**INTERNATIONAL
MARITIME
ORGANIZATION**

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GUIDELINES FOR SETTING UP A SINGLE WINDOW SYSTEM
IN MARITIME TRANSPORT

1   The Facilitation Committee, at its thirty-seventh session (5 to 9 September 2011), approved the attached guidelines for setting up a single window system in maritime transport.

2   Member Governments are invited to bring the guidelines to the attention of all parties concerned.

3   Member Governments, international organizations and non-governmental organizations with consultative status are also invited to bring to the attention of the Committee, at the earliest opportunity, the results of the experience gained from the use of the guidelines for consideration of action to be taken.

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ANNEX

**GUIDELINES FOR SETTING UP
A SINGLE WINDOW SYSTEM IN MARITIME TRANSPORT**

1. Introduction

There is a strong international consensus that there is a need to set up a "single window" system in maritime transport, taking into account and building upon existing standards.

There is a substantial amount of literature available on the single window concept, but this is mostly concerned with trade- and cargo-related issues. The issue of clearance of the ship as a means of transport is less extensively covered. Thus, these guidelines attempt to provide more specific guidance on maritime transport clearance, including the clearance of the ship. This does not necessarily mean that one needs to define different single windows for transport and trade. Ideally, one single window should cater for both.

Definitions of specific terms can be found in section 3. An important background to these guidelines is the discussion on the different types of single windows and how these relate to trade and transport. This leads up to the actual guidelines in section 5, which makes references to other sections and general background material. Some references to documented and practical experiences are discussed in section 9 and an overview of applicable standards can be found in section 10. The guidelines make extensive use of external references in the form of an abbreviation enclosed in square brackets. The corresponding reference can be found in section 10. A list of other external resources can be found in section 11.3.

2. Scope

Though recommendations and guidelines have been developed by the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), the World Customs Organization (WCO) and other organizations, they only provide basic definitions, models, data harmonization or roadmaps towards implementation of single window systems. Implementers may face many difficulties in developing single window systems because there are no guidelines covering the overall development life cycle, including business process analysis, requirements collection, system design and development. The goal of this document is to develop single window guidelines and framework that does cover the entire life cycle. It is believed that the resulting system will provide for (1) simplified electronic means of clearance of ships in maritime transport, (2) standardization of logistics activities, interface and information in overall maritime transport, and (3) improved maritime logistics efficiency and strengthened maritime logistics competitiveness of IMO Member States. These guidelines are built upon general single window concepts and characteristics which have been expanded to integrate the requirements of maritime transport.

A single window does not necessarily imply implementation and use of high-tech information and communication technology (ICT), although facilitation can often be greatly enhanced if Governments identify and adopt relevant technologies for a single window.

2.1 Maritime transport

These guidelines focus on the development of single window solutions for maritime transport. However, transport is only one component of trade facilitation (see section 4.1) and maritime transport is only one of several other transport modes.

2.2 Electronic messaging

Electronic exchange of information is obviously the most efficient way to perform the necessary clearance of ships before loading or discharging cargo. Thus, these guidelines cover implementation of an electronic facility for clearance of ships and/or cargo. However, the definition of a single window does not preclude the use of paper documents, where appropriate. The Convention on Facilitation of International Maritime Traffic (FAL Convention) still requires authorities to accept paper forms when presented.

2.3 No standards defined

These guidelines do not define any particular standard for implementing a single window. They point to different internationally recognized standards that are available and that can be utilized as appropriate.

3. Definitions

The definitions in this section are for use in these guidelines and will not necessarily be fully accurate in a more general trade or transport setting. They are based on commonly used terms, but do not necessarily cover all details of the terms in all circumstances.

3.1 Bill of lading

A bill of lading is similar to a waybill (see below) and the two terms are sometimes used for the same document. However, a bill of lading is normally more formal and is often negotiable, which gives the person with ownership of the bill of lading the right of ownership of the goods and the right to re-route the shipment.

3.2 Carrier

The party undertaking the physical transport of a consignment, as part of a larger supply chain.

3.3 Clearance

The process of getting the necessary permits (written, electronic or informal) to allow a certain process to be performed. In the scope of these guidelines, the following clearances are relevant:

- Clearance for a ship to enter or leave national waters.
- Clearance for a ship to berth. This will normally include clearance for the cargo or passengers to proceed to import/immigration control.
- Clearance for the ship to load or offload.
- Clearance for the ship to leave berth.
- Clearance for cargo to be imported or exported.

Other forms of clearance may also be relevant, e.g. clearance to enter ship reporting areas, port fairways, channels, locks or other restricted traffic areas. However, this is normally part of traffic management.

3.4 Consignee

The party, as defined in the transport document, by whom the consignment is to be received and accepted. The consignee is normally responsible for import procedures such as paying customs duties and is a party in the discharging procedures subject to terms and conditions.

3.5 Consignor/Freight Shipper

The party that is the sender and/or formal owner of the consignment. The consignor is generally liable for the freight or the hire for the carriage of consignment.

3.6 Consignment

A collection of goods or merchandise that has a consignor and consignee. Ownership of the merchandise shipped on consignment rests with the consignor or freight shipper until the goods are disposed of as agreed.

3.7 Electronic Data Interchange (EDI)

The abbreviation "EDI" is used to refer to any type of electronic data interchange. The interchange can take place with XML-formatted data, UN/EDIFACT-formatted data or any other formatted text files, e.g. as comma-separated fields.

3.8 Electronic Port Clearance (EPC)

The abbreviation "EPC" is used to refer to a single window solution for the electronic clearance of ships arriving at or departing from a port. EPC does not normally include cargo clearance for import or export.

3.9 Electronic signature

Data in electronic format which are attached to or are logically associated with other electronic data and which serve as a method of authentication that meets the following requirements:

(a)   It is uniquely linked to the signatory;

(b)   It can identify the signatory;

(c)   It is created using means that the signatory can maintain under his/her sole control; and

(d)   It is linked to the data to which it relates in such a manner that any subsequent change of the data is detectable.

3.10 FAL forms

The FAL forms are a number of paper forms defined in the FAL Convention that define reporting requirements for ships visiting foreign ports.

3.11   Freight Forwarder

The party arranging the carriage of goods including related services and/or associated formalities on behalf of a freight shipper or consignee. The freight forwarder is often contracted by the principal, the consignor or the consignee, depending on which terms of contract apply in the business relation between them.

3.12   Manifest

A specification of all cargo transported on a means of transport (ship). This can be viewed as an aggregate of all waybills. However, the purpose is for management of the transport operation.

3.13   National Single Window (NSW)

The term "national single window" (NSW) is used in two different contexts:

- As the only single window solution nationally. This implies that all single window operations are performed through one NSW.

- As a portal between international data exchange systems and national trade data management systems.

These guidelines use the term single window only, except when referring to single window solutions that mix local clearance functions (e.g. for one or a few ports) and national clearance functions through one common national single window.

3.14   Port Community System (PCS)

The term "port community system" (PCS) can be defined as a computerized system that simplifies information exchanges between non-public authorities in a port. This typically includes functionality also found in single windows, such as databases, message exchanges, etc. The definitions used in other literature vary somewhat between authors and contexts, but the above definition is used in these guidelines. Exchange of information with governmental parties could also be part of the scope of a PCS.

3.15   Port Single Window (PSW)

A single window system that provides local level information about a vessel to the authorities at port level. PSW systems may be connected to a higher level NSW.

3.16   Principal

An individual or organization that entrusts the execution of a carriage order to a contracting party in return for appropriate remuneration. It is a generic term for the entity that requests carriage; for example, the consignor, consignee, freight forwarder or any third party.

3.17   Ship's agent

The party representing the ship's owner or charterer in port. In cooperation with the port, the agent is responsible for arranging a proper berth and pilots, clearing the vessel with the port and other authorities and releasing or receiving cargo on behalf of the ship's owner or charterer.

3.18 Single Window

UN/CEFACT Recommendation No. 33 defines a single window as a facility that allows parties involved in trade and transport to provide standardized information and documents through a single entry point to fulfil all import, export and transit-related regulatory requirements. If information is electronic, then individual data elements should be submitted once only.

The three basic models for the single window are:

- *A single authority* that receives information, either on paper or electronically, disseminates this information to all relevant governmental authorities and coordinates controls to prevent undue hindrance in the logistical chain.

- *A single automated system* for the collection and dissemination of information (either public or private) that integrates the electronic collection, use and dissemination (and storage) of data related to trade that crosses the border. There are various possibilities:

  (i)   Integrated system: data is processed through the system.
  (ii)   Interfaced system (decentralized): data is sent to the agency for processing.
  (iii)   A combination of (i) and (ii).

- *An 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.

WCO members prefer to use the term single window environment because single window implementations are invariably a collection of interdependent facilities, regulatory requirements and cross-border regulatory agencies' business processes. The establishment of the single window environment for border-control procedures for conveyance, transport equipment, goods and crew is considered by customs administrations as the best solution to the complex problems of border automation and information management involving multiple cross-border regulatory agencies.

3.19 UN/EDIFACT

UN/EDIFACT is the abbreviation for the United Nations Electronic Data Interchange for Administration, Commerce and Transport. It is a special format defined by UN/CEFACT and later standardized by the International Organization for Standardization (ISO) as the ISO 9735 standards.

3.20 Waybill

An agreement between consignor, carrier and consignee covering the transport of a consignment. This agreement covers the ownership and liability issues of the parties in relation to the consignment.

### 4. A high-level overview of international trade

This chapter discusses the concepts behind the single window for maritime transport and looks at its relationship to the general trade requirements which in many cases include their own single windows.

One of the major factors affecting the successful deployment of any technical system, whether single window or not, is how well it satisfies the requirements of the intended users. This implies that the designers of the single window need to know who the users are and what requirements they have.

Thus, the main message in this chapter is that trade has different dimensions, each with different parties and different responsibilities. A single window solution must define what dimensions, what parties and what responsibilities it is intended to serve and then implement technical solutions that satisfy these requirements.

4.1   Different business process groups

Trade involves a number of different business processes which interact to solve the higher level objective of movement of goods. Figure 1 attempts to illustrate some of the main business processes and parties in trade and transport. The top level, driving the whole process, is international trade. This creates the need for transportation, which in many cases is supplied by transport service providers, e.g. the forwarders. The actual transport may be performed over several legs, some of which are typically by ship. During the ship transport, there are also operational issues that need to be taken care of between the parties involved in the transport operation.
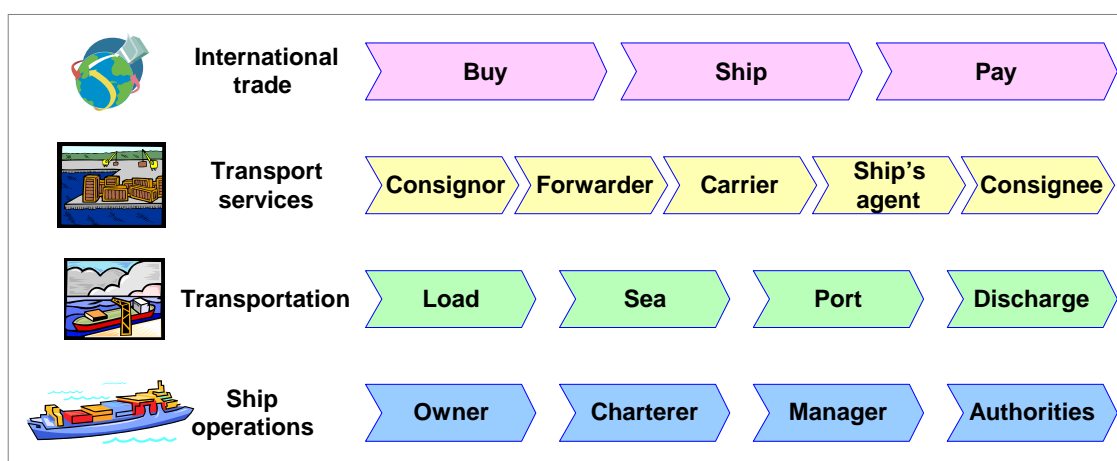
Figure 1 — Main business processes in trade and transport

Note that Figure 1 is much simplified and that the real processes are significantly more complex. Also, these four levels may be repeated several times over the freight operations and the roles and actions on each level will often be intertwined with other levels' roles and actions. This is only a high-level view of the processes.

The users' requirements on each level are driven by the business process on that level and have different focuses. On the highest level they are driven by the sale and purchase of transported goods, while on the lowest level they are driven by the need for return on investments in ship and infrastructure. Thus, single window solutions may not be able to cater for all requirements and in many cases use a combination of different single windows and more conventional party-to-party interaction will be used.

4.2   Different roles in each process

In general, one will also find that each process involves different groups of parties that have very different roles in the process. This is illustrated in Figure 2.
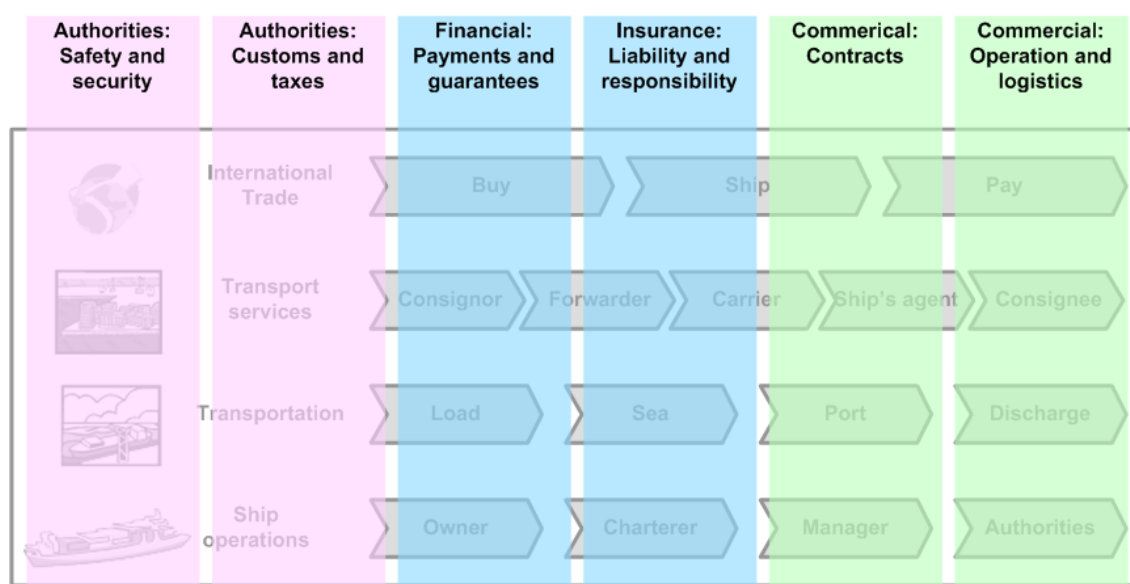
Figure 2 — Different roles in each process

The vertical boxes indicate the different party groups and their roles. From left to right, these are:

- *Authorities – Safety and security*: Various authorities are in charge of safety and security in the different operations. Duties may include stopping prohibited goods or controlling carriage of legal but dangerous materials.

- *Authorities – Customs and taxes*: Other authorities are charged with levying taxes on import and export as well as on some forms of general transport. The most common are export and import customs duties.

- *Financial – Payments and guarantees*: This covers interaction with banks and other financial institutions and in general payment for commercial services and those provided by authorities.

- *Insurance – Liability and responsibility*: This covers all aspects of responsibilities for safe delivery of cargo at scheduled times and under contractual obligations. It also covers liability insurance for accidents or spills.

- *Commercial – Contracts*: This covers interaction related to contracts, e.g. exchange of ownership proofs, status messages, etc.

- *Commercial – Operation and logistics*: This covers operations and exchanges related to planning and execution of the operations, ordering resources, sending arrival and departure notifications, etc.

The important message here is that the different groups of actors with individual responsibilities also have a significant impact on what information needs to be exchanged, when and in what format.

The point in the process at which a single window is introduced has a significant impact on the required functionality of the single window.

4.3   Transport timeline

Reporting requirements and hence the use of the single window will depend on where a ship or the cargo is on its voyage. Figure 3 below shows some of the phases that can be used as a reference for reporting.
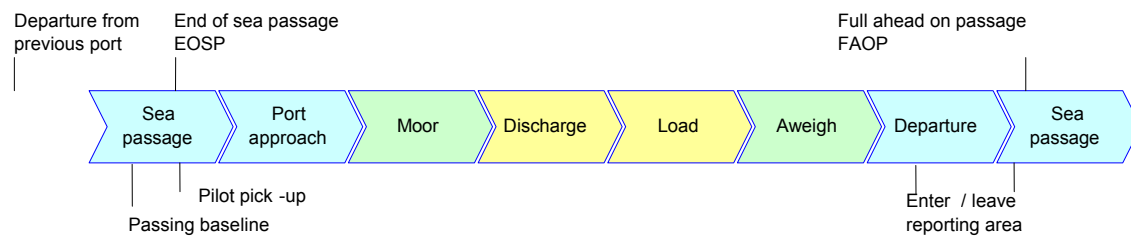
Figure 3 — Timeline in a transport process

Depending on applicable rules or commercial processes, a number of other subdivisions are in use. Some are included in Figure 3:

- Passing baseline: Where the ship enters national waters, normally with some reporting requirements to the coastguard, navy or police.
- End of sea passage (EOSP): Normally used in transport contracts, where the ship decelerates from transit speed.
- Pilot pick-up: Often at EOSP.
- Enter/leave ship reporting area/VTS area.
- Full ahead on passage (FAOP): Where transit to the next port starts.

Note also that the sea passage may contain channel or strait passages and that the port approach likewise may be subdivided into more phases.

While harmonization of reporting is in general desirable, it should be verified that the integration of reporting into a single window does actually have benefits. As an example, if a specific report does not overlap with other reporting requirements in terms of data and/or parties involved, then integration of that report into the single window system might complicate the overall processes rather than simplify them.

5.   Guidelines for implementing a single window

This section is written as short step-by-step guidelines to the implementation of a single window solution for maritime transport. Each step is relatively briefly described, but will give references to other parts of the guidelines with more information when required. Also, more detailed information can be found in the IMO FAL Compendium on Facilitation and Electronic Business (FAL Compendium).

Note that the results of each new step may invalidate certain assumptions from earlier steps, possibly requiring some backtracking.

5.1   Determine scope and stakeholders

It is necessary to determine what functions the single window will have and who the main stakeholders are. More details are given in section 6, but the main issues that need to be addressed are:

.1   The domains covered, e.g. cargo import/export or transit, ship entry into national waters and ports, national transit legs, ship reporting issues.

.2   The clearance functions implemented. This may include FAL-referenced clearance, additional national ship-related clearance, regional or international legislation, private/commercial functions, etc.

.3   The type of shipping to be supported. There is a significant difference, for example, between bulk shipping requirements and containership requirements.

.4   The geographic scope and types of ports covered. Is it a NSW or a PSW and what types of ports need to be covered?

For each group of functions, the list of stakeholders may change. The issue of stakeholder identification is part of the formal design process, as discussed in section 5.7.

5.2   Analyse relevant policy issues

Legislation and other related policy issues are perhaps the most complex factors in the establishment of a single window. Section 7 discusses this in some detail, but particular consideration should be given to some of the experiences gained in other projects (e.g. see the Single Window Repository of the United Nations Economic Commission for Europe (UNECE), as discussed in section 11.3.1).

5.3   Consider use of legacy systems and processes

The introduction of new single window systems will by necessity change some business processes. The purpose of the single window is to simplify trade and transport processes. However, the overall cost of a new system will be determined by the costs of necessary software and hardware investments as well as by the costs of changes to processes. Thus, to keep costs down, careful consideration should be given to which legacy systems, processes and information flows can be kept without unduly harming the overall objective of simplification. Some issues that can be considered are as follows:

•   Tools exist that let users interface with electronic systems without needing overly specialized software. Several common tools like Adobe Reader, Microsoft Excel and others can read and write XML files with a graphical user interface that looks, for example, like standard paper FAL forms.

•   An automated information transaction system (see section 3.19) may in some cases simplify the overall design of the complete system by allowing legacy document formats to be used.

However, in all cases the emphasis should be on the harmonization of processes and data models, as discussed in section 5.7.3. Use of legacy systems will in a sense increase reliance on formal description of the data or information items that are exchanged.

5.4 Determine requirements for information security

As the single window will be used for transactions that can have commercial as well legal importance, it needs to address the issue of information security. Security normally involves some or all of the following concepts:

- *Confidentiality*: Assurance that information is not disclosed to unauthorized individuals or systems.

- *Integrity*: Assurance that the received (or sent) information is correct and logically consistent.

- *Authentication*: Assurance that the identity of the sender (or receiver) is the one specified.

- *Authorization*: Assurance that the sender or receiver has the authority to provide or receive the information.

- *Availability: Assurance that the system is available when needed.*

- *Non-repudiation: Assurance that the sender or receiver of information cannot deny that the information was sent or received.*

- *Message transmission*: Assurance that messages through the single window are traceable and that some concept of guaranteed delivery is applied.

Sufficient emphasis needs to be put on implementing technical features that address the relevant security issues.

5.5 Determine business model

The success of the single window will also depend on to what degree the business model matches the users' expectations. Thus, the selection of a suitable business model is important. There is a wide range of variants from which to choose, but some typical models are the following:

- Fully operated and funded by public authorities. No payment for using the system.

- Funded by commercial port companies with no direct pay for usage. This may make sense as a single window can significantly simplify many port processes.

- Paid for by users as a fee per transaction. This assigns costs directly to the users of the system. This is mostly the case with port community systems operated by private companies.

The benefit of waiving usage fees is that the uptake among users may be quicker. This will in turn give faster return on investments for the shore authorities and other users. However, this model also requires the long-term funding to be in place before the system is implemented.

5.6 Select methodology and tools

Modern ICT tools may significantly help to organize and improve efficiency in a single window design process. These guidelines do not suggest any specific tools or methods, but encourage the use of whichever is most convenient. Today, this will most likely be based on the Unified
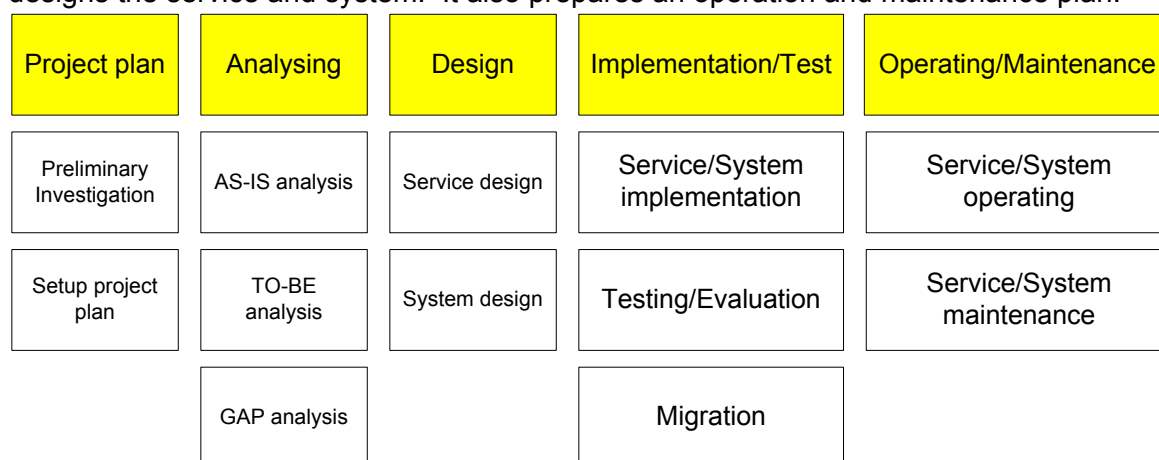
Modelling Language (UML), which is the most popular baseline specification. However, there are a few issues related to tool selection that may be of interest:

- Enterprise Architect Project (EAP) (Sparx Systems) is used to produce some of the development frameworks that are available on the Internet. The native format of the files is called EAP. As an example, the Maritime Navigation and Information Services (MarNIS) architecture and the UN/CEFACT International Supply Chain Reference Model (ISCRM) (section 11.3.2) are available as EAP files.

- UN/CEFACT has developed a modelling methodology (UMM) (http://umm-dev.org/). This methodology is also available as EAP files.

- ARKTRANS is also partly a modelling methodology as well as a framework for ICT systems in co-modal transport (http://www.arktrans.no/).

5.7 Design process

5.7.1 General methodology

The general methodology for normal system implementation is shown in Figure 4. Firstly, it sets up a preliminary investigation and plan including the "strengths, weaknesses, opportunities and threats" (SWOT) analysis for single-window implementation. Next, it analyses the differences and problems by comparing the present model with the future model. With the analysed result, it designs the service and system. It also prepares an operation and maintenance plan.

Project plan	Analysing	Design	Implementation/Test	Operating/Maintenance
Preliminary Investigation	AS-IS analysis	Service design	Service/System implementation	Service/System operating
Setup project plan	TO-BE analysis	System design	Testing/Evaluation	Service/System maintenance
	GAP analysis		Migration	

Figure 4 — General methodology for normal system implementation

5.7.2 Single window methodology

Developing a single window system for maritime transport starts with defining a single window strategy by conducting SWOT analysis and designing "AS-IS" and "TO-BE" models. A service model is defined on the basis of derived strategy and analysis results of administrative and business processes. On the basis of defined services and system model, relevant laws and regulations are revised and a system is simultaneously developed according to the system implementation methodology. Finally, operation and management measures are derived. Annex B contains details of the process.

5.7.3 Data harmonization

The purpose of the International Trade and Business Processes Group (TBG) is to be responsible for private- and public-sector business requirements and content. This is achieved by initiating developments in the areas of process analysis, best practices and international trade procedures. Where appropriate, the UN/CEFACT Modelling Methodology (UMM) is used to support the development of trade facilitation and electronic business solutions. TBG17 (Core Component Harmonization), one of the UN/CEFACT groups, is responsible for consistency and harmonization of core components across business domains and sectors, contributing to a concise and well-defined glossary of business terms and business data semantic definitions and to the structuring of data exchanges.

An important part of the single window design is to harmonize the representation of data between the different authorities and users of the single window. This is discussed in the WCO Data Model on Single Window Data Harmonization (WCO Data Model).
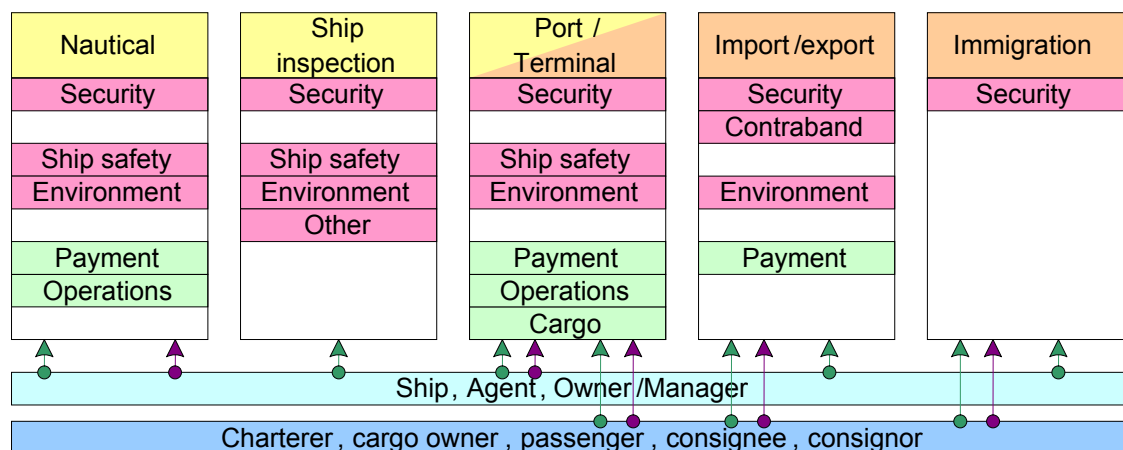
It is important to note the work in progress by WCO to develop the "WCO Compendium: How to Build a Single Window Environment", of which the first chapter was published on 30 December 2010.

5.8 Data elements

The FAL Compendium contains cross references to all the FAL forms and data elements occurring in each. This cross reference also contains maps to the corresponding data element in the WCO Data Model.

Table 1 below is an abbreviated summary of the same data elements, including requirements for waste disposal reports, where these are used. Table 1 also cross-references the corresponding data elements in ISO 28005-2. The codes "A" and "D" reflect differences in requirements for arrival ("A") and departure ("D") reports.

Description	ISO 28005-2 Data element	FAL1	FAL2	FAL3	FAL4	FAL5	FAL6	FAL7	ISPS	WASTE
Contact information of ship's agent	Agent	X						X	X	
Purpose of call	CallPurpose								X	
Cargo description list	CargoData		X					X	X	
Brief description of cargo	CargoOverview								X	
Certificate of registry	Certificate (RegistryCertificate)	X								
International ship security certificate	Certificate								X	
Company name, IMO company ID. no.	Company								X	X
Company security officer information	ContactInfo								X	
Crew list	CrewList					X				
Security level	CurrentShipSecurityLevel								X	
Crew effects list	DutiableCrewEffects				X					
Person, date, reporting system	EPCMessageHeader								X	X
Date and time of arrival	ETA	A		A		A	A			X
Date and time of departure	ETD	D		D		D	D			X
Gross tonnage	GrossTonnage	X							X	X
Approved security plan	HasSecurityPlan								X	
Inmarsat call number	InmarsatCallNumber								X	
Last port of call	LastPortOfCall	A		A	X					X
Location where report is made	Location		X						X	
Name of master	NameOfMaster	X	X					X		
Net tonnage	NetTonnage	X								
Next port of call	NextPortOfCall	D		D						X
Passenger list	PassengerList						X			
Period of stay	PeriodOfStay			A						
Number of crew and passengers	PersonsOnboard	X		X						
Last 10 port calls	PortCalls								X	
Port of arrival, position of ship in port	PortOfArrival	A		A		A	A		X	X
Port of departure	PortOfDeparture	D		D		D	D			
Flag state	RegistrationPort	X	X	X	X	X	X	X	X	X
Remarks	Remarks	X							X	
Ship name, IMO number, call sign	ShipID	X	X	X	X	X	X	X	X	X
Course and speed, pilot on board	ShipStatus									
Ship stores list	ShipStores			X						
Most recent ship-to-ship activities	ShipToShipActivityList								X	
Ship type	ShipContent	X							X	X
Brief description of voyage/cargo	VoyageDescription	X								
Voyage number	VoyageNumber	X	X	X	X	X	X	X		
Waste and residue disposal requirements	WasteDisposalRequirements	A								
Waste and residue detailed information	WasteInformation									X

Table 1 — Summary of data elements

5.9   Users of a single window

Figure 5 below shows a more detailed view of the user groups involved in clearance of a ship. The top-level boxes define the main user groups responsible for the clearance process and the rectangles at the bottom show the user groups involved in the transport operation.

Nautical	Ship inspection	Port / Terminal	Import /export	Immigration
Security	Security	Security	Security	Security
			Contraband	
Ship safety	Ship safety	Ship safety		
Environment	Environment	Environment	Environment	
	Other			
Payment		Payment	Payment	
Operations		Operations		
		Cargo		

Ship , Agent, Owner /Manager

Charterer , cargo owner , passenger , consignee , consignor

Figure 5 — Single Window user groups

The colour of the top-level boxes indicates whether the group of actors processes clearance purely for maritime transport (yellow) or for several transport modes (orange). The port and terminal actors have been shown to belong to both areas. This is because the terminal (or in some cases the port) also has to relate to hinterland transport, e.g. by road, rail or inland waterways.

To indicate the reason for the information exchanges, the top-level boxes have some internal operational labels showing some of the operations performed.

The arrows indicate reporting requirements. Green arrows show data flows that normally have to take place well before arrival while mauve arrows show flows that take place closer to or even after arrival.

Tables 2 and 3 below show some examples of specific parties that can be assigned to the actor groups. The actual parties may have different names and functions in different countries and even in different ports, but the list presented here is relatively general.

Group	Function	Example party (documents)
Nautical	Security	Navy (ISPS reports, arrival notifications)
	Safety	Coastguard (arrival notifications, passing baseline)
		VTS, pilot, ship reporting area (arrival notifications)
	Environment	Coastguard (dangerous goods manifest, ballast water reports)
	Payments	Fairway fees, pilot fees
	Operations	VTS, pilot (arrival notification)
Inspection	Security	Port State control (ISPS documents)
	Safety	Port State control (certificates)
	Environment	Port State control (waste and oil records)
	Other	ILO (contracts)
Port/terminal	Security	Port security officer (ISPS reports)
	Safety	Safety officer (dangerous goods manifest, arrival notification)
	Environment	Safety officer (waste reports, ballast water reports)
	Payment	Port/terminal fees
	Operations	Arrival/departure notifications
	Cargo	Clearance status for cargo, cargo manifest

Group	Function	Example party (documents)
Import/export	Security	Cargo manifest
	Contraband	Arrival notification (previous ports), cargo manifest
	Environment	Cargo manifest, veterinary, health, other certificates
	Payment	Customs dues
Immigration	Security	Crew list, passenger list

Table 2 — Specific parties (1)

The authorities using the single window have been more extensively investigated in the MarNIS architecture report (MNHA3F). Table 3 below is taken from that report and gives a more detailed overview of the authorities involved. Note that the "Role" is a generalized role that may be taken by different actual users in a specific port or State. As an example, the "Immigration Authority" may be police, military or other special authorities, depending on country and region.

Role	Description	Comment
Agricultural authority	Competent authority for agriculture.	Admittance of agricultural products.
Clearance authority	Competent authority for vessel clearance.	Entry/exit clearances of vessels before entry/exit to/from territorial areas, ports, etc. The clearance process may also involve coordination with other authorities.
Customs authority	Competent authority for the cross-border movement of goods.	Levying of duties and taxes on imported goods. Control over the export and import of goods such as control over prohibited goods and security purposes.
Defence authority	Competent authority for defence.	Protection of the territorial waters against foreign armed forces.
Health authority	Competent authority for public health.	Entry of people or objects that may cause a health risk.
Immigration authority	Competent authority for immigration.	Enforcement of regulations and laws applicable to persons requesting entry to a country or territory.
Policing authority	Competent authority for policing.	Enforcement of civil law applicable to vessels and their presence in territorial waters.
Port State inspection authority	Competent authority for the inspection of ships visiting ports.	Port State inspection (of coastal State). Inspection of certificates, adherence to safety regulations and testing of safety and other equipment.
Registry authority	Competent authority for ship registry (flag State).	Establishment and maintenance of ship registry. Issues certificate of registry.
SAR authority	Competent authority for search and rescue (SAR).	Responsible for the SAR policy for an area and for bilateral agreements on SAR regions.
Safe working inspection authority	Competent authority for the use of equipment.	Responsible for rules and regulations on how equipment is used in relation to transport, loading, unloading and trans-shipment.
Safe working procedures authority	Competent authority for healthy and safe work procedures.	Responsible for rules and regulations on how work related to transport, loading, unloading and trans-shipment is executed.
Safety authority	Competent authority for safety at sea.	Responsible for emergency response and the final decisions on how to handle emergencies or incidents, e.g. decisions on place of refuge to be used.
Security authority	Competent authority for security.	

Role	Description	Comment
Ship inspection authority	Competent authority for ship inspections and the implementation of IMO and national rules on flag State ships.	Flag State inspection (of flag State). Inspection of certificates, adherence to safety regulations and testing of safety and other equipment.
Statistics authority	Competent authority for statistics and systematic collection of data and facts.	
Veterinary authority	Competent authority for animals (dead or alive).	Entry/exit of animals and animal products.
Environmental authority	Competent authority for environmental protection.	Protection and preservation of the marine environment and marine species.
Waste authority	Competent authority for compliance with legislation on waste.	Monitoring and reporting of waste disposals from ships (according to legislation on waste). Compliance with legislation on waste.
Pollution response authority	Competent authority with respect to pollution.	The establishment of rules and regulations with respect to pollution control.
Local security authority	Competent authority with respect to security in ports.	Enforcement of ISPS Code.
Local safety authority	Competent authority with respect to nautical safety in local areas.	Needs information about dangerous goods, use of port facilities, etc.
VTMS authority	Competent authority for the definitions of vessel traffic management system (VTMS) areas and for the regulations concerning these areas. Also responsible for the enforcement of laws and regulations for transport and maritime traffic.	Knowledge of the position of vessels in the territorial waters. Establishment of regulations for transport and maritime traffic. Enforcement of laws and regulations for transport and maritime traffic.

Table 3 — Specific parties (2)

Some of these authorities are not relevant for a given port and the list is supplied for information only.

5.10   Non-functional requirements

During the implementation phase, one has to consider various "non-functional" requirements that limit the implementation selections quite substantially. The typical problem is establishing the degree to which one can expect the prospective users to actually make use of the new technological solutions provided. This is obviously a critical issue regarding the final adoption of the proposed technical solutions. Section 8 discusses this in some detail.

6. Scope of a single window

6.1 Scope definition

6.1.1 Cargo and/or ship single window

In the context of shipping, two main types of single window can generally be distinguished, although in practice many implementations will be a mix of the two.

Ship single window: The FAL convention and the FAL Compendium define the maximum amount of clearance information that may be required before a ship can go to berth. However, getting cleared according to the FAL requirements does not automatically imply that the passengers or crew can enter the country or that the cargo can be imported. Normally, ship clearance means that cargo can be offloaded to the quay side and that passenger may disembark for immigration control.

Cargo and trade single window: Most existing single window implementations deal with the import or export clearance of cargo and can be normally operated by customs authorities and in some cases veterinary or agricultural authorities. This is related, among others, to protection of national interests in terms of taxation and to protection of the State from various forms of dangerous imports.

Passenger clearance beyond what is done in ship clearance is normally not done through a single window, although some countries enforce various forms of pre-registration before passengers are allowed to disembark.

Note also that the UNECE definition of a single window is mostly related to the cargo and trade type. Thus, not all concepts discussed in the UNECE documents are applicable to ship clearance.

6.1.2 Clearance functions implemented

Consideration may also be given to the different types of clearance that can be given. The following categories can be distinguished:

.1 *Clearance of ship to enter territorial waters*: This allows the ship to proceed from international to national waters and usually requires some kind of permit from military or similar entities.

.2 *Clearance of ship to berth*: This includes clearance of the ship in relation to various safety and security issues, possibly including sanitary, phytosanitary and security-related clearance of cargo and passengers.

.3 *Clearance of passengers and crew*: This includes necessary measures to allow the crew and passengers to leave the ship.

.4 *Clearance of cargo for discharge, load or trans-shipment*.

.5 *Clearance for bunker or other port operations*.

Similar clearance levels may be defined for departure. Note also that this list does not include customs' and other authorities' clearance of goods for import and export. However, it does include clearance of goods and pre-arrival and pre-departure clearance.

6.1.3 Types of shipping supported

There are wide variations between types of shipping. Some examples are the following:

- *ROPAX*: The impossibility of knowing what cargo is in passengers' cars makes it necessary to consider how to achieve clearance of cars and their passengers. A special problem is posed by very short international ferry rides that may need special legislation to avoid excessive delays for embarkation and disembarkation.

- *Passenger/Cruise*: There are special requirements in terms of large groups of passengers, both moving between national ports and also as "day immigrants".

- *Ro-ro/Container*: This is characterized by large amounts of cargo information, typically in UN/EDIFACT format. The manifest and bills of lading are usually readily available as electronic documents.

- *Bulk*: Bulk shipping normally involves simple manifests and bills of lading with correspondingly simple procedures in customs.

- *General cargo*: More complex in relation to manifests and customs procedures, normally with several receivers and shippers. This sector also includes vessels with regular calls to a given port, usually more frequently in comparison to bulk shipping.

Thus, the proposed single window should consider what types of ships are most likely to be handled through the system and what can be handled as exceptions.

However, since most of the clearance may be done by the ship's agent, problems with bulk and spot shipping may be less acute than described above.

6.1.4 Geographic scope

A single window can provide clearance for different geographic areas. From larger to smaller areas, some examples are the following:

.1 *Regional clearance*: Clearance for entry into a region of more than one State.

.2 *National clearance*: Clearance for entry into a State.

.3 *Port clearance.* Clearance for entry into a specific port.

Depending on national legislation and regional agreements, one or more of these levels of clearance may be required.

7.   Legislation issues

7.1   General issues

UNCEFACT Recommendation No. 35 on the legal aspects of a single window, while primarily covering cargo clearance and trade, is of general interest in this context. The Recommendation states that when a national or regional single window is established, legal issues mentioned in this checklist may arise.[1] It is important to note that this list is not exhaustive. Depending on the actual implementation of the single window facility, legal issues not mentioned in these guidelines may arise. For many Governments, this initial list of legal issues will provide the basis for discovering other issues related not only to Business to Government (B2G) and Government to Business (G2B) transactions but also to the broader Business to Business (B2B) environment nationally and internationally.

- Has the legal basis for the implementation of the single window facility been examined/established?

- Has an appropriate organizational structure for the establishment and operation of a single window facility been chosen?

- Are proper identification, authentication and authorization procedures in place?

- Who has the authority to demand data from the single window?

- When and how may data be shared and under what circumstances and with what organizations within the Government or with Government agencies in other countries?

- Have proper data protection mechanisms been implemented?

- Are measures in place to ensure the accuracy and integrity of data? Who are the responsible actors?

- Are liability issues that may arise as a result of the single window operation addressed?

- Are there mechanisms in place for dispute resolution?

- Are procedures in place for electronic archiving and the creation of audit trails?

- Have issues of intellectual property and database ownership been addressed?

- Are there any situations where competition issues may arise?

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[1]   It is important to distinguish between national and regional (or transnational) single windows. Where a national single window is established, attention is primarily paid to the legal regime of the State concerned, including the international agreements that are binding on the State. A regional single window, however, must in principle observe the requirements of all States that it is serving but also consider the broader trade opportunities for members of such regional group beyond the member States themselves.

7.2   Specific types of shipping

In addition to the general issues discussed above, there are also more specific legal issues related to different types of shipping that need to be considered. The following paragraphs point to some of the types of legislation that need to be considered.

7.2.1   International shipping

Normally, requirements for international shipping are covered in national legislation. However, national legislation will often reflect the FAL Convention or other regional directives; for example, as in Directive 2010/65/EU of the European Parliament and of the Council. There may also be other national or international legislation to consider; for example, in relation to security clearance and special requirements for early arrival notification.

7.2.2   Regional shipping

Some regions have special legislation covering ship traffic between States in the region. This typically involves stricter controls at entry to the region than when moving between regional ports.

7.2.3   National shipping and cabotage

National shipping and cabotage operations are normally covered in national legislation. Cabotage agreements may again refer to international legislation.

7.3   Trade and import/export issues

Trade issues and import and export of cargo are normally covered by different legislation than ship calls to port. Cargo and trade legislation and contracts partly cover financial liabilities of cargo buyers/consignees and sellers/consignors towards each other or towards the State from which they export or to which they import. The legislation also covers various issues related to the safety of imported goods, e.g. from veterinary or agricultural authorities.

These issues are much more extensively covered in the various UNECE documents listed in the reference section. See also UN/CEFACT Recommendation No. 35.

7.4   Special considerations for regional single windows

The UNCEFACT Recommendation No. 35 on the legal framework for single windows particularly emphasizes issues related to cross-border and regional single windows. It states that apart from adherence to national law, the operation of single windows across borders should be in accordance with international trade law. The following (model) laws and treaties should be taken into consideration when operating (regional) single window facilities:

- United Nations Convention on the Use of Electronic Communications in International Contracts(2005);
- UNCITRAL Model Law on Electronic Commerce (1996);
- UNCITRAL Model Law on Electronic Signatures (2001);
- OECD Recommendation on Electronic Authentication and OECD Guidance for Electronic Authentication (2007);
- General Agreement on Tariffs and Trade (GATT).

7.5 Privacy and intellectual property

UN/CEFACT Recommendation No.35 also addresses the issues of privacy and intellectual property rights. It states that respect for privacy and adequate data protection are important factors when it comes to operating a single window. While there is no global privacy law, there are documents that set forth general guidelines for data protection and privacy:

- OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data (1980);

- OECD Recommendation on Electronic Authentication and OECD Guidance for Electronic Authentication (2007).

Intellectual property is also of importance when it comes to the establishment and operation of a Single Window. It is important to note that at the time of publication of UN/CEFACT Recommendation No.35, a global treaty on the protection of databases did not exist. At the regional level (for instance, in the European Union), rules for the protection of databases have been established:

- Berne Convention for the Protection of Literary and Artistic Works (1886);

- Paris Convention for the Protection of Industrial Property (1883);

- WIPO Patent Law Treaty (2000);

- WIPO Patent Cooperation Treaty (1970);

- WIPO Copyright Treaty (1996).

8. Implementation issues

Technology develops rapidly and these guidelines do not recommend the use of any specific technical solutions. However, there are some general issues that should be considered before a system solution is selected. This section discusses some of these issues.

8.1 Physical realization

There are various ways to implement physical networked systems interconnecting ports, NSWs and commercial operators.
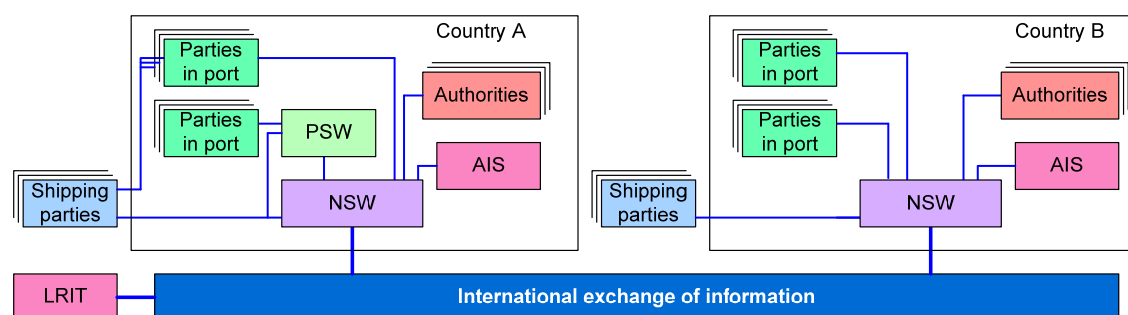
Figure 6 — Physical realization of single windows

Figure 6 illustrates a country, B, that has a common NSW both for authorities and port clearance. This is an interesting approach, particularly for countries with several relatively small ports and where legislation allows this form of information exchange. Country A has one port with a PSW handling commercial clearance and another port where clearance must be undertaken with the involved parties. A NSW handles authorities' clearance independently of the port.

An international information exchange mechanism is also shown. One example of this is the SafeSeaNet that is being used in Europe (see section 11.3.4).

8.2   Data entry into single window

Normally it is necessary to consider different ways for data to be entered into the system. These methods should cater for different users' requirements and possibilities for entering data. Some common methods are:

*   *Manual web interface*: This is typically a web page where users can manually enter data into specific fields. This is useful for casual users that use the system rarely and that do not want to invest in automatic systems.

*   *Low bandwidth web interface*: The same mechanism as above can be designed to be used over low bandwidth (typically ship-to-shore) data links. This may be necessary if the ship is expected to enter some data.

*   *EDI via e-mail*: Electronic documents can be sent as e-mail attachments to a central server. This is a useful method for users that are not always online (e.g. ships) or for a single window that cannot guarantee continuous availability.

*   *EDI as direct Internet entry*: Electronic documents can also be deposited directly via an online protocol such as FTP, HTTP or others. This is the most automated way to perform data entry and is increasingly popular, typically in the form of "web services".

8.3   Tools to aid users' data entry

For EDI interfaces, it is also necessary to consider how the users format their EDI file. In most automated systems, the EDI formatting is done by the local administrative systems and sent more or less automatically to the single window. However, it is also possible to provide data-entry tools that allow the user to enter data manually and generate an EDI file for deposit through e-mail or directly through the Internet.

Data-entry tools can be stand-alone applications or can be implemented with the help of HTML forms, Adobe PDF or Microsoft Excel workbooks, for example. The benefit of the latter variants is that they do not require installation of any special software on board the ship or on the user's premises.

8.4   EDI formats

As section 10 demonstrates, there is no lack of standards for EDI, and that section only scratches the surface of the area. There are numerous other formats in use, also for ship clearance.

In most cases, UN/EDIFACT and the FAL Compendium should be used as the basis for implementing a new single window. This is briefly discussed in section 8.4.1 below. However, the use of XML is increasing and this may be an alternative in special cases, although a problem with XML is that there are no de facto standards. This issue is discussed in section 8.4.2 below.

8.4.1 UN/EDIFACT and FAL Compendium

At the time of writing, only one set of electronic messages can be said to have the status of de facto standard: the UN/EDIFACT messages (see section 10). However, even in the area of UN/EDIFACT, there is a plethora of different message types in use and even different ways to use each message. The main reference for use of UN/EDIFACT should be the FAL Compendium, which contains a comprehensive discussion of the relevant UN/EDIFACT message types and how they should be used in ship clearance.

In some cases, the use by the PROTECT Group of UN/EDIFACT messages may also be considered (see section 10.11). These standards cover some issues that are not covered in the FAL Compendium, such as waste-related reporting and berth management.

The FAL Compendium contains a more extensive discussion of the use of UN/EDIFACT for ship clearance.

8.4.2 Extensible Markup Language (XML)

Most new developments within the area of electronic messaging are being based on the use of Extensible Markup Language (XML). XML is a relatively simple system for electronic data interchange with extensive support in common office automation tools and off-the-shelf or public-domain computer software. Thus, the threshold for implementing XML support in an organization can be perceived to be lower than for UN/EDIFACT, which normally requires more specialized competence and more expensive tools.

However, the relative ease with which new variants of XML can be created has led to a large number of different and partly competing standards. This also applies to ship clearance, although the use of XML for this purpose is not widely implemented. Some relatively well known examples are listed below:

- PortNet in Finland uses XML for ship clearance, but does also support FAL forms and UN/EDIFACT. Information about the system can be found at the Single Window Repository (see section 11.3.1).

- The (Electronic Notice of Arrival/Departure (eNOA/D) system was implemented by the United States Coast Guard for early arrival and departure notification. It is a mandatory XML-based messaging system (see http://www.nvmc.uscg.gov/).

- SafeSeaNet in Europe is intended for data interchange between port and coastal State authorities and not for direct user submission. However, it is based on XML and a message guidelines structure has been developed (see http://www.emsa.europa.eu/).

Various research projects have also looked at XML message formats for ship clearance and information on several of these are available from Internet resources. At the time of writing, none of these can be identified as a likely emerging standard for ship clearance. This is a

significant problem as ships travel between many ports, and developing and incompatible XML implementations will require that the ship has to support many different message formats.

ISO/TC 8 (see section 10.9.1) has developed a new XML-based standard (ISO 28005-2) that contains definitions of the data elements currently in use for ship clearance. The intention is that this standard can be used as a basis for the implementation of new ship clearance systems.

XML is also gaining ground in the case of more trade-oriented applications. UN/CEFACT is cooperating with the Organization for the Advancement of Structured Information Standards (OASIS — see section 10.13) to develop ebXML (Electronic Business Extensible Markup Language) for trade documents; ebXML has also been published as ISO standard. OASIS is also involved in the development of UBL (Universal Business Language; see section 10.14). Some developments can also be expected here that may support ship clearance.

8.5 Information repository

The report "Blueprint for a virtual port" (BLU-VH) describes three different models for collaboration through electronic systems such as a single window. The report analyses these three models in terms of different perspectives, namely infrastructure, messaging, security and mobility. The three e-collaboration models are:

.1 *Bilateral information model (BIM)*: In this model, information is exchanged directly between the different actors on a bilateral basis. This is the traditional system without a single window or where the single window only supplies information about what server can perform what function.

.2 *Centralized information model (CIM)*: In this model, data is stored at a central information service provider. Information can be retrieved from this central information service provider by trading partners that have the right to do so.

.3 *Decentralized information model (DIM)*: In this model data is stored and controlled by each individual party. A broker service can help in retrieving the information from the right source.

Many modern systems will today use the CIM approach, while, as an example, the European Union's SafeSeaNet is a DIM system, in which a central hub, known as the European Index Server, keeps track of important events and of which member State stores the information on each event. The index server receives a notification each time a report is made to a member-State system, but the full details of the report are stored either at the member-State level or even more locally within a member State and only exchanged with other users on the basis of a request sent via the European Index Server. This model allows a balance to be found between supporting the free flow of information throughout the system and allowing individual users to deliver their data-collection and processing functions in the most appropriate way to suit their own operational and organizational context.

9.   Lessons learned

This section contains some lessons learned from the implementation of other single windows, with references to additional documentation where available. A suitable selection of cases has been made in order to represent various ways of implementing a single window. Annex A contains some examples of best practice.

9.1   Authorities-only single window

An authority-based NSW without port services. Several examples can be found on the WCO website (http://www.wcoomd.org/sw.htm).

9.2   Private-public partnership single window

Examples include the Finnish PortNet or the proposed Norwegian MIS system.

9.3   National public single window

A system has been implemented by the Brazilian Government known as "Paperless Port" (*Porto sem Papel*) which integrates all the information required by the port, maritime, immigration, customs, sanitary, animal and phytosanitary authorities. This system allows the authorities to provide notification of clearance directly through the website.

9.4   Regional port

The port of Gothenburg in Sweden has developed a web-based information system called Vessel Traffic Management System (VTMS). It can be seen as a partial port community system (PCS). VTMS facilitates and handles, among others, vessel reporting, ordering procedures, waste reporting, health clearance, crew- and passenger-list distribution and other relevant services and reporting operations in the port. The collected data are used to streamline the information flow and facilitate operation and vessel calls at the port. The main purpose is to reduce the vessels' administrative burdens and to be a Single Window for vessels bound for Gothenburg. The system also gathers the required European Union SafeSeaNet information and sends it in XML format to the Swedish SafeSeaNet system.

Several small- to medium-sized ports in Sweden have implemented port management information systems (PMIS). These serve as a tool for real-time control of administrative and logistical processes from planning a vessel's arrival through berth operations along the whole process until the vessel departs. The systems used are port-operated data systems that link different parties and systems together. PMIS converts incoming electronic notifications automatically to processed data in order to create efficient internal processes. Examples of such features are planning of berth and loading/discharging operations, positioning of containers and cargo using the Global Positioning System (GPS), automatic identification system (AIS) integration, verification with Lloyd´s Register, national authority integration, agent reporting and ordering, security issues and financial system integration. The systems are also able to import vessel call information from the European Union SafeSeaNet system by using XML messages and to deliver automatic output to external partners or systems.

9.5   Large port

Portbase is the port community system for the ports of Rotterdam and Amsterdam and certain smaller ports in the Netherlands. Although it is a private system, several public authorities have been involved in its development and receive information through this community system or directly from private parties.

10.   List of applicable standards

This section discusses some of the standards that are or may be applicable to single window implementation for ship clearance. This is not an exhaustive list, but attempts have been made to include the most relevant.

However, it should be noted that at time of writing, it is mainly UN/EDIFACT standards as listed in the FAL Compendium that are used to any great extent.

10.1   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).

The EDI messages which can be used to implement the FAL reporting requirements are indicated in Table 4 below, which has been compiled using information from the FAL Compendium.

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

Table 4 — FAL forms and EDI

10.2   World Health Organization (WHO)

WHO issues the International Health Regulations (IHR), which require ships on international voyages to provide the following documents:

- *Maritime Declaration of Health*: The content and basic format is defined in IHR.

- *Ship Sanitation Control Certificate/Ship Sanitation Exemption Certificate*: If not carried, officials may board the ship for inspection at arrival and require the ship to undergo disinfection, decontamination, disinsection or deratting as appropriate.

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

10.3   World Customs Organization (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 176 Member States, spread throughout the world. WCO publishes recommendations to its members on various issues, among them electronic customs declarations and clearance (see http://www.wcoomd.org/).

In the International Convention on the Simplification and Harmonization of Customs Procedures as revised by its protocol of amendment of 1999 (revised WCO Kyoto Convention), principles and standards have been given for customs procedures and other customs formalities, the collection and payment of duties and taxes, security, customs control and the application of information technology.

Chapter 7 of the General Annex of the revised WCO Kyoto Convention and the accompanying guidelines on information technology mention 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 revised WCO Kyoto Convention indicates that the harmonized use of codes at application level will be of great benefit to the facilitation of international trade.

WCO has developed the WCO 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.

The result of 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

These messages will soon be replaced by a single UN/EDIFACT message, the Government Cross-Border Regulatory message (GOVCBR), which will cover the information requirements from several cross-border authorities.

WCO produced Version 3 of the WCO Data Model in December 2009, which includes not only customs-related data but also the data requirements from other public authorities, such as data elements for agriculture, food safety, maritime safety, immigration (crew) and dangerous goods. The WCO Date Model Version 3 is a basis for development of a single window and also contains detailed guidelines on the data sets and on how to use the messages in trade and transport. While EDI using the UN/EDIFACT international standard is presently being implemented by a large number of WCO Member States as one of the preferred interchange options, WCO has made the recommendation to offer more than one solution for the electronic exchange of information. Customs are now also looking at other options, such as ebXML. The WCO Data Model recommends the use of international codes such as ISO standards, United Nations transport codes such as the United Nations Code for Trade and Transport Locations (UN/LOCODE) and the WCO International Convention on the Harmonized Commodity Description and Coding System (HS). The WCO Data Model is aligned to the United Nations Trade Data Elements Directory (UN/TDED) B2B data model.   The draft UNCEFACT Recommendation No. 34 on data simplification and standardization for international trade is based on WCO guidelines related to this subject.

The WCO Data Model is also used as a basis for development of the FAL Compendium.

WCO developed for the recent security requirements the SAFE Framework of Standards which consists of four core elements. First, it harmonizes the advance electronic cargo information requirements on inbound, outbound and transit shipments. Second, each country that joins the SAFE Framework commits to employing a consistent risk management approach to address security threats. Third, it requires that at the reasonable request of the receiving State, based upon a comparable risk targeting methodology, the sending nation's customs administration will perform an outbound inspection of high-risk containers and cargo, preferably using non-intrusive detection equipment such as large-scale X-ray machines and radiation detectors. Fourth, the SAFE Framework defines benefits that customs will provide to businesses that meet minimal supply-chain security standards and best practices.

The harmonization of advance cargo information resulted in a list of security data elements to perform risk analysis. The security data element from that list is also part of the WCO Data Model Version 3.

As part of business and customs cooperation, the SAFE Framework provides the concept of the Authorized Economic Operator. This is a party involved in the international cross-border movement of goods in whatever function that has been approved by or on behalf of a national customs administration as complying with WCO or equivalent supply-chain security standards. Authorized Economic Operators include, inter alia, manufacturers, importers, exporters, brokers, carriers, consolidators, intermediaries, ports, airports, terminal operators, integrated operators, warehouses and distributors.

10.4   World Trade Organization (WTO)

10.4.1   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 agreements which obliges WTO member States to ensure that technical regulations, voluntary standards and conformity assessment procedures do not create unnecessary obstacles to trade.

Basically, the Agreement requires member States to use international standards whenever they 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 standardization work where the work is important for members' trade. Furthermore, the agreement lays down rules for how international (and national) standardization work shall be done. Basically, it requires work to be transparent and open to comments from other members that may have an interest in the work.

10.4.2   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 General Agreement on Tariffs and Trade (GATT) (1994) 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 expertise of the United Nations and the deliverables of its work through the Inland Transport Committee and UN/CEFACT, both administered by UNECE, are considered highly relevant by WTO members as evidenced by various submissions of the European Communities (documents G/C/W/394 and G/C/W/422), Japan, Australia and many others.

GATT prescribes measures to reduce difficulties for international trade and 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 measures are simplifying and standardizing customs procedures and documentary requirements, including risk management and limitation of physical inspection. On import and export article VIII recognizes the need to simplify formalities and documentation. It does not, however, provide any mandatory requirements. Several WTO 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, such as the revised WCO Kyoto Convention.

The objective of article X of GATT, concerning the 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.

10.5   United Nations Economic Commission for Europe (UNECE)

The United Nations Economic Commission for Europe (UNECE administers, among others, the Inland Transport Committee — which is responsible, among others, for 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 maintain and publish 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, over 40 years it has developed and maintained specifications that are referenced by legislation and other standards. The applicable standards are discussed in the next chapter. This section briefly looks at the respective United Nations recommendations pertaining to transport and trade facilitation in the form of improved processes.

10.5.1   A trade reference model: Buy-Ship-Pay

On the highest level, transport is generally driven by trade. Facilitation of maritime transport is therefore a subset of the more general drive to facilitate international trade.

The scope of the UN/CEFACT International Supply Chain Reference Model (ISCRM) covers quotation, ordering and transportation of goods through to invoicing. ISCRM covers processes in the four main business areas: commercial, logistics, regulatory and financial, as illustrated below.
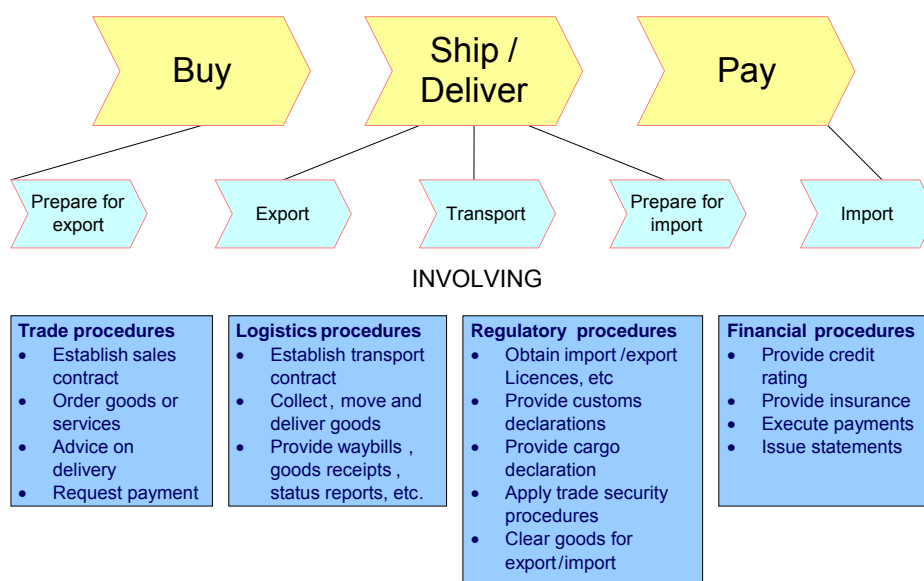
Figure 7 — The UN/CEFACT supply chain reference model

This is an extensive model that is the basis for the development of new electronic standards for invoicing, transport documents, authorities' clearance and many other aspects of trade facilitation. The model is available in electronic format and may also be used as a starting point for development of national single window solutions for trade (see section 11.3.2).

However, the model does not include enough details of the transport or logistics area to use directly in the definition of a single window solution for maritime transport.

The most relevant work of UN/CEFACT for shipping is the work on UN/EDIFACT and related standards. The following definition of the UN/EDIFACT Rules has been published in the United Nations Trade Data Interchange Directory (UNTDID):

- The United Nations Rules for Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT Rules) 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 UNECE in the 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 methods or systems as follows:

- The basis for any trade data interchange (B2B) is the United Nations Trade Data Elements Directory (UNTDED), 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 fulfil specific documentary functions are selected both for UNLK-based forms (United Nations Layout Key) and to form

messages for transmission. Data elements from UNTDED used in United Nations 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 (UNSMs) or by agreement between interchange partners. Each data element is implicitly identified by its position in the segment.

- Data elements in UNTDED are used in the segments specified in the current UNTDID and are also, in a condensed form for this purpose, included in a special directory (UNTDED).

According to the memorandum of understanding between the International Telecommunication Union (ITU), the International Electrotechnical Commission (IEC), ISO and UN/CEFACT concerning standardization in the field of electronic business, it is the responsibility of UN/CEFACT to maintain UN/EDIFACT standards and application guidelines. The syntax for UN/EDIFACT is maintained by ISO as ISO 9735. The latest publication, in 2005, of UNTDED (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 of understanding, 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.

10.6   United Nations Conference on Trade and Development (UNCTAD)

Established in 1964, 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 interrelated issues in the areas of finance, technology, investment and sustainable development.

UNCTAD has developed a number of instruments such as the Automated System for Customs Data (AYSCUDA) to deal with customs requirements in developing countries.

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

10.7   United Nations Commission on International Trade Law (UNCITRAL)

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:

- Coordinating the work of organizations active in this field and encouraging cooperation 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 UNCTAD; and

- Maintaining liaison with other United Nations organs and specialized agencies concerned with international trade.

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

UNCITRAL and WCO are cooperating in a joint legal task force to identify the legal aspects of a single window with the aim of developing international legal instruments for single windows. Some results from this work are included in UNCEFACT Recommendation No. 35 and are discussed in sections 7.4 and 7.5 of these guidelines.

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

10.8 United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT)

UN/CEFACT does not have a legislative role in 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 UN/EDIFACT and related standards.

International standards bodies such as UN/CEFACT and OASIS have defined ebXML Messaging Services (ebMS) and web services as standard communication interfaces for trading partners to exchange data, and they are actually implemented in real business. By using a standard communication interface, the users (shipping agencies) can be conveniently connected to various port authorities regardless of the country of arrival/departure of the vessel. Messaging involves creating messages, following the rules according to the defined business service and applying security for reliable messaging. The trading partners need to agree on the exchanging method in advance to interchange messages with one another. For reliable messaging in the Internet-based communication protocol, the reliability module and web service security model may be applied.

10.8.1 ITU, IEC, ISO and UN/CEFACT Memorandum of Understanding

According to the memorandum of understanding between ITU, IEC ISO and UN/CEFACT concerning standardization in the field of electronic business, it is the responsibility of UN/CEFACT to maintain UN/EDIFACT standards and application guidelines. The syntax for UN/EDIFACT is maintained by ISO as ISO 9735. The latest publication, in 2005, of UNTDED (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.

10.8.2   Electronic data interchange (EDI)

The following definition of the UN/EDIFACT Rules has been published in the United Nations Trade Data Interchange Directory (UNTDID:

- The United Nations Rules for Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT Rules) 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 UNECE in UNTDID and are maintained under agreed procedures.

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

- The basis for any trade data interchange (B2B) is the United Nations Trade Data Elements Directory (UNTDED), 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 fulfil specific documentary functions are selected both for UNLK-based forms (United Nations Layout Key) and to form messages for transmission. Data elements from UNTDED used in United Nations 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 (UNSMs) or by agreement between interchange partners. Each data elements are implicitly identified by its position in the segment.

- Data elements in UNTDED are used in the segments specified in the current UNTDID and are also, in a condensed form for this purpose, included in a special directory (UNTDED).

10.9   International Standards Organization (ISO)

ISO is a non-governmental organization that was established in 1947. The mission of ISO is to promote the development of standardization and related activities in the world with a view to facilitating the international exchange of goods and services, and to developing cooperation in the spheres of intellectual, scientific, technological and economic activity. The work of ISO results in international agreements, which are published as international standards. More information is available from http://www.iso.org/.

10.9.1 ISO/TC 8 — Ships and marine technology

ISO Technical Committee 8 on ships and marine technology (ISO/TC 8) has published standards in the area of EDI. Most important is ISO 28005-2, which defines information elements for ship clearance.

10.9.2 ISO/TC 154 — Processes, data elements and documents

ISO Technical Committee 154 (ISO/TC 154) is entitled "Processes, data elements and documents in commerce, industry and administration". In the scope of EDI, they are responsible for formal standardization of UN/CEFACT documents, like UNTDED (ISO 7372) and UN/EDIFACT (ISO 9735) syntax. They also work with ebXML and conversion of EDI to XML. A list of some of the standards is given in Table 5 below.

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 type — 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 type — 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 type — KEYMAN)
ISO 9735-10	Syntax service directories

Table 5 — UN/EDIFACT ISO standards

ISO/TC 154 has also converted some of the ebXML specifications into ISO documents. Table 6 below lists the relevant 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)

Table 6 — ebXML ISO documents

10.10 Legal issues in a single window project

The project to develop a single window arose first in UNCTAD and UN/CEFACT. Legal issues are still being defined, but they clearly include the cross-border recognition of data, authentication of all parties to communications and of their documents, responsibility for managing the data and security of the data. These issues need to be given careful considerations when supporting legislation is drafted.

It was noted in discussions that centralizing data or giving it a single format could present problems of security.

10.11   PROTECT

The PROTECT Group was established by the port authorities of several major ports in north-west Europe. The group aims to harmonize the implementation of the UN/EDIFACT standard messages for vessel reporting in the different ports (see http://www.smdg.org/ for more information about the PROTECT Group).

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 (message implementation guides (MIGs) for these messages, as well as for the acknowledgement message from the port authority and for the berth (request) management message (BERMAN) to port authorities.

10.12   Transportation Data Coordinating Committee (TDCC) and Accredited Standards Committee (ASC X12)

TDCC devised an electronic railway 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 EDI standard, which became accredited under the American National Standards Institute (ANSI) as the ASC X12 committee. ASC X12 incorporated the work of TDCC into its standards in the early 1980s.

These standards together with the Trading Data Interchange (TDI) standards used in Europe were the building blocks for UN/EDIFACT when work was started in 1985 on the invoice, purchase order and ships manifest. UN/EDIFACT has been recognized by ASC X12 as the uniform worldwide standard to replace the older standards whenever possible.

ANSI is the United States membership organization in ISO. It also develops its own standards. One of these is the X12 standard, which is functionally more or less identical to UN/EDIFACT, although other coding schemes and keywords are used. It is being used extensively in electronic business in the United States, but is probably not relevant for EPC use. The standard is used in the United States, Canada and to some degree in Australia. The X.12 transaction sets cover a wide range of industry sectors, including administration, education, finance and government.

The X.12 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 development of the X.12 standard is now on 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.

10.13 Organization for the Advancement of Structured Information Standards (OASIS) — ebXML

OASIS is a non-profit international consortium that drives the development, convergence and adoption of e-business standards. The consortium produces web services standards along with standards for security and e-business and participates in standardization efforts in the public sector and for application-specific markets.

OASIS develops XML-based standards for a wide range of applications. The most relevant is ebXML (Electronic Business Extensible Markup Language), which was started in 1999 as an initiative of OASIS and UN/CEFACT.

ebXML has also been published as ISO technical specifications (see section 10.9.2).

10.14 OASIS — Universal Business Language (UBL)

OASIS has also published UBL. Created by UBL localization subcommittees (LSCs) to aid global UBL deployment, the UBL 1.0 International Data Dictionary (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 (http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ubl).

11. Resources

The following sections provide references and links to external resources. Section 11.1 provides a cross reference between these resources and requirements related to single windows.

11.1 Cross reference to important documents

Table 7 below lists some specific document resources that are particularly important for the design of new single window solutions. The first column gives a brief overview of the issues covered, the second a reference to where the document can be found and the third the status of the document.

Item	Location	Type
FAL Convention	FAL Convention	Legal
FAL Compendium	FAL Compendium	Guidelines
International trade law	Sections 7.4 and 10	Legal
Privacy and intellectual property rights	Section 7.5	Legal
Agreement on technical barriers to trade	Section 10.4.1	Legal

Table 7 — Document resources

11.2   Bibliography and references

Directive 2010/65/EU of the European Parliament and of the Council of 20 October 2010 on reporting formalities for ships arriving in and/or departing from ports of the Member States and repealing Directive 2002/6/EC.

(BLU-VH) Blueprint for a virtual port, report by Virtuele Haven, June 7th, 2002, Version: 3.3, URL: https://doc.telin.nl/dscgi/ds.py/Get/File-19322.

IMO Convention on Facilitation of International Maritime Traffic (FAL Convention), 1965.

IMO Compendium on Facilitation and Electronic Business, FAL.5/Circ.15, 19 February 2001,

Revised Kyoto Convention on the Simplification and Harmonization of Customs Procedures, WCO, 2006.

EU Project MarNIS MN13H, Contract N°: TREN/04/FP6TR/S07.36353/506408, Deliverable D1.3H, Commercial information needs in a Port Environment, November 2004.

EU Project MarNIS MNHA3, Contract N°: TREN/04/FP6TR/S07.36353/506408, Deliverable HA3F, Final report on the MarNIS e-Maritime architecture, December 2008.

"International Shipping — Carrier of World Trade", Round Table of international shipping associations, 2005.

WCO SAFE Framework of Standards, June 2007.

UN/CEFACT Recommendation No.18 on "Facilitation Measures Related to International Trade Procedures", 3rd Edition 2002.

UN/CEFACT Recommendation No.33, Recommendation and Guidelines on Establishing a Single Window.

UN/CEFACT Draft Recommendation No.34, Data Simplification and Standardization for International Trade.

UN/CEFACT Recommendation No. 35, Establishing a Legal Framework for International Trade Single Window.

Business Requirements Specification — TBG2 — Cross-Border Supply Chain (UNeDocs), TBG2-2007-33-1-UNeDocs BRS, March 2007.

WCO Data Model — Single Window Data Harmonization , WCO, 2007.

11.3   Other resources

11.3.1   UNECE Single Window Repository

The UNECE Single Window Repository currently has 12 case study reports available as well as links to other single window resources:

http://www.unece.org/cefact/single_window/welcome.htm.

11.3.2   International Supply Chain Reference Model (ISCRM)

Information about ISCRM, including electronic modelling files in EAP format, is available from the UNECE web pages:

http://www1.unece.org/cefact/platform/display/TBG/TBG14.

11.3.3   WCO single window guidelines

WCO has a website discussing single window implementation issues, which also contains a link to the WCO Data Model on Single Window Data Harmonization: http://www.wcoomd.org/sw_overview.htm.

11.3.4   SafeSeaNet

SafeSeaNet was established in Europe to exchange safety and security information between port States. More information can be found at:

https://extranet.emsa.europa.eu/index.php?option=com_content&view=article&id=70:ssn-main&catid=103&Itemid=114.

11.3.5   Maritime Navigation and Information Services (MarNIS)

The MarNIS project was partly funded by the European Commission in order, among other things, to improve efficiency and reliability of maritime information management systems. The project has done extensive studies into these areas and many of the reports are publicly available.

Some of the documents that may be of most interest are tabulated below.

Document code	Description
D1.3D1	State of the art (from 2004) on EPC initiatives, standards and standardization organizations. Most of the information in chapter 10 is taken from this document.
D1.3G	Description of a possible implementation of an EPC system. May be used as starting point for new designs.
D1.3H	Analysis of ship reporting requirements in a number European ports (arrival and departure). May be used to do a similar mapping in own ports.

Table 8 — Documents of interest

ANNEX A

BEST PRACTICES

ANNEX A.1

Single Window of Republic of Korea

1.   Background

In the early 1990s, a national project was elaborated to enhance the public sector's work. This entails changing the paper-based process into an electronic (EDI) process. In addition, the Government of the Republic of Korea has implemented and provided web-based systems for the sector's convenience since the late 1990s. In so doing, the Republic of Korea has launched e-business for the clearance of ships through electronic technologies (EDI and web systems). Based on these environments, the Republic of Korea launched a single window service in 2004, bringing together several national Government agencies.

2.   Challenges of the single window

(a) Little or no cooperation between Government agencies owing to varying work styles.

(b) Less consistency of laws and policies related to logistics and transportation.

(c) Duplication of requests for the same or similar contents owing to individual organizations' processes.

(d) Low reusability of resources due to little or no association between logistics entities.

(e) High level of discontent among users owing to inefficient processing of individual organizations' officers and to lack of association between and lack of integration of Government systems.

3.   Strategy

(a)   Strengths
  -      Powerful leadership of the Government of the Republic of Korea
  -      Recognizes the importance of national logistics business
  -      Shares the vision of a national logistics plan for the public sector as well as the private sector
  -      Set up the outstanding strategy for national logistics

(b)   Subject
  -      Work process standardization
    ▪   Merge or remove steps covering duplicate or similar processes
    ▪   Set up seamless logistics flow plan (policy) between logistics hub or logistics entities
    ▪   Modify laws and policies related to logistics
  -      Implementation of single-entry-point service
    ▪   Provide user-oriented one-stop service for the logistics business
    ▪   Improve user convenience by system and network upgrade

- ▪ Consolidate connectivity between Government agencies and logistics entities or related organizations
  - Information linking and common use
    - ▪ Enhance information distribution functionality with information common use
    - ▪ Improve the accuracy of logistics planning for a timely transportation environment
  - Promote work automation or systemizing the private sector
    - ▪ Propose new technology to the private sector
    - ▪ Set up the strategic plan and construct a system
  - (c) Related organizations and documents
    - The number of Government organizations that adopted the single window is 12, which includes authorities related to ports, customs, rail, immigration and quarantine. They cooperated to build the SP-IPC (Shipping and Port Internet Data Centre).
    - Documents analysis
      - ▪ Analyse the export-/import-related documents in order to set up form consolidation

- ▪ As a result, the Republic of Korea analysed approximately 130 documents (including electronic and paper documents), such as the general declaration (FAL Form 1), manifest (FAL Form 2), crew and passenger list (FAL Form 4), dangerous cargo manifest (FAL Form 7), export and import cargo report, container discharging and loading report and container gate in/out report
      - ▪ Perform document simplification and unification for the analysed documents (similar or same documents)

4.   Single window construction

- • The Republic of Korea single window is called "SP-IDC", which stands for Shipping and Port Internet Data Centre. SP-IDC supports a single-entry-point service and also provides global or domestic maritime information to users in the Republic of Korea. In summary, SP-IDC is an information and operating system that processes user-request operations (input) through a single entry point
- • The characteristics of SP-IDC are the following;
  - User-oriented service viewpoint for domestic export/import business
  - Enables access through a single entry point
  - Provides customer service for authorization and permission
- • Provides connectivity with other Government agencies
  - Distributes electronic documents to the related organizations, such as customs and immigration.
  - The primary protocol is SOAP (standard) and the second is TCP/IP. The protocol is determined depending on each organization's environment.

- Service Configuration
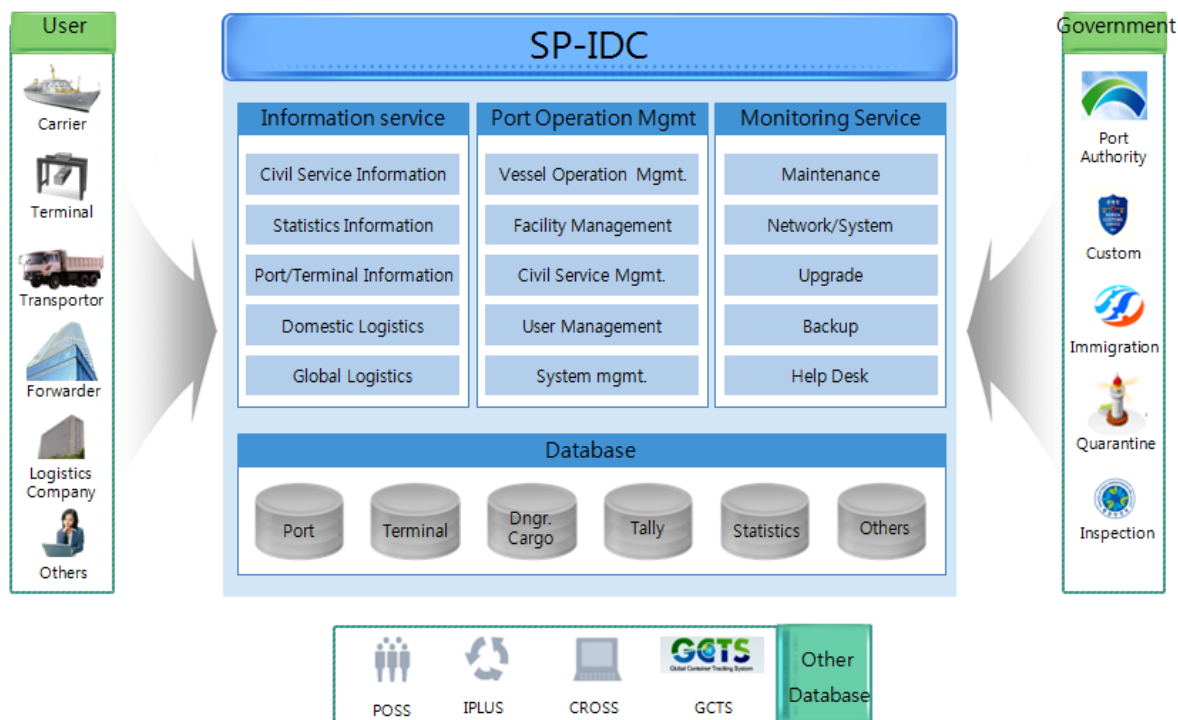
- Basic function of SP-IDC
  - Port operation management
    - Vessel Operation Management: Vessel arrival/departure notice (ocean-going/coastal), Crew/passenger list, Vessel security information and Vessel arrival/departure approval (ocean-going/coastal)
    - Facility Management: Request/Approval for facility use, Facility use records
    - Civil Service Management: Vessel particulars report/approval, Port-MIS application/approval, Company registration/approval, Customized information and application send/receipt status notification
  - Information service: provides statistics, Logistics information, tally information, etc.
  - Monitoring service: System/network maintenance, upgrade, help desk, backup, etc.

- Construction Process

The following is the national construction process released by the Government of the Republic of Korea. Therefore, the Government of the Republic of Korea had applied the following steps to build SP-IDC.

Analyse	Strategy	Service model
○ Current status of work 　- Organization 　- Paper document 　- Electronic document 　- Requirement ○ Laws policy ○ Information system 　- System status 　- Resource 　- Network environment	○ Work process standarization ○ Constructs single entry point ○ Information linking and common use ○ Press work automation and systemizing	○ Design single window service model 　- Work logic 　- System architecture 　- e-document 　- Implement methodology

	Operating	Implementation
	Single Window of the Republic of Korea	○ Construct single window ○ Enhance work flow and information system of each organization

5.　Expected benefits

(a)　Qualitative effects

- Minimizes double declaration and increases work efficiency with a single entry point

- Reduces work processing time and costs to users as well as Government agencies

- Secures and maximizes national competitiveness

- Enhances convenience and interoperability through the unification and standardization of forms

- Solves information disruptions through information linking and common use

- Raises accuracy in demand forecasting logistics lead time is reduced

- Enables transparent policymaking

(b)　Quantitative effects

- Work innovation: Reduce about USD 7.8 million thanks to the enhancement of logistics work through process and form unification

- Public service: Reduce about USD 5 million per year though e-documents and single window

- In particular, it reduce about USD 1 million per year in the maritime transport area

- Example: transport and transhipment

Reduce processing time from 13 hours, 30 minutes, to 3 hours, 37 minutes.

As a result, work efficiency improves by about 80%.

Annex A.2

The Netherlands

The Dutch maritime single window envisages streamlining the transmission of data in the maritime sector between trade and Government agencies, reducing the administrative burden and coordinating feedback from Government agencies to trade. The main results should be trade facilitation and more effective and efficient Government action.

The starting point for the maritime single window should be, as far as possible, compatible with that for a single window for air transport and consecutive inland transport and should be attainable for all actors in the supply chain.

Any single window remains within the responsibility of Government but must be developed in cooperation with trade partners.

The maritime single window in the Netherlands involves combining lots of already existing initiatives and partial solutions and systems, like information technology systems and coordinated border-management initiatives. Only should be done what is necessary and what is advantageous based on a cost-benefit analysis.

The maritime single window in the Netherlands is applicable to means of transport, goods and persons; aligns sea and inland transport; is part of a larger supply chain; and is an intelligent window that consists of four stages. Founding the single window on these stages facilitates management, research and implementation.

Stages of the maritime single window

The oval represents the supply chain (in this case sea–inland transport and vice versa)

Border crossing

producer   single window   consumer

1   2   3   4

data   single portal   single risk management   One stop shop
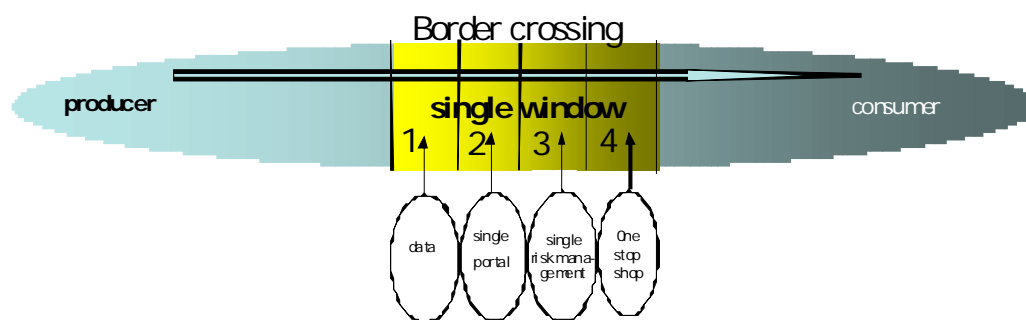
Annex A.3

Japan

Introduction

1   In 1999, an electronic applications system of arrival and departure procedures etc. for port administrators and harbour masters (hereinafter referred to as the "Port EDI system") was completed and launched. Electronic application systems for customs, immigration and quarantine etc. were respectively developed for the promotion of electronic applications. In 2003, the "Single Window of import/export and port-related procedures" (hereinafter referred to as "the First Single Window") was realized, and was the first of its kind in the world. The First Single Window is a system that connects electronic systems for customs, the Port EDI system and crew landing permit support systems to one another. (The crew landing permit support system was developed for the realization of the First Single Window).
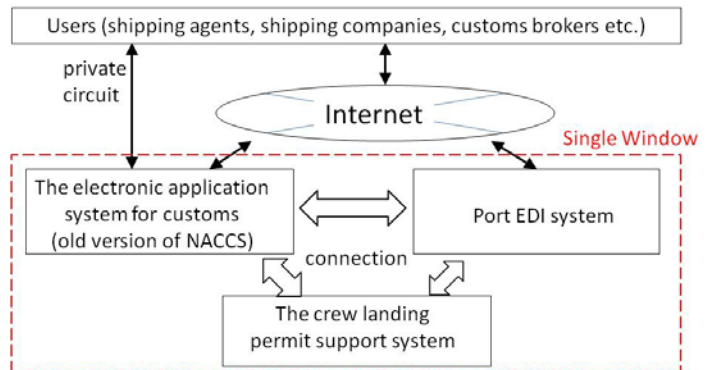
Figure 1 — First Single Window

2   However, the separate development made it difficult for users to use these systems — except for the First Single Window — because users were required to access each system and to input the same items individually. Therefore, the systems were requested to allow users to submit documents of port-related procedures to many port-related Government offices in only one single transaction without inputting similar items several times.

3   In 2008, the Port EDI system and the electronic application system for customs were integrated on the demand of users. (Hereinafter, the integrated system is referred to as the "NACCS system"). In addition, the Inter-Ministerial Common Portal (unified electronic application single window) was set up to facilitate connections to the electronic application systems of plant and animal quarantine. As a result, the single window was accomplished in Japan (hereinafter referred to as "the Next Generation Single Window"). After accomplishing the set-up of next-generation single windows, things became very convenient for users because it became possible to submit applications to all port-related Government offices at one time through one single transaction. This document describes the concept behind the port-related procedures system (NACCS system).
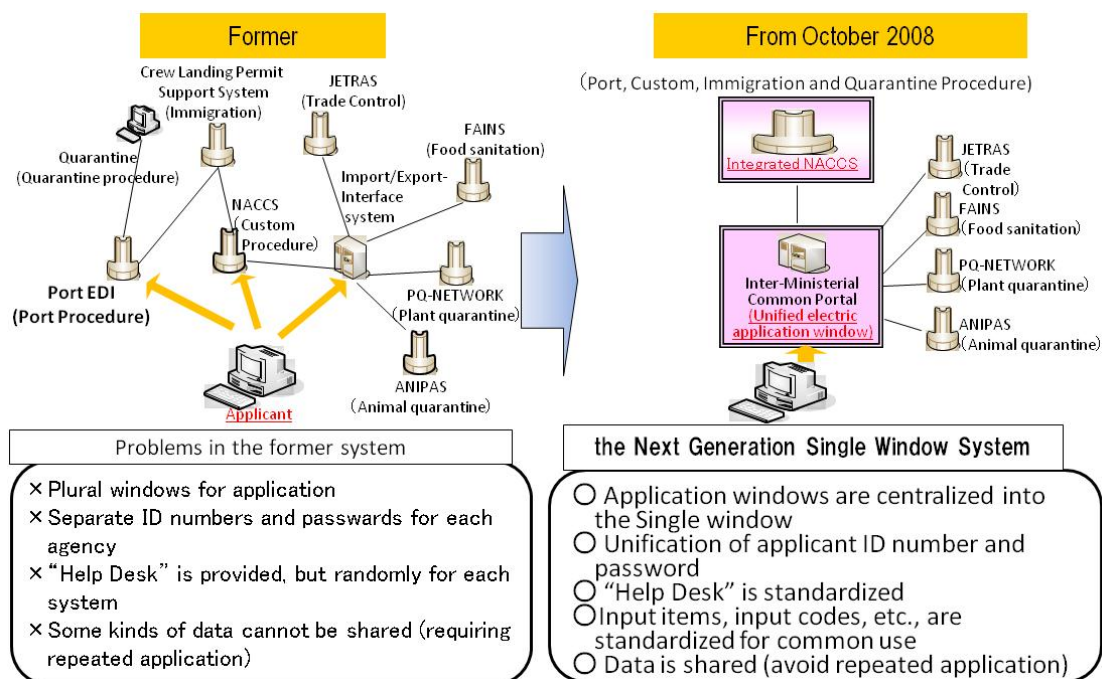
Figure 2 — Changes in systems for port-related procedures

Port-related procedures in Japan

4   The NACCS system is used by many types of users (for example, shipping companies, shipping agents, customs brokers and terminal operators, etc.). Electronic applications by these users are submitted to each port-related Government office through the NACCS system. In the NACCS system, users input one form and send it; after that, each port-related Government office receives these applications at the same time in one single transaction. Each port-related Government office then sends responses, including permissions etc., through the NACCS system.
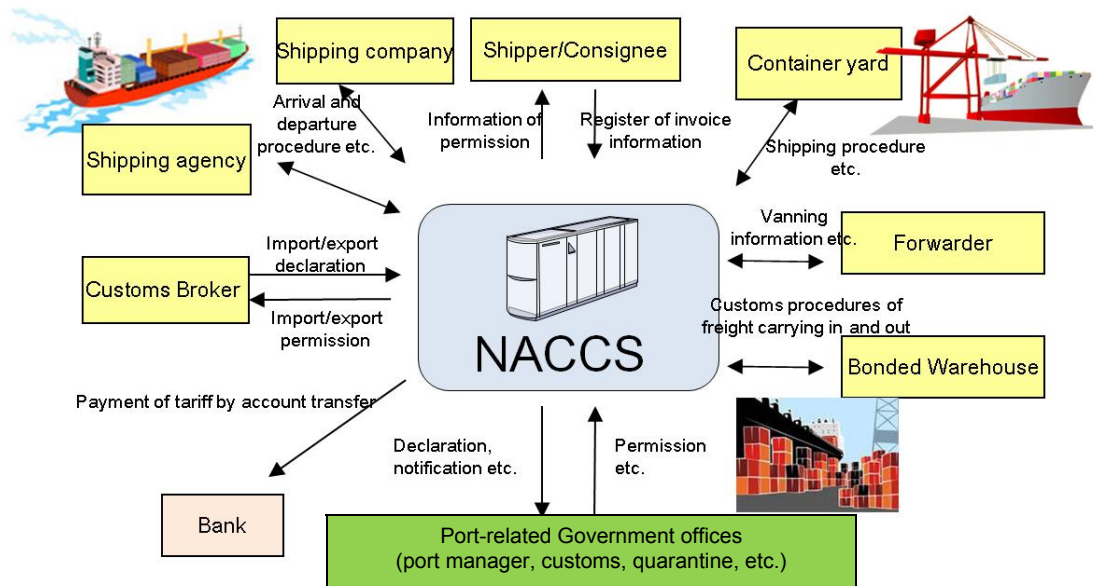
Figure 3 — Processing scope of NACCS system

5   In 2005, port-related procedures were simplified as follows along with the conclusion of a FAL treaty by Japan, before the NACCS system was developed.

- Arrival/departure procedure documents etc. were streamlined from 16 types (Japanese formats) to eight types (FAL formats).
- Pre-arrival procedure documents that were not in FAL formats were streamlined from eight types to a single type.
- The number of input items of port-related procedures was greatly reduced, from 600 to 200.

Also, with regard to electronic applications that make use of the NACCS system, the United Nations Standard Message (UNSM) in relation to FAL forms are as follows.

- FAL form 1: General Declaration→CUSREP
- FAL form 2: Cargo Declaration→CUSCAR
- FAL form 3: Ship's Store Declaration→CUSCAR
- FAL form 4: Crew's Effects Declaration→ PAXLST
- FAL form 5: Crew List→PAXLST
- FAL form 6: Passenger List→PAXLST
- FAL form 7: Dangerous Goods Manifest→ does not correspond with IFTDGN
  *United Nations correspondence forms are sent in a different way from the UN/EDIFACT message.

The policy efforts taken towards electronic applications, a single window and simplification of port-related procedures have helped to simplify and speed up port-related procedures.

The features of port-related procedure systems in Japan

6   The features of port-related procedure systems (after the Port EDI system and the electronic application system of customs were integrated) are as follows:

.1   High degree of convenience
- Anyone can submit applications from anywhere through the Internet after he/she registers to become an administrator of the NACCS system.
- It is not necessary for users to submit applications by both paper and the NACCS system because of the systemization of all basic port-related procedures. (This system covers all basic procedures including arrival/departure procedures, mooring facilities and cargo-handling equipment.)
- As a result of the integration of the Port EDI system and the electronic applications for customs, computer systems and passwords were integrated, alerting users to the fact that the NACCS system is a single window system.
- It is possible for users to utilize past input records; consequently, the procedures have become very efficient.

.2   International issues
Compliant with:
- FAL formats
- Permit applications for mooring facilities and ship security information, which are not regulated under the FAL format
- UN/EDIFACT
  (International Standard)

.3   Wide-ranging application targets
- 104 important ports in Japan
- Domestic/International ships

.4   High cost-performance
- The cost of operation is inexpensive because new system is fully integrated as a system

(After integrating the Port EDI system and the NACCS system, the operational cost fell by 30% or more.)

Future developments

7   With regard to the NACCS system, in addition to port-related procedures between businesses and Government, work has been under way to facilitate information-sharing between businesses (for example, systemized booking registration information by shippers, etc.). Through these efforts, the NACCS system has progressed in terms of its performance, and is expected to be positioned as a total logistics platform. In addition to the above, efforts are being made to further enhance efficiency in international logistics in ports.

8   In the future, there are hopes to establish a perfect integrated system by integrating the NACCS system and the electronic application systems of plant and animal quarantine, etc.

Annex A.4

Norway

Introduction

1   Ships entering Norwegian waters and ports are required to report arrival and departure information to several national governmental agencies. The execution of these reporting requirements is time-consuming both for mariners as well as for shore-based personnel.

2   In 2002, a Community-wide vessel traffic monitoring and information system called SafeSeaNet (SSN) was established in Europe through the European Union. The Norwegian Government appointed the Norwegian Coastal Administration (NCA) to coordinate the development and implementation of the national component of this EU-wide system. Accordingly, the SafeSeaNet-Norway ship reporting system was established in 2005.

3   The establishment of SafeSeaNet Norway as a national ship reporting system was the first step towards simplifying reporting and information flow between ships and shore-based facilities in Norway.

SafeSeaNet Norway; the single window portal for ship reporting

4   The United Nations Economic Commission for Europe has described "single window" as "a system that allows traders to lodge information with a single body to fulfil all import- or export-related regulatory requirements" (ECE/TRADE/324).

5   The development of SafeSeaNet Norway has been implemented as closely as possible to the above-mentioned definition. However, current implementation emphasizes regulatory reporting requirements (Electronic Port Clearance[2]) more than fulfilling information requirements related to international trade.

6   Arrival, departure and HAZMAT reporting requirements are applicable to all SOLAS Convention ships (passenger ships and cargo ships of 300 GT and upwards) entering Norwegian territorial waters with the intention of crossing the Norwegian baseline or entering a Norwegian port. Currently the system handles on average over 7,000 ship reports every month.

7   SafeSeaNet Norway enables Norwegian governmental agencies to receive, store, retrieve and exchange information reported by SOLAS Convention ships in national waters. In broader terms the system contributes to maritime safety as well as port security and logistics.

8   Since the establishment of SafeSeaNet Norway, a process of replacing traditional, non-electronic national reporting schemes, such as those related to customs, border control and port State control, has been initiated in order to make ship reporting more seamless and smooth for all stakeholders involved. The inclusion of notifications relating to customs and border control also requires non-SOLAS ships to report through SafeSeaNet Norway.

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[2]   The term EPC is used as an abbreviation for a single window solution for the electronic clearance of ships arriving at or departing from a port. EPC will not normally include cargo clearance for import or export.
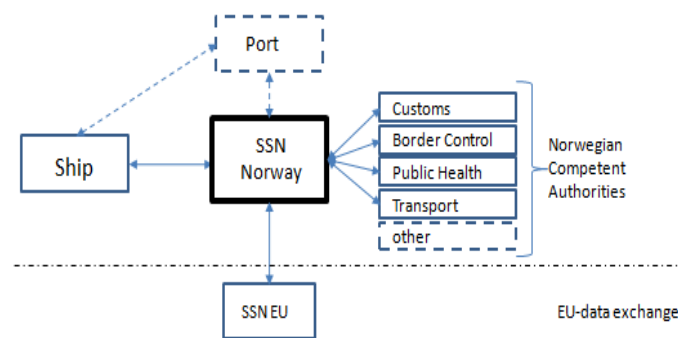
Figure 1 — General architecture of SSN-Norway

9   Figure 1 illustrates the information flow between ship and port via SafeSeaNet Norway and the information distribution to other Norwegian governmental agencies.

10   There is international consensus that there is a need to set up national maritime single windows, taking into account and building upon existing standards. The development of SafeSeaNet Norway takes into account the European Union's efforts to progress and align development of single windows within European Union countries, including the exchange of reported data between countries. These efforts are primarily concerned with the Electronic Port Clearance (EPC) of the ship as a transport means, and less with the trade- and cargo-related issues.
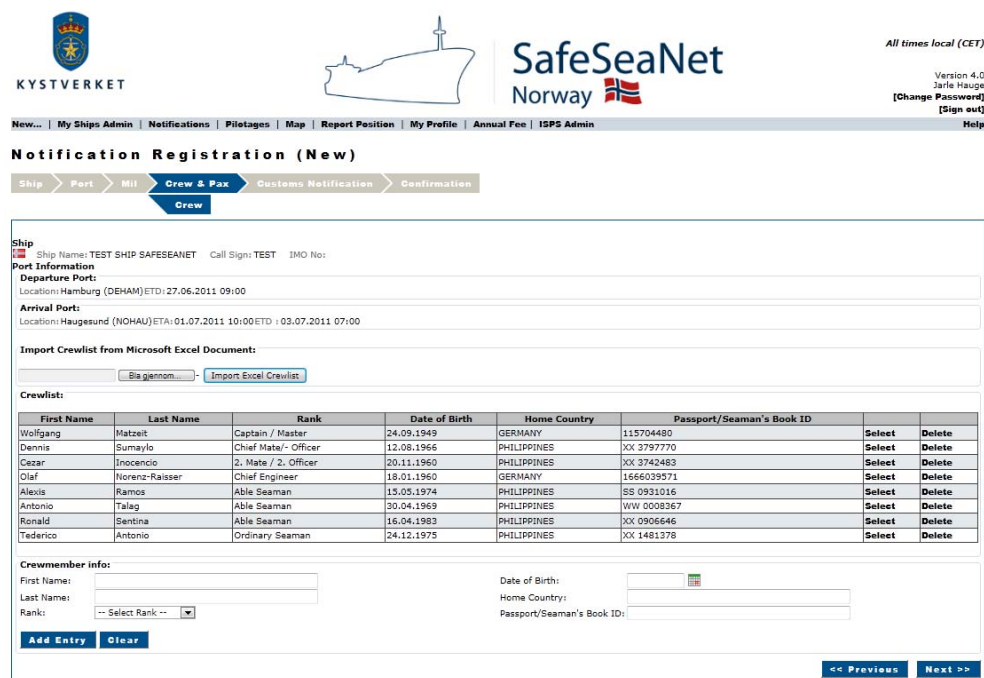
11   Norway views single window systems as future components of the IMO e-navigation concept. Thus the development of SafeSeaNet Norway will take into account the IMO e navigation process.

The involvement of governmental agencies

12   Since the national reporting system was established, NCA has continuously encouraged other governmental agencies to participate in the NSW, and to implement their reporting requirements using SafeSeaNet Norway. Through SafeSeaNet Norway, information reported by ships is distributed to the relevant governmental agencies according to their mandatory reporting requirements.

Mandatory pre-arrival declarations to Norwegian Customs were launched in SafeSeaNet Norway in January 2011. Prior to the transition, Norwegian Customs annually received and processed approximately 180,000 paper-based pre-arrival declarations. The integration of electronic reporting into SafeSeaNet Norway eases the administrative burden for Norwegian Customs personnel, mariners and agents. Electronic notifications also provide Norwegian Customs with relevant vessel information at an earlier stage, giving the agency more time to organize and plan operations in Norwegian waters.

An example of the reporting interface is shown below in Figure 2. This shows the interface for the collection of customs declarations where the users have an option to upload a prepared file containing crew information or enter the same information manually.

Figure 2 — SSN Norway Customs interface

13   In January 2011, NCA and the Norwegian Maritime Directorate launched electronic port State control (PSC) pre-arrival notifications in SafeSeaNet Norway.   Inclusion of PSC notifications represents another step towards more efficient ship reporting and information flow between ships and shore-based facilities.

SafeSeaNet Norway — further development

14   At present, NCA cooperates with the Norwegian Police Directorate to include border-control reporting requirements, containing crew and passenger information, in SafeSeaNet Norway.   Also, in cooperation with Norwegian Defence Forces, NCA is now finalizing the implementation in SafeSeaNet Norway of ship reporting requirements prior to entry into Norwegian waters.

15   SafeSeaNet Norway is now being utilized beyond its original intended purpose because of its ability to receive, store, retrieve and exchange information. This is exemplified by the Norwegian Climate and Pollution Agency, which currently uses derived information to monitor for the potential illegal transport of hazardous waste in 160 port terminals. Also, the Norwegian Radiation Protection Authority and the Norwegian Coast Guard are utilizing SafeSeaNet Norway for accident prevention and maritime safety and security within the Norwegian waters. Statistical functions have been established to meet both national and international needs and demands for specific types of information.

Conclusions

16   Experience during the past few years indicates that SafeSeaNet Norway has become an important information platform for several governmental agencies by removing paperwork, simplifying information flow and reducing the need for telephone and facsimile exchanges.

17   Norway intends to continue developing SafeSeaNet Norway until all maritime ship reporting required by all relevant Norwegian agencies is fully consolidated and electronic. The development will be based on the needs of onboard and onshore users as well as mandatory reporting requirements.

Annex A.5

Israel

Background

An epic poem drawn from Greek mythology recounts the travels of Jason and the Argonauts, his fellow travellers and the crewmembers of the **Argo** in their quest to retrieve the Golden Fleece for King Pelias.

Other legendary figures of the ancient world travelled with Jason aboard his ship, among them the great Heracles, famed for his physical prowess, and Orpheus, who was renowned for his musical talent.

The story of the Argonauts and the Golden Fleece is described in the works of several authors and mentioned in passing by others.

The number of crewmembers who manned the **Argo** differs among the various accounts:

- Apollonius Rhodius, who lived in the third century BCE, proclaims that there were a total of 64 crewmembers.

- Diodorus Siculus, a Greek historian of the first century BCE, sets the number at 54.

- Apollodorus of Athens, an erudite Greek living in the second century BCE, claims that there were only 45 crewmembers.

The reason for these discrepancies is, naturally, the lack of an official, definitive crewmember manifest such as the **IMO FAL Form 5**.
This may be owing to the fact that it was not until 1948 that IMO was established (then IMCO, or the Inter-Governmental Maritime Consultative Organization).

IMO Crew List

| ☒ Arrival | ☐ Departure | Page number 1 |

1.1 Name and type of ship Argo 1.2 IMO number 0001 1.3 Call sign yahoo!	2. Port of arrival/departure Colchis	3. Date of arrival/departure once upon a time B.C
4. Flag state of ship Greek	5. Last port of call Iolkos	6. Nature and number of identity document (seaman's passport)

7. Number	8. Family name, given names	9. Rank or rating	10. Nationality	11. Date and place of birth	
1	Jason son of Aeson	admiral	Greek	Iolkos	111-leather, human birth certificate
2	Tiphys son of Hagnias	steersman	Greek	Boeotia	222-clay, human birth certificate
3	Orpheas son of Oeagrus	musician	Greek	Thraece	333-Parchment, human birth certificate
4	Hercules son of Zeus	prow-officer	Greek	Theba	444-Unknown material, Olympus birth certificate
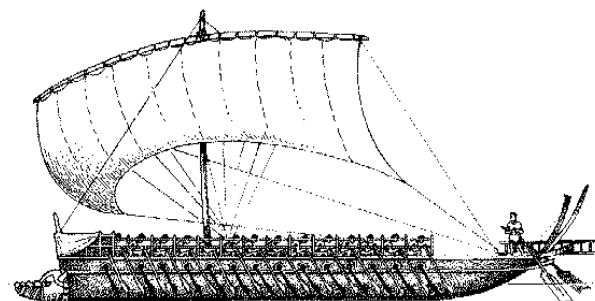
Problems with the existing method

- The ship's agent had to transmit the data to about five separate authorities, a step that then had to be repeated by the captain.

- The process was rife with errors (unintelligible handwriting, typographical errors, misspelled names, etc.). This sometimes led to cases where an individual would be registered several times in the system and under a different name at each port.

- Checking a seaman's history was problematic owing to the aforementioned inaccuracies in the data.

- If a seaman had several credentials (e.g. passport, seaman certificate), the system would fail to identify him as a single individual and would store his personal data twice.

- Identification was done visually (using photographs): an unreliable process.

- Papers were also inspected visually, so that forged papers could easily pass as authentic.

The solution

- A nationwide system that documents all seamen that arrive in the country.

- The advance reception of crewmembers' personal information via electronic communication.

- The one-time transmission of the data and the subsequent distribution of the information to all relevant authorities through MAINSYS (Port Community System).

- Seamen undergo a biometric inspection, and their paperwork is checked electronically by means of a mobile kit (stored in a suitcase) on board the ship.

- New seamen are enrolled while still aboard the ship.

- The distribution of data regarding the seamen to all the country's ports.

- Shore passes are issued and biometric inspections are made at the port gates whenever a seaman enters or exits the port.
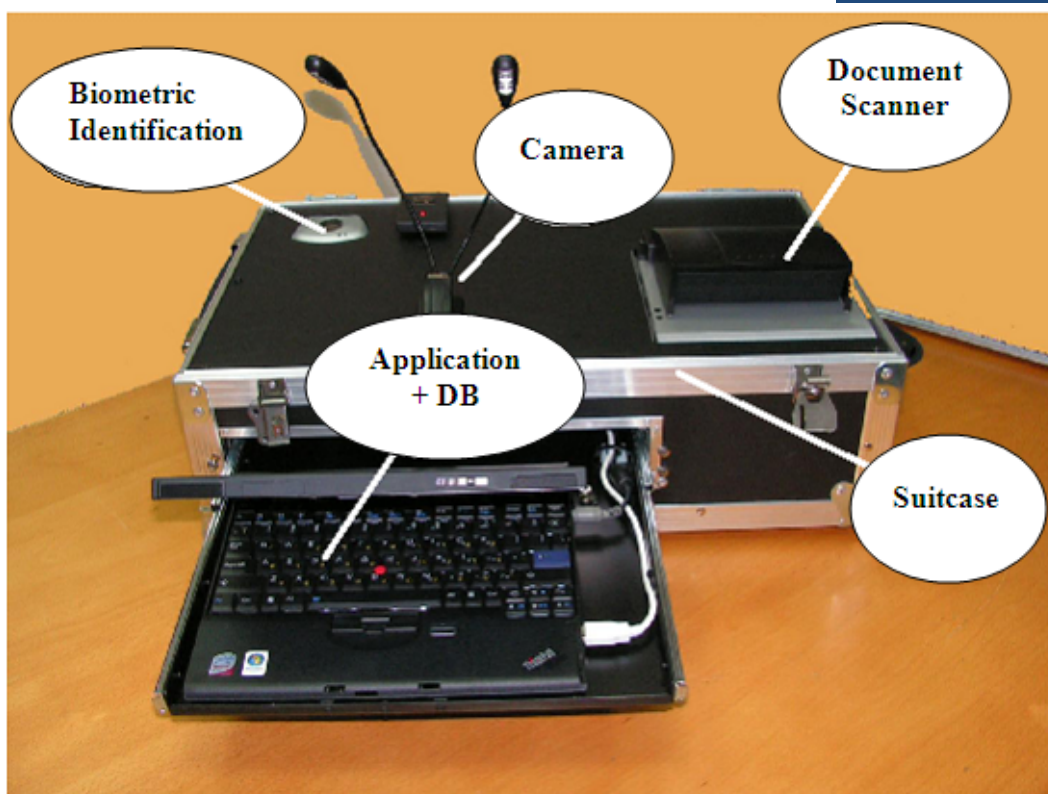
A schematic depiction of the system

<u>System Typology</u>
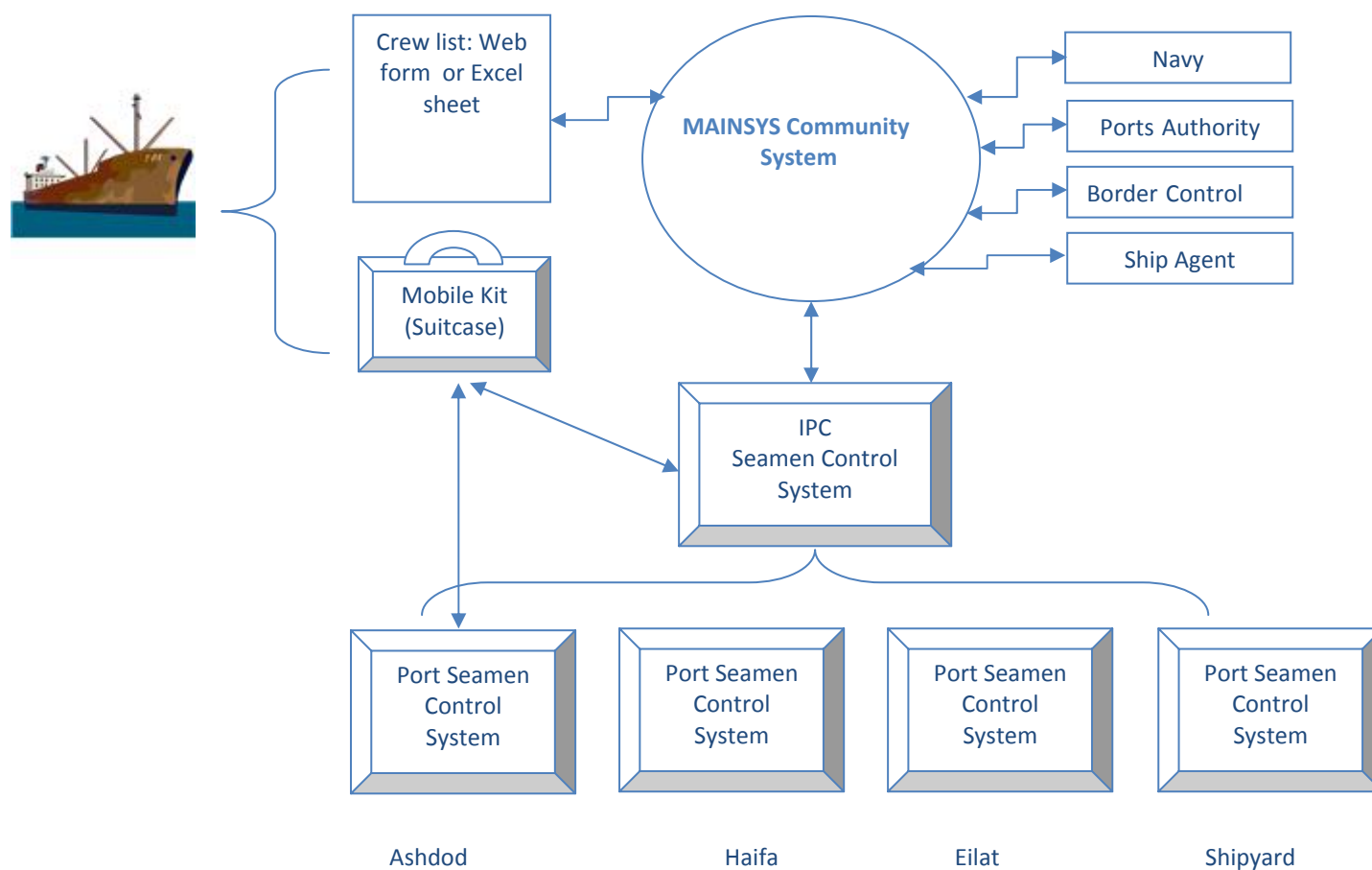
<u>Mobile Kit (Suitcase)</u>

**The combined system consists of the following modules:
An IMO crew list module, and a seamen control system.**

The IMO Crew List module:

- The captain reports his crew members by means of an integrated Microsoft Excel file that is sent by e-mail to MAINSYS. This minimizes satellite communication expenses.

- Using an Internet-based screen, the captain files a crewmember manifest directly to MAINSYS. This minimizes the potential for errors, since online logical validation algorithms are applied to the incoming data.

- Afterwards, the ship agent, the navy and other relevant authorities receive an automatic e-mail notification that the report has arrived. Using MAINSYS, they can read the computerized crewmember report and approve it. At the same time, they receive the data via electronic transmission and are able to store it in their systems.

- A computerized electronic report transmission of the crewmember manifest is also sent to the Seamen Control System, which loads it into its database. Thus, the list is already available to the inspectors when the crewmembers undergo the onboard security checks.

The Seamen Control System:

- **Seamen and ships management module**: responsible for managing the seamen and ships whose records are stored in the system.

- **Crew reporting module**: responsible for transmitting crewmembers' personal data from the seamen reporting system to the Seamen Control System.

- **Biometric module**: a technological module responsible for managing the system's fingerprints database.

- **Image acquisition module**: a technological module responsible for acquiring imagery obtained from the mobile suitcase.

- **Document acquisition module**: a technological module responsible for acquiring new documents by means of a designated program for scanning.

- **Interface with ships system module**: a technological module allowing communication with the port's ships system.

- **Reports module**: a module that allows users to generate reports based on various criteria.

- **Shore pass production module**: a module capable of issuing shore passes for seamen.

- **System management module**: a module responsible for managing users and system definition tables.

Results achieved

At the current stage, most of the improvements are concrete and evident in the work process. Economic gains will be evaluated at a later stage.

- A nationwide system that documents all seamen arriving in the country.

- Early reception of information about the seamen through electronic transmissions.

- Single transmission of data and the subsequent distribution thereof to all relevant authorities using MAINSYS (Port Community System), which improves efficiency and prevents mistakes.

- An onboard biometric inspection process for seamen and electronic inspection of documents, using the mobile kit (suitcase) on board the ship.

- Onboard enrolment of new seamen.

- Distribution of seamen information to all ports in the country.

- Production of shore passes and biometric inspections at the gates of any port whenever a seaman passes (entering or exiting).

Obstacles overcome

- The conservativeness of several authorities, which made it difficult to introduce new methods for reporting crewmembers.

- Difficulties in quantifying benefits when it came to data quality and examinations.

- Some of the authorities have yet to install community interfaces.

- Satellite communication from ships is costly.

- Quality of data in the file transmitted by e-mail.

- The necessity of technical solutions for synchronizing the inspection systems of the various ports (the databases stored in the mobile kits are not always connected to the network).

- Integration of physical aspects of the seamen inspection into a suitcase that can be carried manually onto a ship.

Quantifiable Data

Number of seamen currently recorded in the national system:	20,000
Average number of seamen per ship:	15
Number of ships visiting each port daily:	10-20
Number of mobile kits in use:	9

Technology

- A designated suitcase that contains a computer, camera, document scanner and printer. The suitcase's relatively light weight makes it easy to scale a ship's ladder while carrying it. The suitcase is impermeable to water and buoyant. A built-in power supply allows it to operate for an entire shift without an external power source.
- A designated program for scanning and checking passports. The software can identify passports from all over the world, and is capable of recognizing forgeries.
- Biometric identification technology capable of operating under rough conditions (oily hands, etc.).
- Software and technology for synchronizing scattered Oracle databases and the databases of the mobile kits.
- The integration of external Microsoft Excel files arriving via e-mail at the MAINSYS Cyber Ark electronic safe system, and the generation of feedback in case of erroneous data.
- Technology that can be accessed from an Internet platform.

In summary

The journey of the Argonauts, which lacked crew reporting processes and onboard biometric inspections, took place in a world where mundane sorcery and divine intervention were a continuous source of disruption to otherwise carefully drawn-up plans. Nowadays, in a world facing the threat of terrorism, data quality and technological efficiency are vital components of professional and effective crewmember inspection.

ANNEX B
An example of methodology details

Republic of Korea

1 Basic principle to be applied

1.1   A possible methodology is based on the underlying principles of a recently developed information technology called service-oriented architecture (SOA). SOA is a software design methodology for implementing an information system comprising interoperable, reusable services. In other words, SOA implements a distributed information system so that services can be discovered and used within multiple, separate subsystems across several business domains. Flexibility is enhanced through the loose coupling of services. Interoperability is enhanced across heterogeneous software applications by using a well known standard for defining and accessing these services.   That combination, flexibility and interoperability enables agile adaptation to rapidly changing business environments. This technical methodology covers the overall process and method for implementing a single window. It is a technical methodology for design, implementation and operation of a single window system for maritime transport business in a detailed manner.

1.2   This annex contains technical guidelines proposing a methodology for the design, implementation and operation of a single window system for maritime transport. Since the single window system is a software system, this methodology is based on a well known development process. That process has five phases: planning, analysis, design, implementation, testing and delivery. These phases are shown in figure 1, which also shows the detailed tasks for each of the five phases.

Plan	Analysis	Design	Implementation	Test and Delivery
Analyze of Current System Environment	Work and BP Analysis	Service Definition	Setup implementing environment	Test
Setup system development plan	Current System Analysis	Architecture Definition	Component Implement	Trainning
	Single Window Model Analysis	Component Design	Interface Implement	Delivery
	Define the requirements	Interface design	UI Implement	
	Extracts the advanced items	Interface design	Service Implement	

Figure 1 — Single window service development and implementation methodology

2 Methodology: detailed specification

2.1 Planning

No.	Phase	Task	Remarks
1	Understand system environment	• Understand environment related to system development • Identify functions, interests and issues of each entity	
2	Establish development plan	• Establish development schedule • Form a project team • Define roles of team members	

2.2 Analysis

No.	Phase	Task	Remarks
1	Analyse business and business process	• Analyse existing target business and business process • Conduct UseCase modelling • Derive services and processes to be implemented • Identify functions, interests and issues of each entity	Analyse and list business flows occurring in maritime transport such as customs, inspection, transport, storage and port arrival/departure
2	Analyse current system	• Analyse existing information systems • Analyse their functions and interests	• Analyse current information system by entities and points • Understand issues and requirements • Define information improvement tasks
3	Analyse single window model	• Analyse single window model • Analyse best practice cases	• Set application scope based on country's environment (business, law, informatization, etc.)
4	Define requirements	• Collect requirements: stakeholder interview • Derive system requirements	• Survey of Government agencies and users • Define by dividing by business areas
5	Derive improvement measures	• Derive issues and improvement points for current processes • Derive major issues through the analysis of requirements • Derive improvement measures and tasks	• Target model is a single window system • Analyse gap with target model • Identify measures to minimize the gap

2.3 Design

No.	Phase	Task	Remarks
1	Define services	• Define business processes as services • Design services to be implemented	• There exist such business services as port arrival/departure, cargo report, etc. • There exist such application services as document relay, document conversion and document retrieval for business services
2	Define architecture	• Design software architecture • Select base framework • Design overall system architecture, components, modules and database	• Measure to encapsulate components • Measure to reuse components • Selection of programming language
3	Design component	• Design components by independent functions • Define relevant component specification • Define in detail up to class level	
4	Design interface	• Define parameters exchanged between components • Define and design interchange interface	• Need to define interface among internal modules or with external organizations
5	Design user interface	• Define and design user interface • Design in a web-based environment	• The goal is to maximize user convenience and accessibility • Guarantee scalability by applying advanced web technologies

2.4 Implementation

No.	Phase	Task	Remarks
1	Establish development environment	• Select development environment and tools • Configure database, web environment • Define development methodology for shared work	• Development methodology: define program naming, parameter naming, annotation processing method
2	Implement component	• Implement component by unit function • Implement web in such a way as to interoperate with server component	• Correct syntactic errors on source codes and compile errors • Runtime errors are corrected at the time of unit test

No.	Phase	Task	Remarks
3	Implement interface	• Implement according to interface design specification • Interconnect relevant components	
4	Implement user interface	• Design screen and interconnect with components after implementation	
5	Implement service	• Assemble business components and data modules • Service assembly and implementation according to business requirements	• The goal is to maximize user convenience and accessibility • Guarantee scalability by applying advanced web technologies

2.5   Testing and operation

| No.	Phase	Task	Remarks
1	Test	• Establish test plan • Conduct unit test • Conduct combined test	• Correct unit module errors through unit test • Measure fulfilment of requirements and performance through combined test
2	Training	• Develop a guide for system user and operator • Train users and operators	
3	Operation	• Install in a running system	

3 Methodology deliverables

No.	Phase	Activity	Task	Deliverables
1	Plan	Understand system environment	Identify relevant systems	Analysis of existing systems
		Establish development plan	Team formation, division of labour and development schedule	Development plan
2	Analysis	Analyse business and business process	Analyse current businesses business modelling	Business analysis report Definition of business
		Analyse current system	System analysis	System analysis report
		Analyse single window model	Analysis of single window model Analysis of best practice cases	Report on the analysis of single window model Report on benchmarking cases
		Define requirements	Stakeholder survey Stakeholder interview Requirements specification	Survey result Analysis report on interview Requirements specification
		Derive improvement measures	Define future model	Definition of future model
3	Design	Define services	Service specification Service design	Service specification Service design
		Define architecture	Architecture specification Architecture design Database design	Architecture specification Architecture design Database design
		Design component	Component specification Component design	Component specification Component design
		Design interface	Interface specification Interface design	Interface specification Interface design
		Design user interface	User interface design User interface design	User interface design User interface design
4	Implementation	Establish development environment	Define development environment	Definition of development environment
		Implement component	Implement components	Components codes
		Implement interface	Implement interface	interface codes
		Implement user interface	Implement user interface	User interface codes
		Implement services	Implement services	Services implementation codes
5	Testing and operation	Testing	Prepare test cases Conduct unit test Design combined test Conduct combined test	Test cases Result of unit test Combined test specification Result of combined test
		Training	Prepare user manual Prepare operator manual Train users Train operators	User manual Operator manual Report on user training Report on operator training
		Operation	Takeover test System release	Result of takeover test Report on system release

4   System architecture

4.1   System architecture

In principle, a single window system for maritime transport business should be independent of hardware systems, scalable in its structure, and, to the extent possible, reusable. It must also define all the necessary business processes and low-level functions as simple service components. These components are stored in a service repository. They can be used as is, or composed (assembled) into more complex services as needed. Users and other organizations can access this repository using standard communication protocols such as TCP/IP, HTTP, web service and SMTP. If the single window system is developed as a web-based system, which is our recommendation, it will contain a web server. To process the data transmitted to a single window system from this server, we recommend an enterprise service bus (ESB). The set of services needed to process that data, and the sequence in which they are executed, are determined by additional external logic typically written in Java or any other object-oriented language.
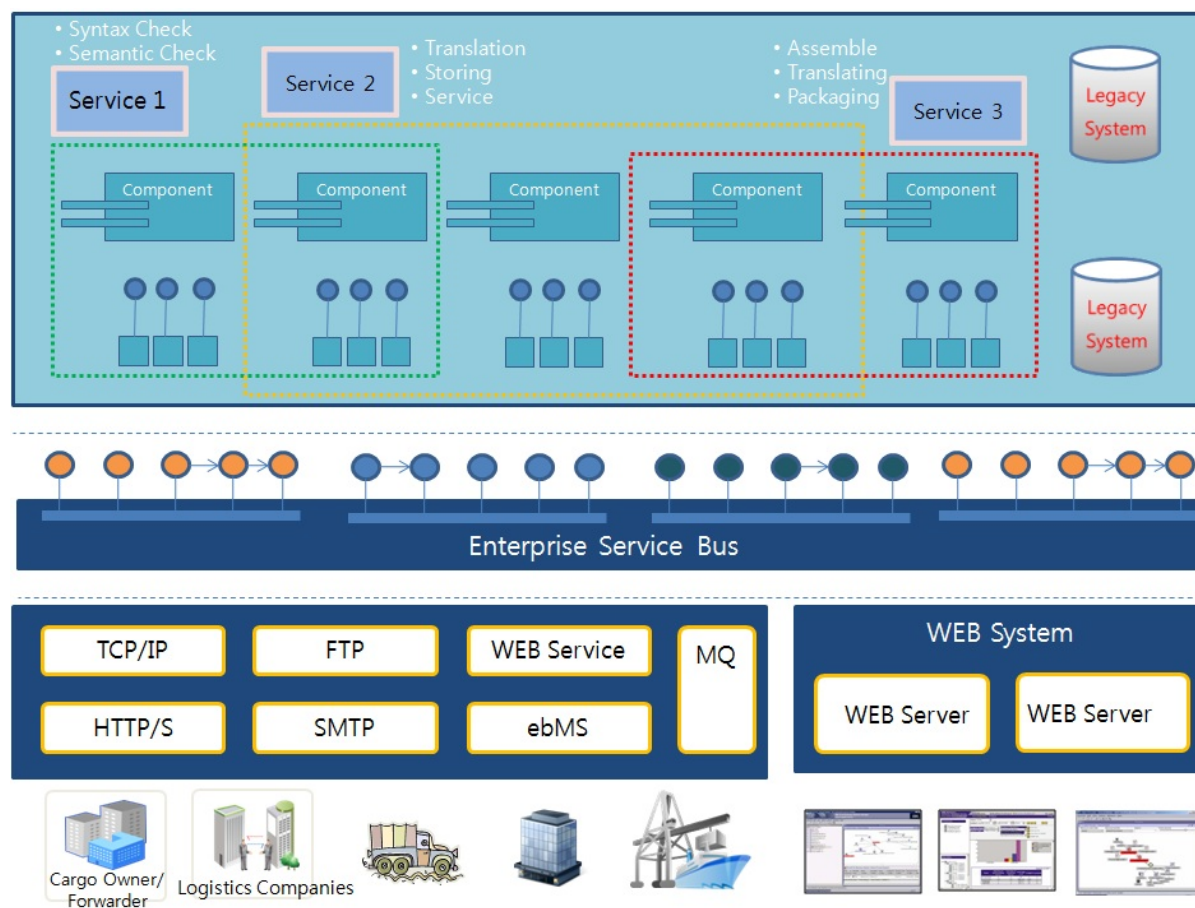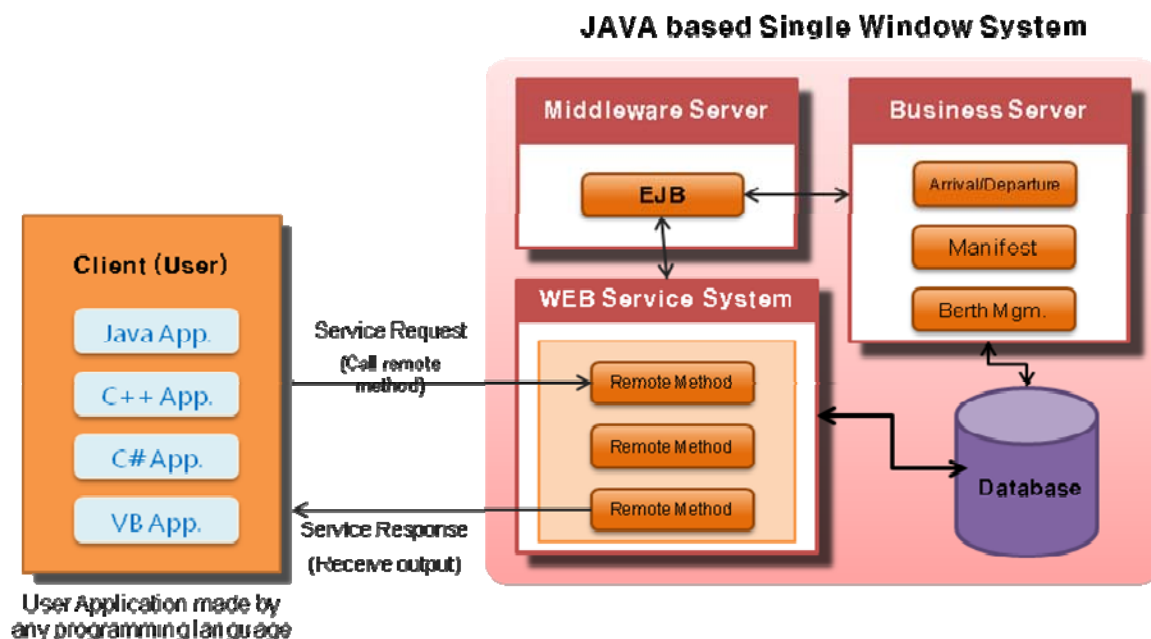

Figure 2 — SOA single window system architecture

5   Implementation case

5.1   Operation example when a single window system is implemented using Java.

        As shown in Figure 3, if a web-based single window system is implemented:

- Web-related modules are developed and ported to a web service system
- Here, web-related modules refer to programs that execute functions (such as inputting values and transmitting data) by selecting menus like port arrival/departure report (General Declaration, FAL Form 1) or viewing previously processed application/approval.
- To retrieve information, users access a web client and request information; then the information is brought from the database by remote methods and Enterprise JavaBeans (EJB)
- Business server system refers to a system to which the program, containing business logic for processing information input from the Web or electronic documents transmitted in EDI or XML formats, is ported.
- The program ported to the business server system should be implemented, based on the businesses managed, by port authority.

Figure 3 — The Java 2 Platform, Enterprise Edition (J2EE) system

5.2   Operation example when a single window system is implemented using .NET Framework.
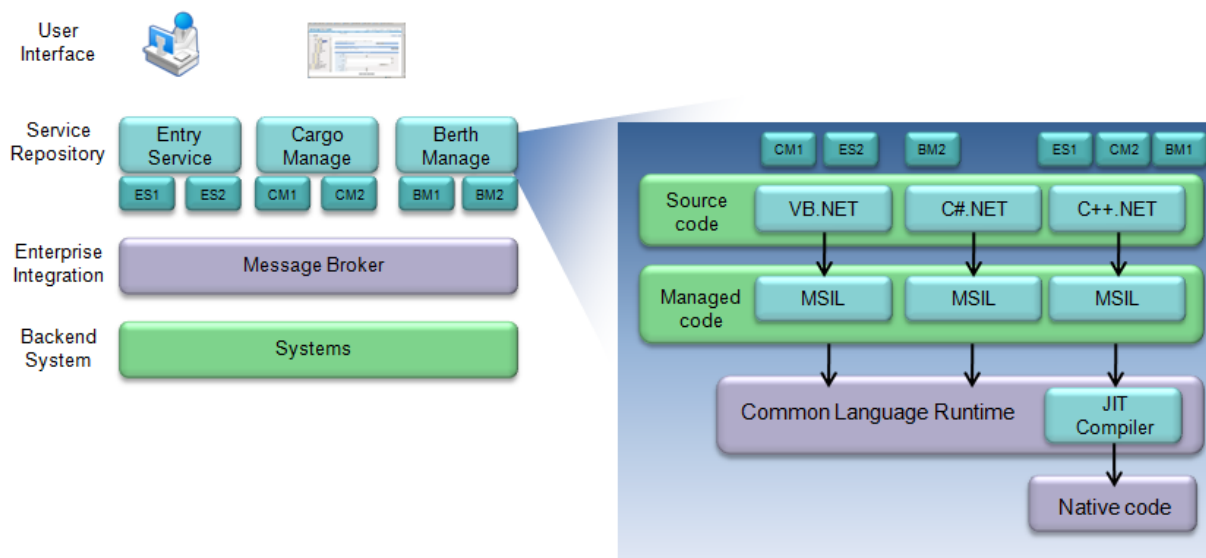
Figure 4 — .NET Framework

- When a single window system is implemented using .NET Framework, the configuration can be expressed in a layered structure as shown in Figure 4. The service repository, which is a central part of this structure, manages all the services of an enterprise. Services cannot be directly connected to systems, but they can communicate with systems through message brokers. When a user executes on a user interface, appropriate services are called from the service repository.

- When it is developed in the .NET Framework, the services to be stored in a service repository can be developed using programming languages supported by Microsoft. For example, assume that existing application programs were developed on C++.NET and VB.NET respectively. When a single window system is implemented using .NET Framework, source codes of application programs implemented by different development languages are compiled and translated into codes of MSIL (Microsoft Intermediate Language). The MSIL codes are converted into codes that can be directly recognized by an operating system; namely, they are converted into native codes that can be directly interpreted by an operating system through a JIT (Just In Time) compiler in the execution of CLR (Common Language Runtime).

- In other words, when a single window system is implemented using .NET Framework, existing source codes (only those supported in .NET) can be reused.

6.   SOA

In service-oriented architecture (SOA), the concept of service can be understood as a software component that executes a business process from a business point of view. In SOA, services are loosely coupled, platform independent and neutral interface. Therefore, the effects on other services are minimized when any particular service is changed. Because of this, a system based on SOA is agile in dealing with business changes and its components can be reused in many different combinations. Main features of SOA include

a. Model-driven development methodology
  - Developing a software system is an abstraction of complicated business
  - Process of making abstract business implementable
  - Use of UML (Unified Modelling Language) as a modelling language

b. Service-oriented development methodology
- "Service orientation" is based on the "separate of concerns" in software engineering theory; in other words, it is based on the concept of dividing and classifying a big problem into individual areas of interest
- Services are platform independent and accessed by applications in a standardized way
- Services are reusable and loosely coupled
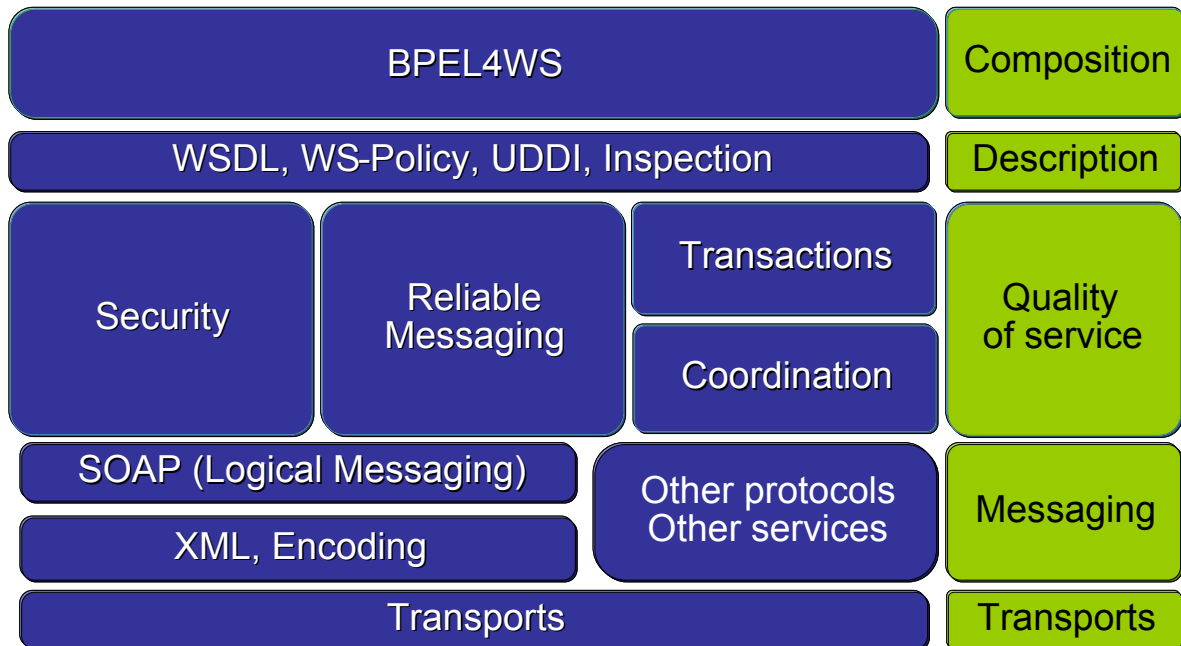- Services can be combined
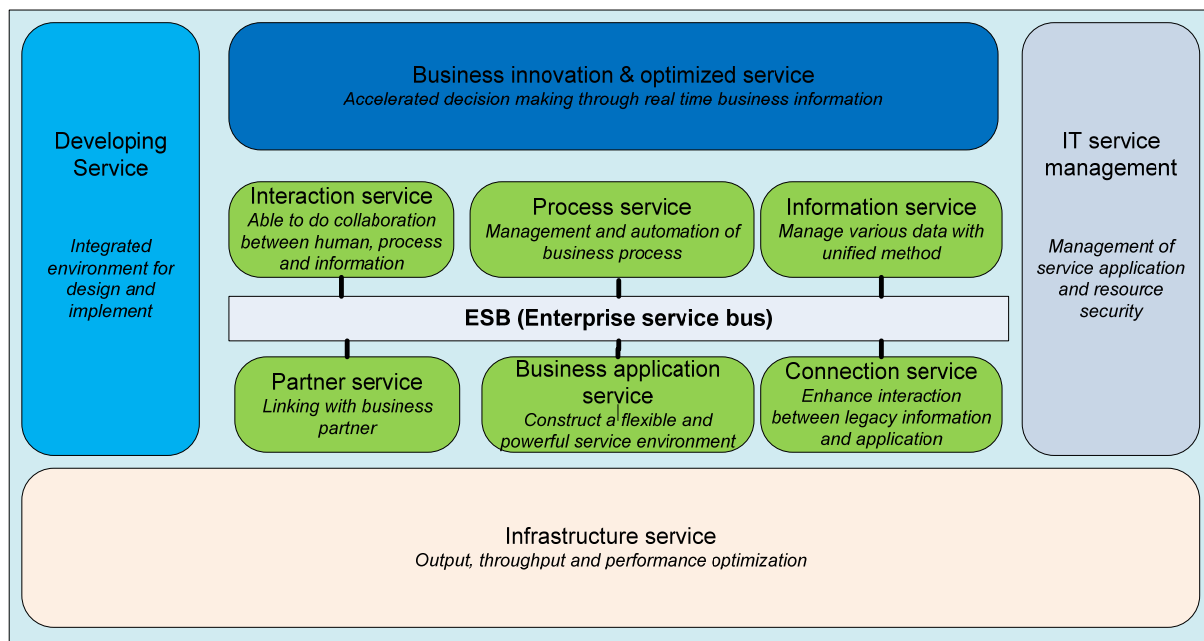
Figure 5 — SOA conceptual configuration

Figure 5 shows the conceptual configuration of SOA. SOA is based on a traditional request/response mechanism. The service consumer calls the service providers through a common service bus (ESB). The consumer requests specific services through a standard set of "request" communication protocols across the ESB. When the services complete, the results are communicated to the consumer using another set of standard "response" protocols. More explanation of Figure 5 is given below.

a. "Access service" is a component supporting the connection between a single window system and users or external organizations. This service is based on a standard communication protocol.

b. "Interaction service" is a service for transaction among unit modules or between unit modules and the service repository within a single window system.

c. "Business application service" is the execution of service modules implemented within a single window system. Examples in a single window for maritime transport business include port arrival/departure, application/approval, cargo report/approval and dangerous cargo report/approval.

7. Web service

BPEL4WS	Composition
WSDL, WS-Policy, UDDI, Inspection	Description
Security · Reliable Messaging · Transactions · Coordination	Quality of service
SOAP (Logical Messaging) · XML, Encoding · Other protocols Other services	Messaging
Transports	Transports

Figure 6 — Web service standard

a. WSDL (Web Services Description Language)
   - Entry point for service provider
   - Used as a service endpoint or end point
   - Provision of end point interface definition, physical service location (address) definition

b. SOAP (Simple Object Access Protocol)
   - XML-based protocol for systematic information exchange in a distributed environment
   - Transport independent, can be combined with such protocols as HTTP, JMS, SMTP and FTP
   - Designed for communication among applications and on the Internet
   - Based on the Internet and HTTP, and can be used in combination with security policies

8. Java

a. Java overview
   Java is an object-oriented language developed by the Sun Microsystems of the United States of America in 1990. Java gained prominent attention with the emergence of the Internet and Web.

b. Java features
   - Simple: Java was developed based on C++, but removed the difficult concepts and constructs from that language.
   - Object-oriented: In object orientation, the focus is on object and functions manipulating objects rather than steps.
   - Operable in a distributed environment: Java has a library that supports many protocols operating in a TCP/IP network environment such as HTTP. As a

result, it can control objects in a remote computer using URL (uniform resource locator).
- Platform independent: If there is a Java virtual machine, Java can be executed anywhere, regardless of a system.
- Supporting multiple threads: Java can support multiple, simultaneous threads within a single program. In other words, a single Java program can be composed of multiple thread programs and each thread can independently perform other tasks.

c.   MVC pattern
- MVC is an abbreviation of Model–View–Controller. MVC means to develop an application in a division of View, Model and Control. Hereby, View for presentation to users, Model for processing business logic and Control for managing Model and View.
- The MVC pattern aims to avoid difficulties in development and maintenance of complicated source codes resulting from the effort to write all the functions within an application. The advantage of the MVC pattern is that it realizes object-oriented and component-based methodologies.

d.   EJB (Enterprise JavaBeans)
EJB is a component architecture for developing and sharing distributed and object-oriented Java applications. By providing various services supporting extensible application server components, it enables developers to write business applications as components.

9.   Spring framework

a.   Spring Framework overview
The Spring Framework provides functions needed in enterprise applications. Because it supports multiple functions provided by J2EE, the Spring Framework is becoming popular as a replacement for J2EE.
b.   Spring Framework features
- It is a lightweight container. It is a container having Java objects. It manages the life cycle of these Java objects from creation to disposal and can bring the necessary objects for use.
- It supports the dependency injection (DI) pattern. It can configure dependency among objects using configuration files. Therefore, objects do not need to create or search dependent objects by themselves.
- It supports aspect-oriented programming (AOP). Because it supports AOP by itself, Spring framework can divide and apply functions that are commonly needed in various modules. Examples include transaction, logging, and security
- It supports POJO (Plain Old Java Object). Java objects stored in the Spring Framework do not need to implement specific interfaces or inherit particular classes. Therefore, existing codes can be used without modification.
- It provides a consistent method for processing transactions. Because it inputs transaction-related information through a configuration file, the Spring Framework can use the same code in multiple environments, regardless of transaction implementation.
- It supports various application programming interfaces (API) that are related to continuity. It supports interoperation with widely used libraries related to database such as JDBC, iBATIS, Hibernate, JPA and JDO.

- It supports interoperability with various APIs. The Spring Framework enables developers to use various APIs needed in developing enterprise applications (such as JMS, mail and scheduling) through a configuration file.

10.   Ajax

a.   Ajax (asynchronous JavaScript and XML) overview
Ajax is an asynchronous communication technology for exchanging XML data between client and server using asynchronous JavaScript and XML. In traditional web applications, users can see the result on a browser only after a response is sent from the gets back from a server. With Ajax, a user can see the result on a browser in the process of sending a request and can check the result without page shift upon receiving a response from a server.

b.   Ajax features
   - It can bring data simply without page shift, therefore can improve user interface. For example, in a Google map, it can display location information on a screen through a mouse drag without page shift.
   - Using Ajax, office programs or calendar programs can be developed on the Web.
   - It does not work in a browser that supports JavaScript because it is composed of JavaScript.

11.   C#

a.   C# overview
C# is a programming language developed by Microsoft to strategically support the .NET platform. It is based on C++ and further developed from C++ by standardizing C++ syntax. Therefore, it completely covers C and C++, and can use existing COM components easily.

12.   .NET Framework

a.   .NET Framework overview
".NET" refers to an ideal development environment that supports everything needed in developing programs. For example, in developing a program using C language, various necessary components should be collected individually. However, .NET provides a language, development tools, a library, number relevant technologies, etc., that are needed in development. In short, it refers to a type of environment for easier development.

b.   .NET Framework components
   - Class library: the .NET Framework supports various libraries necessary in development and execution. It supports the environment needed for developing databases, web application, graphics, XML and web service.
   - Common Language Runtime (CLR): CLR provides the execution environment. It is a virtual operating system that loads, dynamically compiles and executes programs developed by languages supporting .NET, such as VB.NET, C#, C++ and Jscript.NET, as well as managing memories.

c. .NET Framework features
- Usually, codes written in each programming language are translated into machine language at "compile" time. In .NET, they are translated into an intermediate language. That language can be considered as a pre-machine language that can be translated into machine language easily. The resulting file compiled with intermediate language in .NET is called an assembly. In C#, they are equivalent to .exe files or .dll files
- The assembly is composed of (1) metadata that have all the information on intermediate language and class, (2) a manifest that has information on assembly itself, and (3) resources that are data used by programs. The assembly we use can be classified into private assembly and public assembly. Private assembly refers to a simple library that is used when needed. Public assembly refers to a library commonly shared by a system by registering it to a directory in a system
- Because .NET programs can be operated in any operating system as long as .NET Framework is provided, it can be platform independent. As long as there is a compiler for translating intermediate language into machine language, it can be executed in any platform and is called a JIT (Just In Time) compiler).

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