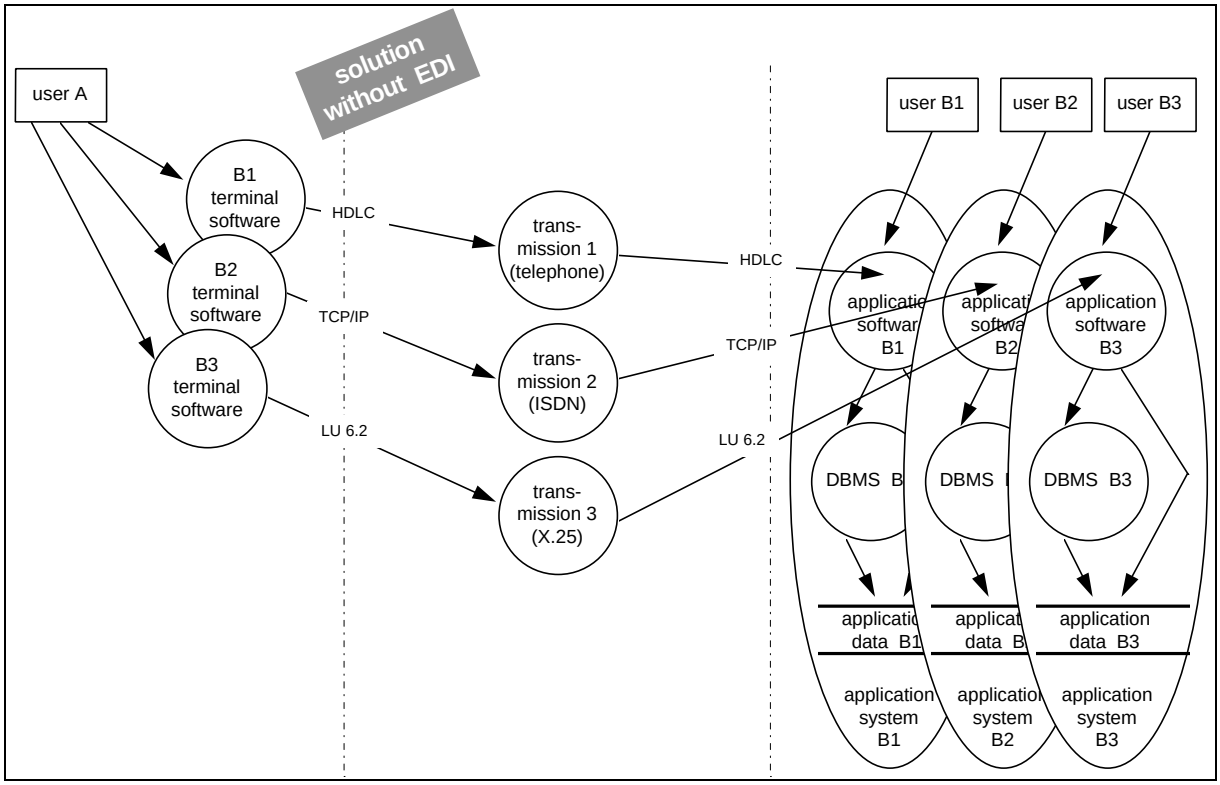


Fig. 5-2: The terminal solution without EDI for users without an own application system

This is a typical solution for big companies and their small business partners and customers. They can operate „big brother's" application system in exactly the same way, than the in-house user („B" in Fig. 5-2) - of course with appropriate restrictions of the access rights to the application data.

Typical applications of this kind of non-EDI solutions are booking systems (consigner <-> transport operator) and ordering systems (supplier <-> final manufacturer).

This is easy to implement, fast and cheap for partner B - but may cause problems for partner A, if he has to communicate with several different partners. Then, he has to operate different kinds of terminal software - may be, on different hardware and with different communication links and protocols (Fig. 5-2).

Another typical EDI solution for communication partners, which are both equipped with application systems is shown in Fig. 5-3.

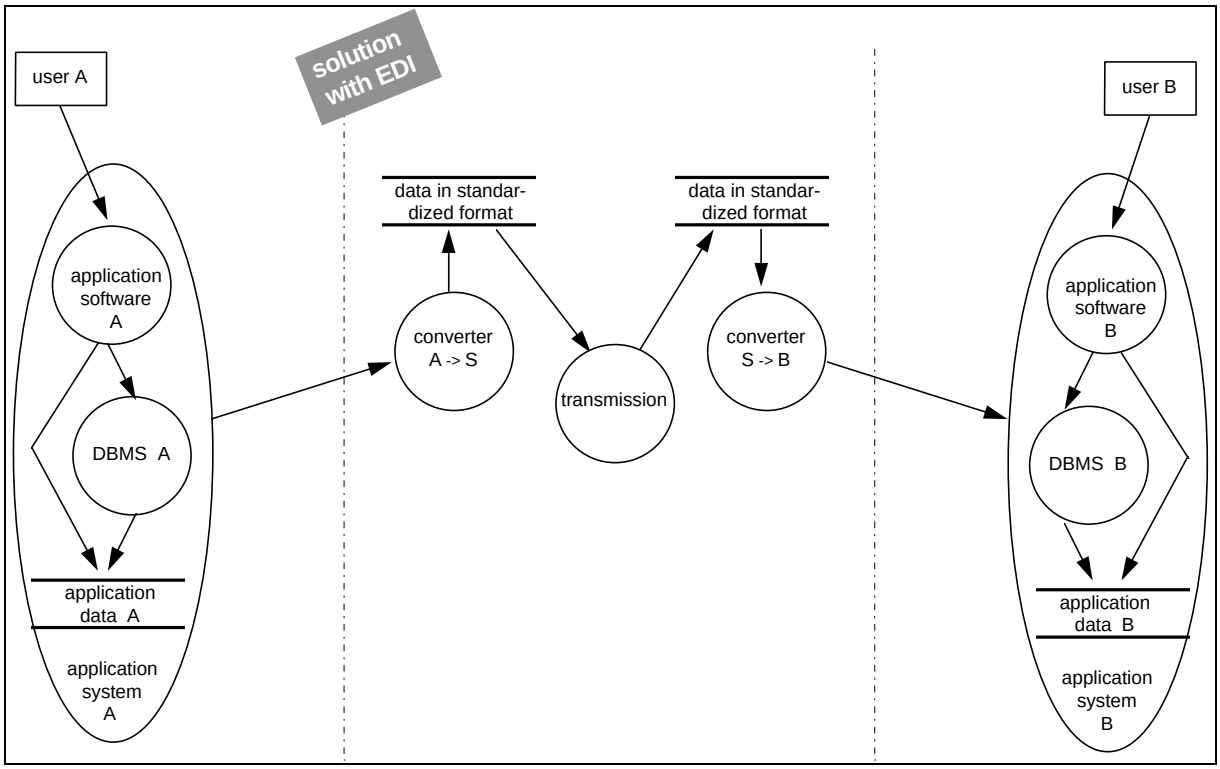


Fig. 5-3: The „classical“ EDI solution for users with own application systems

Different application systems usually are speaking different „languages“, that means, that they store their data in different formats and manipulate them according to different algorithms. One possibility for enabling information exchange between application systems is therefore to translate both languages into one common standardised language - known as EDIFACT, ODETTE, ANSI X.12, ... and so on.

For this EDI solution every communication partner needs a special converter software, which is able to translate between the in-house language and the standardised one (Fig. 5-3).

This seems to be a clear and simple concept - but it hasn’t gained a wide acceptance since several years because of

- the difficult implementation of the converter software and its access to the application data
- a lot of costs for consulting, for investments in hard- and software and for transmission
- low benefit expectations compared with the effort.

Especially for small companies and for companies with a low amount of information to be transmitted the entry level for this EDI solution is often too high, so that they prefer to continue with fax and telephone.

5.2.2 The functional details of the Interconnectivity Manager (IM)

The main objective of BOPCom is - as already said above - to develop and realise an innovative approach in order to enable the direct exchange of information between existing application systems (subsequently called „**BOPCom Direct**“) and also to enable users without appropriate application systems to participate in electronic information exchange (subsequently called „**BOPCom Online**“).

To this end, the general concept of the „Interconnectivity Manager (IM)“ was developed. It describes a set of components, which can be realised in different ways and then be used for interconnectivity in the above mentioned sense.

The next sub-chapters give an overview on the usage of the IM, its components and examples for their realisation for different applications.

5.2.2.1 Usage of the IM

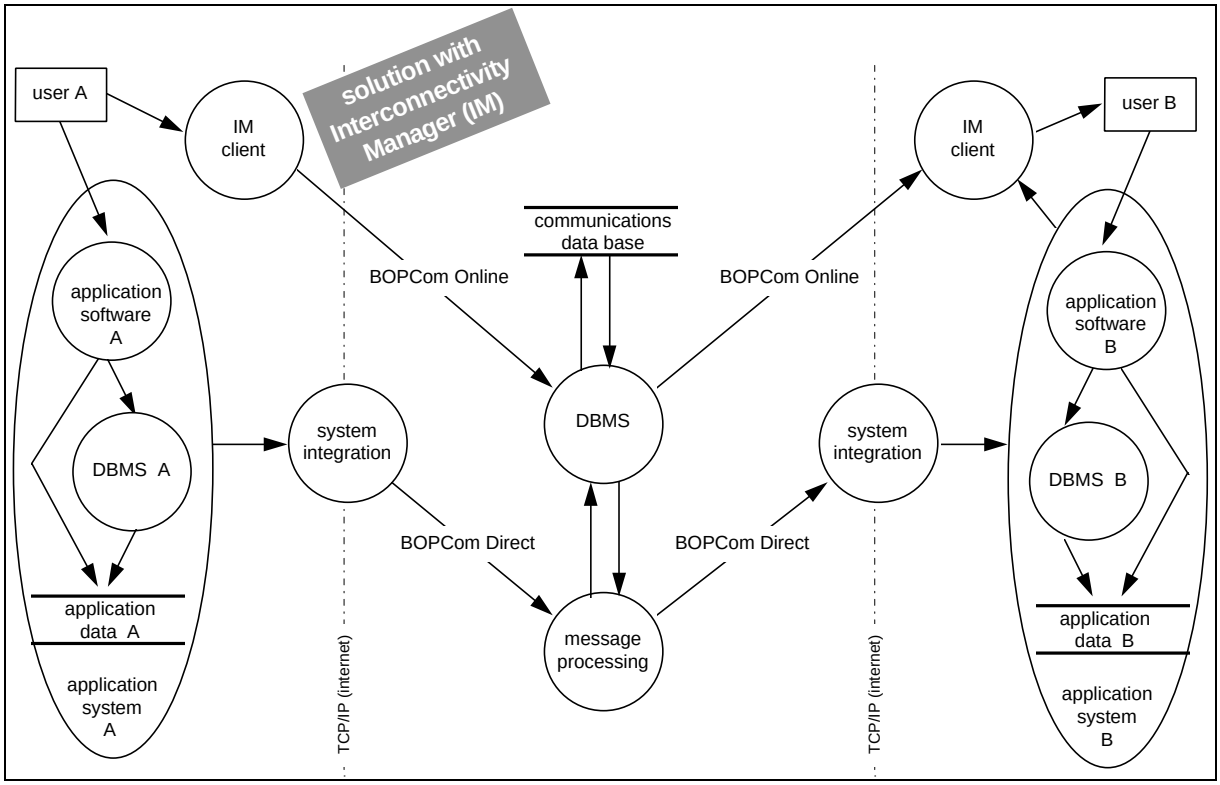


Fig. 5-4: „BOPCom Direct“ and „BOPCom Online“ for the interconnection between users with and without own application systems

„BOPCom Direct“ exports information from the application system A, stores it intermediately in the communications data base, retrieves information again from there and imports it into application system B

„BOPCom Online“	realises the information exchange between partners without application systems by offering them an easy to operate user interface (windows screens) which writes data to and reads data from the communications data base
Mixed operation	between „BOPCom Direct“ and „BOPCom Online“ is also possible: Either one partner sends a message via „BOPCom Online“ which is then imported into the other partner’s application system via „BOPCom Direct“ - or one partner sends a message via export from his application system using „BOPCom Direct“ which is then presented to the other partner by „BOPCom Online“.

The mixed operation is described in detail in Fig. 5-5.

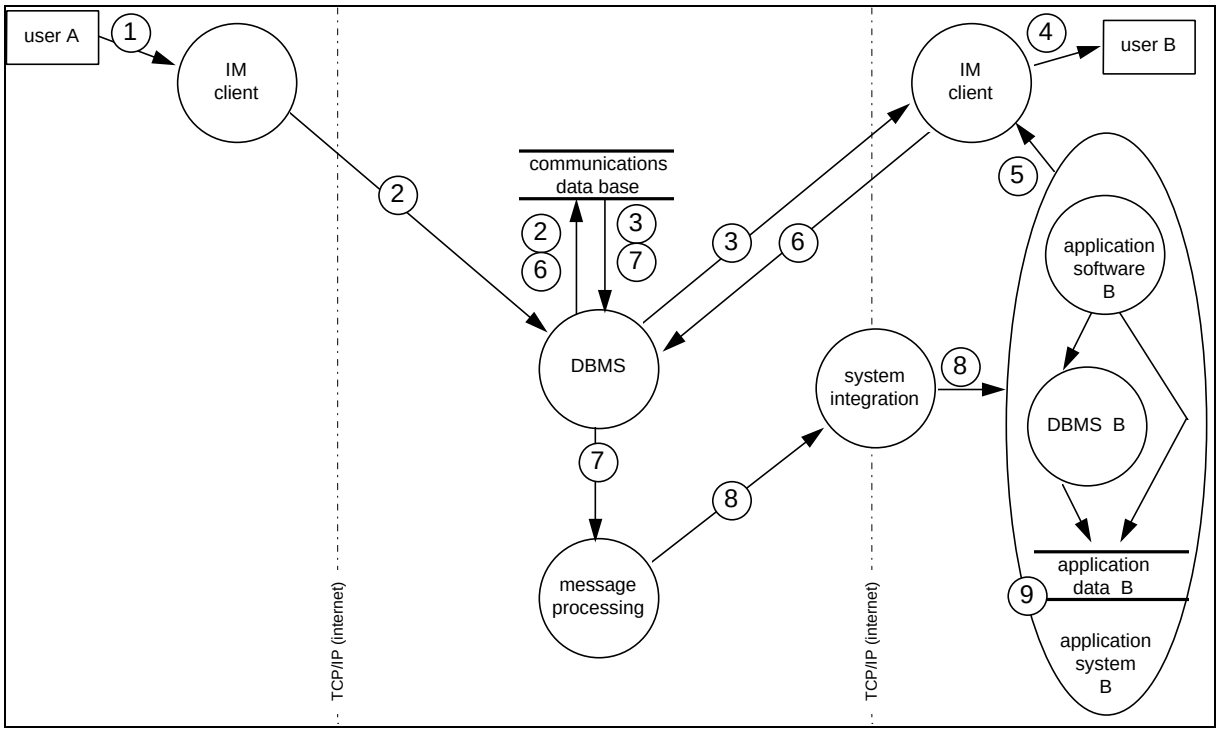


Fig. 5-5: Mixed operation of the IM between a user without application system and a user with application system

step nr.	description
1.	User A, who does not operate an application system, uses his IM client software for message input (for example a booking or a berth request).
2.	The IM client software contacts the DBMS of the IM for storing the message in the communications data base.
3.	User B uses his IM client software to retrieve the incoming messages from the communications data base and ...
4.	.. to control / to correct / to complete them - may be ...
5.	... simultaneously with some data from his in-house application system, which are needed for correct decisions (for example availability information from his berth allocation or booking system). This kind of usage of the IM client software is called „application integration“.
6.	The controlled / corrected / completed message is stored again in the communications data base and marked as „ready for import“.
7.	The IM message processing extracts the data elements of the message from the data base tables and builds a message file.
8.	The message file is sent and imported into the application system of user B. For this step there is no general solution, because it strongly depends on the architecture and functionality of the application system.
9.	The data sent by user A are now contained in the application data of user B and can be used by his application system (for example for resource management).

5.2.2.2 IM components overview

For „BOPCom Online“ internet technology is used for the data base access - either HTML pages in a WWW browser with a CGI-Interface between the WWW server and the DBMS or Java applets running from the browser with a JDBC interface to the DBMS. For the communication link the internet itself may be used - or, if the users have doubts because of its safety and speed, dedicated lines to the computer, where the communications data base is located.

The usage of internet technology offers a low entrance level for small companies and for companies with a low amount of information to be transmitted. They need only a WWW browser running on a PC and a modem.

The IM client may also be used for application integration (see below).

The IM client is the graphical user interface of the Interconnectivity Manager and serves two purposes:

- to enable the application integration (see below) and

- to be used for message in/output (see also below).

The software is the same for both purposes. The main task of the IM client is to support communication by enabling the user to send and retrieve messages and to display their content. This requires the access to the communications data base of an IM via a local network connection if the IM is running in-house or via a wide area network connection if the IM is running at a communications partner or at a service provider.

This means, that the IM client is one uniform fronted for possibly many communications data bases, which belong to IM's running at different places (companies and service providers). These communications DB's have the same data model (tables and their columns) - but different data in their tables.

If the user does not want to be constantly on-line with a remote IM, he must operate a local one with a communications data base, where his inputs can be stored before they are sent. A local storage of his inputs without a DMBS (for example in files) would require too much development effort.

Additionally, the IM client may also display data from the user's in-house application system and offer special functions to process them. This supports the application integration function of the IM and requires access to the user's application data via a local area network connection.

If the access of the IM client to the application system is not possible directly, the IM client may use the system integration to export data from the application system.

The message in/output is a function of the IM client that is used by users without appropriate application systems. With the IM client as a kind of a database viewer they will be enabled to enter data into the communications data base as well as to

retrieve data from the communications data base for a specific application. Furthermore, it is planned also to maintain the IM using this kind of access.

The application integration is a function of the IM client that guarantees that incoming data from the IM will be pre-processed manually before being entered into the in-house system in order to keep the in-house data consistent. As an example it might be necessary to complete incoming information with data which are necessary for the in-house system but not contained in the incoming message. To this end it might be necessary for the IM client to display not only information from the communications data base but also application data from the in-house database.

Another reason for this component is, that several users do not want, that information from external parties will get into their in-house system automatically. They want to keep control over this import. So they want to release the messages manually.

The communications data base is created according to a generalised data model for the transport business (see corresponding BOPCom deliverable D2). Therefore, it is possible to store any kind of message in it, that is exchanged between transport companies, their customers and authorities.

The messages are stored only intermediately on their way from the sender to the receiver - that means in general, no longer than a week. After the task the message refers to (a transport, a storage, a transhipment) is executed, it may be deleted by one of the involved parties.

But, to delete a message from the communications data base does not mean, that it disappears really - before it is deleted it may be copied to an archive data base with the same structure than the communications data base. This archive may be used for statistics and control in case of any disagreements between the communication partners.

The usage of the communications data base makes an important difference between the BOPCom IM and other, mailbox-like message exchange systems: In those systems the messages are handled independently from each other. In the communications data base, messages which refer to the same object are marked as to belonging together - for example a container booking sent from a forwarder to a shipping agent and a dangerous cargo message for the same container sent from the consigner to the port authority. That means, the communications data base represents a kind of „self learning knowledge base“ which knows more than every single message.

This property may also be used for checking the content of new messages or completing them by using the data already known from earlier messages or from a stock of base data, which is permanently present in the communications data base (for example dangerous cargo classifications, time tables, addresses, ...).

The system integration links the interconnectivity manager with the user's application system. It performs the physical entry of information into the in-house system of the user - either automatically or triggered by the IM client function „application integration" (see above). On the other hand, it retrieves information from the user's application system and provides a file which content will be entered into the communications data base.

The concrete realisation of the system integration is strongly dependent from the application system. It may be

data oriented, that means, it accesses the application data either directly or via the DBMS

or

software oriented, that means, it uses functions of the application software (for example remote procedure calls) to access the application data.

The message processing knows how to put the content of messages into data base tables and, vice versa, how to generate messages from the content of data base tables. Reading a configuration file for the message to be processed, the message content will be split into the different tables, the links will be set, links to already existing table entries will be set, etc.

Consequently, the message processing is a bridging software between the two worlds of flat files and of data base tables.

The file processing is a part of the message processing that reads data which are received on different input channels (sockets, ftp, email, ...) and converts them into messages (= ASCII files without any protocol overhead information) to be further processed by the message processing. Vice versa, it sends messages produced by the message processing using different output channels.

5.2.2.3 Realisation of the IM components

The Interconnectivity Manager is a general concept. Its components may be realised in different ways for different applications - according to the complexity of the application and according to the availability of hard- and software.

Examples:

Nr.	Data Base	IM Client	Communi-cation	Message Processing	System Integration
1.	Oracle	Java + (JDBC - ODBC bridge)	internet / closed user groups via telephone modem or ISDN	„mail cutter“ + Perl software	Perl software
2.	MS-SQL-Server	MS Active Server Pages, MS Active Data Objects	internet	OSIS	OSIS
3.	Oracle	Java + (JDBC - ODBC bridge)	intranet / internet	-	-
4.	MS-Access	HTML + CGI	analogue telephone line	Intranet Assistant	-
5.	Sybase	Powerbuilder	ISDN	OSIS	OSIS

The configurations 1, 2 and 3 are realised within the BOPCom project in Lübeck, Helsinki and Rostock, respectively.

The configurations 4 and 5 are realised within other projects at the ISL.

5.2.2.3.1 The realisation of configuration 1 in Lübeck

Because of the EDP infrastructure of those companies, that will test the TraDaV modules „Booking“ and „Transport Order“ the IM components for „BOPCom Online“ as well as for „BOPCom Direct“ are necessary. Some of the smaller forwarders don’t have own application systems - therefore, they will need the IM client software for message in- and output. On the other hand, the shipping companies usually have application systems for order control, resource management and bookkeeping. Therefore, they will need the message processing and the system integration for message im- and export into and from their application systems.

Data Base: For the prototype the shareware data base „Postgres“ was used, but for the final development it will be an Oracle product („Oracle7 Workgroup Server“).

For the operational use Oracle is installed on Solaris on an Intel computer in Lübeck - and for the development it is installed on Solaris on Sun at the ISL in Bremen.

IM Client: After a first prototype development using HTML+CGI (which can still be tested at http://www.tradav.de) it was decided to change the development environment for the IM client software (= „BOPCom Online“) to Java -

including the Java Development Kit (JDK) version 1.1. A number of basic classes will be developed - on one hand for the data base access and on the other hand for the presentation of the data on the screen. These basic classes can then be used for any module.

The access of the Java front-end to the data base is realised with OpenLink's JDBC/ODBC for Oracle.

Communication: In a first step the communication of the users is organised in a closed group by direct telephone modem or ISDN access to the TraDaV computer. Later on it may be opened to the Internet without any technical problems - the restriction to a closed user group is only made from speed and security reasons.

Message Proc.: The im- and export of data files into and from the communications data base is realised by a Perl program. It is a kind of interpreter, that needs a control file, that describes, how to handle a certain message type. It is also able to handle EDIFACT messages.

The message processing is also able to receive data from an incoming email. To this end, there is a small script („mail cutter"), that removes the header from the mail file and gives the pure message file to the Perl program.

System Integr.: This component is strongly dependent on the application system. Since all the users in Lübeck, which operate own application systems use data base management systems (Oracle, Informix, MS Access) the Perl program from the message processing can also be used for system integration, because it is able to im- and export data into and from any kind of data base (Of course, its table structure must be known).

5.2.2.3.2 The realisation of configuration 2 in Helsinki

Pilot users for Finnish workpackages (dangerous cargo, vessel movement and berth allocation, hinterland transports, customs co-operation and statistics) consists of different companies who will use mainly IM Client software. Because of heterogeneous nature of pilot users, it is critical to find consistent and generic platforms for the software. Using techniques mentioned below there are no specific requirements for the client computers, only WWW-browser is needed.

Data Base: Both the prototype and the operational software use SQL Server database installed in Intel computer located in Espoo. Development database is similar, but separated.

IM Client software is developed using MS Active Server Pages (ASP) technology. The basic idea of ASP is to use rich set of techniques in WWW-server and produce only pure HTML for the client (browser). WWW-server uses server side scripting (VBScript) and VB4/VB5 OLE Components. WWW-server also produces client side scripting (JavaScript) for the browser. OLE Components and part of VBScript is developed using Dupe II 3-tier application framework developed in EDI Management Finland. Dupe II ensures high re-use capabilities and analoguous structure between different workpackages. Database interface is OLE DB based (most ODBC drivers

can also be used via OLE DB-ODBC bridge) and is implemented using MS Active Data Objects (ADO) architecture.

Communication is based on Internet protocols.

5.2.2.3.3 The realisation of configuration 3 in Rostock

In order to realise the BOPCom development step 1 (WWW-viewers for both ends of the Communication Database) an Interconnectivity Manager (IM) is about to be developed, which works with Oracle as Data Base Management System. To offer the Transhipment functionality to users without appropriate EDP systems, the Java technology is used to develop the graphical user interface of the IM. The Transhipment WWW-viewer is being developed as a Java applet, which can be loaded from a WWW-server. Then it can be executed by every Java enabling WWW-browser. In order to get access to the Oracle Database by Java, the JDBC-Interface (with JDBC - ODBC bridge driver for Oracle) is used for the first steps of development. The System will be offered to the potential pilots as intranet or internet solution. Dependent on the demands of the pilots, further developments concerning the integration of existing in-house EDP systems are planed in future.

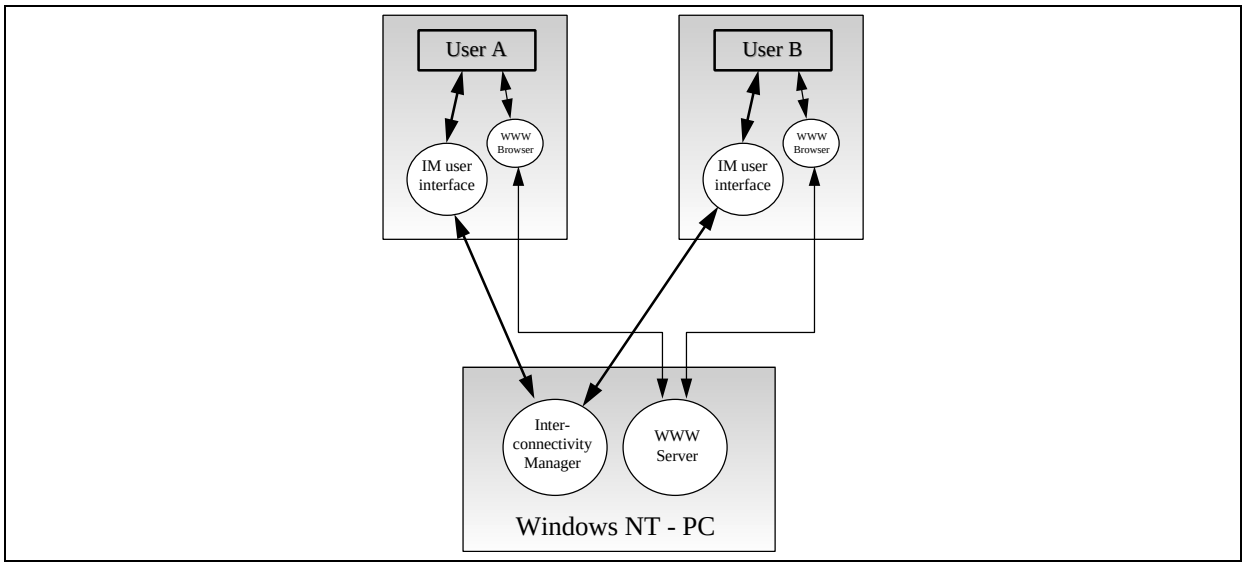


Fig. 5-6: Principle realisation of BOPCom development step 1 in Rostock

5.2.3 Communication Scenarios

Six scenarios will be discussed in this chapter showing the different communication possibilities for the different types of users (see Fig. 5-7):

- users without an own application system („type 1“)

  Nevertheless they can participate in electronic data exchange, if they operate the IM client software for message in- and output.

- users with an own application system - but no IM („type 2“)

  They can use the IM operated by a service provider for direct message im- and export to and from their application system.

- users with an own application system and IM („type 3“)

  They can be contacted directly by any other type of user. The communications database of the IM serves as a back-end for the IM client software operated by type 1 users and the message processing executes the message exchange with type 2 and other type 3 users.

- service provider with IM.

  He operates an IM, which can be used by type 1 and 2 users.

The different types of users and the service provider can be connected via the internet, or - if the users think, this would be too much unsure and too slow - via direct lines between each other based on telephone, ISDN, X.25 or whatever network, that is able to transmit the TCP/IP protocol.

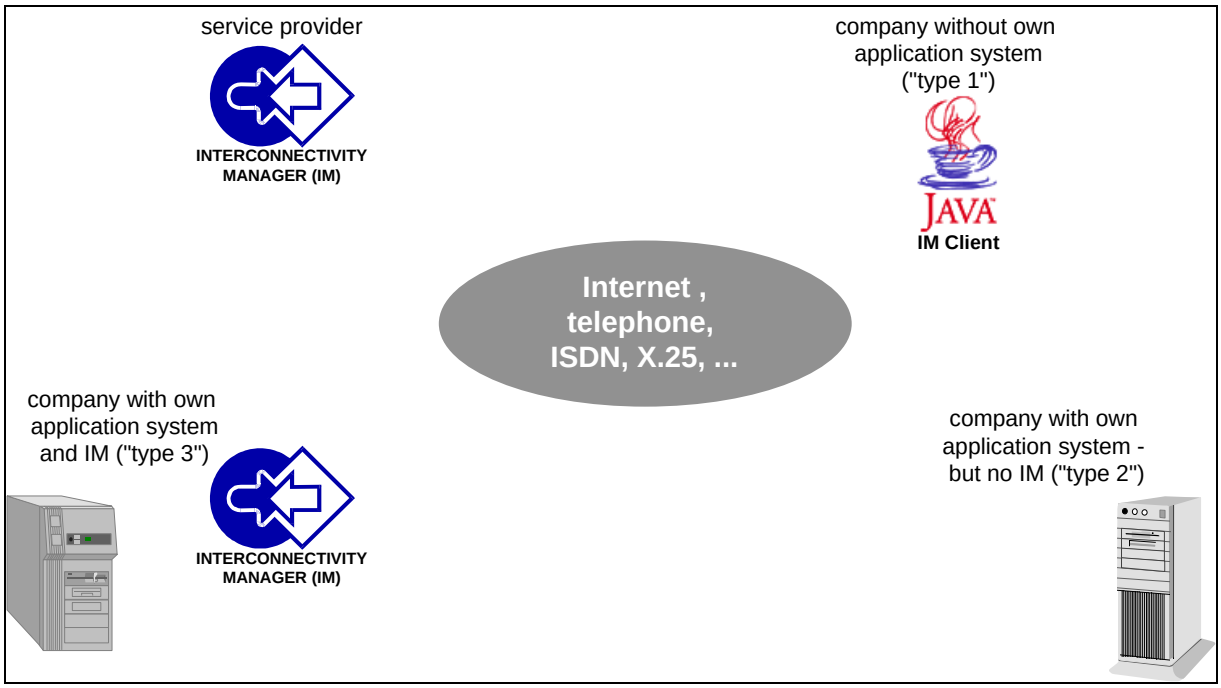


Fig. 5-7: Participants in the communication scenarios

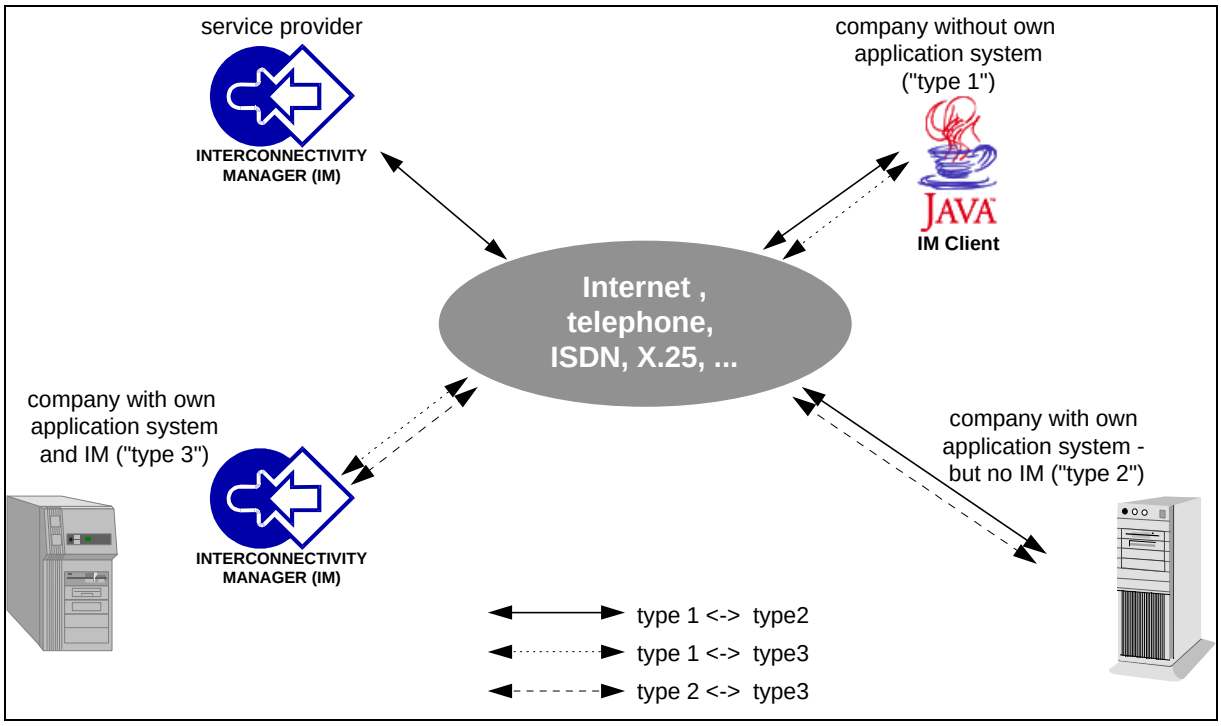


Fig. 5-8: Three communication scenarios between users of different types

Scenario	Description
type 1 <-> type 2	The type 1 user without an application system sends and receives messages using his IM client software - where in fact „send“ and „receive“ means, that he accesses the communications data base of the service provider where the messages are intermediately stored. Then, the message processing at the service provider is used to extract the messages from the communications data base and the system integration imports them into the type 2 user’s application system. Vice versa, the system integration of the service provider’s IM extracts messages from the type 2 user’s application system. Then the message processing imports them into the communications data base, from where they can be retrieved again by the type 1 user with the help of his IM client software.
type 1 <-> type 3	The type 1 user without an application system sends and receives messages using his IM client software - where in fact „send“ and „receive“ means, that he accesses the communications data base of the type 3 user where the messages are intermediately stored. Then, the message processing at the type 3 user is used to extract the messages from the communications data base and the system integration imports them into his application system. Vice versa, the system integration of the type 3 user’s IM extracts messages from his application system. Then the message processing imports them into the communications data base, from where they can be

	retrieved again by the type 1 user with the help of his IM client software.
type 2 <-> type 3	In this scenario no IM client software is necessary, because both partners operate own application systems. The task of the IM running at the type 3 user is to extract messages from his application system, to store them intermediately in the communications data base, to extract them from there and - last not least - to import them into the type 2 user's application system. Vice versa, the type 3 user's IM extracts messages from the type 2 user's application system, stores them intermediately in the communications data base, extracts them from there and imports them into the type 3 user's application system.

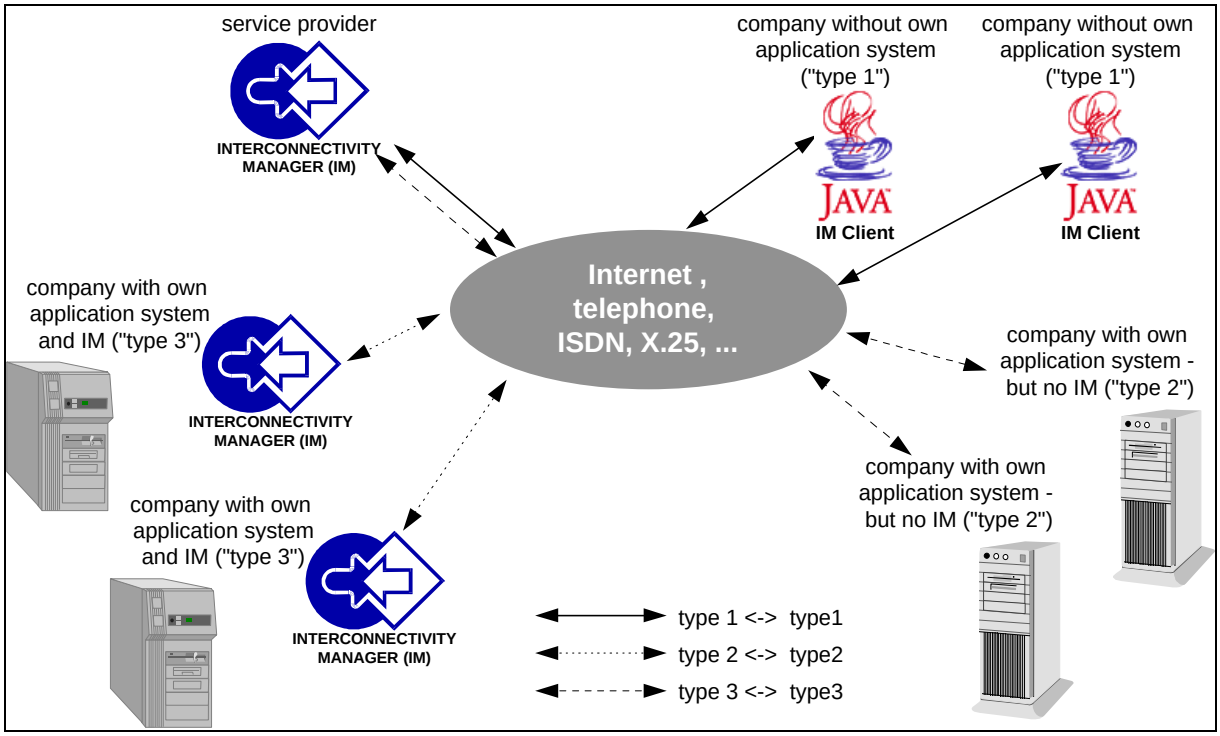


Fig. 5-9: Three communication scenarios between users of the same type

scenario	description
type 1 <-> type 1	The type 1 users without own application systems send and receive messages using their IM client software - where in fact „send“ and „receive“ means, that they access one and the same communications data base of the service provider where the messages are intermediately stored.
type 2 <-> type 2	The type 2 users with own application systems can exchange messages directly from application system to application system using the IM running at a service provider. To this end, the system integration of the service provider's IM extracts messages from one of the application systems and the message processing

	stores them intermediately in the communications data base. Then, the message processing extracts them from the communications data base and the system integration imports them into the other application system.
type 3 <-> type 3	The type 3 users with own application systems can exchange messages directly from application system to application system using an IM running at one of them. To this end, the system integration of one of the IM's extracts messages from one of the application systems and the message processing stores them intermediately in the communications data base. Then, the message processing extracts them from the communications data base and the system integration imports them into the other application system.

5.3 Overview of the BOPCom Toolbox

Based on the general concept BOPCom provides tools and services which are useful for the realisation of EDI concepts in the port and transport business. Based on the innovative concept for communication called „Interconnectivity Manager“ (IM) described above, related tools have been developed for linking all kinds of application system so that they can interact automatically. For users without appropriate application systems Internet/World Wide Web links are offered, e.g. for SMEs in the transport business.

The tools solve a wide variety of today´s processing and communication problems between application systems. The toolbox offers individual solutions for individual problems.

The AIM tools can be installed and operated directly by a company or authority or by a service provider which could offer not only services for physical data transmission but also assist in establishing direct links between companies.

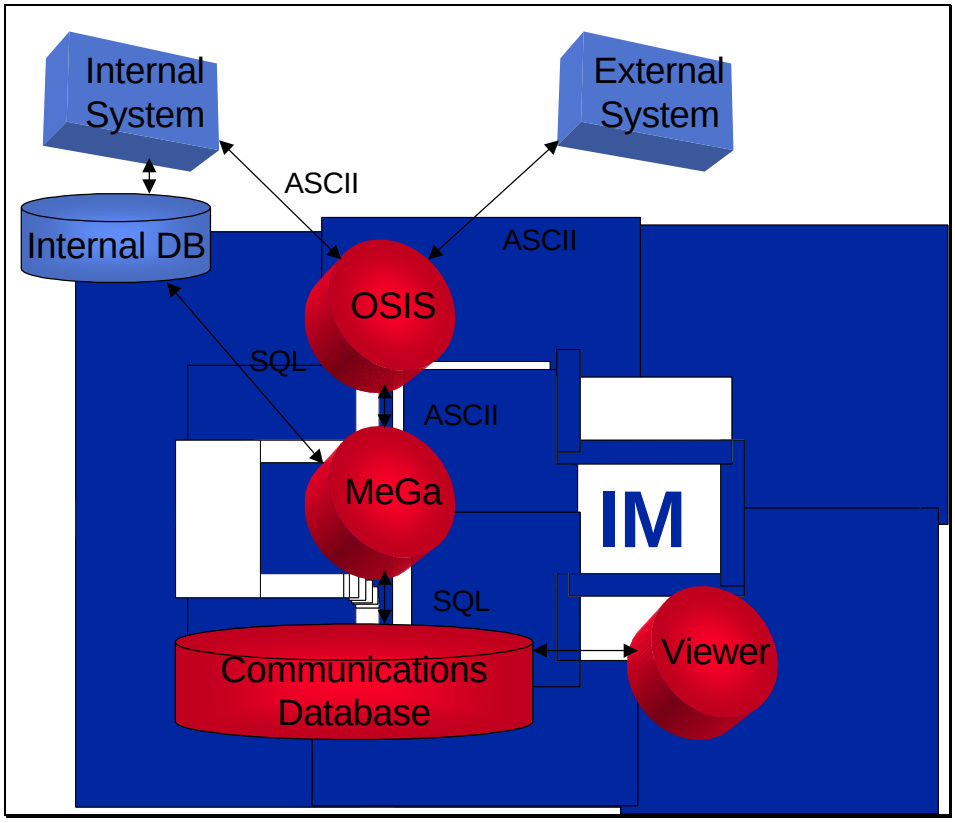


Fig. 5-10: The BOPCom Toolbox

The components of the BOPCom toolbox are briefly described below.

5.3.1 OSIS (Open System Interconnection Software)

OSIS enables the link between any systems exchanging ASCII or EBCDIC Files (e.g. EDIFACT messages) to be linked up.

The functions of OSIS are:

- Technical level
  - Protocol and network control, e.g. TCP/IP, SAP protocols and host access via LU6.2
  - Communication control, e.g. active and passive communication, time or event driven, remote function calls
  - Links to different information suppliers and receivers
- Functional level
  - Format conversion, key replacements (e.g. for converting between in-house formats and standard formats like EDIFACT or SAP-IDOCs)
  - Processing of different messages
  - Status monitoring, error handling and recovery functions for system shutdown
  - Logging of activities

The commercial product OSIS has been installed over 80 times in a working environment. It can be configured individually to the specific user needs, i.e. with regard to the messages to be exchanged and systems to be interconnected.

5.3.2 MeGa (Message Gateway)

The MeGa Tool enables the convenient linking between ASCII Files (e.g. EDIFACT messages) and database structures.

MeGa thus supports

- the generation of ASCII files from in-house databases or CoDaBa and
- the integration of ASCII files into in-house databases or CoDaBa.

MeGa is implemented in the programming language PERL; the users do not need any programming knowledge because MeGa can be configured to process different kinds of ASCII files just by setting parameters. A manual describes how to operate and configure MeGa. It can be individually configured to the needs of the users (the structure of the internal database) and messages to be exchanged.

5.3.3 CoDaBa (Communications Database)

CoDaBa is a generic database structure that can be used for storing any information to be exchanged in the port and transport business. The user can implement CoDaBa with any kind of relational database management system (RDBMS).

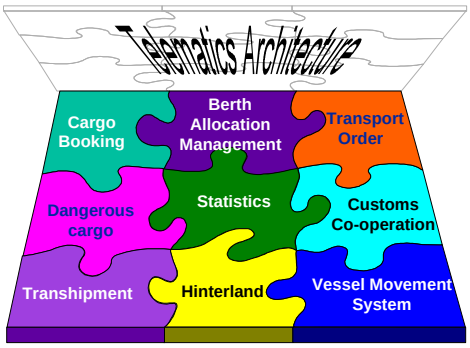
CoDaBa is provided as SQL scripts that create a skeleton for basic database tables („parent“ tables) and their relations. The object-oriented CoDaBa concept provides for „child“ tables realising the concrete entities of the application concerned to be generated easily by the users themselves.

CoDaBa will be directly accessed by the Application Viewers (ApVis) which have been developed in the BOPCom project.

5.3.4 ApVis (Application Viewers)

ApVis are tools for directly accessing the Communications Database CoDaBa. They can be used for on-line data entry and retrieval by communication partners who do not have an application system supporting the communication. In the BOPCom project, ApVis examples covering several applications have been implemented using Java and HTML technology, e.g. the transmission of:

- cargo bookings
- transport orders
- dangerous cargo notices
- berth requests/confirmations
- loading and discharging orders



5.4 The Communications Database

The Communications Database (CoDaBa) has been the core for all developments of application viewers.

5.4.1 The philosophy of the BOPCom data model

5.4.1.1 The background

A typical problem in communication today is the storage of a lot of pieces of information where it cannot be seen easily which parts belong together. In the BOPCom area, all information belong to the common object: **transport of goods**.

A simple example can outline the general problem of interconnectivity and interoperability. Let us assume that a shipping company will receive shipping orders from a car manufacturer (resp. a forwarding agent) from the actual production data (cp. Fig. 5-11).

Fig. 5-11: Manual interaction in data conversion

At the shipping company the receiver is not of interest; here, the port of discharge must be known. Normally a clerk (despite of maybe existing EDI link!) will have the task to change the incoming data in such a way that the inhouse system can process them.

The BOPCom approach tries to overcome this necessity for manual interaction. Such a functionality shall be automated. For this aim, an **Interconnectivity Manager** performs this conversion task.

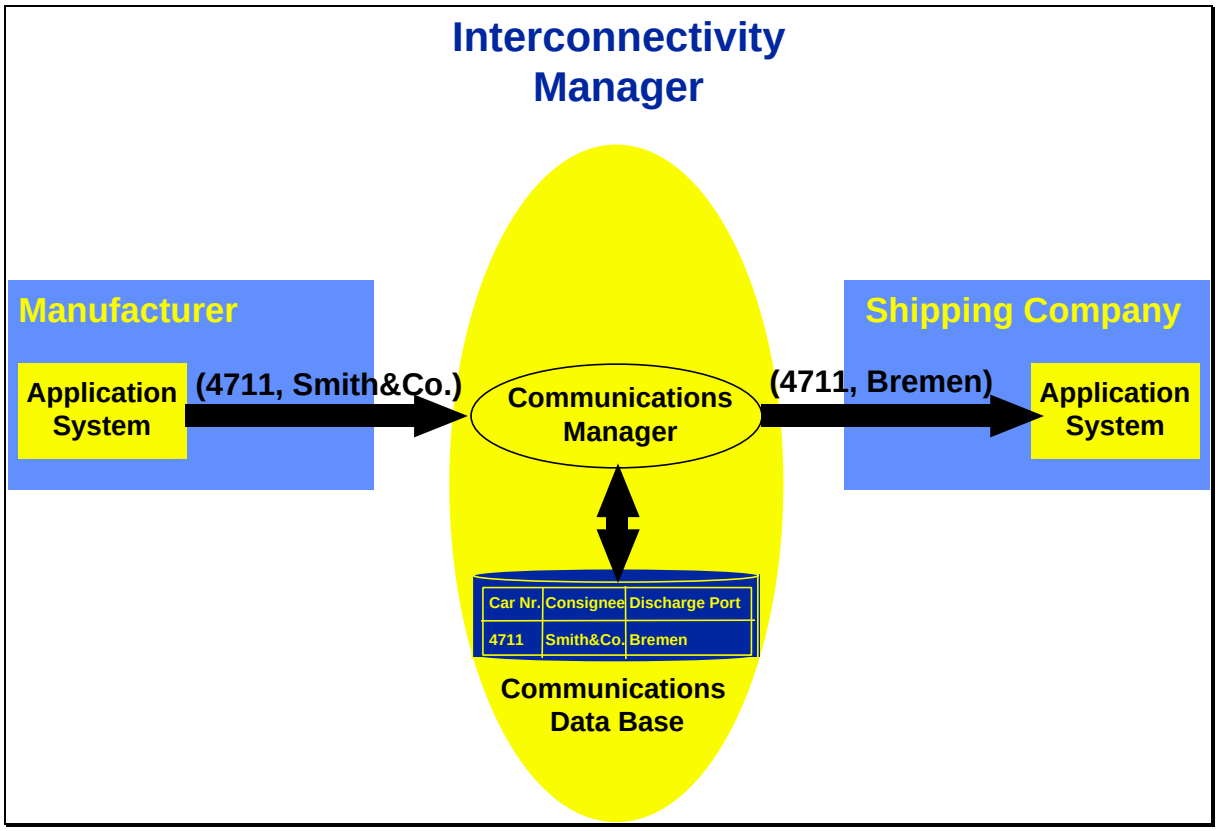


Fig. 5-12: Automatic performance of data conversion

As is can be seen in Fig. 5-12 this Interconnectivity Manager consists of two parts:

- the Communications Database
- the Communications Manager.

These two components will be described in detail in the Deliverable „Telematics Architecture“. Hereafter the focus is on the Communications Database.

The Communications Database builds the skeleton for the communication.

The Communications Database enables on one hand the link to existing application systems, which can be either inhouse systems (if the database is installed in the own premises) or systems of external communication partners, but also (using a „data browser“) the input and retrieval of stored information for communication partners without appropriate application systems.

The necessity for the creation of such a communications database becomes clear in the following situation. A company, in this example a shipping company, receives and processes a lot of information as **messages** (see Fig. 5-13).

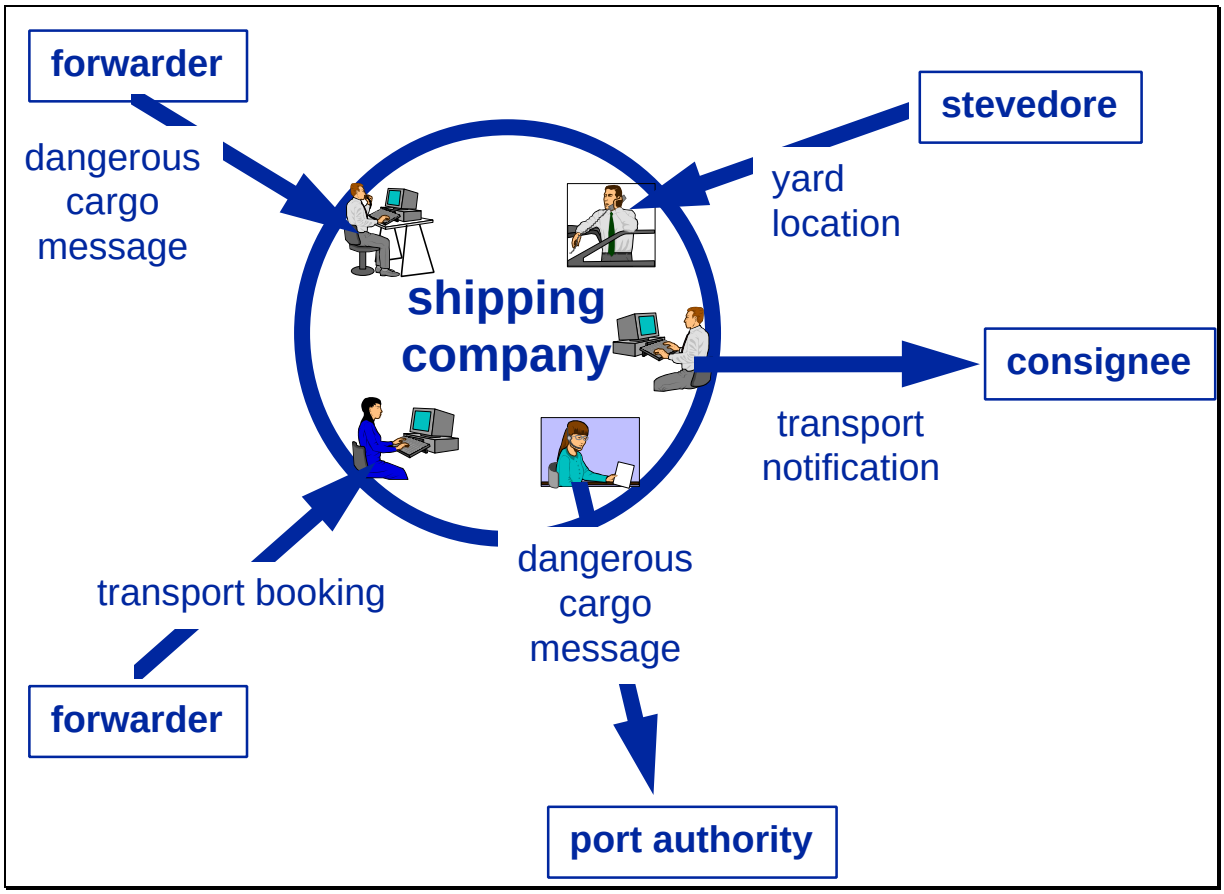


Fig. 5-13: Actual communication situation

Many of the shown messages will be processed in different departments by different people, possibly also by different EDP systems. The consequence is a number of independent „information pieces“ which do contain identical and redundant information. But one thing is common to all of them: they belong to the same transport! Links between these „information pieces“ are hardly to establish.

It seems to be natural to link these „information pieces“. If such a project will be realised in a company, in most cases the whole inhouse EDP systems have to be re-developed which is from the budget´s and the organisational view a very costly process.

Therefore, the idea to create a Communications Database together with the Communications Manager will be a solution in order to avoid the modification of the existing inhouse systems although implementing the link and consistent storage of the information pieces which belong together - linked by the element **transport** (see Fig. 5-14).

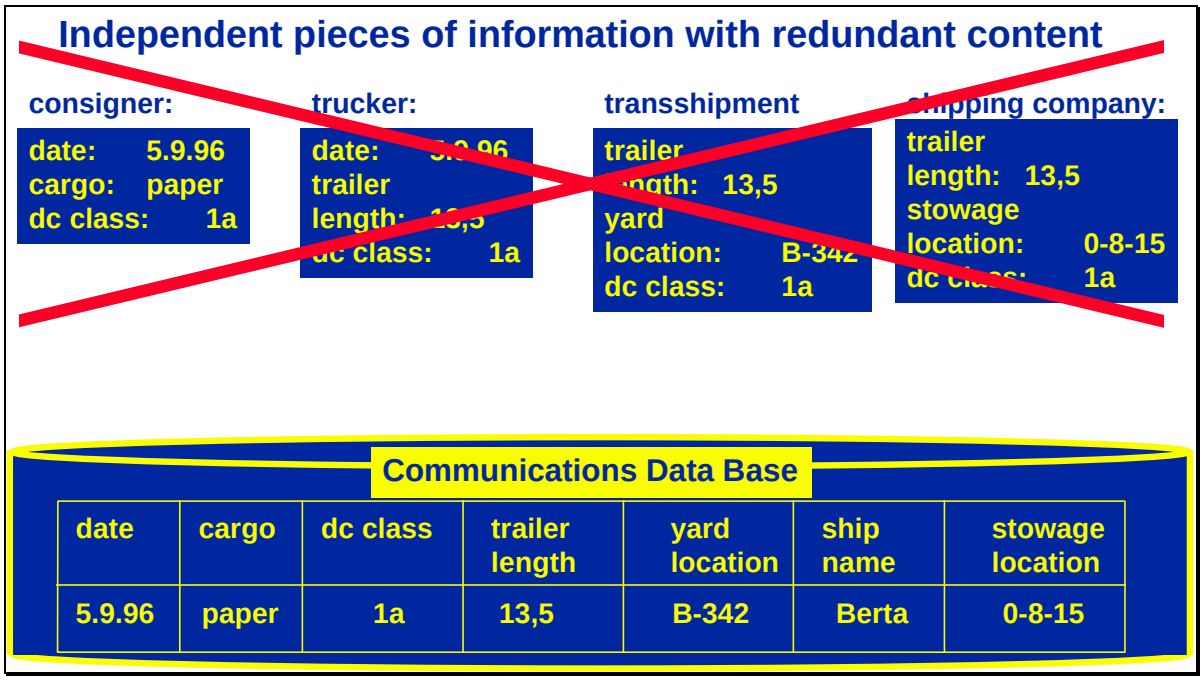


Fig. 5-14: The Communications Database

The Communications Manager owns the knowledge how to combine incoming and outgoing information and performs this task automatically (see Fig. 5-15). If an information is missing for the establishment of that link he either looks into his own knowledge base or tries to retrieve this information by sending a request to another information system and enters the retrieved information into his Communications Database. With this mechanism the interconnectivity manager can always give qualified answers on all information available to one transport.

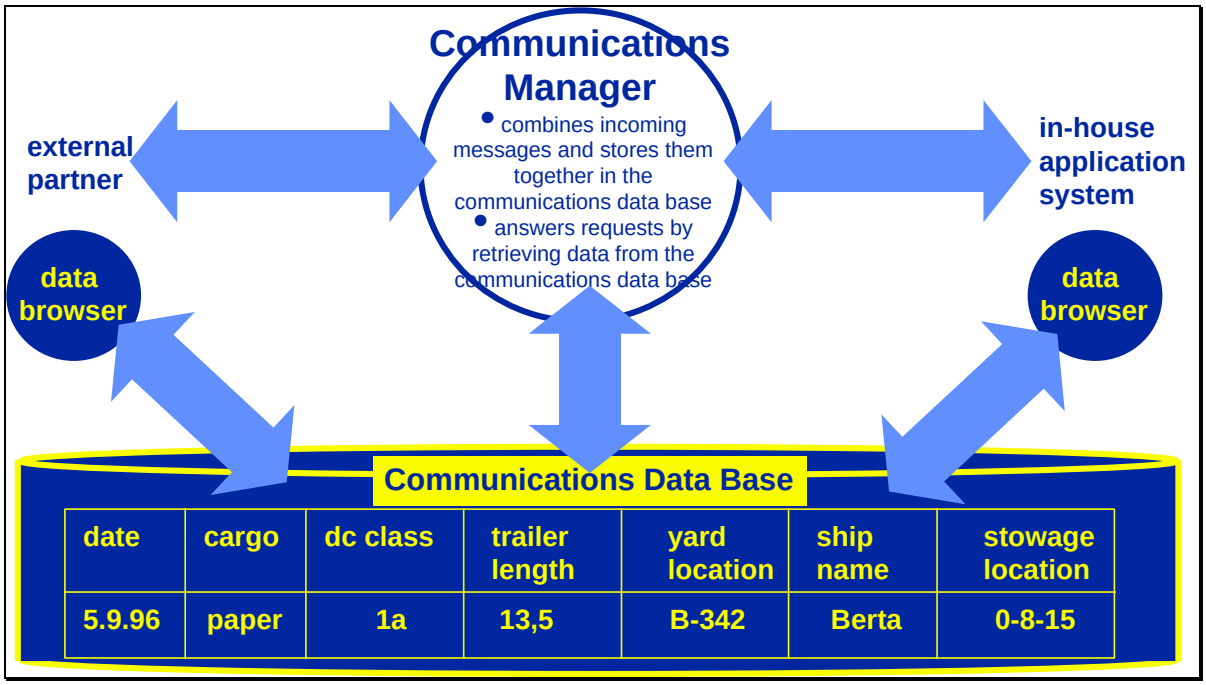


Fig. 5-15: Communications Manager and Database

The solution of the set-up of an Interconnectivity Manager at the premises of a company, e.g. a SME, could look in the following way (see Fig. 5-16):

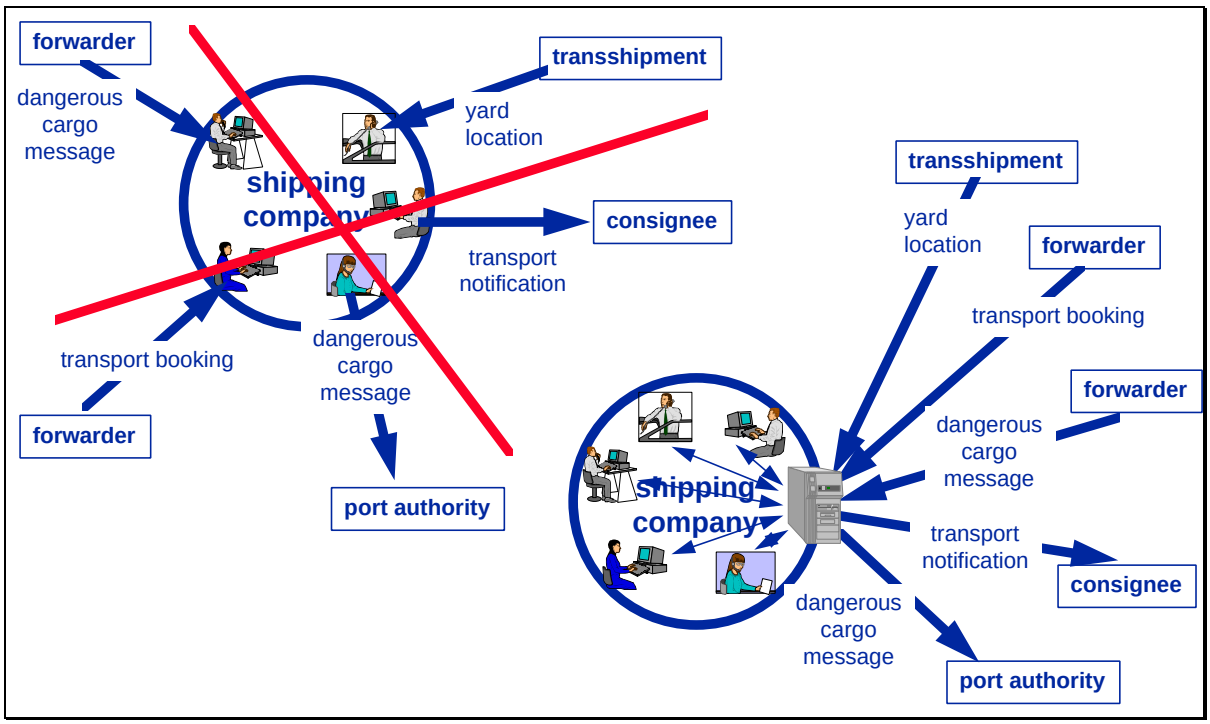


Fig. 5-16: Future Situation

The data tables in the Communications Database must be designed in such a way that it can process and create all possible messages in the transport area (e.g. EDIFACT messages).

5.4.1.2 Benefits from a data model

A **data model** gives a very much clearer representation of real life objects like, for example, a transport, a cargo or a trailer than messages do because one **message** contains a mixture of properties of different objects, like for example, the departure date (= property of the transport), the weight (=property of the cargo) and the length (=property of the trailer).

Therefore - the exclusive look on messages is confusing.

On the contrary - if one has a data model he can easily understand the content and the structure of a message, and additionally he will be able to define new messages.

The basic philosophy of the BOPCom system architecture is to interconnect different EDP systems by fitting the messages coming from them into one single stock of information into the Communications Database. Then, different messages (for example, a booking, a dangerous cargo message or a transport notification) which belong to the same object (for example a certain trailer) can be stored together. To this end there is a need to develop a **data model** for the Communication Database and to to assign the data elements of the different messages to the attributes of the entities in this data model.

Will it be successful to create this database as generic transport data model it could function as a „standard“ for all transport relevant objects in the future.

The main benefits of the Communications Database are:

- No redundancy because each fact is stored only once in the communications data base.
- Validation checks between new incoming information and information stored already in the communications data base.
- Extended enquiry capabilities from the interconnected information pieces in the communications data base.
- User interface ("Data Browser") for users without own application systems.

In Lübeck, the „added value“ of the Communications Database CoDaBa became obvious. Having all the booking related information stored in the TraDaV Communications Database, the generation of dangerous cargo declarations to the Lübeck Port Authority is possible quite easily: no new data has to be sent by the users; these messages can be generated from the existing information without additional data entry! This considerably reduces the efforts in labour and communication costs of the shipping agents.

5.4.2 The Development Approach

5.4.2.1 General data model development

In data model development the first step is to identify the objects of the „world“ which should be covered. These objects will later form the entities of the data model. For the BOPCom data model these objects have been grouped under certain headings while using an object-relational approach.

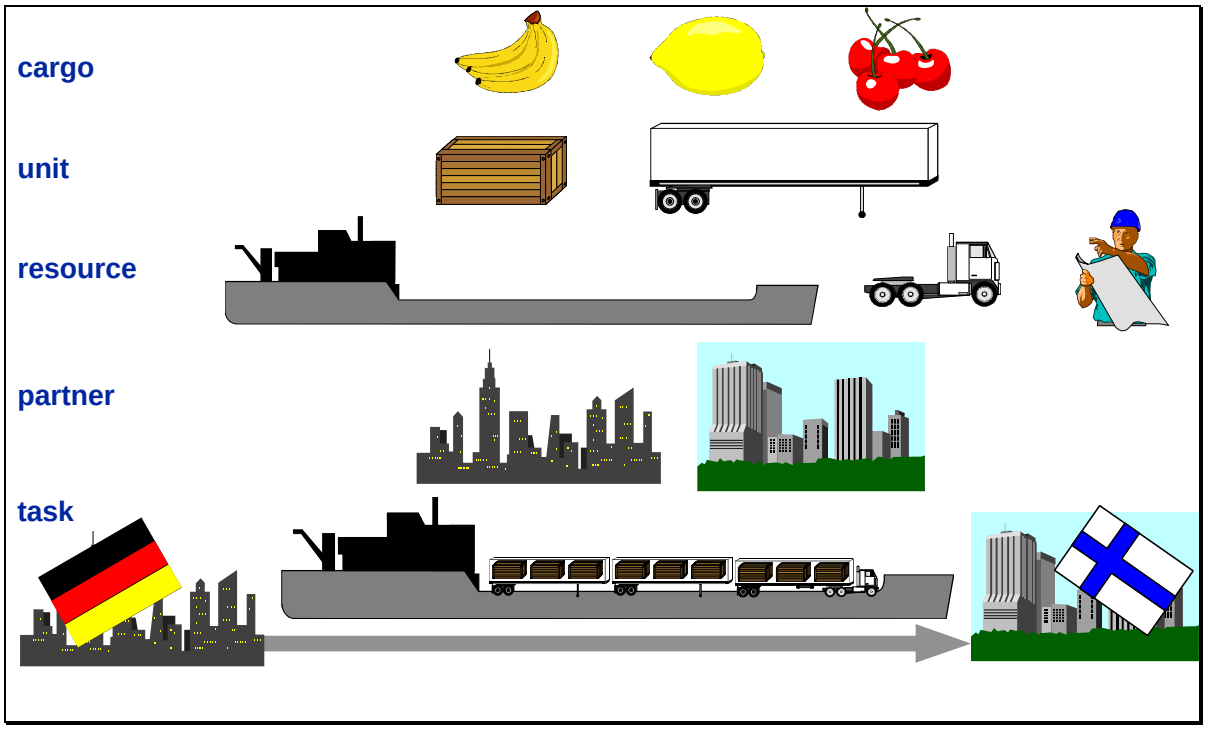


Fig. 5-17: Entities

As described above, one of the tasks is to assign the data items of the relevant messages to the entities of the data model as shown in Fig. 5-17, e.g. a truck transport order (task) will employ a truck (resource) which will be linked with a trailer (resource) transporting a container (unit) which may contain several boxes (units) with several cargoes each.

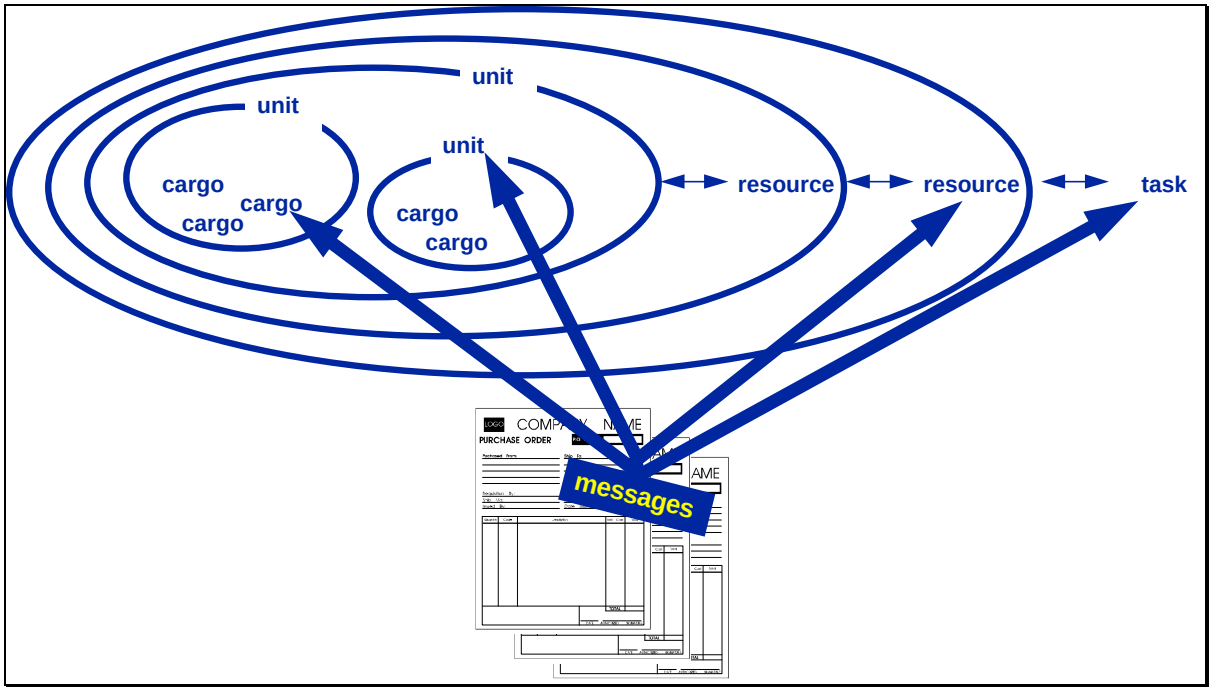


Fig. 5-18: Entities and Messages

If having identified the entities (objects) and their links to messages the relations (connections) between the entities will be drawn (Fig. 5-19).

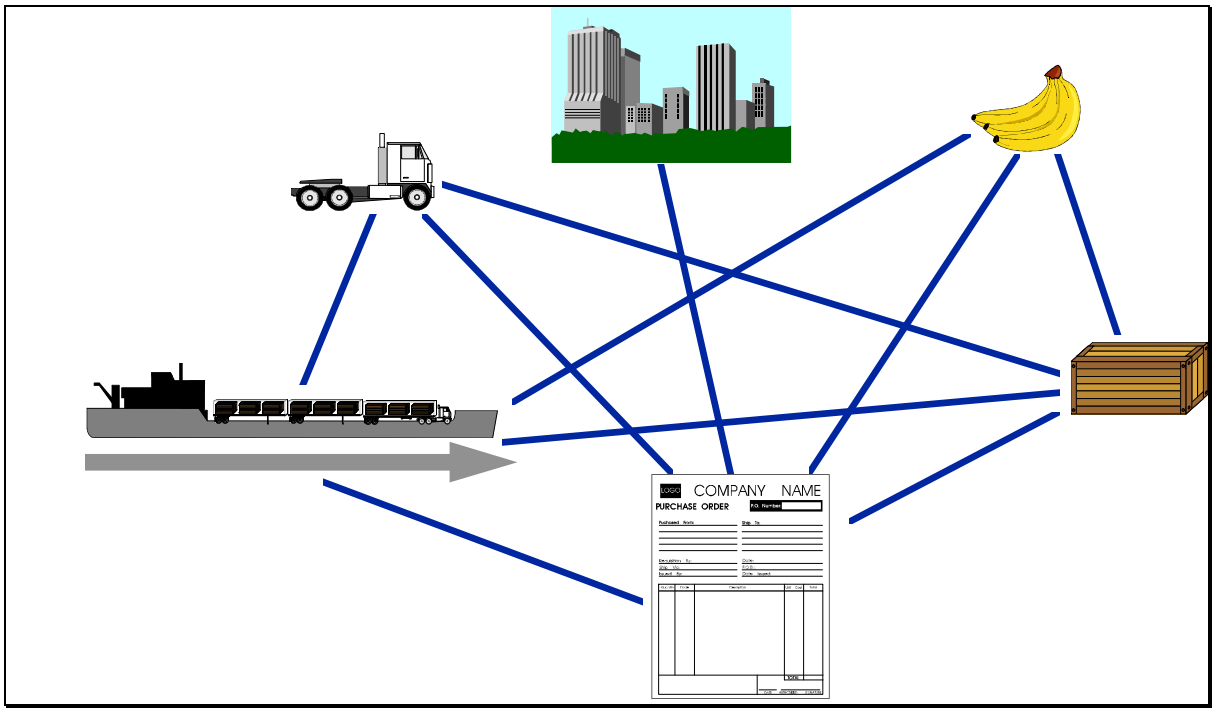


Fig. 5-19: Entities and Relations

After this, the process of formalisation takes place in order to describe the entities and relations in a formal way which enables the transmission to a computer database afterwards (see Fig. 5-20).

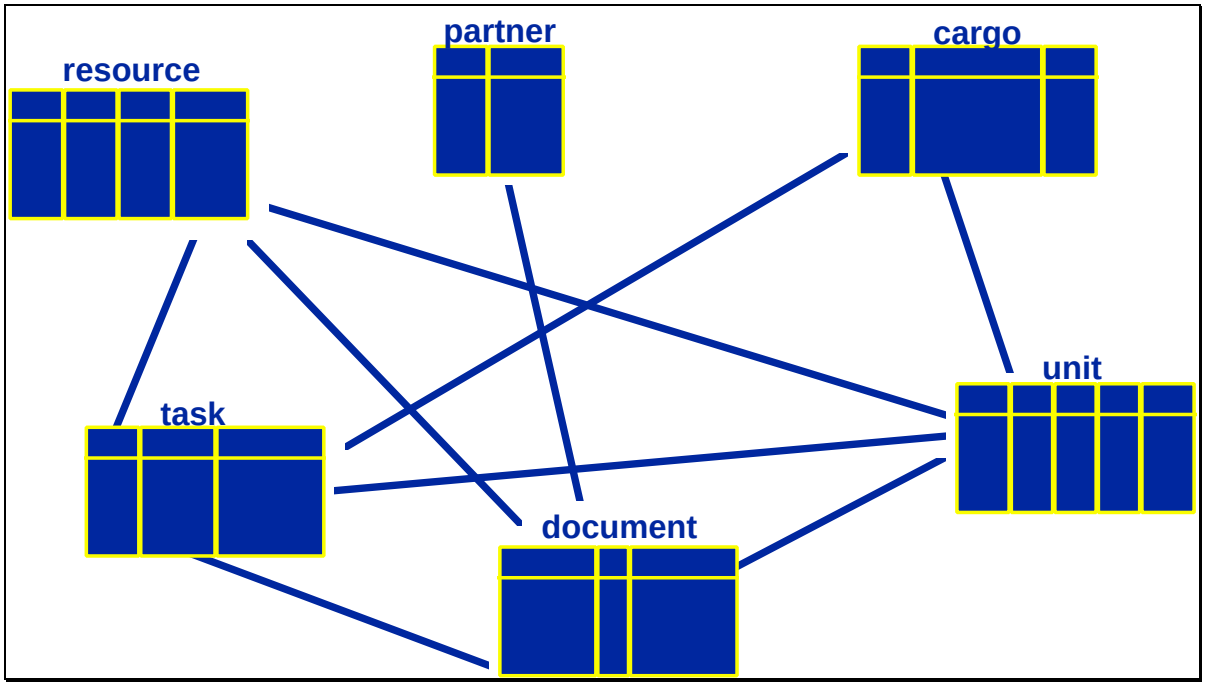


Fig. 5-20: Formalisation of the data model

5.4.2.2 Special BOPCom development features

The BOPCom data model is designed in a **generic** way, i.e. reducing the basic entities (or objects) on a limited number and deriving the remaining entities as „children“ according to the object-relational approach. For example, the basic entity ***document*** represents all its children, such as ***booking***, ***avis***, ***berthing order***, etc.

The **attributes** (data fields) for the entities have - of course - to be defined and completed. Following the **inheritence** method of the object oriented approach it has to be decided where these attributes have to be put - either at the generic father object or at the child object (e.g. if all documents will have a document number, this attribute will be at the father object ***document*** whereas e.g. attributes specific to a berthing order will be stored at the child ***berthing order***).

This data model has been developed using a two-way approach. On one hand - for the rapid prototyping of the Booking application - a basic draft model has been developed by ISL and TRADAV according to a purely object oriented approach and its realisation with a relational database management system (RDBMS). This draft is presented here in an abstract view (Fig. 5-21) and has been distributed to the development partners as detailed description.

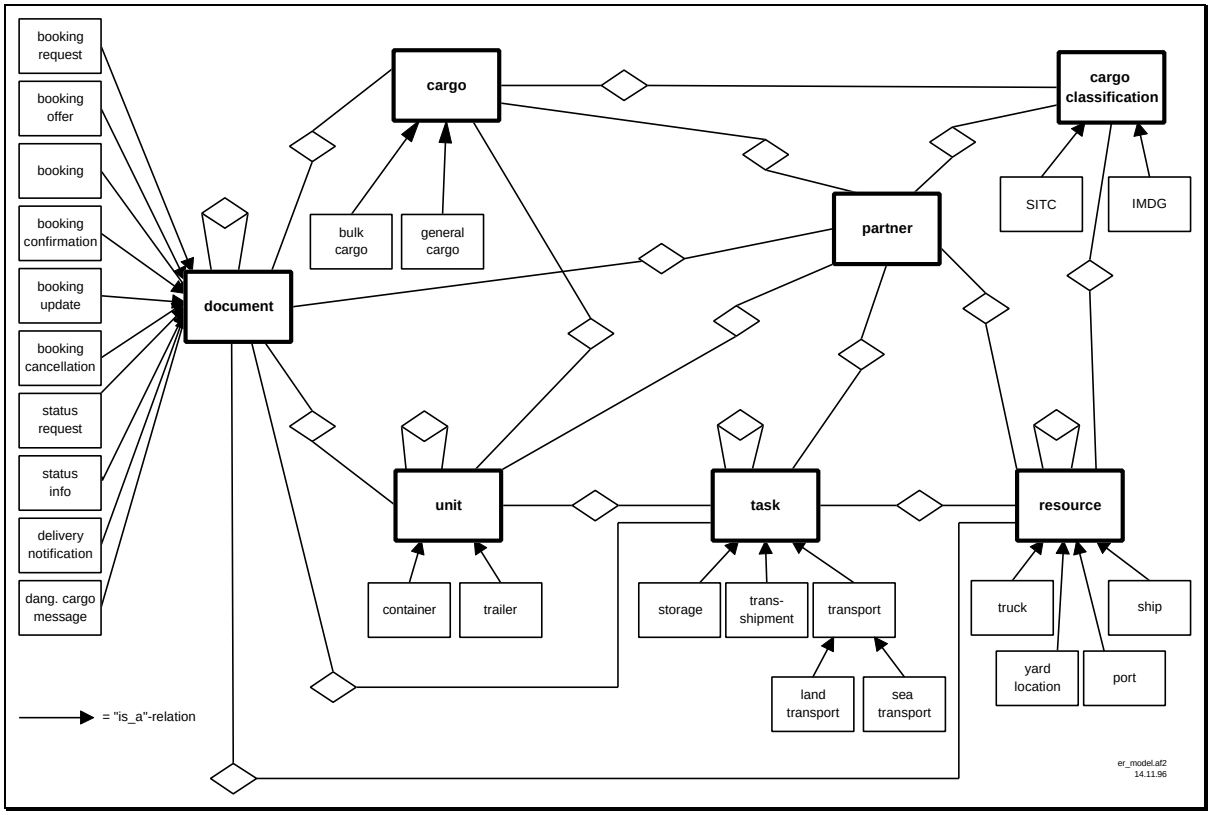


Fig. 5-21: The "complete" generic BOPCom data model

This „complete“ data model had the clear philosophy that:

- there are **parent entities** which are fixed and may not be changed (bold)
- there are **child entities** for all parent entities depending on the application, e.g. the parent entity resource may have child entities ship, truck, railway wagon, etc.
- **relations** are existing only between the parent entities (the parent entities may be treated to be hard-wired)
- system managers may **create** child entities according to the application but no relations

With this draft model first experiences especially concerning the performance had been collected which led to some refinements and changes. Especially the search statements consisting of nine or more database tables (which will be caused often by the pure object oriented approach, e.g. having different partners, different resources, etc.) required a substantial change in the complete model - not in the tables and the data contents themselves, but in the overall structure.

The parent entities have been divided into two groups:

- the **permanent entities** containing basic data which remain in the database (as vessel, partners, resources) and remain unchanged for a longer period
- the **transit entities** containing information for one transport (e.g. booking data) and can be deleted (resp. transferred to an archive) after the performance of the transport.

With the new approach only the transit entities, i.e. task, document, cargo and unit, remain as parent entities whereas the base entities will be treated as „normal“ database tables (Fig. 5-22), where the partners and resources tables are - for simplicity reasons - combined in one block in this abstract diagram.

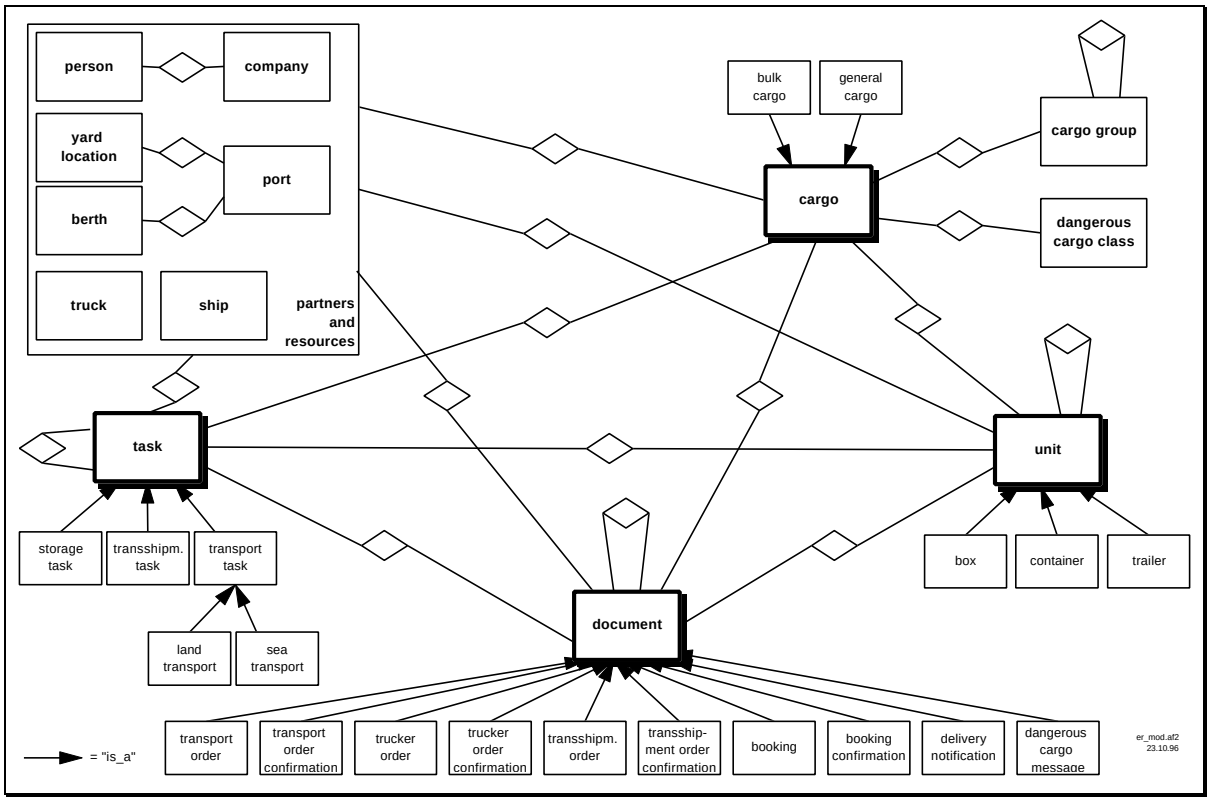


Fig. 5-22: The "simplified" generic BOPCom data model

In parallel the other development partners reviewed the basic draft model and added resp. modified components according to their workpackage needs.

The definition of the attributes were made according to the data elements of the EDIFACT directories wherever possible in order to be conform to the developments which have been made there.

Additionally, the BOPCom data model presented in this report has been validated with the EDIFACT strategy using the IFTMBF (Firm Booking Message) as an example and comparing it to the structure of the data model.

5.5 Application Viewers

The application viewers have been developed for the realisation of the „BOPCom Online“ concept, i.e. the support of companies which do not operate appropriate own systems for communication. The application viewers were built upon the Communications Database allowing the entry and retrieval of information for those users.

5.5.1 Applications for supporting the commercial chain

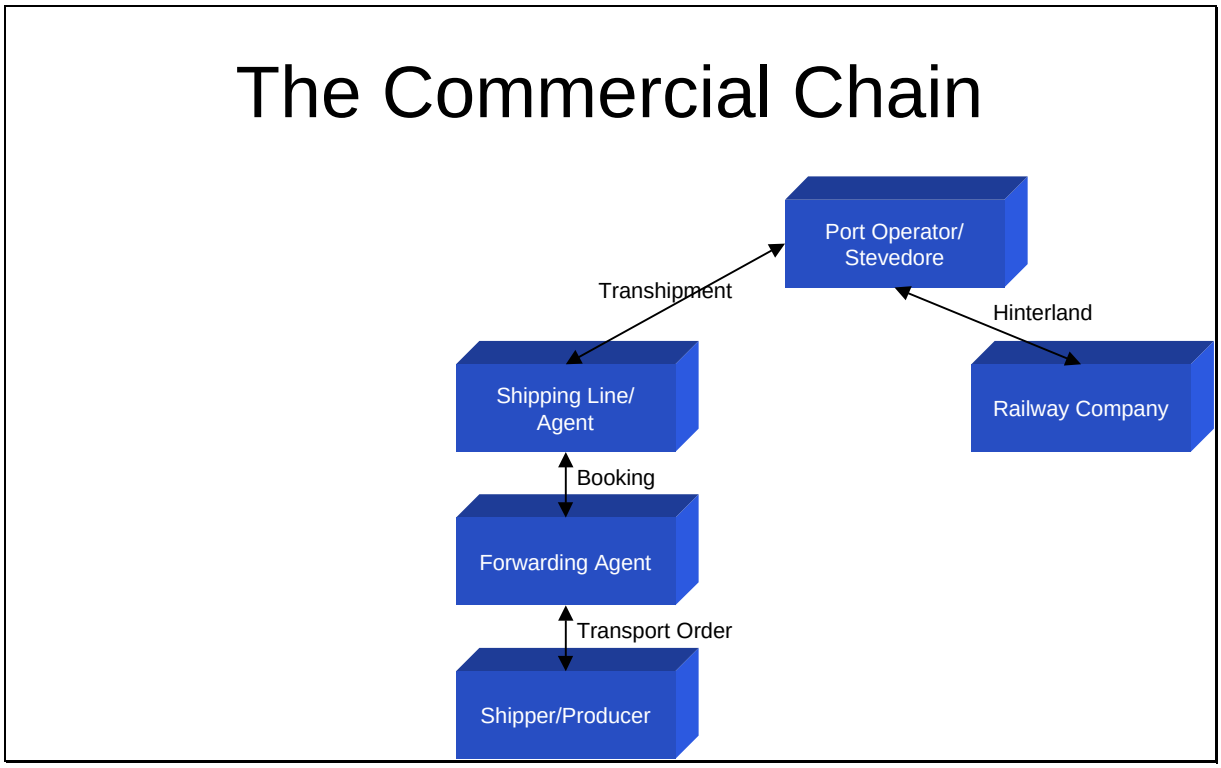


Fig. 5-23: BOPCom applications of the commercial chain

5.5.1.1 Booking

5.5.1.1.1 Principle

The Booking application shall be a link between existing inhouse applications in order to exchange information concerning the process of booking between forwarding agent and shipping agent. It will not include the development of a booking system itself.

However, for non-computerised users resp. users without appropriate inhouse systems a simple-to-use interface shall be included enabling this type of user to participate in EDI as well.

This interface is presented in this chapter.

The general workflow with the service provider TraDaV in between is shown below:

Forwarder	TraDaV	Shipping agent
1. Select application „Send Booking“		
2. Input booking, unit and cargo data		
	3. Store data	
		4. Select application „Edit Booking“
		5. Edit booking data (especially set trailer status to „confirmed“ / „waiting list“)
	6. Store data	
7. Select application „Edit Booking“		
8. Accept the booking		
... some time later:		
9. Select application „Edit Booking“		
10. Change booking data (for example: add a trailer)		
	11. Store data	
		12. Select application „Edit Booking“
		13. Edit booking data (for example: confirm the added trailer)
	14. Store data	
... and so on ... ... and so on ...		

5.5.1.1.2 Booking Status

One important conceptional aspect for the development of the booking user interface is the following:

There is no „Booking Message“ which is sent and replied by a „Booking Confirmation Message“. Instead of, there is only the „Booking“, which is stored in the communications data base and which may have different status’:

„not completed“ The sender of the booking hasn’t already put in all the data. In this state, the booking is not visible for the addressee.

„requested“ The sender has put in all the data but the addressee hasn’t yet read and edited them.

„confirmed“ The addressee has read the booking and has answered it - for example by changing the status’ of the trailers mentioned in the booking either to „confirmed“ or to „waiting list“. Possibly he has also changed some other data (for example, he has changed the ship name and the departure date, because the ship requested by the sender is overbooked)

„accepted“ The sender has given his „OK“ for the decisions of the addressee.

„modified“ Although the booking was agreed between sender and addressee, the addressee changes it again (possibly, now there is a more important customer and the trailers booked by the sender must be shifted to a later departure)

The transitions between these status’ are shown in the figure below - together with the events causing the transitions:

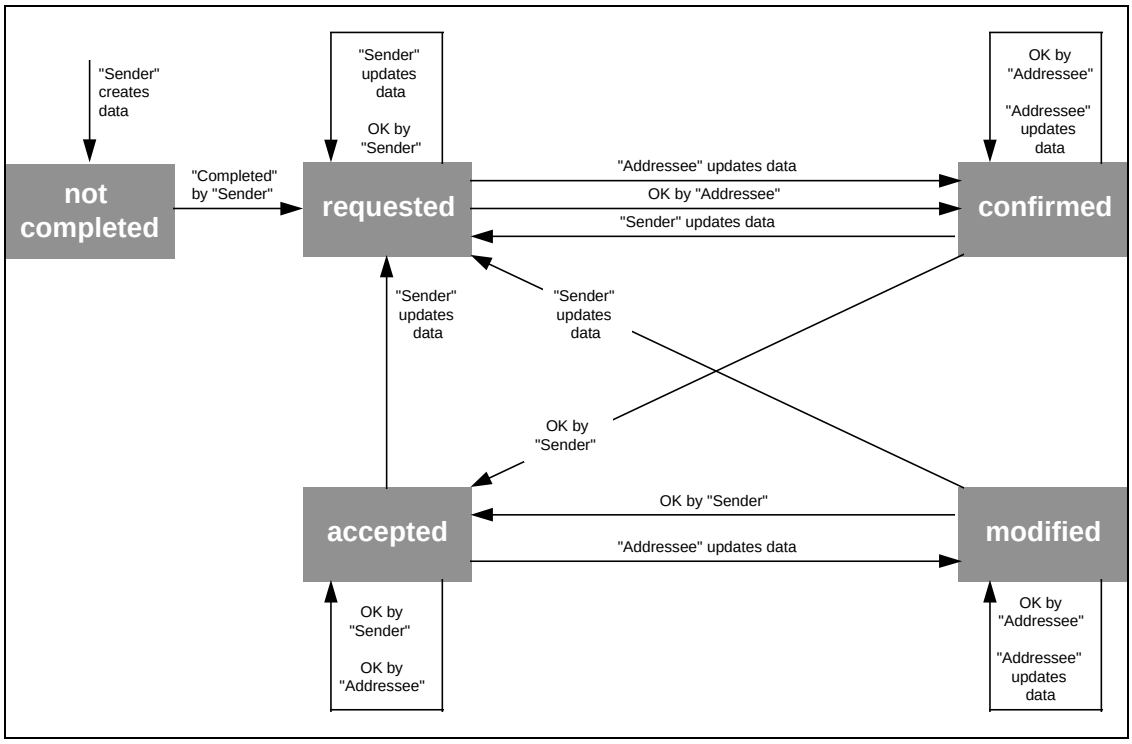


Fig. 5-24: Booking status

According to this basic philosophy of the booking status’ there are only two main screens - besides the application manager:

- the „Booking (List)“ screen and

- the „Booking (Detail)“ screen (either with or without data in it)

Then, to send a new booking means to open the „Booking (Detail)“ screen without data - whereas to edit an already sent booking means to open the „Booking (List)“ screen, to select one of the bookings from the list and then to open the „Booking (Detail)“ screen with data (see figure below):

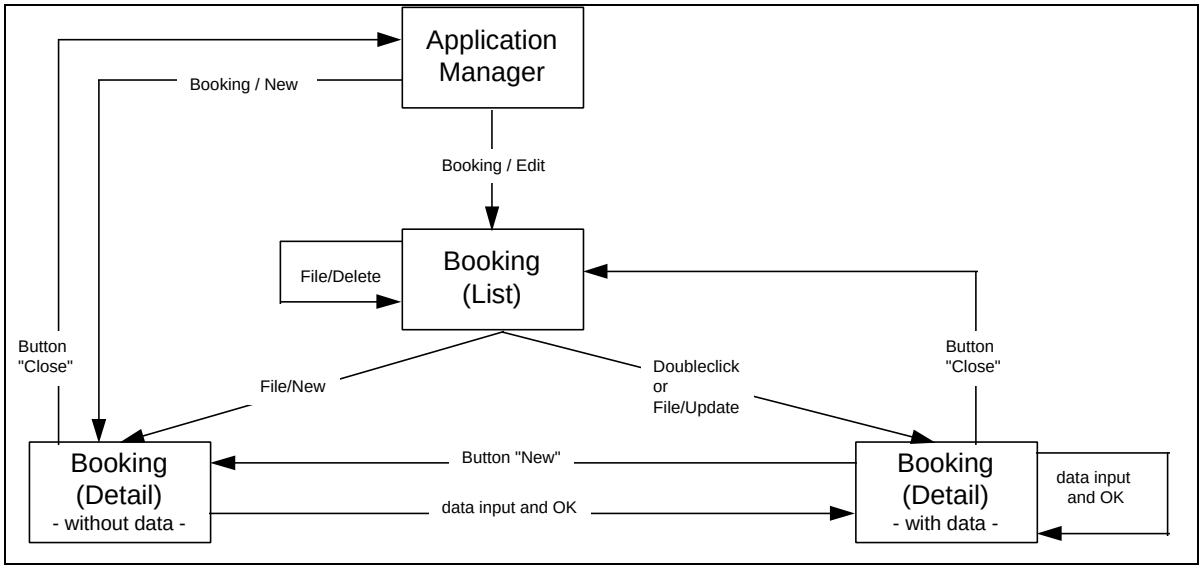


Fig. 5-25: Navigation in the Booking module

5.5.1.1.3 Screen examples

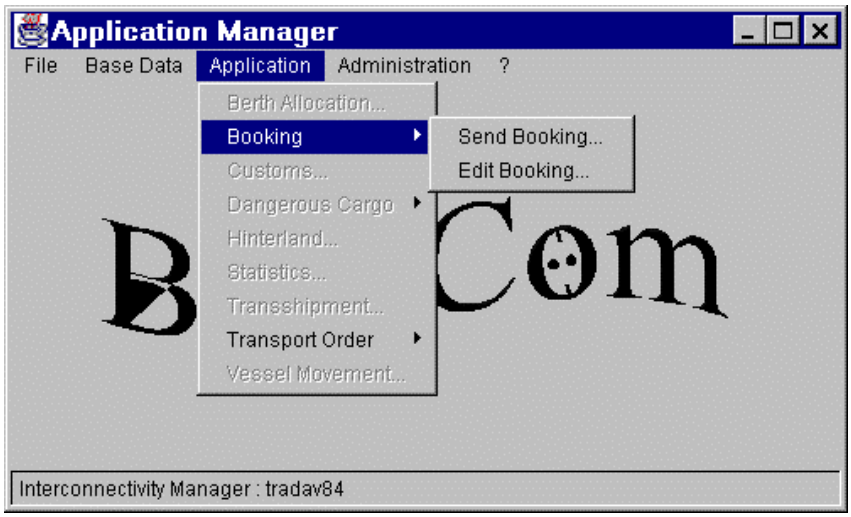


Fig. 5-26: Entry Screen of the Booking Module

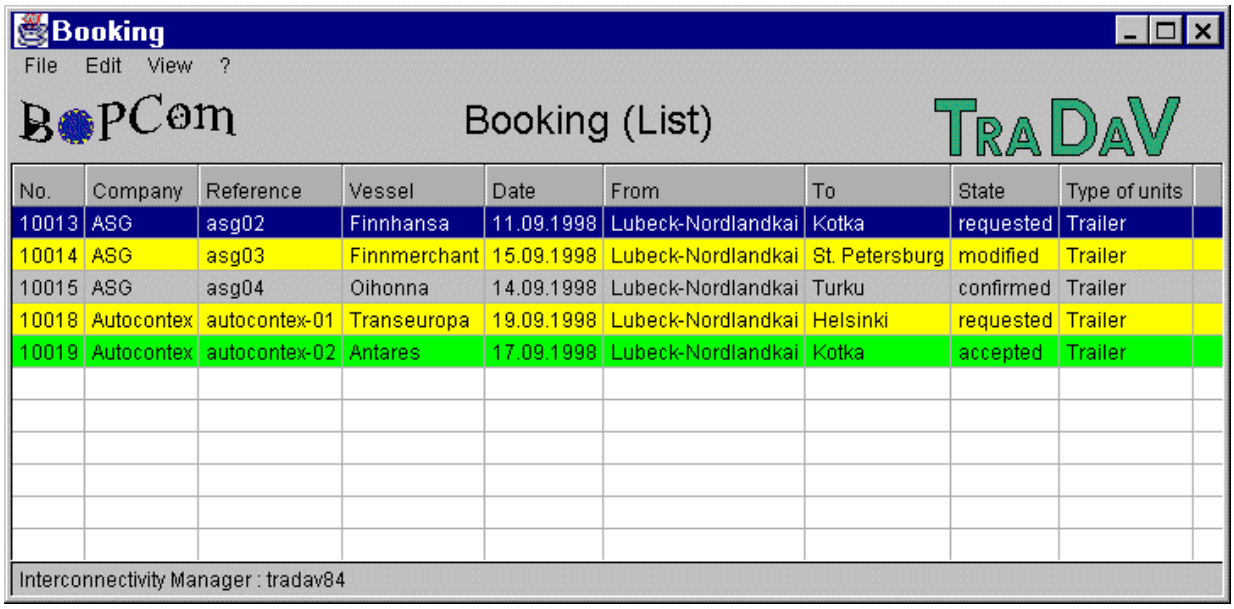


Fig. 5-27: Sample list screen (bookings) of the Booking module

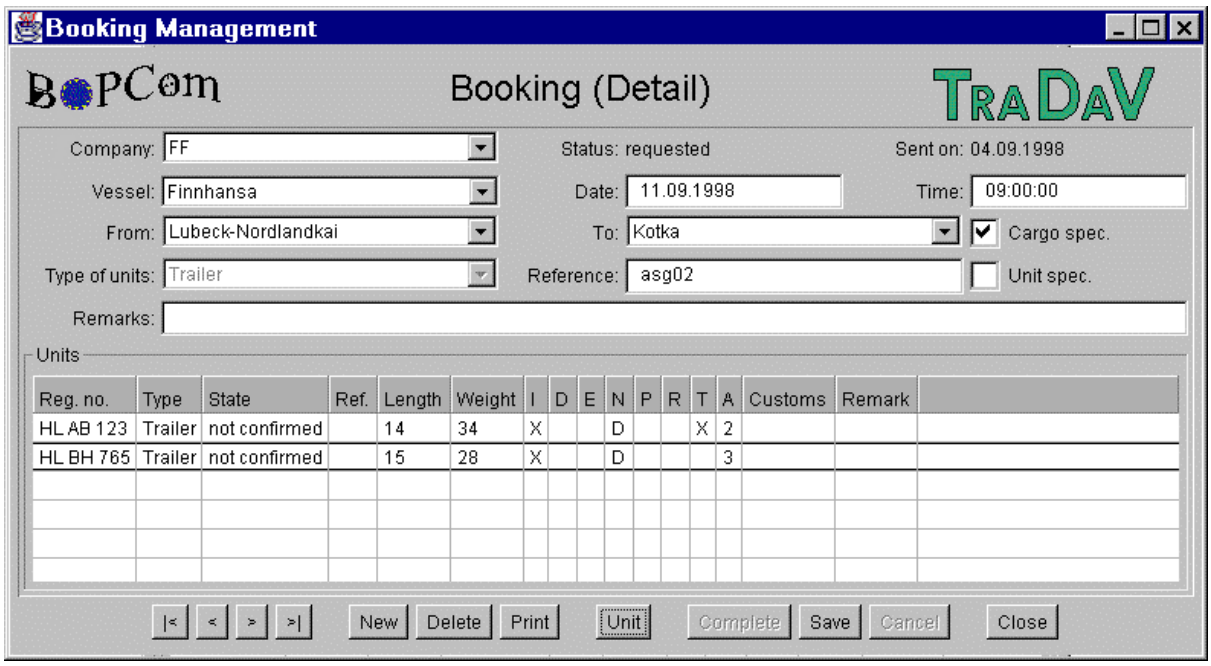


Fig. 5-28: Sample detail screen (bookings) of the Booking module

5.5.1.2 Transport Order

5.5.1.2.1 Principle

The Transport Order application shall be a link between existing inhouse applications in order to exchange information concerning the process of transport orders between shipper and

forwarding agent. It will not include the development of a booking system for transport orders itself.

However, for non-computerised users resp. users without appropriate inhouse systems a simple-to-use interface shall be included enabling this type of user to participate in EDI as well. This interface is presented in this chapter.

The general workflow with the service provider TraDaV in between is shown below:

Shipper	**TraDaV**	**Forwarding agent**
1. Select application „Send Transport Order“		
2. Input transport order, unit and cargo data		
	3. Store data	
		4. Select application „Edit Transport Order“
		5. Edit transport order data
	6. Store data	
7. Select application „Edit Transport Order“		
8. Accept the transport order		
... some time later:		
9. Select application „Edit Transport Order“		
10. Change booking data (for example: add cargoes/units)		
	11. Store data	
		12. Select application „Edit Transport Order“
		13. Edit transport order data (for example: confirm the added cargoes/units)
	14. Store data	
... and so on ...		

The status management is identical to those of the bookings, i.e. there is no „Transport Order Message“ which is sent and replied by a „Transport Order Confirmation Message“. Instead of, there is only the „Transport Order“, which is stored in the communications data base and which may have different status.

5.5.1.2.2 Screen Examples

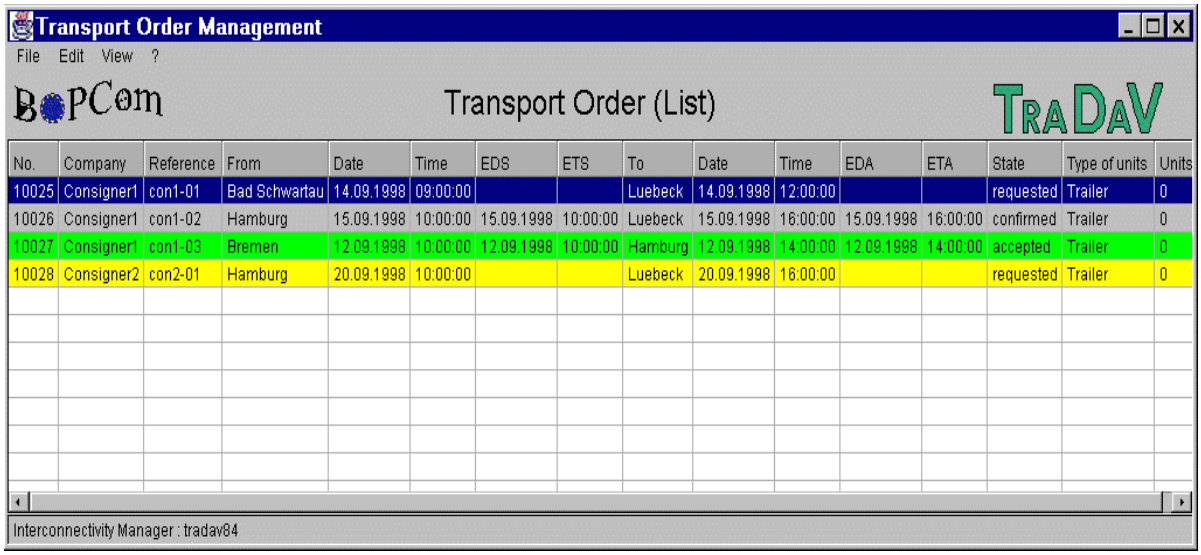


Fig. 5-29: Sample List Screen (transport orders) of the Transport Order module

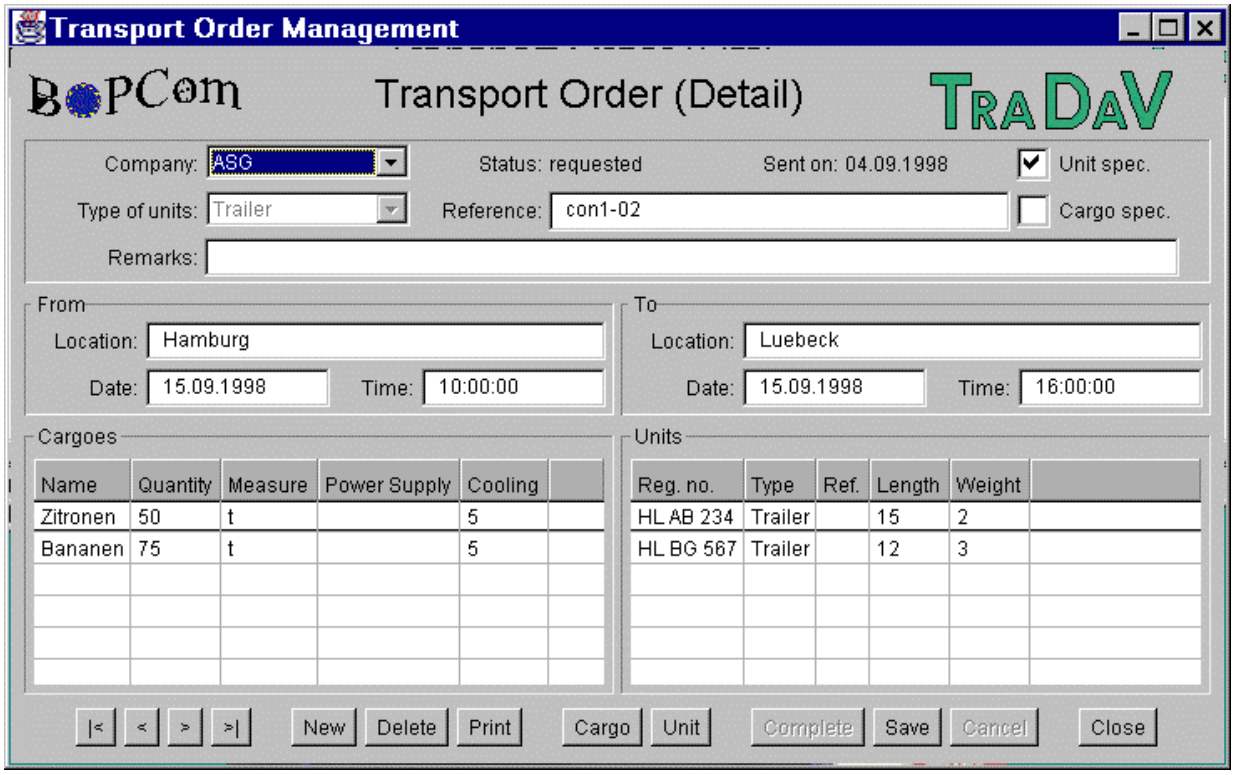


Fig. 5-30: Sample Detail Screen (transport orders) of the Transport Order module

5.5.1.3 Transhipment

5.5.1.3.1 Principles

The aim of the transhipment module is to develop a common information system regarding the most important order – relationships, connected with cargo handling operations.

The main purpose is to generate orders and confirmations from a common data source by using the BOPCom communication database and to distribute these orders and confirmations to different receivers.

The system contains the relevant available information of actual and planned cargo flow-details via a certain port.

These information will be stored in the communication database and are based on various documents:

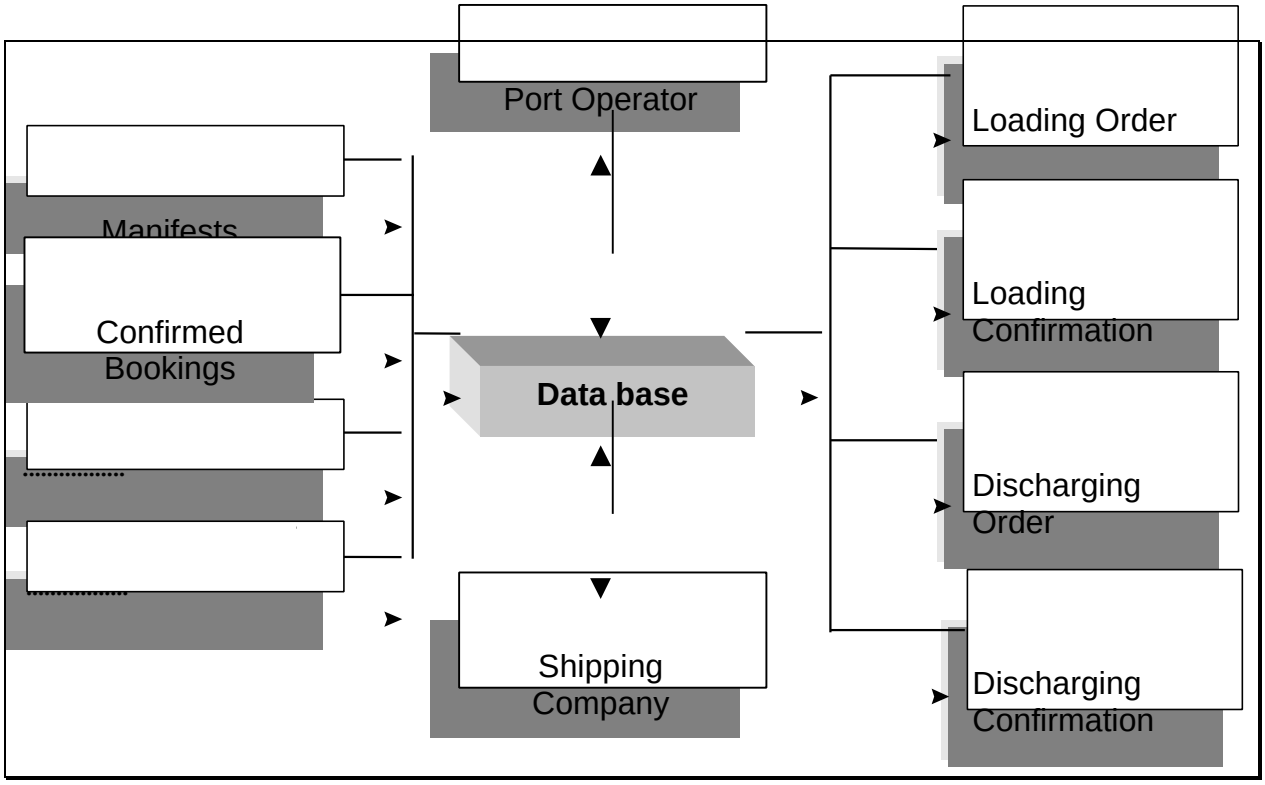


Fig. 5-31: Relation between database and documents

5.5.1.3.2 Main Functions

The BOPCom module (Application Viewer) Transhipment offers effective methods of data exchange for cargo related datas.

The Transhipment module will allow:

- the handling of loading/discharging orders and confirmations from the shipping line/agent or the inland transport operator/agent to the port operator and vice versa,
- the collection and storage of assignment information concerning transport units and cargo and their transfers to the companies,
- the collection, storage and, in connection with other BOPCom modules, provision of status information about the cargo (position within the transport chain) to all parties dealing with that specific transport from consignor to the consignee, thus improving the availability of all information necessary for transhipment and benefitting customers.

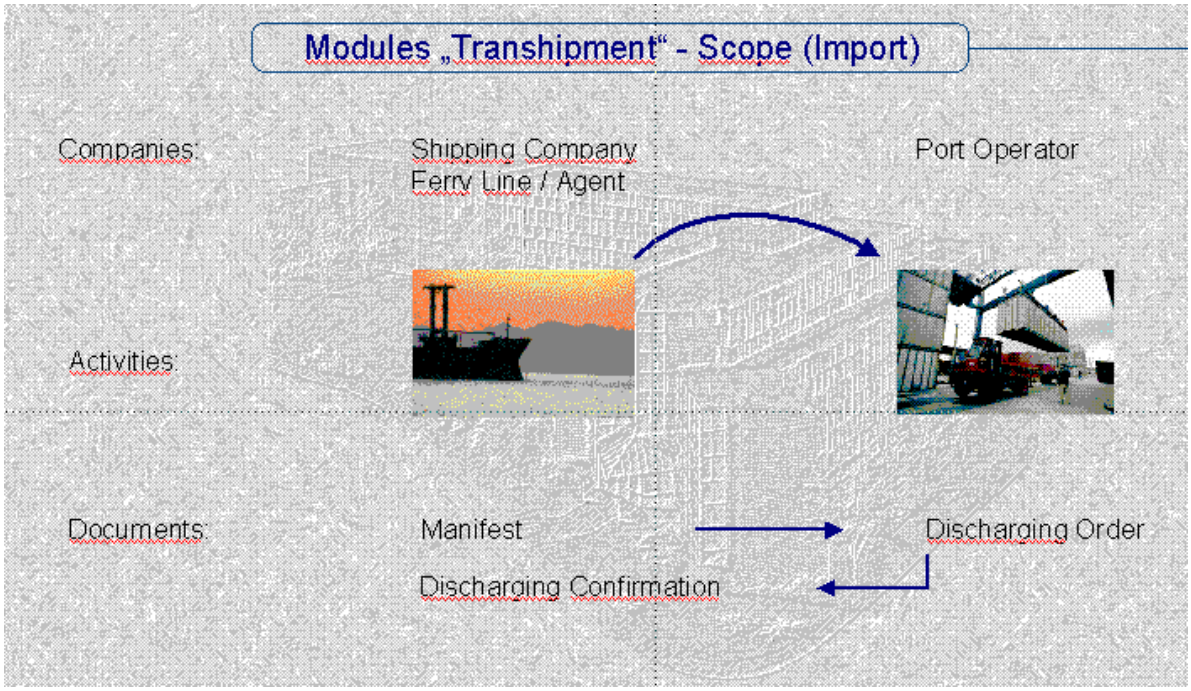


Fig. 5-32: Scope of the BOPCom Module Transhipment (Import)

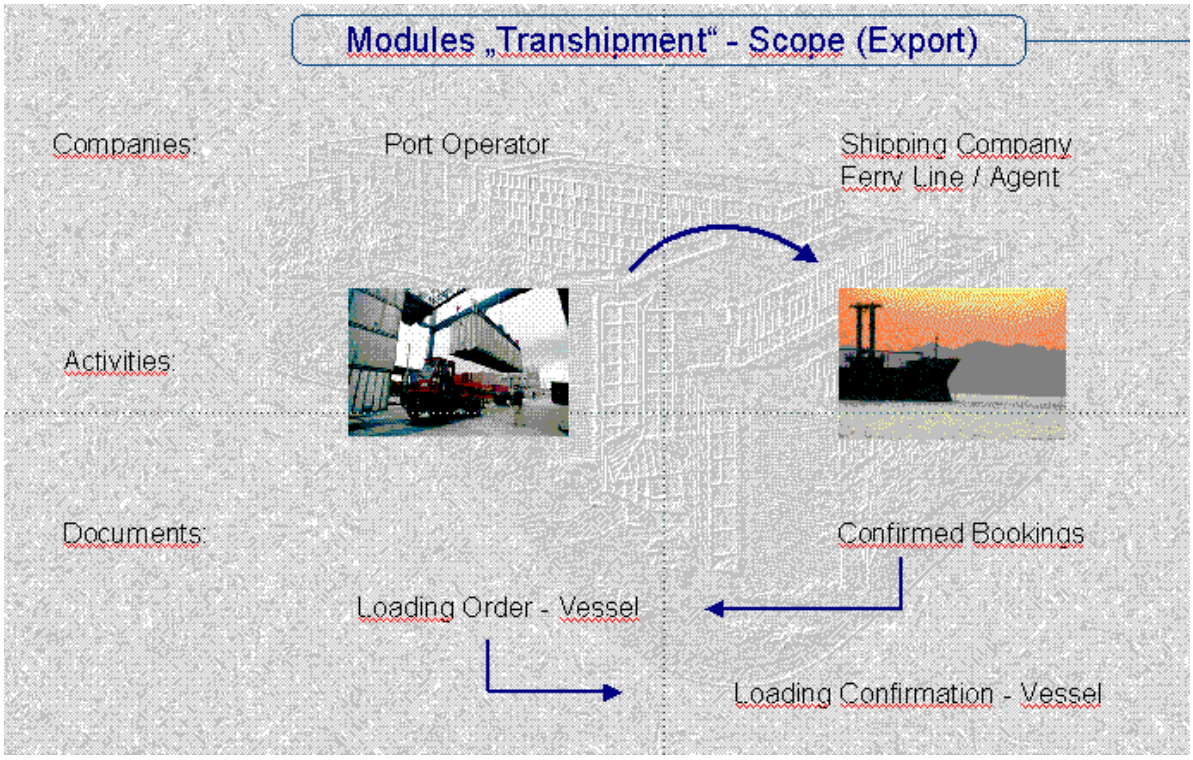


Fig. 5-33: Scope of the BOPCom Module Transhipment (Export)

5.5.1.3.3 Procedure to create a document

Starting with the basic information in the communication database (Confirmed Bookings, Manifest Data) the user create a document (Loading / Discharging Order / Confirmation) by adding additional information, which are stored already in the database (e. g. Companies) resp. which he has to add manually during the procedure.

All documents are stored only once in the communication database and are available for the users also for further procedures.

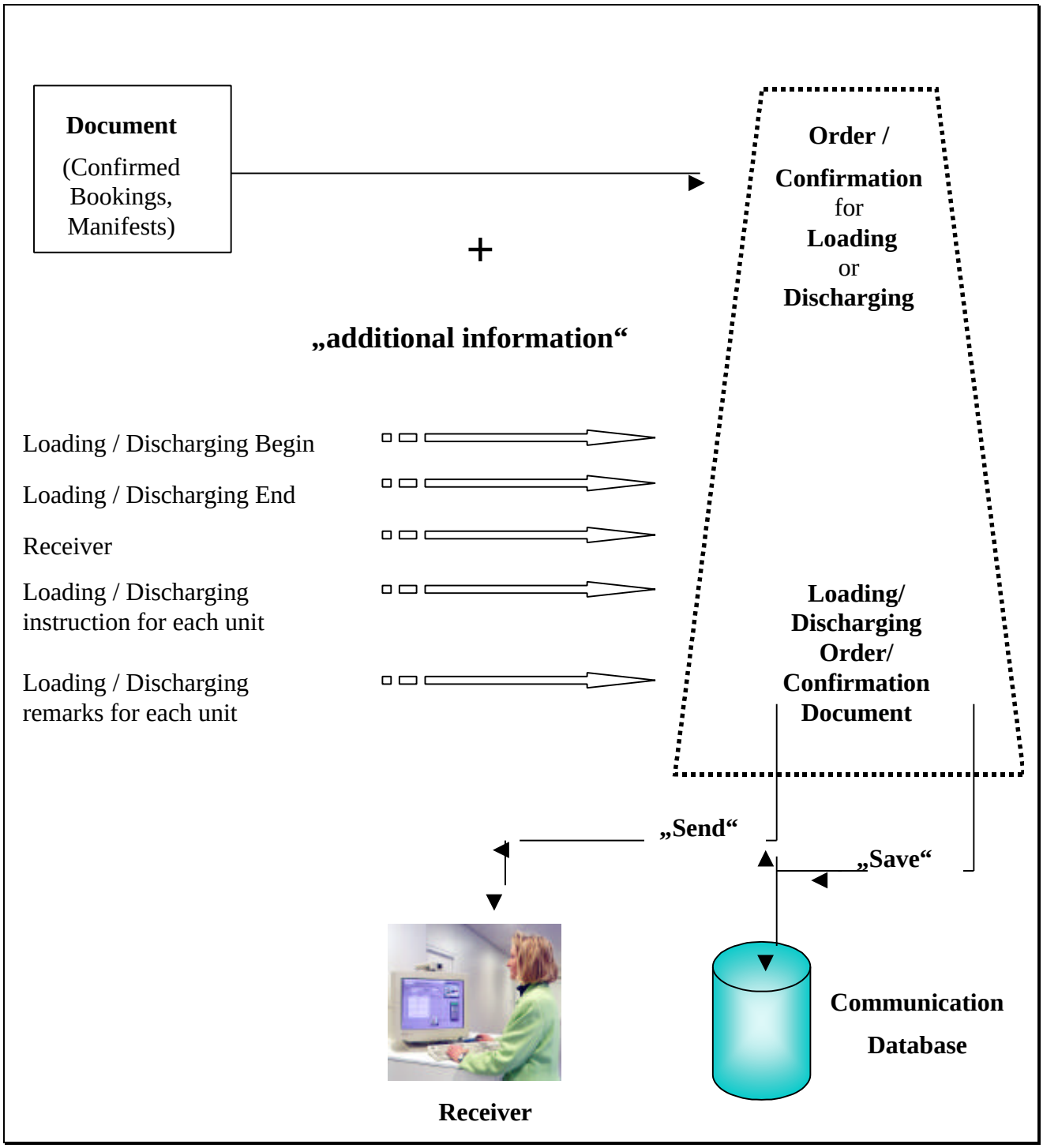


Fig. 5-34: Procedure to create a document

5.5.1.3.4 Screen Examples

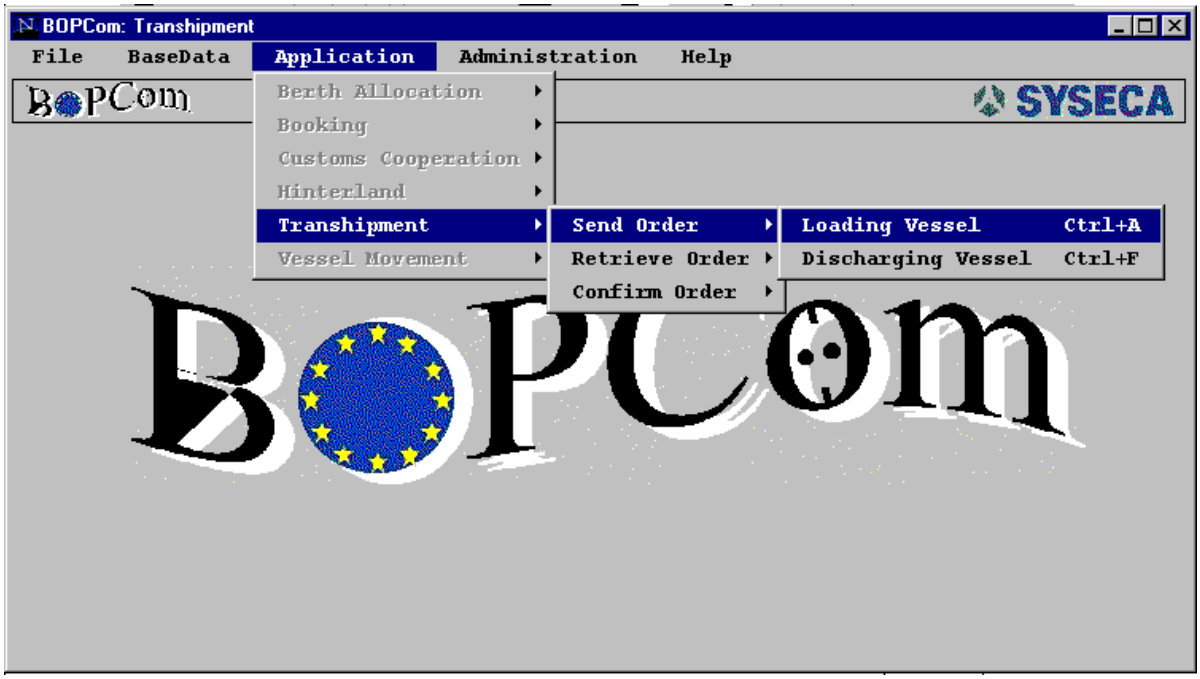


Fig. 5-35: Entry Screen of the Transhipment Module

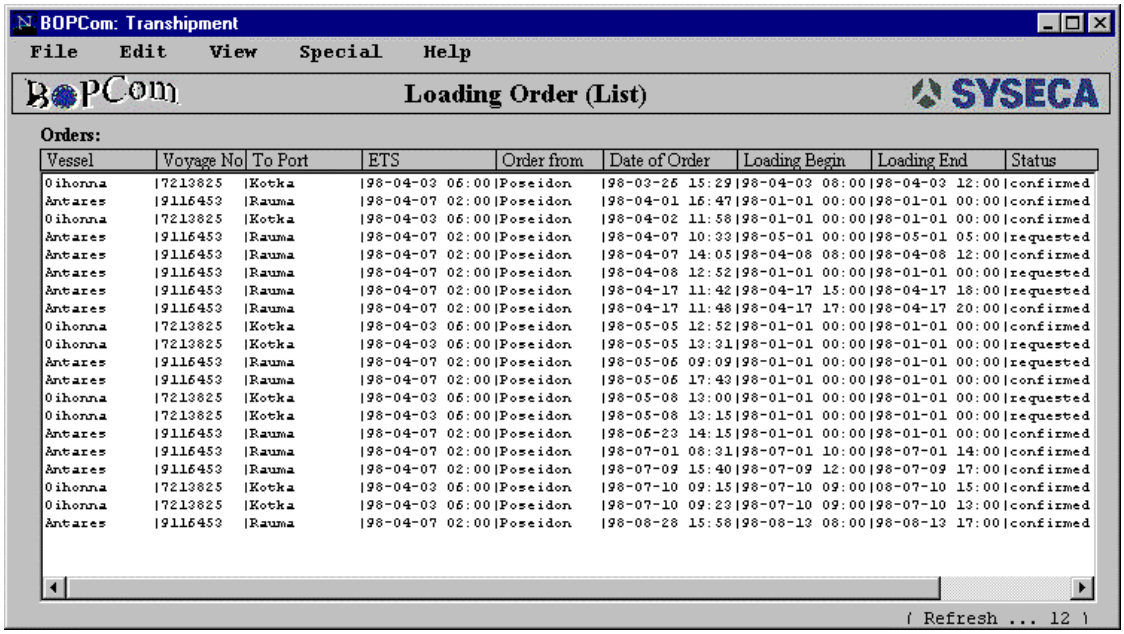


Fig. 5-36: Sample list screen (loading orders) of the Transhipment module

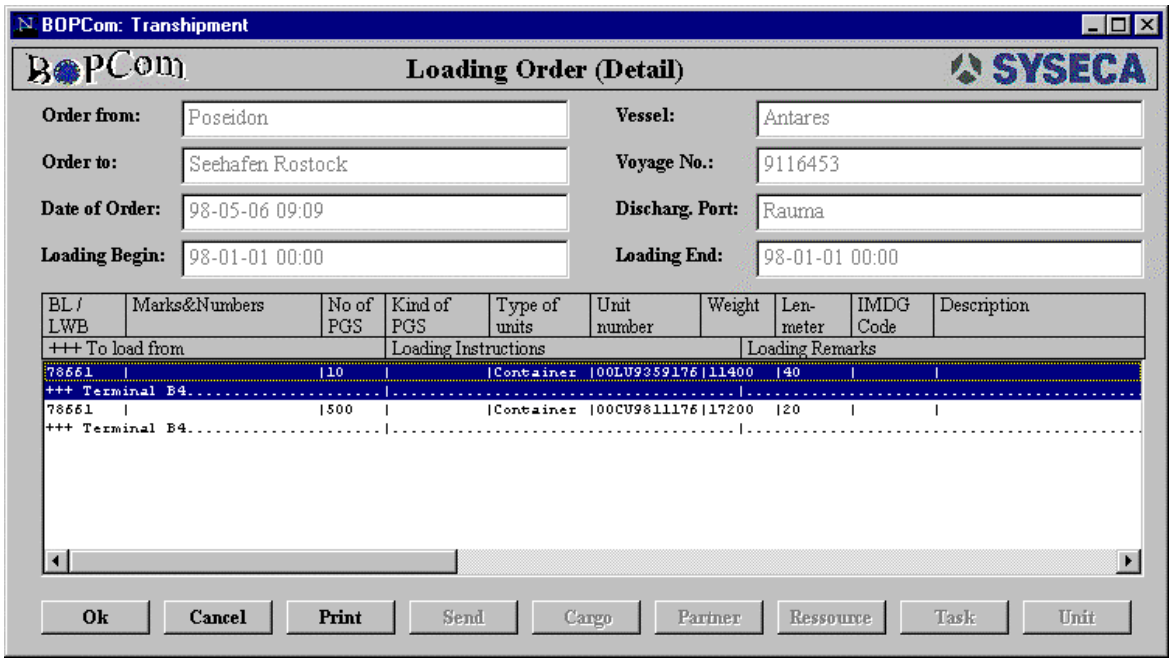


Fig. 5-37: Sample detail screen (loading orders) of the Transhipment module

5.5.1.4 Hinterland

5.5.1.4.1 Principle

The Hinterland Transport system for the port operator and the railways focuses on exchanging information about incoming trains and wagons and the related freight waybills. The module consists of combining the wagons with appropriate freight waybills, managing of wagon orders for discharge purposes and maintaining informatio of wagons already discharged and ready for circulation.

Advance planning

The advance planning function enables the railways to give information to other interest groups of incoming trains, their estimated time schedules and the preliminar vessel for loading of goods. The plan is made daily by the railway company.

The data sources for the advance planning are

- the list of the sailing vessels at the port
- the advance information of the incoming trains once they have left the hinterland departure stations

For the port operator the advance planning gives a general overview of the estimated number of wagons for discharge for preliminar resource planning.

Advance notice

Advance notice is a preliminar work order for the railway company to split the arriving train onto reserve rails. The port operator uses the advance notice data for resource planning of the next shifts.

The data sources for the advance notice are

- freight waybills from the exporting company via the port operator
- wagon lists from the railway company

The freight waybills are combined to the apporiate wagon lists giving entire information of the wagons and the consignments in the wagons. On the basis of this data the wagon lists are divided onto different reserve rails.

Wagon order

The ‘wagons on rail’ list is delivered to the module several times per day. The port operator uses the order data as the actual work order confirmation to the railways for the cargo discharge from the wagons. Normally the orders are made two hours before the actual discharge.

The data sources for the wagon order are

- freight waybills from the exporting company via the port operator
- ‘wagons on rail’ list from the railway company

The freight waybills and the ‘wagons on rail’ lists are combined in order to display the cargo and the consignments in a wagon. On the basis of this data the ‘wagons on rail’ list the wagons are split onto different rails in front of the warehouses.

After the wagon order and during the discharge procedure the port operator updates the wagon orders with different time stamps, the last being the time when the discharge has been completed and the wagon can be fetched back to rotation. This is of vital importance to the railways, since it will speed up the rotation.

5.5.1.4.2 Screen Examples

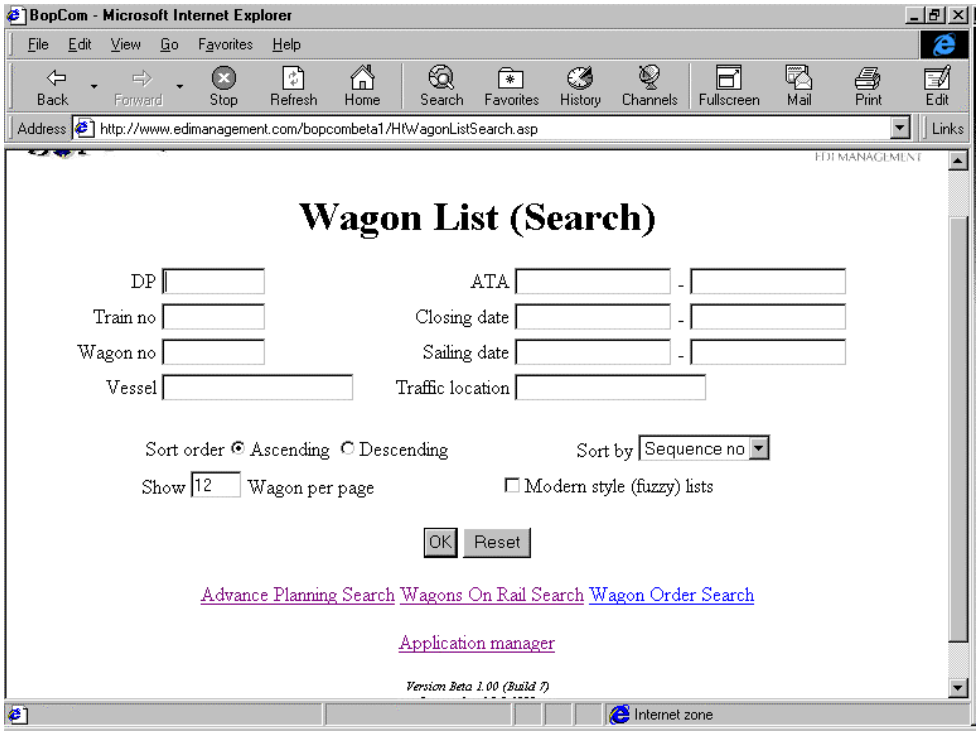


Fig. 5-38: Sample search screen (wagons) of the Hinterland module

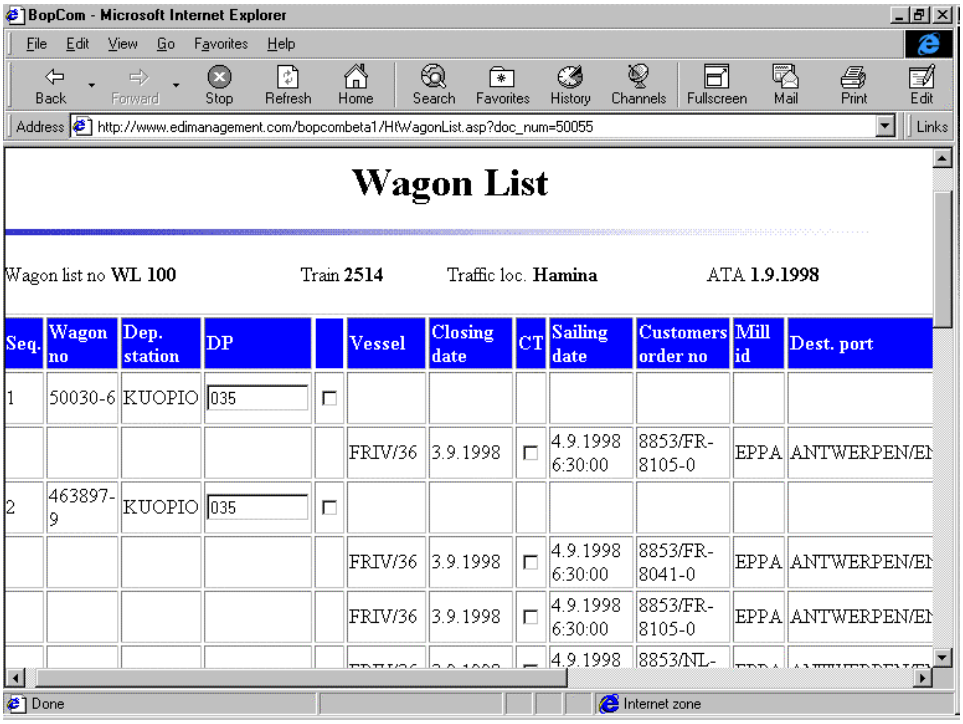


Fig. 5-39: Sample list screen (wagon list) of the Hinterland module

5.5.2 Applications supporting the administration chain

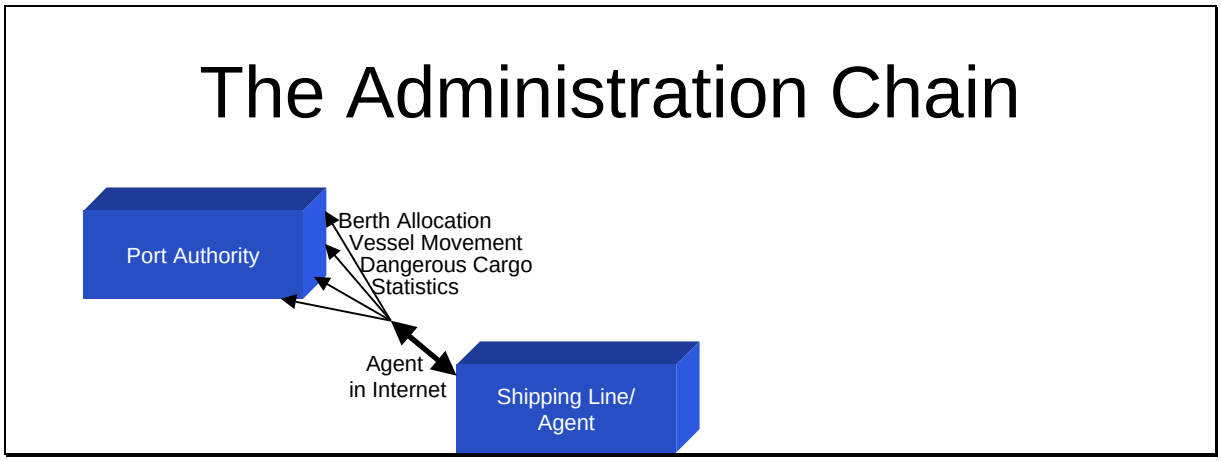


Fig. 5-40: BOPCom applications of the administration chain

5.5.2.1 Agent in Internet

5.5.2.1.1 Principle

The Agent in Internet system covers the creation and sending of different type of notices to the Port Authority or Maritime Administration such as the advance notice, dangerous goods notification and final notice. The Agent in Internet module is developed for SME agents without own IT systems for eg. vessel clearance.

There are different type of notices, the basic idea being that the agent always updates the previous or original notice, so that the information becomes more accurate notice per notice. The notice types are the following

Stage 1. 24-hours notice of arrival/2-6 hours notice of departure

- this notice includes information of the vessel itself, the voayge, shipping line, time schedule and different type of service requests such services required from the port of discharge or for example in Finland ordering the pilot

Stage 2. Dangerous Goods Notification

- in case the vessel will discharge dangerous goods in the port of destination the agent can update the advance notice with dangerous cargo information such UN numbers, IMDG classes, technical names, amount of cargo, unit type and id etc.

Stage 3. The final notice

- the final notice is given once the vessel has either arrived or left the port
- the notice consists of the actual voyage and vessel information as well as the cargo loaded or discharged
- the final notice is the basis for the statistics for the Maritime Administration and the basis for invoicing and statistics for the ports.

5.5.2.1.2 Screen Examples

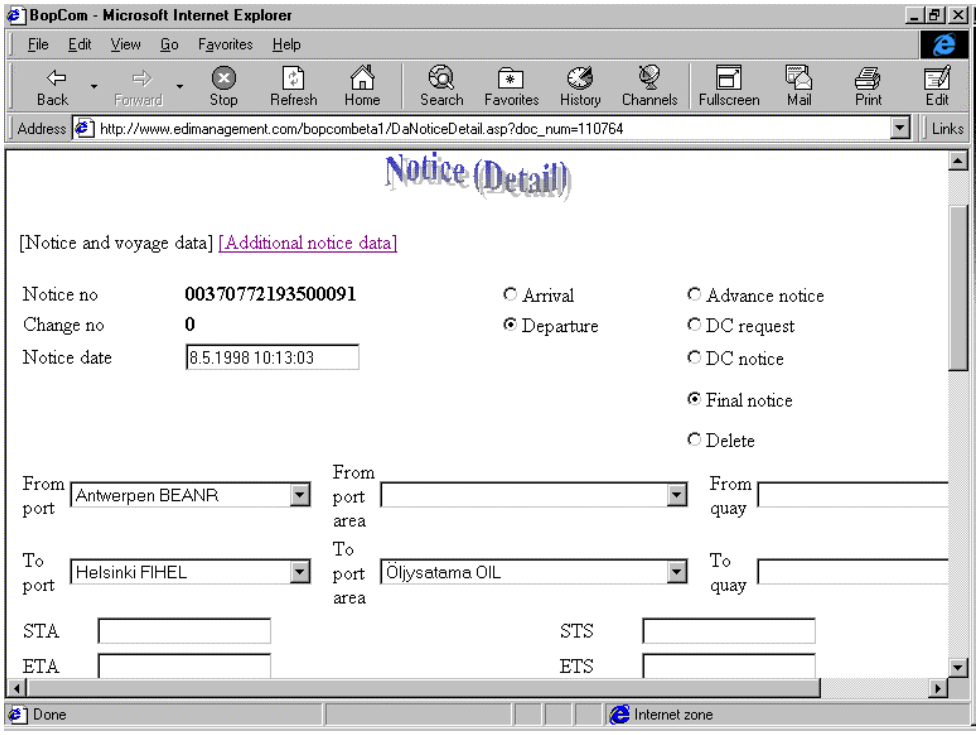


Fig. 5-41: Sample detail screen (notices) of the Agent in Internet module (part 1)

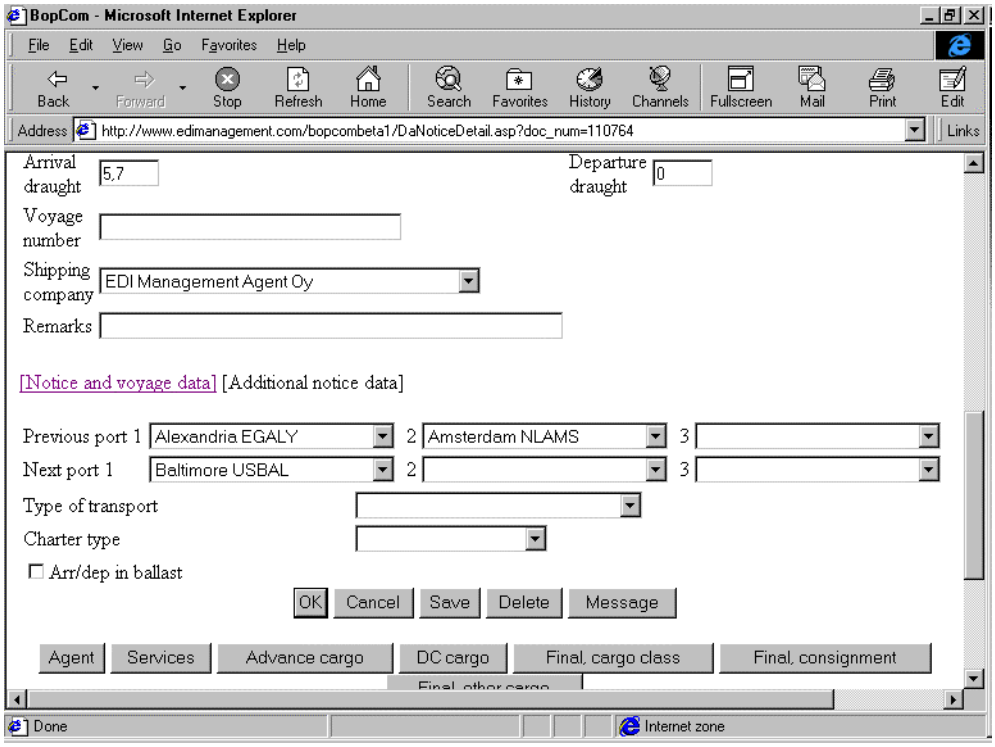


Fig. 5-42: Sample detail screen (notices) of the Agent in Internet module (part 2)

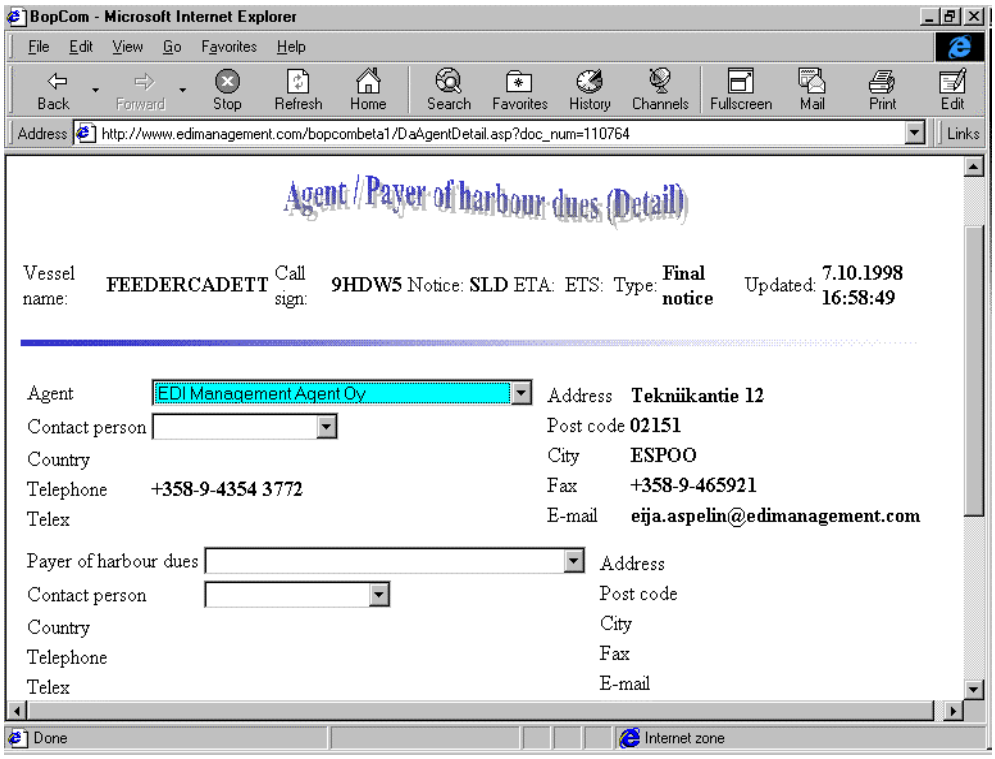


Fig. 5-43: Sample detail screen (Agent/Payer of harbour dues) of the Agent in Internet module

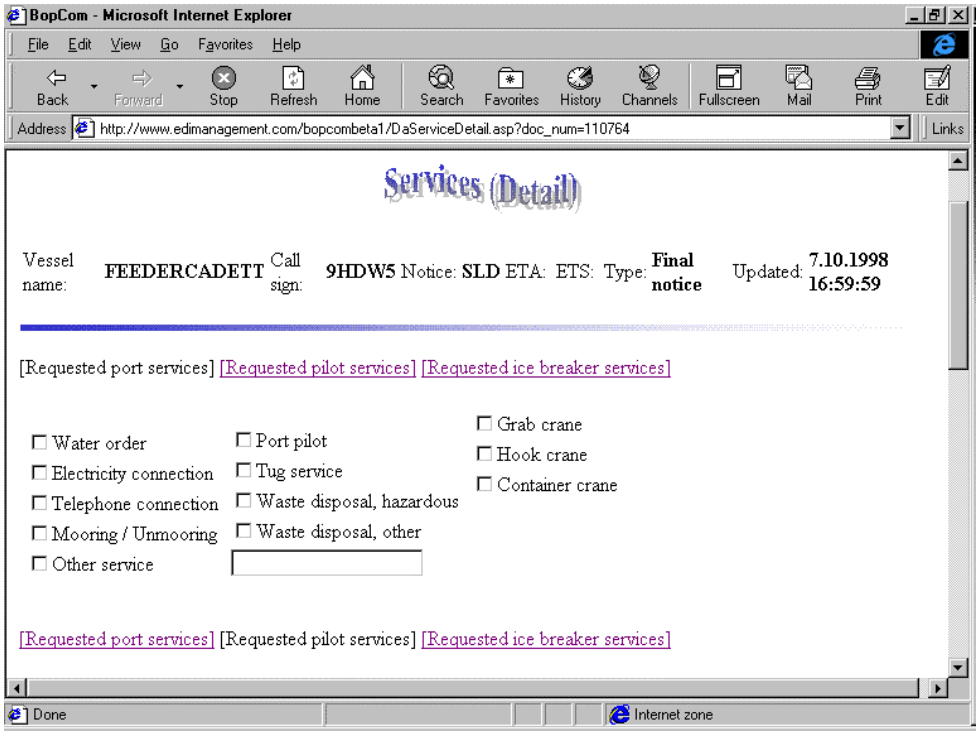


Fig. 5-44: Sample detail screen (Services) of the Agent in Internet module

5.5.2.2 Berth Allocation and Vessel Movement

5.5.2.2.1 Principle

The Vessel Movement & Berth Allocation system is designed to manage, to control and to follow the movements of the vessels, the berth requests and related service requests. It is aiming to develop a system for facilitating the work of the Port Authority. The information is received as EDI messages from shipping lines and agents and used by the Port Authority and other interest groups such as port operator, inland transporters, forwarders etc.

The information of incoming vessels and the requested services is sent electronically to Port Authority's Vessel Movement and Berth Allocation application, which is located on an Internet server run either by the port itself or by service provider. After receiving the advance notice of the vessel from the agent, the Port Authority will allocate a berth place for the vessel as well as the services requested and send back an electronic confirmation to the shipping line or its agent.

For liner traffic the time schedules can act as a basis for the long-term berth allocation. With the help of the application the Port Authority has an overview picture of the arriving and sailing vessels as well as the current and future use of the berths. The main functions of the module are the management of vessel time schedules, management of berth allocation and services and the reporting of berths and services used.

The following elements can be considered as main information sources and requirements for the berth allocation management.

Shipping lines, ship owners and agents

- Time tables and sailing lists, the common expression vessel schedules
- List of ships with relevant information on characteristics of vessels

Port Authorities

- Vessel schedules or weekly lists provided for port users and clients
- Locations of ships at port, berth occupation
- Characteristics of quays and berthing places
- Confirmed information of utilization of berths and services for vessel dues accounting system

The system contains the following functionalities.

Management of berth allocations

Reply to the request is made against the original vessel schedule information. The reply can permit the vessel to enter the port area or it can also be a rejection.

Vessel schedule management

Contains time schedule follow-up and information management. Included are vessel names, their routes and rotations, the scheduled times of departures and arrivals.

5.5.2.2.2 Screen Examples

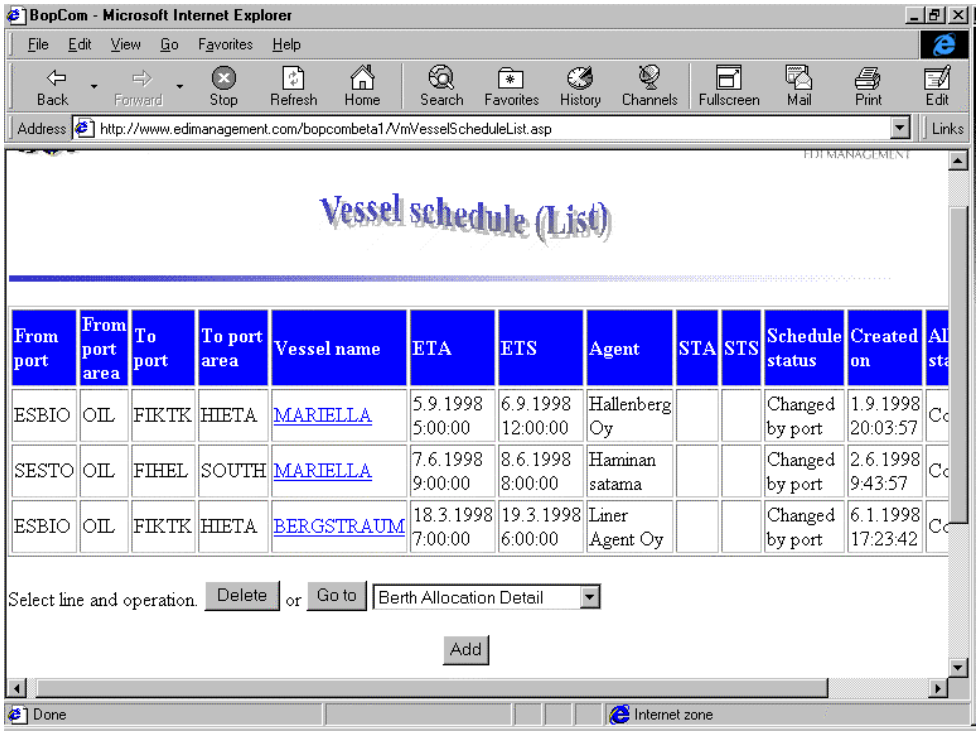


Fig. 5-45: Sample list screen (schedule) of the Berth Allocation/Vessel Movement module

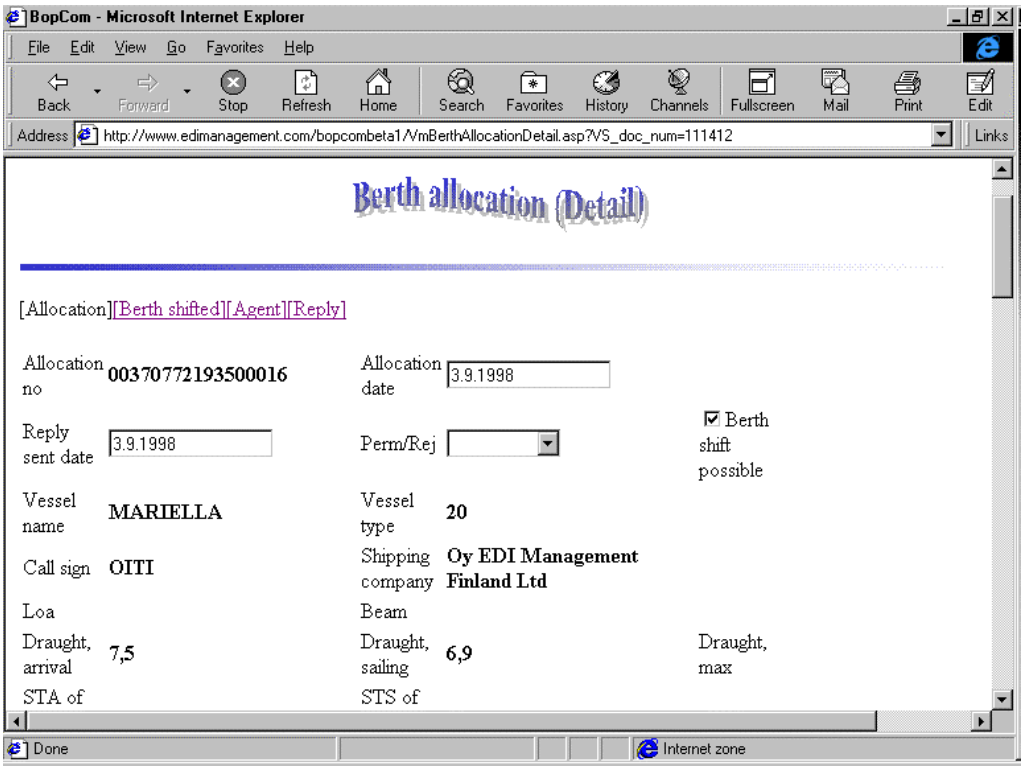


Fig. 5-46: Sample detail screen of the Berth Allocation/Vessel Movement module

5.5.2.3 Dangerous Cargo Declaration

5.5.2.3.1 Principle

This is the Dangerous Cargo (DC) module for the port authority. The purpose of this module is to support the port to control dangerous goods in the port area, to authorize the incoming dangerous goods and to produce statistics of DC.

The port authority has the responsibility of giving permissions for incoming DC's and they are also responsible for controlling the DC's in the port area when the dangerous goods are stored.

Management of DC requests

The request for permission contains information of specifically dangerous substances.

Management of DC request replys

Reply to the request is made against the original DC request. The reply can permit the dangerous cargo to enter the port area or ot can also be a rejection.

Management of advance notices

The DC advance notice contains detailed information of dangerous goods lots entering the port area.

Maintenance of DC storage situation in the port area

The receival of dangerous cargo is made against the advance notice. When the dangerous cargo leaves the port area a storage issue transaction is made based on the receival information. For invoicing and statistical purposes a storage transaction is saved in the database when the storage issue is made.

5.5.2.3.2 Screen Examples

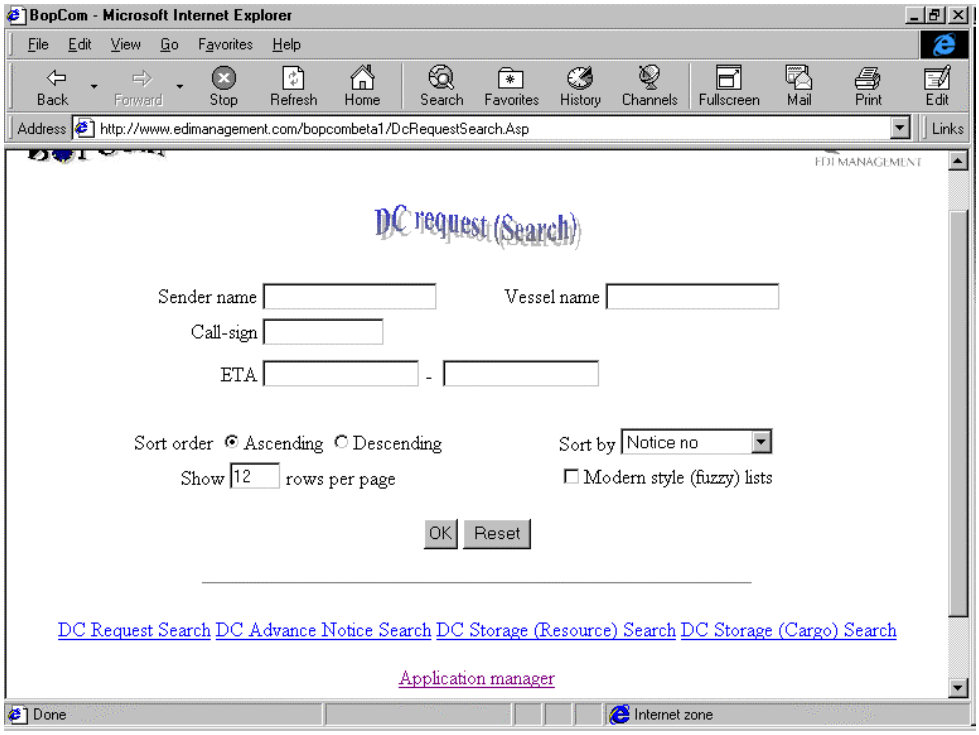


Fig. 5-47: Sample search screen (DC Notice) of the Dangerous Cargo module

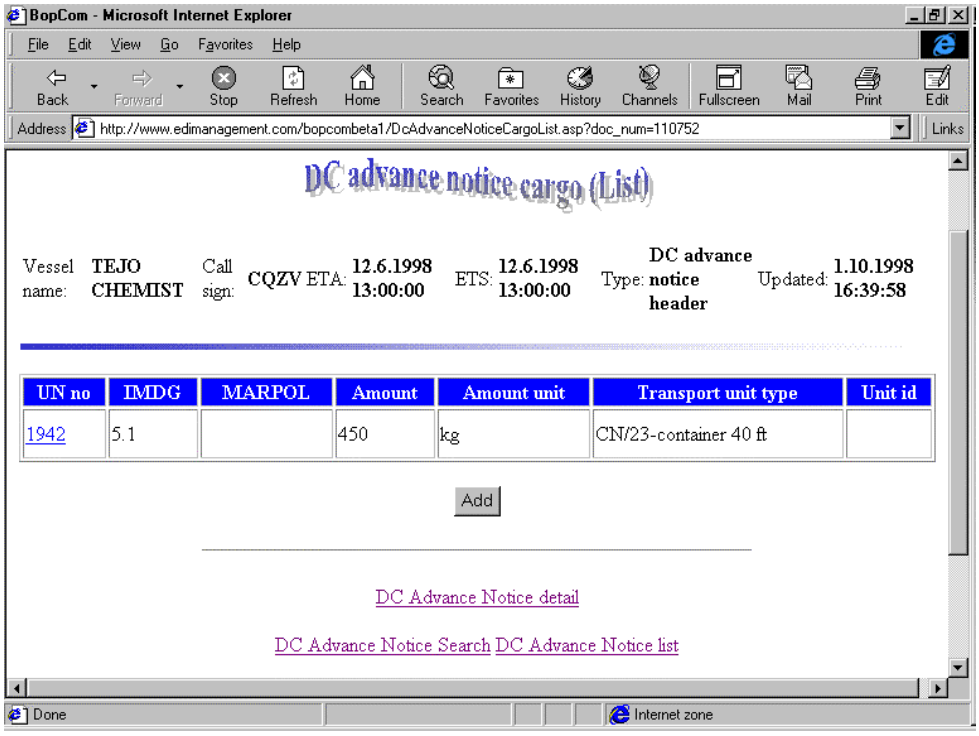


Fig. 5-48: Sample detail screen (DC Cargo) of the Dangerous Cargo module

5.6 The BOPCom applications and pilot tests

The capabilities and benefits of using the BOPCom AIM tools have been demonstrated in several port-related applications, all of them designed along the same lines in order to make the results transferable to other ports.

5.6.1 Summary of the application modules

As described in detail above, the modules which have been tested are summarised hereafter in a brief overview:

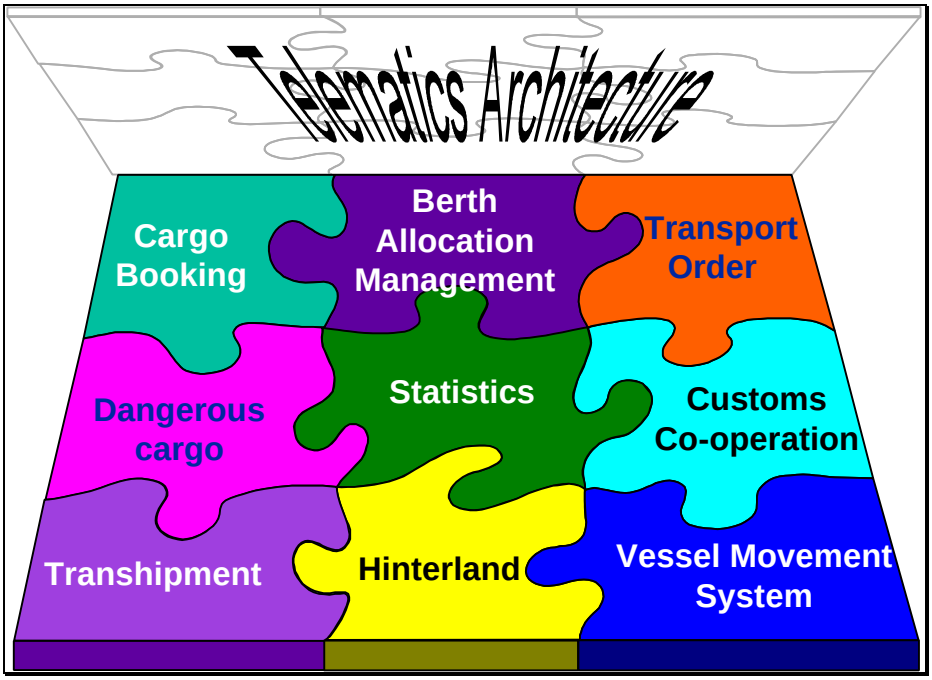


Fig. 5-49: BOPCom Application Modules

Cargo Booking	Exchange of cargo bookings and confirmations between freight forwarders and shipping companies in ferry shipping
Berth Allocation Management	Exchange of berth requests and confirmations between shipping agent and port authority as well as additional functions for the port authority
Transport Order	Exchange of transport orders and confirmations between shippers/producers and freight forwarders
Dangerous cargo	Exchange of dangerous cargo advance notices, requests and authorisations between shipping agents, freight forwarders and port authorities.
Statistics	Exchange of vessel import and export declarations (integrated into „Agent in Internet“)

Customs cooperation	Exchange of vessel manifests and customs related information between shipping agents, port customs and border customs at the EU/non-EU border (specification only due to not sufficient resources by the Finnish Customs)
Transhipment	Exchange of loading/discharging orders and assignment information, e.g. which load unit is on which wagon, truck, trailer or ferry.
Hinterland	Exchange of information between port operators and railways about incoming trains and their consignments in order to improve the discharge planning and time allocated.
Vessel Movement	Exchange of vessel movement information (schedules, deviations, predicted ETAs) in a certain region.

However, the BOPCom tools can be used for any other transport-related application as well.

5.6.2 Services to be offered

BOPCom enables offering communication services in two different ways:

- the operation of a physical communication node by a service provider (as done by TraDaV and EDI Management)
- the installation of the Interconnectivity Manager in the premises of a user (Port Authority, Agent, Forwarder, Stevedore) with possible assistance from a service provider in installation, maintenance and support

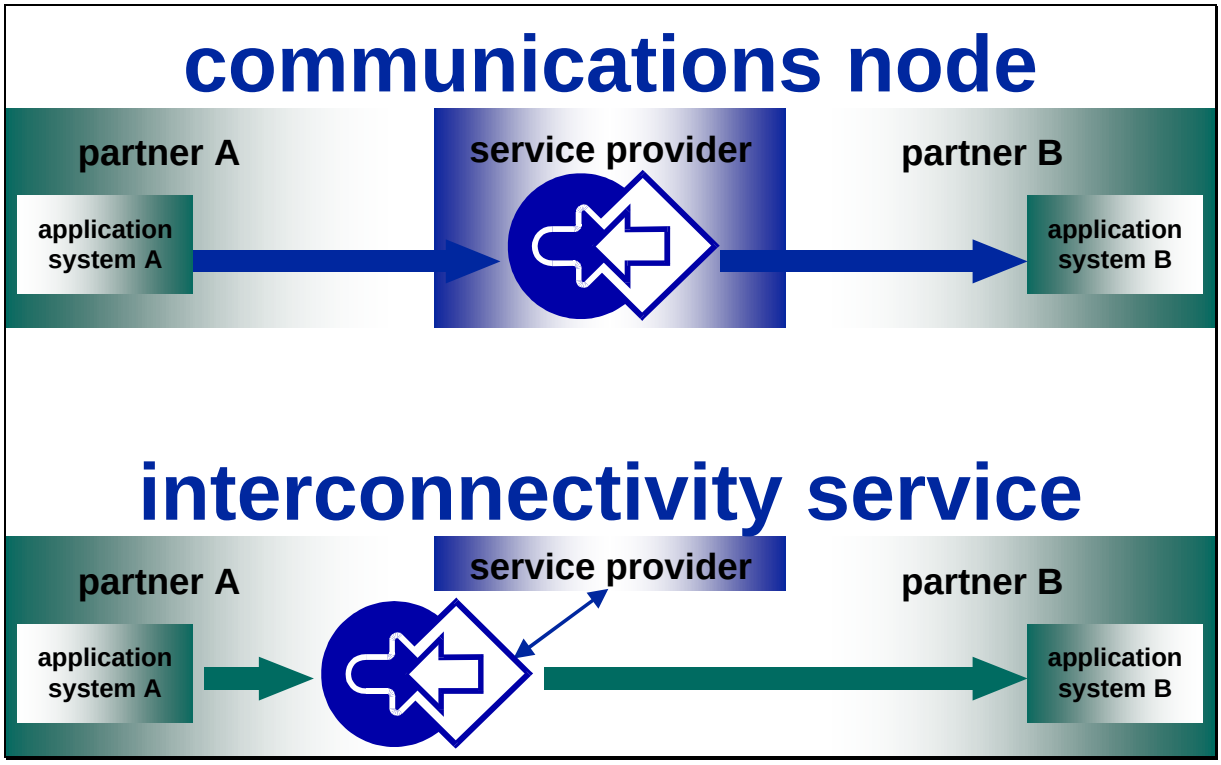


Fig. 5-50: Service levels

5.6.3 The pilot test sites

Related scenarios have been defined involving users without appropriate application systems as well as computerised users for integrating their systems. Demonstrations started in 1997 and have been performed e.g. in the following areas:

- Baltic region
  - Germany (Lübeck, Rostock)
  - Finland (Helsinki, Kotka, Rauma, Hanko, Turku, Hamina)
  - Sweden (Stockholm)
- Mediterranean region
  - Greece (Piraeus)
  - Portugal (Porto/Leixões)
  - Spain (Barcelona)
- Atlantic Arc region
  - France (Brest, Bayonne, Lorient)
  - U.K. (Southampton)

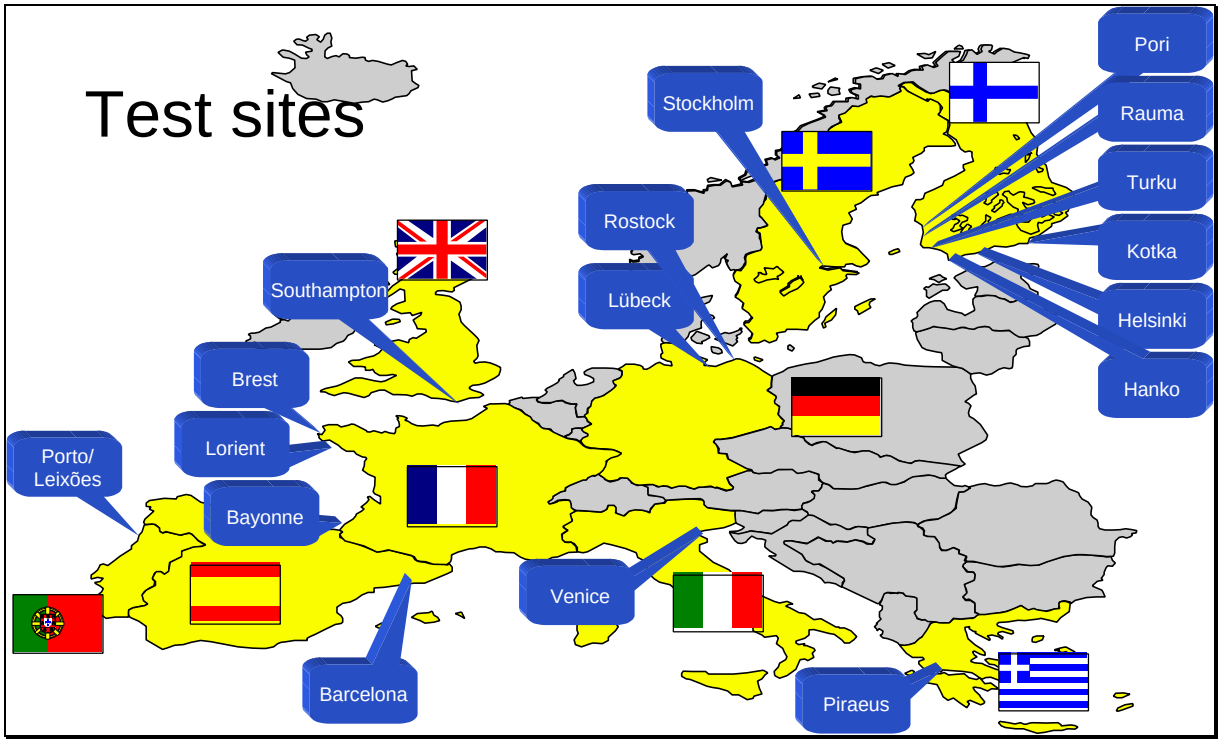


Fig. 5-51: BOPCom test sites

The „home users“ in Finland, Germany and Sweden have been heavily involved in the development process so their requirements have been incorporated in the developed solutions.

5.6.4 Pilot test results

This chapter summarises the results from the pilot tests as they have been presented also by the users resp. BOPCom partners during the Final BOPCom Workshop on December 2nd in Lübeck.

5.6.4.1 BOPCom Online Tests

The following statements were given by the test sites from the Mediterranean and Atlantic Arc ports involved in BOPCom:

Port	Modules tested	Partners involved	Statements

Venice	• Agent in Internet
	• Vessel Movement/ Berth Allocation
	• Dangerous Cargo Management
		• Venice Port Authority
		• Consorzio Venezia Ricerche
		• Harbour Master
		• Shipping Agents
		• Forwarding Agents
			• Paper-based analysis showed differences in functions, data and responsibilities
			• The data model is very good
			• Agent in Internet for the use in the Adriatic sea: port operators agree that it is a good idea to realize a module based on an internet browser. The information covers their needs, but the system needs to be adapted.
			• Vessel Movement/Berth Allocation for the use in the Adriatic sea:
			  • only a part of the information processed can be of public domain
			  • Maritime Agents prefer to privilege the VESSEL instead of the TASK
			  • Service management is too abstract
			  • Cargo management covers the needs of the Port Operators but needs to be adapted for the retrieval and re-usage of information
			• Dangerous Cargo Management for the use in the Adriatic sea:
			  • only a part of the information processed can be of public domain
			  • Maritime Agents play a primary role in the DC management, more than Forwarding Agents
			  • DC management covers the needs of the Port Operators but needs to be adapted for the retrieval and re-usage of information.

Porto/Leixões	• Agent in Internet • Booking	• National Forwarders Association • Shipping Agents Association • Leixoes Port Authority • Other Portuguese Port Authorities	• BOPCom was a tremendous help on targeting the way to their future systems • BOPCom Online approach have been used for own developments • Technology aspects reached by BOPCom will be used • Data integration with inhouse systems should be done • Continuation of contact to BOPCom developers are expected

Barcelona	• Booking
	• Dangerous Cargo Management
		• Barcelona Port Authority
		• Freight Forwarders
		• Shipping Agents
			• Booking:
			  • Internet connection to Bremen quite slow
			  • Secure application because runs over an extranet
			• Dangerous Cargo Management:
			  • Concerns about security using the internet
			  • Customisation required: data entry can be simplified and accelerated reducing the number of screens and optimising the navigation among them
			  • Adaptation for each port authority with the mandatory fields could improve the application.
			• Use the BOPCom technology for their business

Southampton	• Booking • Transport Order	• Ro-Ro Operator • Forwarder	• System was available for testing at all times and response times acceptable • Both potential users found the two modules interesting as a concept but not as a commercial tool yet. • Relationship between the modules should be improved

			• Lack of functions for a ro-ro operator
Piraeus	• Dangerous Cargo Management • Hinterland • Berth Allocation/ Vessel Movement	• Piraeus Port Authority (OLP) • Shipping Agents	• Positive comments about the BOPCom concept and the „feeling“ of the applications • Wish to use formally the modules as soon as the applications were stable • Detailed documentation and on-line help is required • Training for the tools and Internet is required • Concerns about security issues • The forms should be adapted to the local needs because they include too much items which are not required • Improvement of document exchange between agents and OLP seems possible with this approach • Hinterland should be extended to truck operation • Graphical user interface for berth allocation is desirable • acknowlegdement mechanism ensuring the delivery of messages is desirable • Definite commitment to make a propoer assessment of BOPCom in a truly industrial environment as soon as the PMIS infrastructure becomes fully available associated with the overall business strategy of OLP
Bayonne, Lorient, Brest	• Booking	• Chamber of Commerce and Industry (Port Manager) • Ports Service Manager	• Easy access, but Internet response time too long • Promising approach • BOPCom modules are a sound basis covering about 90% of the required functionalities, good systems to base applications upon • The BOPCom tools are supposed easy to customise to the needs of small and medium-sized ports in which the traffic is very small

			• On-line help required

Rostock	• Transhipment	• Port Operator • Shipping Agent	• Universal Communications Database enables to handle transport documents more effectively • Convince additional users athat the BOPCom application will be an advantage for them - in their daily office work, concerning cost savings in EDP/EDI, their competition in the market. • Recommendation to offer the BOPCom Tools to all interested clients without expenses for a first period of time. • BOPCom Marketing in Baltic Ports Organisation (BPO)

5.6.4.2 BOPCom Direct Tests

There were two scenrios for BOPCom Direct tests: one with the actual PORTNET system in Finland and one in Lübeck with the freight forwarder Autocontex.

In the Finnish case users can now use the BOPCom tools in order to enter and retrieve their data with communication possibilities to PORTNET users.

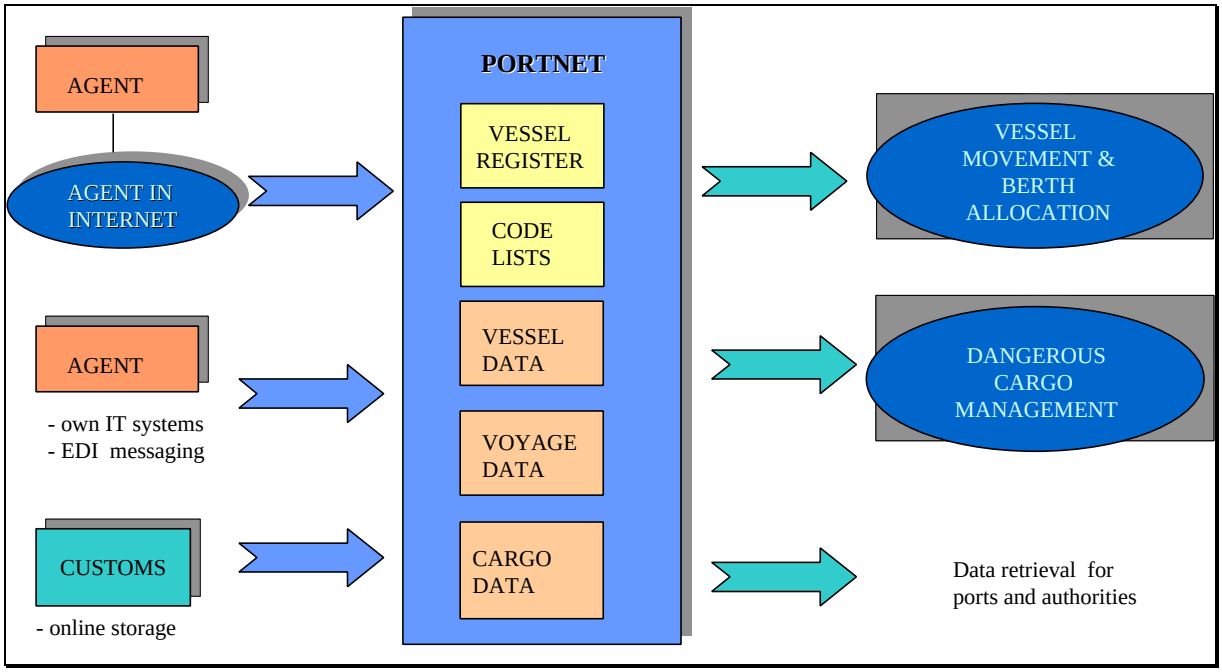


Fig. 5-52: "BOPCom Direct" tests in Finland

5.6.5 Summary of the tests

The tests performed in 17 ports in 9 European countries show the following general comments:

- The BOPCom EDI tools (Interconnectivity Manager) are appropriate to support SMEs in transport
- Integration of classical EDI with Web-EDI offers opportunities for both types of users
- Pilot tests show optimistic perspectivesThe BOPCom communication tools are well suited
- Added value through tests in „abroad“ areas showed that procedures and responsibilities are different in North and South Europe
- The application viewers have to be customised to the local requirements of the users
- Local support is required.

5.7 Comparison of initially planned activities and completed work

The work for nearly all of the envisaged workpackages have been concluded. The following table gives an overview of the achievements, problems and their reasons.

WP	Name	Achievement	Comments	Test Sites
1	Berth Allocation	operational, combined with WP12 (Vessel Movement)	Online modules for shipping agents („Agent in Internet“) and Port Authorities	Finnish Ports Leixões Piraeus Venice
2	Booking	operational	Online modules for freight forwarders and shipping agents; direct link to one shipping agent in Lübeck	Lübeck Leixões Barcelona Bayonne, Lorient, Brest Southampton
3	Transhipment	development finished, ready for operation	Online modules for port operator and shipping agents; delay concerning operational use because of change of developer (SECOM -> Syseca) and change of management structures of the main users (port operator and shipping agent in Rostock)	Rostock
4	Customs Cooperation	concept; functional model (without IT) is in use for daily routine work	remained in the concept phase, because the key user (Finnish Customs) had - although still claiming big interest - no resource available	-
5	Dangerous Cargo	operational	Online modules for shipping agents („Agent in Internet“) and Port Authorities	Finnish Ports Stockholm Leixões Piraeus Barcelona Venice

6	Quality Management		Electronic Quality Management Handbook available in several languages	-
7	Hinterland	ready for operation	functions completed; main users (port railway station and port operator) have different priorities	Kotka Piraeus
8	Transport Order	ready for operation	functions completed; forwarding agents are open to use it, but shippers could not be convinced yet. Web pages in the Internet envisaged.	Lübeck Southampton
10	Statistics	operational	Online module for shipping agents („Agent in Internet“); Direct link to Maritime & Port Authorities via Portnet	Finnish Ports Leixões Venice
11	Telematics Architecture	completed	Common architecture has been used for all developments	All test sites
12	Vessel Movement	operational, combined with WP1 (Berth Alliocation)	Online modules for shipping agents („Agent in Internet“) and Port Authorities	Finnish Ports Leixões Piraeus Venice

6 Conclusions and Perspectives

BOPCom started based on the clear situation that communication solutions in the transport sector are required - and are more and more shifted to a bilateral basis instead of big Port Community Systems.

The pilot demonstrations showed that the BOPCom tools are well suitable to serve a big bundle of communication problems in the transport and shipping sector - involving well-equipped participants, existing solutions (such as Portnet) as well as for partners without appropriate application systems.

This new approach combining the EDI world and the Internet/World-Wide Web world using a common generic database open new doors for future communication solutions all over Europe. First results in this area can be taken from the fact, that - as BOPCom spin-off - the Interconnectivity Manager tools have been used and will be used in several other European projects, such as COREM, VTMIS-NET, EIES and PROSIT as well as for local solutions, e.g. for submitting Dangerous Cargo Declarations according to the HAZMAT in Bremen or enabling imrpoved distribution control by ENSO/STORA. Further negotiations e.g. with INFO-LOG are still on the way.

However, to use and support these tools in an efficient commercial way apart from the „home regions“ of the developers, the set-up of a distribution network is essential. Future users will require local service suppliers which can assist them in the installation, configuration, adaptation offering support and hot-line services in their domestic language.

The use of the BOPCom results will not stop with the end of the BOPCom project in December 1998. All developers declared their willingness to continue the operation of their established services. The „home“ users want to continue using the established BOPCom services for their daily operation.

7 Annex: Dissemination

This Annex contains a list of publications, conferences and presentations where the BOPCom project, its philosophy and achievements have been presented.

7.1 BOPCom Presentations

Date	Person	Activity	Location
17/01/96	Prof. Speidel	BOPCom presentation at the German Federal Ministry of Transport (Bundesministerium für Verkehr)	Berlin
12/04/96	Prof. Speidel	BOPCom presentation at the Forschungsbeirat der Bundesvereinigung Logistik (Federal Logistics Association)	Düsseldorf
10/09/96	Prof. Speidel	Presentation at the Baltic Sea Conference „Maritime Future in the Baltic Sea“	Helsinki
24/09/96	Prof. Speidel	BOPCom presentation at the MARIS conference	Dublin
24/10/96	Prof. Speidel	BOPCom/TEDIM Presentation on the ATM Workshop of the Bremen Government	Brussels
08/11/96	Prof. Speidel	BOPCom presentation at the Concerted Action on Short Sea Shipping	Brussels
15/11/96	Prof. Speidel	BOPCom presentation at the EIES Conference	Brest
23/01/97	Prof. Speidel	BOPCom presentation at the TEDIM International Coordination Committee	Helsinki
19/02/97	Prof. Speidel	Report at the G-7 MARIS coordination meeting (BOPCom certificated as a MARTRANS peoject)	Dublin
20/02/97	Prof. Speidel	BOPCom presentation at the G-7 MARIS conference	Ottawa
10/03/97	Frank Arendt	BOPCom presentation for a delegation from the port of Shanghai	Bremen
19/03/97	Pekka Koskinen	Presentation for 40 maritime students at the seamens´ school	Kotka
07/04/97	Pekka Koskinen	Presentation for 60 maritime experts at the university	Gdansk
11/04/97	Dr. Andreas stern	Presentation „Datenmodellierung für die Kommunikation im Transportwesen“, 3rd Silverrun Konw-How Meeting	Hamburg
15/04/97	Pekka Koskinen	Presentation for 40 students at the university	Helsinki
18/04/97	Prof. Speidel	BOPCom presentation at the EC Workshop on R&D in Transport	Moscow

29/04/97	Pekka Koskinen	Presentation for 20 maritime experts at the university	Turku
05/05/97	Frank Arendt	BOPCom presentation at the COREM/WISDOM/ INTERPORT/EUROBORDER/EIES/BOPCom information exchange meeting	Hamburg
07/05/97	Frank Arendt	Presentation of the BOPCom concept at the MARTRANS project meeting	Genoa
15/05/97	Eija Aspelin	BOPCom presentation for the Confederation of Finnish industry and employers/Transport Working Group	Helsinki
22/05/97	Prof. Speidel	Presentation at the MARIS Conference	Bilbao
27/05/97	Pekka Koskinen	Presentation for 20 maritime experts at the university	Turku
28/05/97	Pekka Koskinen	Presentation for 50 persons from Finnish Logistics Association	Espoo
14/06/97	Prof. Speidel	Concerted Action Short Sea Shipping	Athens
23-25/06/97	Prof. Speidel, Dr. Andreas Stern, Frank Arendt, Pekka Koskinen, Raimund Mildner	Exhibition at the Pan-European Transport Conference	Helsinki
10-14/06/97	Prof. Speidel, Matthias Dreyer, Lars Riekers	Presentation and Exhibition at the Transport ´97 Fair	Munich
11/08/97	Pekka Koskinen	Presentation for 5 Irish ports	Dublin
28/08/97	Eija Aspelin	BOPCom presentation for the Finnish Maritime Administration and the Swedish Statistical Center	Helsinki
02/09/97	Prof. Speidel, Dr. Mildner	TEDIM International Coordination Committee	Helsinki
12/09/97	Eija Aspelin	BOPCom presentation for the Port operators of Rauma and Pori (Rauma Stevedoring Oy, Hacklin Ltd)	Rauma
17/09/97	Pekka Koskinen	Presentation for 30 maritime experts and representatives from the transport industry at the university	Turku
18/09/97	Pekka Koskinen	Seminar for 20 private companies	Helsinki
24/09/97	Prof. Speidel	Regional Meeting of MARIS-REG North Sea	Bremen

24/09/97	Eija Aspelin	BOPCom presentation at the Port Invoicing Seminar (7 ports)	Pori
26/09/97	Frank Arendt	Presentation at the 4th WEGEMT Workshop „Ships for River-Sea and Shortsea Shipping“	Duisburg
14/10/97	Eija Aspelin	BOPCom presentation for the BaseVan project/ELC Finland	Espoo
14/10/97	Eija Aspelin	Briefing of the Portnet and BOPCom development (ports and shipping line agents of Helsinki, Porvoo, Inkoo, Tammisaari, Hanko), 60 participants	Helsinki
15/10/97	Frank Arendt	Presentation for 30 members of the TeLoTec project from Italy and Greece	Bremen
16/10/97	Frank Arendt	Presentation at the MARCOM ´97 Conference	Bremen
17/10/97	Eija Aspelin	Briefing of the Portnet and BOPCom development for ports and agents of Turku, Naantali, Uusiukaupunki, Rauma, Pori	Turku
21-24/10/97	Frank Arendt	Exhibition at the 4th International Workshop on Intelligent Transport Systems	Berlin
28/10/97	Eija Aspelin	Briefing of the Portnet and BOPCom development for ports and agents of Oulu, Kristiinankaupunki, Kaskinen, Vaasa, Pietarsaari, Kemi, Tornio	Oulu
04/11/97	Eija Aspelin	Briefing of the Portnet and BOPCom development for ports and agents of Kotka, Loviisa, Hamina	Kotka
17/11/97	Frank Arendt	Presentation of the BOPCom idea at the Workshop on Vessel Traffic Management and Information Services (VTMIS)	Amsterdam
26/11/97	Mildner, Stern, Arendt, local partners	Kick-Off Meeting for TraDaV-Online; presentation of BOPCom and the Lübeck applications for about 40 participants	Lübeck
13/01/98	Andreas Stern	Presentation „Interconnectivity im Einsatz“ given on a regional meeting of the German Informatics Association (Gesellschaft für Informatik (GI))	Bremen
22/01/98	Andreas Stern	Presentation „Online-Buchung im Ro/Ro-Verkehr“ at the ISL seminar on information systems for sea port logistics	Bremer-haven
01/98 - 06/98	Andreas Stern	Presentation on stowage planning, customs, cargo and transport exchange and dangerous cargo management at workshops of the TEN-Telematics project with representatives from the Lübeck industry	Lübeck
18/02/98	Andreas Stern	Presentation „Informationstechnische Vernetzung logistischer Systeme“ at the colloquium „Telematics and Logistics“ by CSC Ploenzke	Dresden
18/02/98	Prof. Speidel	BOPCom presentation at ARCDEV Meeting	Brussels

26/03/98	Michael Fritze, Michael Schaffarzyk, Eckhard Erdmann	Presentation for Transhipment-Online piloting preparation within the port community Rostock Local user: „Seehafen Rostock Umschlags-gesellschaft mbH“ „Poseidon Schiffahrt AG (Agentur Rostock)“	Rostock
29/04/98	Arendt	BOPCom presentation for students of the World Maritime University of Malmö	Bremen
30/04/98	Michael Fritze	Transhipment and BOPCom presentation at a meeting of the local employers association	Rostock
07/05/98	Pekka Koskinen	BOPCom presentation for 30 students at the Center for Maritime studies	Turku
11/05/98	Arendt, Stern	Presentation of the BOPCom Approach of the generic data model and its spin-off in the COREM project on the Workshop on Database Interoperability organised by DG XIII	Brussels
14/05/98	Andreas Stern	Presentation „Interconnectivity im Transport“ held at the logistics colloquium at Bremen University	Bremen
29/05/98	All partners	BOPCom presentation/Meeting on Cooperation with the 3SNet project	Bremen
18/06/98	Arendt, Böttger	BOPCom presentation/Meeting on Cooperation with the INFO-LOG project	Bremen
03-05/06/98	Stern	Presentation „Interconnectivity in Transport and Port Business“ at the TREC98 Conference (trends in Electronic Commerce)	Hamburg
05/06/98	Böttger, Speidel	Presentation of the BOPCom concept and the trial results with MARNET for European Commission representatives	Lisbon
08/06/98	Böttger, Speidel	Presentation of the BOPCom concept and the trial results with MARNET at the meeting of the Concerted Action Short Sea Shipping	Lisbon
19/08/98	Pekka Koskinen	BOPCom presentation for 20 shipping professionals at the Center for Maritime studies	Turku
08/10/98	Arendt	Presentation of the BOPCom concept at the VTS workshop of the VTMIS-NET project	Rotterdam
13/10/98	Pekka Koskinen	BOPCom presentation for 20 shipping professionals at the Center for Maritime studies	Turku
23/11/98	Pekka Koskinen	BOPCom presentation for 40 students at the Swedish School of Economics and Business Administration	Helsinki
24/11/98	Pekka Koskinen	BOPCom presentation for 35 students at the Turku School of Economics and Business Administration	Turku

27/11/98	Michael Fritze	Presentation of Transhipment and BOPCom results and perspectives for the local area at the conference „The maritime transport within Mecklenburg-Vorpommern – and the development of logistical services“	Rostock
09/12/98	Prof. Speidel, Frank Arendt	Presentation of the BOPCom achievements at the 12th Meeting of the Concerted Action Short Sea Shipping	Brussels

7.2 BOPCom Workshops

Date	Person	Activity	Location
25-26/11/96	All BOPCom partners	First International BOPCom Workshop	Lübeck
28/05/97	Frank Arendt	International NEPTUNE Workshop	Gothenburg
25/06/97	All BOPCom partners	Second International BOPCom Workshop	Helsinki
22-23/09/97	All BOPCom partners	Workshop on Modern Information Technologies in Maritime Transport and Trade	Gdansk
02-03/10/97	All BOPCom partners	Third International BOPCom Workshop	Venice
02/12/98	All BOPCom partners	Final International BOPCom Workshop	Lübeck

7.3 BOPCom Publications

Date	Person	Activity	Location
15/10/96	Andreas Stern	Article in Lübecker Nachrichten (regional newspaper) on BOPCom developments in Lübeck (TRADAV), German language	Lübeck region distribution
24/01/97	Frank Arendt	Telephone interview published in "Logistics Technology Europe" Volume 1 Number 17, January 24, 1997 (English language)	European distribution

03/97	Andreas Stern	Article „Verteilte Kommunikation“ in German journal iX on BOPCom developments in Lübeck (TraDaV), 3/97, p. 100, German language	German speaking countries
09/97	Prof. Kondratowicz	Article in "Computerworld" Warsaw on EDI and BOPCom	Poland
13/12/97	Andreas Stern	Article „Datenverbund bietet universelle Lösung für den elektronischen Geschäftsdaten-austausch im Lübecker Hafen“, Deutsche Verkehrszeitung Nr. 149, 13.12.1997	Germany
06/98	Andreas Stern	„Interconnectivity in Transport and Port Business“, Conference Proceedings „Electronic Commerce TREC98“, dpunkt Verlag, Heidelberg 1998	worldwide

7.4 Other material

The following material had been prepared for BOPCom dissemination and to create awareness on BOPCom:

- A project brochure explaining the BOPCom approach with details about the BOPCom tools and application modules
- The BOPCom World-Wide Web pages to be accessed worldwide via the Internet (www.bopcom.de)