b2mos

business to motorways of the sea

Activity 1

Electronic Sea Waybill Interoperability

Document Version: 2.2

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ABSTRACT

This document aims to check the feasibility of using the electronic sea waybill solution, which is studied and designed for intra-EU freight flows.

The possibilities associated with utilising the data included in the electronic commercial invoice for generating the shipping instructions is also analysed.

New data requirements that could be needed as well as opportunities for sharing the data included in the electronic sea waybill or for verifying its information with other data sources are explored and suggested within the report.

The use of other electronic documents for creating the electronic sea waybill (i.e. the electronic commercial invoice) or using data included in the electronic sea waybill to create other documents and comply with formalities (i.e. the electronic T2L) are considered.

The role of port community systems in supporting this solution from the origin to the destination is assessed, including specific functionalities for preparing, creating and using the electronic sea waybill information as well as the associated freight status events.

Through the use of surveys, the data transmitted for the electronic sea waybill is identified and data requirements are established. These data requirements then form the base of a data structure for which a design is made for a service capable of transmitting and validating the document through the use of SOA and web services.

Finally a work plan is outlined for the implementation process, which gives a step-by-step walkthrough of the development cycle until its final deployment.

DISCLAIMER

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GLOSSARY OF ABBREVIATIONS

Abbreviation	Description
B2MOS	Business To Motorways of the Sea
BIMCO	Baltic and International Maritime Council
EDI	Electronic Document Interchange
EDIFACT	UN/EDIFACT United Nations/Electronic Data Interchange For Administration, Commerce and Transport
EORI	Economic Operators' Registration and Identification number
EU	European Union
GRM	Grupo Romeu Multiservices
IT	Information Technology
MRN	Movement Reference Number
NVOCC	Non Vessel Operating Common Carrier
P2P	Peer-to-Peer
PCS	Port Community System
R&D	Research and Development
SOA	Service Orientated Architecture
XML	Extensible Mark-up Language

XSD	XML Schema Definition
SWB	Sea Waybill
BL	Bill of Lading
PoUS	Proof of Union Status

GLOSSARY OF TERMS

Term	Description
UN/CEFACT	The Centre for Facilitation of Procedures and Practices for Administration, Commerce and Transport
UNLocode	United Nations Code for trade and transport locations (UN/LOCODE). http://www.unece.org/cefact/locode/service/location.html
INTTRA	INTTRA is an e-marketplace backed by over 50 carriers and is the world's largest network of ocean shippers.
Bill of Lading	The Bill of lading is a detailed list of a ship's cargo in the form of a receipt given by the master of the ship to the person consigning the goods.
Sea waybill	Shipping document that is only a receipt of cargo taken 'on board' a vessel and which, unlike a bill of lading, is not a document of title.

1 Introduction

Bills of lading and sea waybills are two basic documents that verify the carriage of goods by maritime transport, the latter is used predominantly in short sea trade while the former is mainly used for deep sea transportation. They are closely related to the underlying contract of sale and where applicable, to the documentary credit transaction of the banks concerned. The sea waybill is a non-negotiable receipt for the goods loaded aboard the carrying ship at the port of loading, which also evidences the terms and conditions of the contract of carriage.

A sea waybill is not a document of title conferring ownership, so it can be either a paper document or an electronic data transaction. Its use does not imply the need to convey a paper document of title to the goods to the destination to secure delivery. The use of the electronic sea waybill leads to reduced trade administration costs for all parties in the international and intra-European supply chain.

The Centre for Facilitation of Procedures and Practices for Administration, Commerce and Transport (UN/CEFACT) revised the Open Development Process started in 2006 and issued an update for Recommendation 12. Measures to Facilitate Maritime Transport Documents Procedures stating:

"To governments, to encourage and accept the use of the sea waybill (or other non-negotiable documents) including its electronic equivalents and to ensure that national legislation does not prevent or hinder the use of such documents or the electronic exchange of its data".

Within this document, an analysis of interoperability and harmonisation issues regarding electronic sea waybills is carried out aiming at the simplification, rationalisation and harmonisation of procedures and documents used to evidence the contract of carriage in maritime transport.

Using input received from interviews conducted in five different countries involving multiple stakeholders, many aspects of this process are analysed, beginning with the procedure itself, its impact on flows, effect on existing systems, implementation and finally the overall economic benefit.

1.1 Main objective

There are three objectives behind the promotion of the development of the electronic sea waybill. The first stems from the European level, as a white paper on European transport competitiveness and efficiency counted among its 40 initiatives, the developments of an e-sea waybill. This white paper entitled "Roadmap to a Single European Transport Area – Towards a Competitive and Resource Efficient Transport System" was commissioned in 2011, it not only sets a precedence but also an objective; the improvement of efficiency within the European transport system in order to make it more competitive.

Secondly the report attempts to highlight a few of the inefficiencies regarding the sea waybill, there are time consuming procedures such as emails, paper documents, phone calls and draft validations that are still active today. The costs associated with these types of actions are borne by shippers, freight forwarders and sea carriers.

This introduces the third aim of the initiative; exploring how to negate such time and cost consuming actions by prototyping electronic means to execute them whilst studying the effect and savings of such an action.

1.2 Scope

There are five different countries, all within the European Union, that are involved in the study. This is particularly important to the study as each country's procedures differ, even with European standards in place. It will be the goal of the surveys to identify these differences in order to, if necessary, adjust the implementation strategy of an electronic sea waybill.

Figure 1. Geographical Scope

There is not only a variety of countries represented but also a number of different actors and entities, from public to semi-public and private enterprises. Amongst the consortium include PCS operators, port authorities, carriers, IT companies, R&D centres, a public administration, logistics operators and a classification society.

Figure 2. Participating Partners

There is a large group of participating partners in the project (Figure 2), which gives a varied perspective with a large sample size for the interviews.

2 Applicability of electronic sea waybill solutions for intra-EU freight flows

It is clear that, worldwide, e-sea waybill solutions currently exist having been adopted by many ocean carriers worldwide. These solutions comprise the exchange of booking requests, booking confirmations, shipping instructions and freight transport events.

Having been developed separately, each solution would have been implemented and adapted to a unique scenario based on the requirements of the carrier. This is something that requires additional study as any proposal consisting of an integrated and standardised solution will need to consider both learning best practices from these solutions and also the requirements for harmonising these services.

To this end, as part of the questionnaires and interviews with carriers, a question was included to ask whether or not the carrier was providing an electronic sea waybill solution to their customers. The intention would be to receive feedback from the different solutions operated by different carriers in various countries so the proposal could incorporate and learn from as many existing services as possible.

Generally the response from the carriers participating indicated that they were providing these types of services when they were requested. In fact, the majority of the carriers have already implemented solutions. These solutions varied in functionality and method, with some of them having been developed through their own website and some implementing using an EDIFACT solution. As pointed out by a German carrier, the sea waybill is generated by the system only when a letter of credit is needed, which accounts for less than 20% of the overall business. As of 2014, Spanish partners have calculated the ratio to be around 14%.

From the Spanish responses gathered, there were some insights gleamed about the current status of electronic sea waybills that was of interest. Firstly, it is clear that the interest and potential are very high when considering the e-sea waybills are used in intra community flows, with one carrier estimating that 65% and another at 70% of total flows could use the e-sea waybill solution.

The method of which these sea-waybills are being sent is automated, and the document itself remains as a pdf file. Providing a service that not only sends the pdf of the document but all of the data in a structured way could add value to the process by providing instantaneous validation and confirmation of retrieval.

Another interesting point was raised in regards to flows outside the EU, particularly African countries where, currently it seems that the original Bill of Lading is the most commonly used transport document followed by the telex release. There is interest in introducing the e-sea waybill to these flows.

In Greece, a carrier reported that they were attaching the document to an email for 20% of its transactions. This is a process that could benefit highly from an automated solution as the process of physically checking each individual mail is both time consuming and prone to human error. While another carrier responded that the Baltic and International Maritime Council (BIMCO) sea waybill form was used by one of their clients and could be open to further requests in the future. The process involved here is a completely automated electronic solution.

The Greek carrier also pointed out some negative issues regarding the sea waybill. From the point of view of the carrier, they would prefer not to use the sea waybill due to its “limited terms and conditions”. Also mentioned was the additional issue that it is not accepted by banks if a letter of credit is involved. The second issue was also confirmed by other carriers and does put a limit on the applicability of the solution. These issues mentioned are only referring to approximately 20% of the overall Bill of Lading, however, an electronic sea way bill solution would be applied to a much larger percentage of traffic.

3 Study of Task Duplicities

3.1 Analysis of Input Messages

There were a number of documents identified within the process that were included in the questionnaire and from these documents interviewees were encouraged to indicate which might constitute an input to generate the sea waybill. These documents included the following:

- Commercial invoice
- Booking
- Booking confirmation
- Status events
- Shipping instructions

The inputs differed depending upon the role of the interviewee as each stakeholder in the chain would not interact with every document. Generally, the carriers would be involved in the booking, booking confirmation and shipping instructions, with some interaction on occasion with status events. The questionnaire also attempted to verify if the documents were typically sent electronically or if it still relied on a physical copy or fax. Furthermore, for each of the documents a list of variables was included that listed the data normally associated with it. Next the interviewee was then given the opportunity to identify the data that could provide input into the e-sea waybill. The results of which are summarised below for each of the aforementioned documents:

- **Commercial invoice**: In general not all of the participants would work directly with commercial invoices but those who did recorded that it was not possible to send and receive the document digitally and would rely on paper and pdf. A possible input for the e-Sea Waybill was suggested by a freight forwarder, suggested the inclusion of Terms of Shipment, Value of Goods, Packing list, Point of Collection, Final Point of Delivery.
- **Booking/Booking Confirmation**: The booking document is used by carriers, contains more information than the e-sea waybill and is sent prior to the commercial invoice so it could be a good source for the e-sea waybill. More feedback pointed out that because the freight forwarding community is mainly based on professional relationships, there is an element of trust but it is important to know and differentiate between who is whom.
- **Status Events**: Since status event messages are not always sent and received, they would not make ideal input into the e-sea waybill.
- **Shipping Instructions**: Shipping instructions to the carrier were also flagged as being an area where the freight forwarder can become fiercely protective about one key point

on how to decide how much commercial information is released to the carrier. The list of variables for the booking included the Master/House BL, however these were seen as irrelevant for the sea-waybill.

- **Sea Waybill**: The list of variables for this document were mostly seen as important to the e-sea waybill, however some carriers using their own Electronic Data Processing systems also include the shipper and consignee. One point raised was that the document should differentiate between peripheral and ultra-peripheral movements.

3.2 Impact on the Efficiency of Other Processes

Identified in the section above shows that information is being duplicated in a number of different documents that are sent and received throughout the process of importation and exportation. This section will look to exploit these similarities in order to highlight the benefits that can come of the e-sea waybill. The move to electronic documentation is desirable due to the many benefits that come along with it e.g. the efficiency, security and accuracy. The e-sea waybill would also impact other processes as the information within can be used by these processes as input or used for cross referencing.

Three possible documents that could be impacted positively by the e-sea waybill were identified; the electronic T2L, the import customs declaration and the electronic manifest particularly in relation to the PoUS forming part of the summary declaration. These were then included within the interview questionnaire along with parameters typically contained within these documents.

The Electronic T2L is an electronic version of the document used to prove the Community status of goods in intra-Community trade flows. The T2L is issued by Customs authorities in each of the individual member states and facilitates trade. When the stakeholders were encouraged to discuss how an e-sea waybill would influence the electronic T2L the response revealed the following. In a scenario where full automation exists the benefits of re-using data comes into the force, any electronic T2L or equivalent should be able to cater for split consignments.

The Electronic manifest (or e-Manifest) is a collection of sea waybills for one ship generated by the carrier it generally contains the same information as the sea waybill, making it ideal for both input and cross referencing. One interviewee pointed out that e-Manifests should be able to cater for goods in transit being sold on as this will affect the final Customs declaration. Another comment highlighted that where required, third-party agents handle all T2L and/or Customs declarations involved in manifesting.

The Export Customs declaration document differs from country to country and in some cases from port to port within the same county. Customs in Valencia, for example, require the document four hours before the vessel leaves, while in Bilbao the deadline is when the vessel

leaves and in Barcelona, agents have five extra days to submit the document. As for impact from the introduction of the e-Sea Waybill, the data crossover could be used for confirming the accuracy of the data. Furthermore these processes could benefit from each other by sending an EDI message based on the information that each operator has within their own system to verify each data entry. One interviewee pointed out that data flows are always important and if an improvement can be made to speed up Customs clearance or any other regulatory requirements then this is in everyone's interest.

Finally, other, more generic benefits that were mentioned independently of the documents listed about included a comment from a freight forwarder/declarant that the advance of information and primary data is of vital importance to the logistics chain and this would obviously facilitate completion of these documents. Also from a much wider perspective the payment processes will be safer and easier, authorised receipts for bill payments, authorised e-tickets, payment alerts sent to mobile phones, no registration required, and more could all receive some impact from the e-sea waybill.

3.3 Advanced Information to the Port of Destination

For the port of destination it is particularly relevant to accelerate the release of freight flows coming from neighbouring countries. More specifically, retrieving advanced data regarding goods being transported from a port in a third country (i.e. Tangier) through a short sea shipping service will enable the port authority at destination in the EU and the respective consignees, customs' brokers and/or freight forwarders facilitate a better planning of cross-border regulatory bodies' inspections (sanitary, phyto-sanitary, health, quality,...) as well as preparing Customs procedures. Sanitary and phyto-sanitary inspections of these traffics are quite usual as there is a considerable volume of foodstuff being traded between neighbouring countries and Europe.

4 PCS Operators and Methods of Data Exchange

This section is directed towards Port Community Systems (PCSs) and their potential to play a major role in the provision and exchange of messages related to the establishment of an e-sea waybill. The first aspect to consider is the position of the PCS. These systems are centre points of port communication with very long and well established links with a large number of stakeholders. These stakeholders include customs authorities, port authorities and other official bodies at the port, as well as shipping agencies, freight forwarders, shippers and consignees who are all willing to give and receive information as a means of common gain.

The interconnection of the services provided by large sea carriers platforms (such as INTTRA) with the services provided by port community systems offers great opportunities to facilitate intra-EU trade, simplify and optimise port operations. Port community systems can also offer

new opportunities for notifying reliable freight status events to the sea carriers' network. This takes advantage of the well-established communications they have with port terminal operators and authorities, as well as rail and road operators providing pre and post carriage when house transport operations are included in the electronic sea waybill.

There are multiple PCS operators involved with the project such as; dbh, Dakosy, MCP, Port Authority of Bilbao, Portic, Port Authority of Valencia, Port Authority of Piraeus, Luka Koper and Port Authority of Livorno. The point at which these PCS's communicate with the established networks of the sea carriers requires an amount of development that is yet unquantified, in order to build interoperable communication; it is into this development the analysis will delve.

The first point to recognise is that although each of the PCS's inhabits the same role, as the central communication point between actors involved in port activities, they differ vastly in terms of the services that they provide and the means of which they provide them. Some of the systems were established more than 20 years ago and have been adapted due to changes in circumstances such as Port Authority of Valencia's Valenciaportpcs.net, MCP's Destin8 and DAKOSY's portal in Hamburg port.

Generally these systems have moved to a Service Oriented Architecture (SOA) in order to be more scalable for the high volume of information travelling through the port, which can result in hundreds of thousands of messages being exchanged per day. However, they still provide legacy services in order to maintain connections with actors who have not yet developed as quickly.

It is using SOA in combination with web services which would enable PCS operators to work with INTTRA and other sea carriers using a predefined interface that would be capable of accepting and processing a large amount of requests. The interface, which will be explored in sections five and eight, would require some development and adaptation from the PCS operators. However, the systems are designed for additions and changes such as this.

In order to gain a better understanding of how the interfacing would work an explanation of what a web service can provide is required. Web services provide a platform that allows two software systems to exchange data over the Internet; put simply, when a software system requests data the web service simply provides it.

Web services are stateless, allowing them to meet high performance demands and they simplify the design and implementation of components because it removes the need to synchronize data with an external application, only becoming active when a request is being made.

Furthermore, if used in conjunction with the xml format and schema definitions, a web service becomes a powerful software tool capable of ensuring real time validation of the data being transferred displaying errors when it occurs.

This validation would allow for every message to be validated based on a schema that can be designed built on information gathered from interviews and analysed in section 5 of the report.

As in the schema is shown, some of these data exchanges could require some validation points or workflows to be completed. In order to solve the technological barrier, different solutions could be implemented that could fit perfectly for some cases but not so well for others.

Using the following methods of data exchange, the advantages and disadvantages will be identified to select the most useful implementation approach.

- Peer to Peer or P2P
- Delivery platform
- Interactive platform

4.1 Peer to Peer

Generally, a peer-to-peer data exchange is a direct conversation between two parties. On one end we can find the sender of the information and the receiver in the other. A connection is made and is maintained until all the information is complete and accepted by both parties:

- *PROS*:
  - Fast implementation between the two parties for a specific project.
- *CONS*:
  - When a third or more parties are included in the process it becomes more complicated.
  - No data can be accessed if the party is not part of the conversation.
  - No tracking history.
  - Implementation for multiple participants is slow.
  - If problems are raised, no one can ensure which information was sent.

4.2 Delivery Platform

A transport platform is an intermediary system that would act only as a repository of information. In this scenario, every participant would send the information through the platform, thus would make the information available to the different participants involved:

- *PROS*
  - This repository would act as a contract of information being sent, to referee if problems are raised.
  - More than one party can be involved in the same procedure.
  - Easy implementation and cheap maintenance for the platform.
- *CONS*
  - No validations on the information are sent.

- The workflow of the information has to be implemented on each part increasing cost on the development phase.

4.3 Interactive Platform

An interactive platform is a system that keeps track of any information exchanged and provides interaction with all parties at a given process level. The interaction could be given to each party in many different ways; as the logic and data validations remain on the platform, the technological means to interact with it are not relevant.

Normally, these types of platforms offer a web interface to interact with the user and another web service so that any party can integrate it into their own system and make use of the services offered by this platform following the method they most prefer or can financially afford.

- PROS
  - The information resides on the platform, thus the reliability is greater and this information could be used to benefit the generation of other processes.
  - Workflows and validations reside on the platform, thus is only one implementation on the program logic.
  - As the information resides on the platform and a web gateway could be created, not all parties should be necessarily integrated by EDI. In fact, a party could be working with EDI and the other with the web gateway, interacting with the same information.
  - Opens the door to step into new developments and improvements.
  - Any party involved in a process can access the same information in real time.
  - Different roles could be implemented to give access only to the information they need, excluding irrelevant parts.
  - Notifications could be programmed to inform the availability of the information on the system so that they would only have to retrieve it.
- CONS
  - Maintaining the system and developing it has a greater cost than other methods.
  - Breakdowns and unusual problems make the system collapse.

5 Data Requirements

As part of the data requirements analysis, questionnaires were sent to partners to gather information and feedback about the data that would be expected to be included in a proposed e-sea waybill document. A table of parameters and the type (text, numeric etc.) were provided within the questionnaire for the interviewees to remark, add to and comment on. The results

of which have provided us with a strong understanding about exactly what would be expected when we begin to design and outline the data structure.

The targets for the questionnaire were shippers, freight forwarders and sea carriers.

In the following table the aforementioned table of parameters is presented:

Table 1. Sea waybill data

Fields	Type	Harmonised by
Shipper (Name, Address, Postal code, etc.)	text	EORI code
Consignee (Name, Address, Postal code, etc.)	text	EORI code
Shipper reference	text	
Consignee reference	text	
Origin	text	UNLocode
Destination	text	UNLocode
# Packages	number	
Packages type	text	UN/ECE
Package marks & commodity & numbers	text	
H.S Code	text	HS Code
Gross weight	number	in kg
Dimensions	number	in cbm
Master/House BL	text	
Vessel	text	
Voyage	text	
Port of Loading	text	UNLocode
Port of Discharge	text	UNLocode
E.T.A	date	YYYY-MM-DD
E.T.D	date	YYYY-MM-DD
Carrier	text	SCAC Code
Carrier reference	text	
Delivery to (Name, Address, Postal code, etc.)	text	EORI code
Notify party (Name, Address, Postal code, etc.)	text	EORI code
Hazardous	yes or no	Y/N
Hazardous Class	text	IMDG Class
Hazardous UNNumber	text	UN Number
Hazardous Flashpoint	number	Centigrade
Incoterms	text	INCOTERM CODE

Service type	text	D2D, Door-to-door; D2P Door-to-pier; P2D Pier-to-door; P2P Pier-to-pier; R2P Rail-to-pier …
Equipment type	text	UN/ECE
Freight type	text	P for Prepaid / C for collect
# Containers	number	
Container #	text	
Container Seal #	text	
Bill of lading type	text	SWB, Sea waybill
SWB reference	text	
Freight charges	text	
Destination Country	text	UNLocode
Dispatch Country	text	UNLocode
Attachment OEA certificate	document	pdf format
Attachment Commercial invoice	document	pdf format

Generally, the included parameters were agreed upon among the interviewed shipping agencies and freight forwarders from all the participating countries. However there were some comments and feedback that would be worth exploring further, these suggestions are:

- A shipping company based within the UK suggested the addition of the Movement Reference Number (MRN).
  - While in Spain (particularly in Valencia) the MRN is something that is communicated via the customs formality, in the UK it might be something interesting to include.
- A Greek based interviewee suggested that the columns for the number of containers should be combined with the container number.
- The same Greek organisation commented that the EORI code could be difficult to implement.

Generally, this response is encouraging as it provides start-up information for the development of a data structure using this table as a foundation not just in terms of requirements but also for assisting the validation of the document.

6 Analysis of Current Flow of Agents

In the questionnaire it was important to establish a workflow to understand the interactions between stakeholders during the import and export process. A general workflow was included in the questionnaire for participants to comment upon. This workflow (Next Figure) shows the primary actors involved along with the file and format that is transferred.

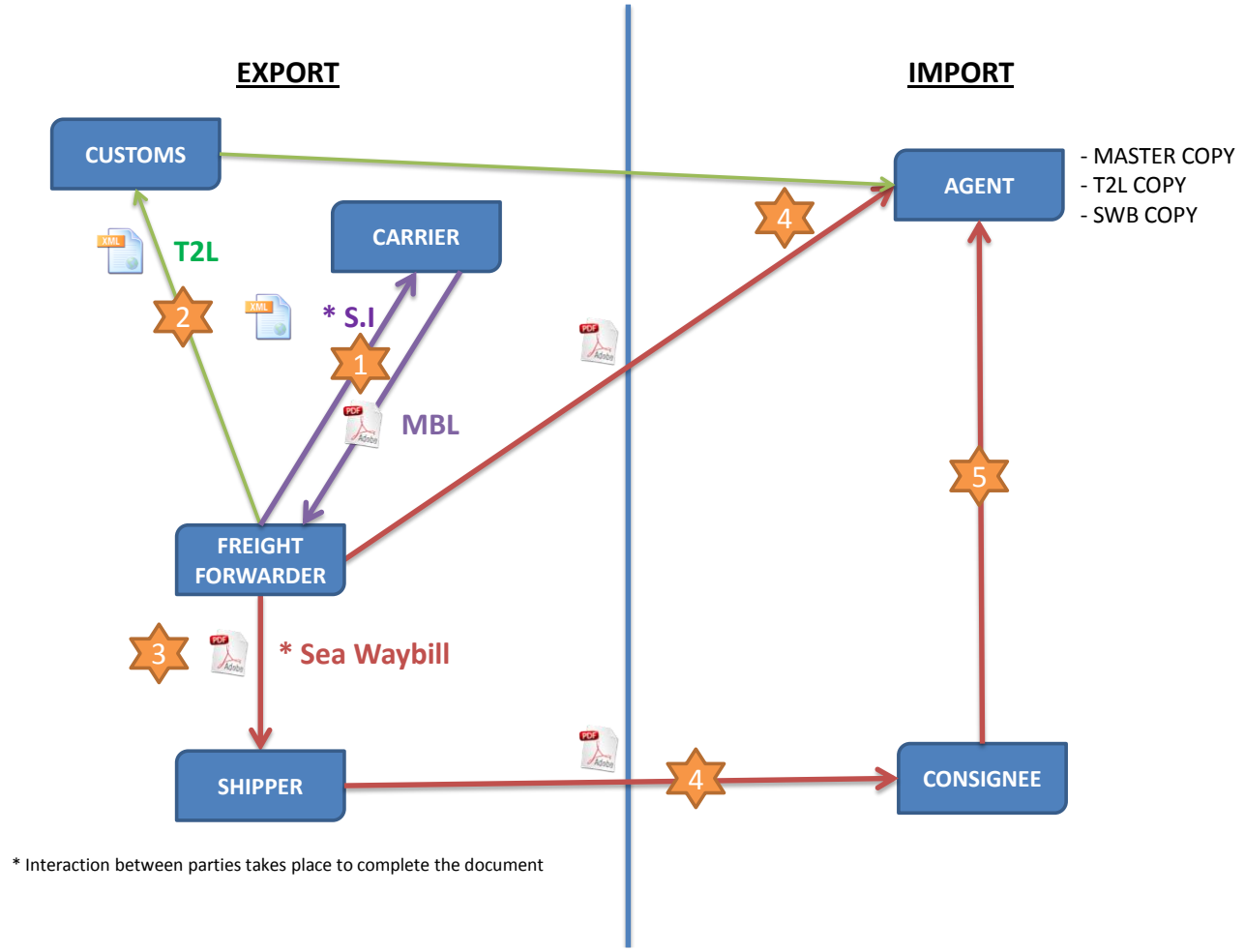

Figure 3: Workflow generated in the questionnaire

The following list describes each of the actions taking place in the workflow:

1. The freight forwarder sends the shipping instructions to the carrier for approval.
2. Communication to Customs using the T2L format to distribute cargo details.
3. Generation of the sea waybill.
4. Once the sea waybill is approved, it is delivered to all parties involved at a given time frame.
5. Documents being delivered at the import side so cargo can be checked out at destination.
6. Validation process, normally manual, to ensure the delivery to the corresponding consignee.

These explanations were expressed in the questionnaire for the interviewee to comment upon in order for any discrepancies, whether they were national or stakeholder based, to be discovered.

Generally this workflow was confirmed to be as similar to how the process was executed in most of the countries involved in the interviews. However some differences were pointed out particularly by the German based carriers and were primarily concerned with steps 1, 3 and 4, these differences were listed as follows:

The freight forwarder sends the shipping instructions to the carrier for approval:

- 80 % of the booking procedure: online portal of carriers agent or EDIFACT-interface between carrier's system and big customer.
- 20 % is running via mail, fax and telephone.

Generation of the sea waybill:

- It is generated within the system of the carrier just in case of bank business; (LC business) in this case paper is needed for less than 20 % of carriers business; 80% of carriers business is paperless Express-B/L. EDP system of the carrier.

Once the sea waybill is approved, it is delivered to all parties involved at a given timeframe

- All partners (agents, carrier, shipper, freight forwarder) can be informed via tracking and tracing system; all information of a shipment is within the closed carrier EDP system; just internal use; no external authorization; partners can get informed by WEB.

Partners from the UK, Spain, Greece and Italy confirmed that in general these flows were accurate apart from some exceptions (e.g. a shipping line in Spain reported that for some Canadian traffic the freight forwarder in not involved).

7 Data Structure

This section will explore a possible data structure that could be potentially implemented if pursuing the electronic version of the sea way-bill. The data structure is a particular way of organizing data in a computer friendly format so it can be used more efficiently. Drawing from a range of questions asked during the interviews with stakeholders, conclusions were drawn on a variety of topics.

The first question asked when discussing the possibility of the electronic exchange is the format of the messages. Within the questionnaire it was asked if XML was the appropriate language for this exchange and generally the response was positive. However, it was noted on some occasions that, although XML was becoming more commonplace for system-to-system interfacing, EDIFACT messaging was still a recognised standard. Based upon this input, the strengths and weaknesses of each will be assessed.

There are many kinds of structures that have been adopted for machine-to-machine communication beyond the aforementioned EDIFACT and XML but while EDIFACT is still more widely used (Destin8 receives almost 100% of manifests and export bookings electronically via EDIFACT), the most commonly used today for new developments is the XML format, for

ensuring data accuracy and effectiveness is the XML format; the benefits of which are highly competitive against other type of formats.

Extensible Mark-up Language (XML) is a flexible text-based format design to exchange or store large scales of complex or atypical data. The data structure uses a marked language, using tags for each element of information. It is extensible because it does not use a fixed format; in fact, it lets you design your own mark-up making it a powerful tool for customised development.

It is also portable and non-proprietary meaning it can be used to store or transfer among different platforms and systems. The popularity of the format has become predominant over other types to enclose and transfer information on business due to its high speed and low costs.

It also supports internationalization (i18n) using a universal character set called Unicode, which permits transferring different writing systems with special support as Chinese or Japanese for example. XML is recommended by the World Wide Web Consortium (W3C), a group that supervises the development of the specification[1].

Within port communication, as it predates XML, the most common communication takes place using EDIFACT messaging. UNEDIFACT standards were introduced in 1987 in order to standardise how ports communicate data and activities that take place pre-port arrival/departure. Today however, Port community systems are developing in both EDIFACT, to maintain legacy systems, and XML for new modern features.

Another major advantage of using XML in conjunction with web services is the use of XML Schema Definition (XSD). XSD is a language for expressing constraints about XML documents. It provides mechanisms to validate data and ensure there are fewer errors while transferring information and providing an assurance on its success.

Documents are only considered valid if they satisfy the requirements of the schema with which they have been associated. It also supports the association of data types to given elements and attributes for software components to read and write[2].

The XSD will be of use in several areas within the proposed e-sea waybill communication, to name one example; the length of the EORI Code can be validated, letting the sender know immediately whether or not a problem exists.

In conjunction with the xml format and schema definitions, a web service becomes a powerful software tool capable of ensuring in real time the validity of the data being transferred displaying error(s) when they occur.

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[1] *All the technical specification can be found here: http://www.w3.org/TR/REC-xml/*

[2] *Specification and definitions can be found here: http://www.w3.org/standards/techs/xmlschema#w3c_all*

Electronic Sea Waybill Data Structure

The purpose of the next section is to define the schema for the data structure in order to exchange relevant information for the Sea Waybill process. It tries to accomplish this with today's standards using codification and typology whenever it is possible.

The schema has been designed to be used with only one SWB per xml file. Therefore each transfer will be unique and provide future auditing on the electronic procedure movements.

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    <MessageHeader>
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        <SenderIdentificationCode>a</SenderIdentificationCode>
        <ReceiverName>a</ReceiverName>
        <ReceiverIdentificationCode>a</ReceiverIdentificationCode>
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        <Version>a</Version>
        <DateTime>2001-12-17T09:30:47Z</DateTime>
        <MessageType>N</MessageType>
    </MessageHeader>
    <MessageBody>
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            <EquipmentType>aaa</EquipmentType>
            <FreightType>C</FreightType>
            <BillOfLadingType>SWB</BillOfLadingType>
            <Containers>0</Containers>
            <Packages>0</Packages>
        </Details>
        <Parties>
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            <ConsigneeCode>a</ConsigneeCode>
            <CarrierCode>a</CarrierCode>
            <DeliveryToCode>a</DeliveryToCode>
            <NotifyPartyCode>a</NotifyPartyCode>
        </Parties>
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            <MasterBLReference>a</MasterBLReference>
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```

```
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            <Voyage>a</Voyage>
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            <ETA>1957-08-13</ETA>
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            <Commodity>a</Commodity>
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            <Volume>0</Volume>
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            </Dimensions>
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```

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        <Cargo>
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            <PackageType>aaa</PackageType>
            <Marks>a</Marks>
            <Commodity>a</Commodity>
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            <Volume>0</Volume>
            <Dimensions>
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                <Height>0</Height>
            </Dimensions>
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            <ContainerSealNumber>a</ContainerSealNumber>
            <Incoterm>aaa</Incoterm>
            <HazardousFlag>true</HazardousFlag>
            <Hazardous>
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                <UnNumber>a</UnNumber>
                <FlashPoint>0</FlashPoint>
                <TechnicalDescription>a</TechnicalDescription>
                <Characteristic>a</Characteristic>
                <EMSNumber>a</EMSNumber>
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            </Hazardous>
        </Cargo>
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        <FreighCharges>
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        </Documents>
        <Documents>
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        </Documents>
    </MessageBody>
</eSWB>
```

Figure 4. E-sea Waybill scheme sample

There are actually two files composing the sea waybill schema:

- ESWBTypes.xsd
  - Document with common types to reutilize and maintain a simple schema.
- ESWB.xsd
  - Primary schema with the relevant elements to be transferred.

8 Roadmap for the Establishment of an Electronic Sea Waybill for Intra-EU Freight Flows

This road map sets a framework for the creation of an interoperable environment for use and recognition of electronic sea waybills.

Within the report a design was developed that specific prototypes and pilots could be based on. Partners would be invited to use these specifications in order to develop future web services or PCS enhancements. Having provided a schema with the data variables gathered from the input received from the questionnaires, this can use used as the foundations of the communications for such developments.

From the data received it has become clear that not all port in all ports in Europe will be able to offer the same level of service, added value and functionalities derived from the introduction of an electronic sea waybill as every port PCS varies greatly in its services and also in its functionality.

Listed above and as attachments to this report are samples of the schema which is being made available for all those who would choose to develop the services. The schema provides a defining map for all variables required in the document. This map will assist end users (logistics operators, freight forwarders, neutral NVOCCs, shippers and consignees) in configuring their supply and distribution logistics networks including MoS according to the facilitation and simplifications that the origin and destination ports are offering for intra-EU movements.

This report also provides relevant outputs for the training and dissemination activities that will promote the adoption of these new tools with the aim of attracting new intra-EU trade flows to be transported by sea, instead of using long road haulage routes within the EU.