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1 List of Abbreviations

BCF – Business Collaboration Framework.

BICS – Binnenvaart Informatie & Communicatie Systeem

BSR – Basic Semantic Register

CCTS – Core Components Technical Specification (see ebXML).

ebXML – electronic business XML (provided by OASIS).

EDI – Electronic Data Interchange. The automated exchange of any predefined and structured data for business among information systems of two or more organizations. (Open-EDI Reference Model Standard - ISO/IEC 14662) [EBMoU]. Thus, EDI encompasses EDIFACT as well as XML based solutions.

EDIFACT – United Nations rules for Electronic Data Interchange For Administration, Commerce and Transport (more correctly, UN/EDIFACT)

EEA – European Economic Area

EMSA – European Maritime Safety Agency (www.emsa.eu.int).

EMSA – Maritime e-Commerce Association (www.emsa.org).

EPC – Electronic Port Clearance for vessels visiting a port deals with the administrative procedures enforced by international, national and / or local authorities. On the one hand Electronic Port Clearance replaces the paper forms currently in use; on the other hand Electronic Port Clearance tries to make the exchange of information more efficiently [BICS]. EPC can be said to be the electronic implementation of “Single Window”.

EU – European Union

EXPRESS – see STEP.

FAL – IMO Facilitation Committee

GATT – The General Agreement on Tariffs and Trade (WTO)

IEC – International Electrotechnical Commission

IMMTA – International MultiModal Transport Organisation

IMO – International Maritime Organisation.

ISO – International Standards Organisation

ITS – Intelligent Transport Systems

ITU – International Telecommunication Union

ISO – International Standards Organisation

ISPS – International Ship and Port facility Security (Code): IMO instrument.

MARPOL – Maritime Pollution Convention: IMO Instrument

MoU – Memorandum of Understanding

MTML – Maritime Trading Markup Language (4.9.6).

NVMC – National Vessel Movement Centre (USA)

OASIS – Organization for the Advancement of Structured Information Standards

One Stop Shopping – This is an informal name of the same concept as “Single Window”.

Single Window – The concept of having one clearing point for all ship reporting requirements. Ship reporting may still be in paper form or voice, but one central desk takes care of the clearance process. This is the term proposed by UN/ECE and adopted by IMO [SWin]. See also “One Stop Shopping” and EPC.

SME – Small and Medium sized Enterprise

SOLAS – Safety of Life at Sea Convention: IMO instrument

SSN – SafeSeaNet

STEP – Standard for exchange of product data. STEP/EXPRESS is a formal description language much used for physical constructions (some ship building, mostly airliners and cars).

TBT – Agreement on Technical Barriers to Trade (WTO agreement)

TDCC – Transportation Data Coordinating Committee

TDED – The United Nations Trade Data Element Directory.

UBL – Universal Business Language (see OASIS).

UN – United Nations

UN/CEFACT – United Nations Centre for Trade and Facilitation and Electronic Business.

UNCITRAL – United Nations Commission on International Trade Law

UNCTAD – United Nations Conference on Trade and Development

UNECE – UN Economic Council for Europe

UNLOCODE – UN/CEFACT Location codes

UNLK - United Nations Layout Key (for documents)

UNTDDED – United Nations Trade Data Elements Directory

UNTDID – United Nations Trade Data Interchange Directory

W3C – World Wide Web Consortium (www.w3c.org).

WCO – World Customs Organisation

WHO – World Health Organisation

WTO – World Trade Organisation

XML – Extensible Markup language (defined by W3C)

2 Executive Summary

2.1 Cooperation in Cluster 1

As has been pointed out in the work plans for WP1.1, 1.2 and 1.3 there is a great deal of overlap between activities in cluster 1. This is most evident in the plans and objectives for WP1.2 and WP1.3. To alleviate this problem, work was divided between partners in all work packages to avoid overlap and to give a good geographic distribution of investigations where that was necessary. This is described in detail in the respective work plans.

During the investigation it has also been made clear that for most small and medium sized ports it is not very meaningful to distinguish between “commercial” and “authority’s” information needs and flows. One has to look at the totality of messages exchanged rather than divide between “commercial” and “official”.

Due to the above issues, as well as the structure of the work packages and the respective deliverables as prescribed in the DoW, it has been very difficult to sort the research results so that the deliverables could be produced without significant overlap. As noted above, this would also have defeated one of the main conclusions from the investigations. The result of this is that deliverables from WP1.2 and WP1.3 to a large extent is based on the same research and findings and, thus, that the same material had to be replicated in both set of reports.

Regardless of this, the respective reports have been written with different audiences in mind and with somewhat different objectives to meet. Thus, one set of deliverables may be more useful to a certain audience than the other set. WP1.2 deliverables have mainly been written with the authorities’ and decision makers’ point of view in mind while WP1.3 deliverables are mostly concerned about the technical details of the implementation of a single window concept and how this affects the commercial actors using or operating this system.

2.2 Summary of this document

This document discusses the issue of Electronic Port Clearance (EPC), who are responsible for it, what are the requirements and what is the state of the art. EPC has to be understood in the broadest sense. As EPC is still being developed and only a few ports are reporting on its progress, this document also covers all activities that have an influence on the possible development of EPC solutions. This includes trade oriented activities, data definition activities, ship internal communication etc.

Note that the document does focus on the use of XML in port clearance, rather than the current electronic document standard EDIFACT. This is intentional since EDIFACT already has been established in many ports, but seems to be stable in its deployment. It is believed that EDIFACT will also be used in the future, particularly for trade related documents. However, for less complicated and future ship reporting, via personal computers EDIFACT may be too cumbersome and other solutions such as XML might be more appealing to the industry.

Chapter 3 gives an overview of those organisations that are in a position to provide legislation, guidelines or in other ways influence users of EPC systems. The focus in that chapter is on the organisations and the tools they are using.

Chapter 4 gives an overview of the organisations that provide standards or examples of how EPC can be implemented. Typically this can be standards for trade documents, ship reporting forms, data definitions, XML definitions etc. Note that some of the organisations mentioned in Chapter 3 is also repeated here.

Chapter 5 describes the state of art in the potential migration from paper, fax and unstructured email to XML. There is also a certain chance that this also will include the

gradual replacement of EDIFACT, at least for some report formats, for XML. However, in spite of a high activity level in the XML world, progress is slow.

Chapter 6 gives a short overview of some existing EPC-solutions with emphasis on Amsterdam. These are based on EDIFACT and other means. This section also gives a short overview of some known uses of XML in ship reporting. This includes obviously SafeSeaNet, but also other initiatives have been found.

References are contained in Chapter 7 and Chapter 8 contains annexes with some background material.

3 Legislative and advisory organisations

This section will try to give an overview of the legislative organisations that are related to EPC. These organisations will in most cases not deal directly with electronic messages, but will provide legislation or advice that in some way support electronic exchange of information.

3.1 International Maritime Organisation (IMO)

IMO is the main International legislative body for the maritime industry, and although it does not deal with electronic port clearance as such, The Facilitation Committee (FAL) has published the IMO Compendium on Facilitation and Electronic Business (IMO-360E).

3.1.1 IMO Facilitation Committee (FAL)

The FAL Convention was adopted in 1965 and has been amended a number of times since then. This Convention defines a maximum number of documents that contracting governments can require from a ship as well as standard formats for these documents (on paper). This is covered in IMO FAL Standard 2.1 [FAL].

Public authorities shall not require for their retention, on arrival or departure of ships to which the convention applies, any documents other than those covered by the present section:

- General Declaration
- Cargo Declaration
- Ship's Stores Declaration
- Crew's Effects Declaration
- Crew List
- Passenger List
- Dangerous Goods Manifest
- Moreover: The document required under the Universal Postal Convention for mail and Maritime Declaration of Health.

The FAL Convention has in Recommended Practice 1.4 given the recommendation for contracting governments when they introduce EDI techniques to facilitate clearance processes to exchange data in conformity with the relevant UN/ISO standards and recommendations.

In FAL Standard 1.6 has it been indicated that public authorities, when introducing EDI techniques for clearance processes, shall limit the information they require from ship owners and other parties concerned to that required by the FAL Convention.

In FAL Standard 1.8 it is said that when introducing EDI techniques to assist clearance processes public authorities shall encourage their use by maritime operators and other parties concerned.

In the FAL recommended practice 4.12 has been indicated that public authorities should use EDI techniques for the purpose of obtaining information in order to accelerate and simplify clearance processes.

The EDI messages which can be used to implement the FAL reporting requirements are indicated in the below table which has been compiled from the FAL Compendium [FALc15]. This document also contains the templates as mentioned in the FAL Convention for the FAL Forms.

Table 1 – FAL Forms and EDI

Data	FAL form	Suggested EDI	Note
General declaration	1	CUSREP	¹
Cargo declaration	2	CUSCAR	
Ship's store	3	INVRPT	
Crew's effects	4		²
Crew list	5	PAXLST	
Passenger list	6	PAXLST	
Dangerous goods	7	IFTDGN	

Recently, some discussions have been made in the FAL committee on the use of XML. It is in particular ebXML that has been suggested [FAL32/5/3]. In the FAL Compendium it is clearly indicated that EDI stands for Electronic Data Interchange in whatever format including standard XML solutions.

The FAL committee has recommended where possible to use the Single Window concept as defined by UN/CEFACT Recommendation 33 [SWin]. One should note that FAL do not require the use of EDI documents for electronic port clearance, but strongly recommends it. (See above)

Note that PROTECT (see 4.3.9) has developed standards for ISPS and the waste directive in addition to the above mentioned list.

3.1.2 International Ship and Port facility Security (ISPS) Code

SOLAS regulation XI-2/9 (ISPS) requires the ship to report certain security related information to ports. [MSC1130] recognizes that the provisions of SOLAS regulation XI-2/9 do not create any obligation on a ship to provide, in advance of arrival in a port, security-related information to a duly authorized officer without receiving a formal request.

The document then identifies the required information. Most of this is already contained in other FAL forms, but some are specifically related to the ISPS code, e.g.:

- International Ship Security Certificate details.
- Current security level
- Last ten port calls
- Ship-to-ship activities

Further, it also suggests that this data should be reported at least 24 hours prior to arrival. Note also that no FAL forms have yet been developed or modified to take this information into account. FAL is considering this issue.

¹ As the CUSREP only caters for Customs information and due to the ISPS code also other information is required the BERMAN message has been used and proposed in a number of Ports such as Amsterdam, e.g., [BICS]. Rotterdam, Bremen, Hamburg, Le Havre, Singapore and all other members of the Protect group of ports

² As the crews effects list needs to be signed by each individual crew member as it is their responsibility it was not deemed appropriate to define a message dealing with this FAL Form 4. A suggestion has been made for the Customs to use the crew and passenger lists for this form as well.

3.1.3 Ship certificates

IMO defines a number of certificates and other documents that the ship is required to carry onboard. The port state has the right to inspect the ships certificates and some ports require that the list of certificates is sent to the port before arrival. The necessary list of certificates can be found in [MSC946]. There are 14 different document types for all ships and an additional number of documents for various ship types, e.g., 12 for cargo and 6 for passenger. The same list can also be found in IMO document [FAL 32/15], where all certificates have been identified to provide a good overview

Currently, these certificates are required to be carried onboard for inspection by the competent authorities (port state and others). One should note, however, that the certificates are issued by Class bureaus and the national shipping inspection of the Flag State and that it should be possible to check certificates electronically. Some proposal have been made in the IMO i.e. to have at least the certificates in electronic format on board but this still needs some more research in order to define which is the solution that fits all requirements.

3.1.4 Ship reporting systems

IMO defines the concept of ship reporting systems, but this is not really related to EPC. Ship reporting systems as used in SOLAS Ch. V, regulation 11 is a geographic area, proposed by a contracting government under a specified set of rules and adopted by the IMO member states. A ship entering or passing through this area can be required to send certain reports related to safe operation in the area. The report types that may be required are [A.851]:

- Sailing plan (SP) - Before or as near as possible to the time of departure from a port within a system or when entering the area covered by a system.
- Position report (PR) - When necessary to ensure effective operation of the system.
- Deviation report (DR) - When the ship's position varies significantly from the position that would have been predicted from previous reports, when changing the reported route, or as decided by the master.
- Final report (FR) - On arrival at destination and when leaving the area covered by a system.
- Dangerous goods report (DG) - When an incident takes place involving the loss, or likely loss overboard of packaged dangerous goods, including those in freight containers, portable tanks, road and rail vehicles and ship borne barges, into the sea.
- Harmful substances report (HS) - When an incident takes place involving the discharge or probable discharge of oil (Annex I of MARPOL 73/78) or noxious liquid substances in bulk (Annex II of MARPOL 73/78).
- Marine pollutants report (MP) - In the case of loss or likely loss overboard of harmful substances in packaged form including those in freight containers, portable tanks, road and rail vehicles and ship borne barges, identified in the International Maritime Dangerous Goods Code as marine pollutants (Annex III of MARPOL 73/78).
- Any other report - Any other report should be made in accordance with the system procedures as notified in accordance with paragraph 9 of the General Principles.

[A.851] contains relatively detailed guidelines as to what information is required and how it may be formatted. These reports are often delivered by VHF radio or telex to a control centre responsible for the area, but it is obvious that also electronic and digital data exchanges can be used for this purpose.

3.2 European Commission

The EU will through directives provide legislation that can influence the use of electronic documents. This section will briefly look at some directives that are of interest in the context of EPC. Note that most directives is related to one or more IMO based resolutions or legislation.

3.2.1 Directive 2002/59 – SafeSeaNet

This directive defines the SafeSeaNet (SSN) system and mandates its introduction. By that it also influences the type of messages that are required in an EPC system and how it should interact with the European SSN.

3.2.2 Directive 2002/58 – Privacy and data communication

This directive [D2002/58] defines some boundary conditions for the electronic transmissions of sensitive data.

3.2.3 Directive 2002/6 – Port state reporting formalities

This directive [D2002/6] requires EU and EEA nations' port state authorities to accept that reporting formalities are satisfied by the use of IMO FAL forms 1, 2, 4, 5 and 6 as the basic documents.

3.2.4 Directive 2001/96 - Safe loading and unloading of bulk carriers

This directive [D2001/96] requires masters of bulk carrier to report information related to loading and unloading, typically 24 hours before arrival. The information is usual ship identification data together with various ship and cargo related data.

3.2.5 Directive 2000/59 - Ship-generated waste and cargo residues

This directive [D2000/59] requires masters of all ships to report information related to waste and cargo residues before arrival in port. Relevant data is:

1. Waste oils, including sludge, bilge water and others.
2. Garbage, including food waste, plastic and others.
3. Cargo-associated, including waste, residues and others.

3.2.6 Directive 1999/97 – Port state control

This directive [D1999/97] amends the directive [95/21]. It specifies procedures related to port state control and also a list of certificates and documents that are required to be shown. This list is repeated in 8.1. It is a subset of that presented in [MSC946]. Although this list is a carriage requirement, one can also see that it may be converted into a reporting requirement as in Singapore.

3.2.7 Directive 98/41 – Passenger lists

Passenger ships sailing in Europe are required to count passenger (for shorter voyages) or compile more extensive passenger lists and to transmit these to shore no more than 30 minutes after departure [D98/41]. Reporting can be made to the ship owner's shore office or

to any other suitable party. The purpose is to keep up to date information in case of an emergency.

3.3 National directives

European countries will implement EU directives, IMO legislation and national interests through national directives or legislation. This section gives an overview of a typical set of legislation. It is loosely based on the situation in Norway.

3.3.1 Arrival and departure notification

Typically, the port state will require notification of arrival and departure some time before the event. In most cases this will be referenced to the IMO FAL form number 1. In general, there are different forms of arrival and departure notification:

- Into territorial waters and reporting to port state authorities.
- Into and departure from port, for port authorities.

The use for these reports is mainly for various port state administrative functions, such as port state control.

3.3.2 HazMat notification

Hazardous material notification is also mandated in national regulations, but with reference to various IMO instruments.

3.3.3 Incidents notification

All serious incidents shall be reported to the port state or other relevant authority. Incident types that shall be reported are those that cause emission of dangerous or polluting material or those that cause reduced navigational safety.

3.3.4 Bulk ships notification

Bulk ships are required to report their expected arrival and what requirements they have for discharge and loading of cargo. These directives are normally intended to reduce accidents in conjunction with hull damage in bulk carriers.

3.3.5 Reports to navy or coast guard

Foreign ships will normally be required to report to military authorities when entering and leaving territorial waters and certain restricted areas along a country's coast.

3.3.6 Pilot and fairway fee

Ships will normally have to order pilots in advance of arriving in areas where pilots are required. Even if pilots are not used (pilot exemption etc.), there is normally a requirements to notify of the use of restricted waters. This is used to calculate fees for pilot availability and use of fairways.

3.3.7 Immigration

Foreign nationality crew or passenger must be reported to immigration authorities.

3.3.8 Customs

All items that have to pass through customs must be reported ahead of arrival. Likewise, exported items must also be declared.

3.4 World Health Organisation (WHO)

WHO issues the International health regulation [IHR]. This regulation requires ship on international voyages to provide the following documents:

- *Maritime Declaration of Health*. The content and basic format is defined in [IHR].
- *Deratting certificate or exemption certificate*. If not carried, officials may require the ship to undergo deratting at arrival.

The first document is usually a mandatory report to be sent from the ship before crew are allowed on or off the ship.

3.5 World Customs Organisation (WCO)

The Convention establishing a Customs Co-operation Council, now known as the “World Customs Organization”, entered into force in 1952 with 17 participating countries. Today the WCO has 166 Members, spread throughout the world. WCO publishes recommendation to its members on various issues among them electronic customs declaration and clearance (see www.wcoomd.org).

In the International Convention on the simplification and harmonization of customs procedures (The Kyoto Convention) and its protocol of amendment of 1999, principles and standards have been given for the clearance and other customs formalities, the collection and payment of duties and taxes, security, customs control and the application of information technology.

The WCO has developed the WCO Customs Data Model based on the G7 Customs Data Harmonization Initiative and the WCO Data Mapping Guide for UN/EDIFACT Messages, which includes their definition of Customs data requirements and message implementation guidelines on the basis of the UN/EDIFACT Customs messages.

In the General Annex of the convention has been mentioned that the development and rapid expansion of the Internet has opened up new possibilities for information exchange. Consequently new standards such as XML (possibly ebXML) will become international standards through global usage

The result from the above work is the recommendation to use UN/EDIFACT messages and Codes to facilitate standard message exchanges. The relevant messages are:

- CUSCAR: Customs cargo report message
- CUSREP: Customs Conveyance Report message
- CUSDEC: Customs declaration message
- CUSRES : Customs Response Message

The WCO has produced detailed guideline based on the data model on how these messages shall be used in trade and transport. While Electronic Data Interchange using the international standard UN/EDIFACT is presently implemented by a large number of WCO member countries as one of the preferred interchange options, the WCO has made the

recommendation to offer more than one solution for the electronic exchange of information. Customs now are also looking at other options such as ebXML. Depending on the risks involved, even the use of e-mail and telefax could provide a suitable solution for certain applications.

The WCO recommends the use of International codes such as the ISO country and currency codes, UN transport codes, UNLOCODE, the WCO Convention on the Harmonized Commodity Description and Coding System (HS) The Kyoto Convention indicates that the harmonized use of codes at application level will be of great benefit to the facilitation of international trade.

3.6 World Trade Organisation (WTO)

3.6.1 International standards

The Agreement on Technical Barriers to Trade (TBT) - sometimes referred to as the Standards Code - is one of the legal texts of the WTO Agreement which obliges WTO Members to ensure that technical regulations, voluntary standards and conformity assessment procedures do not create unnecessary obstacles to trade [ISOTBT, TBT].

Basically, this requires members to use international standards whenever these exist or are imminently forthcoming, unless special interests of security and safety prohibit the use of international standards.

The agreement also requires members to participate in international standardisation work where the work is important for the member's trade. Further more, the agreement lays down rules for how international (and national) standardisation work shall be done. Basically, it requires that work is transparent and open to comments from other members that may have an interest in the work.

3.6.2 Trade facilitation

In the decision adopted in 2004 by the WTO General Council on the Doha Work Programme contained in document WT/L/579, WTO members decided by explicit consensus to commence negotiations on Trade Facilitation. The modalities stipulate that negotiations shall aim to clarify and improve relevant aspects of Articles V, VIII and X of the GATT 1994³ with a view to further expediting the movement, release and clearance of goods, including goods in transit. Furthermore the modalities lay down that "the work of relevant international organizations in the area of trades facilitation shall be taken into account". In this context, the United Nations work deliverables and expertise through the Inland Transport Committee and UN/CEFACT both administered by the UNECE is considered highly relevant by the WTO members as evidenced by various submissions of the European Communities G/C/W/394 and G/C/W/422, Japan, Australia and many others.

The GATT agreement prescribes measures to reduce difficulties for international trade, also with respect to transit. Article V sets out the basic principles for freedom of transit through the territory of each Member, but provides no guidelines on how these principles should be applied. Proposed are simplifying and standardizing customs procedures and documentary requirements – including risk management and limitation of physical inspection. Import and export, article VIII, recognizes the need for simplifying import and export formalities and documentation. It does not, however, provide any mandatory requirements. Several WTO

³ GATT stands for the General Agreement on Tariffs and Trade

members have suggested that international standards should be used to simplify border related documentation and procedures.

Although no particular provisions for electronic data exchange is mentioned, it is clear that this is an important element. Through UN/CEFACT , UNECE develops instruments to reduce, simplify, harmonize and automate procedures, information flow and paperwork in international trade. The instruments include international standards, recommendations, guidelines, best practices and other tools for standardization of trade documents, simplification and harmonization of Trade Procedures, automation and use of information technology. Moreover it maintains and publishes standardized codes for international trade. Several of these instruments are specifically referred to in the revised WCO Kyoto Convention.

The objective of Article X of the GATT (Publication and Administration of Trade Regulations) is to ensure transparency by making available all regulations, laws and other information affecting international trade including cross border procedures and customs administration.

3.7 UNECE

The Economic and Social Council, Economic Commission for Europe, the Committee for Trade, Industry and Enterprise development (UNECE) administers among others the Inland Transport Committee which is responsible for among other the Customs Convention on the International Transport of Goods under Cover of TIR Carnets (“TIR Convention”) and the International Convention on the harmonization of Frontier Controls of Goods and the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) which are maintaining and publishing recommendations and standards reflecting best practices in trade and transport procedures, related data and documentary requirements. Whilst UN/CEFACT does not directly have a legislative role for international shipping, it has over 40 years developed and maintained specifications that are referenced by legislation and other standards. The applicable standards will be discussed in the next chapter. This section will briefly look at the respective UN Recommendations pertaining to transport and trade facilitation in the form of improved processes. The main recommendations are listed in the below table.

Table 2 – UNECE Recommendations

Rec. No	Title and content
1	United Nations Layout Key for Trade documents together with the Trade Data Elements Directory is the basis for the standardization of documents used in Trade and Transport.
3	Country codes. Code for the Representation of Names of Countries.
7	Numerical Representation of Dates, Time and Periods of Time (ISO 8601:2000)
8	Unique Identification Code Methodology (WCO Unique Consignment Number)
9	Alphabetic Code for the Representation of Currencies (ISO 4217)
10	Codes for the Identification of Ships (The use of the IMO Ship Identification Number Scheme)
11	Documentary Aspects of the International Transport of Dangerous Goods
12	Measures to Facilitate Maritime Transport Documents Procedures aims at the simplification and harmonization of the contract of carriage in maritime transport.
14	Authentication of Trade Documents by means other than Signature (Seeks to encourage the use of Electronic Data Transfer in international trade)
15	Simpler Shipping Marks
16	UN/LOCODE Code for Trade and Transport Locations Recommends the 5

	digit code for abbreviating the names of locations such as ports, inland freight terminals airports and customs locations
18	Facilitation measures related to international trade procedures
19	Codes for Modes of Transport establishes a one digit numerical code for representing transport modes such as sea, road inland waterway etc.
20	Codes for units of Measure used in International Trade
21	Codes for Types of Cargo, packages and packing material
22	Layout key for Standard Consignment Instructions
23	Freight Cost Code – FCC Harmonization of the description of Freight Costs and other Charges
24	Trade and Transport Status codes
25	Use of the United Nations Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT)
26	Commercial use of interchange agreements for Electronic Data Interchange (EDI)
27	Pre-shipment Inspection
28	Codes for Types of Means of Transport establishes a common code list for the identification of the type of means of transport.
31	Electronic Commerce Agreement takes into consideration the need for a framework of basic provisions to handle electronic commerce operations
32	E-Commerce Self-Regulatory Instruments (Codes of Conduct)
33	Recommendation and Guidelines Establishing a Single window

Some of these recommendations are given a more in depth coverage in the next chapter. Recommendation 33 on the single window is covered below.

3.7.1 Recommendation 33: Establishing a Single window

A Single Window is defined as a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfil all import, export, and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once.

Thus, the single window concept may be used to denote a system that uses electronic as well as other types of media to perform information exchanges. The referenced document goes on to define three types of single window implementation:

- *Single authority*. This is an authority that, on behalf of several others, collect data from the trader and distributes it to those who need it.
- *Single automated system*. that integrates the electronic collection, use, and dissemination (and storage) of data related to trade. There are various possibilities:
 - i. Integrated System: Data is processed through the system
 - ii. Interfaced System (decentralised): Data is sent to the agency for processing
 - iii. A combination of i and ii.
- *Automated Information Transaction System* through which a trader can submit electronic trade declarations to the various authorities for processing and approval in a single application.

3.8 UNCTAD

Established in 1964, the United Nations Conference on Trade and Development (UNCTAD) aims at the development-friendly integration of developing countries into the world economy.

UNCTAD is the focal point within the United Nations for the integrated treatment of trade and development and the interrelated issues in the areas of finance, technology, investment and sustainable development.

The United Nations Conference on Trade and development has developed a number of instruments such as the Asycuda systems to deal with customs requirements in developing countries.

More information can be found on <http://www.unctad.org>.

3.9 UNCITRAL

United Nations Commission on International Trade Law (UNCITRAL) is the core legal body within the United Nations system in the field of international trade law. UNCITRAL was tasked by the General Assembly to further the progressive harmonization and unification of the law of international trade by:

- Co-ordinating the work of organizations active in this field and encouraging co-operation among them;
- Promoting wider participation in existing international conventions and wider acceptance of existing model and uniform laws;
- Preparing or promoting the adoption of new international conventions, model laws and uniform laws and promoting the codification and wider acceptance of international trade terms, provisions, customs and practices, in collaboration, where appropriate, with the organizations operating in this field;
- Promoting ways and means of ensuring a uniform interpretation and application of international conventions and uniform laws in the field of the law of international trade;
- Collecting and disseminating information on national legislation and modern legal developments, including case law, in the field of the law of international trade;
- Establishing and maintaining a close collaboration with the United Nations Conference on Trade and Development;
- Maintaining liaison with other United Nations organs and specialised agencies concerned with international trade;

Examples are the model law on electronic signatures, and the use of electronic negotiable documents.

More information can be found at <http://www.uncitral.org/>.

4 Standardisation organisations

Several international bodies are defining regulations, resolutions, recommendations, standards and other documents that have an impact on the technology used in the maritime world. In this section a short overview of these bodies is given, including addresses on the Internet where one can find additional information. Also some information is given on how to obtain the documents relevant for a certain technology or application.

4.1 IMO

IMO is not in the general sense a standardisation organisation, but it does from time to time include examples of information and document formats in its publications.

4.1.1 FAL Forms

IMO FAL (see 3.1.1) has developed a set of standard forms that can be used for various reporting purposes. Some port states accept these forms in their basic form (simple paper) or in similarly structured formats. The FAL compendium also suggests the acceptance of plain text or spreadsheet type documents, where possible.

The forms are given as examples in the FAL Compendium and the compendium also gives advice on acceptable data formats.

4.1.2 Ship reporting standard

SOLAS specifies certain ship reporting requirements that are also addressed by the FAL Convention (see 3.1.1). In addition to this there are also requirements for various ship reporting facilities when ships are entering VTS or certain special reporting areas. For this purpose, the IMO assembly has also approved a standard reporting form based on simple text codes [A.851]. This format has also been adopted by various other entities. The format can be sent as a text file via INMARSAT or other electronic means. For reference a sample message is included below.

```
AMVER/SP//
A/VESSEL NAME/CALL SIGN//
B/240620Z MAR//
E/045//
F/198//
G/TOKYO/3536N/13946E//
I/LOS ANGELES/3343N/11817W/031300Z APR//
L/RL/190/3448N/13954E/NOJIMASAKI/240850Z//
L/GC/210/4200N/18000E/280400Z/
L/RL/200/4200N/16000W/300030Z/
L/GC/188/3422N/12047W/030500Z APR//
L/RL/161//
M/JCS//
V/NONE//
X/NEXT REPORT 250800Z//
Y/JASREP/MAREP//
Z/EOR//
```

Figure 1 – IMO Ship Reporting Standard Format

This example message is actually an AMVER⁴ message, but uses the standard format. Messages are divided into records (lines) where each record is headed with a record code (first letter) and have a number of fields, delimited with a slash. An informal standard is also used for values inside fields.

4.2 United Nations Economic Commission for Europe - UNECE

The United Nations Economic Commission for Europe (UNECE) was set up in 1947. It is one of five regional commissions of the United Nations. Its primary goal is to encourage greater economic cooperation among its member States. It focuses on economic analysis, environment and human settlements, statistics, sustainable energy, trade, industry and enterprise development, timber and transport.

UNECE activities include policy analysis, development of conventions, regulations and standards, and technical assistance. UNECE has 55 member States. Over 70 international professional organizations and other non-governmental organizations take part in UNECE activities.

Co-operation between the Regional Commissions and UNCTAD has led to the establishment of UN/CEFACT (United Nations Centre for Administration, Commerce and Transport) where about 33 Recommendations on the Facilitation and Simplification of Trade and Transport procedures have been developed. Under the aegis of the UN commission of Trade a number of standards for Electronic Data Interchange have been developed, including UN/EDIFACT and ebXML (more information on <http://www.unece.org>).

4.3 UN Centre for trade facilitation (UN/CEFACT)

Centre for Trade Facilitation and Electronic Business (UN/CEFACT) does not have a legislative role for international shipping, but it develops and maintains specifications that are referenced by legislation and other standards. The most relevant work for shipping is the work on EDIFACT and related standards.

4.3.1 ITU, IEC, ISO and UN/CEFACT Memorandum of understanding

According to the ISO, ITU, IEC and UN/CEFACT memorandum of understanding [EBMoU], it is the responsibility of UN/CEFACT to maintain EDIFACT standards and application guidelines. The syntax for EDIFACT is maintained by ISO as ISO 9735. The United Nations Trade Data Element Directory latest publication 2005 (TDED, published, in part, as ISO 7372) is jointly maintained by ISO and UN/CEFACT. Work on the ebXML specifications is being continued under the respective OASIS and UN/CEFACT processes. OASIS and UN/CEFACT have their own agreement for the joint coordination and management of the ebXML work.

This is the principle as defined in the memorandum, but realities may not quite live up to this standard. Some discussions on this can be found in the respective sections on ISO and OASIS.

⁴ US Coast Guard operated ship registration service

4.3.2 Electronic data interchange

The following definition of UN/EDIFACT has been published by the UN [UNTDID]:

- United Nations rules for Electronic Data Interchange For Administration, Commerce and Transport (UN/EDIFACT) comprise a set of internationally agreed standards, directories and guidelines for the electronic interchange of structured data, and in particular that related to trade in goods and services between independent, computerized information systems.
- Recommended within the framework of the United Nations, the rules are approved and published by UN/ECE in the (this) United Nations Trade Data Interchange Directory (UNTDID) and are maintained under agreed procedures.

The same document goes on to summarize the principles for the establishment of any trade data interchange method or system as follows:

- The basis for any trade data interchange is the United Nations Trade Data Elements Directory (UNTDDED), where data elements are uniquely named, tagged and defined, and where the representation of data entries is specified both as regards expression and syntax. From this directory, data elements required to fulfill specific documentary functions are selected both for UNLK based forms and to form messages for transmission. Data elements from UNTDED used in UN Standard Message types are also part of a separate directory (EDED) in UNTDID.
- Data elements can be grouped in various sets, systematically arranged according to agreed rules. These groups (or "segments"), which are designated by a common denominator (a segment tag), can be arranged as specified in United Nations Standard Message types (UNSM's) or by agreement between interchange partners. Each data elements is implicitly identified by its position in the segment.
- Data elements in the United Nations Trade Data Elements Directory (UNTDDED) are used in the segments specified in the present United Nations Trade Data Interchange Directory (UNTDID) and are also, in a condensed form for this purpose, included in a special directory (UNTDDED).

4.3.3 United Nations Trade Data Interchange Directory (UNTDID)

This is the basic directory defining what EDIFACT actually is and consists of. UNTDID includes:

- UN/EDIFACT Application Level Syntax Rules (ISO 9735);
- UN/EDIFACT Message Design Guidelines (MDG);
- UN/EDIFACT Syntax Implementation Guidelines (SIG) ;
- UN/EDIFACT Data Element Directory, EDED (a subset of UNTDED);
- UN/EDIFACT Code List, EDCL;
- UN/EDIFACT Composite Data Element Directory, EDCD
- UN/EDIFACT Segment Directory, EDSD
- UN/EDIFACT United Nations Standard Message Directory (UNSM), EDMD
- Uniform Rules of Conduct for the Interchange of Trade Data by Teletransmission (UNCID)
- Explanatory material

4.3.4 United Nations Trade Data Elements Directory (UNTDED)

Part of this directory constitutes ISO 7372. It includes the standard data elements for UN/EDIFACT and associated codes. UNTDED is jointly maintained by the UN Secretariat and ISO [UNTDED].

The format is semiformal as exemplified below.

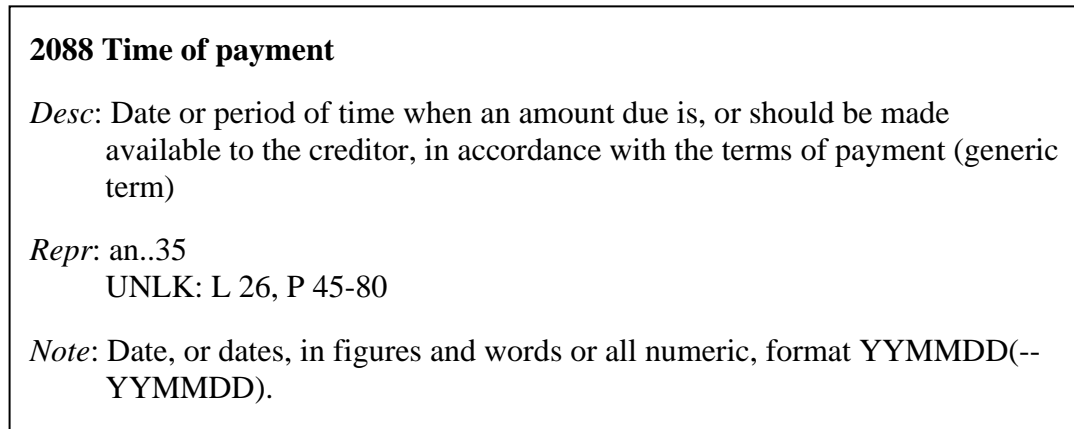


Figure 2 – TDED example format

The entry assigns a numeric code to each data item, gives a description including format and, if appropriate, a reference to the UNLK entry where it is used. Description formats vary quite a bit.

This document gives each data element a numeric (4 digit) code and describes how it shall be encoded. It also defines relationships to paper based documents, among them UNLK.

4.3.5 EDIFACT

EDIFACT syntax is currently defined in [ISO 9735]. The structure is roughly illustrated in Figure 3.

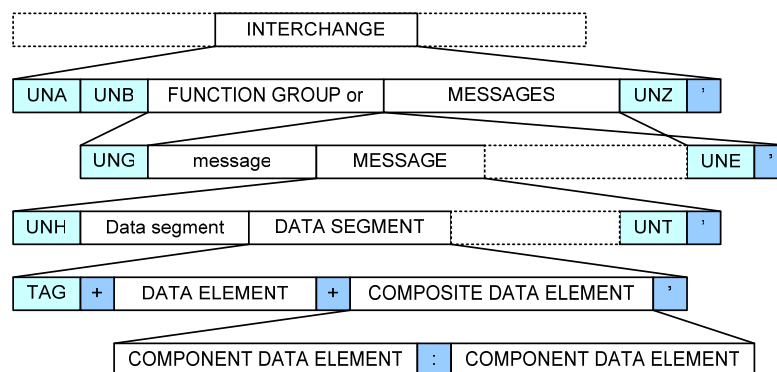


Figure 3 – EDIFACT hierarchical structure

The syntax has the following main characteristics:

- Hierarchical structuring, components are delimited by special keywords or by rules. Some of the keywords are shaded in the figure.
- Implicit data element identification. Rules determine the position of some data elements. Only the value is transmitted in the electronic code.

- Special character data separation. Some of these characters are shaded in the figure.
- Flexible length data structures. Separator characters are used where necessary.
- Mandatory or conditional status of data elements and segments

The encoded message is a string of characters, using encoding rules from [ISO 9735] and data dictionary elements from UNTDED.

4.3.6 United Nations Layout Key (UNLK)

The UNLK, later endorsed as ISO 6422, is intended for application in the designing of documents related to the various administrative, commercial, productive and distributive activities constituting external trade, whether these documents are completed by hand, by mechanical means, such as typewriters and automatic printers, or by reproduction methods (copying). The United Nations Layout Key is intended specifically as a basis for the designing of aligned series of forms employing a master document [UNWPI]. The UNLK forms the basis of some of the main documents currently used in international trade, such as:

- Single Administrative Document (used within the European Union)
- Dangerous Goods Declaration (UNECE)
- GSP (Generalized System of Preferences) Certificate (UNCTAD)
- Air Waybill of the International Air Transport Association (IATA)
- Forwarding Document (used by the International Federation of Freight Forwarders Associations (FIATA))
- Certificate of Origin (revised WCO Kyoto Convention)
- Goods Declaration for Export (revised WCO Kyoto Convention)
- Standard Bill of Lading (International Chamber of Shipping)

The UNTDED standard gives reference to UNLK for each relevant data item and specifies if it is in conformance or not. Also, vice versa, UNLK gives reference to UNTDED where possible.

4.3.7 UNeDocs

A new area that UNECE is working on is UN electronic documents [UNEDOCS]. According to UN itself, UNeDocs is a simple and low cost answer for the exchange of document-based data:

- It has been designed with the objective to make small and medium enterprises participate in advanced supply-chains
- It is built upon the United Nations Layout Key, the world standard for international trade documents in paper format
- It is based on the UNTDED/ISO 7372 United Nations Trade Data Elements Directory
- It incorporates UN/CEFACT trade facilitation recommendations and electronic business standards for efficient and secure trade
- It implements key documents for trade (invoice, custom declaration, shipping instruction, forwarding instruction, etc.)

It is claimed to be an open and technology-neutral solution that can be easily implemented by SMEs and large companies alike. UNeDocs documents can:

- Be generated in paper, XML, PDF⁵ and EDI format
- Be visualized using a standard Internet browser or can be implemented in standard office software
- Support electronic signatures

It is also claimed to be a powerful migration tool from paper to paper-less environment. UNeDocs has been developed by UNECE and provides interoperability for the exchange of document-based information between the public and private sector.

Currently (Version 0.4), the following documents have been defined:

- Invoice
- Order
- Quotation
- Consignment Document Dispatch Notice
- International Consignment Note
- Certificate of Origin
- Export Customs Declarations
- Shipping Instructions
- Non-negotiable Sea Waybill
- IMMTA Non-negotiable Transport document
- IMMTA Negotiable Transport document
- Forwarding Instructions

UNECE is now (June 2005) calling for an extension of the UNeDocs project [UNEnew]. This project will extend the current work and further the deployment of the electronic documents. The plan is also to include UBL (4.8.5) in the scope of work, at least to the degree where it is considered.

4.3.8 SMDG

SMDG – User group for Shipping Lines and Container Terminals – is a non-profit foundation, run by and on behalf of companies and organizations working in the maritime industry, like container terminals, ocean carriers and related companies and organizations. SMDG develops and promotes UN/EDIFACT EDI-messages for the Maritime Industry and is an official Pan European User Group (www.smdg.org).

Of particular interest for EPC is the fact that SMDG coordinates the development work on BAPLIE – the EDIFACT message for bay plans and storage.

⁵ PDF - Portable Document Format, developed and owned by Adobe

4.3.9 PROTECT

The PROTECT Group has been established by the Port Authorities of the six major ports in North-West Europe, supported by their Port Community systems. The Group aims to harmonise the implementation of the UN/EDIFACT standard messages for vessel reporting in the different ports (see www.smdg.org for more information about PROTECT).

The PROTECT Group has developed the UN/EDIFACT standard messages for the electronic notification of Dangerous Goods (IFTDGN) and of waste (WASDIS) to Port Authorities.

The PROTECT Group has further developed MIG"s - Message Implementation Guides - for these messages and also for the acknowledgement message from the Port Authority and for the berth (request) management message (BERMAN) to Port Authorities.

Very recently the work of this group has resulted in the completion of a universal implementation guide.

In April 2005 the PROTECT Group released a new version of the PROTECT Message Scenario, also called the PROTECT Guide [PROT]. This develops a number of new message standards as shown in the table below.

Table 3 – PROTECT EDI recommendations

Data	Suggested EDI
Dangerous goods	IFTDGN
Waste report	WASDIS
ISPS and berth management	BERMAN
Acknowledgement and errors	APERAK

Note that it may be discussed if the messages actually conform to the respective directives and regulations. As an example, ship to ship interactions are not covered in BERMAN.

4.4 ISO-IEC Joint Technical Committees

ISO (see below) is responsible for international standardisation related to non-electrical issues. The latter is normally taken care of by IEC (see below). Computer related applications are normally divided between IEC and ISO. Thus, IEC and ISO have established some joint technical committees to coordinate work between the two organisations.

4.4.1 ISO/IEC JTC 1/SC 32 - Data Management and Interchange

This committee is charged through the [EBMoU] to work on naming, defining and coding of data elements through ISO/TC 184/SC 4 « Industrial Data-Parts Libraries » and also in various other ISO and IEC committees. This has relatively little impact on EDI work.

The committee has also developed [ISO/IEC 14662] that specifies the framework for coordinating the integration of existing International Standards and the development of future International Standards for the inter-working of Open-EDI Parties via Open-EDI and provides a reference for those International Standards. As such, it serves to guide the work necessary to accomplish Open-EDI by providing the context to be used by developers of International Standards to ensure the coherence and integration of related standardized modelling and descriptive techniques, services, service interfaces and protocols.

SC32 is doing work on meta-data that may be relevant for descriptions of content of EPC messages. The relevant standards are issued as ISO 11179. The group is also working on

meta-models for interoperability between different representations of meta data (ISO 19763). This may be used in mapping of, e.g., EDIFACT based models to XML based models.

4.5 International Standards Organisation (ISO)

The International Organisation for Standardisation (ISO) is a non-governmental organisation established in 1947. The mission of ISO is to promote the development of standardisation and related activities in the world with a view to facilitating the international exchange of goods and services, and to developing co-operation in the spheres of intellectual, scientific, technological and economic activity. ISO's work results in international agreements, which are published as International Standards. More information is available from <http://www.iso.ch>.

4.5.1 ISO TC8

ISO TC8 (Ships and marine technology) has published some standards in the realm of EDI. These standards have not had much impact so far, but also new standards are planned that may have a greater impact. A list of relevant work items and standards can be found below.

Table 4 – ISO TC8 items

Code	Name	Status
ISO PAS 16917	Data transfer standard for maritime and intermodal transportation	PAS
ISO/PAS 22853	Ships and marine technology -- Computer applications -- Specification of Maritime Safety Markup Language (MSML)	PAS
	Ship safety record	Proposed
	Message formats and transport protocols for electronic port clearance	Proposed

The work on the ship safety record is more or less obsolete after the introduction of the ISPS code and will most likely be terminated. Any remaining issues will then be taken care of by the electronic port clearance initiative. This is defined as a possible work item, but has not yet been formally voted over within ISO.

4.5.2 ISO/TC 104

TC 104 (Freight containers) develops standards related to freight containers. This is mostly of limited interest for EPC, except for in some cases, the standards listed below.

ISO 668 Series 1 freight containers – Classification, dimensions and ratings

ISO 830 Freight Containers – Vocabulary

ISO 6346 – Freight Containers Coding, identification and marking

ISO 9669 Interface for tank containers

ISO 9711-1 Information related to containers on board vessels part 1 Bay plan system

ISO 9711-2 Data transmission

ISO 9897 Freight containers general communication codes

ISO 10368 Thermal Containers – Remote condition monitoring

ISO 10374 Automatic identification

4.5.3 ISO TC 154

ISO TC154 is named “Processes, data elements and documents in commerce, industry and administration”. In the scope of EDI, they are responsible for formal standardisation of UN/CEFACT documents, like TDED and EDIFACT syntax. They also work with ebXML and conversion of EDI to XML.

4.5.3.1 *ISO 6422 - Layout key for trade documents*

This standard [ISO 6422] is the ISO variant of the corresponding UN/CEFACT specification (see 4.3.6).

4.5.3.2 *ISO 7372 - Trade data interchange, trade data elements directory.*

This document [ISO 7372] is an ISO format duplication of the UN/CEFACT TDED data dictionary. A description of contents and form can be found in 4.3.4.

4.5.3.3 *ISO 9735 – EDIFACT*

This standard [ISO 9735] is divided into 11 separate parts as listed below.

Table 5 – EDIFACT ISO Standards

Number	Content/Title
ISO 9735	Application level syntax rules
ISO 9735-1	Syntax rules common to all parts.
ISO 9735-2	Syntax rules specific to batch EDI.
ISO 9735-3	Syntax rules specific to interactive EDI.
ISO 9735-4	Syntax and service report message for batch EDI, message CONTRL
ISO 9735-5	Security rules for batch EDI (authenticity, integrity and non-repudiation of origin).
ISO 9735-6	Secure authentication and acknowledgement message, message AUTACK
ISO 9735-7	Security rules for batch EDI (confidentiality).
ISO 9735-8	Associated data in EDI.
ISO 9735-9	Security key and certificate management message, message KEYMAN
ISO 9735-10	Syntax service directories

An overview of the structure of EDIFACT was given in 4.3.5.

4.5.3.4 *ISO 15000 – ebXML*

TC154 has converted some of the ebXML specifications into ISO documents. The below table lists the relevant documents.

Table 6 – ebXML ISO Documents

Number	Content/Title
ISO/TS 15000-1	Collaboration-protocol profile and agreement specification (ebCPP)
ISO/TS 15000-2	Message service specification (ebMS)
ISO/TS 15000-3	Registry information model specification (ebRIM)
ISO/TS 15000-4	Registry services specification (ebRS)
ISO/TS 15000-5	ebXML Core Components Technical Specification, Version 2.01(ebCCTS) – In work

As noted in the section on ebXML, it is not quite clear what position ebXML will get in future EPC solutions. Port of Hong Kong has in any case used parts of ebXML.

This group is also responsible for the publication of ebXML standards as technical specifications. TS do not have the same weights as international standards and are generally considered a recommendation from the committee.

4.5.3.5 ISO 17369 – Statistical data

ISO/CD TS 17369 Statistical data and metadata exchange (SDMX). This has little relevance to EPC, but should be kept in mind for statistics reporting.

4.5.3.6 ISO 20625 – EDI to XML

TC154 has also published a technical specification on production of XML schema files from EDI(FACT) specifications [ISO 20625].

4.5.4 ISO TC 184

TC 184 (Industrial automation systems and integration), SC 4 (Industrial data) has been working on ship to shore reporting in conjunction with their work also on STEP/EXPRESS standards. However, this work item has been cancelled and the group is not directly involved in maritime EDI work at this time.

4.5.4.1 ISO 10303 – STEP/EXPRESS

TC184 has been responsible for development of STEP based standards for the manufacturing industry. This includes technical arrangement for ships, structures and moulded forms. There also was a work item under application protocol 234 on “Ship operational logs, records and messages”. This item has been deleted, but the draft specification is available.

STEP (STandard for the Exchange of Product data) is the colloquial term for the International Standard ISO 10303 *Industrial systems and integration - Product data representation and exchange*, the first release of which occurred in 1994. EXPRESS itself is a lexical object flavoured information modelling language and is defined in ISO 10303-11:1994. EXPRESS-G is an iconic language that provides a subset of the lexical modelling capabilities; this is defined in Annex D of ISO 10303-11:1994. EXPRESS-I is another member of the family and is designed for the display of data instances and the specification of abstract test cases. It is defined in ISO/TR 10303-12:1997 [SandE].

STEP and EXPRESS is not very relevant for work on EPC, except as noted in the next section. For the EPC2 project, EXPRESS was used in part of the modelling, but all implementations use XML.

4.5.4.2 ISO 15926 – Life cycle data for oil and gas

The above standard [ISO 15926], in two parts, have been used by the Norwegian project EPC2 as basis for definition of data items on their EPC message. The claimed benefit from this approach is to get a more consistent and maintainable data model. Although the standard was originally developed for the oil and gas industry, it is also being adopted by other actors in the market.

4.5.5 ISO TC 204

TC 204 (Intelligent transport systems) work as the name suggests with all aspects of computerised transport technology. They are also active in the definition of semantics and

syntax for various message transfers. They also focus on intermodal transport and publish standards related to this.

The scope of TC204 is standardization of information, communication and control systems in the field of urban and rural surface transportation, including intermodal and multimodal aspects thereof, traveler information, traffic management, public transport, commercial transport, emergency services and commercial services in the Intelligent Transport Systems (ITS) field. Excluded are in-vehicle transport information and control systems. Note that TC 204 is responsible for the overall system aspects and infrastructure aspects of ITS, as well as the coordination of the overall ISO work program in this field including the schedule for standards development, taking into account the work of existing international standardization bodies (from ISO web pages).

4.5.5.1 ISO 24533 – Intermodal data dictionaries

The full title of this standard is “Transport information and control systems -- Data dictionary and message set to facilitate the movement of freight and its intermodal transfer -- Road transport information exchanges”. It is currently in committee draft stage and one can assume that it will not be finished before end of 2006 at the earliest.

This standard will include a unified standard Data Dictionary and Message Set, all elements of which are intended to be harmonized with the United Nations Trade Data Element Directory (UN/TDED) and United Nations Trade Data Interchange Directory (UN/TDID). The standard will be recognized, understood and used by international customs agencies and international trade organizations [TDD].

4.5.5.2 ISO 17687 – Dangerous Goods data dictionaries

The full name of this standard is “Transport Information and Control Systems (TICS) -- General Fleet Management and Commercial Freight Operations -- Data Dictionary and Message sets for electronic Identification and Monitoring of Hazardous Materials/Dangerous goods Transportation”. It is currently in draft standard stage and will probably be finished in 2005 or 2006.

In a recent report of the UNECE international trade and business processes group (TBG) to the UN/CEFACT plenary, TBG3 stated that they are “not supporting the ISO draft standard DIS 17687 “Data Dictionary and Message sets for Electronic Identification and Monitoring of Hazardous Materials/Dangerous goods Transportation” developed by ISO TC204, because the data specifications are neither compliant with the TDED ISO 7372 and UN/EDIFACT Directories published by UN/CEFACT nor with the ebXML Core Component Technical Specifications (CCTS 2.01) published as ISO TS 15000 Part 5. This draft standard is in conflict with the existing UN/CEFACT and ISO standards which are extensively used in commercial freight operations for all modes of transport. TBG3 resolves that this issue be addressed by the Standard Liaison Rapporteur within the MoU between ISO and UN/CEFACT” [TBG05]

4.6 TDCC and ANSI X.12

The Transportation Data Coordinating Committee (TDCC) devised an electronic railroad bill of lading in 1975 and went on to establish a whole suite of electronic documents for rail, motor, ocean, and air freight. Individual companies and industries began developing their own means of exchanging data, which raised the prospect of splintering and conflicting documents that created more work for the users rather than less. The result, in 1979, was the United States Electronic Data Interchange standard, which became accredited under the

American National Standards Institute as the X12 committee. X12 incorporated the work of TDCC into its standard in the early 1980s.

These standards together with the TDI standards used in Europe were the building blocks for UNEDIFACT when work was started in 1985 on the Invoice, Purchase order and ships manifest. UNEDIFACT has been recognised by ANSI X12 as the uniform world wide standard to replace whenever possible, the older standards

ANSI (American national Standards Institute) is the US membership organisation in ISO. It does also develop own standards. One of these is the ANSI X.12 standard which is functionally more or less identical to EDIFACT although other coding schemes and keywords are used. It is being used extensively in US electronic business, but is probably not relevant for EPC use [X12]. The standard is used in the USA, Canada and to some degree in Australia. The X12 transaction sets cover a wide range of industry sectors, including administration, education, finance and government.

The X12 EDI had a large impact on the business-to-business electronic commerce in the 1970s and 1980s and consists of more than 315 transaction sets. The transaction sets concerning transportation are addressed by the subcommittee X12I containing the following 11 workgroups.

- TG1 XML
- TG2 Air Transport
- TG3 Motor Transport
- TG4 Ocean Transport
- TG5 Rail Transport
- TG6 Technical Review
- TG7 Information and Procedures
- TG8 Travel, Tourism and Leisure
- TG9 Customs
- TG10 Multimodal
- TG11 Logistics

The development of the X12 standard is now on the ASC X12's new XML architecture, called Context Inspired Component Architecture (CICA). This architecture aims to enable individuals to build XML business documents in a cross-industry setting.

4.7 W3C

The World Wide Web Consortium (W3C) is responsible for maintaining a number of web related standards, among them most activities related to XML. They do not undertake work in more application oriented areas, like EDI or as OASIS does.

Note also that there are some overlaps between W3C and OASIS in the area of web services definitions and other more business oriented use of XML. This applies to technology that is similar to ebXML.

4.8 OASIS

The Organization for the Advancement of Structured Information Standards is a not for profit international consortium that drives the development, convergence, and adoption of e-business standards. The consortium produces more Web services standards than any other organization along with standards for security, e-business, and standardization efforts in the public sector and for application-specific markets. Founded in 1993, OASIS has more than 4,000 participants representing over 600 organizations and individual members in 100 countries (from www.oasis-open.org).

OASIS develops XML based standards for a long range of applications. Some of those that are most relevant for MarNIS are:

- Emergency Management and Common Alerting Protocol (CAP). This will not be discussed further in this document.
- ebXML - Electronic Business using eXtensible Markup Language. ebXML was started in 1999 as an initiative of OASIS and the United Nations/ECE agency CEFACT (see www.ebxml.org).

In the following, the aspects of ebXML will be discussed in some detail. Much information is taken from [ECc], other sources are referenced where appropriate.

4.8.1 Relationship to UN/CEFACT

UN/CEFACT published a press release in 2003 [UNCO], with the following statements included.

The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) announces the successful completion of the ebXML technical standards work with the Organization for the Advancement of Structured Information Standards (OASIS). UN/CEFACT continues to capitalize on the gains made from ebXML in the further development of technology-neutral and implementation-neutral global e-Business standards for government, industry and commerce.

“Recognition that the next technology trend is just around the corner resulted in the recent UN/CEFACT Plenary meeting directing a new work program to move UN/CEFACT closer to web services” said Dr Christian Fruhwald, Chair of UN/CEFACT. “This new work, known as UN/CEFACT Business Collaboration Framework (BCF), will allow UN/CEFACT to identify the growing needs of government, commercial and industrial organizations as they approach their global information exchange requirements.”

Thus, one can probably expect that ebXML in itself will not be a very dominant factor of future UN/CEFACT work. However, it is still considered by the organization and may have an impact, particularly on transport protocol and more physical levels.

4.8.2 Components of ebXML

The main components of ebXML are (see also 4.5.3.4):

- CCTS: Core Components Technical Specification.
- MSH: Message Service Handler.
- UMM: UN/CEFACT Modelling Methodology.
- RIM: Registry Information Model

- RS: Registry Service

Of particular interest is the CCTS that defines a code structure similar to that developed in UNTDED. The specification has later also resulted in a catalogue of core components (from OASIS web pages).

4.8.3 ebXML technical architecture

ebXML does not provide a mapping of EDIFACT messages to XML. Neither does it provide a method to do so. On the technical level, it defines an architecture in which electronic business can take place. The main components of the architecture are [ECc]:

- Messaging Service - This provides a standard way to exchange business messages between organizations. It provides for means to exchange a payload (which may or may not be an XML business document) reliably and securely.
- Registry - The registry is a database of items that support doing business electronically. The particular implementation of the registry/repository database is not specified, but only how other applications interact with the registry (registry services interfaces) and the minimum information model (the types of information that is stored about registry items) that the registry must support.
- Trading Partner Information - The Collaboration Protocol Profile (or CPP) provides the definition (DTD and W3C XML schema) of an XML document that specifies the details of how an organization is able to conduct business electronically.
- Business Process Specification Schema (BPSS) - The Specification Schema provides the definition (in the form of an XML DTD) of an XML document that describes how an organization conducts its business.

In general, the specification is relatively weak as a prescriptive standard and requires additional specifications to achieve interoperability.

4.8.4 Application of ebXML

There are two significant problems with ebXML according to [ECc]:

- Lack of prescriptive standards will make it more difficult to ensure interoperability. This will in particular be a problem for smaller companies until a time when larger operators agree on a standard implementation.
- The specification is too wide for general use. In most maritime EDI operations, the business process and the trading partner roles are well defined and there is no need for advanced mechanisms to model and specify either. Thus, the actual data transport is the most interesting.

Parts of ebXML have been applied by, e.g., the port of Hong Kong, to implement a message transfer system. However, as noted above, it is not clear to what degree one can expect to see further implementations in the maritime sector.

4.8.5 UBL – Universal Business language

OASIS has also published the first edition of UBL, Universal Business Language. Created by UBL localization subcommittees (LSCs) to aid in global UBL deployment, the UBL 1.0 IDD consists of over 600 normative business data definitions from the UBL 1.0 Standard together with translations of the definitions into Chinese (Traditional and Simplified), Japanese, Korean, and Spanish. With the original English, these definitions make the XML

business documents specified in UBL 1.0 understandable to more than two-thirds of the world's current online population (from OASIS web page).

Again, UN/CEFACT has some reservations about this standard “to clarify the working relationship with UBL regarding the applicable rules and the development of XML documents for the various business domains. Since OASIS has published the UBL standard version 1.0 including XML messages, the user community is confused about the respective roles of OASIS and UN/CEFACT and the potential duplication of deliverables”. [TBG05].

4.9 Other EPC related organisations

This section gives a short overview of some organisations that deal with EPC related standards, but with a limited impact on mainstream standards.

4.9.1 RosettaNet

RosettaNet is a subsidiary of the Uniform Code Council, Inc. (UCC) and is a non-profit consortium of more than 500 organizations working to create, implement and promote open e-business standards and services. It comprises world-leading Electronic Components, Computer and Consumer Electronics, Logistics, Semiconductor Manufacturing, Solution Provider and Telecommunications companies.

RosettaNet drives collaborative development and rapid deployment of e-business standards and services, creating a common language and open processes that provide measurable benefits that are vital to the evolution of the global trading network.

RosettaNet standards and services are nonproprietary and freely available to the public on the RosettaNet Web site, RosettaNet standards encompass data dictionaries, implementation framework, and XML-based business message schemas and process specifications. RosettaNet services, including Standards Delivery, Partner Discovery and more, are available to the public and incrementally to members to help accelerate the velocity and limit the cost of standards implementation (from web site at www.rosettanet.org).

It is not clear what position this organization has for general trade as it is concentrating more on high tech manufacturers' need than the transport sector's needs. It is included here for completeness. It has links to EDIFICE (see below).

4.9.2 EDIFICE

EDIFICE provides a forum for companies with interests in Computing, Electronics, and Telecommunication, which as a group, drives and enables global standardised B2B adoption in Europe. EDIFICE is a non-profit organisation, organised in the form of an association in Switzerland.

The organization has probably relatively little impact on general trade, but is included for completeness.

4.9.3 EanCom and GS1

GS1 has 101 Member Organisations representing 103 countries. It started in 1974, when manufacturers and distributors of 12 European countries formed an ad-hoc council. Its brief was to examine the possibility of developing a uniform and standard numbering system for Europe, similar to the UPC system already in operation in the USA. As a result, a UPC compatible system called "European Article Numbering" (EAN) was created.

The actual EAN association was formed in February 1977. The new body was set up as a not-for-profit international association under Belgian law with a Brussels based Head Office. Its aim was and still is the development of a set of standards enabling the efficient management of global, multi-industry supply chains by uniquely identifying products, shipping units, assets, locations and services. It facilitates electronic commerce processes including full tracking and traceability.

EANCOM® is a detailed implementation guideline of the UN/EDIFACT standard messages. UN/EDIFACT messages are often complex and users may easily misunderstand the principles and original intentions of messages' designers. EANCOM® guideline is a subset of UN/EDIFACT messages, it provides clear definitions, explanations and examples which allow trading partners to exchange commercial documents in a simple, accurate and cost effective manner (from web site at www.gs1.org).

Again, this organisation has limited impact on general transport related standards.

4.9.4 Marine e-business standards association (EMSA)

EMSA was formed in 1994 by a consortium of shipyards, classification societies, model basins and software companies, with the aim of producing electronic data exchange standards which would enhance their business efficiency and produce economic benefits. EMSA contributes to standards within the shipping community with emphasis on STEP and XML languages (from www.emsa.org).

The organisation seems to concentrate on issues related to ship building and does probably not have any significant impact on ship shore communication.

4.9.5 AMMITEC

AMMITEC is the non-profit Association of Maritime Managers of Information Technology and Communications. It is a global forum where ICT Managers of shipping companies and other ICT Professionals involved in the shipping sector meet to exchange experiences and ideas. The main goal of AMMITEC is to promote the efficient usage of modern ICT in the whole maritime sector (see <http://www.ammitec.org>). AMMITEC publishes some standards on XML based e-procurement.

4.9.6 MECA and MTML

Founded in December 1999 MeCA has developed its own XML based standard, called MTML (Marine Trading Mark-up Language). It has widespread support through out the maritime buyer and supplier community as well as with marine supply chain software providers. The latest version is MTML Version 2.0. This support includes close relationships with IMPA (International Marine Purchasing Association) and ISSA (International Ship Suppliers Association), both of whom are represented as Directors on the MeCA Board (<http://www.meca.org.uk/>). Not very relevant for EPC, but mentioned for completeness.

4.10 Other communication related organisations

The following brief overview lists some organisations that are important in the maritime standardisation area, but which have limited or no impact on EPC. However, for certain messages or data formats, these organisations may provide definitions.

4.10.1 International Electrotechnical Commission – IEC

Founded in 1906, the International Electro technical Commission (IEC) is the world organisation that prepares and publishes international standards for electrical, electronic and related technologies. The IEC has its headquarters in Geneva and the Technical Committee dealing with Maritime navigation and radio communication equipment and systems, TC80, prepares the Type Approval Test Specifications for ships mandatory equipment required under SOLAS (see <http://www.iec.ch>).

IEC is mainly dealing with equipment, cables and systems and not normally with general communication. Thus, IEC has a minor role in the area of EPC. However, it may in some cases be relevant to refer to standards from IEC TC80 that deals with radio communication and navigation. In particular, WG6 develops standards associated with digital communication between bridge equipment. This includes standard formats for some navigation related information.

4.10.2 ITU

The International Telecommunications Union (ITU) has its headquarters in Geneva and is a specialised agency of the United Nations within which governments and the Private Sector co-ordinate global telecommunication networks and services.

The ITU is the leading publisher of communication technology, regulatory and standard information in the form of ITU Recommendations, to guarantee the interoperability of communication systems. It concerns both Telecommunications (ITU-T) and Radio communications (ITU-R) (see <http://www.itu.int>).

4.10.3 IALA

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) has its headquarters in Paris. IALA is a non-profit making international technical association. Established in 1957, it gathers together marine aids to navigation authorities, manufacturers and consultants from all parts of the world and offers them the opportunity to compare their experiences and achievements. A number of technical committees have been established facilitating the design and implementation of buoyage systems, radio navigation services and traffic management services (see <http://www.iala-aism.org>).

4.10.4 IHO

The International Hydrographic Organisation (IHO) is an intergovernmental consultative and technical organisation that was established in 1921 to support the safety in navigation and the protection of the marine environment. The object of the Organisation is to bring about:

- The co-ordination of the activities of national hydrographic offices;
- The greatest possible uniformity in nautical charts and documents;
- The adoption of reliable and efficient methods of carrying out and exploiting hydrographic surveys;
- The development of the sciences in the field of hydrography and the techniques employed in descriptive oceanography.

More information on <http://www.iho.shom.fr>.

4.10.5 CEN, CENELEC and ETSI

Many international organisations have their European member organisations. However, for most purposes, shipping has to be considered international and regional organisations has a very small or non-existent role to play in standardisation.

The below table lists the most interesting organisations and their web resource addresses. Note however that in most European cases, other than real international activities, the European organisations would be the proper instrument for establishment of standards

Table 7 – European Standards Organisations

International	Europe	WWW
ISO	CEN	www.cenorm.be
IEC	CENELEC	www.cenelec.org
ITU	ETSI	www.etsi.org

Note that most nations also have their respective counterparts to these organisations. In USA ANSI and ASTM is both liaised to ISO and IEC, although not in a one to one fashion.

4.10.6 CIRM

Eight (8) companies engaged in the application of radio to the maritime service originally founded the Comité International Radio-Maritime (CIRM) in Spain in 1928. It was reconstituted in Belgium in 1947 and subsequently moved to London. It is now the principal international association for companies engaged in maritime electronics. CIRM is one of the nine original international bodies accredited in 1949 as a non-governmental organisation in consultative status to the International Maritime Organisation (IMO). It enjoys mutual observer status with International Electrotechnical Commission (IEC) and International Telecommunication Union (ITU), and all the other relevant international organisations (see <http://www.cirm.org>).

4.10.7 RTCM

The Radio Technical Commission for Maritime Services (RTCM) is chartered in the District of Columbia, USA, as a non-profit scientific and educational organisation, focusing on all aspects of maritime radio communications, radio navigation, and related technologies. Since its establishment in 1946, the RTCM has been supported by its member organisations to serve as a focal point to collect and distribute information, and to serve as a catalyst to bring together those in government and in the private sector to work together in developing jointly agreed solutions to both national and international maritime radio communications and radio navigation issues. RTCM government and non-government member organisations are from countries around the globe including Australia, Austria, Canada, Denmark, France, Italy, Japan, Norway, Russia, The United Kingdom, The United States of America, and Venezuela. See <http://www.rtc.org> for more information.

4.10.8 NMEA

The National Marine Electronics Association (NMEA) was founded in 1957 by a group of mainly US maritime electronics companies to discuss how to strengthen relationships with electronic manufacturers. After the incorporation of NMEA in 1969, the association began to lay plans for the production of an association newsletter. NMEA created the only uniform interface standard for digital data exchange between different marine electronic products back in the early eighties.

Note that NMEA is closely aligned with IEC TC80/WG6 with respect to digital communication between bridge systems. IEC 61162-1 and -2 is more or less identical to NMEA 0183© and NMEA 2000© is being worked on to become IEC 61162-3.

More information can be found at <http://www.nmea.org>.

4.11 European Research Projects

4.11.1 Intermodal Portal – IP

This project developed XML variants for several EDIFACT messages. “Intermodal Portal (IP), which started in January 2000, was planned to end in December 2001, and which had the aim of improving the flow of information between vessels, harbours/terminals and the transfer to land transport. The XML messages were developed in cooperation with the PHAROS project (5.1.3).

After 2001, little seems to have happened in the project and it is not clear what long range effects the project have had.

4.11.2 MANATEE - MSML

The MANATEE project developed among other things the “Maritime Safety Markup Language” MSML. MSML has later been accepted as a public available specification by ISO TC8 (4.5.1).

The MSML is a good piece of work, but has never been implemented. Thus, it must compete with other standards for a place in EPC applications. More information about MANATEE can be found at <http://www.manatee.cc/>.

4.11.3 Virtuele Haven

This Dutch project has provided an overview of various electronic port clearance initiatives in Europe and elsewhere. The report is a bit out of date, but still contains useful information [NLVH].

4.11.4 TransportXML and ETC

Norstella in Norway, together with the short sea shipping network has developed XML messages for management of transport operations. The short sea shipping network has also just completed a project on “Electronic Trade Corridors” (ETC) where use of electronic clearance is an issue. Information about both results can be found at <http://www.shortseashipping.no/DB/Documents.aspx>.

5 Transition from EDIFACT to XML

It is no doubt that the only de facto international standard for electronic document interchange is EDIFACT. However, as has been pointed out also by UN/CEFACT themselves, there is a need to consider the use of new technology in this area, particularly XML-based technology. The work with ebXML was obviously one effect of this.

There are many arguments both in favour and against doing this transition. The most important argument against is the established status of EDIFACT and the investment that already has been put into it, plus the present overhead that is created through the use of XML solutions which especially for expensive networks is something to be considered. The most reasonable arguments in favour is the benefit of using a mainstream technology with extensive and relatively cheap tools support rather than having to rely on expensive and proprietary solutions for implementing EDIFACT systems. This argument is particularly important for developing countries and for smaller companies.

It is a fact that although EDIFACT is the de facto standard, it has not been very widely deployed.

Regardless, this chapter will briefly look at some initiatives to speed up this transition.

5.1 Direct mapping of syntax

5.1.1 ISO/TS 20625

ISO/TS 20625 has been produced by ISO TC 154 to produce XML schemas from EDIFACT specifications. It seems to be a relatively mechanical translation that does not bring much beyond XML support.

Thus, it may be similar to UBL, but possibly with less functionality.

5.1.2 Perl EDIFACT to XML

A public domain project has provided a script system (based on the Perl language) that will translate EDIFACT messages to and from XML using a special interpretation of the EDIFACT definition files. It is not clear what the quality of the result is, but it is claimed that the system will handle the translation fairly well (<http://www.xml-edifact.org/>). The project seems to be discontinued around 2002.

5.1.3 PHAROS

The Swedish Transporters EDI Association has published EDIFACT Message Implementation Guides (MIGs) since 1990 under the name of Pharos. They cover relevant scenarios within Transport and Logistics, like booking, instructions, track and trace, and freight invoice.

During 1999 – 2000 a new project, called Pharos Internet, has been carried out with a major task to find the best way to migrate the Pharos messages from EDIFACT syntax to XML format. The result is a recommendation of a transformation method in three steps, including use of the Unified Modelling language, UML.

The [PHAROS] report describes the Pharos Transformation Method. It is one part of the final report from Pharos-Internet. Another part deals with methods for secure physical communication when using the open Internet for EDI.

5.2 New specification basis

5.2.1 UNeDocs

This was discussed in 4.3.7. The initiative is a general approach to the issue of providing electronic documents in XML (and other formats) and does not directly address conversion of EDIFACT messages. However, it is closely aligned with other UN/ECE standards and mapping to and from EDIFACT should be relatively simple.

5.2.2 UBL

OASIS Universal Business Language provides a way to construct XML messages based on standard terms. It also provides schemas and style sheets for a number of electronic documents.

UBL is farther removed from UN/ECE standards than UNeDocs and may be more difficult to map to and from EDIFACT. Neither does it have the formal relationship to the UN/ECE system that lends some official standing to the UNeDocs.

6 Electronic port clearance

This section lists some initiatives that have used or demonstrated the use of electronic port clearance. In addition, one should also consider various specifications that have never been used, e.g., MSML.

Note that this is only a selection as most larger ports have some form of electronic port clearance system, including various forms of port community systems and cargo community systems. Emphasis has been put on systems that have started to deploy XML-based solutions.

6.1 European River Information Systems and BICS

BICS or “Binnenvaart Informatie & Communicatie Systeem” (inland shipping information and communication system) was developed in 1996 by the Zeeland Directorate of Rijkswaterstaat (the Dutch ministry of public works). It is used to transmit data about transported cargoes and voyages of ships easily and rapidly by PC and GSM mobile telephone from the ship or the quay to the various inland waterway authorities (in the Netherlands these are Rijkswaterstaat and a number of provinces) and port authorities. These bodies need adequate information to ensure prompt and safe handling of inland shipping. Moreover, in emergency situations they must also be able to determine immediately whether, and if so what, dangerous cargo may be involved, such that prompt action can be taken to protect people and the environment. (see www.bics.nl).

BICS uses both EDIFACT (for dangerous goods notifications and arrival notifications) and XML (for water level information and same applications as for EDIFACT). BICS has thus defined one possible mapping of EDIFACT messages IFTDGN and APERAK to XML.

Whereas BICS is adapted for use in inland waterways and is not directly applicable to international EPC functions, it seems to be a fairly widely used system and may serve at least in part as an example of an EPC system.

In addition to BICS, inland waterways in Europe have had several projects where electronic port clearance has been investigated.

Known examples are:

- COMPRIS. Although COMPRIS did not develop XML messages as such, it has provided information on information management and other issues of interest. (see <http://www.euro-compris.org/index2.asp>).
- The ERI working group which has been appointed by the CCNR and the Danube commission maintains the XML specifications of the XML messages use in the area of River Information services as established by the RIS directive
- United Nations Economic Commission for Europe (UNECE) has a working group on information systems for inland waterways. Part of this is a system for notices to skippers based on XML message [UNE-RIS].
- In 2004 the so-called RIS Directive 9912/04 TRANS 212 CODEC 775 on harmonised river traffic information services has been accepted and herein is a clear link towards standards and the maintenance thereof for cross border, electronic charts, notices to mariners (Skippers) and tracking and tracing of vessels.

6.2 Port of Amsterdam - PortNet

The Port Authority in the Port of Amsterdam have in 2000 started with the project PortNet. This is a public private initiative to enhance the application of ICT. In 2001 this initiative led to discussions with Customs, the department of Transport of the Netherlands, Port Authorities Immigration authorities and a number of carriers and agents. These discussions led to the Electronic Port Clearance pilot project which started in 2003 in close co-operation with the already existing BICS (Barge information and communication services). After the successful trials, the EPC became operational and in 2004 the software became available for all companies needing to deal with the import of goods.

As a result of a number of customs offices being closed, it is strongly recommended to electronically declare goods and cargo. This has further reduced the number and there is now almost no customs offices available to deal with manual procedures. The various documents that can be exchanged electronically are based on the IMO FAL forms, and for the information requirements the IMO FAL Compendium has been used to ensure compatibility with other initiatives.

The software to deal with this reporting was made available to all agents and carriers that showed interest.

In accordance with the EU directive 2002-6-EC the following documents are supported by the Amsterdam EPC initiative:

- FAL 1 using the BERMAN or an XML equivalent thereof as this message also contains operational information dealing with ISPS
- FAL 2 Using the ICS manifest (CUSCAR)
- FAL 3 Ships stores using the INVRPT message or XML equivalent
- FAL 5 and 6 crew and passenger lists (PAXLST) also dealing with stowaway information..
- FAL 7 Dangerous goods information using the IFTDGN or XML equivalent

The submitted information remains available to those parties which have a legal right to that information and the data has been protected and made secure in such a way that only the owner of the information can change, add to or delete this information.

In the meantime a web interface has been created making it possible for small and medium sized companies to execute the afore mentioned functions on line.

The present PortNet functions will be extended in the coming period with the possibility of electronic invoices for harbour dues and other port costs.

6.3 SafeSeaNet

SafeSeaNet (SSN) is obviously the first example here, although the system is not used for direct ship to port clearance. Rather, the system is used as an information network between authorities. However, all messages are exchanged as XML messages and the system could in principle be extended to also operate from ship to shore. Information on SSN can be got from EMSA (www.emsa.eu.int).

6.4 FRS – Sweden Fartygsrapporteringsystemet

The Swedish FRS system (Ship reporting system) is planned to be operational early 2005 and is planned to have an XML based interface. In the planned version it handles reports for:

- Port visit (according to directive no 2002/59/EC of the European Parliament and the Council)
- Dangerous Goods declaration (according to directive no 2002/59/EC of the European Parliament and the Council)
- Waste report (according to directive no 2000/59/EC of the European Parliament and the Council).
- Alert report

It is not clear what the basis for the message definitions are, but they are to some extent similar to EDIFACT messages [SEFRS].

6.5 USA Electronic Notice of Arrival and Departure – eNOA/D

All ships entering US waters after June 2005 must complete an electronic entry form and deliver this to the National Vessel Movement Centre (NVMC). This form is more or less a complete ship clearance message, delivered either interactively through a web interface or as an XML message in B2B fashion.

The USCG has developed an XML file and a corresponding schema. They also provide Microsoft Infopath® software for a B2B solution (see www.nvmc.uscg.gov).

6.6 Port of Hong Kong

Port of Hong Kong accepts a long range of reports to be submitted in electronic XML format. Information and files can be got from their web site at http://ebs.mardep.gov.hk/pub/en/index_frame.html.

6.7 China XML Port Manifest Project

The China XML Port Manifest project has development of a draft standard for the Port Manifest message based on both UN/EDIFACT IFCSUM message as well as the Chinese Ministry of Communication (MOC) standard. It has also developed a prototype XML gateway: The prototype consists of two main components: a) a Web application which enables users to enter port manifest details which is then transmitted over the Internet using

the SOAP (Simple Object Access Protocol) and b) the XML engine which accepts this message and translates it into either the MOC format or UN/EDIFACT format. [CHEPC]. The final report was written in 2004. The project was funded by Australia through an APEC (Asia-Pacific Economic Cooperation) support project. The system has been deployed in the port of Tianjin, but it is not clear if it has been tested with real ships.

6.8 EPC2 – Norway and Singapore

The EPC2 project was a joint initiative between Singapore and Norway. It has developed an XML message standard for electronic port clearance, with a certain emphasis on ship certificates. The message structure is based on the ISO 15926 standard [EPC2].

The EPC2 project is running a pilot project in Singapore with a few ships using the EPC2 system in parallel to the normal clearance routines. The EPC2 messages have also been used internally by Norwegian maritime administrations.

6.9 PortNet in Finland

The PortNet is a national information network serving the different parties of maritime cargo transport. The kernel of the system consists of the data submitted to the Finnish Maritime Administration, Finnish Customs and port authorities and the information services provided by them. In addition to these authorities the PortNet community also includes private companies. Information to and from the system can be transferred directly via the Internet or in the form of XML and EDI messages [PNFI].

6.10 Port of Valparaiso

The Chilean Customs Authority has implemented a new system called ISIDORA to enable the management of customs process over the Internet. The features of the system include:

- Electronic documents, signatures and payments
- Simplified operations and transactions
- More selective inspections

Using the new system, carriers/agents send electronic manifests to the customs authorities who then pass a copy on to Port of Valparaiso (Empresa Portuaria Valparaiso, EPV). The system uses XML-formatted messages to exchange messages. Once this is fully implemented, the requirement for carrier/agents to provide 3 copies of paper declaration to the port authority and also to customs will be eliminated [APECstudy].

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8 Annexes

8.1 Annex A – List of certificates from [D1999/97]

1. International Tonnage Certificate (1969)
2. Safety certificates, one or more as listed below
 - Passenger Ship Safety Certificate,
 - Cargo Ship Safety Construction Certificate,
 - Cargo Ship Safety Equipment Certificate,
 - Cargo Ship Safety Radiotelegraphy Certificate,
 - Cargo Ship Safety Radiotelephony Certificate;
 - Cargo Ship Safety Radio Certificate,
 - Exemption Certificate,
 - Cargo Ship Safety Certificate.
2. International Certificate of Fitness for Carriage of Liquefied Gases in Bulk;
3. International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk;
4. International Oil Pollution Prevention Certificate.
5. International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk.
6. International Load Line Certificate (1966) or International Load Line Exemption Certificate.
7. Oil record book, parts I and II.
8. Cargo record book.
9. Minimum Safe Manning Document, Certificates of Competency.
10. Medical certificates, (see ILO Convention No 73 concerning Medical Examination of Seafarers).
11. Stability information.
12. Copy of the Document of Compliance and the Safety Management Certificate issued, in accordance with the International Management Code for the Safe Operation of Ships and for Pollution Prevention (SOLAS, Chapter IX).
13. Certificates as to the ship's hull strength and machinery installations issued by the classification society in question (only to be required if the ship maintains its class with a classification society).
14. Document of compliance with the special requirements for ships carrying dangerous goods.
15. High speed craft safety certificate and permit to operate high speed craft.

16. Dangerous goods special list or manifest, or detailed stowage plan.
17. Ship's log book with respect to the records of tests and drills and the log for records of inspection and maintenance of lifesaving appliances and arrangements.
18. Special purpose ship safety certificate.
19. Mobile offshore drilling unit safety certificate.
20. For oil tankers, the record of oil discharge monitoring and control system for the last ballast voyage.
21. The muster list, fire control plan, and for passenger ships, a damage control plan.
22. Shipboard oil pollution emergency plan.
23. Survey report files (in case of bulk carriers and oil tankers).
24. Reports of previous port State control inspections.
25. For RORO passenger ships, information on the A/A-maximum ratio.
26. Document of authorization for the carriage of grain.
27. Cargo securing manual.
28. Garbage management plan and garbage record book.
29. Decision support system for masters of passenger ships.
30. SAR cooperation plan for passenger ships trading on fixed routes.
31. List of operational limitations for passenger ships.
32. Bulk carrier booklet.
33. Loading and unloading plan for bulk carriers.

8.2 Annex B – List of EDIFACT Messages

The below table lists EDIFACT message names and a short description. Most of these messages are not used in maritime trade, but the full list is included for reference. It should be realised that for the application of the messages always so called implementation guidelines are required to indicate exactly which codes should be used and which information is mandatory and which information is optional.

Table 8 – Overview of EDIFACT messages

Name	Description
APERAK	Application error and acknowledgement message
AUTHOR	Authorization message
BALANC	Balance message
BANSTA	Banking status message
BAPLIE	Bayplan/stowage plan occupied and empty locations message
BERMAN	Berth management message
BMISRM	Bulk marine inspection summary report message
BOPBNK	Bank transactions and portfolio transactions report message
BOPCUS	Balance of payment customer transaction report message
BOPDIR	Direct balance of payment declaration message
BOPINF	Balance of payment information from customer message
BUSCRD	Business credit report message
CALINF	Vessel call information message
CASINT	Request for legal administration action in civil proceedings message
CASRES	Legal administration response in civil proceedings message
CHACCO	Chart of accounts message
CLASET	Classification information set message
CNTCND	Contractual conditions message
COACSU	Commercial account summary message
COARRI	Container discharge/loading report message
CODECO	Container gate-in/gate-out report message
CODENO	Permit expiration/clearance ready notice message
COEDOR	Transport equipment stock and profile report message
COHAOR	Container special handling order message
COLREQ	Request for a documentary collection message
COMDIS	Commercial dispute message
CONAPW	Advice on pending works message
CONDPV	Direct payment valuation message
CONDRA	Drawing administration message
CONDRO	Drawing organisation message
CONEST	Establishment of contract message
CONITT	Invitation to tender message
CONPVA	Payment valuation message
CONQVA	Quantity valuation message
CONRPW	Response of pending works message
CONTEN	Tender message
CONWQD	Work item quantity determination message
COPARN	Container announcement message
COPAYM	Contributions for payment
COPINO	Container pre-notification message
COPRAR	Container discharge/loading order message
COREOR	Container release order message

COSTCO	Container stuffing/stripping confirmation message
COSTOR	Container stuffing/stripping order message
CREADV	Credit advice message
CREEXT	Extended credit advice message
CREMUL	Multiple credit advice message
CUSCAR	Customs cargo report message
CUSDEC	Customs declaration message
CUSEXP	Customs express consignment declaration message
CUSPED	Periodic customs declaration message
CUSREP	Customs conveyance report message
CUSRES	Customs response message
DEBADV	Debit advice message
DEBMUL	Multiple debit advice message
DEBREC	Debts recovery message
DELFOR	Delivery schedule message
DELJIT	Delivery just in time message
DESADV	Despatch advice message
DESTIM	Equipment damage and repair estimate message
DGRECA	Dangerous goods recapitulation message
DIRDEB	Direct debit message
DIRDEF	Directory definition message
DMRDEF	Data maintenance request definition message
DMSTAT	Data maintenance status report/query message
DOCADV	Documentary credit advice message
DOCAMA	Advice of an amendment of a documentary credit message
DOCAMI	Documentary credit amendment information message
DOCAMR	Request for an amendment of a documentary credit message
DOCAPP	Documentary credit application message
DOCARE	Response to an amendment of a documentary credit message
DOCINF	Documentary credit issuance information message
ENTREC	Accounting entries message
FINCAN	Financial cancellation message
FINPAY	Multiple interbank funds transfer message
FINSTA	Financial statement of an account message
GENRAL	General purpose message
GESMES	Generic statistical message
HANMOV	Cargo/goods handling and movement message
ICASRP	Insurance claim assessment and reporting message
ICSOLI	Insurance claim solicitor's instruction message
IFCSUM	Forwarding and consolidation summary message
IFTCCA	Forwarding and transport shipment charge calculation message
IFTDGN	Dangerous goods notification message
IFTFCC	International transport freight costs and other charges message
IFTICL	Cargo insurance claims message
IFTMAN	Arrival notice message
IFTMBC	Booking confirmation message
IFTMBF	Firm booking message
IFTMBP	Provisional booking message
IFTMCA	Consignment advice message
IFTMCS	Instruction contract status message
IFTMIN	Instruction message
IFTRIN	Forwarding and transport rate information message

IFTSAI	Forwarding and transport schedule and availability information message
IFTSTA	International multimodal status report message
IFTSTQ	International multimodal status request message
IMPDEF	EDI implementation guide definition message
INFCON	Infrastructure condition message
INFENT	Enterprise accounting information message
INSDDES	Instruction to despatch message
INSPRE	Insurance premium message
INSREQ	Inspection request message
INSRPT	Inspection report message
INVOIC	Invoice message
INVRPT	Inventory report message
IPPOAD	Insurance policy administration message
IPPOMO	Motor insurance policy message
ISENDS	Intermediary system enablement or disablement message
ITRRPT	In transit report detail message
JAPRES	Job application result message
JINFDE	Job information demand message
JOBAPP	Job application proposal message
JOBCON	Job order confirmation message
JOBMOD	Job order modification message
JBOFF	Job order message
JUPREQ	Justified payment request message
LEDGER	Ledger message
LREACT	Life reinsurance activity message
LRECLM	Life reinsurance claims message
MEDPID	Person identification message
MEDPRE	Medical prescription message
MEDREQ	Medical service request message
MEDRPT	Medical service report message
MEDRUC	Medical resource usage and cost message
MEQPOS	Means of transport and equipment position message
MOVINS	Stowage instruction message
MSCONS	Metered services consumption report message
ORDCHG	Purchase order change request message
ORDERS	Purchase order message
ORDRSP	Purchase order response message
OSTENQ	Order status enquiry message
OSTRPT	Order status report message
PARTIN	Party information message
PAXLST	Passenger list message
PAYDUC	Payroll deductions advice message
PAYEXT	Extended payment order message
PAYMUL	Multiple payment order message
PAYORD	Payment order message
PRICAT	Price/sales catalogue message
PRIHIS	Pricing history message
PROCST	Project cost reporting message
PRODAT	Product data message
PRODEX	Product exchange reconciliation message
PROINQ	Product inquiry message
PROSRV	Product service message

PROTAP	Project tasks planning message
PRPAID	Insurance premium payment message
QUALITY	Quality data message
QUOTES	Quote message
RDRMES	Raw data reporting message
REBORD	Reinsurance bordereau message
RECADV	Receiving advice message
RECALC	Reinsurance calculation message
RECECO	Credit risk cover message
RECLAM	Reinsurance claims message
RECORD	Reinsurance core data message
REGENT	Registration of enterprise message
RELIST	Reinsured objects list message
REMADV	Remittance advice message
REPREM	Reinsurance premium message
REQDOC	Request for document message
REQOTE	Request for quote message
RESETT	Reinsurance settlement message
RESMSG	Reservation message
RETACC	Reinsurance technical account message
RETANN	Announcement for returns message
RETINS	Instruction for returns message
RPCALL	Repair call message
SAFHAZ	Safety and hazard data message
SANCRT	International movement of goods governmental regulatory message
SLSFCT	Sales forecast message
SLSRPT	Sales data report message
SOCADE	Social administration message
SSIMOD	Modification of identity details message
SSRECH	Worker's insurance history message
SSREGW	Notification of registration of a worker message
STATAC	Statement of account message
STLRPT	Settlement transaction reporting message
SUPCOT	Superannuation contributions advice message
SUPMAN	Superannuation maintenance message
SUPRES	Supplier response message
TANSTA	Tank status report message
TAXCON	Tax control message
TPFREP	Terminal performance message
UTILMD	Utilities master data message
UTILTS	Utilities time series message
VATDEC	Value added tax message
VESDEP	Vessel departure message
WASDIS	Waste disposal information message
WKGRDC	Work grant decision message
WKGRRE	Work grant request message