Regional Study:
The use of Logistics Information Systems for increased efficiency and effectiveness

UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

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The use of Logistics Information Systems for increased efficiency and effectiveness

2016

This publication was prepared under the Project on Inclusive and Sustainable Development through Regional Cooperation and Integration in Transport in the Asia and Pacific Region financed by the Government of China.

ACKNOWLEDGEMENT

The present publication was prepared by Transport Division, ESCAP. The study was led by Mr. Yuwei Li, Director, Ms. Virginia Tanase, Transport Facilitation and Logistics Section Chief, managed by Mr. Edouard Chong, Economic Affairs Officer, and Ms. Heini Suominen, former Associate Economic Affairs Officer, Transport Division, with substantive research work by the following experts: Mr. Jingyan Gu and Ms. Tang Hui, Research Institute of Highway, China; Mr. Soo-Yeob Kim, Korea Maritime Institute; Mr. Yoshio Kito; and Mr. Yizhou Wu, LOGINK. Mr. Desmond Tay, vCargo Cloud Ptd. contributed to finalizing the report. Ms. Anchalika Phasukit, Ms. Jeerawan Buranavalahok and Ms. Srisakul Kanjanabus assisted in formatting and finalizing the report.

Special appreciation is expressed to the Ministry of Transport, China for co-organizing the Regional Seminar on Development of Efficient and Effective Logistics Systems, held on 7-8 May 2013 in Hangzhou, China.

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I. INTRODUCTION

Aim of the Study

The objective of the study is to promote capacity building in ESCAP member countries on good practices for the development of the logistics industry through the use of logistics information systems (LSI) to increase the efficiency and effectiveness in the movements of goods. Within the objective, the immediate aim of this publication is to review the technical aspects of existing national and transnational logistics information systems, identify best practices and provide recommendations on regional technical standards in the establishment and utilization of logistics information systems.

Methodology

This publication was completed through three phases of activity.

In the first phase, a Regional Seminar was organized and attended by officials from member countries, sub-regional organizations and private sector representatives. During the Seminar, participants presented their experiences in developing national logistics capacity, including the development of logistics information systems, improvement of logistics infrastructure, enhancement of national policy framework and co-operations with the private sector. The Seminar also extensively discussed the Northeast Asia Logistics Information Service Network (NEAL-NET), recognized as regional best practice in the Seminar. A field visit was organized to the China Transport and Logistics Public Information Sharing Network (LOGINK) to collect information.

Next phase of activity entailed outlining conclusions and recommendations from the Seminar. ESCAP secretariat and external experts defined the study scope and carried out extensive research on the subject matter. Discussions were held with several research institutes involved in the development of NEAL-NET to seek for input of their expertise in the study and better understand the challenges of formulating technical recommendations.

Three Expert Group Meetings were organized between 2014 and 2015 to share knowledge on research findings, identify specific needs and challenges of the logistics sector in the region and design recommendations on technical standards. Reviews of various national and transnational logistics information systems, technical recommendations and the "Standard Model of Logistics Information System" were compiled into this publication for the benefit of ESCAP member countries.

Relationship with ESCAP Work Programme

The publication directly contributes to ESCAP Transport Division Capacity Development Project Document for 2011-2015, which aims to provide Government officials and industry representatives with knowledge and skills to institutionalize the development of freight forwarding, multimodal transport and logistics in their countries.

II. REVIEW OF SELECTED NATIONAL LOGISTICS INFORMATION SYSTEMS

A. China

1. LOGINK (National Transport & Logistics Public Information Platform)

1) Background to system development

a. National context

In China, most freight is transported by road. There are more than 7.45 million road transport operators providing cargo transport services with the majority of transport service providers being SMEs. Market fragmentation and lack of coordination among service providers lead to inefficiency and high logistics cost. In 2014, logistics costs accounted for 16.6per cent [1] of China's GDP. Improving logistics efficiency is therefore a priority for the Chinese Government.

Information Communication Technology (ICT) can play an important role to improve the efficiency of the logistics sector by reducing information barriers and ensuring better coordination among different supply chain participants. Larger logistics companies usually have their own internal logistics information systems while SMEs mainly rely on external commercial logistics platforms. However, these platforms are not interconnected resulting in many isolated information islands. Therefore, the National Transport & Logistics Public Information Platform (LOGINK) was developed to help business partners exchange and share logistics information across the entire supply chain in an efficient, effective and secured environment.

LOGINK is an open, public sharing Logistics Information Exchange Network financed by Ministry of Transport (MoT), China and the Government of Zhejiang Province. Road Transportation Administration Bureau of Zhejiang Province established an Operation and Maintenance (O&M) Center to construct and maintain LOGINK. The system integrates logistics related information by putting in place information exchange hubs to connect to numerous logistics information platforms and enterprise operation systems, forming seamless logistics information flow across regions and industries.

b. Development process

LOGINK was initially developed in 2007 by the Zhejiang Government to serve as a regional logistics information platform. Data standards were developed to ensure the seamless data flow and interoperability.

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[1] "China Hand: Logistics." Economist Intelligence Unit (EIU) 24 Dec 2015 http://country.eiu.com/article.aspx?articleid=1903805974&Country=China&topic=Economy&subtopic=Recent+developments

The MoT and Zhejiang provincial Government signed a strategic cooperation agreement in 2009 to set the status of LOGINK as the national transport logistics public information platform. Subsequently, joint conference, technical expert committee and standards working group as well as a cooperation and coordination mechanism were established to ensure the smooth and efficient development and implementation of LOGINK.

c. Stakeholders

LOGINK focuses on the development of an open, public and shared logistics information interchange network. It is jointly put in place by MoT, provincial transport departments, logistics associations, IT vendors and logistics service suppliers. Road Transportation Administration Bureau of Zhejiang Province established the Operation and Management Center (O&M) which is responsible for the operation and promotion of LOGINK. The Center also participated in the construction of Northeast Asia Logistics Information Service Network (NEAL-NET) on behalf of the Ministry of Transport, China.

LOGINK provides services for all participants in the supply chain, including manufacturing enterprises, wholesalers and retailers, logistics companies, value-added service providers, authorities, financial and insurance service providers etc. These users can connect to LOGINK for free basic service. They can also select to use the value-added service at a marginal cost.

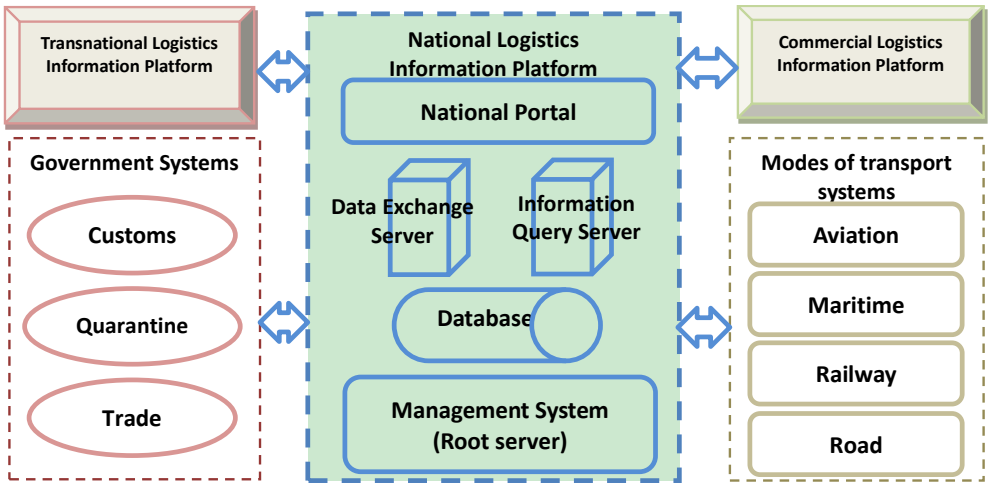
d. Timelines

2007: LOGINK was launched by Zhejiang Provincial Transport Department
2008: Zhejiang Provincial LOGINK platform (data exchange server) was established. Sixteen provinces signed a Memorandum of Understanding (MoU) to jointly put in place LOGINK
2009: Ministry of Transport and Zhejiang Provincial Government signed a MoU to jointly put in place the further development of LOGINK and to upgrade the system for nationwide coverage (MoT Public Information Sharing Platform for Transportation & Logistics)
2010: The Governments of China, Japan and Republic of Korea signed a MoU to establish Northeast Asia Logistics Information Sharing Network (NEAL-NET) to improve the transnational logistics information sharing among the three countries. LOGINK would be linked to NEAL-NET.
2012: The first meeting of the Joint Conference on Building the National Transport Logistics Public Information Platform was held in Beijing. During the meeting, the Joint Conference System for further construction of LOGINK was founded and Technical Experts Group was set up.
2013: Standards Working Group was established by MoT to further develop and promote LOGINK.
2014: Long Term Development Planning of Logistics Industry (2014-2020) was published by the State Council. LOGINK was upgraded to "National level platform."

2) System design/architecture

LOGINK serves as a non-profit, one-stop logistics information service platform with high data security for business entities, especially SMEs. The platform provides services through its portal on internet; the system interfaces with Government authorities' systems and commercial logistics information platform. LOGINK can also connect to other transnational logistics platforms through internet.

Figure II-1. LOGINK architecture

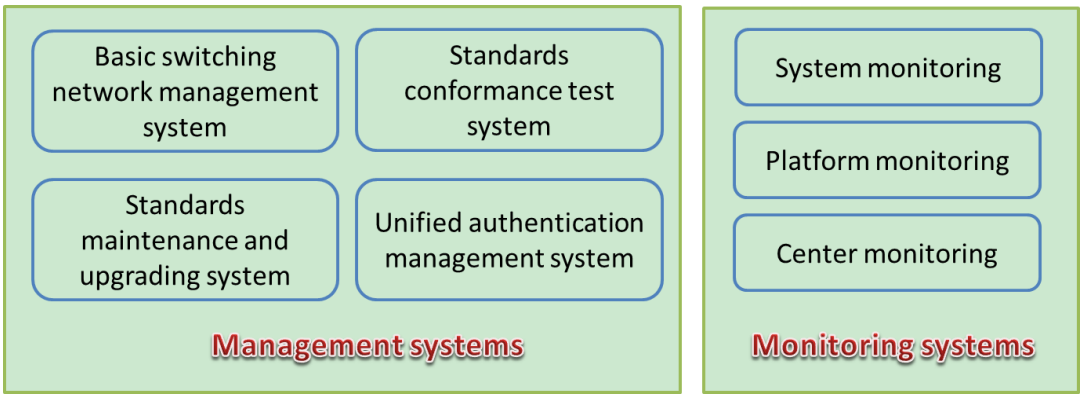


Source: LOGINK

LOGINK mainly consists of two parts: *Basic Information Exchange Network* and *Management and Monitoring system.* Government departments and business companies can connect to the *Basic Information Exchange Network* and fulfill B2G, G2B, and B2B data exchange for regulation purposes and business requirements. Two core components of LOGINK are data exchange and information query. Data exchange function allows users to exchange their business documents such as road transport waybill with their partners or to submit declaration documents such dangerous goods manifest to Government authorities in XML schema format. Information query function allows users to inquire information services such as transport status based on information resource directories and catalog maintained by LOGINK.

Management and Monitoring Systems are built to ensure the reliability and stability of system operation for LOGINK.

Figure II-2. Management and Monitoring Systems



Source: LOGINK

The main functions of Management and Monitoring Systems include:

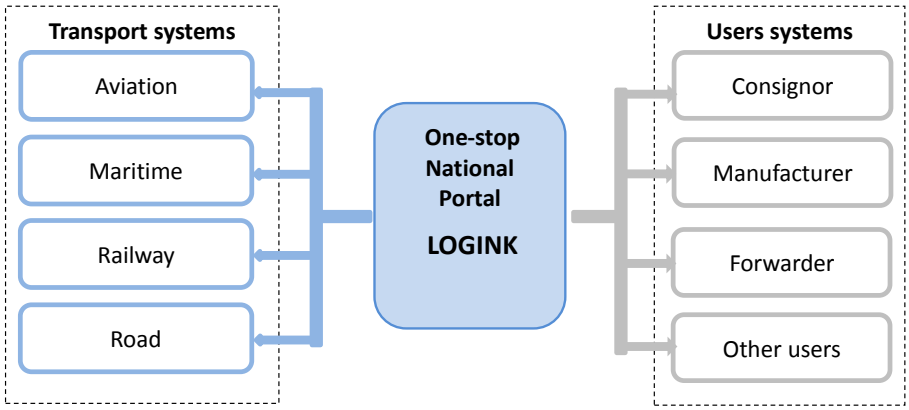
- user management
- interchange code management
- server and service management
- data synchronization and router management
- application maintenance management
- operational diagnostics service

3) Messages available

a. What the system can do

LOGINK provides public information services such as carrier registration, regulation compliance and violation information, truck tracking information through connection to road transport departments. It also provides other information services such as shipping tracking information, e-booking, electronic waybill through connection to port authorities (seaport and airport) as well as information services such as e-booking, freight rates inquiry, tracking, electronic waybill through connection to railway departments (See Figure II-3). LOGINK can also provide services like Customs clearance through link or interface with Customs departments.

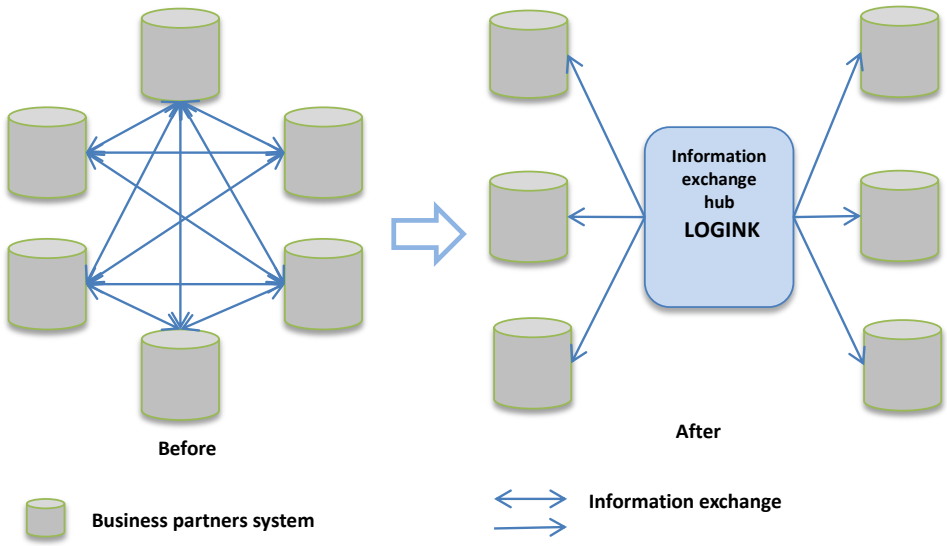
Figure II-3. Services for all modes of transport



Source: LOGINK

Enterprises and their partners in the supply chain need to develop interfaces to connect to LOGINK based on unified standards, and they can interconnect and exchange information through the Basic Information Exchange Network.

Figure II-4. Business Data Exchange



Source: LOGINK

b. Who are the users and what are the functions available to them

LOGINK provides services for variety of users in both public and private sectors: consignors/consignees, logistics companies, transport authorities, Customs, inspection and quarantine departments and other information service providers. LOGINK can help users to connect to their suppliers and customers to facilitate and improve their business operation efficiency by ensuring seamless cargo, financial and information flows.

Documents transmission

After user registration and authentication, participants of the supply chain can send and receive electronic documents to/from their partners through *Data Exchange*.

Service request and response

After registration and authentication, service providers can provide their own information services to users. Users can search and find service providers through the *Fundamental Interchange Network*. Service providers can respond to their users' queries.

Value-added services

Through the *Fundamental* Interchange *Network*, service providers can provide other value-added services.

Security and credibility

LOGINK focuses on free information transmission without compromising business confidentiality and privacy. Data confidentiality including network segmentation with multi-layer architecture, secure integration protocols supported and information security are ensured through IT security policies. LOGINK also applies disaster recovery, business contingency and risk management planning strategies through "two sites active-active" architecture with data mirroring and advanced backup features to ensure data availability and integrity.

c. Type of data shared

Participants in supply chain, e.g. suppliers, logistics companies, transport authorities, Customs, inspection and quarantine departments, can exchange and share a variety of information such as:

- electronic booking;
- vessels schedules;
- Customs clearance information;
- inspection and quarantine clearance;
- consignment;
- freight/Shipment status;
- vehicle access and departure time;
- warehousing and logistics park;
- finance and insurance; and
- fee and payment.

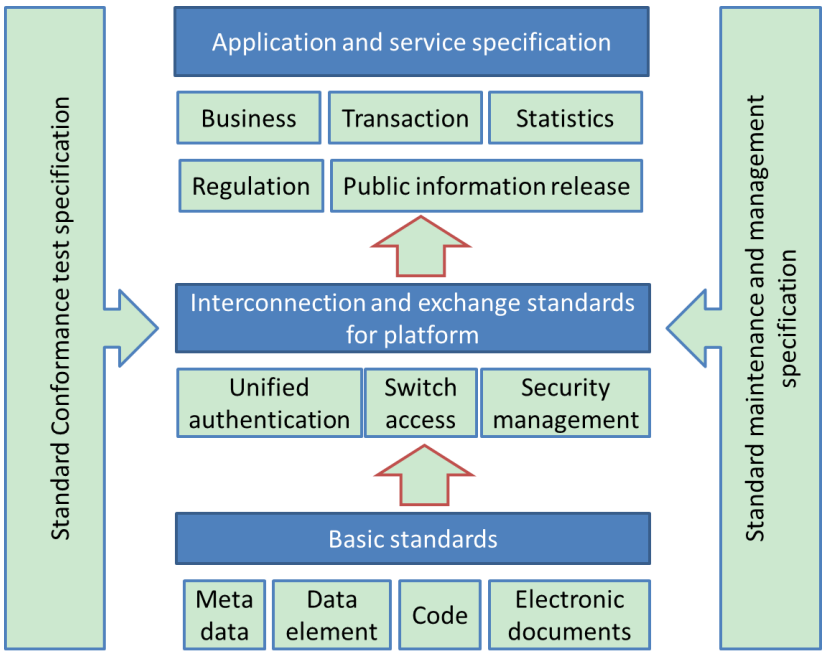
d. Relevant data standards

LOGINK standards framework

The Work Plan of Transportation Logistics Public Information Platform Standardization (2013-2015) was issued by the Ministry of Transport in 2013.

The standards framework (Figure II-5) has five parts: Basic Standards, Interconnection and Exchange Standards for Platform, Application and Service Specification, Standard Conformance Test Specification and Standard Maintenance and Management Specification.

Figure II-5. LOGINK Standards Framework



Source: Ministry of Transport, China

Data elements, codes and metadata

Basic standards for the platform contain data elements, codes, metadata and electronic document. Data elements and codes have partly:

i. adopted appropriate international, national and industry standards;

ii. included amendments and additions with reference to the methodologies of international, national and industry standards such as:

- ISO7372:2005 Trade data interchange - Trade data elements directory (UNTDED, United Nations Trade Data Elements Directory);
- ISO 9735 Electronic data interchange for administration, commerce and transport (EDIFACT);
- ISO 15000 Electronic Business Extensible Markup Language (ebXML); and
- The United Nations Standard Products and Services Code (UNSPSC).

The standard defines the precise meaning of each data element and represents the data types listed in the data elements directory. There are nine sets of data elements.

Table II-1. Data Element Attributes

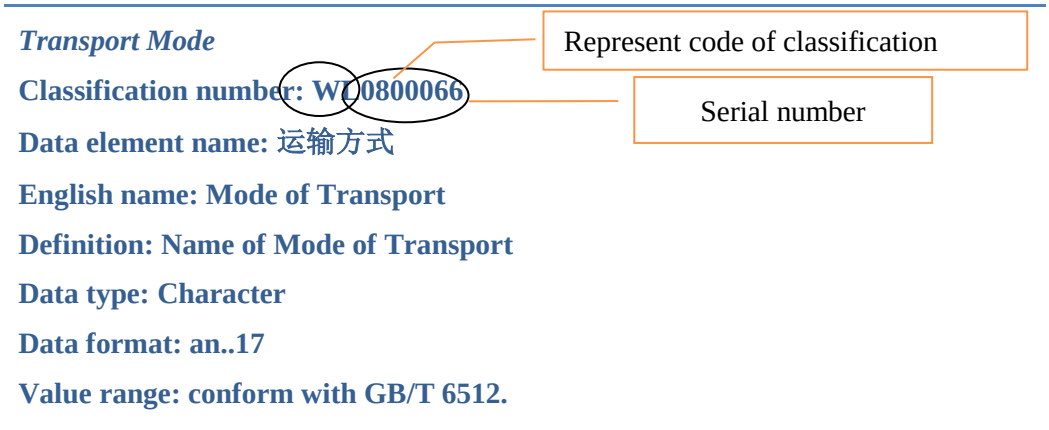
Represent Code of Classification	Classification
WL00	Service data
WL01	Documents, References
WL02	Date, Time
WL03	Participant, Address, Location, Country
WL04	Terms, Conditions, Glossary, Description
WL05	Currency, Fee, Percentage
WL06	Identifier, Quantity (Non-monetary amount)
WL07	Description and identifier of goods and items
WL08	Transport mode and transportation means, container and other equipment
WL09	Other data elements

Source: JT/T 919.1-2014 Transport logistics information interexchange – Part1: Data elements

Each data element is described in twelve categories of attributes: classification number, data element name, English name, definition, data type, data format, value range, relational description, measurement unit, synonyms, version number, remarks.

Data elements can also be divided into two types: narrative data element and code data element which has codomain listed in the standard.

Figure II-6. Example of Data Element in the Data Elements Directory



Source: JT/T 919.1-2014 Transport logistics information interexchange – Part1: Data elements

Metadata standard defines the classifications of logistics information resources, basic elements and attributes, storage locations and records of accessing time.

Electronic Documents

Electronic Documents Standard specifies all the documents used by all partners in transport logistics, e.g. bills, notices and certificates etc. LOGINK Standard Documents are XML type of messages with unified header. Each message is structured similar to UN/EDIFACT, using a segment as a basic unit, i.e. a data entity consisting of several data elements. Each message contains Header and Body described by eight attributes of a message. LOGINK Standard defines the structure of electronic documents, data items in the message bodies and their attributes.

Table II-2. Message Attributes

Attribute Name	Description
Message Level	Position and hierarchy of data element in the message structure.
Classification Number	Data elements classification number in the Data Elements Directory.
English Name	The English name of data elements and segments, used as its XML tag name
Chinese Name	Data element definition in Chinese
Constraint / occurrence	The number of data elements appear
Data Format	a- alphabetic character, n- digital character, an- alphabetic and digital character For instance: an3..8 means characters with the max length of 8 and min length of 3.
Reference	The standards adopted as the codomain for code type of data elements
Remarks	A brief description and interpretation for tag name

Source: JT/T 919.2-2014 Transport logistics information interexchange - Part2: Road transport electronic documents

The basic levels of standard are developed as follows:

- Transport Logistics Information Interexchange: Part 1 Data Elements (and Codes);
- Transport Logistics Information Interexchange: Part 2 Road Transport Documents (General good, Dangerous goods and Container);
- Transport Logistics Information Interexchange: Part 3 Logistics station;
- Transport Logistics Information Interexchange: Warehouse; and
- Transport Logistics Information Interexchange: Ocean Consignment Bill and Booking Receipt.

Data Interchange interface standard and Service Query interface standard

LOGINK Interconnection and Interexchange Standards include Unified Identity Authentication, Switch Access and Security Management. Switch Access also consists of Data Interchange Interface Standard and Service Query Interface Standard. The standardized interfaces are defined for both *Data Exchange* and *Service Query*.

At this level, there are two standards as follows:

- Transport Logistics Information Interconnection and Sharing: Unified identity authentication (Logistics Exchange Code); and
- Transport Logistics Information Interconnection and Sharing: General Technical Requirements for Data Interchange Interface.

Information Security Management Standard

Logistics information network covers many application systems with interoperating activities between both public and private sectors and involves wide range and large amount of data sources. Data security is very important for stakeholders. Information Security Management Standard specifies the requirements for data and system security, and users' privacy. Security is ensured by applying necessary information security technology and management measures which are aligned to national and industry standards.

Application and Service specifications

Application and Service Specifications are technical documents that help developers in implementing business application in freight tracking, credit, statistical analysis etc. by using IT systems. LOGINK has developed five application and service specifications for its users:

- Transport Logistics Information Interconnection and Sharing: vehicle and cargo tracking;
- Transport Logistics Information Interconnection and Sharing: vehicle ID card;
- Transport Logistics Information Interconnection and Sharing: logistics resource;
- Transport Logistics Information Interconnection and Sharing: container tracking; and
- Transport Logistics Information Interconnection and Sharing: vessel tracking.

Managerial specifications

LOGINK works on two managerial specifications:

Standard Maintenance and Update Management Specification specifies the process of confirmation, modification, amendment and abrogation of LOGINK standards; and the procedures of approving and publishing standards.

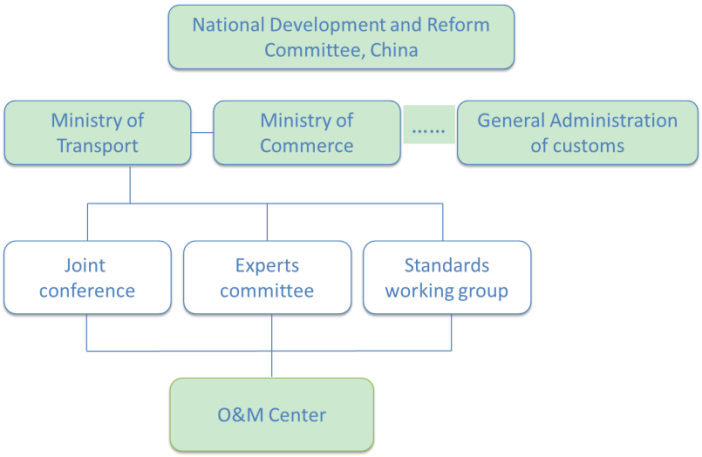
Standard Conformance Test Specification specifies the procedure of conformance test for regional platform and application systems, examining if these platforms and systems comply with LOGINK standards; and allowing them to make necessary adjustment to ensure systems inter-operability.

4) Institutional arrangements

LOGINK is managed by Zhejiang Transport Department under the guidance and support of the Ministry of Transport (MoT). Operation is carried out by Zhejiang National Transportation Logistics Public Information Platform Management Center (O&M Center).

The institutional structure for LOGINK development consists of Joint Conference, Technical Expert Group, Standards Working Group, and National Transportation Logistics Public Information Platform Management Center (see Figure II-7).

Figure II-7. Institutional Structure of LOGINK Development



Source: LOGINK

Joint Conference

To better develop LOGINK and its Fundamental Interchange Network, MoT has built a Joint Conference System which allows provincial transport departments to join the construction of the Fundamental Interchange Network nationwide. Each province builds its own "regional exchange node" and interconnects with the national exchange node. The conference members include related departments and institutes subordinated to MoT, Zhejiang National Transportation Logistics Public Information Platform Management Center, and provincial transport departments. The Transport Planning Department of MoT is the Joint Conference convener and regularly holds meetings to report the progress in continuous development of LOGINK, share best practices and act as coordinator for other relevant issues.

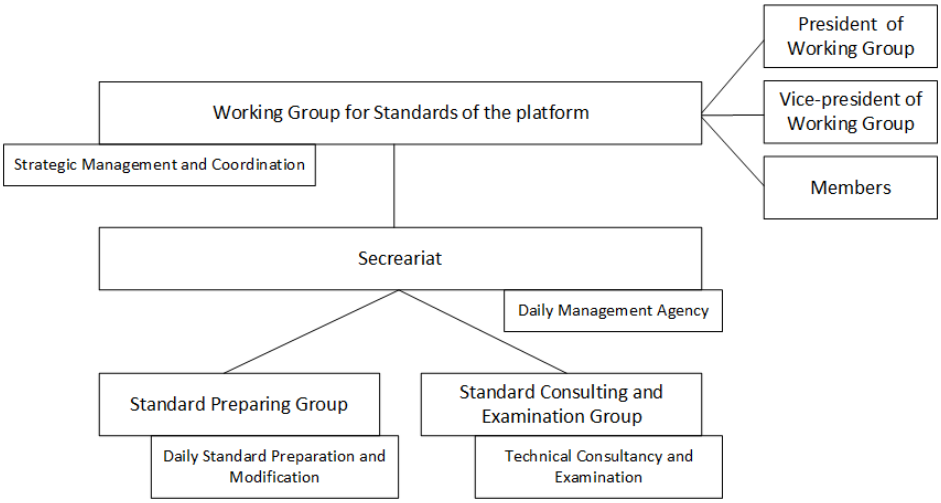
Technical Expert Group

Technical Expert Group consists of eighteen experts from different Ministries, research institutes, universities, associations and enterprises with expertise in many areas such as multimodal transport, logistics, IT, e-commerce and Customs. The experts are responsible for formulating strategies, planning and managing architecture construction, providing advices and suggestions on operational and technical mechanism, and other development. Technical Expert Group holds plenary sessions and special topic seminars and carries out surveys.

Standard Working Group

Standard Working Group (Figure II-8) was set up for the purpose of organizing research, development and implementation of LOGINK standards, under the leadership of Science and Technology Department of MoT.

Figure II-8. Organizational Structure of Standard Working Group



Source: Ministry of Transport, China

The director of the Standard Working Group comes from the Government and the vice-directors from Research Institute of Highway (RIOH) and LOGINK O&M Center; members come from provincial transport departments, research institutes, universities, associations, enterprises, technical committees of national and industry standards. The Secretariat is located in Zhejiang National Transportation Logistics Public Information Platform Management Center (O&M Center). The main task of O&M Center is to manage, operate and maintain LOGINK on a daily basis.

5) Financing

LOGINK is mainly funded by the Government of Zhejiang and subsidized by the Ministry of Transport, China.

2. China E-Port

1) Background to system development

a. National context

In mid-1990s, in order to prevent the occurrence of illegal activities such as smuggling of goods and money laundering, the State Council of China decided to construct China E-Port, the national Single Window of China. The project was led by the General Administration of Customs, in close cooperation with subsidiary Customs and relevant departments such as quarantine and tax administration.

After 18 years of construction and development, China E-Port has gradually developed into a unified platform not only for Customs clearance enforcement management but also to provide related logistics information services.[2]

b. Development process

The General Administration of Customs developed the first project of China E-Port, which was named Import Customs Declaration and Foreign Currency Check System. The system was successfully implemented nationwide since 1 January 1999.

In 1999, the General Administration of Customs in cooperation with the State Administration of Foreign Exchange, State Commercial Code Management Office, China Telecom, Chinese Bank, Beijing Foreign Economic and Trade Commission, General Staff Department and other relevant unit; organized a comprehensive research work on Electronic Port Enforcement System.

By the end of year 2000, the development and testing of database, network platform, safety certification and export proceeds verification subsystem of Electronic Port Enforcement System have been completed. In the same year, the State Council officially approved the establishment of the **Electronic Port Enforcement System**. From January 2001, the system was gradually promoted domestically.

c. Stakeholders

China E-Port is a Customs clearance information platform approved by the State Council and jointly built by the Customs General Administration, Ministry of Public Security, Ministry of Finance, Ministry of Railway, Ministry of Transport, Ministry of Industry and Information Technology, Ministry of Commerce, People's Bank of China, the State Administration of Taxation, the State Administration for Industry and Commerce, State Quality Inspection Administration, Civil Aviation Administration of China, State Administration of Foreign Exchange, National Development and Reform Commission, Ministry of Environmental Protection and other 14 ministries.

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[2] http://www.chinaport.gov.cn/gywm/gywm1/index.htm

d. Timelines

First stage (from 1998 to 2001)

Main objective: To realize interconnection, information sharing and network verification among different departments

Members of China E-Port had developed a series of cross-departments interconnection applications such as export settlement of exchange and import value-added tax on the basis of practical needs. Through network verification based on electronic records, the administrative efficiency of the authorities and import/export managing department improved significantly.

Second stage (from 2002)

Main objective: To promote China E-Port platform nationwide and to related departments.

Local Governments promoted the establishment of local electronic ports according to the local needs and reached success in Ningbo, Shanghai, Hangzhou and Tianjin.

Local electronic ports made a breakthrough on interconnection in 2008. Zhejiang E-Port realized interconnection which enable for information sharing with Ningbo E-Port and Shanghai E-Port respectively, Liaoning E-Port also integrated with Dalian E-Port. At the end of June 2010, the General Administration of Customs had signed 35 Memorandums of Cooperation with 41 local Governments, involving 27 provinces, districts and cities. By 2011, there were 35 local E-Port platforms providing services in China, including 10 physical platforms and 25 virtual platforms.[3]

2) System design/architecture

a. Network structure

China E-Port changed from point-to-point connection to relying on national public telecommunication network, establishing a common data center and interchanging platform to realize data interchange and sharing mechanism among ministries and enterprises.

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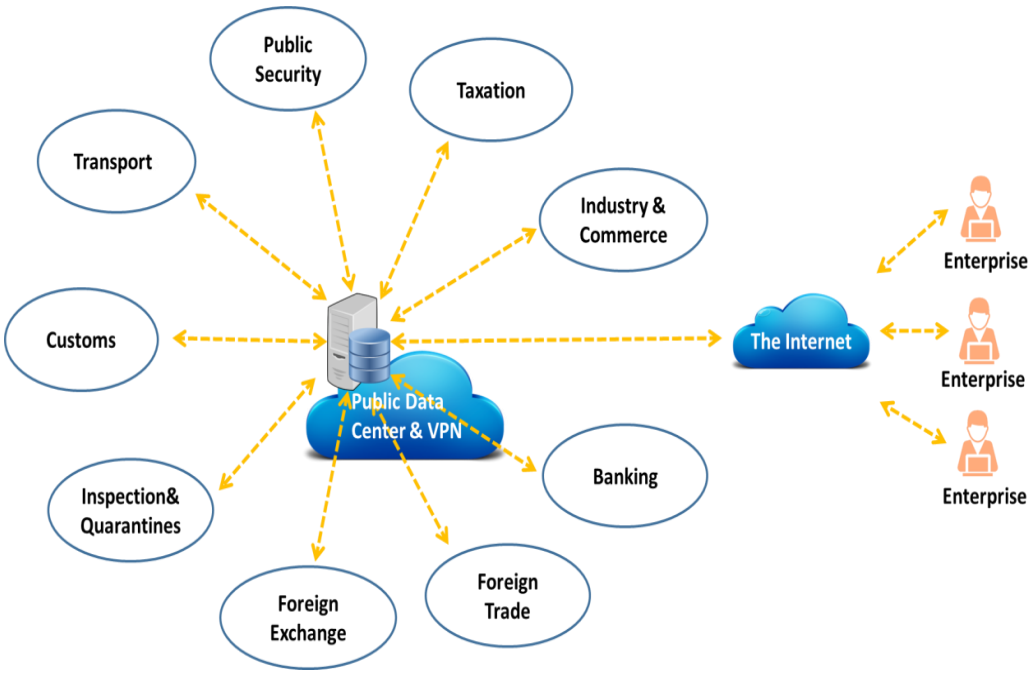
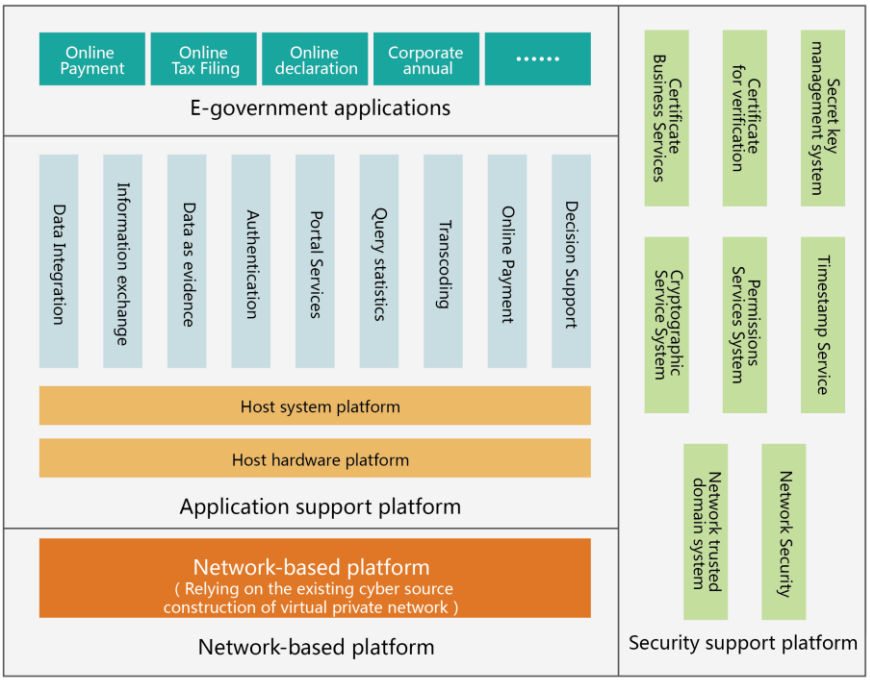
[3] http://www.chinaport.gov.cn/ztch/dzkafzyjzw/2715.htm

Figure II-9. China E-Port Network Structure[4]



b. Logical structure

Figure II-10. China E-Port logical Structure



Source: China E-Port

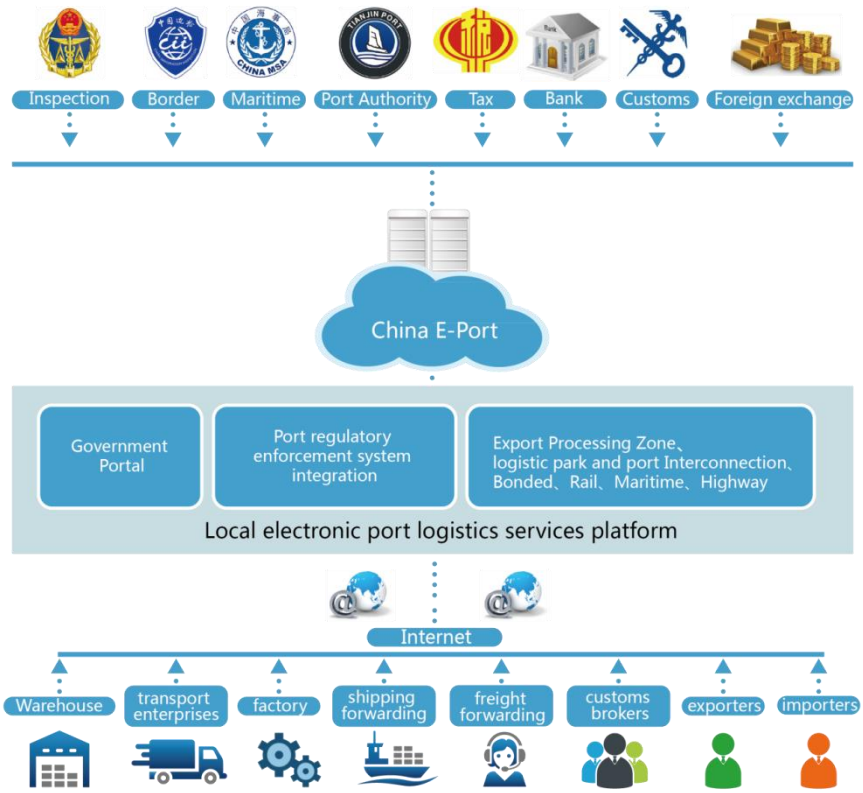
[4] http://www.chinaport.gov.cn/ztch/dzkafzyjzw/2496.htm; Research on Electronic Port Public Information Platform, by Nie Ruining

c. Local information platform

According to the State Council policy, China's E-Port system consists of two levels: China E-Port for the national level and local electronic port for the local level. China E-Port connects with departments of central Government and provides simplex service. Given that China is a vast territory with different import and export processes and diverse business needs, China E-Port is supported by "local electronic port systems."

Local electronic port is built by the local Governments. It works as a local Single Window which is mainly responsible for local departments, Customs clearance units and enterprises to process import/export declarations. Local electronic port is an important extension and supplement of China E-Port[5]. It helps China E-Port to fulfill the users' diversified needs.

Figure II-11. China E-Port stakeholders



Source: China E-Port

[5] http://www.chinaport.gov.cn/gywm/gywm1/index.htm

3) Messages available

a. What the system can do

China E-Port is a cross-sector, cross-regional and cross-industry platform based on national telecommunications network. It allows for data sharing and on-line inspection. It connects import and export related administrative departments such as commerce, taxation, Customs, foreign exchange, foreign trade, quality inspection, public security, railways, banks and other departments as well as import and export enterprises.

The platform stores logistics, capital and goods information of import and export business in a centralized database, and provides cross-sector, cross-regional and cross-industry data exchange and verification network to State administrative departments. It also provides "one-stop" e-Government services to enterprises, such as Customs declaration, online payment, foreign exchange verification, export tax rebate etc.

Functions:

G2G and B2G can perform data interchanging and sharing through China E-Port Infrastructure. Data interchanging objects include Government authorities, social organizations, sub-Government departments, domestic & international enterprises, foreign embassies in China and other individual business. The connection methods are PSTN, ISDN, ADSL, DDN, FR, ATM (wire connection); or GPRS, CDMA (wireless connection). The format of data interchanging includes EDIFACT, XML, HTML, WML, SWIFT etc.

There are two categories of data declaration and interchanging methods:

- QP system (Quick Pass System)

  QP system is China Customs' Declaration Document Preliminary Entry and Declaration System which was designed by China E-Port. Enterprise users can easily conduct Customs declaration document, Customs-transit preliminary declaration document, Customs-transit declaration preliminary entry/declaration and other relevant querying of data, Customs receipt and business statistics. It enhances the effectiveness of Customs declaration work for enterprises. However, there is no data interface for data submission for enterprises' legacy systems.[6]
- LIS (Logistics Integration System[7])
  LIS helps B2B and B2G user to realize seamless connection for data declaration. The system optimizes procedures for import and export coordination through electronic processing. It also allows for data exchange and documents sharing, enabling smooth coordination among enterprises and

[6] http://www.zjport.gov.cn/ask/questionDetailt.jspa?fid=126631

[7] LIS System is the EDI system provide by China E-Port for those large enterprise, which enable them submitting clearance data directly from their legacy system by EDI service.

authorities by paperless and automatic business handling and minimizes manual mistakes.[8]

LIS provides two basic services:

- *B2B Original logistics electronic data processing, exchanging and sharing:* According to the requirement of daily logistics coordination and information sharing among enterprises, it has implemented all kinds of business documents (e.g. invoice, container number, bill of lading and booking reference) which are processed electronically among enterprises.
- *Customs information electronic processing and interchanging between enterprises and Customs authorities:* it can help enterprises to automatically convert original logistics data to all kinds of Customs data drafts (e.g. Customs declaration document draft), transfer Customs data from enterprise business system to Customs authority declaration system (e.g. China E-Port QP system and other facilitating system). It can return Customs clearance status to enterprise business system once declaration data has been confirmed.

Declaration assistance

"Pre-check" function of Customs declaration document is provided for enterprises. This function reduces the error rate of Customs documentation declaration and thus, reduces enterprises' risk of committing compliance irregularity.

Transaction processing

Documentation approvals, such as verification sheet, manufacture-trading contract, tax reduction/exemption, Customs declaration, import/export permission and foreign exchange verification application, ATA document application etc. and other online services can be handled through China E-Port system. It helps enterprise users to manage and monitor their business procedures from the internet.

Identity authentication

China E-Port users need to pass the access qualification examination by six Government authorities. After passing examinations, IC card with digital signature will be issued to the enterprises.

Witness of proof

China E-Port data center is responsible for "witnessing the proof" of interchanged data. Data storage time span is 20 years.

Message standard conversion

China E-Port data center converts EDI data format according to Government authorities' requirement.

[8] http://www.zjport.gov.cn/detail/article/2013_4/11_21/2030504_1.shtml

Statistics querying

The system is opened for data query and contains statistics service interface for public use. The sharing of data for specific users includes import/export Customs declaration data, enterprise profile data, foreign exchange cancellation after verification data, logistics status data and intellectual property data.

Isolation of internet

China E-Port works as the gateway between Government's intranet and the internet. Enterprises can access "One Point Access" to communicate with the authorities; this enhances Government system security.

Security support

The system uses China E-Port Certificate Authority System (CA System) to encode the transferring data in order to ensure the enterprises' data security.[9]

b. Who are the users

China E-Port has four categories of users: import/export enterprise, foreign trade agency, manufacturer, foreign trade consignor.[10]

c. Data and standards

China E-Port handles almost all documents that are required for the Customs import and export procedures, such as declarations, various kinds of permits, certificates, licenses etc.

Table II-3. Data and Standards of China E-Port

No:	Information Instrument	Source	Destination	Data Type
1	Commercial Invoice	Shipper	Freight Forwarder	Private
2	Packing List	Warehouse	Freight Forwarder	Private
3	Shipping Instruction	Shipper	Freight Forwarder	Private
4	Certificate of Origin	Shipper	Regulators	Private
5	Customs Declarations	Freight Forwarder	Regulators	Private
6	Customs Release	Regulators	Freight Forwarder	Private
7	Dangerous Goods Declaration	Freight Forwarder	Regulators	Private
8	Cargo Manifest	Freight Forwarder	Regulators	Private

[9] http://baike.baidu.com/link?url=5djoL0fBXJMSI9BeU0NLry3t4ErLlgcqVOYXpcgcl0Ncsv04Lqde1A0g_kmGfvN06XUJUnmlwMe6LZ764oiFe_

[10] www.chinaport.gov.cn

4) Institutional arrangements

a. Lead agency

The Electronic Port Enforcement System Coordination Committee was set up in August 2001. The main purpose is to promote national electronic port construction.

In May 2006, Electronic Port Enforcement System Coordination Committee was renamed National Electronic Port Construction Steering Committee. The Committee was chaired by the Deputy Secretariat General of the State Council. Members include National Development and Reform Commission, Ministry of Public Security, Ministry of Finance, Ministry of Railways, Ministry of Transport, Ministry of Information Industry, Ministry of Commerce, People's Bank of China, National Administration of Taxation, State Administration for Industry and Commerce, General Administration of Quality Supervision, Inspection and Quarantine, Ministry of Environment, Civil Aviation Administration of China and National Foreign Exchange Bureau.

Customs plays the leading role in China E-Port construction and its operations. The "Electronic Port Committee" office is located at the General Administration of Customs.

b. Cooperation mechanisms

China E-Port Data Center

China E-Port Data Center is founded in May 2001. It was an independent organization supervised directly by General Administration of Customs. China E-Port Data Center is the carrier of China E-Port. Its main mission is to develop, maintain and promote China E-Port project on the national level and to support the construction of local electronic port systems at the same time.

Local Data Center of China E-Port

In January 2002, 41 local Data Centers of China E-Port were established in 41 direct subsidiary Customs. Local Data Centers of China E-Port are responsible for local promotion of the electronic port service, providing technical support and customer service to local customers. These local centers are subsidiaries of local Customs and supervised both by the local Customs and China E-Port Data Center.

Other Cooperation

China E-Port cooperates with World Customs Organization (WCO)[11] to adopt the Harmonized System Convention. The Harmonized Commodity Description and Coding System, also known as the Harmonized System (HS) of tariff nomenclature is an internationally standardized system of names and numbers to classify traded products. It came into effect in 1988 and has since been developed and maintained by WCO.

China E-Port also cooperates with other countries' and regions' Single Window to interchange necessary information.

c. Legal framework

Promote the paperless Customs clearance

General Administration of Customs issued an Announcement in year 2013 to implement and promote paperless Customs clearance operation, enabling enterprises to submit the clearance of related document electronically via China E-Port EDI service.

Electronic signature law

Electronic signature law of China acknowledges the same legal effect between "digital" and "wet ink" signature. Duties and rights of all parties are defined to guarantee the legal effect in the exchange of electronic messages. [12]

5) Financing

The establishment and operation patterns of electronic port can be categorized as follows:[13]

- *Local Government oriented*. Local Government invests and specifies one Government department to build and operate the system. The provinces and cities in Central and Western China, such as Chongqing, Hubei, Jiangxi, use this pattern

[11] The World Customs Organization (WCO), established in 1952 as the Customs Co-operation Council (CCC) is an independent intergovernmental body whose mission is to enhance the effectiveness and efficiency of Customs administrations.

[13] Maritime Transport Information Platform on Big Data Time, Page 101-102, by Dr.Xu Kai

- *Customs oriented.* Government invests and mandates local Customs to build and operate the system. Border area provinces, such as Guangxi, Xinjiang and Neimenggu use this pattern.
- *Public Private Partnership (PPP).* Government, port related companies and related inspection departments jointly invest for the establishment and operation of the system. Shanghai, Jiangsu, Ningbo and Guangzhou use this pattern.

For services of public nature provided by the electronic port system, the Government finances most of the establishment and maintenance cost. Supplementary charges are also imposed on service users. However, for other value added services provided by the system, system operators invest and collect fees from service users.

6) Security issues

Network security: strict isolation of internet and intranet

China E-Port uses "one point access" to separate each administration office from other administration offices and enterprises. Multiple protection guards are installed in the public data center to ensure the system operation and network safety.

System usability: multiple backup systems

Considering the importance and responsibility of national import and export management of China E-Port, backup system was given special attention at the design stage. Disaster recovery center was built not only in the same city but also in other faraway cities. Network safety and reliability are enhanced on a yearly basis.

User authentication and credentials

China E-Port users need to pass the access qualification examination by Government authorities. After enterprises passed the examination, IC card with digital signature will be issued.

7) Costs and benefits

Benefits of China E-Ports establishment:

Strengthened ports regulation; improved Government's ability in administration and law enforcement

E-Port uses electronic account and online verification management mode. This improves information sharing ability among the departments and port management. It

also prevents smuggling, tax fraud, and other illegal and criminal activities from the source.

Since the Customs and foreign exchange department started using online verifications for import declaration in 1999, smuggling activities have been curbed. The Customs tax revenues have also increased significantly. According to statistics, Customs tax revenues were 87.9 billion CNY in 1998, 159.1 billion CNY in 1999, and 224.2 billion CNY in 2000.

Reduced cost on Customs clearance and improved efficiency

China E-Port has realized the interconnection among various departments, enterprises and integrated related resources. It reduced the Customs clearance formalities and the enterprise cost, improving the international competitiveness of Chinese products.

LIS (Logistics Integration System) has provided services to hundreds of large manufacturing enterprises and logistics enterprises. After using TSC System[14], the benefits are as follows:

- reduced operational cost: enterprises save at least RMB 7 per submission of Customs declaration (e.g. savings on human power, fax, and express postage).
- improved working efficiency: enterprises save more than two hours of working time on submission of Customs declaration.
- reduced error rate and returning rate: enterprises reduced error rate by 90per cent . Customs rejection rate has reduced by more than 90per cent .
- increased transparency in working process: clearance progress/status and other relevant processes can be easily tracked.
- helped enterprises to develop green economy: enterprise can fully realize paperless operation which supports eco-friendliness. For example, each submission of Customs declaration could save more than ten sheets of A4 paper.

[14] TSC System is the EDI system provide by China E-Port for those large enterprise, which enable them submitting clearance data directly from their legacy system by EDI service.

Improved investment environment and supported the development of logistics industry

Large scale port Customs clearance with related unified information platform, as well as Customs law enforcement management and other logistics business services were made available through the electronic port system. Having a unified information sharing mechanism among all modes of transport (i.e. rail, road, air and maritime) solved operational information fragmentation, improved efficiency and reduced costs in the logistics sector. The improvements created better business and investment environment for logistics industry development and promoted regional economic development.[15]

[15] http://www.chinaport.gov.cn/gywm/gywm1/1245.htm

B. Japan

1. Container Logistics Information Service (COLINS)

1) Background to system development

a. National context

In 2009, the Ports and Harbors Bureau of Ministry of Land, Infrastructure and Transport (MLIT) in Japan announced a new program, "the comprehensive and intensive reform program of container logistics", which aimed to enhance port services and efficient seamless logistics network covering cross-border and domestic coastal transportation. This program started in April 2009 and ended in March 2012 with the following missions:

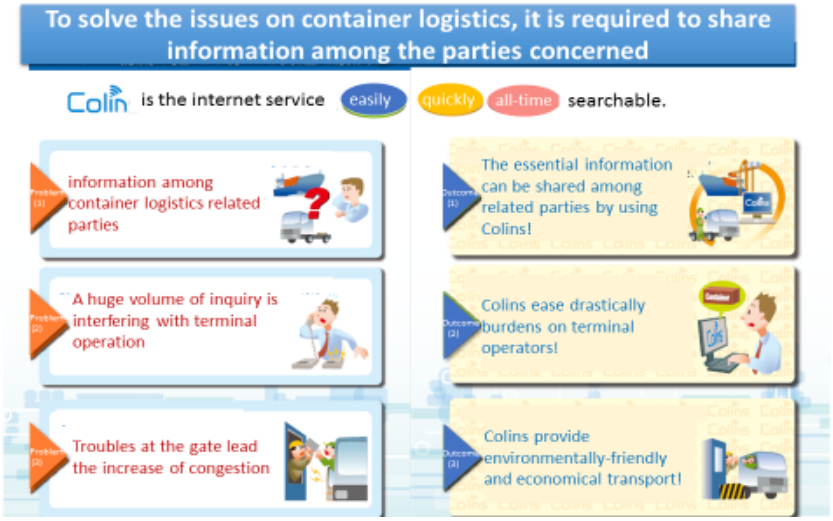
- to develop and perform a business model for 24 hours open service at container terminals;
- to enhance costal feeder services (Port of Kobe and local ports in the western area of Japan);
- to enhance services to transport container by rail from Port of Tokyo/Yokohama to inland points;
- to establish new logistics services using inland depots; and
- to enhance the use of automation within the logistics community by using ICT, RFID etc.

An evaluation committee was organized by experts from the industry, Government and academia in order to advise and monitor the development. Nine meetings were organized between 2011 and 2014.

Expected advantages/benefits of COLINS are as follows:

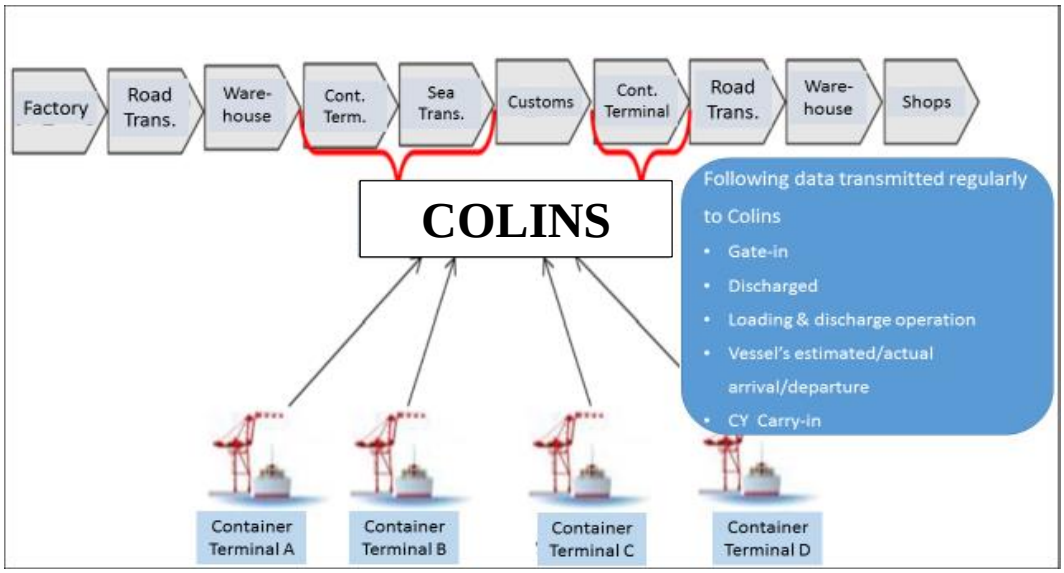
- information sharing among relevant stakeholders: essential information can be shared among parties concerned by using COLINS services;
- decrease in inquiry volume - COLINS eases drastically the administrative burdens on terminal operators;
- environment friendliness – COLINS provides environmentally friendly and economical transport by minimizing truck queue at terminal gates; and
- small & medium size enterprises (SMEs) can also share information using internet and/or mobile phones in addition to big enterprises.

Figure II-12. Merits/Benefits from COLINS



Source: Intelligent Port Promotion Office Ports and Harbors Bureau MLIT, Japan

Figure II-13. Scope of COLINS through International Maritime Supply Chain



Source: JILS Report, 2014 related to 'Coordination of logistics information system, efficient control of distribution in the visibility of the supply chain

b. Development Process

Ports and Harbors Bureau and a consulting company interviewed many stakeholders to collect information on business requirements to enhance the container/cargo tracking system.

c. Stakeholders

COLINS was developed and is maintained by MLIT. The stakeholders include: container terminal operators, shippers, freight forwarders, road transport service providers (e.g. trucking & rail-road companies) and van pool[16] operators.

d. Timeline

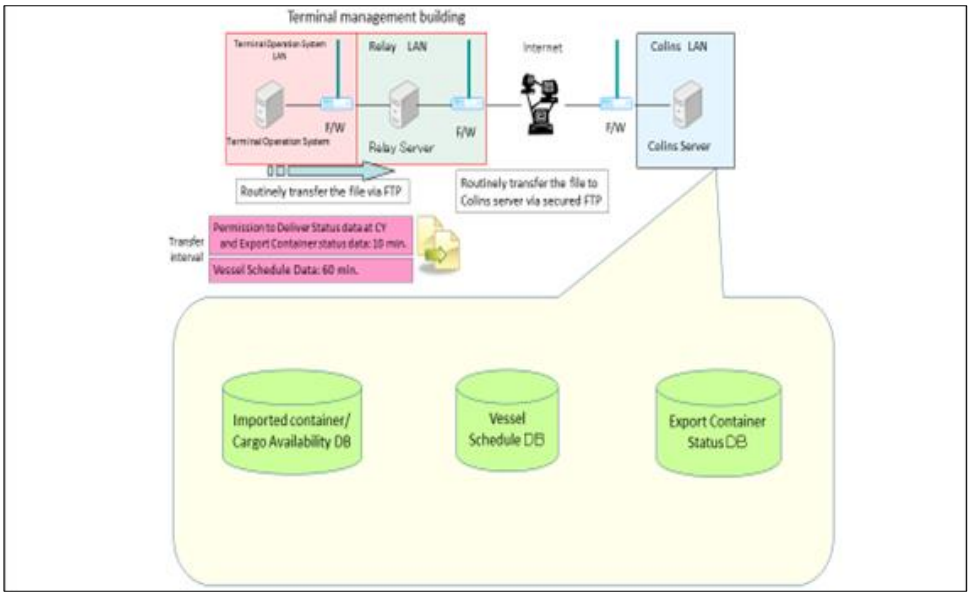
- Ports and Harbors Bureau of MLIT of Japan announced "the comprehensive and intensive reform program of container logistics" in 2009;
- The program started in April 2009 and ended after three years, in March 2012. All costs and business risks were born by MLIT;
- COLINS entered into service since 19 April 2010; and
- MLIT operates and maintains COLINS

2) System design/architecture

The main purpose of COLINS is to establish information-sharing system in the international container logistics chain to enhance the efficiency of terminal operations and cargo traceability in the supply chain management, especially for shippers (consignors) and importers (consignees).

Figure II-14 shows how the COLINS can capture data from stakeholders and different databases.

Figure II-14. COLINS Database and Data Capturing Process



Source: Presentation material by MLIT, Japan

[16] Van pool: A place to stock empty containers for export also a place to stock/repair containers returned from importers/consignees.

3) Messages available

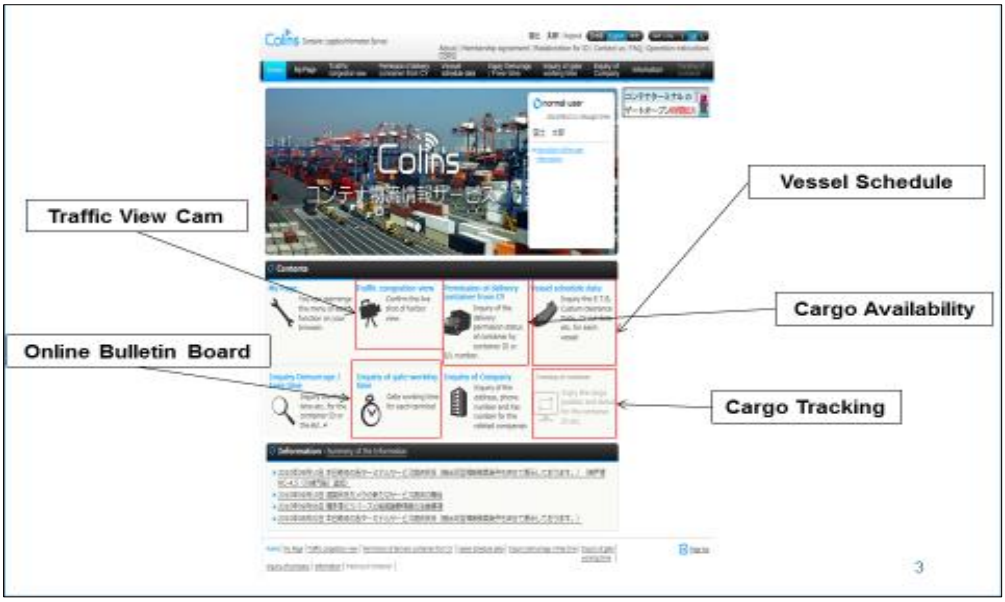
a. What the system can do

COLINS contains three kinds of databases: "Imported container cargo availability", "Vessel schedule" and "Export container status." Data are transmitted by container terminal operators. "Permission to deliver status" and "export container status at container terminal" data are transmitted every ten minutes while "vessel schedule data" are transmitted hourly. Data are transmitted in CSV[17] format.

The system provides the following services to users by PC and/or mobile phone after capturing the data:

- Traffic View Camera - displays live traffic views from more than 50 traffic cameras at port districts;
- Vessel's schedule - displays vessel schedule information provided by container terminal operators and port authorities. In addition, COLINS also get vessel's passing data and time from the AIS (Automatic Identification System);
- Online bulletin board service - displays announcements/information from container terminal operators such as operating date & time, cut-off time etc.;
- Cargo Availability service - displays import cargo availability for pick up; and
- Cargo tracking service - displays container cargo tracking information.

Figure II-15. Services provided by Colins



Source: Presentation material by MLIT, Japan

[17] CSV (Common-separated values): CSV format is a common, relatively simple file format that is widely supported.

b. Who are the users and what are the functions available to them?

1. Who are the users?

COLINS users are:

- container terminal operators
- shipper, Consignee and their agents (freight forwarder)
- road transport service providers (trucking company, railroad company)
- van pool operators

2. What are the functions available to them?

COLINS is a web-based information system to centrally share container logistics information between container terminal operators, shippers/consignees, freight forwarders, and road transport service providers.

COLINS' service aims to enhance the traceability of container/consignment within Supply Chain Management. Shippers and consignees can obtain accurate container/consignment location with their statuses and date/time through internet. Container terminal operators no longer have to respond to inquiries by phones and faxes.

c. Type of Data Shared

Table II-4. Type of Data

Message / Function	Public vs. private	Standard vs. non-standard	Negotiable vs. non-negotiable	Open data vs. personal data (privacy)	B2B vs. G2B/B2G
Vessel Movement Message (From Container terminal operator)	Private	Non-standard	Non negotiable	Open	B2B
Export Container Message (From Shipper, trucking company, van pool operator)	Private	Non-standard	Non-negotiable	Personal	B2B
Import Container Message (From container terminal operator)	Private	Non-standard	Non-negotiable	Personal	B2B

2. Kinds of data

(1) Data related to vessel schedule

- Vessel's name;
- Vessel's call sign*;
- Vessel's IMO number;

- Port code (including berth code)*;
- Estimated/actual date & time of berth (ETB / ATB);
- Estimated/actual date & time of loading & discharge working (EWST / AWST);
- Estimated/actual date & time of departure (ETD / ATD);
- CY open date & time;
- CY cut date & time; and
- Discharging permission (yes or not).

(2) Data related to export container

- Vessel name;
- Vessel's call sign*;
- Vessel IMO number;
- Booking number;
- Container number;
- Container size, type & height;
- Port code (including berth code)*;
- Container size & height;
- Empty container pickup time/place (Van pool);
- Place for full container;
- Gate-in date time;
- Container loading/unloading date time;
- Shipping availability;
- Customs permit; and
- Shipping date time.

(3) Data related to import container availability

- B/L number*;
- Container number*;
- Container size, type & height;
- Port code (including berth code)*;
- Vessel's name;
- Vessel's call-sign*;
- IMO code;
- CY carry-in;
- Inspection status;
- CY carry-in day;
- Gate-in date;
- Inspection object;

- Gate-out date-time;
- Inspection charge;
- Customs permit;
- D/O (obtained or not);
- Free time; and
- OLT[18] permitted period (start/end).

Remark: '' is mandatory*

d. Relevant data standards

1. Relevant data standard

COLINS does not adopt international EDI format such as UN/EDIFACT and ebXML.

2. Collaboration with other international organization/groups

COLINS is a domestic system meant to enhance export/import containers' traceability and provide vessels information to all parties concerned. Nevertheless, COLINS had to adopt codes which are being used internationally in the maritime community to be connected to the international supply chain management.

- **Adoption of international codes developed by UNECE**

To facilitate the exchange of electronic data from a terminal to COLINS, the following international codes developed & maintained by UNECE are adopted:

- UNECE Recommendation No.7: Numerical Representation of Dates, Time and Periods of Time;
- UNECE Recommendation No.10: Code for the Ship Identification of Ships;
- UNECE Recommendation No.16 (Code for Trade and Transport Locations); and
- UNECE Recommendation No.24 (Trade and Transport Status Codes).

- **Collaboration with GS1[19]/EPCglobal[20]**

  COLINS adopts EPCIS function which enables auto information sharing via internet with companies' own logistics systems with GS1, including EPCglobal.

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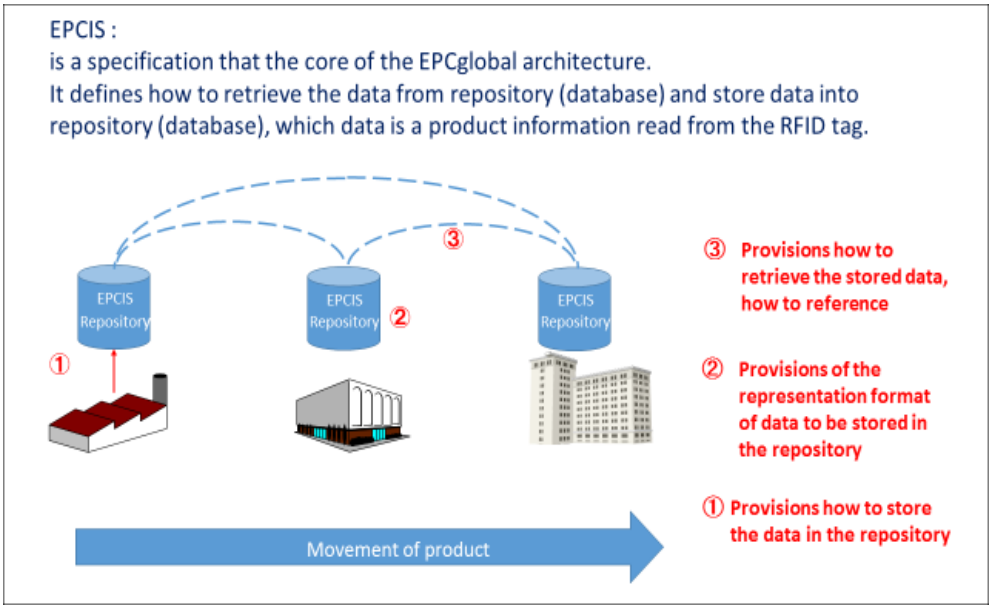
[18] OLT: An abbreviation of Over Land Transport, a kind of bonded transportation in Japan. Customs Authorities' permission is required in order to land transportation foreign cargo from the specified bonded area until the specified bonded area.

[19] GS1 is an international not-for-profit association with Member Organizations and is dedicated to the design and implementation of global standards and solutions to improve the efficiency and visibility of supply and demand chains globally and across sectors. The GS1 system of standards is the most widely used supply chain standards system in the world.

[20] EPCglobal is an organization under GS1 focusing on RFID standards and services for increased visibility and efficiency throughout the supply chain.

Figure II-16. EPCIS Function



Source: Presentation material by MLIT, Japan

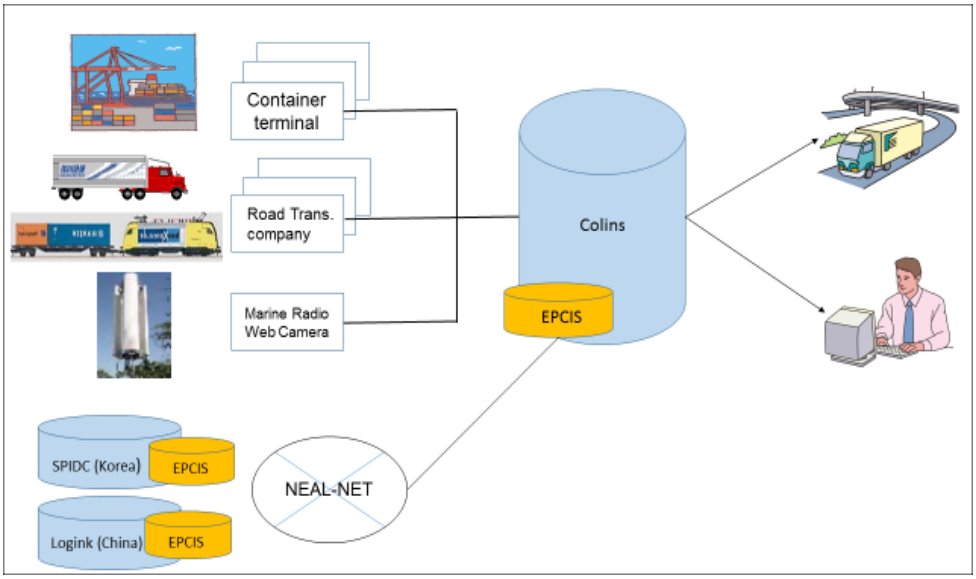
- **Co-operation with SMDG**

  COLINS collaborates with SMDG to adopt the SMDG's Terminal codes.

- **Co-operation with NEAL-NET**

  COLINS is only a gateway in Japan to NEAL-NET, which provides vessel & cargo traceability information services between China, Japan and Republic of Korea.

Figure II-17: Relation between Colins and NEAL-NET



Source: JILS Report, 2014 related to 'Coordination of logistics information system, efficient control of distribution in the visibility of the supply chain

4) Institutional arrangements

a. Lead agency

COLINS is led by MLIT in Japan.

b. Role of/ support from Government

COLINS development and maintenance is fully supported by MLIT.

c. Legal Framework

There is no special legal framework requirement.

5) Financing

All costs (development and maintenance) are covered by MLIT. Users do not pay any charges.

2. Nippon Automated Cargo and Port Consolidated System (NACCS)

1) Background to system development

a. National context

Following high growth in air trade volume particularly the rapid increase in imported air cargo, the Customs Bureau of the Ministry of Finance decided in December 1971 to adopt an IT system to improve import Customs procedures.

A bill was enacted in 1977 to give legal value to electronic Customs procedures. Nippon Air Cargo Clearance System (Air-NACCS), an air cargo import clearance system, was launched in August 1978.

Subsequently, the legal environment was modified in March 1991 to pave the way for the introduction of Maritime Automated Cargo Clearance System (Sea-NACCS) at the Keihin Port Area (Tokyo & Yokohama) for import and export Customs clearance operations. In October 1991, Sea-NACCS was launched and Air-NACCS upgraded to process both import and export cargoes.

Below is the survey report which shows the decrease of time used for certain sea-cargo and air-cargo procedures.

Table II-5. Decreased of Time used to Import Cargo by Sea

Year	Time used from a vessel's arrival to a designated place	Time used for cargo import declaration	Time used to get an import permission	Total time used
1991	47.6	94.5	26.1	168.2
1992	45.2	84.9	19.8	149.9
1993	39.4	63.7	13.1	116.2
1996	35.4	49.5	10.2	95.1
1998	35.1	46	5.6	86.7
2001	31.1	37.8	4.9	73.8
2004	26	36.8	4.3	67.1
2006	26.8	33.7	3.3	63.8
2009	26.3	33	3.1	62.4
2011	27	31.2	2	60.2

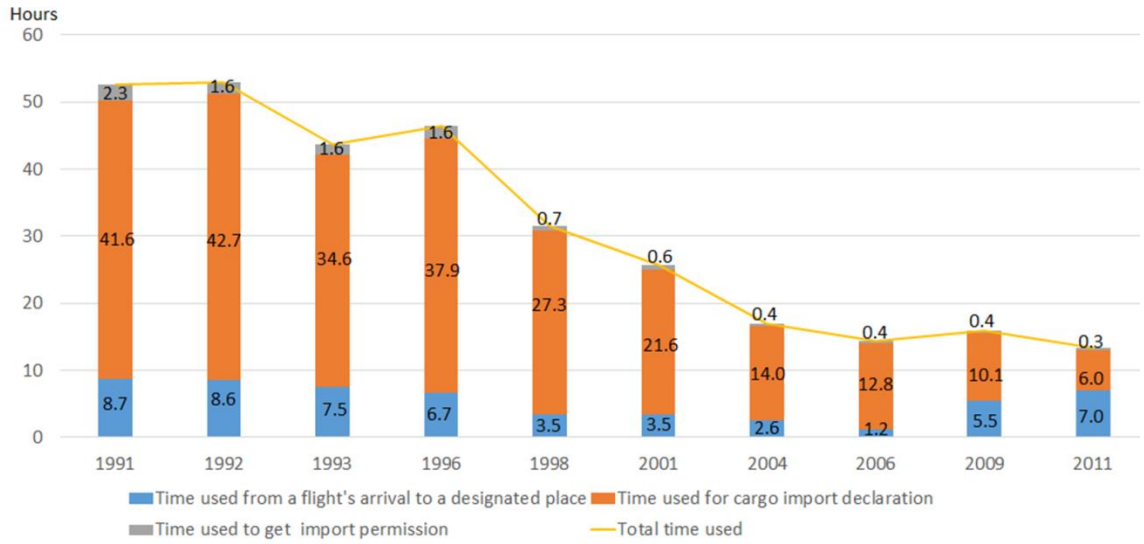
Figure II-18. Lead time for Sea Cargo

Source: 10th import procedures required time survey summary results by Ministry of Finance, 2012

Table II-6. Decreased of Time used to Import Cargo by Air

Year	Time used from a flight's arrival to a designated place	Time used for cargo import declaration	Time used to get import permission	Total time used
1991	8.7	41.6	2.3	52.6
1992	8.6	42.7	1.6	52.9
1993	7.5	34.6	1.6	43.7
1996	6.7	37.9	1.8	46.4
1998	3.5	27.3	0.7	31.5
2001	3.5	21.6	0.6	25.7
2004	2.6	14.0	0.4	17.0
2006	1.2	12.8	0.4	14.4
2009	5.5	10.1	0.4	16.0
2011	7.0	6.0	0.3	13.3

Figure II-19. Lead time for Air Cargo



Source: 10th import procedures required time survey summary results by Ministry of Finance, 2012

The main functions of NACCS are as follows:

1. import-export information on cargo, e.g. content, quantity, registration and management of packing etc.;
2. import-export Customs declarations;
3. payment procedures of Customs for importation, i.e. payment of import taxes could be and are mainly done online;
4. import-export cargo traceability through NACCS system; and
5. act as a Single Window for private sectors to Government agencies.

b. Development process

First stage (May 1977-September 1991): The main objective was to implement electronic system for import/export air cargoes Customs procedures.

Second stage (October 1991 -January 1993): NACCS started their services to handle not only import/export air cargoes but also import/export sea cargoes.

Third stage (February 1993-September 1999): NACCS started to cover other governmental agencies applications through the NACCS system. The first service was to link Food Automated Import Notification and Inspection Network System (FAINS) to Ministry of Health, Labor and Welfare, followed by services to Ministry of Agriculture, Forestry, and Fisheries.

Fourth stage (October 1999-June 2003): Sea-NACCS and the Air-NACCS were upgraded to cover B2B in addition to existing B2G.
Fifth stage (July 2003-present): Port EDI System" was added to NACCS allowing for a "Single Window" system to support international/cross-border logistics.

c. Stakeholders

A special law was passed in May 1997 to establish the legal environment of NACCS. In October 1997, NACCS Center was established with joint investment from the public (75 per cent) and private (25per cent) sector.

NACCS is a public-private, cross-industry platform based on national telecommunications network to realize online inspection, cargo tracking and data sharing. It connects relevant administrative departments such as: commerce, taxation, Customs, foreign trade, quality inspection, public security, quarantine etc. as well as the import-export enterprises and container terminals.

It stores information and data on import-export cargoes in a centralized database. This allows convenient public-private and cross-industry data exchange. It also provides "Single Window" service to enterprises related to the international logistics.

Examples of NACCS stakeholders:

1. *Private sectors:*
   - airlines companies / shipping companies;
   - air cargo agents / agent of shipping company;
   - flight caterers & suppliers;
   - consolidators / NVOCC;
   - warehouse operators;
   - Customs brokers;
   - importer/exporters;
   - banks;
   - shipping brokers; and
   - container terminal operators.
2. *Public sectors:*
   - Ministry of Finance (MOF);
   - Ministry of Agriculture, Forestry and Fisheries (MAFF);
   - Ministry of Health, Labour and Welfare (MHLW);
   - Ministry of Land, Infrastructure and Transport (MLIT);
   - Ministry of Justice (MOJ);
   - Ministry of Economy, Trade and Industry (METI); and
   - Local Government (Port authorities).

Table II-7. Timelines of the Development of NACCs

May 1977	A bill for "special law" authorizing NACCS passed by the DIET.
October 1977	The NACCS Center was established.
August 1978	Air-NACCS import system began operations (Ver.1).
January 1985	· Integrated Import-Export Air Cargo System began operations. · The Direct Interface System Began Operations (private export operations) (Ver.2).
March 1991	The Special Law of Customs Procedures for Air Cargo was changed to an Act on Processing of business related to Import and export by Means of Electronic Data

	Processing System (NACCS Special Law).
July 1991	According to the Special Law, the Nippon Air Cargo Clearance System Operation Organization was renamed the "Nippon Automated Cargo Clearance System Operations Organization".
October 1991	Sea-NACCS was put into operation (Ver.1).
February 1993	The upgraded Air-NACCS was put into operation (Ver.3).
February 1993	Data interchange with "FAINS" of the Ministry of Health and Welfare (currently Ministry of Health, Labour and Welfare) was put into operation.
April 1993	Data interchange with "PQ-NETWORK" and "ANIPAS" of the Ministry of Agriculture, Forestry, and Fisheries was put into operation.
October 1999	The upgraded Sea-NACCs was put into operation (Ver.2).
October 2001	The upgraded Air-NACCS was put into operation (Ver.4).
December 2001	Following the Reorganization and Rationalization Plan for Special Public Institution (adopted by the Cabinet on December 19, 2001), it was decided that NACCS would be transformed into an independent administrative agency.
November 2002	Data interchange with "JETRAS" of the Ministry of Economy, Trade, and Industry was put into operation.
December 2002	The NACCS Special Law was partly revised (NACCS was reorganized as an independent administrative agency).
March 2003	Net-NACCS (the provision of service via the internet) was launched.
July 2003	The "Single Window" System for import/export procedures or port-related procedures (linking NACCS and relevant Government systems) was initiated.
October 2003	The NACCS Center was reorganized into an independent administrative agency.
March 2004	NACCS and the Multi Payment Network were connected.
September 2004	Sea-NACCS and the private-sector system "Shimizu Port network system" were linked.
February 2005	・ The upgraded Interface system was put into operation. ・ Data interchange with "MOTAS" and "LMVIS" of the Ministry of Land, Infrastructure and Transport (currently Ministry of Land, Infrastructure, Transport and Tourism) was put into operation.
March 2007	The outline of specifications for the upgraded NACCS was developed by the Steering Council for Data Processing.
July 2007	Sea-NACCS and the private-sector system "CATOS" (Hibiki Container Terminal Operation System) were linked.
December 2007	Following the Reorganization and Rationalization Plan for Independent Administrative Agencies (adopted by the Cabinet on December 24, 2007), it was decided that the NACCS Center, Incorporated Administrative Agency would be privatized as a special incorporation.
April 2008	The NACCS Center formally joined the PAA (Pan-Asian e-Commerce Alliance).
May 2008	The Special Law of Customs Procedures through the Electronic Data Processing System was changed to the "Act on Special Provisions for Customs Procedure by Means of Electronic Data Processing System" (privatization of the incorporated

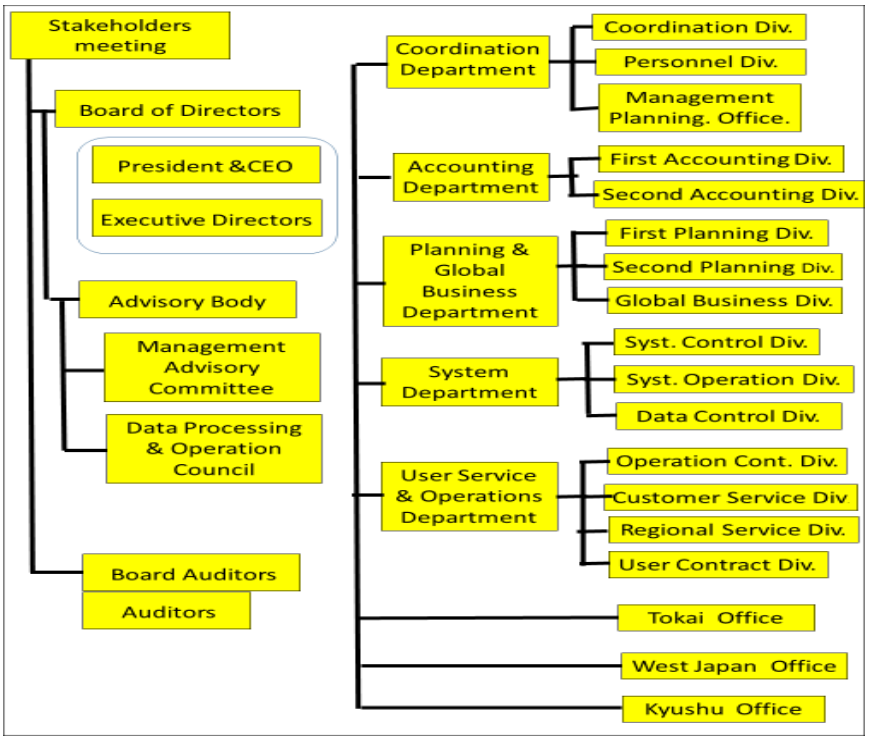
	administrative agency NACCS Center).
October 2008	・ The NACCS Center was reorganized into a stock company. ・ The upgraded Sea-NACCS was put into operation (Ver.3). ・ The portal system for Import/Export Procedures and Port-related procedures was put into operation. ・ The method of Real-time account transfer (direct method) was started.
February 2010	・ The upgraded Air-NACCS was put into operation (Ver.5). ・ The new NACCS (integration of Air-NACCS and Sea-NACCS) was put into operation. ・ The trade control subsystem was put into operation. ・ The "Single Window" system for airport arrival/departure procedures was initiated.
October 2013	Animal quarantine, plant quarantine, and food hygiene procedures were added to the "Single Window".

Source: NACCS Center Pamphlet

d. Organization chart

In October 2008, the NACCS Center was dissolved and reorganized as a stock company. Figure II-20 shows the current organization chart of the NACCS Center.

Figure II-20. NACCS Center Organization Chart



Source: NACCS Center Pamphlet

2) System design/architecture

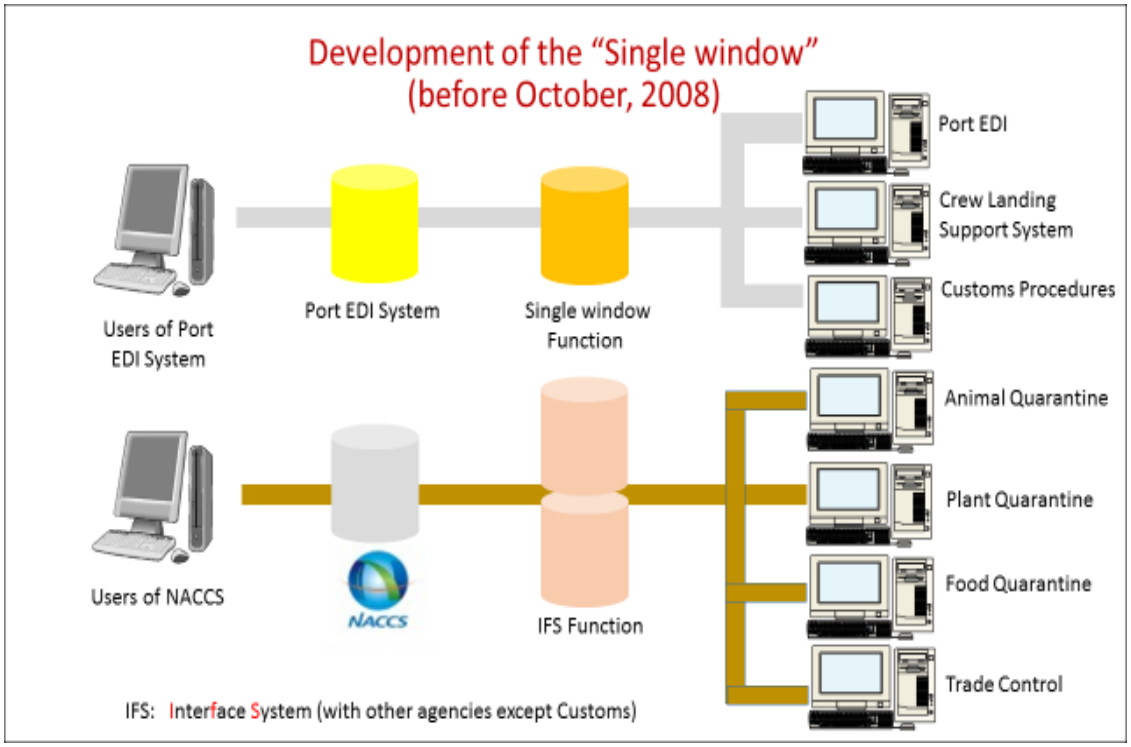
NACCS was originally designed to handle import-export cargoes by air and sea between the Customs authorities and business sectors. However, NACCS now also

provides services covering other governmental agencies, e.g. Ministry of Finance (Customs procedures), Ministry of Land, Infrastructure and Transport (Port procedures), Ministry of Economy, Trade and Industry (Trade control), Ministry of Agriculture, Forestry and Fisheries (Animal & Food quarantine) and Ministry of Health, Labour and Welfare (Quarantine), acting as a "Single Window" for international logistics and cross-border trade.

Figures II-21, II-22 and II-23 show the development of the "Single Window system" by NACCS.

Stage 1: Development of the "Single Window": users face two windows of Port EDI system for vessel's arrival/departure procedures at a marine port in Japan and for clearance of cargo to be discharged/loaded at an air/marine port.

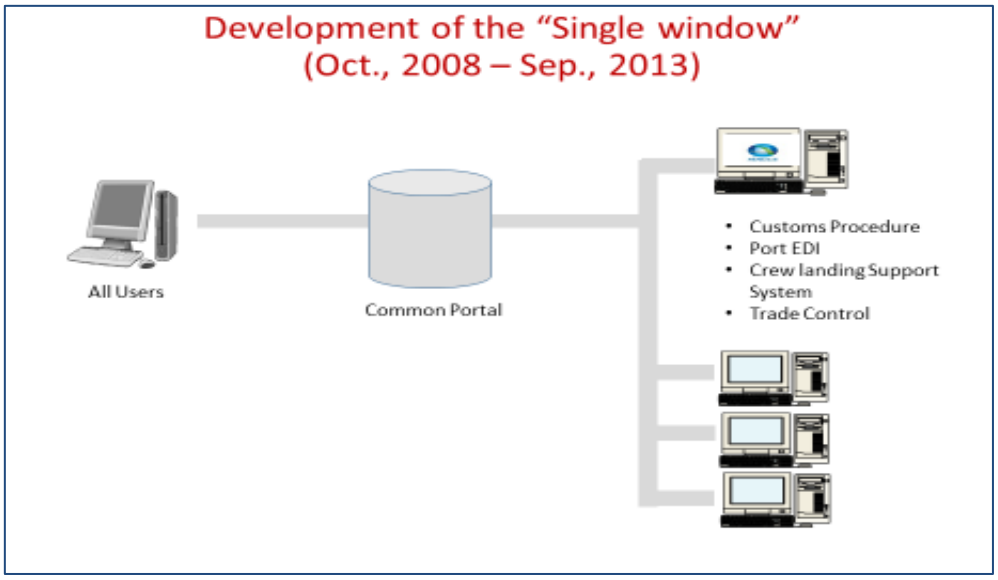
Figure II-21. Single Windows System Development, Stage 1



Source: NACCS pamphlet

Stage 2 - Development of the "Single Window": NACCS only covers Customs procedure, port EDI, crew landing support system and trade control.

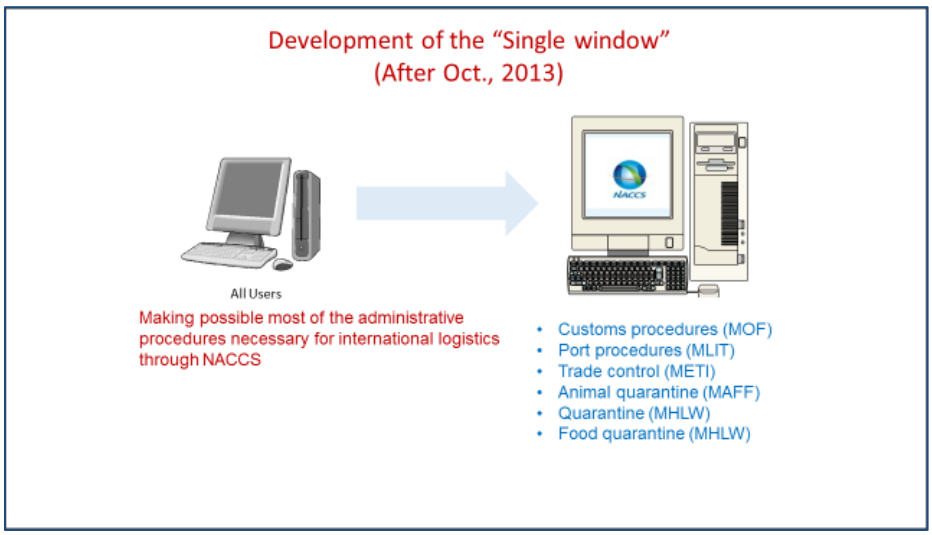
Figure II-22. Single Window System Development, Stage 2



Source: NACCS pamphlet

Stage 3 - Development of the "Single Window": NACCS covers all Government agencies' procedures from the private sector to the public sector.

Figure II-23. Single Window System Development, Stage 3



Source: NACCS pamphlet

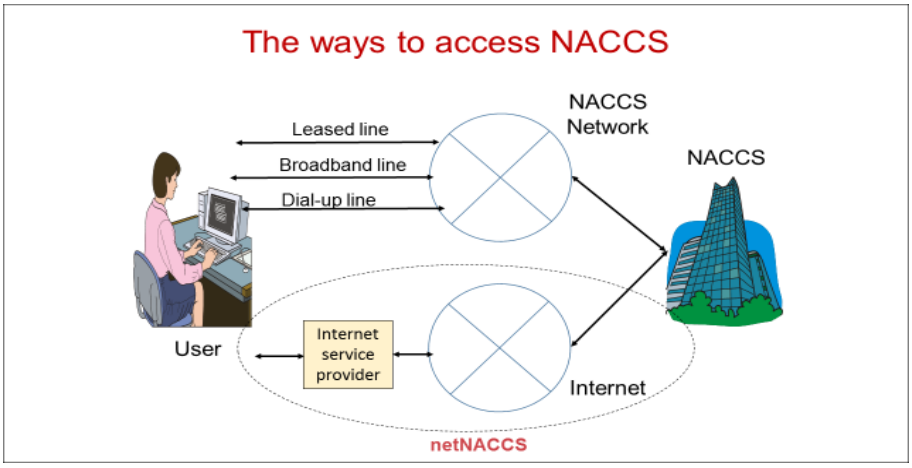
3) Messages available

a. What the system can do?

How to access to NACCS?

- Using NACCS network through leased line (dedicated line), BIA (Broadband Internet Access), PSTN (Public Switch Telephone Network)
- Using internet through service providers

Figure II-24. Ways to Access NACCS



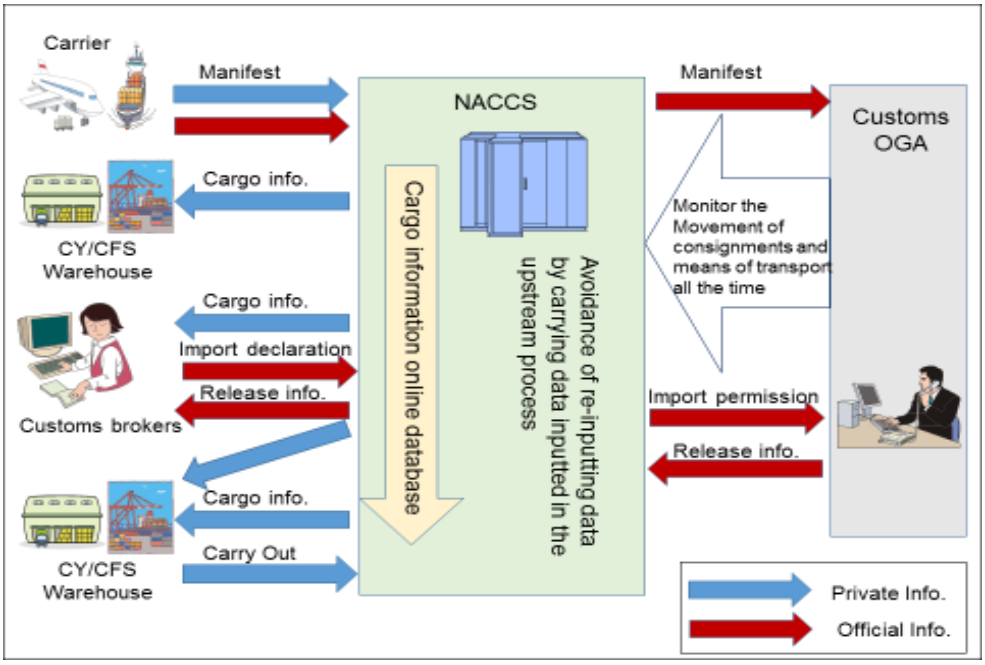
Source: Y. Kito

Benefits of using NACCS

Benefits of using NACCS include:

- eliminate the need to go to Customs and other relevant administrative agencies. Import tax payment can also be completed online;
- allow quick response to customer inquiries due to the availability of real time cargo information;
- no large scale capital investment given that users can perform Customs clearance procedure via internet; and
- information stored in NACCS database can be easily retrieved at any time. The information, as an example, can be used to identify difference between the quantities/volumes of actually imported cargoes and a contract. Users can therefore automatically recognize the discrepancy if they retrieve such information and feed them into their in-house system.

Figure II-25. NACCS data sharing for Imported Cargo



Source: Y. Kito

b. Who are the users?

NACCS processes Customs and related administrative procedures as well as cargo management in international logistics and the cross-border trade. List of NACCS users are listed in section 2. 1) c.

Figure: II-26. Number of Stakeholders for air-NACCS (Dec 2013)

Number of NACCS Users
(Air cargo)

	Company			Offices		
	Dec. 2013	Plus/Minus	Dec. 2012	Dec. 2013	Plus/Minus	Dec. 2012
Airlines companies	93	1	92	311	3	308
Air cargo agents	160	4	156	585	-8	593
Warehouse operators	175	7	168	365	12	353
Consolidators	186	10	176	584	6	578
Customs brokers	381	71	310	697	71	626
Flight caterers & suppliers	20	2	18	29	3	26
Banks	25	-1	26	28	-1	29
Exporters/importers	891	169	722	899	172	727
Others	785	48	737	1,011	54	957
Total	2,253	292	1,961	3,335	315	3,020

Source: Y. Kito

Figure II-27. Numbers of Stakeholders for Sea-NACCS (Dec 2013)

Number of NACCS Users
(See-going cargo)

	Company			Offices		
	Dec. 2013	Plus/Minus	Dec. 2012	Dec. 2013	Plus/Minus	Dec. 2012
Shipping companies	175	9	166	256	23	233
Shipping agents	893	28	865	1,586	32	1,554
Container yard operators	425	5	420	1,087	13	1,074
Warehouse operators	1,502	18	1,484	3,372	36	3,336
NVOCC	174	51	123	336	54	282
Customs brokers	1,139	81	1,058	2,118	101	2,017
Shipping brokers	266	35	231	645	61	584
Banks	47	-1	48	50	-1	51
Exporters/importers	974	170	804	1,029	174	855
Van pool	785	48	737	1,011	54	957
Others	2	0	2	4	0	4
Total	4,506	367	4,139	8,253	447	7,806

Source: Y. Kito

c. Type of data shared

The tables below show procedures related to import and export.

Table: II-8. Procedures related to Import and Export

Process	Information	Public vs. private	Standard vs. non standard	Negotiable vs. non negotiable	Open vs. personal data	B2B vs. G2B/B2G	From	To
Import Procedures								
Port entry of aircraft / ship and unloading	Procedures for port entry	Private	Standard	Non-negotiable	Personal	B2G	Carriers	Customs
	Invoice information and other items	Private	Standard	Non-negotiable	Personal	B2B	Shipper	Freight forwarders and/or cargo agents
	Registration of cargo information	Private	Standard	Non-negotiable	Personal	B2G	Freight forwarders and/or cargo agents	Customs
Transport to import storage facility / CY	Load	Private	Standard	Non-negotiable	Personal	B2B	Importer	Warehouse
	Devanning	Private	Standard	Non-negotiable	Personal	B2B	Importer	Warehouse
	Mixed cargo	Private	Standard	Non-negotiable	Personal	B2B	Importer	Warehouse
Transport to bonded warehouse	Statement on bonded transportation	Private	Standard	Non-negotiable	Personal	B2B	Freight forwarders and/or cargo	Customs

							agents	
Sorting of mixed cargo	Loading	Private	Standard	Non-negotiable	Personal	B2B	Importer	Warehouse
	Devanning	Private	Standard	Non-negotiable	Personal	B2B	Importer	Warehouse
Customs clearance for import	Declaration of imports	Private	Standard	Non-negotiable	Personal	B2B	Freight forwarders and/or cargo agents	Customs
	Delivery of permissions and other information (also deliverable to consignor)	Private	Standard	Non-negotiable	Personal	B2B	Customs	Freight forwarders and/or cargo agents
Export Procedures								
Cargo shipment	Invoice information	Private	Standard	Non-negotiable	Personal	B2B	Exporter	Freight forwarders and/or cargo agents
	Shipping instruction (S/I) information	Private	Standard	Non-negotiable	Personal	B2B	Exporter	Freight forwarders and/or cargo agents
Transport to bonded warehouse	Registration of freight information	Private	Standard	Non-negotiable	Personal	B2G	Freight forwarders and/or cargo agents	Customs
	Loading/Stuffing/Mixed cargo and etc.	Private	Standard	Non-negotiable	Personal	B2B	Exporter	Warehouse
Customs clearance for exports	Export declaration	Private	Standard	Non-negotiable	Personal	B2G	Freight forwarders and/or cargo agents	Customs
	Delivery of permissions and other information (permissions and (also deliverable to consignors)	Private	Standard	Non-negotiable	Personal	B2G	Customs	Freight forwarders and/or cargo agents
Transport to scheduled destinations for loading such as a bonded warehouse or CY	Domestic Transportation for Export	Private	Standard	Non-negotiable	Personal	B2B	Exporter	Warehouse
Transport to loading facility / CY	Loading	Private	Standard	Non-negotiable	Personal	B2B		

Procedures for loading Processing for port departure, etc.		Private	Standard	Non-negotiable	Personal	B2G	Carriers	Customs
Common procedures for import and export								
Administrative applications & notifications		Private	Standard	Non-negotiable	Personal	B2G	Carriers, Exporters, Importers	Administrative agencies
Reception of Customs and other duties		Private	Standard	Non-negotiable	Personal	B2G	Carriers, Exporters, Importers Banks	Customs

d. Relevant data standards

Table: II-9. Data standards used by Type of Messages / Message Categories

Process	Information	Which data standards?	Which data standards are used?
Import Procedures			
Port entry of aircraft / ship and unloading	Procedures for port entry	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
	Invoice information and other items	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
	Registration of cargo information	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Transport to import storage facility / CY	Load	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
	Devanning	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
	Mixed cargo	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Transport to bonded warehouse	Statement on bonded transportation	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Sorting of mixed cargo	Loading	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
	Devanning	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Customs clearance for import	Declaration of imports	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
	Delivery of permissions and other information (also deliverable to consignor)	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Export procedures			
Cargo shipment	Invoice information	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
	S/l information	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Transport to bonded warehouse	Registration of freight information	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations

	Loading/Vanning/Mixed cargo and etc.	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Customs clearance for exports	Export declaration	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
	Delivery of permissions and other information (permissions and (also deliverable to consignors)	Self-defined and/or Standards	UN/EDIFACT, XML, UNECE/Recommandations
Transport to scheduled destinations for loading such as a bonded warehouse or CY		Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Transport to loading facility / CY	Loading	Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Procedures for loading Processing for port departure, etc.		Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Common procedures for import and export			
Administrative applications & notifications		Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations
Reception of Customs and other duties		Self-defined and/or Standards	UN/EDIFACT, ebXML, UNECE/Recommandations

4) Institutional arrangements

a. Lead agency

The NACCS Center developed and maintains NACCS since October 1977. The system is upgraded often to meet the business requirement of both private sector and Government agencies. The NACCS Center plans to install the next version of the system from April 2017.

b. Role of / support from government

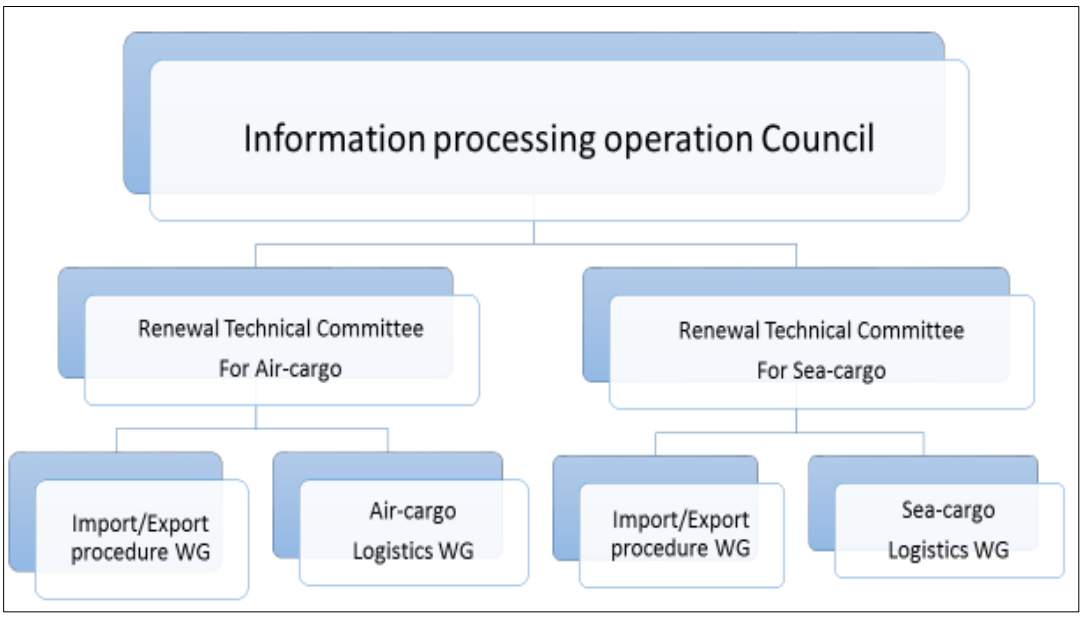
National logistics strategy policy

The Japanese Government provides full support to NACCS by creating the necessary legal environment and continuously upgrading the system. The Diet (Japanese Parliament) enacts special law in each NACCS business scope expansion. The latest one was "Privatization of the incorporated administrative agency NACCS Center" enacted in May, 2008.

Technical (human) resources

Working groups consisting of industry experts were established accomplish through each NACCS system upgrade. A new working group has been recently formed to study and plan the next version of system upgrade scheduled for 2017.

Figure II-28. Working Group Structure for the next NACCS Upgrade



Source: Materials 6th Information processing operation Council

c. Cooperation mechanisms

International Logistics Center in Japan

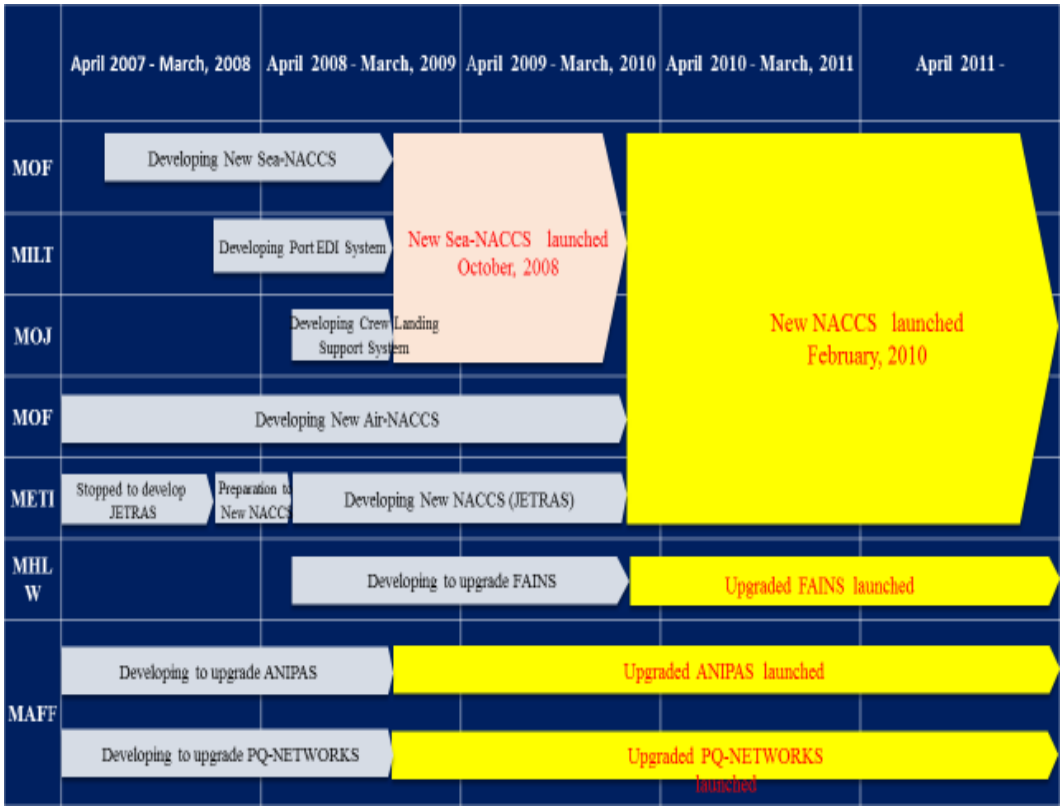
NACCS Center launched the air-cargo Customs clearance function in 1978 and expanded the system's services step by step. Following UNECE Recommendation #33 (Recommendation and Guidelines on establishing a Single Window), NACCS Center upgraded NACCS to offer "Single Window" services for imports-exports and other related enterprises related to the international logistics.

Inter-country arrangements/cooperation mechanisms

Importers and exporters have to apply and prepare various documentations for the imports and exports of goods not only for the Customs authority but also for other Government agencies. In order to reduce and improve efficiency, NACCS, as a Single Window, has the function to connect with the following Government agencies' systems:

- Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
  Port-in/out System for airplane & vessel
- Ministry of Economy, Trade and Industry (METI)
  JETRAS (Japan electronic open network trade control system)
- Ministry of Agriculture, Forestry and Fisheries (MAFF)
  ANIPAS (Animal quarantine inspection procedure automated system)
  PQ-Net (Plant quarantine network)
- Ministry of Health, Labour and Welfare (MHLW)
  FAINS (Food automated import notification and inspection network system)
- Ministry of Justice (MOJ)
  Crew Landing Support System

Figure II-29. Development on Various Systems operated and managed by different Government Agencies merged into NACCS



Source: Explanation of JETRAS by METI

The NACCS Center in collaboration with the Ministry of Finance, cooperate with WCO[21] on WCO Data Model and IMO[22] on IMO FAL Form as well as with other international organizations including UN/CEFACT to streamline and adopt international business procedures.

d. Legal framework

Promote the paperless Customs clearance pilot reform

A bill of "special law" was enacted in 1977 to set up the legal framework for authorizing electronic procedures and applications via NACCS. Electronic application improves efficiency and reduces time and cost for users. Nowadays import-export procedures related to Customs are performed through NACCS.

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21 WCO: World Customs Organization

22 IMO (International Maritime Organization) is a specialized agency of the United Nations.

Electronic signature law in Japan

Act No. 102 on Electronic Signatures and Certification Business was passed in May 31, 2000. The purpose of the Act is to promote the distribution and processing of information in electromagnetic form and define various aspects pertaining to the utilization of electronic signatures, such as the accreditation system for designated business certification, establishment of electromagnetic records and other matters related to electronic signatures.

5) Financing

The development and maintenance of NACCS system is mainly financed by the Government as a basic public service.

3. Review of Logistics EDI Committee

1) Background to system development

a. National context

The Logistics EDI Promotion Committee (hereinafter referred to as LEDIC) is an organization responsible for the development and maintenance of standard EDI messages and guidelines for logistic data exchange use in Japan. LEDIC is not to be confused with "Logistic EDI System Service Providers".

The mission of LEDIC is as follows:

- to develop national standards on EDI Implementation Guidelines); thus eliminating the needs to develop EDI Implementation Guidelines by each user, i.e.
- to reduce time in the implementation of EDI system; and
- to reduce cost in the implementation of EDI system.

LEDIC does not provide a common information network's platform for electronic data interchange among business partners.

b. Development process

LEDIC, on the basis of cooperation and support of the Ministry of International Trade and Industry (METI), the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Japan Information Processing Development Corporation[23] (JIPDEC), was established in November 1996 as an organization to develop and maintain Japan Transport EDI standards for logistics industry (JTRN). The Committee is composed of representatives of logistics sector, shippers industry, EDI promotion organization and academic experts. METI and MLIT participate in the Committee as observers. Japan Institute of Logistics Systems [24](JILS) and Japan Association for Logistics and Transport[25] (JALoT – renamed from Japan Federation of Freight Industry) act as the Secretariat of LEDIC.

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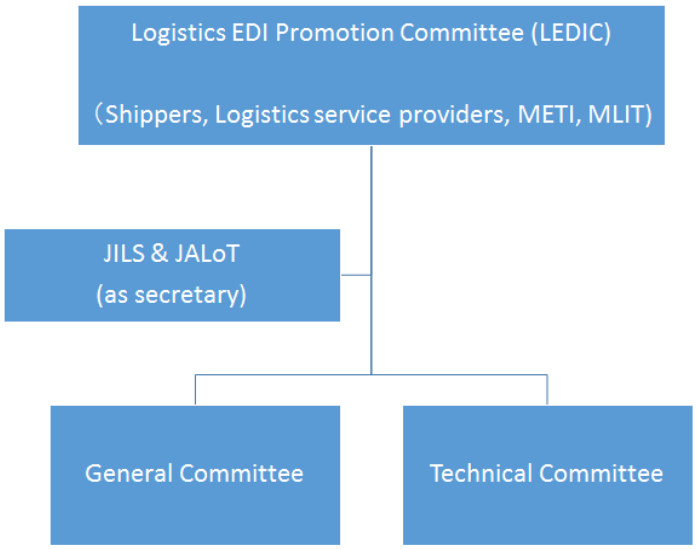
[23] JIPDEC: On December 20, 1967, Japan Information Processing Development Center (JIPDEC) was established as a nonprofit organization supported by Ministry of International Trade and Industry (MITI, now, Ministry of Economy, Trade and Industry, METI) ,Ministry of Posts and Telecommunications (MPT, now, Ministry of Internal Affairs and Communications) , and industries including computer industry. The main purpose of JIPDEC is to promote computer industry in Japan.*(Source: http://english.jipdec.or.jp/Aboutus.html)*

[24] Japan Institute of Logistics Institute (JILS): It was established on June, 1992 on receiving a charter as Institute by Ministry of International Trade and Industry (now METI) and Ministry of Transport (now MLIT). Their missions are as follows:

- Promote logistics, which play a key role in modern society, and improve the environment for logistics operations
- Conduct activities to boost the status of logistics and establish a system to develop human resources
- Encourage inter-industrial activities in logistics
- Support cooperation with foreign countries and contributions to the international community though logistics
- Maintain a logistics database

[25] Japan Association for Logistics and Transport (JALoT): It was established on July 1991 as non-profitable organization and is intended to establish measures for the cross-cutting issues related to the logistics industry,

Figure II-30. Overview of Logistics EDI Promotion Committee



Source: Annual report 2013

c. Stakeholders

Both METI and MLIT are essential stakeholders in the establishment of LEDIC. In addition to these ministries, the following industries within the private sectors are represented in LEDIC:

- Warehousing industry (10 organizations)
- Trucking industry (13 organizations)

d. Timelines

JTRN is a national standard EDI messages which were developed to create a unified and standardized cross-industry logistics EDI messages in Japan. Previously, there were three separated standards messages depending on the industry sectors. They were created by The Japan Electronic Equipment Manufacturers Association (EIAJ), the Transportation Technology Center (juridical foundation) and the Japan Institute of Logistics Systems (JILS).
In order to integrate these three sectorial standards, METI and MLIT and JIPDEC (the Secretariat) launched the "EDI Coordinating Committee for national standards" on May, 1995. Then transportation related messages (JTRN ver.1A) were released on July, 1996.

On November, 1996, the "EDI Coordinating Committee for national standards" was replaced by the "Logistics EDI Committee" mandated to develop, maintain and enhance a single unified domestic logistics EDI standard messages and guidelines.

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contribute to the sound development of the logistics industry such as by promoting above measures in collaboration with land, sea and air logistics service providers.

The first JTRN EDI messages (version 1) were released in 1996. Revision and new development were subsequently carried out by LEDIC. Table II-11 shows the history on JTRAN Messages Developments.

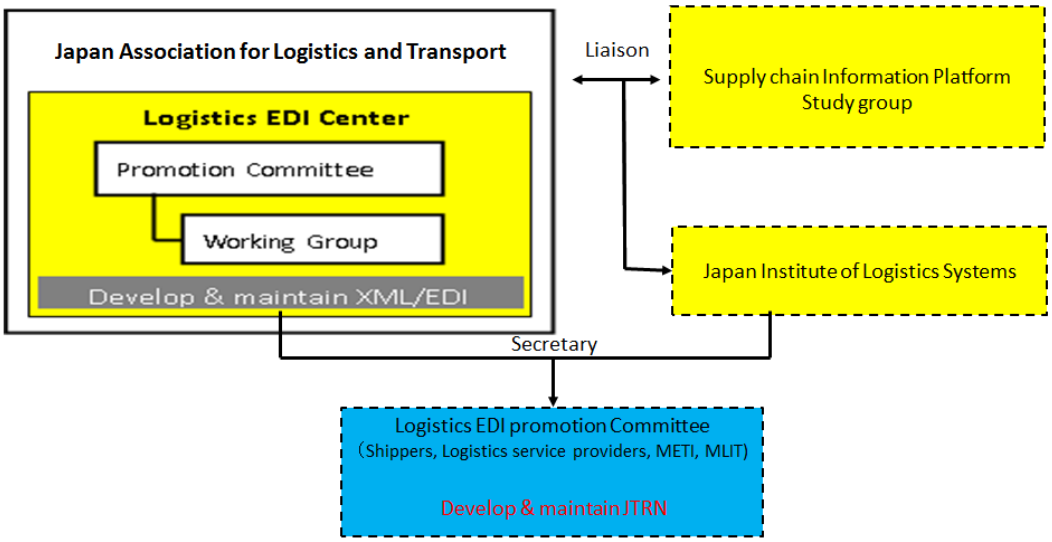
Table II-10. History of JTRN Messages Development

Released ver. 1A on July 1996	**Developed 10 JTRN messages related to transportation)**
Released ver. 2A on April 1998	Upgrade existing 10 JTRN messaged and developed a new message related to transportation Developed 19 JTRN messages relate to warehousing
Released ver. 2B on April 1994	Some data elements added
Released ver. 2C on April 2000	Some data elements added
Released ver. 2D on September 2001	
Released ver. 3A on September 2004	Some data elements added Enhancement of some messages
Released ver. 3B on March 2006	Some data elements added Developed new messages
Released ver. 3C on March 2008	Some data elements added

e. Organization of LEDIC

LEDIC was formed by the 'General Committee' and the 'Technical Committee'. The General Committee was formed by industry representatives and academia. Committee members have voting rights to decide on important matters concerning the operations and activities of LEDIC. The Technical Committee, consisting mainly of industry professionals, carried out relevant activities in implementing the adopted policies. LEDIC has suspended all its activities since there is no plan to further develop and upgrade JTRN messages.

Figure II-31. Organization chart of Logistics EDI Promotion Committee



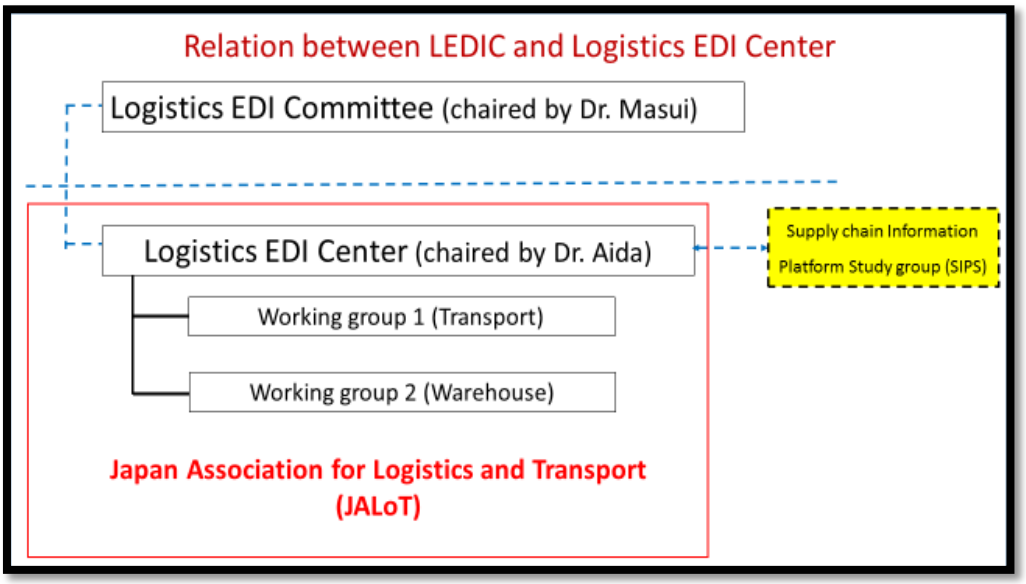
Source: http://www.butsuryu.or.jp/edi/nyuukai.html

f. Logistics EDI Center under JALoT

One of LEDIC functions was to develop & maintain JTRN EDI messages, which can be named "Traditional EDI" as they are not based on newer XML technology. However, for the time being, LEDIC has no plans to develop new JTRN messages or upgrade its deliverables and has suspended all its related activities.

Nevertheless, national logistics service providers would like to develop and implement EDI messages based on XML technology since this technology is cheaper and easier for small and medium size companies to adopt. This is why the development and implementation of XML/EDI have been carried out by Logistics EDI Center under JALoT, not by LEDIC. The relation between LEDIC and Logistics EDI Center is illustrated in Figure II-32.

Figure II-32. Relation between LEDIC and Logistics EDI Center

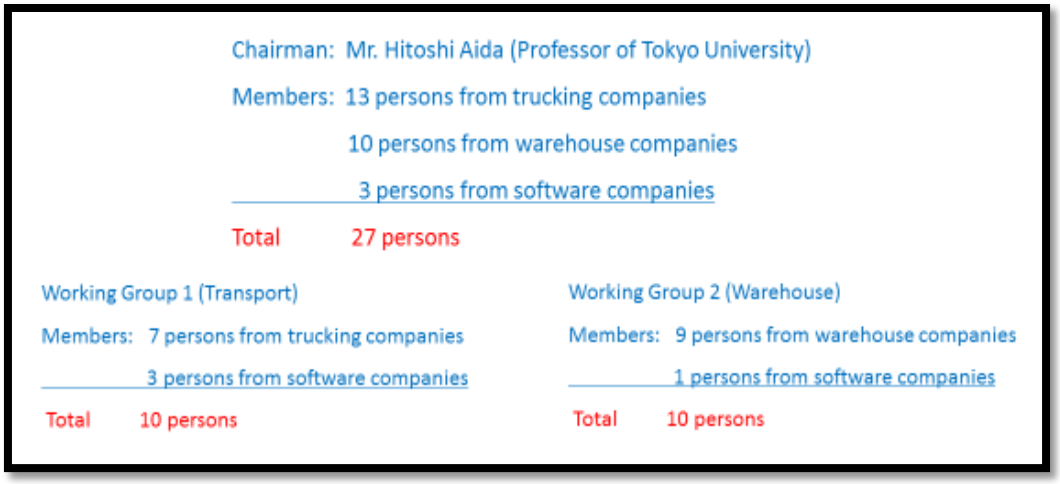


Source: Y. Kito

The main mission of Logistics EDI Center is to develop and maintain XML/EDI as well as propose new business requirements to JTRN messages. Logistics EDI Center has various activities and also acts as a focal point to LEDIC. In order to develop XML/EDI messages, Logistics EDI Center has established the "Supply Chain Information Platform Study group (SIPS)[26]". Figure II-33 shows the composition of Logistics EDI Center, number of members and working group.

[26] Supply chain Information Platform Study group (SIPS): It is a non-profitable organization and inherits the achievements of the next generation EDI Promotion Council, which has been promoting the business infrastructure construction (cross-industry EDI) in Japan. It was launched as one of working groups under the United Nations CEFACT Japan Committee with the results including the information cooperation of financial& commercial flow in the supply chain. (*Sauce: http://www.caos-a.co.jp/SIPS/sips/about.html)*

Figure II-33. Composition of Logistic EDI Center – Number of Members as of 31 March 2014



Source: Y. Kito

2) System design/architecture

LEDIC is the organization that develops and approves JTRN EDI messages to be used between shipper, trucking and warehousing industries. An expert group is working to draw best business processes and develop EDI messages.

3) Message available

a. What the system can do

LEDIC has developed and maintained JTRN messages to cover all business processes, from orders to deliveries and financial settlements.

1. *Message types of JTRN*

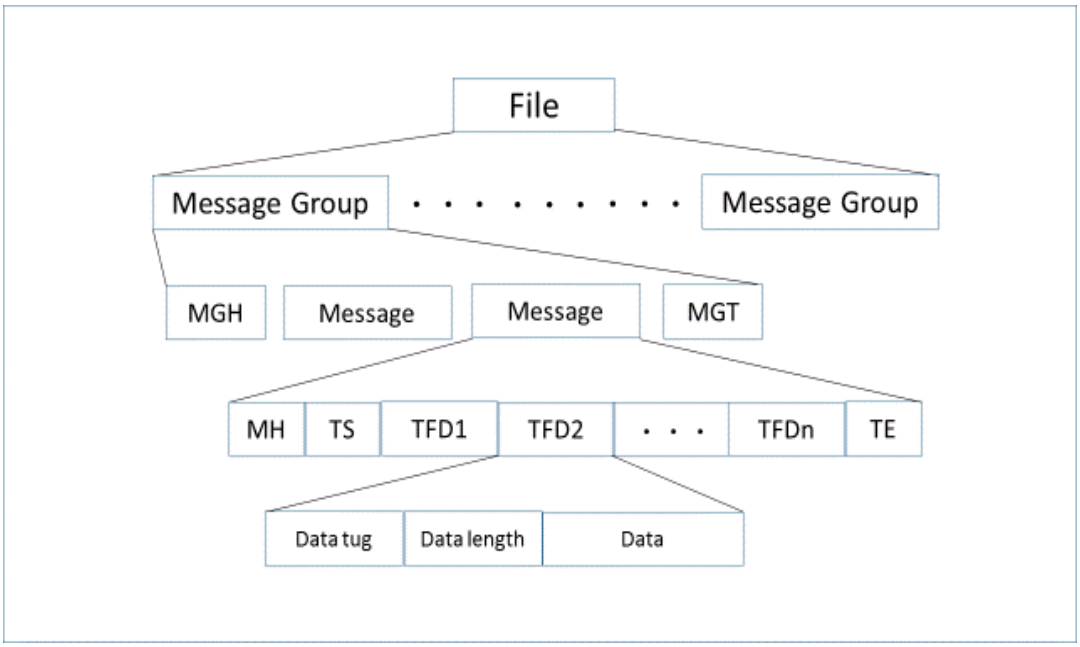
Table II-12 shows a list of implemented JTRN messages among the business partners.

Table II-11. List of JRTN Messages

Classification	Message	Business partners	
		From	To
Transportation	Transportation planning information	Shipper	Carrier
	Transportation request/acceptance information	Shipper	Carrier
		Carrier	Shipper
	Pickup information	Carrier	Shipper
	Unloading confirmation information	Shipper	Carrier
	Transportation status information	Carrier	Shipper
	Delivery designation information	Shipper	Carrier
	Transportation completion report information	Carrier	Shipper
	Receipt information	Shipper	Carrier
	Freight billing information	Carrier	Shipper
	Freight billing information with breakdown	Carrier	Shipper
	Freight billing confirmation information with breakdown	Shipper	Carrier
	Freight payment information	Shipper	Carrier
	Freight payment information with breakdown	Shipper	Carrier
	Delivery area master information	Carrier	Shipper
Warehouse	Shipment request information	Depositor	Warehouse
	Goods leaving from warehouse report information	Warehouse	Depositor
	Inventory mortgage notice information	Warehouse	Depositor
	Machine number report	Warehouse	Depositor
	Warehouse schedule information	Depositor	Warehouse
	Warehousing report information	Warehouse	Depositor
	Distribution processing request information	Depositor	Warehouse
	Distribution processing report information	Warehouse	Depositor
	Stock report information	Warehouse	Depositor
	Stock variance report information	Depositor	Warehouse
	Stock adjustment information	Warehouse	Depositor
	Stock adjustment approval information	Depositor	Warehouse
	Warehousing costs billing information	Warehouse	Depositor
	Warehousing costs billing information with breakdown	Warehouse	Depositor
	Warehousing costs billing confirmation information with breakdown	Depositor	Warehouse
	Warehousing costs payment report information	Depositor	Warehouse
	Warehousing costs payment report information with breakdown	Depositor	Warehouse
	Commodity master information	Depositor	Warehouse
	Load destination master information	Depositor	Warehouse
Common	Arrival-of-goods schedule information	Carrier/ Depositor	Shipper/ Warehouse

LEDIC JTRN/EDI messages are developed based on the CII Syntax Rule [27]((JIS X 7012). Figure II-34 shows the "hierarchical structure of an interchange" of JTRN message.

Figure II-34. Hierarchical Structure of an Interchange



Source: JTRN Guide ver.2.0

A FILE contains one or more message group (s).

- A MESSAGE GROUP contains:
  - MGH (Header Group);
  - Messages or only a Message; and
  - MGT (Message Group Trailer).
- A MESSAGE contains:
  - MH (Message Header);
  - TS (TFD starting identifier); and
  - TE (TFD ending identifier).
- Aa Transfer Form Data element contains:
  - Data tag;
  - Data length; and
  - Data.

[27] CII Syntax Rule: It is a syntax rules developed by the 'Center for the Informatization of Industry' in consideration of the use of the communication system available Kanji characters fit to EDI in Japan. This is an EDI Syntax Rule in Japan approved by JIS (Japan Industrial standards Committee).

2. *XML/EDI Message Types*

"Logistics XML/EDI" is the next generation EDI running on internet.
The reason Logistics EDI Center developed XML/EDI in addition to JTRN EDI was that in 2004, JILS did a survey on EDI implementation and concluded not to implement EDI within the logistics community because of the following problems:

- **Low usage**

  JTRN EDI was mainly used in large enterprises and not implemented by most SMEs. Only 25 per cent of logistics service companies adopted the JTRN Standards. The main reason for that was that major logistics companies had already built their own/private EDI System for physical distribution; hence conversion to JTRN EDI Standards would be expensive.

- **Costs of development & implementation**

  JTRN EDI development and implementation tools were expensive and required additional personnel resources. This was a financial burden for many SMEs.

- **Change and expansion of EDI transactions batch**

  The needs for EDI application were changing, namely not the batch type but interactive, equal to non-regular business. JTRN messages could not correspond to such new requirements given that they could not support real-time interactive transactions.

- **Consistency with international standard**

  Two different standards were used in Japan, the JRTN messages for domestic logistics business and UN/EDIFACT messages for international logistics business. These dual standards may have created problems in the globalized logistics services industry.

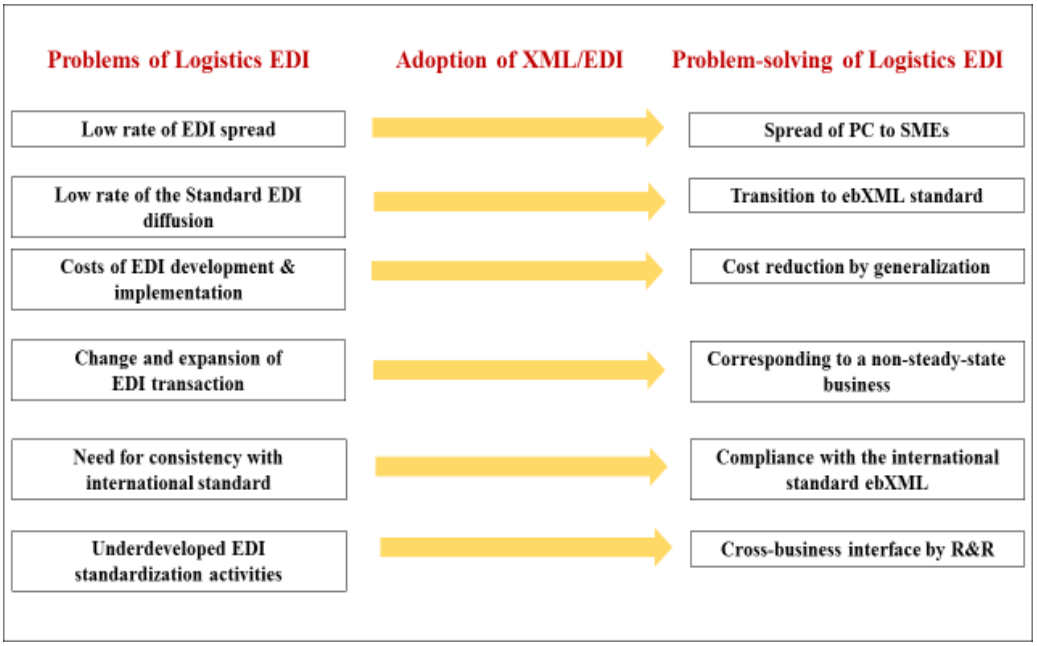
- **Underdeveloped EDI standardization activities**

  There is insufficient experience and knowledge sharing between EDI experts, and a lack of cross-business interface and cross-industry adjustment mechanism.

XML/EDI provides solutions to the problems stated above, considering the following changes in the external environment:

- SMEs have computers in their offices;
- Increasing awareness of environmental issues – paperless business;
- Development of IT technology and easy access to the internet;
- Globalization of logistics service and expansion of businesses with foreign countries; and
- Strengthening of security measures and traceability of cargo/container equipment.

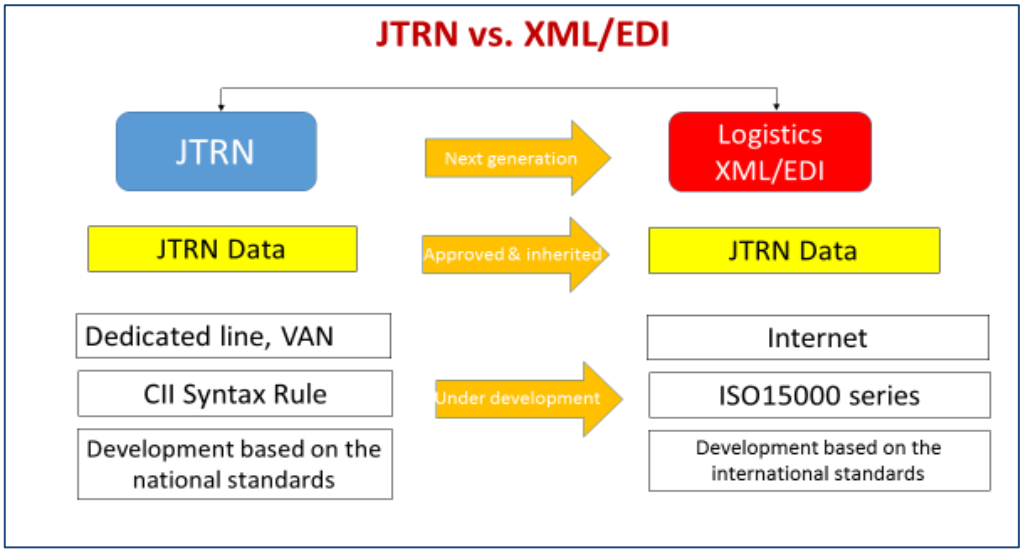
Figure II-35. Problem-solving by adoption of ebXML



Source: International standardization business report of import and export and domestic logistics EDI infrastructure by JILS, 2005

It is important to note that 'Logistics XML/EDI' inherits deliverables from JTRN messages and adopts the international standards (ebXML architecture by UN/CEFACT and ISO).

Figure II-36. Relationship between JTRN & Logistics XML/EDI



Source: Logistic XML/EDI Implementation Manual ver.2.0

Table II-12. List of XML/EDI Messages

Classification	Message	Years of development
Transportation	Transportation planning information	2013
	Transportation request/acceptance information	2005
	Pickup information	2009
	Unloading confirmation information	2005
	Transportation status information	2006
	Delivery designation information	
	Transportation completion report information	2005
	Receipt information	
	Freight billing information	2006
	Freight billing information with breakdown	2006
	Freight billing confirmation information with breakdown	
	Freight payment information	2011
	Freight payment information with breakdown	2011
	Delivery area master information	2008
	Cargo inquiry information	2005
	Cargo inquiry response information	2005
Warehouse	Shipment request information	2005
	Goods leaving from warehouse report information	2005
	Inventory mortgage notice information	2010
	Machine number report	2007
	Warehousing schedule information	2005
	Warehousing report information	2005
	Distribution processing request information	2012
	Distribution processing report information	2012
	Stock report information	2006
	Stock variance report information	2009
	Stock adjustment information	
	Stock adjustment approval information	
	Warehousing costs billing information	2006
	Warehousing costs billing information with breakdown	2006
	Warehousing costs billing confirmation information with breakdown	
	Warehousing costs payment information	2011
	Warehousing costs payment information with breakdown	2011
	Commodity master information	2008
	Load destination master information	2010
	Stock inquiry information	2005
	Stock response information	2005
Common	Arrival-of-goods schedule information	2007

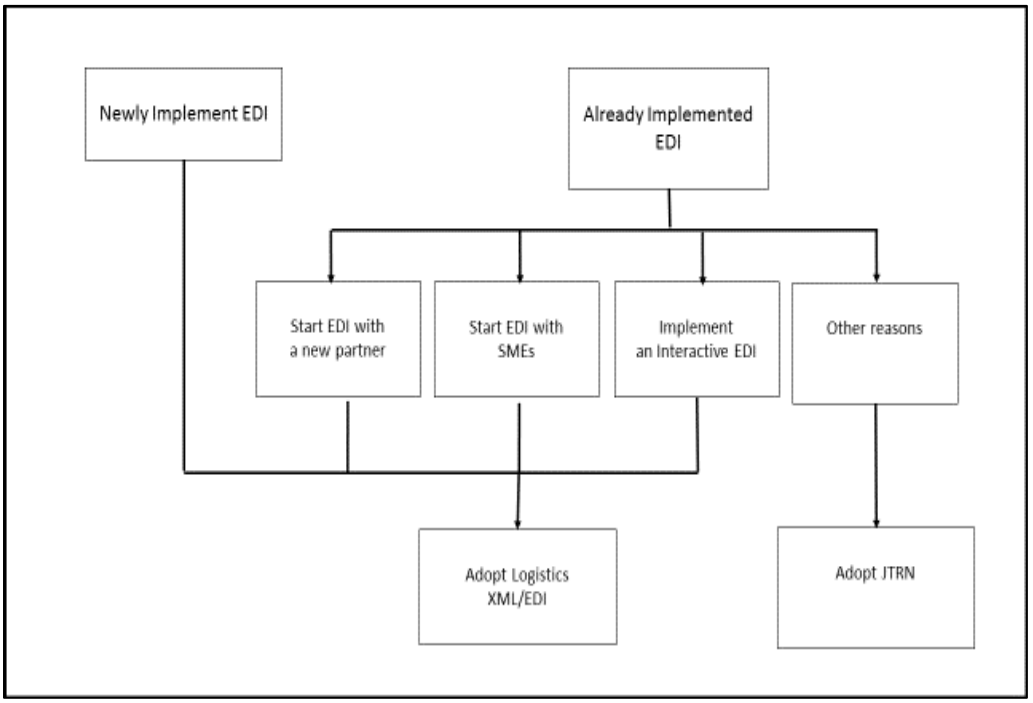
Source: Investigation and research report on logistics EDI, 2013 by the JEDIC

Remarks: The messages in a yellow column have not been developed.

3. *Adoption of JTRN and/or XML/EDI messages*

In order to start business with business partners using EDI, users have to choose whether they adopt JTRN and/or XML/EDI messages standard.

Figure II-37. A Guideline to select of XML/EDI and/or JTRN



Source: Logistic XML/EDI Implementation Manual ver.2.0

b. ***Who are the users and what are the functions available to them?***

Who are the users?

The users are shippers, trucking companies, rail companies and warehouse companies.

What are the functions available to them?

LEDIC only develops and maintains JTRN EDI messages to improve time and cost efficiency and reduce paper documents. The LEDIC can establish working groups consisting of users' community focusing on specific business requirements. Once the standard EDI messages are developed by working groups, deliverables will be circulated on LEDIC website. The deliverables are also maintained by them. LEDIC plays the role of a common platform for its users.

Table II-13. Type of Data Shared

Messages \ Functions	Public vs. private	Standard vs. non standard	Negotiable vs. non negotiable	Open data vs. personal data (privacy)	B2B vs. G2B/B2G
Transportation planning information (Shipper/Carrier)	Private	Standard	Non-negotiable	Personal data	B2B
Transportation request information (Shipper/carrier) Transport acceptance information (Carrier/Shipper))	Private	Standard	Non-negotiable	Personal data	B2B
Pickup information (Carrier/Shipper)	Private	Standard	Non-negotiable	Personal data	B2B
Unloading confirmation information (Shipper/Carrier)	Private	Standard	Non-negotiable	Personal data	B2B
Transportation status information (Carrier/Shipper)	Private	Standard	Non-negotiable	Personal data	B2B
Delivery designation information (Shipper/Carrier)	Private	Standard	Non-negotiable	Personal data	B2B
Transportation completion report information (Carrier/Shipper)	Private	Standard	Non-negotiable	Personal data	B2B
Receipt information (Shipper/Carrier)	Private	Standard	Non-negotiable	Personal data	B2B
Freight billing information (Carrier/Shipper)	Private	Standard	Non-negotiable	Personal data	B2B
Freight billing information with breakdown (Carrier/Shipper)	Private	Standard	Non-negotiable	Personal data	B2B
Freight billing confirmation information with breakdown (Shipper/Carrier)	Private	Standard	Non-negotiable	Personal data	B2B
Freight payment information (Shipper/carrier)	Private	Standard	Non-negotiable	Personal data	B2B
Freight payment information with breakdown (Shipper/carrier)	Private	Standard	Non-negotiable	Personal data	B2B
Delivery area master information (Carrier/Shipper)	Private	Standard	Non-negotiable	Personal data	B2B
Cargo inquiry information (Shipper/Carrier)	Private	Standard	Non-negotiable	Personal data	B2B
Cargo inquiry response information (Carrier/Shipper)	Private	Standard	Non-negotiable	Personal data	B2B
Shipment request information (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Goods leaving from warehouse report information (Warehouse/Custodian)	Private	Standard	Non-negotiable	Personal data	B2B
Inventory mortgage notice information (Warehouse/ Custodian)	Private	Standard	Non-negotiable	Personal data	B2B
Machine number report (Warehouse/ Custodian)	Private	Standard	Non-negotiable	Personal data	B2B
Warehousing schedule information (Custodian/Warehouse	Private	Standard	Non-negotiable	Personal data	B2B
Warehousing report information (Warehouse/Custodian)	Private	Standard	Non-negotiable	Personal data	B2B
Distribution processing request information (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Distribution processing report information (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B

Messages \ Functions	Public vs. private	Standard vs. non standard	Negotiable vs. non negotiable	Open data vs. personal data (privacy)	B2B vs. G2B/B2G
Stock report information (Warehouse/Custodian)	Private	Standard	Non-negotiable	Personal data	B2B
Stock variance report information (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Stock adjustment information (Warehouse/Custodian)	Private	Standard	Non-negotiable	Personal data	B2B
Stock adjustment approval information (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Warehousing costs billing information (Warehouse/Custodian)	Private	Standard	Non-negotiable	Personal data	B2B
Warehousing costs billing information with breakdown (Warehouse/Custodian)	Private	Standard	Non-negotiable	Personal data	B2B
Warehousing costs billing confirmation information with breakdown (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Warehousing costs payment information (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Warehousing costs payment information with breakdown (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Commodity master information (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Load destination master information (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Stock inquiry information (Warehouse/Custodian)	Private	Standard	Non-negotiable	Personal data	B2B
Stock response information (Custodian/Warehouse)	Private	Standard	Non-negotiable	Personal data	B2B
Arrival-of-goods schedule information (Carrier or Custodian/Shipper or warehouse)	Private	Standard	Non-negotiable	Personal data	B2B

c. Relevant data standards

1. <u>Data standard of JTRN messages</u>

JTRN messages are developed based on CII syntax rule, not ISO syntax rule and they are used in Japan only. Meanwhile, codes used in JTRN messages are developed by JILS. Nevertheless, the following codes are used in referring the UN/ECE Recommendations developed by UNECE;

- UN/Recommendation No. 19 (Codes for modes of transport)
- UN/Recommendation No. 20 (Codes for units of measure used in international trade

2. Data standard of Logistics XML/EDI[28] messages

Logistics EDI Center decided to adopt the following international standard in developing the XML/EDI messages in collaboration with SIPS:

- ISO/TS 15000-1: Electronic business eXtensible Markup Language (ebXML) -- Part 1: Collaboration-protocol profile and agreement specification (ebCPP)
- ISO/TS 15000-2: Electronic business eXtensible Markup Language (ebXML) -- Part 2: Message service specification (ebMS)
- ISO/TS 15000-3: Electronic business eXtensible Markup Language (ebXML) -- Part 3: Registry information model specification (ebRIM)
- ISO/TS 15000-4: Electronic business eXtensible Markup Language (ebXML) -- Part 4: Registry services specification (ebRS)
- ISO/TS 15000-5: Electronic Business Extensible Markup Language (ebXML) -- Part 5: ebXML Core Components Technical Specification, Version 2.01(ebCCTS)

3. Collaboration with UN/CEFACT

The Logistics XML/EDI messages are developed by UN/CEFACT Core Component Library (UN/CCL) which is based on ISO/TS 15000-5.

4) Institutional arrangements

Lead agency
No Government agencies.

Role of/ support from agency
No support from Government agencies.

Legal framework
There was no special legal framework requirement.

5) Financing

LEDIC has suspended its activities. As for Logistics EDI Center, each member pays 50,000 Japanese Yen of annual membership fee to finance its activities. There are currently 28 companies which are members of Logistics EDI Center.

[28] XML/EDI is a kind of trademark for XML message developed & maintained by Logistics EDI Center

C. Republic of Korea

1. Integrated Information System for Port Logistics (PORT-MIS)

1) Background to system development

a. National context

Port-MIS is a computerized management system that handles vessel and cargo movement activities in and out of ports. The system is used to link the nation's ports to realize paperless administration and to provide integrated port service to users. The system provides users with real time information about vessel arrival/departure, port facilities management and decision-making etc. The Port-MIS network comprises two areas of port management information system and logistics EDI network system using electronic documents. Main functions of Port-MIS are as follows

Table II-14. Main Functions of Port-MIS

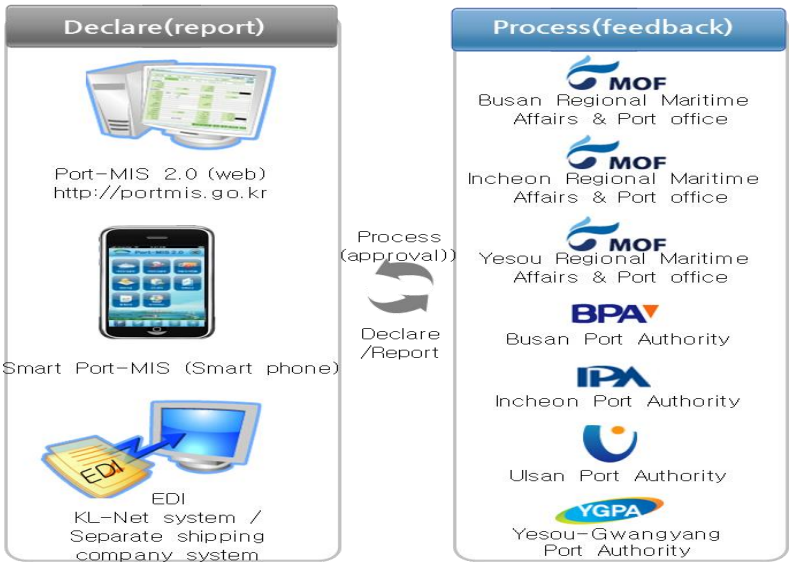
Vessel control	Vessel arrival/departure	Systemized management for efficient vessels' arrival/departure
	Berth control	Systemized berth management
	Vessel traffic control	Systemized management for vessel arrival/departure and movement status in the port
	Tugboat/pilot control	Systemized management to prevent damages and accidents inside the port
Cargo control	Cargo loading/ discharging	Systemized management for cargo/container loading and discharging
	Dangerous goods management	Systemized management for dangerous goods
Billing	Automatic accounts of harbor dues and cargo handling fees etc.	
Statistics & Analysis	Provide statistics & analysis report related port	

Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

Single Window

Port-MIS is a Single Window for the Port Authority and the Government. It covers all port operations including the management of vessel and cargo movement. Port-MIS provides paperless job processing through a nationwide network linked with all ports utilizing electronic data interface/web/Mobile.

Figure II-38. Simple Structure of Port-MIS



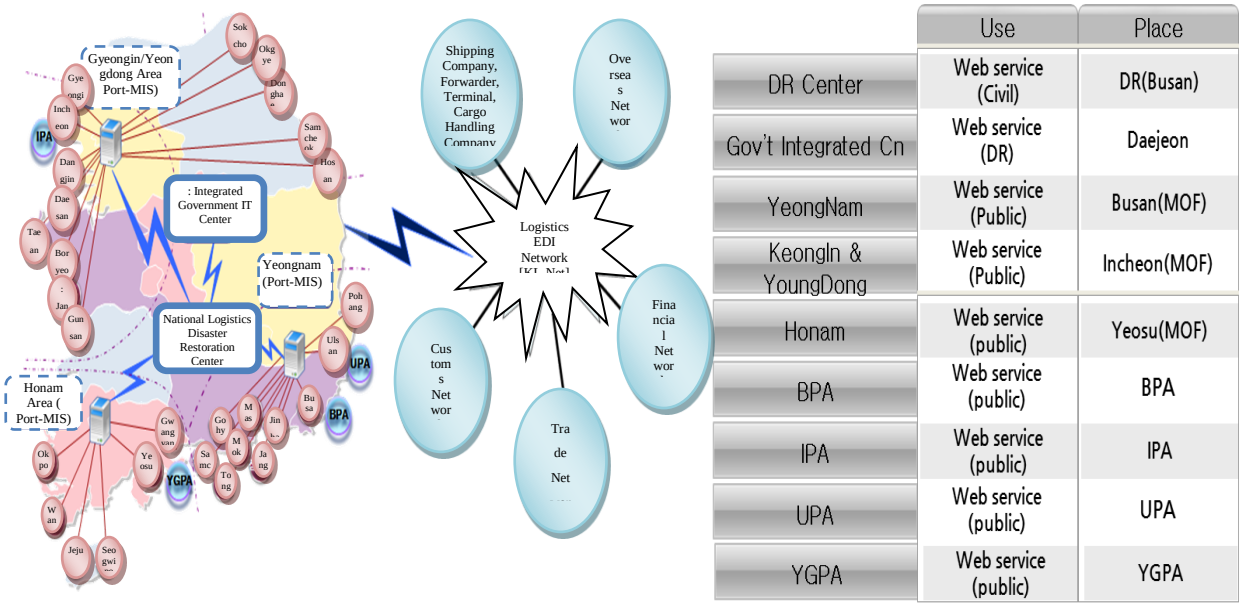
Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

Operation of Port-MIS

The Ministry of Oceans and Fisheries (MOF) and the Port Authority are responsible for ports operation and management of 31 international ports within the Republic of Korea.

- 14 national ports: Busan, Incheon, Pyeongtaek, Dangjin, Daesan, Gunsan, Janghang, Mokpo, Gwangyang, Masan, Ulsan, Pohang, Donghae, Mukho.
- 17 local ports: Seoul, Taean, Boryeong, Wando, Samcheonpo, Tongyeong, Jangseungpo, Okpo, Gohyeon, Jinhae, Hadong, Samcheok, Okgye, Sokcho, Jeju, Seogwipo, Hosan.

Figure II-39. Operation of Port-MIS



Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

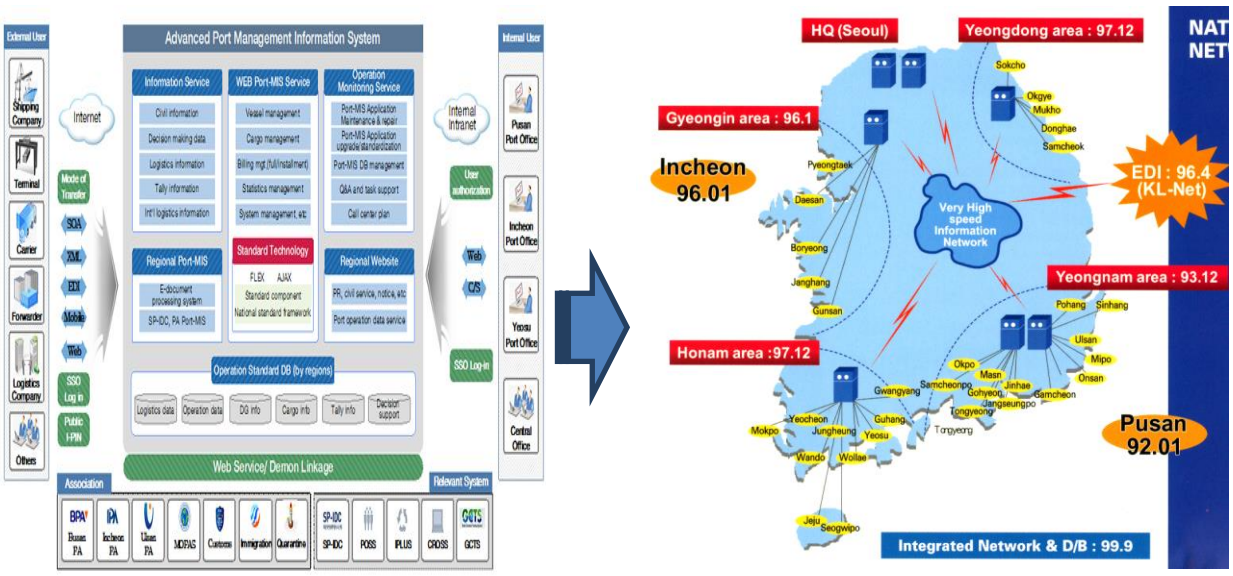
b. Development process

Port-MIS was developed back in 1994 by the Government of the Republic of Korea. The system was initially invented in order to speed up imports-exports clearance and vessel control. Along with shipping companies and logistics related companies, the Ministry of Oceans and Fisheries (MOF) funded and founded KL-Net under the "promotional law on export/import." In 1994, Electronic Data Interface system was introduced.

In 1996, MOF launched the development plan for Port-MIS based on EDI system. Port-MIS started operation in full scale, covering all ports and terminals nationwide as well as the port authority and local Government offices. The system is fully connected to Customs, immigration and quarantine offices and allows for one electronic document submission with instant approval/disapproval message to applicant. Port-MIS is the only Single Window system offering nationwide service within the logistics sector in the Republic of Korea.

In 2004, web and mobile service were made available and in 2010, Port-MIS 2.0, a web-based service commenced. Users do not need to install dedicated network and program to use EDI and no EDI fee is charged. Users have access to services offered through http://portmis.go.kr from anywhere with internet connection.

Figure II-40. Transition from Port-MIS to Port-MIS 2.0



(Port-MIS) (Port-MIS 2.0)

Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

c. Stakeholders

Port-MIS is a service platform provided by the Ministry of Oceans and Fisheries. The system, including the server, is operated and maintained by a Service Management contractor year by year.

KL-Net is the main system operator responsible for logistics network that has been verified in port and logistics technique; and operational and has the technical know-how of systems and institutes related to logistics.

d. Timelines

The timeline of Port-MIS is as follows:

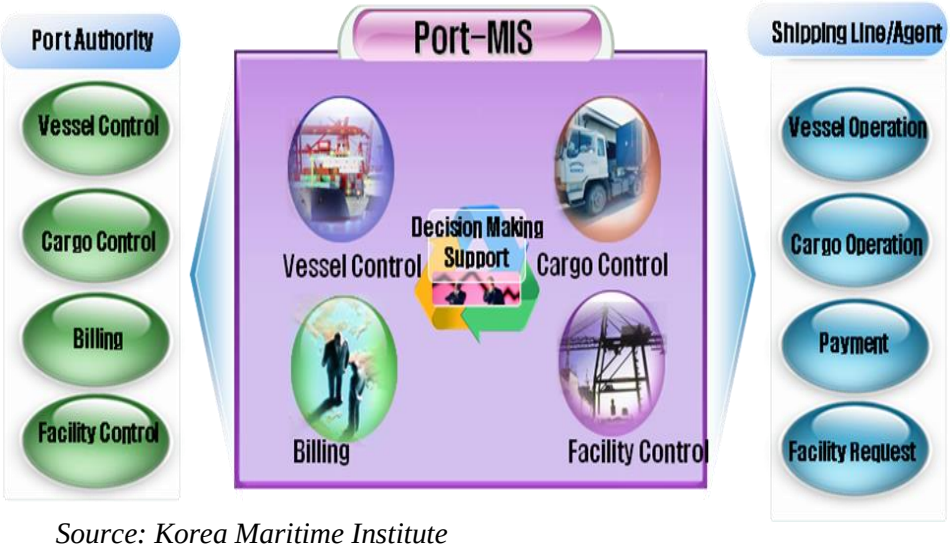
1986 – 1991	Feasibility study and detailed design
Jan. 1992	Port-MIS on-line service in Port of Pusan. The service expands to other ports including Ulsan, Masan, Pohang and Incheon up to Jan 1996.
Apr. 1996	Port-MIS EDI service commences
Dec. 1997	All major ports in Korea are linked with Port-MIS network
Sep. 1999	Nationwide Port-MIS network and integrated database building completed
Dec. 2004	Mobile Port-MIS service inaugurated
Apr. 2010	Port-MIS 2.0 service commences

2) System design/architecture

a. System concept

The system covers all processes related to port operation and customer service procedures, such as declaration of vessel arrival, declaration of port-using facility, declaration of cargo in/out, collection of levy and declaration of departure.

Figure II-41. System Concept of Port-MIS

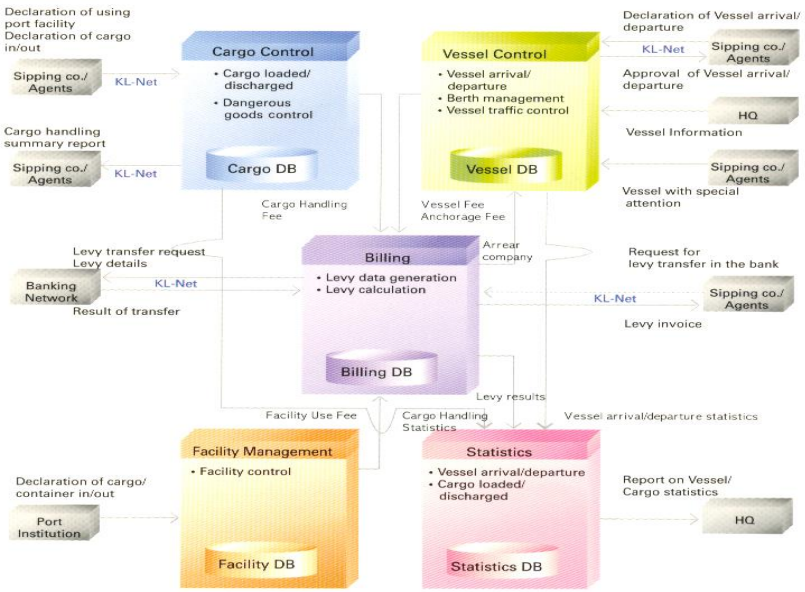


Source: Korea Maritime Institute

b. System architecture

Port-MIS architecture is described in Figure II-42.

Figure II-42. System Architecture of Port-MIS



Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

3) Messages available

a. What the system can do

Port-MIS services can be broadly divided into vessel management system, cargo management system, support system to relevant organizations and billing system.

Vessel management system

Before a vessel reaches the port to load/unload designated cargo, it should report in advance to the relevant port authority and the authority makes a plan based on reported information. The authority needs to input final data on the arriving vessel 24 hours before arrival.

Data should be inputted by customer through the terminal linked to particular shipping company and agency. The inputted data and common data with CIQ organization are sent through Port-MIS terminal electronically. Customers no longer have to deliver the data in person.

Cargo management system

Actual data on cargo movement is captured in databases and analyzed. These data are valuable sources of information for future port planning and construction.

Facility management system for relevant organizations (support system)

The system calculates various fees for the use of facilities such as berth, anchorage and unloading device. The integrated bill, including bill for berthing, anchorage and arrival based on data confirmed in vessel management system is printed and notified to individual user. Notification collected from bank for national treasury receipt is used to manage the amount due by inputting the information into barcode system.

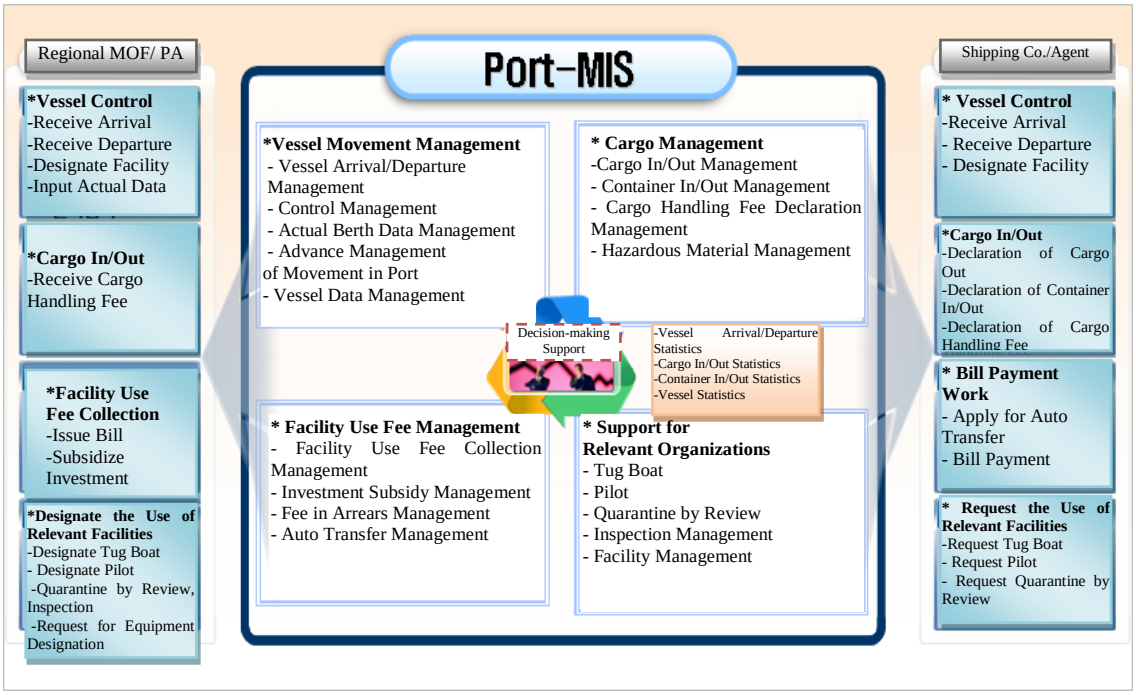
Facility use fee management

The system manages collection of facility usage fee, facility fee in arrears management, subsidy investment and automatic transfer.

Decision making management system

The system analyzes various data for statistical purpose in an accurate manner. Data can also be generated in graphic form to maximize visual effect. Other statistical data provided include: vessel movement statistics, cargo handling statistics, efficiency index etc.

Figure II-43. Service Concept of Port-MIS



Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

b. Who are the users

Port-MIS users can be divided into public and private sector. Public users are Government organizations such as the Ministry of Oceans and Fisheries (MOF), Regional MOF, Port Authority, CIQ etc. Examples of users from the private sector are mainly logistics related companies such as shipping lines, terminals operators, shippers, trucking companies etc.

c. What type of data is shared

Table II-15. Data type

Data type	Public and private	Standard vs non standard	Open data vs personal data (privacy)	B2B vs G2B/B2G
cargo/tracking information	Private data	Standard	Personal data	B2B
EDI transmission Message	Private data	Standard	Personal data	B2B
Code set	Public data	Standard	Open data	G2B

Source: Korea Maritime Institute

d. Relevant data standards

Table II-16. Data Standards with Contents

Division	Contents
National data standard	▪ Follow national standard (ex : KS) ▪ Adopt and consider to apply international standard ▪ (ex : Code set, EDI message and technical standard)
International data standard	▪ UN, WCO, IMO, ISO, ebXML and other international standard

Source: Korea Maritime Institute

4) Institutional arrangements

a. Lead agency

Port-MIS is totally supported by the Ministry of Oceans and Fisheries. Every year the MOF provides the required budget for Port-MIS management and operation.

b. Cooperation mechanisms

PORT-MIS covers all national ports and is linked to regional offices, port authorities, CIQ (customs, immigration, quarantine) and other users.

c. Legal framework

The legal basis of Port-MIS is Port Act article 89 (Organization and operation of Port Logistics Integrated Information System) and enforcement decree on Port Act article 88 (Organization, operation and utilization of Port Logistics Integrated Information System).

5) Financing

The Government, mainly the Ministry of Oceans and Fisheries, have invested in the development of the system and continued to finance its maintenance and operational budget yearly.

6) Security issues

Information security is very important, particularly sensitive cargo information such as B/L number, record of individual company, cargo value.

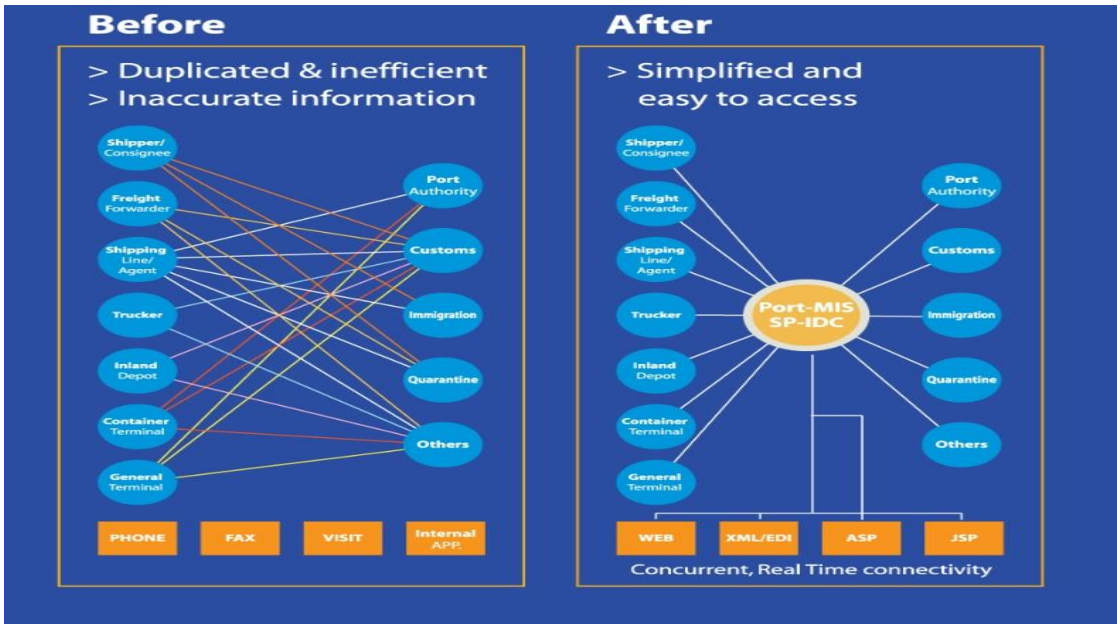
The system is set up to strictly protect sensitive information complying with the Republic of Korea's Personal Information Protection Act. All confidential data is secured and protected during data transmission and sharing between system users. Special software and hardware are applied to ensure information security. Only authorized users can access the system.

7) Costs and benefits

a. Qualitative expected effect

- Simplification of import/export procedure: reduction in the number of application forms from 75 to 22 forms.
- Solving vessel and cargo congestion problem: reduction in waiting time for vessel and container handling time.
- Reduction in total logistics cost: cost reduction due to less application forms, fewer physical Port Authority offices to handle customers and more efficient use of integrated port and shipping database. The use of Port-MIS as an information sharing platform among Government agencies, i.e. Regional Oceans & Fisheries Administration, Customs Service, Korea Immigration Service, Coast Guard etc., also lead to overall cost reduction.
- Improvement in customer service: paperless administrative system leads to overall improvement of public service quality. Customers can complete most functions electronically instead of having to be physically present at particular department to submit paper documents.
- Increase in operation efficiency of "social overhead capital," e.g. roads, ports and improved decision-making capability by using information in a rapid and proper way.

Figure II-44. Expected Effects of Port-MIS



Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

b. Quantitative expected effect

Trips and visits to physical offices to handle related work are reduced by 95per cent and paper documents used have been reduced by 97per cent. Business transparency and predictability have improved dramatically.

8) Connectivity between different systems

MOF also runs the Disaster Restoration Center (DR Center) to respond to disaster Port-MIS is linked to DR Center, enabling real-time back-up. Port-MIS is interfaced with the system via a secure system to maintain security and protect data.

9) Future developments

MOF is currently implementing project to integrate three Port-MIS platforms: Gyeongin/Yeongdong area, Yeongnam area and Honam area. After the completion of the project, Port-MIS will be a unified and single system that can provide more efficient and convenient service for its users.

2. Shipping and Port Integrated Data Center (SP-IDC)

1) Background to system development

a. National context

The Ministry of Ocean and Fisheries (MOF) recognized the importance of swift and accurate access to data and information online to support efficient and timely decision making for policy makers and key players in the maritime logistics sector.

Latest maritime shipping statistics, e.g. cargo shipping volume, container throughput, records of vessel arrival and departure etc., based on information reported by port users, registered vessels data and international logistics statistics is made available through the Shipping and Port Integrated Data Center (SI-IDC) website. The site also offers extensive range of international maritime logistics information including data on shipping companies, logistics companies and port information.

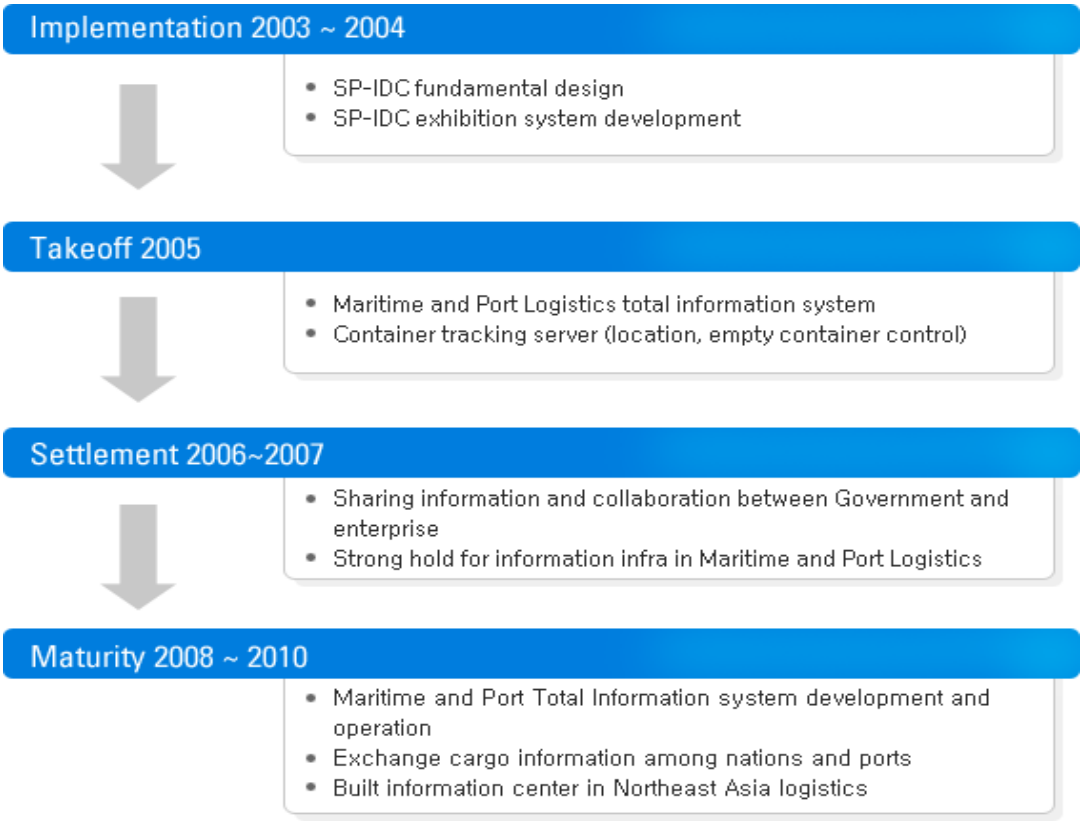
SP-IDC improves data accessibility as users can access substantial amount of information at anytime from anywhere.

b. Development process

Design of framework for SP-IDC establishment started in 2003. The homepage of SP-IDC was built and operational facilities were introduced in 2004 and service was launched in 2005. The primary service at the early days included on-line registration of vessel approval/departure and cargo in/out along with provision of logistics statistics.

In 2005, a basic plan to build information system for the Korea Logistics Information Center (KLIC) was drafted. After the introduction of KLIC service in 2006, the service was upgraded in 2007. The main service of KLIC at that time included provision of information by category of users as a portal for shipping, ports and logistics. Aiming to create synergy and reduce operation cost, the Government integrated SP-IDC and KLIC starting in 2008. The services are provided through an integrated single platform since 2009.

Figure II-45. Development Process



Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

c. Stakeholders

The Ministry of Ocean and Fisheries (MOF) is the leading supervisory body of the system. Since its establishment, SP-IDC is operated by the Korea Maritime Institute (KMI). In addition to MOF, the Government, supervisory authorities of harbors in the respective regions and four Port Authorities managing Busan, Incheon, Ulsan and Yeosu/Gwangyang ports take part in the system operation. SP-IDC users include logistics companies, shippers, shipping companies, agencies, forwarders and terminals, researchers, students and the general public. These users visit SP-IDC to obtain relevant logistics data. Recently, connection to related systems in China and Japan is has been built to create a logistics data sharing platform among Korea, China and Japan.

d. Timelines

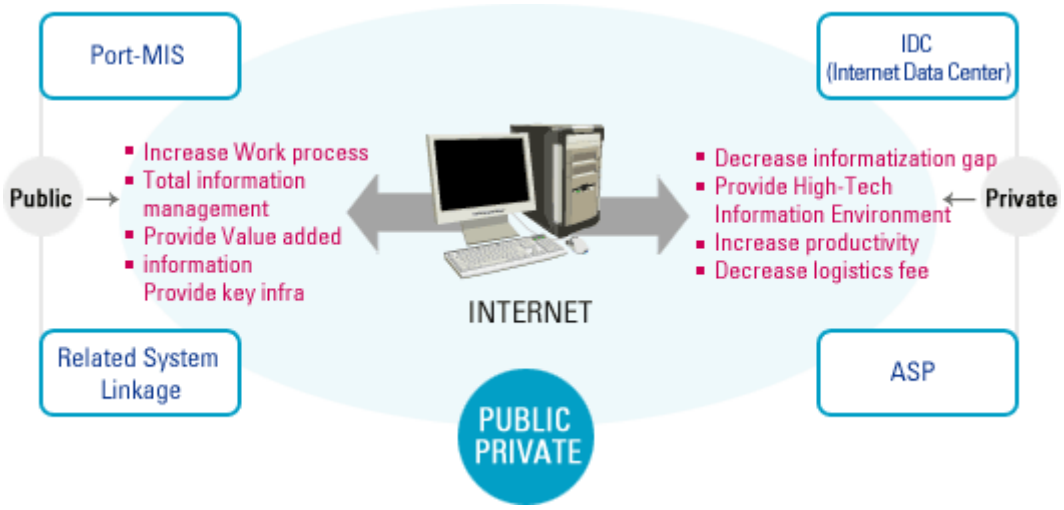
SP-IDC started in 2003 with basic design. The system was introduced in 2004 and began operation in 2005. In 2009 it was integrated with KLIC to expand service scope and in 2011 the service was initiated to share logistics data with China and Japan.

2) System design/architecture

a. Network structure

SP-IDC offers easy access for the general public to obtain data and information generated on Port-MIS (Port-Management Information System) as well as systems from other relevant organizations via internet. Information produced and managed by KMI (Korea Maritime Institute), the primary operator, is available via internet and mobile.

Figure II-46. Network Structure



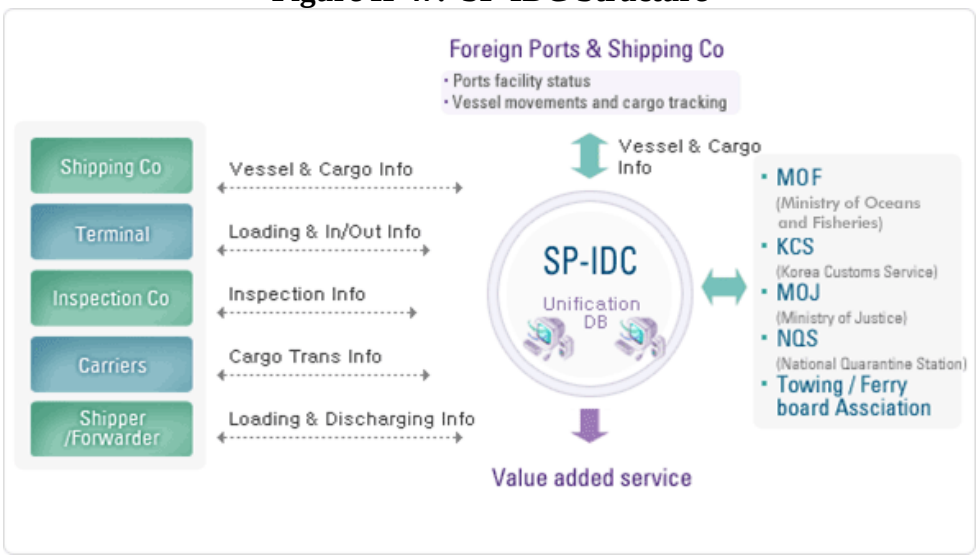
Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

b. Logical structure

SP-IDC is a web-based portal meant to integrate, collect and analyze data and information generated by relevant organizations. It offers a Single Window access to these data and information for the general public.

SP-IDC performs direct research and analysis information of shipping companies, logistics companies and ports and uploads the outcomes to provide additional data.

Figure II-47. SP-IDC Structure

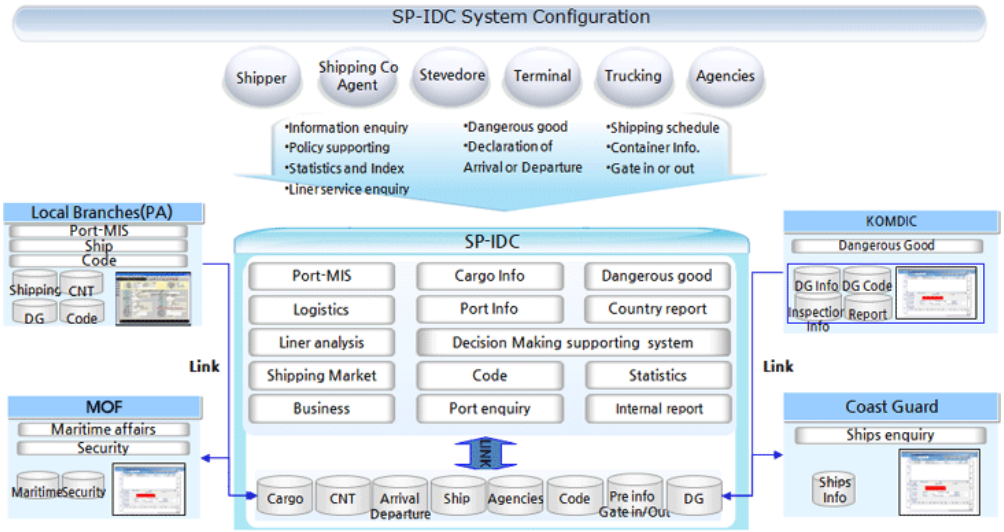


Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

c. Information platform for regional office

SP-IDC is an Internet-based system. All users with access to internet network can use the system. Since 2012, it also provides mobile-based service, allowing access to the service through smart phones. Local maritime and port administrations, local Government offices and officials at Port Authorities can perform their work using the system. SP-IDC supports decision making for policy makers and logistics key players in the maritime shipping sector by providing key information on maritime shipping logistics (cargo shipping volume, vessels arrival and departure etc.) based on reports from port users across the nation.

Figure II-48. SP-IDC System Configuration



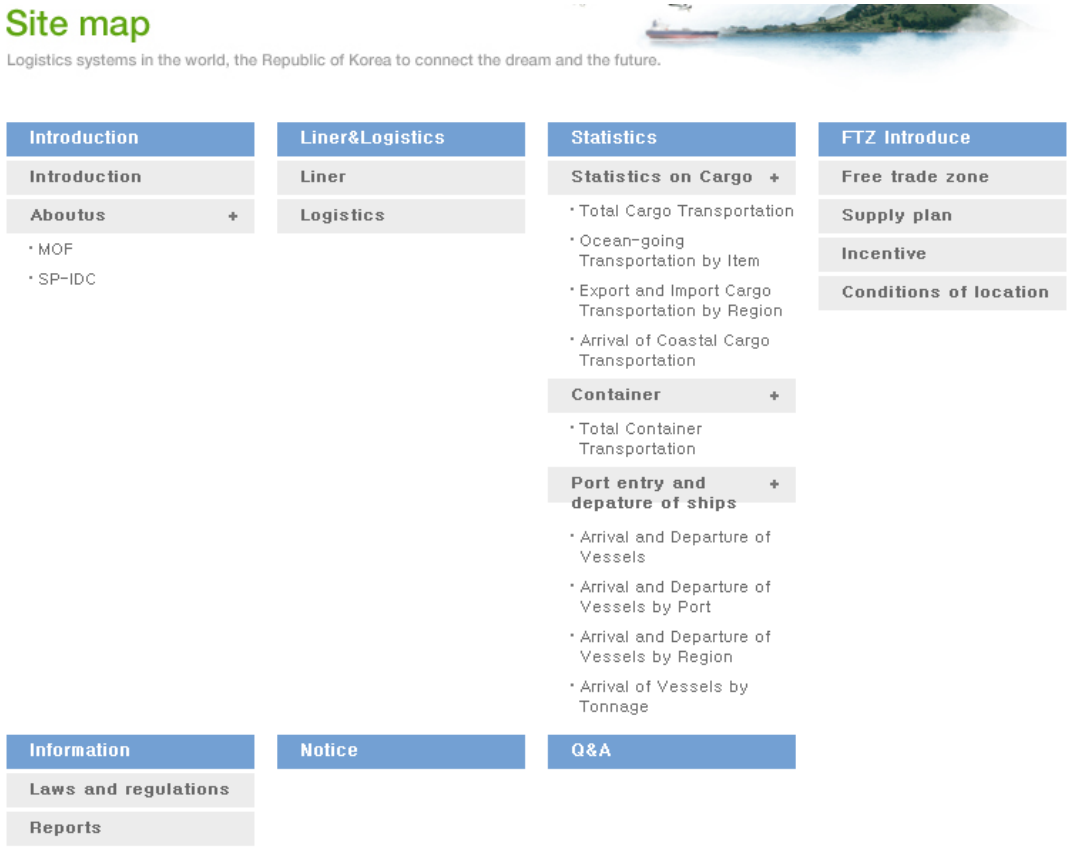
Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

3) Messages available

a. What the system can do

Functions:
SP-IDC is a portal system, offering diverse information and data on maritime shipping, ports and logistics. In the initial days of development, the system handled e-documents correspondence for report of vessel arrival and departure or cargo in and out. It no longer offers e-correspondence service though users can still track the status of their complaints, handling in progress and downloads data and statistics they need from the system.

Figure II-49. Site Map



Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

b. Who are the users

SP-IDC is open to all logistics companies and the general public. It offers differentiated services between registered members and non-registered users. Members from the Government (the Ministry of Ocean and Fisheries and local maritime and port administrations) are given access to a wider spectrum of data and statistics.

c. What type of data is shared

SP-IDC offers data on cargo handling volume, container throughput and vessel arrival and departure. It also provides links to websites of relevant organizations. Information update and maintenance are managed by the system administrator.

Table II-17. Type of Data

Data Title	Description	Method of Data Provision
Cargo transport volume	Offer the data of import and export cargo processed at domestic ports by period and by certain search condition (by port/item/nation/overseas destination, etc.)	External (Datalink)
Container throughput	Offer data on container throughput transported by vessels in and out of trade ports across the nation to make sure the data to be used for port management and policy building.	External (Datalink)
Vessel arrival and departure data	Offer data on vessel arrival and departure at trade ports across the nation to make sure the data to be used for port management and policy making.	External (Datalink)

Source: Korea Maritime Institute

As a national system for maritime and port logistics statistics, SP-IDC also offers extensive range of statistics in connection to other national information systems. Types of information available are listed on Table II-19.

Table II-18. Type of Information

Linked Organization	System Name	Date to Share	Frequency	Send/Receive
Ministry of Land, Infrastructure and Transport	National Logistics Information Center(NLIC)	Flight and air cargo volume, inland cargo volume	Once a month	Receive
Ministry of Ocean and Fisheries	Statistics portal	Maritime and port statistics	Once a month	Send
Ministry of Ocean and Fisheries	Integrated maritime information system	Statistics on registered vessels	Once a month	Receive
Korea Customs Service		Information on Customs service response	Real time	Receive
Korea Immigration Service		Response from the Immigration Service	Real time	Receive
National Quarantine Station		Response from the quarantine station	Real time	Receive

Source: Korea Maritime Institute

d. Relevant data standards

SP-IDC adopts diverse domestic and international standards on information service establishment and operation, e.g. UNLOCODE for countries and ports and IMO Code for ship call sign, to comply with international standards. For data communication protocol, international standards for information security are adopted, in addition to national standards and policy. For logistics data sharing among China, Japan and the Republic of Korea, SP-IDC applies international standards adopted by all three countries as well as NEAL-Net Standard.

4) Institutional arrangements

a. Lead agency

The Ministry of Ocean and Fisheries is the lead agency playing the key role in establishing SP-IDC. Ownership and system management rights lie with the ministry. System operation is consigned to an external agency, Korea Maritime Institute, a specialized public body under the management and supervision of the Government.

b. Cooperation mechanisms

As mentioned earlier, SP-IDC is linked to related organizations including Korea Customs Service, Korea Immigration Service and National Quarantine Station along with the Ministry of Land, Infrastructure and Transport. It feeds logistics statistics to Statistics Korea. It shares and feeds information, either real time or once a month depending on data variables, to these institutes. Concerning information sharing with China and Japan, it works with NEAL-Net to share logistics information. The information sharing mechanism is operated and managed by cooperative channels of Governments and expert working groups.

c. Legal framework

SP-IDC system was established and is being operated based on extensive legal framework. The Government introduced the “port informatization project” to provide user friendly tools to port users to file reports or complaints as well as to build an information system to enhance accessibility and convenience based on the Public Order in Open Ports Act and Port Act.

First of all, the Government established and operated Port-MIS in accordance with the Port Act (Article 89 Establishment and operation of Integrated Port Management Information System). As part of the service, SP-IDC was launched to allow users to track and review the results of complaints handling they filed and search for information such as cargo handling volume by port. SP-IDC is now an integrated portal, collecting and managing information of PORT-MIS based in the region of Busan, Incheon and Yeosu as well as information of managed data by system operator.

5) Financing

SP-IDC budget is supported by the Ministry of Ocean and Fisheries. Around KRW 300-350 million is invested for the system management each year. SP-IDC is designed to enhance users’ convenience and decision making. The system was

developed and is operated as a SOC (Social Overhead Capital) in logistics informatization. Therefore, the system is free of charge to users. SP-IDC is a national system that provides maritime and port information for general public. It offers diverse information and data free of charge to all users and will continue to develop new contents for the public good.

6) Security issues

Information security is very important; especially sensitive personal information which must be protected during data transmission and sharing among logistics participants. SP-IDC strictly protects sensitive personal information such as cargo data under Personal Information Protection Act. A variety of hardware and software are applied for information security and operations. Only authorized users can access certain data within the system.

7) Costs and benefits

SP-IDC accepts recent trend of Information Technologies to facilitate its system. It integrates simplified port and maritime information system into one information portal. It bridges informatization gap by developing SOA network based system and provide data and information to Small and Medium-Sized Enterprise.
SP-IDC strengthens port and maritime logistics information system and improves productivity and decreases logistics cost. It contributes to establishing the Republic of Korea as a logistics hub.

The system streamlines work processes, improves cost saving with the introduction of paperless work system. Benefits from the system are outlined in the following tables.

Table II-19. Classification for Public and Private Sector

Classification	Public sector	Private sector
Integrating Internal system	○ SP-IDC Total management operation system ○ Produce value added total information	○ One-Stop Service and Total information search
XML/EDI Process	○ Provide linking maritime & harbor logistics information system to foreign harbor ○ Accomplishment of policy objective for northeast logistics hot spot for northeast Asia.	○ Information service based on free IT environment ○ Reduce logistics fee by cutting down cost for information send/receive
ASP Service Design	○ Efficient operation for informatization business based on ERP	○ Improve informatization mind by logistics informatization application software
Related network link	○ Total network system for transportation, finance, trade and industry information net	○ Reduce logistics fee by unification of government agency declaration
Total Integrated DB	○ Security and reduce operation fee based on Total DB and operation ○ Lead the national maritime & harbor logistics field and IT industry	○ Total information search ○ Improve competitive for world trend and technical development information search
High-Tech environment	○ Distribution for maritime & harbor logistics filed informatization based on providing Co-Location.	○ Use high-tech information system and low cost ○ Reduce IT gap among maritime & harbor companies by reducing of information access and process fee.

Source: Korea Maritime Institute

Table II-20. Classification for Content

Classification		Content
Public Area	Budget Saving	○ Information Center manages each individual system hardware and software: Prevention for overlapping investment of system development and maintenance fee.
	Improve Efficient	○ Improving workflow by collaboration of information ○ Providing value added information to users.
Civil Area	Development Cost Saving	○ High-tech information system development and usage for SMEs with low-level of IT environment.
	Improvement Productivity	○ Support quick and safe in and out for vessel and cargo.
	Fare Saving	○ Easy access to information and cut off information processing fee.
Common	Rearing New Tech & Increase its needs	○ Expansion of informatization fundamental and development of various application software such as(ERM, SCM, EAI, XML/EDI) by supplement of IT environment

Source: Korea Maritime Institute

3. Global Cargo Tracking System (GTCS)

1) Background to system development

a. National context

Since early 1980s, the Government of the Republic of Korea developed many logistics information systems to improve logistics efficiency of air, land, ports, shipping, and multimodal transport. Port-MIS, SP-IDC and GCTS are the three major logistics information systems operated by the Ministry of Oceans and Fisheries (MOF). These three systems integrate with each other. Their common goal is to build a seamless global logistics system through providing updated logistics statistics/data, improving logistics efficiency as well as logistics security.

Figure II-50. The Goal of GCTS

Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

Main reasons for establishing GCTS

- Need to improve efficiency for workflow, maritime and harbor logistics
  - Automated gates and efficient operational facilities can improve productivity.
  - Requirements for port logistics productivity improvement are increasing, such as reducing load time.
  - Through information supply with logistics subjects and relevant agencies, maximizing information system utilization is enhanced.
- Need to strengthen national competitiveness
  - Export and import shipping volume continues to increase: shipping volume makes up to 99.7per cent of all the trade cargoes

  - More and more countries begin to introduce RFID technology, e.g. China, Japan, USA and countries in Europe.
  - Enhance port logistics security
  - Requirements such as cargo positioning and status for industry's successful promotion
  - Need for RFID technology-based port logistics standard
  - Need for expansion to all domestic ports
  - Need for expansion to some inland logistics facilities and foreign ports
- After 9.11, cargo security becomes an important issue. Thus, US Government requires strong security measure from other countries.
- RFID use gives high efficiency for workflow, maritime and harbor logistics become more efficient in the future.

Goal of GCTS

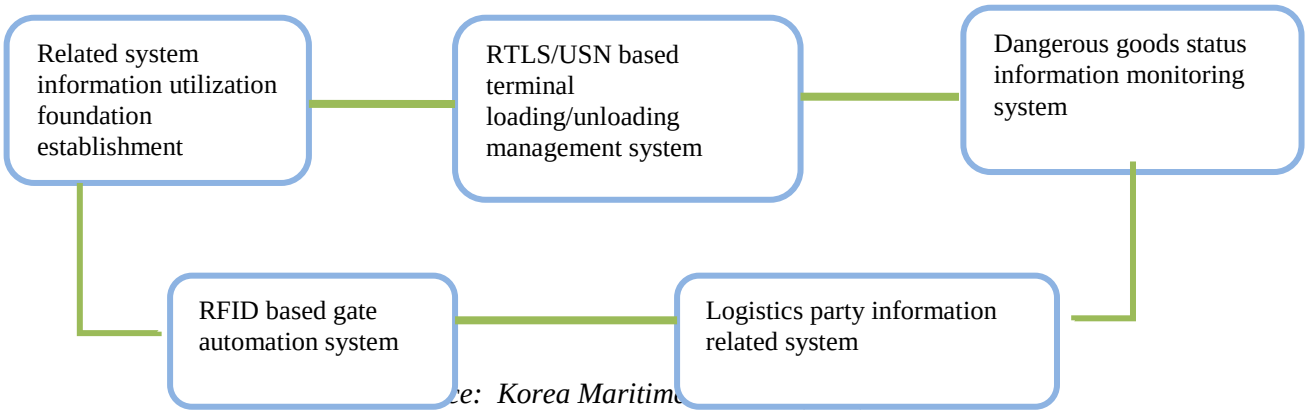
The major goal of GCTS is to establish a highly advanced Ubiquitous Hub-Port in Northeast Asia, which is one of main Government policies in the maritime and harbor area. The Government implemented three activities to achieve this goal: RFID/USN infra, intelligent integrated logistics system and u-Port Advertisement System establishment.

GCTS definition

- GCTS is RFID based logistics information network system. It collects real-time information about vehicle and container location and user can inquire container and cargo location by container and B/L number.
- GCTS Web based system provides easy accessibility to harbor facility information and status of cargo.
- GCTS auto collects tracking data by RFID tag, middleware, controller, operation server and network. Each reader located in the logistics node provides tracking info about container/vehicle/harbor facility operation status.
- GCTS allows users all over the world to get access to the statistics and analysis result derived from GCTS and related systems (SP-IDC, PORT-MIS etc.).

In conclusion, GCTS is a RFID/USN Infrastructure for cargo/truck tracking and provides movement status of container/vehicle in real-time for all users.

Figure II-51. GCTS System



Source: Korea Maritime

b. Development process

GCTS has developed through three development stages.

Stage 1: Pilot stage

The goal of this stage was to build RFID application model. The goal was achieved by:

- Building port logistics RFID infrastructure
  - Domestic: ICD, Busan terminal etc.
  - International: Tianjin Port(China), Long Beach port(USA) etc.
- Building GCTS system
  - Container/truck position tracking service etc.

Stage 2: Promotion stage

The goal of this stage was to expand basic understanding about RFID. The goal was achieved by:

- Holding achievements seminar about pilot stage on industry to provide nationwide activation opportunities
- Attending APEC IT exhibition and presenting advanced u-Port model and to improve country status in the world

Stage 3: Main project stage

The goal of this stage was to build u-Port system. The goal was achieved by:

- progressively expand RFID application model
  - Expanding GCTS and building major logistics base infrastructure in the Republic of Korea and abroad. Domestic: mainly in port terminal, ICD, C/Y, truck terminal and highway T/G. International: China, Japan, USA and countries in Europe.
  - Building dangerous cargoes tracking systems based on USN sensor, e.g. ConTracer, GICOMS etc.
- Connecting service among various logistic subjects, including shippers, shipping companies, terminal operators, and relevant agencies.
- Participating in related international conference such as the TOC ASIA.

c. Stakeholders

GCTS is a service platform provided by the Ministry of Oceans and Fisheries. The server is operated by KL-Net (as service and maintenance contractor). The shippers, shipping lines, terminal operators, trucking companies and related entities joined GCTS as users to share information of cargo status including positioning and time.

d. Timelines

First Stage:

RFID adoption: Installation of PORT RFID Infra (2005 - 2007)

- RFID based maritime logistics efficient Project exhibition (2005)
  - RFID based export/transit process model development
- RFID based maritime logistics efficient Project 1st Stage (2006)
  - Containers and inland RFID/USN based system in Busan area
- RFID based Port & Logistics efficiency securing business 2nd phase (2007)
  - nationwide container terminal RFID based gate operation infrastructure diffusion
  - support and diffuse RFID technique to domestic Port & Logistics facilities including most of container terminals step by step.

During the 2nd phase in 2007, project team implemented following steps by month:

August: present status of business progress

- investigate operation environment of target container terminal computation performance test of 900mhz reader satisfying gen 2, 6b multi-protocol

September: present status of business progress

- opening report launching conference
- on-the-spot inspection to build RFID infrastructure of targeting container terminal

October: present status of business progress

- launching research on building & standardizing GCTS application system
- building RFID infrastructures and unit test for Sun-kwang container terminal

November: present status of business progress

- to build RFID infrastructure of Incheon, GICT, Hutcheson Kwangyang, Dong-bu Kwangyang, KIT Korea Kwangyang, and Kunsan container terminal
- opening intermediate report conference, opening business progress presentation targeting terminal operating companies

December: present status of business progress

- executing integration test (Hutcheson Kwangyang)
- test execution of operating Inchon/Kunsan/Kwangyang system, issuing electronic tag for free

Second stage

RTLS/USN Application: Model development for RTLS/USN (2007)

- Port logistics RTLS/USN model pilot project (2006-2007)
  - Container installation and unloading efficiency model (RTS) exploration
  - Container risk detecting sensor model (USN) exploration
- Development of value added information system based on RFID for maritime process efficient
- RFID/USN based system in Inchon/Kwangyang area

Third stage

- Building U-Port: RTLS/USN-based u-Port project (2008-2012)
- RTLS/USN application on port logistics (2008)
  - RTLS model application on international container terminals
- RFID dissemination project for major logistics hubs on home and abroad
  - Vehicle tracking model application through ICD, ODCY, port terminal, railway depot, toll gate etc.
  - Shared logistics information with relevant organizations (Korea Customs Service, Ministry of Knowledge and Economy etc.)
- Initiative to share information with logistics stakeholders and relevant organizations
  - Shared use of information with shipping companies, transportation companies and relevant organizations

Fourth stage (2012 onwards)

- System Development for location tracking and container security info related to decision making
- Cargo tracking system expands to major container terminals in the Republic of Korea as well as foreign countries including China, Japan, USA and some Europe countries.

Table II-21. RFID Phase

Phase	Introduction (Phase 1)	Dissemination (Phase 2~3)	Settlement/Stability (Phase 4~5)
Key Initiative	1) RFID infrastructure building - Port terminals and inland logistics base in Busan, Incheon and Kwangyang (including ICD) 2) Establishment of RFID information system - Gate automation system 3) RFID education and promotion - Pilot project presentation : September ’05 - APEC IT Exhibit participation: Nov. ‘05. - RFID education for general audience and those in the field - Support for development of application technology for port logistics RFID	1) RFID infrastructure expansion Stage 1 - All the terminals in Korea (including general wharf) - Major domestic logistics base (ICD, IFT, C/Y, etc.) and toll gate at highways - Major overseas logistics facilities (US, China, etc.) 2) RTLS/USN-based port terminal efficiency enhancement - MULTI CYCLE facility management system 3) Information sharing with relevant organizations - SP-IDC, PORT-MIS, GICOMS, etc. 4) RFID education and promotion -Establishing framework for academia-industry cooperation and technology education	1) Settlement/stability (Phase 4~5) -Container chassis recognition and adding inland hubs and toll gate -Overseas logistics facilities (Japan, Russia, Poland, etc.) 2) RFID sophistication -Replacing outdated RFID infrastructure at port terminals and middleware upgrade 3) Logistics information sharing with government institutes -Sharing with the Customs Service and the Ministry of Trade, Industry and Energy 4) Applying the latest technology -Cargo tracking based on Global Navigation Satellite System (GNSS)
Objectives	- RFID infrastructure establishment in Incheon and Kwangyang logistics facilities - Presenting RFID technology-based u-Port application model	- RFID infrastructure expansion in all port terminals, plants of shippers and major logistics facilities in Korea - Applying advanced RTLS/USN-based port efficiency improvement measures	- RFID infrastructure expansion in major logistics facilities home and abroad - Leveraging information of e-government - RFID technology transfer to relevant organizations and general audience

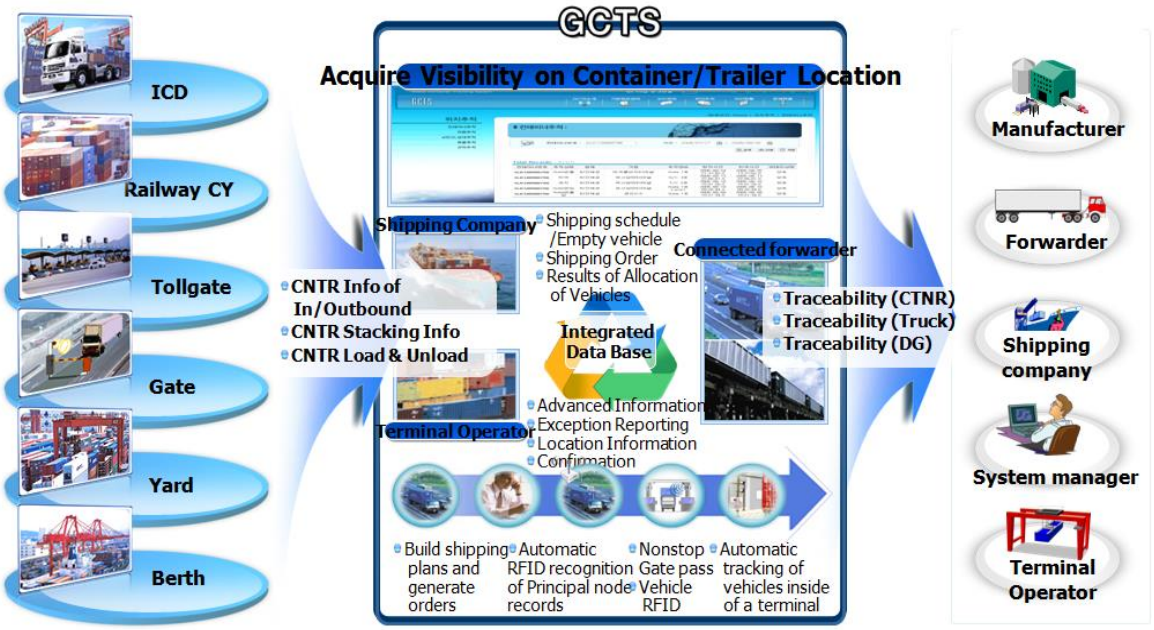
Source: Korea Maritime Institute

2) System design/architecture

a. System concept

The main purpose of GCTS is to improve performance of logistics activities and to secure container cargo security. In order to collect cargo information and share it between related business entities, MOF has introduced the RFID system within the supply chain especially for major logistics nodes including ICD, Terminal gate, Tollgate at highway container yard and berth.

Figure II-52. GCTS Concept

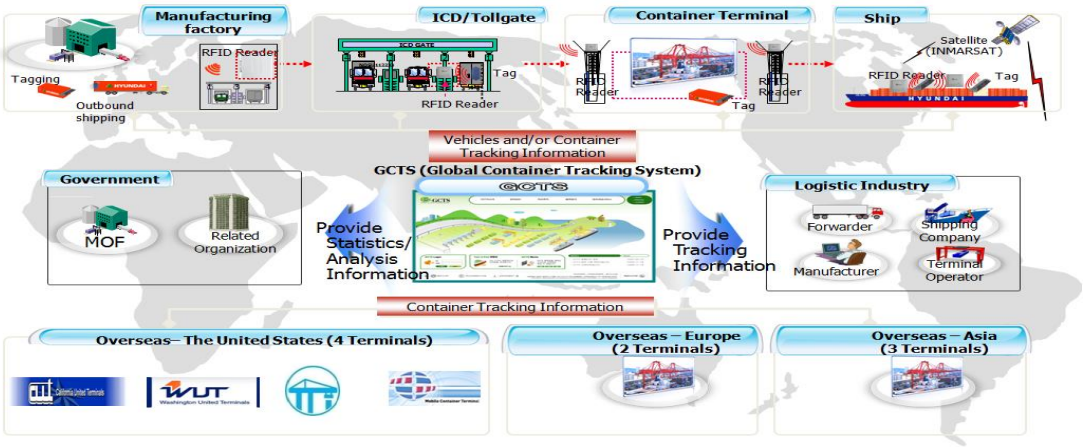


Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

b. System architecture

GCTS consists of RFID reader, RFID middleware sending real time data to main server, DB server collecting information and web interface for users. Readers for container (433MHz) and vehicle (900 MHz) are located at each logistics facility. Cranes have RFID readers for processing auto detection.

Figure II-53. GCTS System Architecture

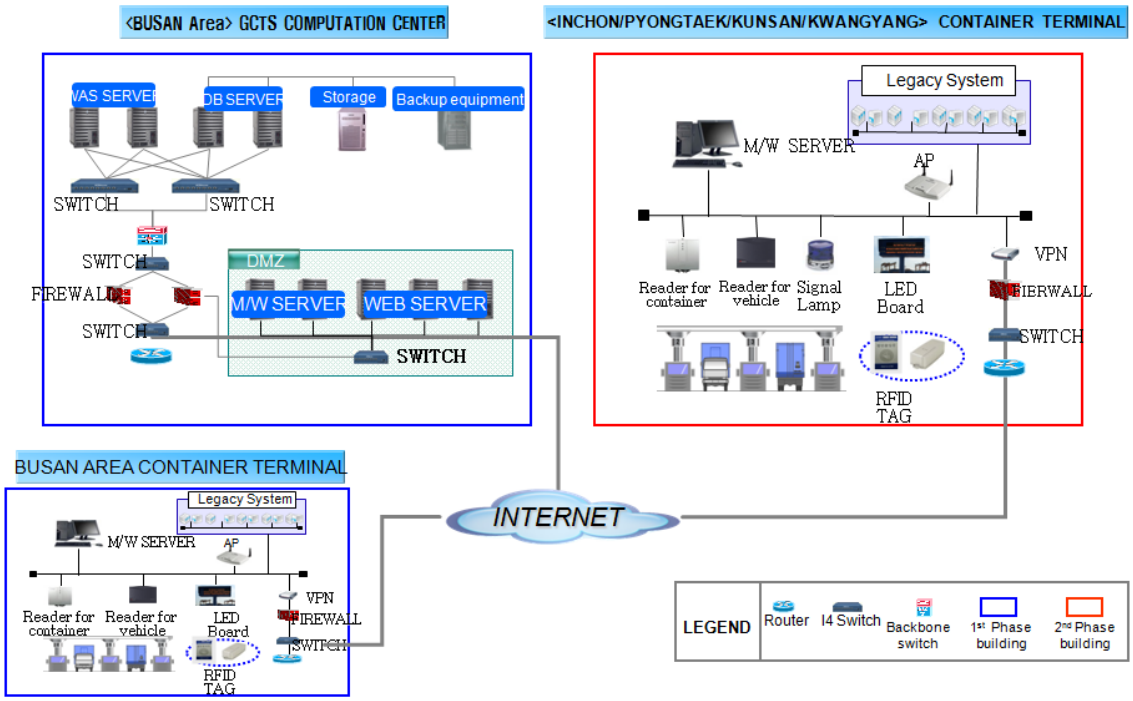


Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

c. Hardware composition

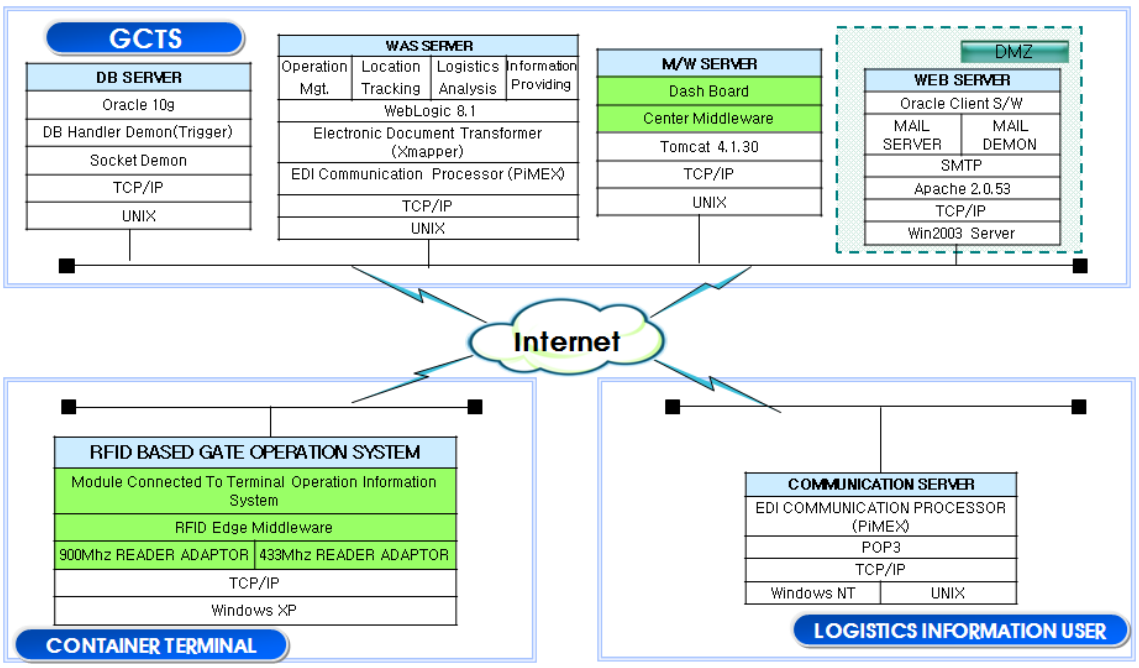
All GCTS components are connected to the internet and wireless communication including mobile telecommunication and GNSS (global navigation satellite system).

Figure II-54. GCTS Components, Stage 1



Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

Figure II-55. GCTS Components, Stage 2



Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

3) Messages available

a. What the system can do?

Global Cargo Tracking System (GCTS) is a RFID and GNSS-based system to automatically collect information of vehicles/containers coming in and going out of logistics facilities. The system also collects information at major highway toll gates within the Republic of Korea and abroad to feed into logistics tracking information (cargo/container) i.e. container B/L numbers which allow cargo traceability worldwide.

GCTS Menu Scheme

Figure II-56. GCTS Menu Scheme

Source: Ministry of Oceans and Fisheries of the Republic of Korea (MOF)

Key function

1) Collect real time information on arrival/departure, marshalling and loading results via RFID-based logistics information network and provide various information including container / cargo tracking information.
2) RFID-based gate automation
   - System based on RFID technology for automatic control of containers and vehicles in and out of logistics facilities such as container terminal, yard and railway depot.
3) Real time logistics tracking information service
   - Leveraging container/vehicle tracking information automatically collected on RFID-based gate operation system built in logistics facilities, offer cargo/container/vehicle tracking data.

b. Who are the users?

GCTS users consist of the public and private sector. Public users are governmental organizations including Ministry of Oceans and Fisheries (MOF) and Ministry of Land, Infrastructure and Transport (MOLIT). Within the private sector, users include logistics companies such as shipping lines, terminal operators, shippers, trucking companies, academic institutions, consulting firms etc.

c. What type of data is shared?

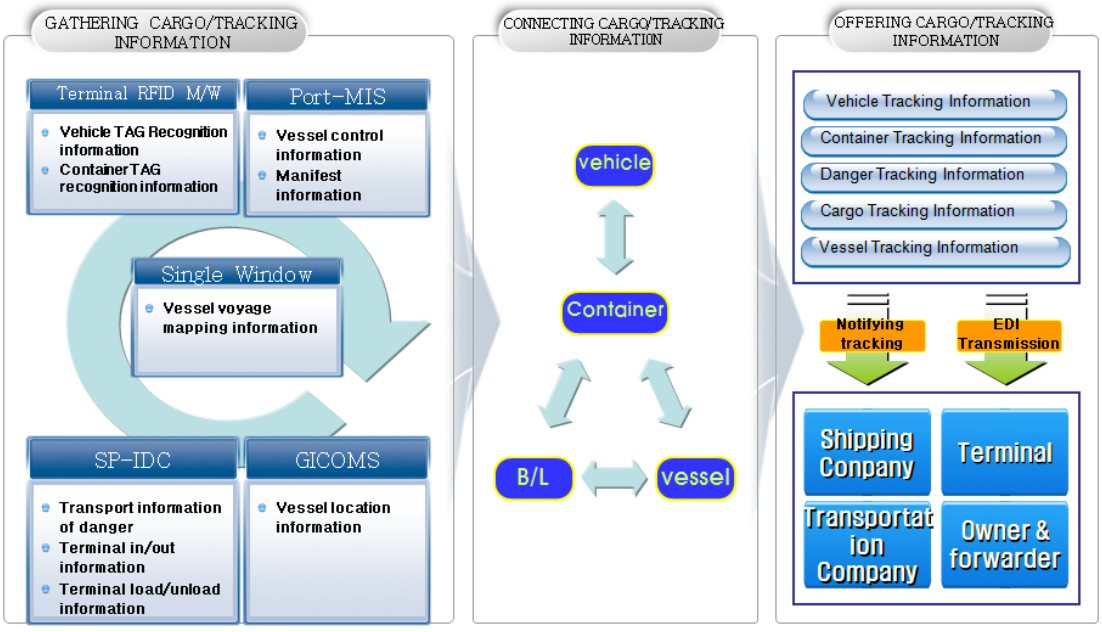
GCTS users share cargo tracking information such as cargo data and mode of transport data including trucks, trains and vessels between the public and private sector.

Table II-22. GCTS Data Type

Data type	Public and private	Standard vs non standard	Open data vs personal data (privacy)	B2B vs G2B/B2G
cargo/tracking information	Private data	Standard	Personal data	B2B
EDI transmission Message	Private data	Standard	Personal data	B2B
Code set	Public data	Standard	Open data	G2B

Source: Korea Maritime Institute

Figure II-57. Cargo and Tracking Information



Source: Korea Maritime Institute

d. Relevant data standards

GCTS has adopted national and international standard, notably EDI standard and code data of IMO.

Table II-23. Date Standard

Division	Contents
National data standard	▪ Follow national standard (ex : KS) ▪ Adopt and consider to apply international standard ▪ (ex : Code set, EDI message and technical standard)
International data standard	▪ UN, IMO, ISO and other international standard ▪ Apply international standard

Source: Korea Maritime Institute

4) Institutional arrangements

a. Lead agency

GCTS is totally supported by the Ministry of Oceans and Fisheries. MOLIT is also involved by sharing logistics information especially on container trailer at highway tollgate data.

b. Cooperation mechanisms

GCTS shares information along supply chain including node terminal, ICD, warehouse, rail and Vessel Monitoring System-GICOMS. Twenty two container terminals are covered by GCTS – Incheon (3), Pyongtaek (1) Kunsan (1), Kwangyang (5), Busan (12).

Internationally, GCTS service covers the entire world. Its pilot projects involve China, Italy, Japan, Russia & the CIS etc.

c. Legal framework

GCTS system was established based on the Port Act.

5) Financing

GCTS' operation is financially supported by the Ministry of Oceans and Fisheries.

6) Security issues

Information security is very important, particularly sensitive cargo information such as BL number. Private data during data transmission and data sharing between logistics participants must be protected. GCTS strictly protects sensitive personal information such cargo data under Personal Information Protection Act. A variety of hardware and software for information security are applied. Only authorized users can access the system.

7) Costs and benefits

a. Qualitative expected effects

There are four expected effects:

- Increased visibility in port logistics and ensuring efficiency
  - RFID-based non-stop GATE automation reduces the time required to pass through gates;
  - Enhance of efficiency in terminal operation with automatic checking on marshalling and loading;
  - Real time logistics data of major logistics facilities at home and abroad;
  - Real time data to key logistics players and ensure linkage to their data.
- Strengthened logistics competitiveness
  - Infrastructure for U-Port built across the nation
  - Enhanced global competitiveness of shipping/port by applying RFID ahead of competitors.
- Compliance with international cargo security regulations
  - Higher cargo security and enhance Customs clearance efficiency by attaching e-Seal on containers
  - USN sensor attachment and surveillance for dangerous cargo
  - WCO' Authorized Economic Operator (A.E.O) certificate
- RFID becoming global standards
  - Build RFID technology standardization bases for import/export cargo
  - Establish and settle RFID-based port logistics process standards

Expected effects in detail:

In terms of efficiency in national logistics information system:

- Facilitate/advance the national logistics information system
- Secure visibility over the flow of logistics at home and abroad and generate added value
- Pursue RFID-based national logistics information system
- Ensure benefits are acknowledged and reflected in national policies by generating reliable statistics

In terms of national logistics infrastructure:

- Ensure balanced development of logistics industry across the nation with close connection to logistics facilities and facilitation of multi transportation system,
- Share infrastructure and information system among multiple logistics players, prevent unnecessary investment, address disconnection in logistics and secure real time traceability.
- Attract global logistics companies into the domestic market.

In terms of business efficiency by logistics players:

- Shipper: real time monitoring on logistics data including cargo arrival, processing in and out and departure, accurate and swift logistics planning.

- Transport companies: enhanced efficiency in vehicle management and interval management with tracking data on vehicles on the move.
- Parcel delivery companies: reduced confusion and time for loading and unloading with automation of stand-by vehicle order management.
- Operator of logistics facilities: real time data on vehicles and cargo passing through gates and accurate information on cargo in and out with resident companies to improve efficiency in terminal operation.
- Shipping companies: enhanced efficiency in management of vessels and cargos to come in and go out.
- Relevant organizations: other organizations that benefit from the system are insurance companies, hazardous materials management organizations, civic groups etc.

b. Quantitative expected effects

Reduced unnecessary expenses

Transportation cost saving by reducing of time and distance between Asia and Europe, e.g. Republic of Korea- Finland: ocean 35 days vs. TSR 25 days; Japan-Europe: Ocean 20,800Km vs. TSR 13,000Km. Cargo can be delivered on time to Russia and the CIS with reduced transportation time.

Real time container tracking

Provide exact container location in real time and prevent cargo lost.

Increase business efficiency

Estimate exact time of arrival at the final destination; shipper can manage related transportation schedule by real-time cargo positioning which improves the reliability and accuracy of cargo location and information.

4. uTrade

1) Background to system development

a. National context

uTrade started with the EDI trade automation project in 1991. It has since been expanded to cargo handling, Customs clearance, foreign exchange, logistics, banking and marketing services.

uTrade is set up considering the context of international trade. The system allows the exchange of e-documents and data with international trade partners as well as relevant organizations and institutions within the Republic of Korea.

Republic of Korea implemented BPR/ISP to conduct research and analysis on existing service systems. The research outcome identified solutions to provide innovative trade procedures through various initiatives as part e-Government project since 2004. Thirty three initiatives were subsequently defined to implement "innovation" in three phases.

The Republic of Korea has pioneered e-L/C (letter of credit) service in 2005. In 2008, the establishment of uTrade service was completed by including e-B/L (Bill of lading). uTradeHub, an international electronic trade service system was opened to launch the most systematic uTrade system in the world in July 2008. uTrade is the service and representative brand name for trade service and uTradeHub is the service system and portal to implement uTrade itself. Streamlining trade procedures through the uTrade system was essential to enhance national competitiveness and improve the competitive edge of trade companies.

uTradeHub (UTrade system) offers a Single Window based on the latest information technology for seamless trade procedures, e.g. market research, contract, commerce, logistics, Customs clearance, marketing to settlement for trade companies. Depending on the level of informatization of trade companies, it offers diverse methods of connection to its services and infrastructures to both big enterprises and also SMEs, relevant organizations and the Government. Global partners can also enjoy the benefits of being connected to the uTrade system.

b. Development process

uTrade started with the establishment of EDI under the "Act on the Promotion of Office Automation for Trade", legislated December, 1991. As a trade automation system for commerce and foreign exchange, uTrade was fully operational from January, 1994. Services offered include export clearance service, L/C opening and notification, cargo management in a bonded area, cargo insurance, invoice and deposit/withdrawal notification and import clearance service.

On the positive side, the EDI-based uTrade had its merit in terms of strong security; however, the system was costly to build and maintain, hence not convenient for SMEs with relative weak financial base. Also, due to the closed nature of the system, it was difficult to expand its scope to include diverse functions. UTradeHub was introduced

as a consequence of growing demand for new uTrade infrastructure that is economically viable and flexible in its nature, and can be to be connected to wider functionalities. It was meant to improve uTrade processes and facilitate trade, allowing trade companies and relevant organizations to connect to the system through a Single Window for diverse services. uTradeHub was initiated by the Korean National Trade Committee in September 2004.

c. Stakeholders

As uTradeHub offers diverse services such as permitting/licensing, report, information search and business handlings, many trade companies are using the system. KTNET, the operator of uTradeHub, has more than 80,000 member trade companies and among them 30,000 companies are expected to use uTradeHub.

Many trade companies use uTradeHub because of convenience given by the use of e-documents. In general, the rate of using uTrade system varies by size of business. Bigger businesses tend to use uTrade system more often. Big enterprises have their own enterprise resource planning (ERP) system as an integrated information system to manage human and other resources used for business activities within the company aiming to strengthen business competitiveness.

Key players involved in the establishment and operation of uTradeHub includes Government institutes, Korea International Trade Association, KTNET, local banks and logistics companies.

d. Timelines

uTrade project was launched as part of "Trade Process Innovation" project implemented from November 2003 to June 2004. The project encompassed designing future model of uTrade, discussing ways of system establishment, identifying initiatives to innovate trade process, and defining measures to implement these initiatives.

1st stage (2004 – 2005): Based on the results of the project, pilot for e-document archive and e-L/C distribution and management system were accomplished.

2nd stage (2005 – 2006): The Single Window for uTrade was built along with service base enhancement for uTrade service improvement and core infrastructure expansion.

3rd stage (2007 – 2008): The Single Window was expanded and the basis for eNego system for export bill negotiation was established, along with the introduction of comprehensive marketing information search system and integrated information system for import and export requirements.

Since then, there have been many improvements such as the introduction of Free Trade Agreement (FTA) origin of country management system, logistics portal and global e-trade portal establishment. These improvements allow quick and easy one-stop service for trade companies to handle the entire trade process from marketing, commerce, F/X, Customs clearance, logistics and settlement on the Internet. With the

system in place, trade companies can handle trade related tasks anywhere, anytime on the internet without visiting banks or import/export entities.

2) System design/architecture

a. Network structure

uTradeHub is a gate allowing access for users from trade, logistics, bank, Customs, and marketing portals with SSO (Single Sign On). It offers overall introduction on uTrade services and other services provided by the sub portals. Trade companies are able to handle the entire process from commerce, F/X, logistics, Customs clearance, marketing and settlement with single sign-in to the system via internet.

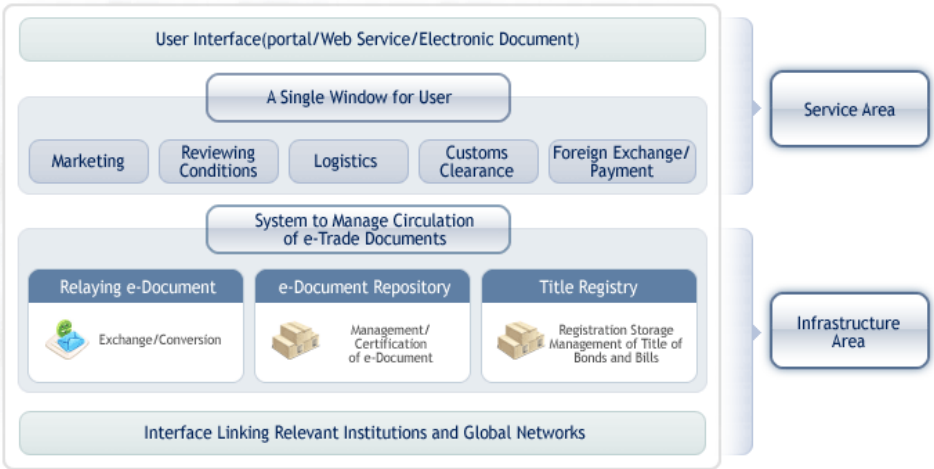
uTradeHub is divided into three categories: uTrade service, uTrade infrastructure and associated services.

uTrade services include application services for small and medium-sized trade companies and it is a workflow-based process management to support various business environments of import and export information system. Common services include components for common tasks accessible via individual company network, as well as uTradeHub and additional services such as comprehensive information analysis of trade data and data mining, based on linkage to relevant organizations.

uTrade infrastructure is a sub-structure to support the main services. It includes functions to exchange e-documents and tighten the security of e-transaction. The internet environment itself constitutes the infrastructure of uTrade.

Lastly, associated services include sub-components provided to users of uTrade system to connect to wider network. Each component of the system has independent functionality and is able to work alone as an independent system. Thus, uTrade system offers integrated services at individual sub-component level or in combination of these sub-components.

Figure II-58. uTradeHub System Architecture

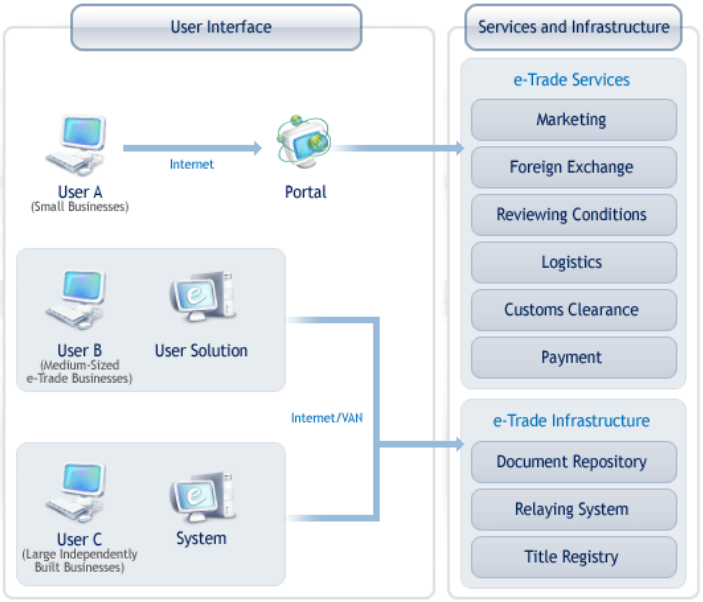


Source: Ministry of Trade, Industry and Energy of the Republic of Korea (MOTIE)

b. Logical structure

User interface of uTradeHub is provided through portals, user solutions and connections to electronic documents, enabling trading companies with different IT environments to choose the interface most suited to their environment

Figure II-59. uTradeHub User Interface



Source: Ministry of Trade, Industry and Energy of the Republic of Korea (MOTIE)

3) Messages available

a. What the system can do

The trade portal provides an integrated workspace allowing companies to rapidly and seamlessly process all trade-related tasks, e.g. marketing, checking conditions, foreign exchange, Customs clearance, logistics and payment.

uTradeHub offers a Single Window for uTrade to streamline business procedures for users and enhance efficiency in trade business. Users can track and check the progress and results of tasks they requested in real time at their own business site. The system also provides diverse services to ensure seamless trade service based on connection to relevant organizations.

b. Major services

uTradeHub offers G2G, B2G, B2B e-document services. Major services can be summarized as follows:

Foreign exchange (F/X) requirement check

F/X service: Business with banks for import and export such as L/C opening and notification and bill payment.

- E-export bill negotiation (e-Nego) service: Application for export bill purchase, notification for purchase results, L/C limit management, etc.
- Local e-L/C opening, notification, on-line application for purchase
- On-line complaint filing, requirement check service: import license permit, import recommendation and issuance of country of origin certificate
- Integrated information service for purchase approval: on-line issuance/distribution/inquiry of purchase approval and internal information management
- FTA country of origin management (FTA-Korea) : Country of origin criterion, country of origin certificate, country of origin confirmation issuance/distribution/storage, consulting support
- Cargo insurance and export insurance service
- On-line payment of export/import related expenses and fees

Logistics, Customs clearance

- Export/import logistics, Customs clearance: provides standardized e-templates for various reports involved in export/import logistics and Customs clearance process
- Manifest Consolidation System (MFCS): collects cargo list submitted by airliners, shipping companies and forwarders and categorizes it by aircraft or vessel to submit to the Korea Customs Service
- e-B/L (Bill of Lading) service: on-line based issuance, registration, modification and delivery of B/L
- e-D/O, (Delivery Order) service: offers service of D/O and application for transportation service for shippers to receive the cargo
- Air/maritime AMS(Automated Manifest System): offers the list of cargo loaded (for companies that provide cargo information in advance)
- Flight passenger information service: flight GD (General Declaration), flight APIS (Advanced Passenger Information System), flight PNR (Passenger Name Record), flight APP (Advanced Passenger Processing), ACPS (Air Cargo Portal Service), flight MAPAS (Manifest Parametric Search), flight sanitary condition report, etc.
- Provides list of Customs clearance, overland MFCS, fire insurance service for bonded goods, logistics B2B

Trade Statistics Service

- F/X trade statistics service: Collects basic Customs clearance data and process it to customize to needs and objectives of customers and provides clearance/refund, cargo information, company-level information and statistics data.
- Company-level import/export data service, MyTrade: rearranges information into key categories at company level and offer via PC, messenger or mobile app for company's review and real time notification.

uTradeHub offers intermediary services for e-documentation including L/C notification, shipping guarantee for institutions handling foreign currencies, opening of local L/C, issuance of purchase approval, issuance certificate of country of origin, issuance of marine cargo insurance policy, issuance of D/O for forwarders, certificate of export and import declaration.

4) Institutional arrangements

a. Lead agency

The Ministry of Knowledge Economy and the Korea International Trade Association (KITA) have carried out a project to build "e-Trade (paperless trade) services" as a part of the "e-Government agenda" since 2003. Consequently, uTradeHub was introduced as a new concept of a national e-Trade network. The Ministry of Knowledge Economy designated KTNET as e-Trade service provider for operating uTradeHub services and systems under the e-Trade promotion law.

b. Cooperation mechanisms

The service is being provided based on extensive cooperation of relevant organizations including financial institutes, logistics institutes, credit investigation agencies, clearings institutes and export/import approval institutes.
On Government side, the Ministry of Knowledge and Economy and the Korea Customs Service are the leading authorities in the cooperative framework with support of KTNET, KOTRA, the Korea Financial Telecommunications and Clearings Institute. The Korea Federation of Banks has a support role.

The cooperative network extends not only to the governmental institutions, but also various private institutes e.g. market research and credit investigation agencies, local banks, shipping companies and airliners. It is also connected to Customs services in foreign countries, buyers and the Chambers of Commerce, as a recognized part in a global network.

c. Legal framework

The establishment of uTradeHub was accompanied by enactment of legal and regulatory framework for facilitation of uTrade, such as the 1991 Act on Promotion of Office Automation for Trade. Following the introduction of VAN/EDI, it was renamed and revised into the Electronic Trade Promotion Act (2005) to better respond to the changing environment of uTrade. It took a year and a half before being implemented, due to opposition of several departments. The progress was meaningful, resulting in ten documents regulating e-trade.

For the introduction of e-documentation of B/L, a series of seminars and public hearings were held to gather opinions of stakeholders and boost awareness on the necessity. After years of discussions at the Marine Law Committee, the commercial law was revised to introduce mandatory e- B/L in 2007. The Minister of Justice is the designated institute to register and manage B/L. The enforcement decree of this regulation specifies matters including the requirements for the registration institutions, registry records, handover of rights and conversion into paper B/L.

5) Financing

Basic architecture design and system establishment of uTradeHub were financed by the Government; the annual operating cost is also supported by the Government. Since the launch of research for system’s establishment in 2003, approximately KRW

70 billion has been invested. Substantial budget is needed every year to run the system.

6) Security issues

a. Information and data security

uTradeHub gives top priority to information protection and security in order to secure stable services and reliability. uTradeHub developed one of the world's top information security management systems which acquired the ISO27001 certification and won the Information Security Award of the Ministry of Information and Communication.

- **Authentication for information security**
  - Aug. 2006: acquired ISO 27001 certification, the international information security management standard system
  - Feb. & Sep. 2007: passed bi-annual post-inspection
  - Feb. 2006: won the Information Security Award of the Ministry of Information and Communication
  - 2006 & 2007: passed the information security testing of the Ministry of Information and Communication
  - 2005, 2007 & 2008: passed the regular security testing of the National Intelligence Service
- **Management of information system security**
  - Physical system
    - Establishment of the access control system that meets the requirements of the national e-Trade service providers
    - Two-tier entry control systems have been implemented: using ID cards and the fingerprint recognition system to ensure secured operation and management of the data center system.
    - Entries into the data center and system access are under 24-hour surveillance, using close-circuit TV.
  - Administrative Safeguards
    - A security taskforce, the top deliberation body responsible for information security, has been formed and bi-annual meetings were held to actively support information security.
  - Physical Safeguards
    - Security incidents can be prevented by carrying out regular reviews of the system and applications to identify their vulnerabilities
    - Web firewalls, transmission encryptions, secure sockets layers and encryption of databases are adopted to brace for the newest security threats.
    - The Enterprise Security Management (ESM) is built to analyze and monitor integrated logs from many different security systems
    - Security through the use of certificates.

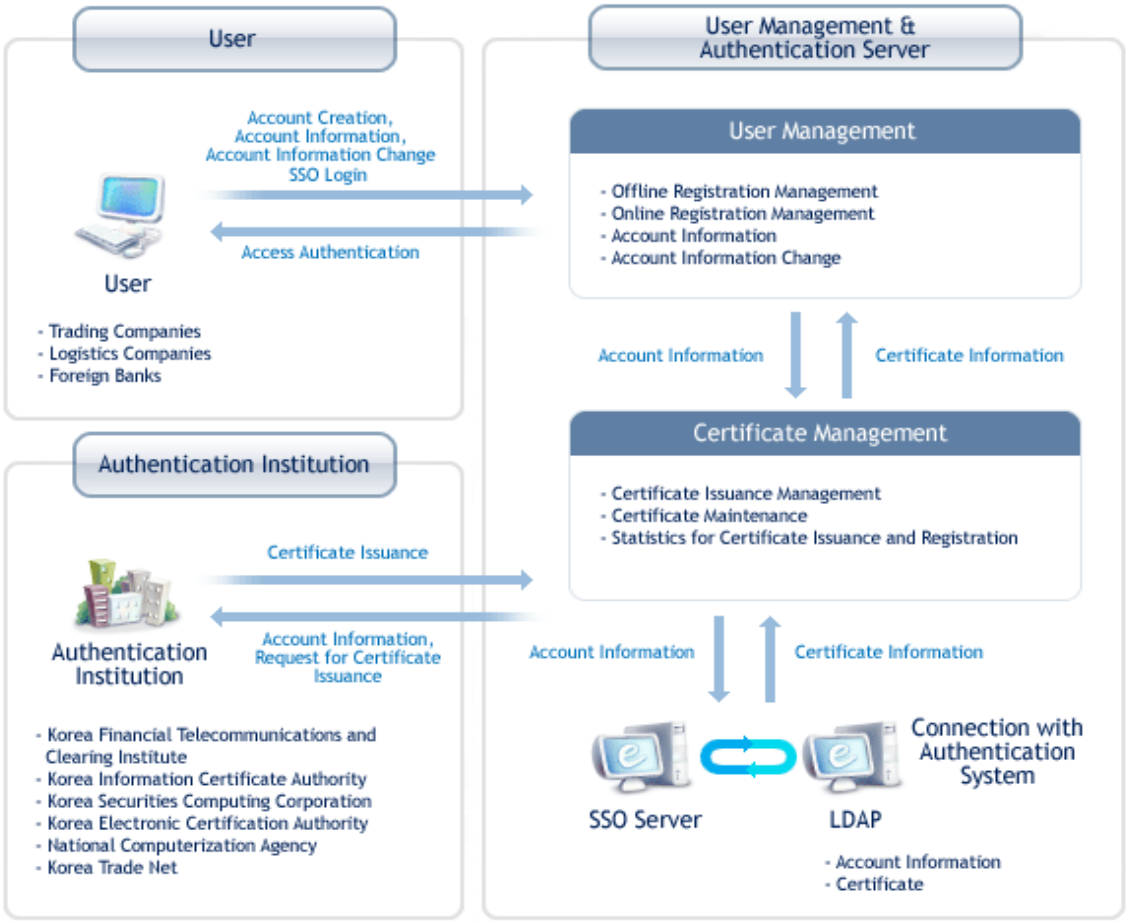
The user authentication system based on ID / Password and the public key infrastructure (PKI) is established to ensure that the consolidated portal has reliability,

transparency and stability. Access authentication is granted to a limited number of users based on levels of confidentiality.

b. Authentication through the use of certificates

Access to services of uTradeHub is allowed to users authorized by user management or authentication server. As most of the services are related to trade, logistics and F/X, all information in the system is carefully managed and controlled in compliance with security protocol and procedures. The system provides high-level security service in connection with authentication institutions in the Government and public sectors to certify users and services.

Figure II-60. uTradeHub Security Architecture



Source: Ministry of Trade, Industry and Energy of the Republic of Korea (MOTIE)

7) Costs and benefits

Benefits

In the past, trade companies had to visit all relevant organizations such as banks, Customs service, shipping companies or airliners and the Korea Financial Telecommunications & Clearings Institute to submit trade documents. With uTradeHub, all the information is gathered and stored in e-documents archive at the

central storage site. Trade companies no longer have to submit the same document multiple times or submit paper document.

Detailed benefits from using the system are as follows:

- One-stop e-trade services: the current e-Trade services and trade-related service networks are integrated into the uTradeHub.
- Support for all trade related activities: the uTradeHub is a smart service network based on business process management (BPM) that automatically generates and processes relevant tasks for export, import and related procedures in accordance with the trade procedure.
- Reuse of information: once information entered into the system, it is stored and automatically used for other documents. The user does not need to submit the same information repeatedly.
- Facilitated distribution of documents: documents stored in the e-document repository of the uTradeHub can be submitted to the third parties such as banks, logistics companies, and the Korea Customs Office with just one click.
- Reduction in working hours and costs: the uTradeHub reduces working hours and costs by replacing all the offline procedures and integrates the entire trade related activities.
- Tailor made services for each user's needs: the user can work in a user-friendly environment that can be customized by selecting needed menu and service.
- Diverse user interface: the user can access e-trade services easily through various methods including web portals, solutions, web services according to different IT environments.
- Secure transaction: since uTradeHub allows only authorized users to access and use the information and documents, security is guaranteed. Transactions are safe from fraud, forgery and financial incidents.

Costs

Cost of running the system is shared between the Government and the Korea International Trade Association. Users can access the system via the internet network without additional investment. Users pay a monthly basic fee of KRW20,000 and KRW 479-392 per 1,000 byte for e-document transmission depending on total traffic.

D. Singapore

General background

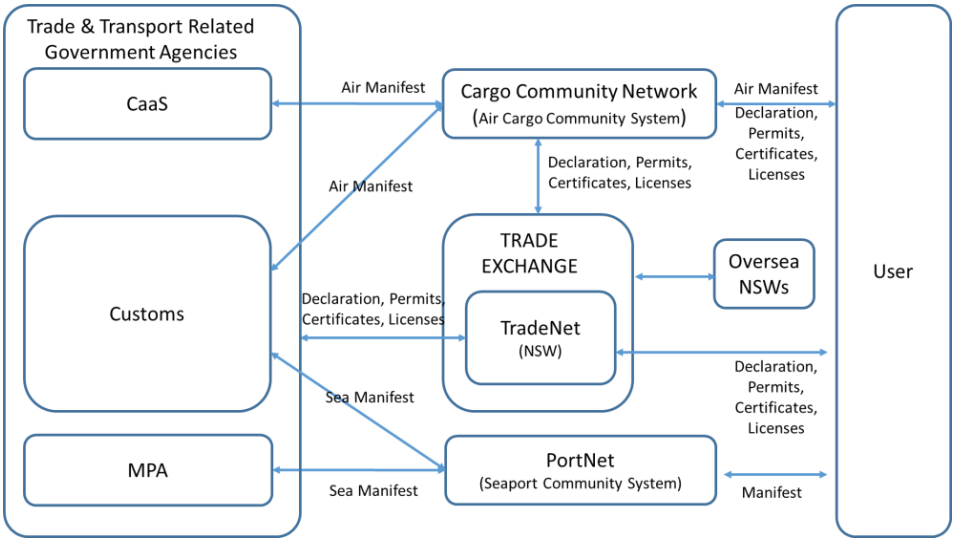
Trade and logistics information systems are provided by several providers in Singapore. Generally, they can be categorized into: trade related and transport related.

TradeNet is Singapore's national Single Window related to trade. It facilitates trade document interchanges among Singapore's shipping community by using Electronic Data Interchange (EDI) technology. TradeNet connects Singapore's Port Authority with global traders, shipping agents, Singapore's Custom services and other Government agencies.

PortNet, a subsidiary of Port of Singapore Authority (PSA), is the biggest seaport community system in Singapore. It serves the entire shipping community that operates through Singapore. Other terminals (non-PSA) have their own port community systems.

There are also several airport community systems in Singapore, e.g. CCN and KEWILL, enabling users to connect with TradeNet and CaaS[29] to submit related necessary documents.

Figure II-61. Outline of Singapore's Trade and Logistics Information Systems



Source: Yizhou Wu

[29] Civil Aviation Authority of Singapore

1. TradeNet and TradeXchange

1) Background to system development

TradeNet is an EDI system. It works as the national Single Window of Singapore. It allows various parties from both the public and the private sectors to exchange structured trade messages and information electronically.[30]

TradeXchange is the extension of TradeNet. It is a neutral and secure trade platform which facilitates the exchange of information within the trade and logistics community. It is also a "one-stop online portal" for all trade-related transactions with regulatory authorities. TradeXchange is a single electronic window for integrated workflow, allowing for documentation submissions and enquiries to the seaports, airports, maritime authorities, Customs and controlling agencies.

TradeNet mainly focuses on B2G declaration while TradeXchange mainly focuses on B2B electronic data interchange which is considered as value added service.

a. National context

In the mid-1980s, Singapore was in recession. The Government established a high-powered economic committee, named Trade Development Board, to review the weaknesses of Singapore economy and to initiate new strategies to improve economic competitiveness.

Hong Kong, major competitor of Singapore, created a trade oriented EDI system "TradeLink" in 1986. This led Singapore to implement the TradeNet system as a tool to maintain its competitiveness. The Trade Development Board was given the task of mobilizing the trade community and coordinating with relevant agencies such as Customs and Excise, Port of Singapore Authority and Civil Aviation Authority of Singapore to create TradeNet.

b. Development process

In December 1986, TradeNet project was conceptualized as part of National Information Technology Plan. A TradeNet Steering Committee was created to oversee the process.

In March 1988, Singapore Network Services Pte Ltd (later renamed CrimsonLogic) was created to develop and operate TradeNet system - world's first Single Electronic Window. TradeNet was officially launched in 1989.

In 2007, TradeXchange was launched to provide the trade and logistics community with a neutral and secure IT platform to enable seamless exchange of information across the supply chain.

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[30] https://www.tradexchange.gov.sg/tradexchange/default.portal?_nfpb=true&_pageLabel=main_tn

In 2009, a "TradeXchange call-for-collaboration" (CFC) was established. Four consortia, involving 22 companies, were awarded grants in February 2010 to integrate their key trade and logistics IT systems, business processes and data through TradeXchange.

c. Stakeholders

The main users from the private sector for TradeNet and TradeXchange are freight forwarders, air cargo agents and shipping agents and traders.
TradeNet users from the public sector include 35 governmental agencies. Among them, the following 15 ministerial level organizations:

- Trade and Industry
- Transport
- Defense
- Education
- Foreign Affairs
- Home Affairs
- Finance
- Health
- Law
- National Development
- Manpower
- Prime Minister's Office
- Information, Communication and the Arts
- Community Development, Youth and Sports
- The Environment and Water Recourses

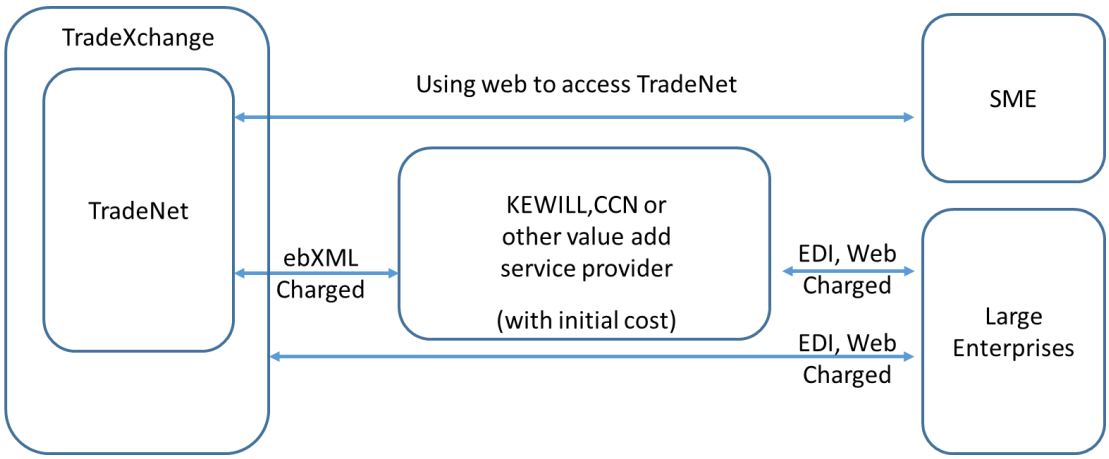
The superintendents of TradeNet are: Customs, IDA (Infocomm Development Authority), EDB (Economic Development Board)

d. Timeline

1989 Version 1.0. TradeNet launched
1990 Version 1.4, Electronic Certificate of Origin (CO) supported
1991 Version 1.5
1992 Version 1.6
1994 Version 1.7. GST supported
1996 Version 1.8. WCO HS Amendments supported
1999 Version 2.0. Y2K resolved and UN/EDIFACT supported
2003 Version 3.1. Web based electronic CO (Non-preferential CO with various chambers) supported
2007 Version 4.0. TradeXchange launched for easy cross border trade.
2015 Tender for new TradeNet and TradeXchange.

2) System design/architecture

Figure II-62. TradeNet Connections



Source: Yizhou Wu

Small and Medium sized Enterprise (SME) users can use web to access TradeNet directly. Large enterprises can use value added services such as TradeXchange, KEWILL or CCN to connect with TradeNet.

3) Messages available

a. System functions and benefits

TradeNet

TradeNet enables businesses to apply and receive trade permits in less than one minute via internet.

Functions:

- Single data entry point to complete various transactions with numerous Government agencies
- One service with multiple agencies' involvement

Objectives of trade declarations:

- Enforce controls laid down by domestic policies and international agreements
- Collect GST and Customs Duties
- Collect Trade Statistics

TradeXchange

The following are nine core services provided by TradeXchange:[31]

1. ACCESS Return

TradeXchange ACCESS Return Service provides instant data for traders' shipments through the ACCESS System of Air Express Companies (AECs).

Benefits:

- This service works with multiple AECs, making it easier for subscribers to reconcile their shipments.

2. Data@Source

TradeXchange Data@Source Service enables sharing and re-use of common data from shippers to freight forwarders. This service is integrated with the Enterprise Resource Planning (ERP) software for shippers to share data with their downstream partners easily, enabling them to re-use data for freight bookings, permit declarations etc.

Benefits:

- Reduces data entry errors in freight processing and permit declarations
- One connection point to access to many players

3. eFreight

TradeXchange eFreight Service enables shippers to share data with freight forwarders, which can be used for downstream processes.

Freight forwarders will be able to receive order information from shippers electronically and prepare downstream documentation such as air way bills.

4. Electronic Certificate of Origin (eCO) preparation

TradeXchange eCO preparation service enables shippers and their authorized agents to re-use the data from Customs' approved permit to apply for non-preferential Certificates of Origin (CO) electronically.

Agents applying for the non-preferential electronic CO for shippers no longer need to fill in the application form manually. Ten out of thirteen data fields, including data-intensive field like Description of Goods, can be extracted from the approved permits and auto-populated in the eCO application. This allows agents to speed up the eCO application process and reduces data entry errors.

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[31] www.tradexchange.gov.sg

Benefits:

- Reduces data entry errors on non-preferential Certificates of Origin

5. *Marine Cargo Insurance*

TradeXchange Marine Cargo Insurance service enables freight forwarders to apply for marine cargo insurance through TradeXchange to reduce the preparation and processing time for their applications by up to 90per cent and receive instant approvals for their cargo insurance applications.

The streamlined integration of their systems through TradeXchange also allows freight forwarders to access multiple insurance companies through single connection to TradeXchange. Equally, insurance companies connected to TradeXchange can connect to multiple freight forwarders through TradeXchange.

Benefits:

- Up to 90per cent time savings in Marine Cargo Insurance applications
- Reduced administrative process through integrated back-end processes
- Reduced documentation errors
- Access to wider customer pool through using a single interface to multiple communities/portals
- Improve customer service, through faster turnaround time and flexibility in printing approved policy documents anywhere at anytime

6. *Permit Return*

TradeXchange Permit Return service enables more efficient data exchange and re-uses Customs' approved permits electronically. This enables shippers to have an instant notification of their permits approval and enables re-use of the data for verification or compliance purposes.

Benefits:

- Easy retrieval of electronic approved permit for data re-use or reconciliation
- Clearer visibility of permits declared

7. *Title Registry*

TradeXchange Title Registry service provides a secure and efficient way to create, transfer and surrender Bills of Lading electronically.

Title documents can be created electronically and exchanged almost instantly. This avoids the delays commonly associated with the use of paper documentation, and improves operational efficiency of various stakeholders (Consignor, Consignee, Ocean Carrier and Bank). Stakeholders involved will also have clearer visibility and traceability of their e-Bill of Lading and endorsement chain, reducing the risk of refusal and forgery.

Benefits:

- Greater protection against forgery as all information is captured securely and stored within the system with proper audit trails
- Clearer visibility and traceability of an e-Bill of Lading and its endorsement chain
- Improved productivity through reduction of administrative efforts in handling paper Bills of Lading
- Flexibility to support both fully or partially electronic chains to cater for different regulatory needs

8. Trade Permit Preparation

TradeXchange Trade Permit Preparation service enables shippers to transmit their shipping information seamlessly from their internal systems to TradeXchange, and to auto-populate the TradeNet front-end vendors' applications for trade permit declaration.

With data auto-population function, the preparation time for trade declaration is reduced from between three to four days to just one to two days. The process also reduces the need for manual data entry by logistics service providers, improves data accuracy and therefore, results in overall faster turnaround for trade permit approvals.

Benefits:

- Considerable time savings (up to 50per cent) in permit preparation
- Reduced data errors by automated data capturing

9. Trade Finance

TradeXchange Trade Finance service enables the exchange of electronic invoice information between buyers, sellers and banks. This service cuts down the amount of manual processing of invoice payments, increases the visibility of documents needed for finance verification, lowers administrative costs and improves the overall turnaround time for financial application, resulting in faster approval of financial applications and a more competitive financing services for suppliers.

Benefits:

- Reduced administrative processes through integrated back-end processes
- Lower risk of default due to greater visibility over buyer's accounts

b. Data and standards

TradeNet handles almost all documents that are required for Customs import and export procedures, such as declarations, various permits, certificates, licenses etc.

Table II-24. Data and Information Interchanged by TradeNet

No:	Information	Source	Destination	Data Type
1	Commercial Invoice	Shipper	Freight Forwarder	Private
2	Packing List	Warehouse	Freight Forwarder	Private
3	Shipping Instruction	Shipper	Freight Forwarder	Private
4	Certificate of Origin	Shipper	Regulators	Private
5	Master Waybill	Carrier	Freight Forwarder	Private
6	House Waybill	Freight Forwarder	Carrier	Private
7	Customs Declarations	Freight Forwarder	Regulators	Private
8	Customs Release	Regulators	Freight Forwarder	Private/Public
9	Dangerous Goods Declaration	Freight Forwarder	Regulators	Private/Public

Manifest (detailed list of loaded cargo) is not within the scope of TradeNet. Manifest data are handled by PortNet and CCN.[32]

4) Institutional arrangements

a. Role of/support from Government

National logistics strategy policy

Singapore aims to be the world's largest transshipment hub. So an effective and efficient Single Window is necessary.

National council

In the early 1980s, the Government of Singapore started its information and communication (Infocomm) plans, aiming to transform the country into a world-class user of information communication technology (ICT). The Government of Singapore realized the urgent need for Singaporeans to familiarize themselves with the usage of ICT. Hence, the National Computerization Plan and Singapore National IT Plan were carried out, aiming to computerize work processes and improve ICT usage in the country.

In response to the growing prospect of IT, the National Computer Board (NCB) was established. One of its most important roles was to oversee the computerization of the civil service. NCB also served as the central authority in promoting, implementing and coordinating the functioning of information systems development in Government ministries. The board is currently known as the Infocomm Development Authority of Singapore (IDA).

The construction of PortNet and TradeNet are the 2 most important milestones of National IT Plan (1986-1991).[33]

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[32] Based on research of logistics players from Singapore

[33] History and Milestones of E-Government in Singapore. Created by Unknown user .https://wiki.nus.edu.sg/display/SPORE/History+and+Milestones+of+E-government+in+Singapore

b. Cooperation mechanisms

Inter-country arrangements/cooperation mechanisms

In 2005, ASEAN member countries agreed to establish and implement the ASEAN Single Window. The ASEAN Single Window (ASW), when fully implemented, will speed up the clearance of shipments and the release of goods by Customs authorities in the respective countries. Customs authorities aim to clear containerized shipments within 30 minutes, a target set in the Strategic Plan of Customs Development, through synchronizing the interventions of Government agencies, traders, shippers, forwarders, transport operators and other parties. Currently, clearance can take up to five days. Businesses will benefit from reducing transaction costs and time and ASW also allows for greater predictability in the administration of Customs procedures. Consumers will enjoy secure and timely delivery of goods at a lower cost.[34]

c. Legal framework

Legal arrangements for information exchange

"Electronic Transaction Act 2010" stipulates that "any public agency may accept the filing of documents and may issue permits, license or approval by means of electronic form."

Digital signature is not required for data exchanges in Singapore. NETRUST is Singapore's Accredited Certificate Authority (CA).

Customs Act authorizes Customs' Director-General to operate e-service on declaration, permit, manifest etc. Registered users can also perform the same service.

5) Financing

Public Private Partnership (PPP)

TradeNet was later upgraded to TradeXchange and was the first IT project in Singapore to be implemented as a Public-Private Partnership (PPP). CrimsonLogic Pte Ltd was appointed by the Government through a competitive tender to develop, operate and maintain TradeXchange.

Shareholders of CrimsonLogic are International Enterprise Singapore (55per cent), Singapore Telecom (15per cent), Port of Singapore Authority (15per cent) and Civil Aviation Authority of Singapore (15per cent).[35]

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[34] Agreement to Establish and Implement the ASEAN Single Window http://www.asean.org/news/item/agreement-to-establish-and-implement-the-asean-single-window-kuala-lumpur-9-december-2005

[35] Survey of IC Tag (RFID) implementation possibility in ASEAN Countries. http://www.jipdec.or.jp/archives/ecom/results/h16seika/h16results-19-1.pdf

Costs

Funding

- Government funding:
  - A one-time and an annual recurring fee
- CrimsonLogic funds:
  - Infrastructure investment
  - Operation and maintenance of the system

Fees for users of the system

- Subscription fee
  - One-time registration fee
  - Monthly account ID fee
  - Monthly user ID fee
- Transaction fee
  - charged on a per declaration basis

Revenue share

- Revenue is shared with Government only on the transactional revenue
- CrimsonLogic collects the fees from the users and then remits Government's share

Roles of the parties

- Government
  - Owner and regulator of the system
- Crimson Logic
  - Builds and operates the system for ten years

Benefits are presented in the table below:

Table II-25. Benefits of TradeNet

Characteristics	Previous Manual process	TradeNet
Submission of document	Via expensive dispatch clerks/ couriers	Submit and retrieve Electronically from comfort of office (or home)
Time of submission	Within office hours	Available 24 hrs X 7 days
Trips per controlling agency per document	At least 2 trips or more	No trips required
Copies of document	Multiple copies	Single copy
Turnaround time for approval	From 4 hours to 2-7 days	Within 10 minutes
Dutiable goods handling	Separate documents for customs processing	Same electronic document routed to customs for processing
Controlled goods Handling	Separate documents sent to different controlling agencies for processing	Same electronic document routed to controlling agencies for processing
Customs duties collection	By cheque	Automatic bank account deduction

Source: Presentation by K. Sathasivam, Regional Manager of CrimsonLogic on 15/7/09 "The Single Electronic Window; Singapore's TradeNet; Scope of Services and Pricing Model"

2. PortNet

1) Background to system development

PortNet is the first business-to-business (B2B) port community solution that empowers the shipping community to easily manage the complexity of cargo operations and the entire shipping process.

It handles all electronic vessel and container data passing through PSA Singapore Terminals, the world's largest transshipment hub. Beyond that, its automated system intelligently consolidates and synchronizes the transactions and information from every player in the logistics process to ensure efficiency and reliability within the supply chain.

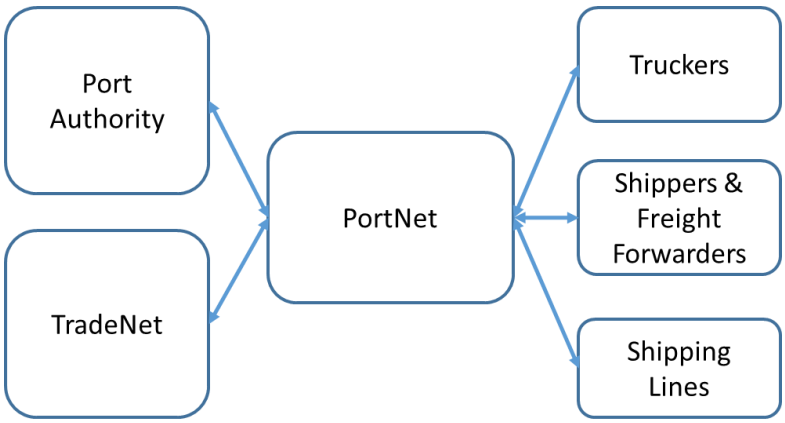
PortNet processes more than 80 million transactions annually. In 2007, a World Bank survey acknowledged PortNet's role in simplifying and integrating complex processes involved in the moving and tracking of cargo worldwide[36], as a key success factor in Singapore's ranking as the world top logistics hub.

PortNet was established by PSA[37] and started providing service since 1985. PortNet adopts the EDI technology, allowing for data exchanges between users and port authority. It is used by 1500 companies (7000 users), of which 60 per cent are shipping companies, 20 per cent consigners and forwarders and 20 per cent trucking companies.

2) System design/architecture

PortNet connects truckers, shippers & freight forwarder, shipping lines, port authority and TradeNet by EDI technology.

Figure II-63. PortNet Connections



Source: Yizhou Wu

[36] PortNet - Empowering Singapore shipping community through technology http://www.portnet.com/WWWPublic/pdt_portnet.html

[37] PSA（Port of Singapore Authority）was founded in 1997 as a port operator in Singapore which operates six terminals in Singapore (including 4 container terminals).

3) Messages available

a. System functions and benefits

PortNet system simplifies point-to-point information procedure and connects parties via fast data and communication exchanges to improve business procedures and efficiency. Nine thousands integrated users rely on the system's unparalleled capability to provide them with real-time, detailed information on all ports, shipping and logistics processes crucial to their businesses (200 million transactions annually). PortNet's 100 per cent industry participation rate further solidifies Singapore's status as the world top logistics hub (World Bank 2007).[38]

Key features:

Online ordering of port services facilitating vessel berthing and container handling through:

- service and vessels declaration
- berth application
- stevedoring services
- yard crane handling services
- pilots, tugs and water boat services
- reefer monitoring services
- labeling/monitoring/fumigation services for Dangerous Goods (DG) cargos
- on-dock depot facilities

Customers' work process modules, supporting seamless flow of information for container shipment and facilitates interaction and synchronization of activities/information across multiple parties, through:

- haulers' job lists and subcontract functions
- Government permits applications
- Electronic Delivery Order (EDO) and delivery processing
- container store & release order
- support system to system integration

Fulfillment facilitation:

- provides real time and updated information on fulfilment of services for end to end control of the entire supply chain.
- empowers sharing and exchanging of information among partners
- facilitates eFreight efficiency and effective discharging/loading of containers upon berthing
- guides clearance of trucks at PSA's "Flow-Through Gates"
- prevents over-stowage during planning
- proactive Exception Management Tool

Track and trace:

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[38] About PortNet http://www.portnet.com/WWWPublic/about_portnet.html

- real time tracking and consolidated information on-demand for query and analysis purposes
- container status, including arrival and discharge timings
- vessel status, including current location, and changes in berthing details
- detailed schedules: shipping, berthing, yard crane
- ship planning data
- reefer containers' temperature
- Dangerous Goods (DG) services enquiry

Financial Functions:

- online billing functions which integrate with customers' in-house systems
- financial electronic data interchange (FEDI) of bills
- facilitate re-billing processes by shipping lines
- online viewing of PortNet charges[39]

b. Data and standards

Table II-26. Messages handled by PortNet

No:	Information Instrument Singapore	Source	Destination	Data Type
1	Shipment Instruction/Order for goods	Shipper	Freight Forwarder	Private
2	Transport Instructions/ Load tendering request for dray, ocean or rail	Freight Forwarder		Private
3	Vessel Booking	Freight Forwarder	OC	Private
4	Booking Confirmation/Vessel Booking Confirmation	OC	Freight Forwarder	Private
5	Loading Appointment Request	LTO	PO	Private
6	Loading Appointment Details	PO	LTO	Private
7	Container Pick-Up Details	OC	LTO and Depot	Private
8	Dangerous Goods	Freight Forwarder	Regulators	Private/Public
9	Vessel Schedule/Status	OC	PO	Private/Public
10	Release Order for Empty Container	Carrier	Depot	Private
11	Equipment Interchange Receipt (EIR)	Depot	LTO	Private
12	Packing List	Warehouse	LTO and Freight Forwarder	Private
13	House Bill of Lading	Freight Forwarder	OC	Private
14	Ocean Bill of Lading	OC	Freight Forwarder	Private
15	Permit Application/Export Authorization	Freight Forwarder	Regulators	Private/Public
16	Export Manifest/Cargo Manifest	Freight Forwarder		Private
17	Proof of Delivery	Dest. Freight Forwarder	Source Freight Forwarder	Private
18	Electronic discharging Instruction			

The EDIFACT standard is adopted by the trading community for the interchange of information.[40]

[39] PortNet - Empowering Singapore shipping community through technology http://www.portnet.com/WWWPublic/pdt_portnet.html

Benefits:

- Streamlined documentation and business processes for the port community
- A single-view, consolidated platform, improving efficiency by eliminating repetitive data entry, processing and transcription errors
- Simplified processes through integration with Government and port authorities' system as well as port users' individual systems
- Real-time tracking and proactive notification on business exceptions
- Consolidated real time information on demand through multiple communication channels such as email and SMS
- Simple to control individual user access levels for maximum security.[41]

4) Financing

PortNet is financed by user charges.

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[40]Based on COMPARISON OF SINGAPORE AND U.S.A. SEA CARGO CONTAINER EXPORT PROCESSES. Alan Erera, Keng-Huat Kwek,Nandini Goswami,Chip White,Huiwen Zhang.

[41]PortNet - Empowering Singapore shipping community through technology http://www.portnet.com/WWWPublic/pdt_portnet.html

III. REVIEW OF INTERNATIONAL MECHANISMS FOR EXCHANGE OF LOGISTICS INFORMATION

A. ASEAN Single Window (ASW)

1) Background to system development

The ASEAN Single Window (ASW) is a trade-facilitating environment operating on the basis of standardized information parameters, procedures, formalities, international best practices relevant for the release and clearance of cargoes at entry points of ASEAN under any particular Customs regime (imports, exports, and others).

It accelerates the release of import and export cargo, reduces Customs clearance time and reduces transaction costs. The ASW is part of the global supply chain and of the logistics industry working for the effective realization of the ASEAN Economic Community.[42]

Currently, the member states of ASW are[43]: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam.

a. National context

In order to reduce trade documentations and improve cross border trade efficiency, countries establish national Single Windows. Inter-connection of national Single Windows can improve the efficiency of cross-border trade. Thus, in October 2003, ASEAN countries started connecting their national Single Windows by adopting the Single Window approach as well as electronic cargo clearance.

b. Development process

ASEAN member countries are obliged to connect to the ASEAN Single Window. According to the original plan, Brunei, Indonesia, Malaysia, Philippines, Thailand and Singapore were to be connected by 2008. Cambodia, Laos, Myanmar and Viet Nam were to be connected by 2012.

However, because of gaps among ASEAN member countries, particularly on their trade and port community EDI systems, the deadlines were postponed to 2012 for Brunei, Indonesia, Malaysia, Philippines, Thailand and Singapore and 2015 for Cambodia, Laos, Myanmar and Viet Nam.

[42] Technical Guide of ASEAN Single Window and National Single Windows Implementation(ASW Technical Guide)
[43] The official site of ASW: http://asw.asean.org/

c. Stakeholders

ASW Steering Committee (ASWSC) was established to promote the establishment of ASW. ASW LWG (Working Group on Legal & Regulatory Matters) and ASW TWG (Working Group on Technical Matters) were set.

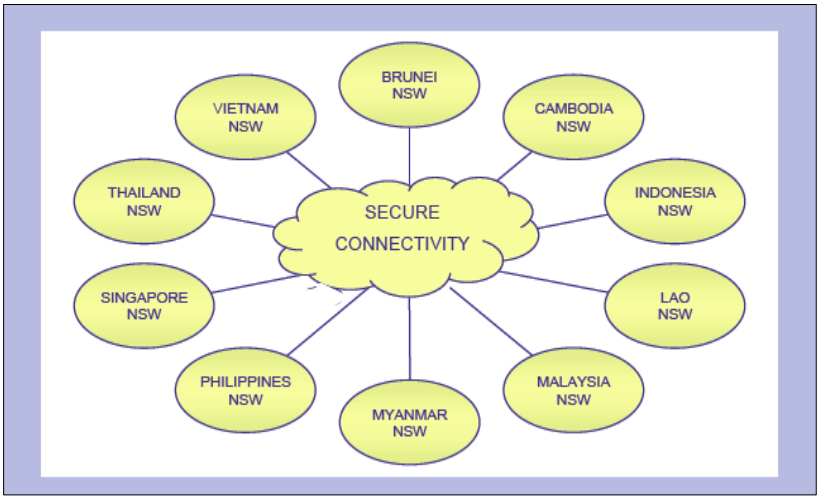
d. Timelines

Oct 2003	Adoption of the Single Window approach including the electronic cargo clearance (the 9th ASEAN Summit in Bali Indonesia)
Jan 2004	Establishment of ASEAN Inter-Agency Task Force to define ASW Model (ASEAN Economic Ministers (AEM) Meeting in Yogyakarta, Indonesia)
Dec 2005	Agreement to establish and implement the ASEAN Single Window (ASEAN Economic Ministers Meeting in Kuala Lumpur, Malaysia)
Mar 2006	ASW Technical Guide was defined (ASEAN Secretariat)
Dec 2006	Protocol to establish and implement the ASEAN Single Window was defined (Agreed and signed by member countries' minister)
Nov 2007	ASEAN Economic Community Blueprint was defined and free flow of goods was ranked as the first item. (13th ASEAN Summit in Singapore)
2008	ATIGA (ASEAN Trade in Goods Agreement) Form-D based certificate of origin data exchanging test was performed
May 2010	ASEAN Trade in Goods Agreement (ATIGA) was reached as regional FTA, certificate of origin also implemented as ATIGA Form-D
Oct 2010	Master Plan on ASEAN Connectivity was defined. (17th ASEAN SUMMIT)
2012	Test of Federated Single Window Model was performed (A model without Central Gateway, ASEAN Gateway included in each NSW)
2013	ASEAN Legal Framework Agreement (ALFA) was agreed
2014	Preparation time for ASW production
2015	Plan to ASW production

2) System design/architecture

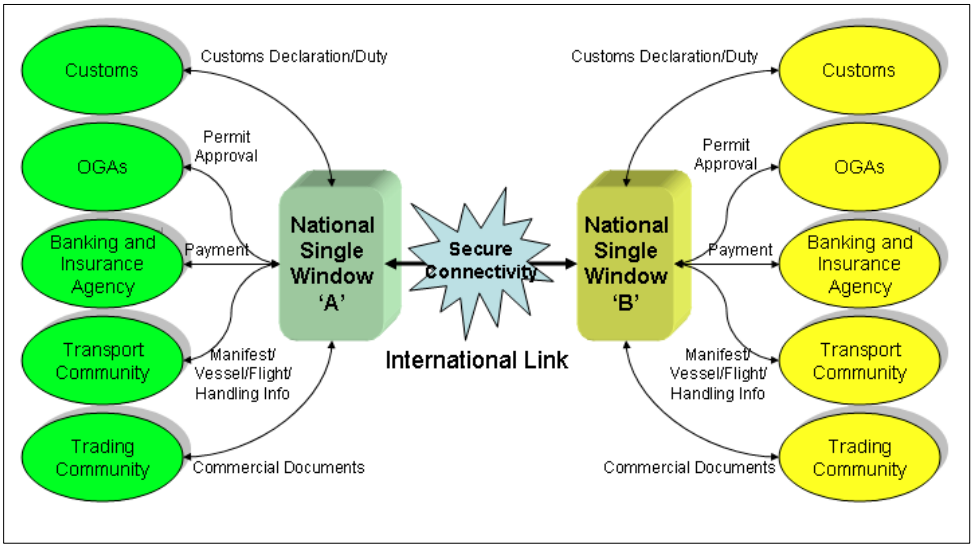
The ASW is the environment where ten National Single Windows (NSW) operate and integrate to expedite Customs release and clearance. It has Government-to-Government, Government-to-Business, Business-to-Business and Business-to-Government functions. It also works in the context of simplifying and harmonizing Customs procedures and formalities as well as standardizing information parameters to international standards (on the basis of the Revised Kyoto Convention). The ASW applies the most advanced development of information processing (Information and Communication Technology – ICT) and integrates itself through a secure networking environment.

Figure III-1. ASEAN Single Window conceptual model[44]



Source: ASEAN Single Window Technical Guide

Figure III-2. ASEAN Single Window model: Prototype flowchart of Information Processing



Source: ASEAN Single Window Technical Guide

3) Messages available

a. What the system can do

A Single Window is a clearance system that enables a single submission of information and data, single and simultaneous processing of the data, and a single point of decision-making through close collaboration among the line ministries and other parties involved in the Customs clearance process. Instead of submitting

[44] Technical Guide of ASEAN Single Window and National Single Windows Implementation (ASW Technical Guide)

different forms and information to multiple agencies (e.g. Customs, port, health etc.) to get a shipment of goods cleared, a trader only needs to submit all the information to one agency.

A Single Window has multiple benefits for both Government and industry. National governments benefit from Single Window because it provides a cohesive approach to supply chain security, more effective and efficient deployment of resources yields, more efficient and accurate fiscal revenue, reduces corruption in the Customs agencies, and improves Customs compliance on the part of industry and traders. The private sector benefits from Single Window because it reduces the financial and time costs of regulatory compliance, reducing rent seeking opportunities by Customs agencies, ensures faster clearance and release of goods, improves predictability and ensures regulations are administered equitably.

b. Who are the users and what are the functions available to them

At the national level, there are six major areas of coordinated processing of information and data for faster clearance, concerning 4 detailed transactions among Customs administrations and governmental agencies, economic agents and operators (e.g. importers, exporters, transport operators, Customs brokers, forwarders, commercial banking entities and financial institutions, insurers etc.), and the completion of procedures by management authorities in the respective areas (trade management, duty and tax management, etc.).

The areas of information processing within the NSW are:

- Customs;
- other Government agencies;
- banking and insurance agency;
- transport community;
- trading community; and
- ASEAN/international link.

c. Type of data shared

The following data were defined to be shared:

- ***ATIGA CO Form-D:*** The ASEAN Trade in Goods Agreement (ATIGA) was established in 2010. ATIGA, with its entry into force, replaced the previous scheme – Common Effective Preferential Tariff (CEPT). ATIGA FORM D replaced CEPT Form D used in the previous CEPT scheme. It is the certificate of origin issued by a national Government to exporters so that it can be used by counterpart importers for a preferential rate. The Form consists of information on exporter, importer, conveyance route, product information, the country which issued the certificate and the purpose of the form.
- ***ASEAN Customs Declaration Document (ACDD):*** ACDD was developed based on the European Union's SAD (Single Administrative Document).
- ***Manifest:*** Manifest information was planned to be shared among member countries.

- ***Other permits or documents:*** Other permits and documents for clearance are planned to be shared, for example animal or plant quarantine documents.
- ***B2B documents:*** Since 2006, agreed ASW Protocol also encourages the data interchanging of B2B documents. In the ASW Protocol, data handled by ASW was categorized in G2B, B2B and G2G.

d. Relevant data standards

Table III-1. Data Requirements in ATIGA CO Form-D

ID	Data Element Name	TDED	Data Element Definition	Code Remarks
0	Declaration Type	1001	Code specifying the name of a document.	
0-1	Reference Number	1004	Reference number identifying a specific document.	
1	Goods consigned from (Exporter's business name, address, country)	3036	Name (and address) of the party consigning the goods as stipulated in the contract by the party ordering the transport (This may be the exporter or seller.)	
2	Goods consigned to (Consignee's name, address, country)	3132	Name and address of party to which goods are consigned	
3-1	Departure date	2380	The value of a date, a date and time, a time or of a period in a specified representation.	
3-2	Vessel's name/aircraft etc.	8212	name of specific means of transport such as vessel name	
3-3	Port of discharge	8212	Name of a location	UNLOCODE
4	For official use (Declaration Type)	1001	Code specifying the name of a document.	
5	Item No	1050	To identify a position within a sequence.	
6	Marks and Numbers on Packages	7102	Free form description of the marks and numbers on a transport unit or package	
7-1	Number of packages	6061	Numeric representation of a quantity value.	
7-2	Type of packages	7064	Description of the type of packaging of an item.	
7-3	Description of goods	7357	Code specifying a type of goods for Customs, transport or statistical purposes.	
9-1	Gross Weight	6018	Weight (mass) of line item including packaging but excluding the transport equipment	
9-2	Item Price	5032	Amount declared for Customs purposes of those goods in a consignment which are subject to the same Customs procedure, and have the same tariff/statistical heading, country information and duty regime	
9-3	Payment Currency	6345	Code specifying a monetary unit or currency.	ISO 4217 Currency Code
10-1	Invoice Number	1334	Reference number to identify an invoice	
10-2	Invoice Date	2376	Date of issue of an invoice, in figures and words	

ID	Data Element Name	TDED	Data Element Definition	Code Remarks
11-1	Country of Origin	3225	Identification of the place in country or country from which the goods were initially dispatched to the importing country	UNLOCODE
11-2	Country of Exportation	3229	Country subdivision where goods begin their journey to export	UNLOCODE
12-1	Place of issue of document	3410	Name of the location where a document was issued and when appropriate, signed or otherwise authenticated	
12-2	Place/location	3224	Name of a location.	
13	C/O Type	4441	Code specifying the format of free text	

Table III-2. Data Elements in *ASEAN Customs Declaration Document (ACDD)*

ID	Data Element Name
1	Declaration : Type and Customs Procedures
2	Customs reference number
3	Forms
4	Date PEX/PIM
5	Date of presenting the goods declaration to the Customs
6	Date of acceptance of the goods declaration by Customs
7	Exporter/Consignor
8	Importer/Consignee
9	Transaction Reference
10	Identification of Declarant/Representative
11	Authentication Place & Date Signature and name of declarant/representative
12	Reference number common access
13	Other information covering the liability of goods to specific requirements
14	Previous Customs procedures
15	Customs value basis
16	added amount
17	deducted amount
18	duty/tax treatment applied
19	Security details
20	Transport document (Sea way bill, Airways bill)
21	total packages
22	Location of goods
23	Identification of Customs warehouses
24	Identification and nationality of transport
25	Identification and nationality of transport crossing the border
26	Mode of Transport
27	Place of loading and place of discharge
28	Container transport indicator
29	Container identifier. Marks and No of packages No and type of package, description of goods
30	Cargo Manifest Reference
31	Gross mass (Kg)
32	Item number
33	Commodity code and description (AHTN)
34	Supplemental quantity
35	Country and/or region of exportation/whence consigned
36	Country of Destination Code
37	Country of Origin Code
38	Terms of Delivery
39	Payment currency
40	Exchange rate
41	Nature of transportation

ID	Data Element Name
42	Differed payment of duty/tax/fee
43	Quota/Licenses
44	Collection of duty and taxes
45	Intended Customs offices and route
46	Customs office of Destination
47	Transfer during Customs transit
48	Control measure/incidents during Customs transit

4) Institutional arrangements, including inter-country arrangements/ cooperation mechanisms

- Member countries adopted the Single Window approach including electronic cargo clearance (9th ASEAN Summit, Bali, Indonesia) in October 2003.
- The Establishment ASEAN Inter-Agency Task Force to define ASW Model (ASEAN Economic Ministers (AEM) Meeting Yogyakarta, Indonesia) in January 2004.
- Agreement to Establish and Implement the ASEAN Single Window (ASEAN Economic Ministers Meeting, Kuala Lumpur, Malaysia) in December 2005.
- ASW Technical Guide was defined (ASEAN Secretariat) in March 2006
- In order to construct ASW, Protocol to Establish and Implement the ASEAN Single Window was defined (Agreed and signed by member countries' minister) in December 2006.
- ASEAN Economic Community Blueprint was defined and free flow of goods was ranked as the first item. (13th ASEAN Summit in Singapore) in November 2007.
- ASEAN Trade in Goods Agreement (ATIGA) was reached as regional FTA, certificate of origin also implemented as ATIGA Form-D in May 2010.

- Master Plan on ASEAN Connectivity was defined. (17th ASEAN Summit) in October 2010.
- ASEAN Legal Framework Agreement (ALFA) was agreed in 2013.

5) Financing

The construction cost of NSW is covered by each country, based on their own approach to finance NSW establishment. For example, Singapore used Public Private Partnership to finance the establishment of TradeNet while Thailand's NSW was covered by Government.

Table III-3. NSWs Financing Details by Country

ID	Country	Operator	Financing	Free/Charged
1	Brunei Darussalam	N/A	N/A	N/A
2	Cambodia	Planning to construct		
3	Indonesia	EDI Indonesia	All by Government	Free
4	Lao PDR	Planning to construct		
5	Malaysia	Dagang Net	PPP	Charged
6	Myanmar	Planning to construct		
7	Philippines	The Customs	All by Government	Free
8	Singapore	CrimsonLogic	PPP	Charged
9	Thailand	The Customs	All by Government	NSW itself free, but service provider charged
10	Viet Nam	General Department of Customs	All by Government	N/A

Table III-4. Costs and Benefits Use of NSWs

ID	Country	Free/Charged	Financing
1	Indonesia	Free	Documents: 20000/day Companies: about 3000
2	Malaysia	Charged	Declaration function: Documents interchanged: 1000000/month Companies: about 3300
3	Philippines	Free	Documents: 3000/day Companies: about 2800
4	Thailand	NSW itself free, but service provider charged	Documents interchanged: 63000000/month Companies: about 8000 Users: about 12500
5	Singapore	Charged	Documents interchanged: 30000-40000/day Companies: about 2500 Users: about 9000

Good practices and lessons learned

ASW is an example of good practice in regional cooperation. However, given the big gap among member countries, examples of challenges in implementing the project include: (i) difficulties to synchronize the working schedule of NSW establishment; (ii) setting national priority vs. international cooperation; (iii) reaching agreement on data and documentations requirement.

B. Northeast Asia Logistics Information Service Network (NEAL-NET)

1) Background to system development

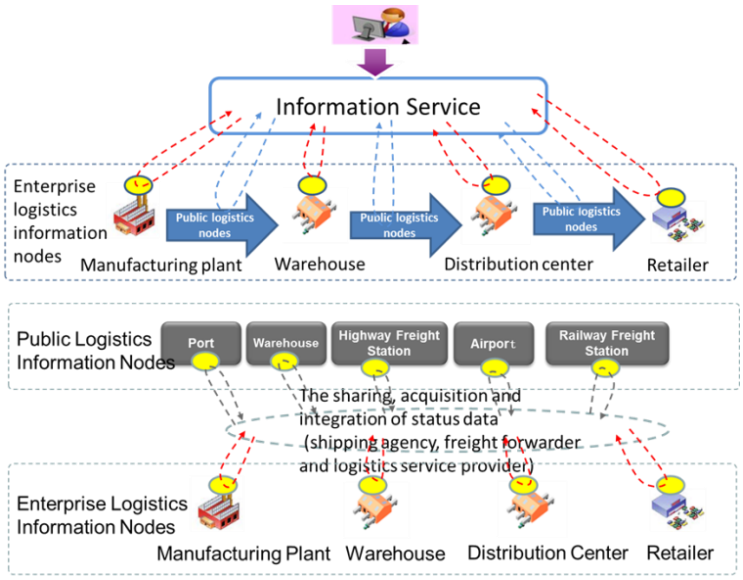
a. National context

Northeast Asia Logistics Information Service Network （NEAL-NET）is a transnational, non-profit cooperative mechanism for logistics information sharing, interchange and technical cooperation. The system was initiated by the Ministries of Transport of China, Japan and Republic of Korea under the China-Japan-Republic of Korea Ministerial Conference on Maritime Transport Logistics.

Fast growth of trade among the three countries gave rise to increasing logistics services demand in recent years. There is intense cross border trade among China, Japan and the Republic of Korea. In 2010, container throughput between the three countries was 1.617 billion TEUs, accounted for 32.12per cent of the world container throughput.

The requirements for seamless supply chain and high-quality logistics services became increasingly important to facilitate trade and economic exchanges among China, Japan and Republic of Korea. Information sharing was a barrier among international trade players and bottleneck in the logistics process. The solution was to build a logistics information interchange platform among the three countries would benefit all participants in the entire supply chain.

Figure III-3. Information Service for the Entire Supply Chain



Source: http://www.nealnet.org/

The Governments of China, Japan and Republic of Korea established NEAL-NET on 2nd December 2010 to promote the sharing of logistics information among Northeast Asian countries. NEAL-NET primary mission was to unify basic standards for logistics information interchange, encouraging the development of international

logistics information sharing standards and technologies and promoting technology application.

NEAL-NET consists of a Joint Steering Committee, the Council, the Secretariat and NEAL-NET members. The Joint Steering Committee provides guidance and advice on major issues in the construction and development of NEAL-NET. The Council is responsible for overall organization and deployment. The Secretariat functions as the daily standing office. NEAL-NET members are relevant Governments, associations, ports, logistics enterprises, IT vendors, research institutes, universities and colleges etc.

b. Development process

Senior Government officials of China, Japan and Republic of Korea met in Hangzhou on 2nd December 2010 to sign the Memorandum of Understanding on the Cooperation Mechanism of Northeast Asia Logistics Information Service Network (NEAL-NET); and officially declared the establishment of NEAL-NET.

In order to develop the NEALNET, thorough discussion and consultations have been carried out to settle issues and seek the acceptable technical and administrative solutions among the three countries.

During the first phase of development on pilot ports, the interface modification of dynamic Container Vessel Schedules was completed in December 2011. Inquiry interface modification for container status was completed by pilot ports in the second phase of development.

At present, Container Vessel Schedules and Container Status Data are available for query. Data from the following ports are available: Ningbo, Tianjing, Qingdao, Weihai, Yantai, Shekou, Yingkou, Rizhao, Lianyun, and Yantian in China; Kawasaki, Osaka, Kobe and Tokyo in Japan; and, Busan, Guangyang and Incheon in Republic of Korea.

c. Stakeholders

NEAL-NET was founded and subsided by the Governments of China, Japan and Republic of Korea. The system was established as an effective platform for public information and developed a set of standards, allowing enterprises of all sizes to access data. Three entities, i.e. LOGINK, COLINS and SPIDC from China, Japan and Republic of Korea respectively provide access to the platform to information providers and customers, using NEAL-NET standards.

NEAL-NET stakeholders include ports, shipping companies, freight forwarders, consignors, road and railway transport companies. Third party logistics service providers can also benefit from access and to NEAL-NET mechanism. In addition to benefit from information sharing, stakeholders also benefiting from cost-cutting through single window and receive more value-added services.

d. Timelines

The first Council Meeting of NEAL-NET was held in Hangzhou China in December 2010. It marks the official start of cooperation mechanism of logistics information sharing in Northeast Asia.

May 2011: The Government of China, Japan and Republic of Korea agreed to establish the "Northeast Logistics Information Service Network" in the "Declaration of the fourth trilateral summit meeting."

December 2011: Container Vessel Schedules from pilot ports such as Zhoushan Port in Ningbo, China, Yokohama port in Tokyo, Japan and Busan Port in the Republic of Korea were made available to the public. The opening ceremony was held at the 2nd Council Meeting of NEAL-NET and Advisory Board meeting in Hangzhou, China.

December 2012: Container Status Data from pilot ports of China, Japan and Korea was ready for opening to public.

March 2013: The three countries drafted the Unified User Management Technical Framework and Standards for User Authentication at the 8th NEAL-NET Technical Meeting in Seoul, Korea.

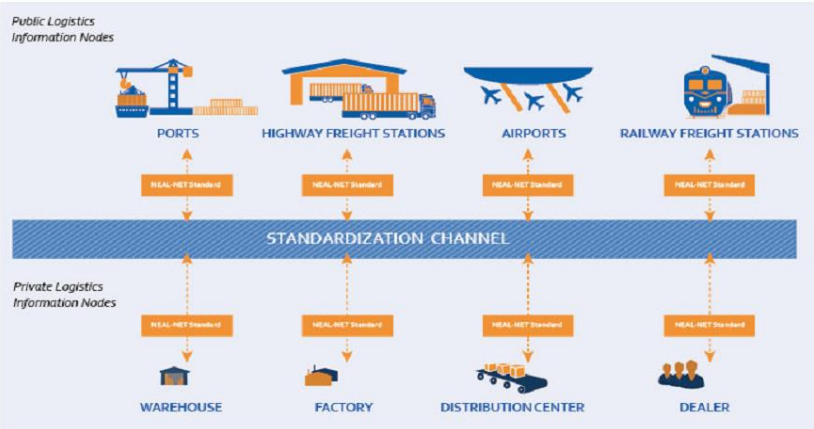
August 2014: The 3rd NEAL-NET Joint Steering Committee and the Council Meeting were held in Yokohama, Japan. NEAL-NET published Dynamic Container Vessel Status and Container Status Standards and opened Dynamic Container Vessel Status and Container Status Information Sharing Service interfaces officially.

2) System design/architecture

NEAL-NET is built as a channel to allow seamless exchange of information between partners throughout the supply chain and to create data standards which assures interoperability of different information systems.

Public logistics nodes, such as highway freight stations, airports, railway freight stations and ports, were defined by the system. NEAL-NET itself neither generates any logistics information nor stores data. Its main task is to define the interface standards of each public logistics nodes and promote the nodes to reform their interfaces in accordance with those standards so cross-nodes data sharing can be made possible.

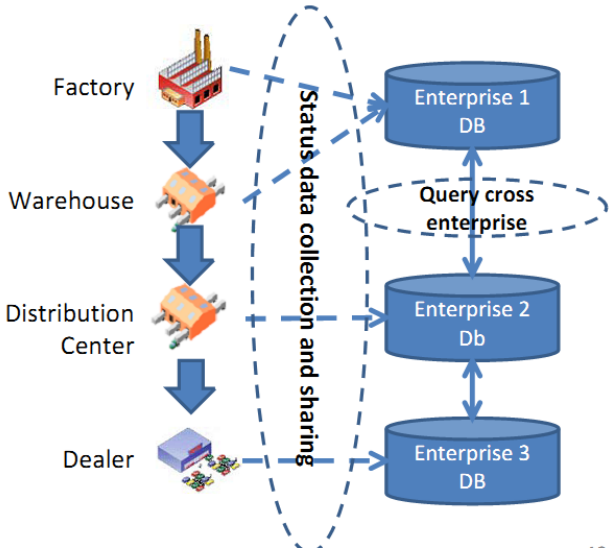
Figure III-4. NEAL-NET Application Frameworks



Source: http://www.nealnet.org/

There are two basic requirements for supply chain business partners: data exchange (documents transfer from one company to another the in supply chain) and business status query. However, NEAL-NET only offers information query service.

Figure III-5. NEAL-NET System Architecture



Source: http://www.nealnet.org/

3) Messages available

a. What the system can do

NEAL-NET provides standardized query interface for users to obtain transnational logistics status data such as container vessel arrival/departure time, container dynamic status etc. through LOGINK, COLINS and SP-IDC. These data can help users to make better operational decisions in booking shipping space, handling operation, production etc.

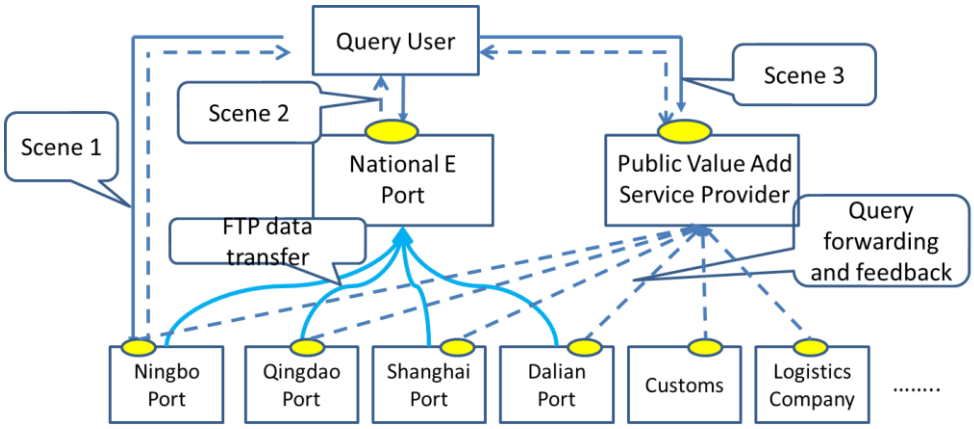
NEAL-NET can be accessed through system interconnection. Big companies may develop or align their own interfaces in accordance with the standard to allow their own systems to access NEAL-NET. In addition, NEAL-NET services can also be accessed through its own website. NEAL-NET website integrates operational data from various ports into one single platform to provide user-friendly services especially for small and medium size enterprises (SMEs).

b. Who are the users and what functions are available to them

NEAL-NET users include freight forwarders, consignors, container yard, ports, shipping companies, and road and railway transport companies as well as third party logistics service providers and manufactures.

NEAL-NET implementation framework allows users to obtain data by using two ways of interaction with LOGINK, COLINS and SPIDC. This is done by either directly retrieving data from the ports which already applied NEAL-NET Standards in their systems, or with the help of query interface provided by LOGINK and other service providers.

Figure III-6. Data Query Scenarios for Users



Source: http://www.nealnet.org/

Currently, NEAL-NET cooperation mainly focuses on the maritime transport. Nevertheless, in the near future, cooperation will be extended to other modes of transport such as aviation, railway and road. Under the leadership of China-Japan-Republic of Korea Ministerial Conference on Transport and Logistics, NEAL-NET strives for better logistics information sharing as well as the improvement of regional cooperation and communication among countries in Northeast Asia.

c. Type of data shared

It is important for private sector to obtain certain types of data so that they are available to timely make plans and gather resources for efficient operation.

For most private players, the following types of data need to be shared and exchanged.

Shippers/Consignor

- Latest vessel schedule data (ETA*, ETB*, ETD*, etc.)
- Date of CY OPEN, CY CLOSING, SI CUT-OFF TIME
- Current status of transport vehicles
- Cargo location, status information (from goods level to container level)

Logistics companies

- Latest vessel schedule data (ETA*, ETB*, ETD*, etc.)
- Date of CY OPEN, CY CLOSING, SI CUT-OFF TIME
- Estimated/actual discharging permission (cargo ready) date-time
- Container gate-in and gate-out time, current status of road transport
- Cargo location, status information (from goods level to container level)

Port operators/terminal operators

- Vessel schedule information/data
- Container status information/data
- Latest vessel schedule data

Shipping companies:

- vessel schedule information/data
- container status information/data

Cargo owners (consignee)

- Latest vessel schedule data (ETA*, ETB*, ETD*, etc.)
- Estimated/actual discharging permission (cargo ready) date-time
- Current location/status of vessel/transit vehicle
- Current location/status of cargo
- Cargo location, status information (from goods level to container level)

d. Relevant data standards

NEAL-NET Standards adopt a framework which is suitable for status sharing.

NEAL-NET Interface uses web-service and SOAP message for data transmission. All three countries agreed that Electronic Product Code Information Service (EPCIS), developed by GS1 to allow partners exchange information through EPC global network, is a well-designed framework. Only minimal features had to be added to adapt to the need of NEAL-NET users.

NEAL-NET allows users to track their goods and enhances the monitoring of the supply chain. Every key status in the process of logistics can be easily queried by users. Logistics nodes, i.e. highway freight stations, railway freight stations, airports and ports, have to follow a set of standards in order to provide these key statuses to their customers. Some of the key status information can also be accessed by other authorized users. At present, NEAL-NET provides two types of information to users: dynamic vessels schedule and container status.

NEAL-NET standards specify two types of standard data "object" and "event". "Vessel" and "container" are two objects, and each has its own specific events for representing the status. The standards specify five vessel events including Estimated Time of Arrival (ETA), Actual Time of Arrival (ATA), Actual Time of Berthing (ATB), Estimated Time of Departure (ETD), and Actual Time of Departure (ATD). The standards also specify five container events including Gate In, Gate Out, Custom Release, Loading, and Unloading.

Each of the events can be described in a data set. For example, Estimated Time of Arrival (ETA) is described in a data set including Vessel Name, Radio Call sign, IMO Number, Voyage Number, Port Code, Terminal Code etc. Actual Time of Arrival (ATA) is described in another set of data. All these data sets are defined in standard data elements and codes. NEAL-NET standards have been developed based on EPCIS technical specifications and also add up some unique data elements and codes to ensure consistency with other existing relevant international standards.

The following documents on Technical Guidance of NEAL-NET Standard are available for download in PDF format from NEAL-NET website.

- Dynamic Vessel Status Sharing Service – Event Lists
- Dynamic Vessel Status Sharing Service – Vocabulary
- Dynamic Vessel Status Sharing Service
- Dynamic Container Status Sharing Service – Event Lists
- Dynamic Container Status Sharing Service – Vocabulary
- Dynamic Container Status Sharing Service

4) Institutional arrangements, including inter-country arrangements/ cooperation mechanisms

Institutional arrangements

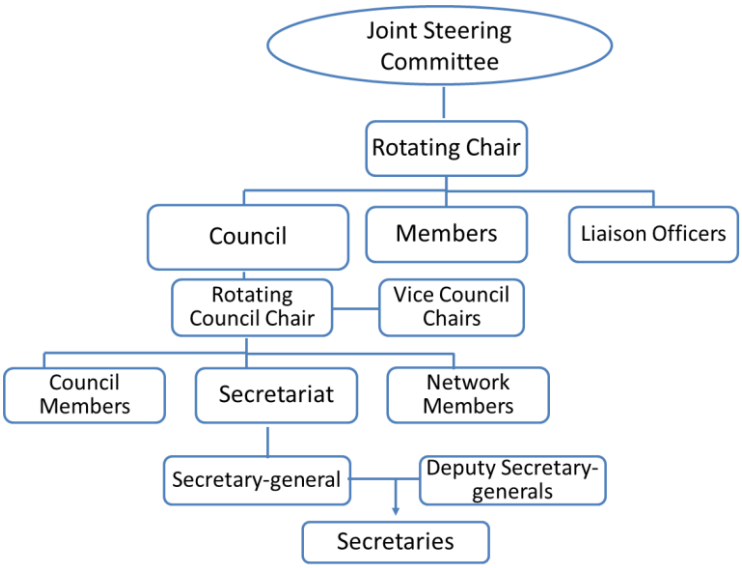
NEAL-NET is a technical cooperation program for logistics information sharing among China, Japan and Republic of Korea established on the basis of a mechanism of cooperation at the Ministerial Conference on Transport and Logistics, led by the Ministries of Transport of the three countries.

NEAL-NET Joint Steering Committee consists of Chairman, members and liaisons held by officials from of China, Japan and Republic of Korea. The Chairman position is rotating every four years between the Director Generals of the International Cooperation Department within the Ministries of Transport of the three countries.

The Council consists of a Director, deputy directors and members. The director of the Council position has a four year term and rotates among the three countries. Council members include research institutes, industry associations, ports, shipping companies and freight forwarders from the three countries.

The Secretariat is in Hangzhou, China with a Secretary General from China and two deputy Secretary Generals from Japan and Republic of Korea. Technical meeting is held several times every year. Participants include official delegates, technical personnel and managerial staff from transport authorities, research institutes and transport enterprises.

Figure III-7. Organization Chart of NEAL-NET



Source: http://www.nealnet.org/

Inter-country arrangements/cooperation mechanisms

In order to develop and promote the coverage of NEAL-NET, efforts are made to increase international cooperation with other organizations in Asia, Europe Union and North America.

Asian Development Bank funded an Advisory Technical Assistance because ADB sees the potential to expand NEAL-NET's coverage to other sub-regions in Asia. Experts from Asia, Europe and North America have also held several meetings and seminars to discuss potential improvement of NEAL-NET in the area of technology, standards and implementation.

Cooperation with the European Union is progressing. In 2012, the "Minutes of Europe and Asia Cooperation on Logistics Information Sharing Seminar" was jointly signed by China, Japan, Republic of Korea and the European Union. All parties agreed to promote the interconnectivity between e-Freight in Europe and NEAL-NET in Asia.

5) Financing

At present, NEAL-NET's operation, development and promotion budget is subsidized by the governments of China, Japan and Republic of Korea. Each country also funds its own national operational needs, i.e. LOGINK in China, COLINS in Japan and SP IDC in the Republic of Korea.

A business model that aims to combine Government subsidy and user payment fees to fund NEAL-NET will be discussed at the next stage of development. The participation of other information service providers is also under consideration.

6) Costs and benefits

Benefits include savings on logistics cost and increased efficiency by improving trade facilitation and logistics among the three countries. However, the actual value of cost saving has not yet been calculated.

7) Good practices and lessons learned

Good standards are fundamental to NEAL-NET development and operations. Officials and technical experts from participating countries continuously analyze potential obstacles and problems and identify practical and feasible solutions. As a result, NEAL-NET standards are well-defined and this plays an important role in the implementation in China, Japan and Republic of Korea.

The next phase of NEAL-NET will incorporate more functions to meet the requirements of all stakeholders. Appropriate business model has to be developed so that NEAL-NET becomes attractive to more potential partners within the supply chain, especially increase ports to participations in providing information services to public users. NEAL-NET geographical coverage will also be expanded.

C. Review of e-Freight Project

1) Background to system development

a. Context

e-Freight was a research and development project co-funded by the European Commission under the 7th Framework Programme. It started in January 2010 and ran until June 2013. e-Freight had 30 partners from 14 EU Member States and Norway. [45]

In order to make European transport of goods as efficient and effective as possible, it is important that the existing transport infrastructure is utilized to its fullest potential. Combining the use of all modes – road, rail, inland waterways, coastal shipping and air – such that each one is optimally used is a challenge that the European Commission has been addressing through a number of research and development projects.

The objective of e-Freight project was to facilitate the use of different transport modes, on their own and in combination, to obtain an optimal and sustainable utilization of European freight transport resources.

e-Freight aimed to provide interoperability of business processes across organizational boundaries and across transport modes, allowing the different organizations involved in a freight transport chain to plan, execute and control transport movements seamlessly – as if the transport movements were being carried out within a single, highly efficient "extended enterprise."

e-Freight could achieve this degree of interoperability, regardless of the number of organizations and modes of transport involved and the size of the consignment, because it was based on the understanding of essential business processes that were required, and how organizations exchanged information required by these business processes through standardized messages. The project presented this understanding using the e-Freight Framework.

Under the e-Freight Framework, e-Freight provided IT capabilities to demonstrate that paperless information exchange among all EU freight transport stakeholders for all intra and certain extra-EU freight transport in adherence to EU co-modality policy, was possible in practice.

The core e-Freight components

There were four completely interdependent components that composed in the e-Freight concept:

[45] E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.14.

e-Freight Framework

A reference model for Freight Transport & Logistics (i.e. a description of processes, actors, information and other domain entities) supporting paperless information exchange among stakeholders in all transport modes

e-Freight Platform

A comprehensive software infrastructure that reflected the e-Freight Framework and facilitated the development and deployment of e-Freight Solutions; the platform had three capabilities:

- it provided a repository (a storeroom) from where e-Freight Solutions and Services could be downloaded,
- it acted as 'run-time' environment that supports operation and interaction of the e-Freight Solutions, and
- it provided a software development environment for the development of additional e-Freight Services and Solutions.

e-Freight Services

e-Freight Services were elementary pieces of software used as the building blocks of e-Freight Solutions. Services were totally interoperable software derived directly from the e-Freight Framework.

e-Freight Solutions (A2A & A2B applications and/or B2A & B2B applications)

e-Freight Solutions were consisted of software components and data feeds (e.g. on traffic, weather, cargo flows) that could perform meaningful functions in the area of Freight Transport & Logistics.

b. Development Process

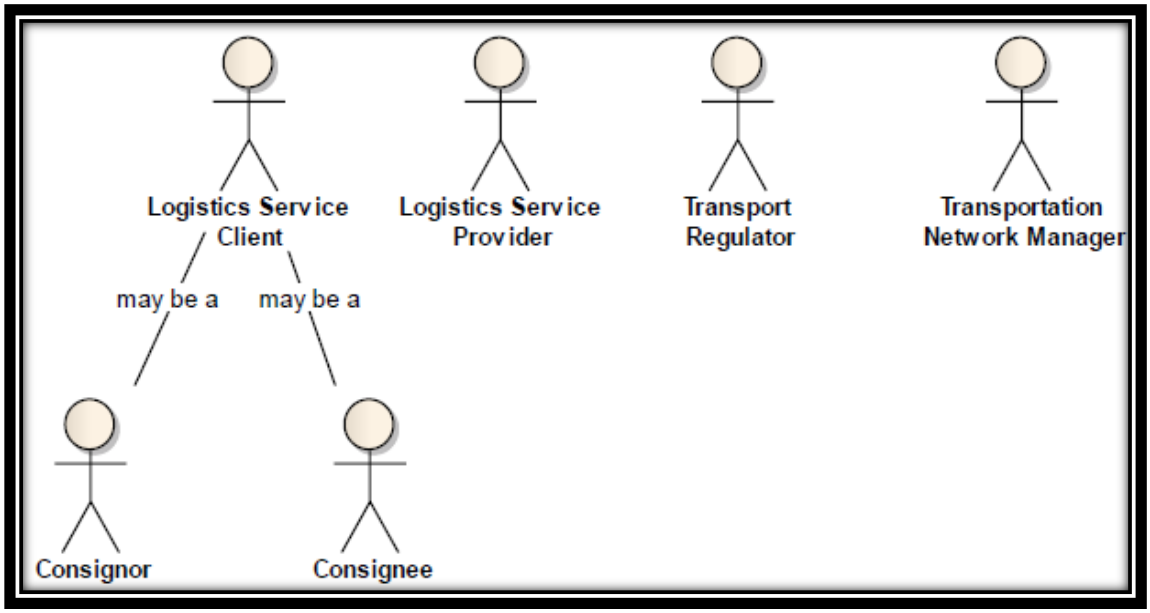
e-Freight started in January 2010 and ran until June 2013. e-Freight had 30 partners from 14 EU member states and Norway.[46]

c. Stakeholders

Six groups of users were hypothetically created.

[46] http://www.efreightproject.eu/default.aspx?articleID=1126

Figure III-8. Roles



Source: E-Freight D1.3b e-Freight Framework

Logistics Service Client (LSC)

The Logistics Service Client represented the role of someone who searched, booked and followed up on the execution of logistics services. LSC provided the Logistics Service Provider (LSP) with instructions and detailed information about the cargo to be included in the logistics services.

Logistics Service Provider (LSP)

The Logistics Service Provider planned, marketed and executed logistics services. Service requirements were collected from LSC. LSP then communicated with the Transportation Network Manager and the Transport Regulator during planning and execution of the logistics services. LSP was also responsible for providing LSC with status information during the execution of the transport services.

Transport Regulator (TR)

The Transport Regulator received all mandatory reporting (and checked if reporting had been carried out) in order to ensure compliance regulations. The Transport Regulator was responsible to do the necessary Customs clearance of the goods.

Transportation Network Manager (TNM)

The Transportation Network Manager played the role of unit that extracted all information available regarding the infrastructure (static or dynamic) related to the planning and executing transportation and made this information available to the LSP.

Consignor

Consignor was the shipper or sender. The consignor was also responsible for arranging exports Customs clearance. The Consignor could be regarded as a third party and could also perform the role of LSC.

Consignee

Consignee designated role was the receiver of cargo handled by a logistics service. The consignee was also responsible for arranging imports Customs clearance. The Consignee may perform the role of LSC or the role of a third party.

d. Timelines

e-Freight project from January 2010 till June 2013

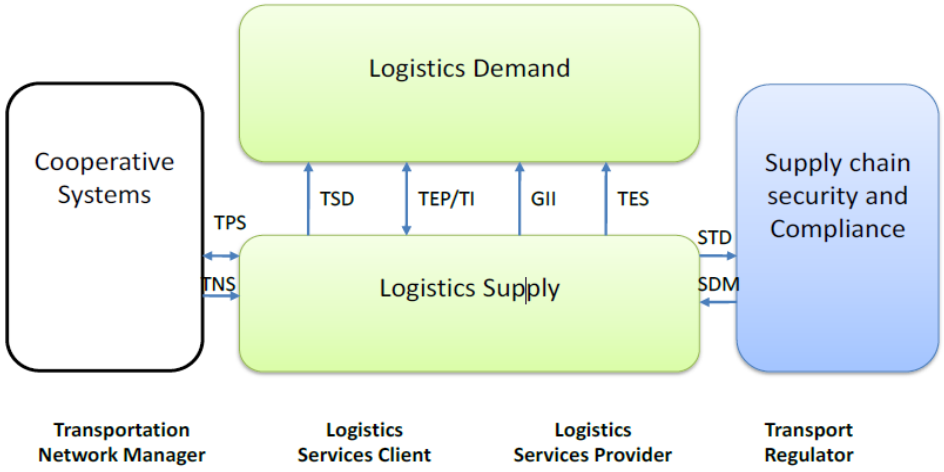
2) System Design/Architecture

Common Framework

The Common Framework related to four domains as showed in Figure III-9.

- Logistics Demand: domain of Logistics Services Clients (Consignor and Consignee).
- Logistics Supply: domain of the Logistics Services Providers
- Cooperative systems (traffic management): domain of the Transportation Network manager
- Supply chain security and compliance: domain of the Transport Regulator

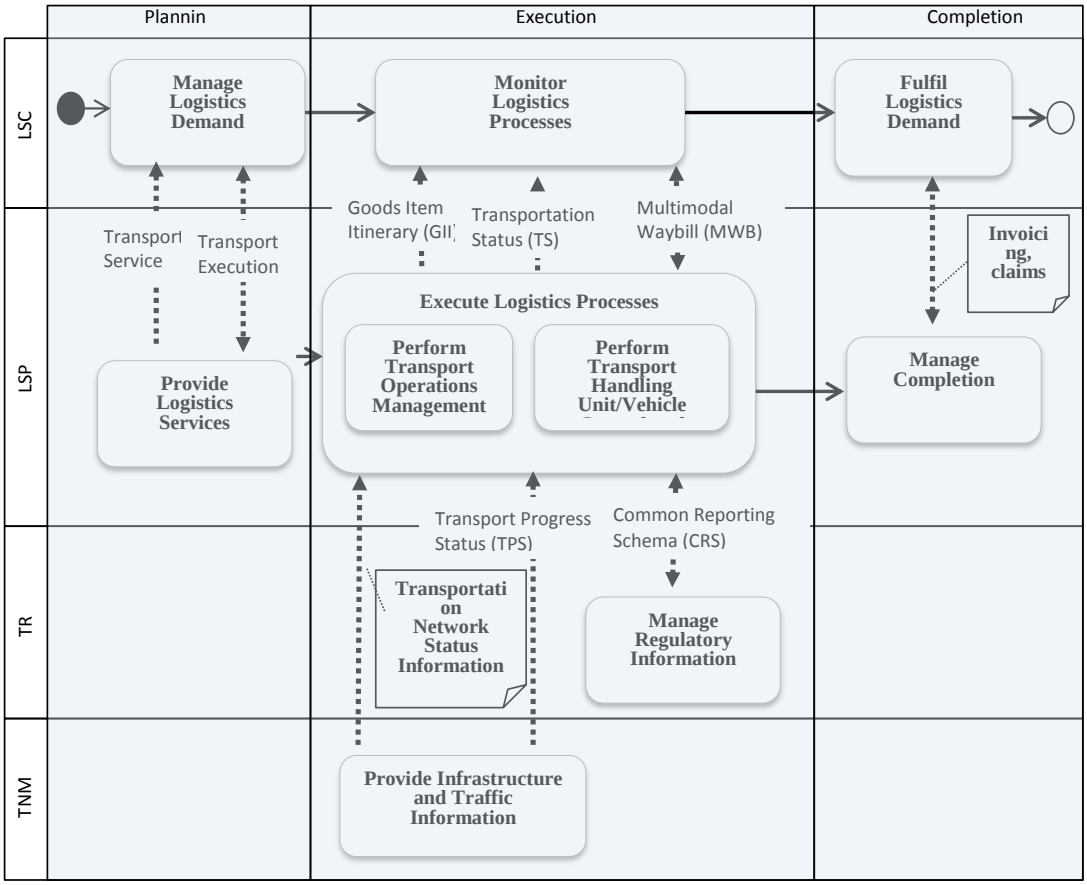
Figure III-9. e-Freight Common Framework



Source: E-Freight D1.3b e-Freight Framework; p8. (http://www.efreightproject.eu/default.aspx?articleID=1126)

Transport Process

III-10. Transport process in e-Freight



Source: Takis Katsoulakos "Creating e-Freight solutions for efficient and sustainable multimodal transport" e-Freight 12 Conference Delft. 19th April 2012. p6.

Transport planning stage

- The LSC defined a service, based on analysis of market data, such as actual incoming orders and order forecasts. The LSC should define service charge, transport corridor or transport mode preferences and specify the service preferences. Once defined, the LSC would then announce their service demand in the service network and in the spot market.
- The LSP planned their service considering market demand, available resources, corridor strategies etc. Once defined, the LSP would announce the services to the market using Transport Service Description (TSD).
  - The selection of transport corridors was influenced by transportation network information related to traffic and infrastructure conditions.
- Once LSC was satisfied with LSP's TSD, the LSC would book the services with the LSP using the Transport Execution Plan (TEP). LSP then sent a Goods Item Itinerary (GII) to the LSC, allowing transparency into the service operation and easy monitoring.
- Between the LSC and LSP, there were two kinds of relationship: long-time cooperation and short-time cooperation. Usually, the LSC and LSP would establish long-term agreements that specify and regulate overall terms and

conditions for their interoperation in business. So when the LSC acquired services or the LSP announced services, they could first search from their long-time partners list to confirm whether they can find the suitable partner for this business.

Transport execution stage

- The LSP and the Consignor (sender) arrange for cargo pick-up based on agreed pick-up information in the TEP.
- Monitor service :
  - (vehicle) LSP tracks the vehicles using TPS message. Service schedule and status notifications are issued to LSC. Based on the TPS, the LSP might issue both a TES and a GII to the LSC if there are consequences for the service schedule established in the TEP, e.g. delays.
  - (cargo) During transport service, LSP monitors the cargo, especially for dangerous cargo. Should there be extraordinary situations, it might be necessary to report the situations to the LSC using Transport Execution Status (TES).
- Report service :
  - LSP must file a report to the Transport Regulator. The Common Regulatory Schema (CRS) is an information model providing base structure. Information can be extracted by the receiving authority for all modes of transport. A Transport Business (an LSP) uses a single window interface application to submit regulatory information, through webpage or a local application.

Transport completion stage

- Once the cargo was delivered, delivery location and time are specified in the TEP.

3) Messages available

a. What the system can do

The focus of e-Freight Framework was on information models, messages supporting electronic information exchange and the standardization of these messages. The system had the following functions:

- Enabled transport users (shippers, freight forwarders etc.) to identify and use the best transport services depending on their needs through an open freight transport e-market place.
- Achieved efficient use of different transport modes, including multimodality through better planning and management of resources.
- Acted as a prerequisite for the development of integrated European transport network, linking road, rail and waterborne resources; and created an optimal usage of transport resources through simplification and harmonization of regulatory requirements across modes within the EU.

b. Who are the users/stakeholders and what are the functions available to them

Figure III-11. Stakeholders of e-Freight

Stakeholder categories	Consortium partners
Transport service providers	Schenker, DSV, SPC, ACOS, STENA, JDR, CSSA
Transport Infrastructure Providers	PORTBASE, Port of Cork, Port of Valencia
Administrations	Maritime Administration of Latvia, Via Donau
Transport research and consultancy	BMT, VTT, MARINTEK, ISL MARLO, HIT, NECL, TREDIT, Mobycon, FORDESI
ICT solutions organisations	INLECOM, PTV, eBOS, K-NET, MJC2
Universities	Innsbruck, Budapest, Newcastle, Aegean
Professional institutions	Institute of logistics and transport

Source: Cane, T. e-Freight Capabilities for Co-modal Transport

Main functions[47]

e-Freight aimed to realize interoperability through standardized electronic information exchange. Its functions were as follows:

- set common terminology
- shared understanding
- mutually beneficial information exchange
- integration of existing systems
- alignment of standards
- removal of barriers to efficient communication

The e-Freight platform

The e-Freight platform was a comprehensive software infrastructure that reflected the e-Freight Framework and facilitated the development and deployment of e-Freight Solutions. The platform had three capabilities:

- provided a repository(storeroom) from where e-Freight solutions and services could be downloaded,
- acted as 'run-time' environment that supports operation and interaction of the e-Freight Solutions, and
- provided a software development environment for the development of additional e-Freight services and solutions.

[47] Cane, T. *e-Freight Capabilities for Co-modal Transport—Achieving fundamental improvements in transport and logistics information exchange*.p6.

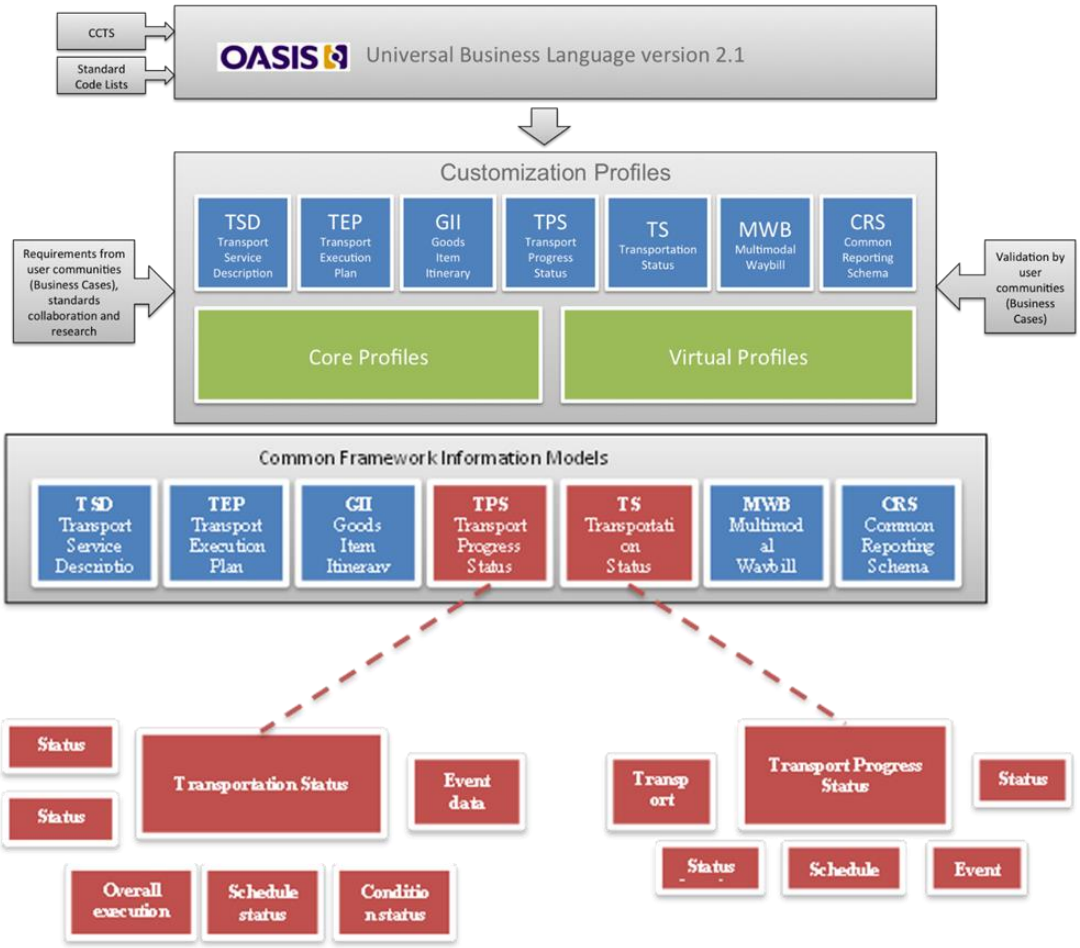
Table III-5. e-Freight Platform Features

e-Freight Platform Features Map		
BUSINESS FEATURES	**FUNCTIONAL FEATURES**	**SYSTEM FUNCTIONS**
Aligned EU Policy Business and IT solutions for the transport industry	• Provide facilities to manage (use and maintain) the e-Freight Framework models. • Enable modelling and analysis of business processes, utilizing the e-Freight Framework, for the definition of company specific viewpoints • Provide appropriate mechanisms to transform process related information to e-Freight Services • Develop e-Freight solutions based on the e-Freight Framework	• Domain Engineering - Ontology • Model Driven Development • SOA based Solution Composition
Industry wide accepted cooperative environment for e-Freight	• Search, Find and Download solutions • Efficient and secure execution through service governance • Flexible deployment • Easy integration with cargo, vehicle, traffic and infrastructure monitoring devices • support data integration and aggregation for use e-Freight solutions	• AppStore • Reliable Messaging infrastructure services • Security (Authentication, Authorization) • Configuration based deployment • Automated guidance
Effective change management	• Ensure consistency across different services of e-Freight solutions under changing conditions • Effective transaction monitoring and alerting for distributed, interconnected applications • Trace the interactions across loosely coupled implementations • Monitor an application in a business or transactional context • Monitoring interface within the service to send messages detailing the transaction's status • Help to monitor the availability and performance of the Service elements of e-Freight solutions to ensure applications meet business agreements (SLAs) • Knowledge management	• Repository services • Audit Trail • Performance Measurement • Semantic Reasoning

c. Type of data shared

- Requirements capture and validation in user communities, other research projects and collaboration with standardization;
- Conformance/compatibility with UBL 2.1 and definition of customization profiles;
- Definition of Core and Virtual Profiles supporting interoperability; and
- Standardized code lists.

Figure III-12. Common Framework Information Models



Source: Vennesland, A., 2013. e-Freight and Common Framework Information Exchange Standards

Table III-6. Information Models and Messages – Transport Progress Status[48]

Element Name	Definition
Transport Progress Status	A document being sent from Transportation Network Manager to Transport Service Provider giving a status on the location and schedule a transport means.
UBLVersionID	The earliest version of the UBL 2 schema for this document type that defines all of the elements that might be encountered in the current instance.
CustomizationID	Identifies a user-defined customization of UBL for a specific use.
ProfileID	Identifies a user-defined profile of the customization of UBL being used.
ID	Identifies a Transport Progress Status.
Issue Date	Date when the Transport Progress Status is issued.
Issue Time	Time when the Transport Progress Status is issued.
Status Available Indicator	Indicates whether there is transport progress status available or not.
Sender Party	Describes the party responsible for sending the Transport Progress Status.
Receiver Party	Describes the party responsible for receiving the Transport Progress Status.
Source Issuer Party	Describes the party being the source of the status information provided in a Transport Progress Status
Transport Progress Status Request Document Reference	Describes a reference to a Transport Progress Status Request
Transport Means	Describes the transport means responsible for carrying out the transport service.
Transport Schedule	Describes the location and schedule relating to a transport means

[48] Vennesland, A., May 2013. *e-Freight and Common Framework Information Exchange Standards*.(Brussels),p.9.

Table III-7. Information Models and Messages– Transportation Status[49]

Element Name	Definition
Transportation Status	A document reporting the status of transport services
UBL Version ID	The earliest version of the UBL 2 schema for this document type that defines all of the elements that might be encountered in the current instance.
Customization ID	Identifies a user-defined customization of UBL for a specific use.
Profile ID	Identifies a user-defined profile of the customization of UBL being used.
ID	Identifies a Transportation Status
Issue Date	Date when the Transportation Status is issued
Issue Time	Time when the Transportation Status is issued
Description	Textual description of the Transportation Status
Transportation Status Type Code	A code specifying the type of status provided in the Transportation Status
Transport Execution Status Code	Describes the overall status of the transport service execution.
Consignment	Describes a consignment for which a Transportation Status provides the status for
Transport Event	Describe events that relate to this Transportation Status
Document Reference	Describes a reference to another document relevant for this document
Sender Party	Describes the party responsible for sending the document.
Receiver Party	Describes the party responsible for receiving the document.
Transportation Status Request Document Reference	Describes a reference to a Transportation Status Request
Transport Execution Plan Document Reference	Describes a reference to a relevant Transport Execution Plan
Updated Pickup Transport Event	Describes an updated pickup event
Updated Delivery Transport Event	Describes an updated delivery event
Status Location	Describes a location associated with the Transportation Status in order to geographically scope the status(es) provided.
Status Period	Describes a period associated with the Transportation Status in order to delimit the status (es) provided.

d. Relevant data standards

e-Freight covered a large area of relevant standards such as message exchange, message broker, semantic web, SOA and modelling.

[49] Vennesland, A., May 2013. *e-Freight and Common Framework Information Exchange Standards*.(Brussels),p.10.

Message exchange[50]

The category "Message exchange" includes standards related to the question on how to prepare and send/exchange data (messages). Examples of categories are:

- Obsolescent ("historical" standards, gave overview about development in the past)
- EDIFACT (a standard developed in the pre-XML era but still in use)
- Message formats (how to organize data to create a message)
- Protocols (how to exchange a message)

The first two categories gave a complete overview on message exchange standards. Message formats define which data to be included and Protocols define how to "encapsulate" and transfer your message.

Message broker[51]

In a small environment, it could be sufficient to define only message format and protocol for a successful message exchange. However, challenges arise when increased numbers of stakeholders are involved and all must use the same standards.
Message broker provides a way to solve this problem. A message broker is a powerful software system, able to convert messages from one format into another or to mediate between different protocols.

Semantic Web[52]

The Semantic Web is a "web of data" that enables machines to understand the semantics, or meaning, of information on the World Wide Web. It extends the network of hyperlinked human-readable web pages by inserting machine-readable metadata about pages and how they are related to each other, which increase the ease of automated data gathering and analysis.

The term "Semantic Web" is often used more specifically to refer to the formats and technologies that enable it. These technologies include the Resource Description Framework (RDF), a variety of data interchange formats (e.g. RDF/XML, N3, Turtle, N-Triples), and notations such as RDF Schema (RDFS) and the Web Ontology Language (OWL), all of which are intended to provide a formal description of concepts, terms, and relationships within a given knowledge domain.

The semantic web comprises the standards and tools of XML, XML Schema, RDF, RDF Schema and OWL that are organized in the Semantic Web Stack. The OWL Web Ontology Language Overview describes the function and relationship of each of these components of the semantic web.

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50 E-Freight D1.2: Assessment and forecasting of e-Freight technologies.pp.28-29.

51 E-Freight D1.2: Assessment and forecasting of e-Freight technologies.p.40.

52 E-Freight D1.2: Assessment and forecasting of e-Freight technologies.p.43.

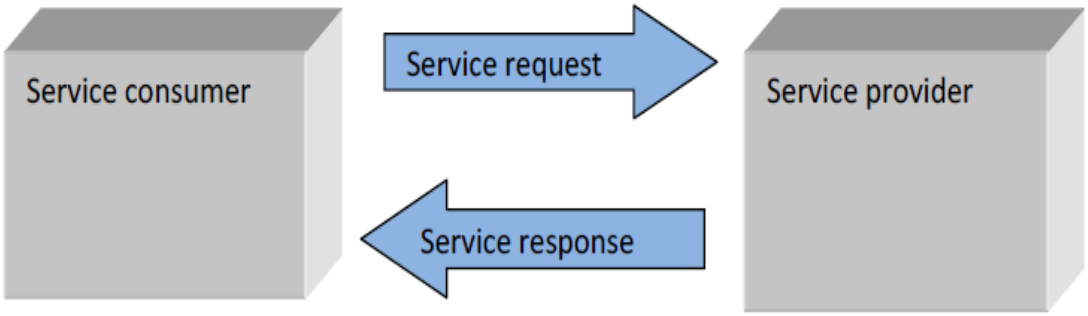
Service oriented architecture (SOA) [53]

A service is a function that is well-defined, self-contained and does not depend on the context or state of another service. It is provided by a so called service provider and used by a service consumer; a service consumer can not only be a person, but also a system or application.

A single service provider or multiple-service providers can deliver the service. In latter case, they cooperate to offer a single service, each delivering a part of that service, while only one of them has the contact with the service consumer. The service provisioning to the service consumer is the result of the appropriate combination of service composing elements.

Figure III-13 shows a service consumer electronically sending a service request message to a service provider. The service provider electronically returns a response message to the service consumer. The request and subsequent response are defined in some way that is understandable to both. This is the simplest form of implementation of what is called the "Service Oriented Architecture SOA".

Figure III-13: Request and Response Interaction between Service Consumer and Service Provider



Modelling[54]

Business Process Modelling provides a formalized way of describing how a business operates and thus enables a common understanding of the key features and requirements of that domain.

Result of the modelling is not only the model itself; in many cases it is possible to convert relevant parts into command structures being executable by process execution machines in SOA.

The e-Freight project also developed the following generic e-Freight Solutions[55]:

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53 E-Freight D1.2: Assessment and forecasting of e-Freight technologies.p.45.

54 E-Freight D1.2: Assessment and forecasting of e-Freight technologies.pp.47-48.

55 E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.15.

- **Next Generation Single Window (NGSW):** a B2A application that allowed parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all reporting obligations for both trade and all modes of transport. NGSW provided interconnections with National Single Windows and EU platforms such as SafeSeaNet (SSN), e-Customs, RIS, TAF/TSI, etc. As such it could become an EU Single Window if managed by an EU agency.
- **Deployment of NGSW in e-Maritime:** a B2A application to facilitate implementation of the Directive on ship reporting formalities. Its applicability was demonstrated based on the requirements of the Maritime Administration of Latvia.
- **Collaborative Security Risk Management:** an A2A application intended to support real time tracking of high risk trucks and vessels and security risk information exchange and sharing among authorities and administrations in different regions or countries.
- **Setting up co-modal Transport Networks:** a B2B application, addressing co-operation strategies, based on electronic interactions, in order to provide quality transport services while at the same time improving the environmental footprint of the entire supply chain.
- **Co-modal Shipment Planning:** a B2B application to assist transport clients in specifying, comparing and negotiating the terms of a required co-modal transport service and
- **Monitoring of Transport Services execution**: a B2B application to support monitoring of the status of co-modal transport services and detection of deviations from the agreed transport plan.

4) Institutional arrangements, including inter-country arrangements/ cooperation mechanisms

a. Lead agency

e-Freight was an integrated project within the EU's 7th Research and Development Framework program that brought together 30 partners from 14 member States and Norway to develop the e-Freight Framework. [56]

b. Cooperation mechanisms

Connecting long and short distance networks for efficient transport (CLOSER)[57]

The scope of the project was the interaction between long and short-distance transport in a door-to-door trip in both freight and passenger transport. This interaction was often a weak link in intermodal transport.

Relevance for e-Freight requirements:

CLOSER aimed to develop an innovative tool for the analyses of interfaces between long and short-distance transport modes. The project aimed to improve freight

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[56] http://www.efreightproject.eu/default.aspx?articleID=1120

[57] E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.91.

network related services.

ECO4LOG[58]

Objective of Eco4log was improvement of the region spanning cooperation within the field of goods transport between the public administrations in the European Union border region East by a 4th Party Logistics Service Provider Approach (4PL).

Relevance for e-freight requirements:

ECO4LOG created a basis for better traffic network between old and new EU member states. For intermodal transportation planning, an ICT-tool was developed, which contributes to the aim of e-Freight.

ELUPEG [59]

The aim of ELUPEG was to support logistics collaboration between competing and non-competing companies, in order to:

- Reduce empty running
- Lower carbon emissions
- Cut transport costs
- Reduce congestion
- Enable modal shift
- Encourage sustainable distribution networks and partnerships
- Improve warehouse utilization
- Enhance customer service
- Give SMEs the critical mass to compete
- Mitigate waste issues

Relevance for e-freight requirements:

The aims of ELUPEG were relevant for e-Freight because they required (or at least were enhanced by) efficient and standardized information exchange across companies, transport modes etc. ELUPEG dealt with freight network related services.

EURIDICE [60]

The basic concept of EURIDICE was to build an information services platform centered on the individual cargo item and on its interaction with the surrounding environment and the user. The EURIDICE platform allowed the simultaneous addressing of logistics, business and public policy aspects of freight transportation by dynamically combining services at different levels of cargo interaction.

Relevance for e-Freight requirements:

EURIDICE was relevant for e-Freight, as it dealt with items comparable to e-Freight,

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58 E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.92.

59 E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.93.

60 E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.94.

especially the interaction between goods items and their environment. Application categories like track and trace and event management showed a clear overlap.

FREIGHTWISE [61]

FREIGHTWISE's overall objective was to support the modal shift of cargo flows from road to intermodal transport using road in combination with short sea shipping, inland waterways and rail. It achieved this objective by means of improved management and facilitation of information access and exchange between large and small, public and private stakeholders across all business sectors and transport modes.

Relevance for e-Freight requirements:

Freightwise was regarded as the predecessor of the e-Freight project. The Freightwise Framework provided the basis for the development of the e-Freight platform and of e-Freight concepts such as Single Transport Document, Single Window and mode-independent information exchange in e-Freight business.

Intelligent Integration of Railway Systems (INTeGRail) [62]

The INTEGRAIL project aimed to create a holistic, coherent information system, integrating the major railway sub-systems, in order to achieve higher levels of performance of the railway system in terms of capacity, average speed and punctuality, safety and the optimized usage of resources.

Relevance for e-Freight requirements:

INTEGRAIL aimed to combine existing information systems into an integrated unity. This was parallel to the aim of e-Freight for facilitating the information exchange between independent systems and organizations.

INTEGRITY[63]

The objective of the project was to improve the reliability and predictability of door-to-door container chains by developing an ICT tool.

Relevance for e-Freight requirements:

- Developing ICT tools to improve the transport chain.
- Applications were mainly of ‘track and trace’, ‘traffic network-related’ and ‘event services’ type.

KOMODA [64]

KOMODA produced a roadmap, with associated action plans, to nurture an integrated e-Logistics platform by and between modes of freight transport across Europe. This complied with a series of basic requirements: based in open standards, usable by

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61 E-Freight D1.1: Policy, legal and stakeholders’ requirements analysis.p.94.

62 E-Freight D1.1: Policy, legal and stakeholders’ requirements analysis.p.95.

63 E-Freight D1.1: Policy, legal and stakeholders’ requirements analysis.p.95.

64 E-Freight D1.1: Policy, legal and stakeholders’ requirements analysis.p.96.

anyone, able to communicate freely between existing applications and allow the integration of legacy systems and future development.

Relevance for e-freight requirements:

- Aim for open standards in data exchange in freight transport (across transport modes).
- Identification of industry requirements for integration of information systems.

MarNIS [65]

MarNIS dealt with sea transport. Its general objectives were:

- Improvement of safety and the protection of the environment through the use of Vessel Traffic Management (VTS) and the use of AIS and integration with Search and Rescue functions.
- Improvement of security, by monitoring vessels and tracking cargoes.
- Improvement of efficiency and reliability focusing on the efficiency of traffic flows and the role of sea traffic in the total transport chain.
- Improvement of the economic aspects of sea transport by the use of new technologies
- Improvement of legal and organizational aspects.

Relevance for e-Freight requirements:

Efficiency of transport chains in relation to intermodal transport and mandatory reporting to administration agencies were enhanced by developing a coherent traffic and cargo reporting system that can be effectively linked to shore-based data management systems to achieve a system of "one stop shop". In the same context optimal solutions (technical and administrative) were developed for the transfer of traffic data, based on its availability and integrity, between Port Community Systems (PCSs) or port VTSs in cases where no PCS was available, Maritime Administrations and transport communities.

The MarNIS approach of integrating several maritime services into one concept was familiar to the Single Window concept, and was explored within e-Freight.

PLATINA [66]

The main objective of PLATINA was to support the European Commission, Member States and third countries in the implementation of the NAIADES action programme. The NAIADES programme was a Commission initiative to enhance the use of inland waterway transport (IWT). PLATINA brought together all the relevant actors in the inland waterway sector in a multi-disciplinary knowledge network. Most members of the consortium already played an active role in transport policy in their countries. Thus, the contribution of the project to the promotion of inland waterway transport in Europe was maximized.

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65 E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.96.

66 E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.97.

Relevance for e-Freight requirements:

- WP1 Markets: provision of dedicated information services – aimed at making information on IWT-services available.
- WP5 Infrastructure: this included the further harmonization, standardization and implementation of RIS (River Information Services).

PROMIT [67]

The objective of PROMIT was to contribute to a faster improvement and implementation of intermodal freight transport technologies and procedures, and to help promoting innovative intermodal freight transport and modal shift by creating awareness on innovation, best practices and intermodal transport opportunities for potential users as well as politicians and research community.

Relevance for e-Freight requirements:

The program was aimed at intermodal transport with the application of technologies. Applications are mainly of the type 'freight network related services'.

PROPS[68]

The PROPS project built on previous EU and national activities undertaken to promote and develop short sea shipping. In particular, PROPS aimed to work closely with the Short Sea Promotion Centres (SSPCs) to develop a workable and replicable methodology that would enhance their practical promotion activities in the fields of legislative, technical, and e-Freight operational actions and to extend their operations to encompass inter-modal and co-modal transport.

Relevance for e-Freight requirements:
The project aimed to identify, from the SSPCs, the best practices for improving the integration of short sea shipping with relevant inland logistics chains. Particular attention was paid to the linkages of key supply chain stakeholders and the removal of bottlenecks.

Tools were developed to assist the SSPCs to improve their performance and their overall integration into European logistics business networks. For instance, an e-booking system integrator was established to improve access to commercial freight booking systems. Both strategic and tactical support mechanisms were developed. Learning from past failures was formalized as a mechanism for improving the work of the SSPCs in promoting short sea shipping and intermodal transport.

RISING[69]

Existing River Information Services (RIS) primarily served nautical traffic purposes in inland shipping. The aim of RISING was to integrate RIS services into transport and logistics planning functions.

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67 E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.98.

68 E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.98.

69 E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.99.

Relevance for e-Freight requirements:

The project defined a so-called 'framework' based on the FREIGHTWISE Framework. RISING would demonstrate new applications based on RIS, with which transport users and transport service providers would be able to optimize their logistics processes.

SKEMA[70]

SKIMA established a sustainable knowledge platform for the use of stakeholders in the maritime transport and logistic industry. Subjects that were treated include:

- The maritime transport market
- Regulatory framework for maritime and intermodal transport
- Trends in logistics and supply chain management
- Maritime and intermodal transport developments
- Design and management of improved D2D networks
- Port Community Systems
- Identification technologies (e.g. RFID)
- ICT developments for integrated D2D freight transport services

Relevance for e-Freight requirements:

The subjects treated by SKEMA which were of direct relevance for e-Freight included:

- Port Community Systems
- Identification technologies (supporting tracking and tracing)
- ICT developments for integrated D2D freight transport services

SMART-CM[71]

The objectives of SMART-CM were to:

- Stimulate interoperable B2B co-operation in door-to-door container transport security.
- Develop compliant application of B2B and B2A container security data solutions with international Customs operations.
- Develop a neutral approach and service platform for secure and interoperable data communications.
- Define added value services and chain visibility enabling techniques for fulfilling operational requirements of the actors in managing global container chains.
- Develop prototypes of advanced applications in global container management, such dynamic scheduling at the containers, resulting from the research and development activity of the project.
- Assess large applicability of the above-mentioned project solutions by considering costs and benefits from solution implementation in real global container chains operational environment.
- Analyze existing business models in global container chain management and

[70] E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.100.

[71] E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.100.

operation and study e-managing business models influencing the exploitation of the project technological outcomes (services of SMART-CM platform).

- Contribute to standards development for advancing of interoperability of technologies currently applied to safe container chain management at global level and for messages exchange and process implementation between Customs and actors and among actors of the global container transport industry.

Relevance for e-freight requirements:

- Developed a service platform for interoperable data communications in door-to-door container transport.

SMARTFREIGHT [72]

SMARTFREIGHT was related to traffic management in urban freight transport. The objective was to develop new traffic management measures towards individual freight vehicles through open ICT services, on-board equipment and integrated wireless communication infrastructure.

Relevance for e-Freight requirements:

- Relation of freight transport, traffic management and ICT.
- Tracking and tracing of vehicles and cargo
- Traffic network-related services

Technical Specifications for Interoperability for Telematics Applications for Freight（TAF TSI） [73]

The aim of the TAFTSI was to define the data exchange between Infrastructure Managers (IMs) and Railway Undertakings (RUs) and between the members of these two groups. At the time of e-Freight project, TAFTSI itself was not ready to be implemented by the rail industry because part of the specifications was pending review by TAFTSI Working Groups.

Relevance for e-Freight requirements:
The specification of data exchange between railway undertakings (transport service providers) and infrastructure managers (network providers) showed clearly a link to the aims of e-Freight.

[72] E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.101.

[73] E-Freight D1.1: Policy, legal and stakeholders' requirements analysis.p.102.

c. Legal Framework

Table III-8. Laws and Regulations Applicable in the EU relevant to the e-Freight project[74]

Laws, regulations and conventions	Issues dealt with	Mode	Relevance to the e-Freight project
Hague - Visby Rules 1968	Carriage contract documentation and responsibilities and liabilities for carriers	Shipping	Liability issues for co-modal networks and the single transport document
Hamburg Rules 1978	Carriage contract documentation and responsibilities and liabilities for carriers (update of Hague Visby Rules)		
Hamburg Rules 1978	Carriage contract documentation and responsibilities and liabilities for carriers (Rules to replace Hague Visby Rules)		
EU Directive 2009/17	Access to the Maritime Information System SafeSeaNET		Single Window
Warsaw Convention 1929	Carriage contract documentation and limits of liability regarding passengers and freight	Air Transport	Liability issues for co-modal networks and the single transport document
Montreal Convention 1999	Carriage contract documentation – the air waybill and limits of liability regarding passengers and freight (update of the Warsaw Convention)		
32nd IATA Cargo Services Conference 2010 - Electronic air waybill	Carriage contract documentation - the electronic air waybill (update of the Montreal Convention)		The single transport document
CMR Convention 1956	Carriage contract documentation and limits of liability	Road Transport – but can cover legs of journey done by other modes	Liability issues for co-modal networks and the single transport document
CMNI Convention 2000	Carriage contract documentation and limits of liability	Inland Waterway Transport – but in some cases can cover legs of journey done by other modes	Liability issues for co-modal networks and the single transport document
COTIF Convention	Carriage contract	Rail Transport – but	Liability issues for co-

[74] E-Freight D1.1: Policy, legal and stakeholders' requirements analysis. pp.65-67.

Laws, regulations and conventions	Issues dealt with	Mode	Relevance to the e-Freight project
1980	documentation and limits of liability	in some cases can cover legs of journey done by other modes	modal networks and the single transport document
COTIF Convention – Vilnius Protocol – CIM Rules 1999 & 2006	Carriage contract documentation and limits of liability (update of COTIF Convention)	Rail Transport – but in some cases can cover legs of journey done by other modes	Liability issues for co-modal networks and the single transport document
UNCITRAL Model Law on Electronic Commerce	Electronic transport documentation	Multimodal	The single transport document
Regulations regarding the FIATA Multimodal Transport B/L	Transport documentation	FIATA - Multimodal	The single transport document
Regulations regarding the FIATA Multimodal Transport Waybill (non-negotiable)			
Regulations regarding the BIMCO Multidoc 1995	Transport documentation	BIMCO - Multimodal	The single transport document
Regulations regarding the BIMCO Combiconbill 1995			
Regulations regarding the BIMCO MultiWaybill 1995			
Regulations regarding the BIMCO Combicon-Waybill 1995			
International Convention on the Harmonization of Frontier Controls of Goods 1982 (amended by EU Decision 2009/161)	Customs control	Multimodal	Relevance to co-modal networks, single window and single transport document
EU Directive 2006/24	Retention of (electronic) data and right to privacy	Multimodal	Single Window
EU Directive 2008/70	Regulations governing e-Customs	Multimodal	Single Window and the single transport document
EU Regulation 2006/1013	Shipment of waste products	Multimodal	Relevance for specific cargo type: waste
Carriage of Dangerous Goods by Road (regulations from 1956 repeatedly amended up to 2009)	Road Transport	Road Transport	Relevance for specific cargo type: dangerous goods
International Maritime Dangerous Goods Code by the IMO (last		Shipping	

Laws, regulations and conventions	Issues dealt with	Mode	Relevance to the e-Freight project
amended in to 2006)			
Dangerous Goods Code by the IATA		Air Transport	
Carriage of Dangerous Goods by Rail (Appendix C of COTIF)		Rail Transport	
European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways 2000		Inland Waterway Transport	
TIR convention 1975	Carriage of oversized goods	Multimodal	Relevance for specific cargo type: oversized goods
EU Regulations 2004/882 and 2005/1	Carriage of live animals	Multimodal	Relevance for specific cargo type: live animals
Convention on the International Carriage of Perishable Foodstuffs 1970	Carriage of perishables	Multimodal	Relevance for specific cargo type: perishables
EU Regulation 2002/1774	Carriage of animal by-products not fit for human consumption	Multimodal	Relevance for specific cargo type: animal by-products

5) Financing

e-Freight was a research & development project, co-funded by the EC under the 7th Research and Development Framework Program. The project involved 30 partners from 14 Member States and Norway with a budget of €12.6 million. Member States did not contribute directly to the project.

The amount of funding from the EU Commission to companies participating in the e-Freight initiative was 50per cent for large companies and 75per cent for small and medium sized companies (SMEs). As an example, for an SME named ABC, the funding was 75per cent with an allowed undocumented overhead of 60per cent and the calculation was as follows:

Payment from the Commission = (Salaries and social expenses for the effort used in the project + travel and subsistence) x 1.6 x 0.75, which means that ABC had all internal and direct costs covered, plus an overhead of 20per cent .

The program under which e-Freight was funded continues under the name Horizon 2020. Under Horizon 2020, the funding is 100per cent or 75per cent from the EU Commission, depending on the type of project. The difference is that all companies can only allow an overhead of 25per cent.

Table III-9. List of e-Freight Consortium[75]

No.	Beneficiary name	Country	Date enter project	Date exit project
1	BMT Group	UK	M1	M42
2	INLECOM Systems	UK	M1	M42
3	Technical Research Centre of Finland	FI	M1	M42
4	Port Infolink (Rotterdam)	NL	M1	M42
5	MARLO	NO	M1	M42
6	Hellenic Institute for Transport	EL	M1	M42
7	STENA	SE	M1	M42
8	Nautical Enterprise	IE	M1	M42
9	MARINTEK	NO	M1	M42
10	Institute of Shipping Economics and Logistics	DE	M1	M42
12	PTV	DE	M1	M42
13	University of Innsbruck	AT	M1	M42
14	eBOS Technologies	CY	M1	M42
15	Maritime Administration of Latvia	LV	M1	M42
16	K-NET	EL	M1	M42
17	Budapest University of Technology and Economics	HU	M1	M42
18	University of the Aegean	EL	M1	M42
19	TREDIT	EL	M1	M42
21	ACOS	DE	M1	M42
22	Via Donau	AT	M1	M42
23	Mobycon	NL	M1	M42
24	Valencia port	ES	M1	M42
25	MJC2	UK	M1	M42
26	Serviço Português de Contentores, S.A	PT	M1	M42
27	Fordesi	PT	M1	M42
28	Port of Cork	IE	M1	M42
29	Newcastle University	UK	M1	M42
31	Schenker	SE	M1	M42
32	Jan de Rijk	NL	M1	M42
33	DSV	SE	M1	M42
34	China Shipping Agency (Spain) S.L.	ES	M18	M42

[75] e-Freight DoW.2011.12.15.

6) Security issues

a. Infrastructure security overview

The five pillars of e-Freight security infrastructure were:

- Trust via a Public Key Infrastructure
- Agreement signed with service providers before joining the infrastructure
  - Agreement regulate responsibilities, requirements, liability
  - Checks for compliance may be performed
- Secure communication protocols
  - Employs encryption, signing, certificates, security tokens
- Operational security requirements for service providers
  - Firewalls, intrusion detection, patching, logging, penetration test
- Sender authentication
  - Sender Access Point to vouch for sender identity

b. Secure communication

The following properties have to be achieved to ensure secure communication in the infrastructure:

- Authentication: who sent a document?
- Integrity: has the content been altered? Is it correct?
- Confidentiality: can outsiders learn the content?

Secure communication could be achieved by:

- Signing SOAP messages (WS-Security), e.g. authentication of service providers, message integrity.
- Using transport-layer security (SSL/ TLS), e.g. confidentiality & integrity.
- Including SAML tokens vouching for sender identity (WSS security), e.g. sender authentication similar to OIO Identity-Based Web Services.

c. Sender authentication

Sender Access Point was required to authenticate sender of document and vouch for the identity to the recipient. The main features of this procedure were:

1. Recipient is relieved from the complexity of handling many different types of credentials
2. Recipient needs only to know sender identity not details of their credential
3. Sender Access Points have business relationships with their customers and should know how to authenticate them (e.g. may have issued their credential)
4. Sender Access Point issues SAML 2.0 token stating:
   - Sender identity (result of authentication)
   - Level of identity assurance (1-4)
   - Issuer of token (signed with PEPPOL certificate)
5. Level of identity assurance: 1=> low confidence in claimed in identity; 4=> very high confidence in claimed identity

6. Assurance level classified according to Liberty Alliance Identity Assurance
7. Framework taking into account:
    - The technical quality of the credential
    - The credential issuing process
    - Organizational factors
8. Discussion with STORK project to align (eIDfocused)

d. Operational security requirements

The goal was to ensure that service providers operated their IT systems in a secure and controlled manner.

Security requirements were an annex to the agreement Service Providers signed with PEPPOL Governing Board. There were many security requirements in operation, such as:

- Requirement for information security programme
- Use of digital certificates (PEPPOL PKI), revocation checks
- Allowed cryptographic algorithms and key lengths
- Incident reporting
- Penetration testing
- Firewalls and network segmentation
- Logging
- Patching and vulnerability scanning
- Surveillance and intrusion detection

7) Costs and benefits

The benefits of e-Freight[76] included:

1. Enabled the stakeholders within the transport sector to connect through a centralized platform.
2. Integrated the processes based on "e-Freight reference processes"
3. Automated the compliance for shippers, freight forwarders, port and terminal operators and carriers
4. Provided "Solution Building Blocks" allowing end users to choose their specific needs to fully optimize their operations

[76] D6.6 e-Freight Impact Assessment support. http://www.efreightproject.eu/default.aspx?articleID=1126

Table III-10. Impacts of e-Freight Solutions on Quality Indicators[77]

e-Freight solutions			
Quality Indicators	**Identification & Positioning**	**EIE Technologies & Standards**	**IoT & Web Services**
Costs – Productivity	- Technology adds investment costs - Reduces personnel costs and increases efficiency	- Customer integration increases investment costs - Lowers operational costs as manual work decreases - Reduces errors costs	- Service information availability intensifies multimodal logistics - Better use of resources (rationalized work processes, reduced labour costs) - Better performance - Automates reporting to authorities
Lead time	- Improved ability to use appropriate services (planning) - Better possibilities to rescheduling and rerouting - Possibility to proactively adapt production in case of delays	- Customer integration saves time - Reduces operations waiting times - Faster data exchange	- Time savings in selecting services - Reduces waiting times - Reduces safety marginal (reserve times)
Reliability & Regularity	- Enables individualization of goods flows - gives possibility to trace - Better response to deviations - Improved security	- Less errors (planning, status) - Interoperability between modes - Less incomplete orders caused by errors in messages	- Real time data, In formation and visibility - Better possibilities to data sharing in networks - More flexibility - Security issues
Completeness & Correctness	- Less identification errors - Real time monitoring - Deviations recognized - Less incomplete shipments	- Less errors in information exchange - Information format standardized - More complete content	- Possibility to monitor all shipments - Easier to automatically detect deviations and errors
Flexibility	- Deviations detected earlier - Enables lower inventory levels with higher service reliability	- Improved response time	- Less inventories with same service quality
Impact for environment	- Possibility to choose most environmental friendly route by avoiding congestions	- Documents in electronic form may reduce paper	- Enables better planning

Within the air transport industry, e-Freight was implemented by International Air Transport Association (IATA) which led to the following advantages.

[77] D6.6 e-Freight Impact Assessment support.p.3.http://www.efreightproject.eu/default.aspx?articleID=1126

- Cost savings: decreased in document processing costs
- Speed: the ability to send shipment documentation to relevant parties before actual cargo could reduce the industry cycle time by an average of 24 hours
- Quality and reliability: electronic documents auto population allowed one time electronic data entry at point of origin and reduced shipments delays error data entry or missing documents
- Visibility: electronic documentation could be tracked and traced online
- Simplicity: uniform e-Freight process and messaging standards for air cargo led to simplified and efficient processing
- Regulatory advantage: the existence of a functioning e-Freight process also encouraged countries to build new e-Customs requirements around these standards,
- Environmental: reduction in the use of paper documents

D. Advanced National Networks for Administrations (ANNA)

1) Background to system development

a. National context

The Advanced National Networks for Administrations (ANNA) project is an EU Member States driven initiative to assist EU Member States, neighbouring countries and businesses to co-operate and to actively support the effective and sustainable development of national Maritime Single Windows (MSW). It is an Action under the TEN-T Motorways of the Sea Multi-Annual Programme, with 14 countries as beneficiaries and runs between 2012 and 2015. Its key objective is to support Member States in the implementation of the Directive 2010/65/EU on reporting formalities for ships arriving in and/or departing from ports of the Member States, whilst securing the greatest degree of harmonization and standardization possible.

The purpose of Directive 2010/65/EU is to define the overall legal framework for the development and implementation of interconnecting national Maritime Single Windows (MSW) by 1 June 2015. The term "Maritime" is used to distinguish the scope of the Single Window. The MSW can be described as a way to:

- electronically receive legally required information once ships arrive to and depart from national seaports;
- respond electronically to the sender of the information;
- exchange this information with various national competent authorities and other EU Member States.

The Directive establishes three key requirements relating to reporting and exchanging data for ships arriving or departing from ports in EU Member States:

- Electronically reporting : meaning electronic exchange of data, not exchange of e-documents
- Reporting unique data once[78] : identifying senders and receivers (parties and either port or country) requiring the application of an appropriate data model and the determination of the unique data and message structure
- Interconnect administrations and business: data exchange within an EU Member State, between Member States (incorporating EU systems) and with non-EU countries.

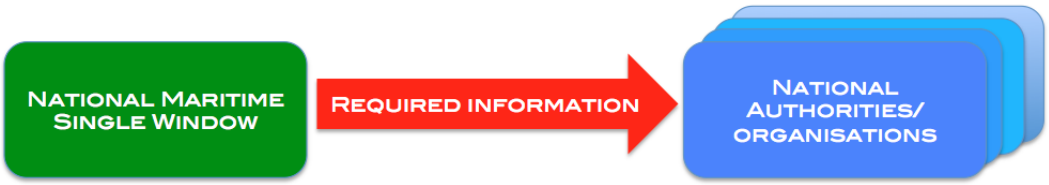
In order to assess and support the implementation of the Directive, a variety of development projects to test different concepts and ideas have been conducted, both within and between countries participating in the ANNA project. Three categories of interactions have been identified:

[78] Also referred to as "single reporting" meaning the submission of information only once to the Maritime Single Window for use in fulfilling all or any of the reporting formalities requiring that information.

- Category 1: Front Office - From ships or agents to Maritime Single Window (MSW): electronic data submission by the reporting party.

From the ship's or its agent's aspect, a common message format will be considered and tested as to if and how it works in different scenarios. Various (harmonized) machine-machine interfaces will be tested and in certain cases man-machine interfaces may be tested.

- Category 2: Mid Office - Inside MSW: the national (internal) solution or engine.



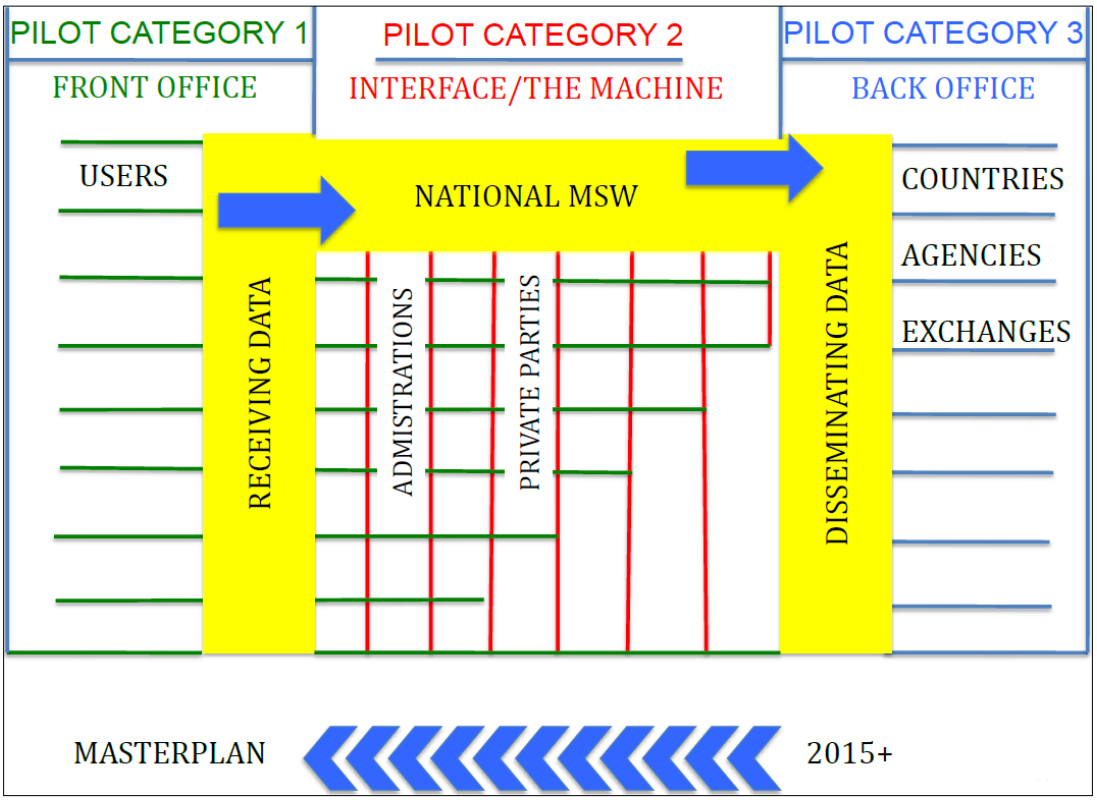
The work within a country, between different stakeholders, can be anything from linking Customs and border control agencies to setting up technical solutions for data flowing between ports and authorities.

- Category 3: Back Office - Between MSWs: electronic data exchange between the EU Member States including existing exchange mechanisms.

It is to be noted that the focus of the harmonization activities is to be found in the interface between:

- Category 1/Category 2 (Data input / National MSWs)
- Category 2/Category 3 (National MSWs/Other MSs – EU systems)

Figure III-14. The Three Pilot Categories to Implement EU Directive 2010/65/EU



Source: European Perspective of the Single Window, Roeland van Bockel

Common pilots

Five common pilots were planned; they were implemented by step by step.

- Harmonized GUI(CP1)
  The aim is to deliver guidelines and best practices towards harmonized GUI for MSWs in Europe. The pilot is carried by the following participating member states: Sweden (sub activity leader), Spain, Slovenia, Cyprus, Latvia, Greece and Norway.

- Message Implementation Guide (CP2)
  The aim is the composition of a European Message Implementation Guide (MIG) for the MSW messages between the maritime industry and the national MSW. The pilot is carried by the following participating countries: Belgium, Netherlands (sub-activity leader), Norway, Spain, Sweden, and United Kingdom.

- MSW security principles (CP3)
  The aim is to define security principles to be applied in the MSW. The pilot is carried by the following participating EU Member States: Belgium, Cyprus, Latvia, Sweden and Spain (WG leader).

  The result would be the delivery of a specific EU SEC Report, incorporating a survey of level of security on validation in port and maritime systems already

in use by each participating country. Report based upon survey results included: differences between end-users and legacy systems validations, deployment levels of security on validation into the NSW, suggestions for change management of security on validations and the digital signature applied to clearance documents (post 2015).

- Regular shipping services (CP4)
  The aim is to identify possible facilitating measures in the framework of a MSW for ships that sail along a regular shipping route. Belgium is chairing a working group with the participation of Sweden, Italy, Slovenia and France.

- National Single Window to National Single Window (NSW2NSW) (CP5)
  The aim of the pilot is to provide the exchange of data between countries in order to reduce administrative burden, facilitate the use of advanced information technology to ensure electronic data exchange environment for all maritime-related sectors.

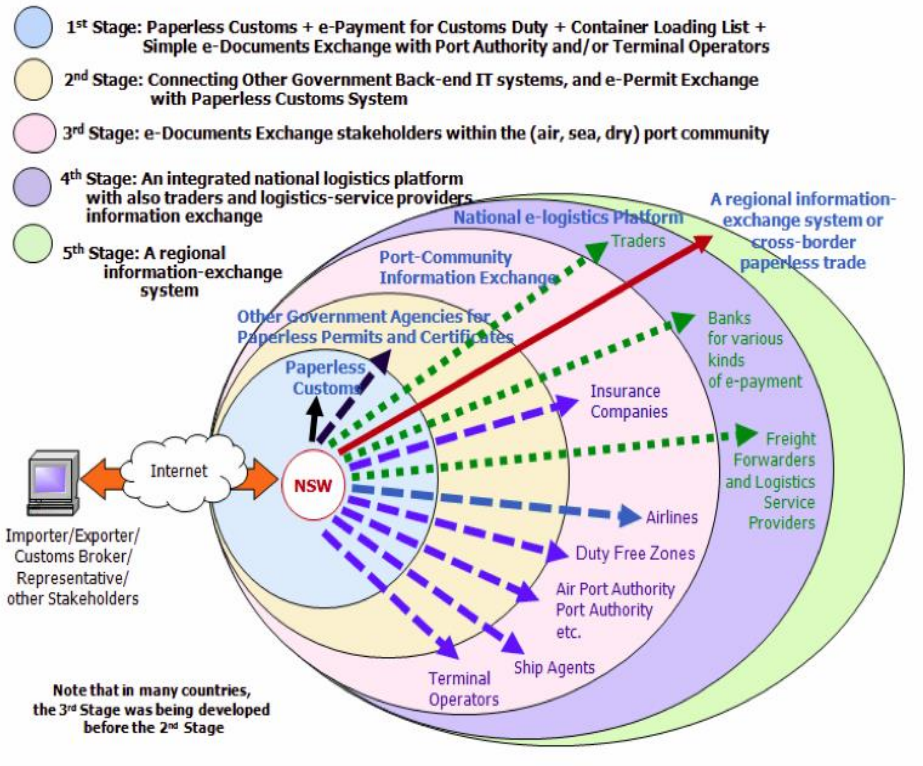
Maritime Single Window to Maritime Single Window (MSW2MSW) functionality will provide the EU Member States' competent authorities with:

- Timely information on the planned ship visit,
- A set of data (e.g. information from the ship's manifest, crew and passenger lists, etc.) to be made immediately available for the next EU port of call (in another EU Member State) after a ship sails from the EU previous port of call;
- Additional data validation – to be ensured between the last port of call and data submitted by authorised personnel.

b. Development process

Five stages can be identified in the various approaches to develop a Single Window.

Figure III-15. Development Process of the Single Window



Source: 10 Years of Single Window Implementation, Tom Butterly, UNECE[79]

Project Planning

2012-2013: The development of a Master Plan – a common implementation framework for national Maritime Single Windows. This Master Plan contains at least three major issues:

- to ensure appropriate (European) interconnectivity in accordance with the specifications as developed by the coordinating (eMS) expert group of Directive 2010/65/EU;
- to develop national scenarios and a mechanism for gauging degree of national implementation
- to set up of a framework to identify the opportunities for standardization and harmonization

2012-2014: Identification and execution of targeted national pilot projects. These projects are clustered amongst three categories with a focus on:

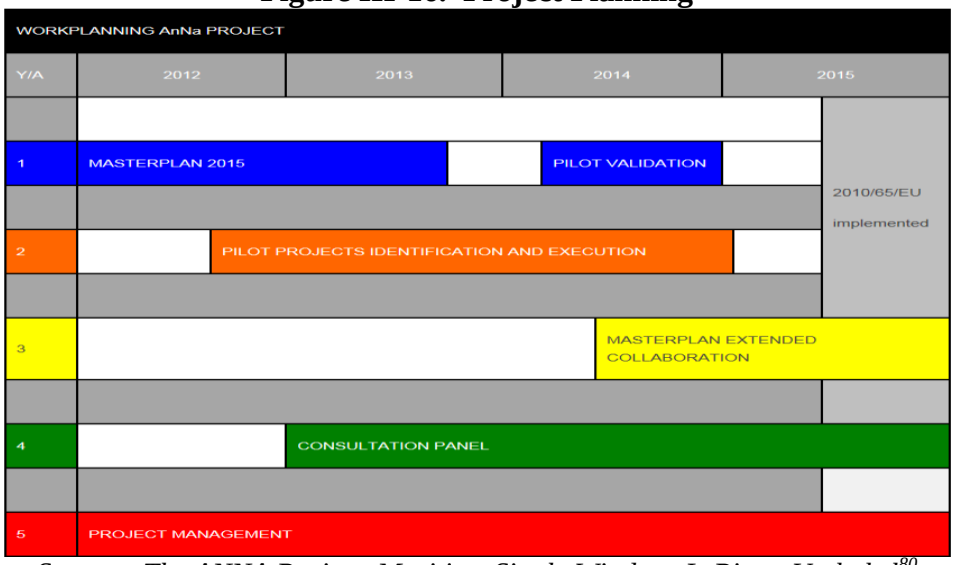
- electronic data submission by the reporting party
- the national (internal) solution;
- electronic data exchange between the participating countries including existing exchange mechanisms

[79] http://www.unece.org:8080/fileadmin/DAM/cefact/cf_plenary/plenary13/PPTs/AI10_1_TButterlySW.pdf

2012-2015: Interaction with various administrations and businesses to obtain involvement and commitment of all stakeholders.

2014-2015: Development of a post 2015 strategy – Master Plan Extended Collaboration - possibly connecting the Maritime Single Window to national logistics platforms, elaborate on e-Freight developments and other initiatives.

Figure III-16. Project Planning



Source: The ANNA Project, Maritime Single Window, Ir Pieter Verbakel[80]

c. Stakeholders

The National Maritime Single Window includes three distinct component parts, namely Front Office, Mid Office and Back Office:

- Front Office: ports, ship owners, ship agencies etc.
- Mid Office/The machine: authorities ((NCA SafeSeaNet, Port State Control), Customs, immigration, port authorities, health authorities)
- Back Office: other countries

d. Timelines

The two main goals of Directive 2010/65/EU on establishing a Maritime Single Window (MSW) are:

- Single reporting opportunity for business – therefore a procedures needs to be organized by public administrations
- Exchange of information within and between Member States – this leads to the principle of reuse of data.

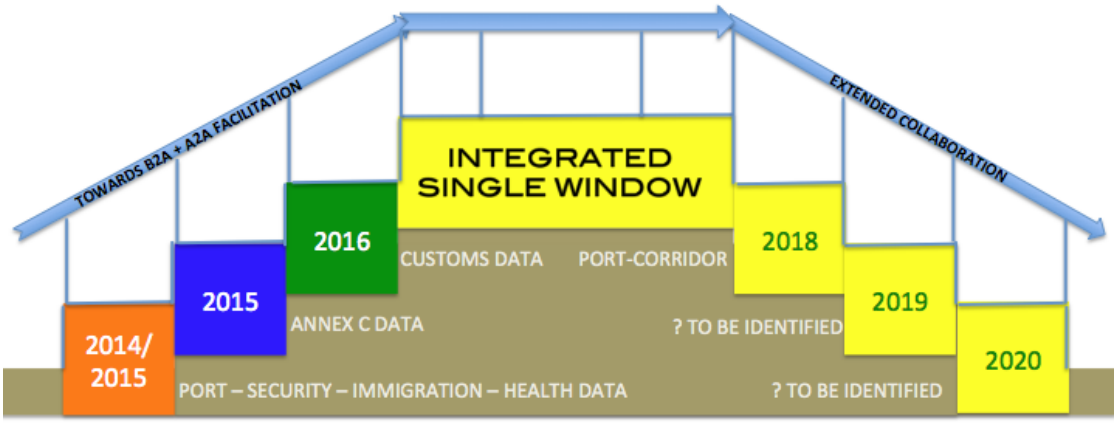
The successful implementation of a MSW can only be achieved when:

[80] https://www.eiseverywhere.com/file_uploads/6c3eff4eb2d152c29ee6fdab29e661d7_D2TT1-pmverbakel.pdf

- A clear view on the feasibility on what can realistically achieved has been established (identified in various ANNA activities)
- A common vision on the road ahead towards a future design is established, i.e. integrating the MSW into the general context of Single Window developments.

The ANNA Extended Collaboration Strategy Paper (link: http://www.annamsw.eu/component/zoo/item/final-extended-collaboration-strategy-paper-pdf.html) elaborates on the vision, identifying several aspects that needs elaboration. As a vision, incorporating the need for effective A2A and B2A and A2B collaboration, Figure III-17 illustrates the way towards integration of MSW-SW in the logistics chain and corridor integration.

Figure III-17. Modular Concept of MSW-SW Development in Europe



Source: ANNA Strategy Paper 2015+[81]

The need for a harmonized approach requiring:

- Collaboration between administrations and between business and administrations
- Policy integration: information society, TEN-T Policy objective (corridors) maritime policies, integrated maritime policies.
- Harmonized standardization activity: covering various exchanges of data activities within a multitude of supply chain operations. The basis most likely being the need to identify where administrations can assist business process optimization regarding reporting formalities.

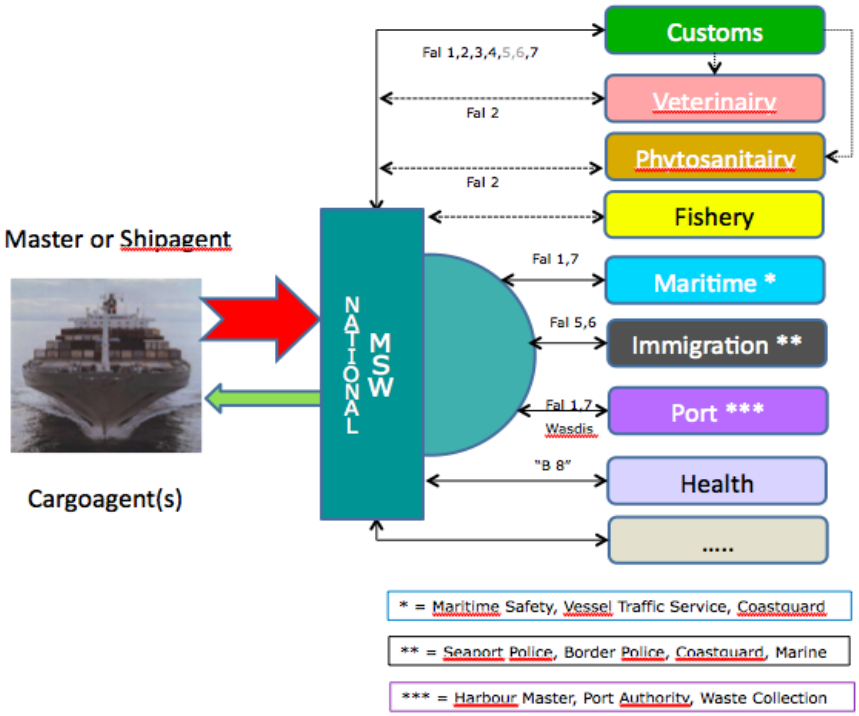
2) System design/architecture

a. Network structure

Maritime Single Window (MSW)

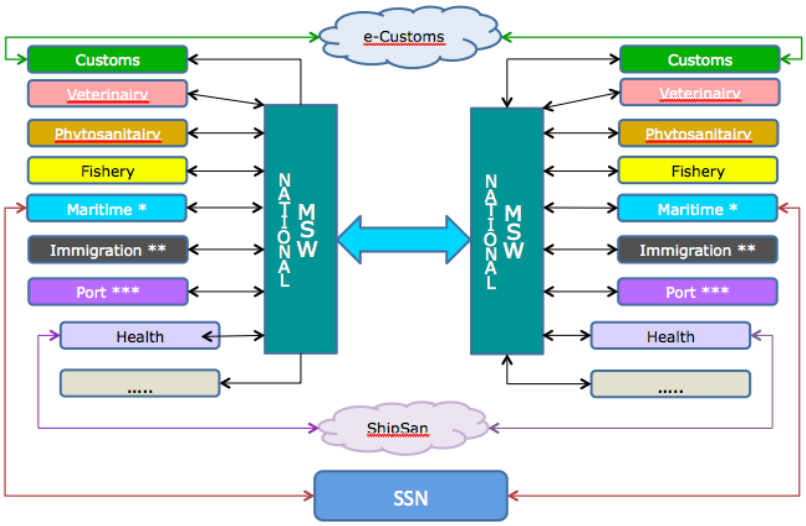
81 http://www.annamsw.eu/news/132-anna-strategy-document-2015.html

Figure III-18. The Internal Aspects of the Maritime Single Window (One Country)



Source: Project ANNA, Roeland van Bockel[82]

Figure III-19. The External Aspects of the Maritime Single Window (Two Countries)



Source: Project ANNA, Roeland van Bockel[83]

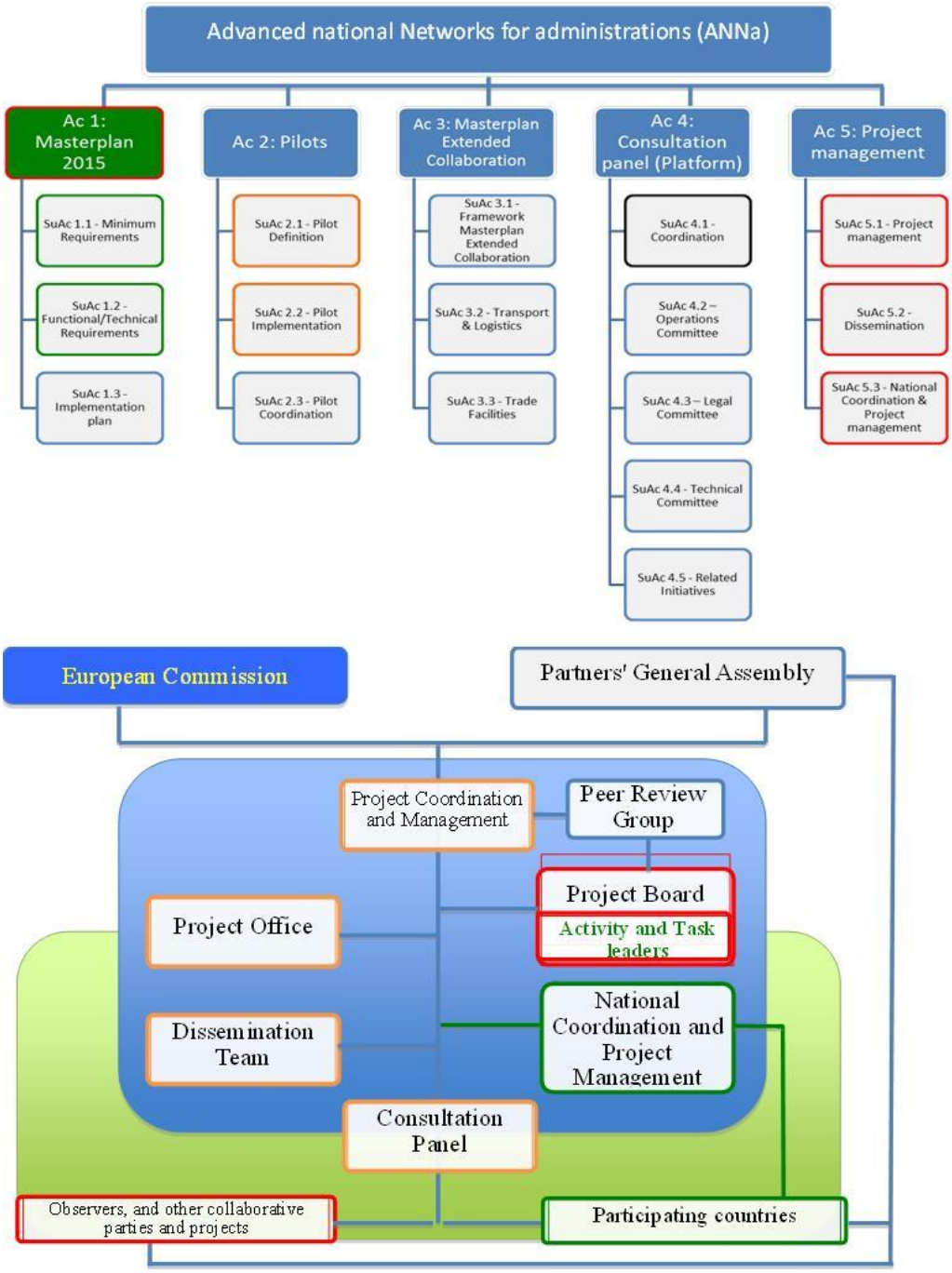
[82] http://www.up.gov.si/fileadmin/up.gov.si/pageuploads/Predstavitve/ANNA.pdf

[83] http://www.up.gov.si/fileadmin/up.gov.si/pageuploads/Predstavitve/ANNA.pdf

b. Logical structure

The following overview presents the activities and sub-activities to be conducted in realizing the study on the Master Plan and the associated pilot actions.

Figure III-20. Organization of ANNA



Source: ANNA, Acitvity 1-Masterplan 2015[84]

[84] http://www.annamsw.eu/activities.html

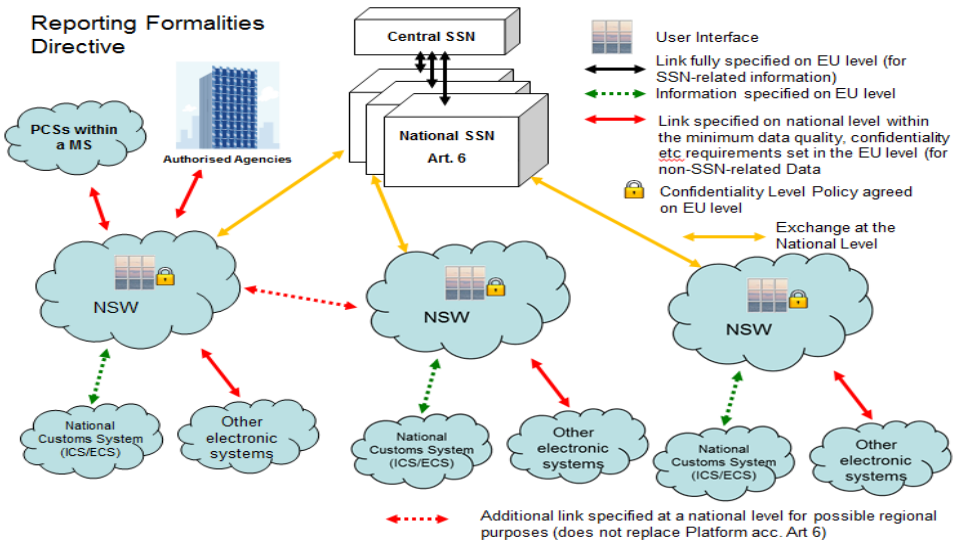
c. Local information platform

National Single Window (NSW)

According to the definition of Single Window, a conceptual model of the NSW Systems in regard to the Directive 2010/65/EU was defined at the 6th EMS Meeting. Some principles were derived as follows:

- Each Member State implements its own NSW.
- The NSW collects the reporting formalities information received from the reporting parties. Each relevant authority receives from the NSW the information it requires.
- Relevant parts of the information are made available to other Member States via SSN, which involves the central and national SSN systems.
- Other EU systems should interact with the NSWs, once the requirement is formulated. Direct links between NSW can also be established upon the bilateral agreements among the Member States to apply the direct exchanges.
- The system context is shown in Figure III-21.

Figure III-21. Conceptual Definition of NSW according to Directive 2010/65/EU



Source: European Commission DG Move[85]

From this context, the requirements for the National Single Window can be considered in terms of three distinct component parts, i.e. Front Office, Mid Office and Back Office, and four key functionalities, i.e. data provision, data processing, data exchange (national) and data exchange (EU).

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85 *Study on Reporting Obligation Resulting from Directive 2010/65/EU <http://ec.europa.eu/transport/modes/maritime/studies/doc/2013-12-reporting-obligation-2010l0065-final-report.pdf>*

- Front Office concerns data provision. It involves the electronic submission of data to the National Single Window by the "Reporting Parties". From the industry's perspective, a common message structure for (harmonized) machine-machine interfaces and/or a user interface would best meet the purposes of the Directive;
- Mid Office concerns data processing and data exchange (national). It involves the processing of the data within the NSW and the further distribution of data to national competent authorities within the Member State – the national (internal) solution or engine. The work within a country, between different stakeholders, can be anything from linking Customs and border control agencies to setting up technical solutions for data flowing between ports and authorities. This focus area may differ between the Member States;
- Back Office concerns data exchange (EU). It involves electronic data exchange between EU Member States including existing exchange mechanisms such as SafeSeaNet (and thereby the exchange of relevant data between Member States) and (eventually) the exchange of data between NSW to competent authorities of other Member States.

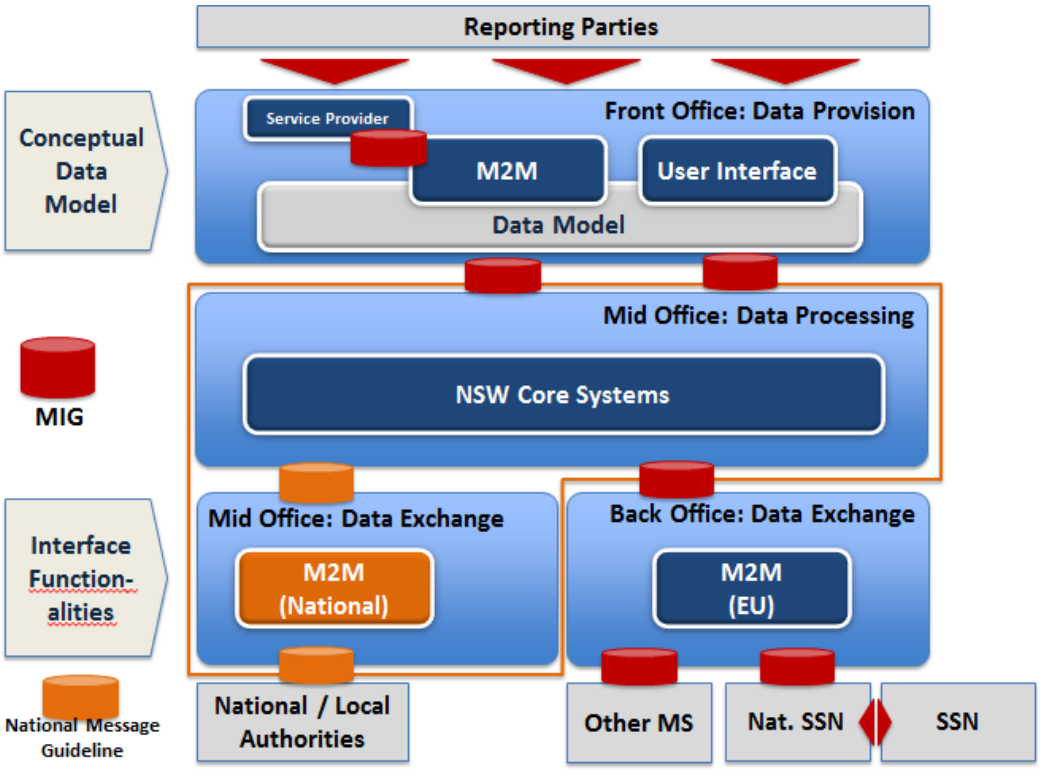
Harmonization and standardization are in the first instance of main relevance to the interfaces:

- Front Office/Mid Office (data input/NSWs);
- Mid Office/Back Office (NSWs/Other MSs – EU systems);
- Mid Office is a matter for national consideration in so far as the national solution should support the interfaces to the Front and Back Offices however be free from constraints concerning internal processing and how the necessary links are to be achieved with the various national competent authorities.

There are ongoing discussions on many issues related to legal requirements which need further clarification and/or a clear statement of the meaning of each aspect including: "Reporting only once"; "Electronic Reporting"; "Exchange of Information in Europe"; some "Legal Acts of the Commission"; and, "Provisions on the IMO-FAL requirements". Once these issues are clarified and the requirements are formulated clearly, the scope of the NSW may change.

To each of these component parts and functionalities, building blocks for the implementation of the NSW can be defined and therefore shape the scope of the implementation as illustrated below:

Figure III-22. Example of Conceptual Architecture of the NSW in accordance with the Directive 2010/65/EU



Source: National Single Window Guidelines, European Commission[86]

3) Messages available

a. What the system can do

ANNA is meant to support (system) integration in Maritime Single Window development:

- within the participating countries (between the various services/ administrations) and
- allow for suitable communication between the national systems, including SSN, based on functional requirements to be further identified.

The goals of ANNA are to facilitate and foster an effective and sustainable Maritime Single Window development that:

- Allows for smooth interaction of data between the user and national administrations involved;
- Optimally meet the needs of the maritime industry;
- Adheres to the Rule of Law;
- Recognizes existing systems;
- Safeguards the varying ambition levels of individual Member States;

[86] National Single Window Guidelines, Final version, 17th April 2015, European Commission" http://ec.europa.eu/transport/modes/maritime/doc/2015-06-11-nswguidelines-final.pdf

- Is future proof, i.e. substantially enhancing interconnection in the logistic chain on the long term.

ANNA also aims to:

- create the conditions where the mandatory EU requirements for national Maritime Single Windows (MSW) are fulfilled in time and are compliant with IMO requirements.
- develop a longer-term perspective to increase MSW efficiency in close co-operation with the European Commission.
- support ICT based system integration in Maritime Single Window developments within the participating countries (between the various services/administrations); and
- allow for suitable communication between the national systems, including SSN, based on functional requirements to be further identified.

Major objectives of ANNA project are to:

- assist in the definition of minimum requirements to implement the Maritime Single Window including harmonization and standardization;
- realize inventory of key characteristics of (existing and proposed) "national" Maritime Single Window solutions including (existing and proposed) links to other systems (e.g. SSN, Customs, Inland, …) per individual country and form consensus on the future scope of cooperation in order to meet the considerations and requirements as set out in the Directive 2010/65/EU with respect to "multilateral" harmonization and standardization, ultimately to secure the wider goals of the Maritime Single Window;
- develop a Master Plan in reflecting the needs to meet the minimum requirements and anticipate on potential extended collaboration including further cooperation and harmonization post-2015;
- identify particular issues requiring additional attention (e.g. legal, organizational, technical, …) to ease the efficient implementation;
- initiate pilot activities to assess viability and confirm final scope;
- Scrutinize the national deployment of the Directive according to pre-established criteria;
- Identify pending legal, organizational and technical issues;
- Develop a roadmap setting out the short- (2012-2013), medium- (2013-2015), and long-term (2016-2020) steps to implementation and detailed work programmes for the specific issues/activities as required;
- Develop an interactive consultation with the various stakeholders also to further involve and commit them for a successful implementation; and
- Establish an effective working relationship with the EC and stakeholder organizations.

The emphasis of ANNA is that it is initiated and coordinated by the EU Member States themselves and will reflect on the aspects identified as being of most benefit to them, i.e.:

- Further enabling and securing reliable data;
- Further enabling effective risk evaluation (pollution, health, etc.);
- Simplifying procedures for users;

- Upgrading the present reporting requirements;
- Facilitating port functionalities;
- Reducing costs;
- Identifying value for money investments; and
- Preparing for new challenges.

ANNA is based on a bottom-up approach, whereby:

- An overarching European dimension – including minimum requirements - on what has to be done to implement the 2010/65/EU requirements is developed (in close cooperation with the work of the EU eMS expert group) and presented within the Master Plan 2015;
- All participating countries present and compare their national implementation scheme;
- Various pilot projects (with common denominators) are defined and executed;
- The results of the pilot projects are validated whether they allow for a successful implementation of the EU Directive 2010/65/EU; and
- A Master Plan "Extended Collaboration" (post-2015) is designed to strengthen the European MSW position in the global supply chain and define possible projects to strengthen the interoperability of the European MSW, in accordance with EC policy documents.

ANNA action plan focuses on three parts:

- Development of Master Plan 2015: a common implementation framework for Directive 2010/65/EU to ensure appropriate (European) interconnectivity in accordance with the specifications developed by coordinating (eMS) expert group, describing and elaborating requirements to implement the Directive, as well as common issues between the countries. This Master Plan relates to issues concerning the minimum implementation of Directive 2010/65/EU whilst facilitating, where practicable, more advanced implementation, and thereby cooperation, by Member States.
- Development and execution of (national) pilot projects; leading to deployment in 2014. The pilot projects was clustered amongst three categories with a focus on:
  - Electronic data submission by the reporting party (the front desk);
  - The national (internal) solution (the mid office); and,
  - Electronic data exchange between participating countries including existing exchange mechanisms (the back office).
- Development of a Master Plan "Extended Collaboration": identifying the post-2015 steps requiring further collaboration, e.g. to develop a system that allows ships to report only once when sailing between different EU ports; connecting the Maritime Single Window to national logistics platforms, elaborating on e-Freight developments and other initiatives.

Maritime Single Window two main objectives of worth being further detailed:

- Business2Authority (B2A): Less administration for the maritime transport sector entering and departing European Ports; and
- Authority2Authority (A2A): streamlining of internal IT management processes relating the transit of Maritime transport.

For inter-organizational/business processes (B2A), simplification was the envisage outcome of Directive 2010/65/EU and its implementation. Extended collaboration focuses on questioning both the "maritime sector" and the Government on how this objective can be met and what should be done to further advance the objective of less administration or simplification. In this context, the Government plays the role of facilitator and regulator for the "maritime citizen" who is obliged to report while entering or leaving European territory.

Concerning intra organizational business processes (A2A), this refers to relational context of intra governmental processes, especially a process where the physical control and virtual processing of data are connected. The great diversity of governmental roles relating to Single Window has to be treated.

b. Who are the users/stakeholders and what are the functions available to them

On 24 January 2012, the first of the three formal Consortium meetings took place. Some EU Member States and Norway have volunteered to participate in a Task Force: Norway, France, Germany, Italy, the Netherlands (coordinator) Portugal, Spain, Sweden, and the United Kingdom. The Taskforce met six times. The ANNA project covers 14 participating EU Member States and ten observer countries. Business associations also participate as partners.

Figure III-23. EU Member States and Observer Countries for ANNA

Source: Towards a Maritime Single Window, ANNA[87]

Functions available in ANNA include:

- **Standard**: Data model, data definitions, message structures, interfaces, agreements and documents in a common format to be implemented in each country.
- **Business Facilitator**: Easier reporting: one place, one format, increase profit
- **Legal Concept**: Fulfilling the directive and national laws.
- **System**: A reliable IT systems for sharing data

[87] http://www.annamsw.eu/phocadownload/anna%20a5%20folder%20web.pdf

- **Authority**: Connection between various authorities and trade, integrated in the maritime domain, cooperation.
- **Principle**: Report data once at one single point, one address both for data and questions.

The state of play of ANNA project is reflected in Figure III-24.

Figure III-24. State of Play[88]

c. What type of data is shared

Data provision (front office)

The reporting parties are the originators of the data and hence they are responsible to ensure that the information transmitted to the NSW is accurate. For this purpose they are also responsible to update the information whenever they are or have been made aware that the initial submitted information is incorrect or incomplete, either because of errors or because circumstances have changed.

Data processing

The NSW authority is responsible for the implementation and operation of the National Single Windows. The role and responsibilities may vary from country to country depending on national legal, political and organizational context. In that respect, the NSW authority may be different than the SSN National Competent Authority (NCA).

The NSW System shall allow the Machine-to-Machine (M2M) communication to automate the transfer of the data between different systems within the NSW environment, for example between the reporting parties and the NSW core system.

Data Exchange - national (mid office)

The NSW authority, in charge with the implementation and operation of the NSW, is also responsible for ensuring the distribution (or making available) of the reporting formalities information to the relevant authorities.

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[88] Maritime single window 2010/65/EU questionnaire responses: second consortium meeting in Lisbon 2 October 2012.

The NSW will have the capability to receive and process all data in one or several messages for further processing by the relevant authorities. According to the role of the receiving authority, it has to be identified based on national legal requirements if the specific data elements are allowed to be disseminated.

The data receiver is the responsible or competent authority entitled to the data from a reporting formality.

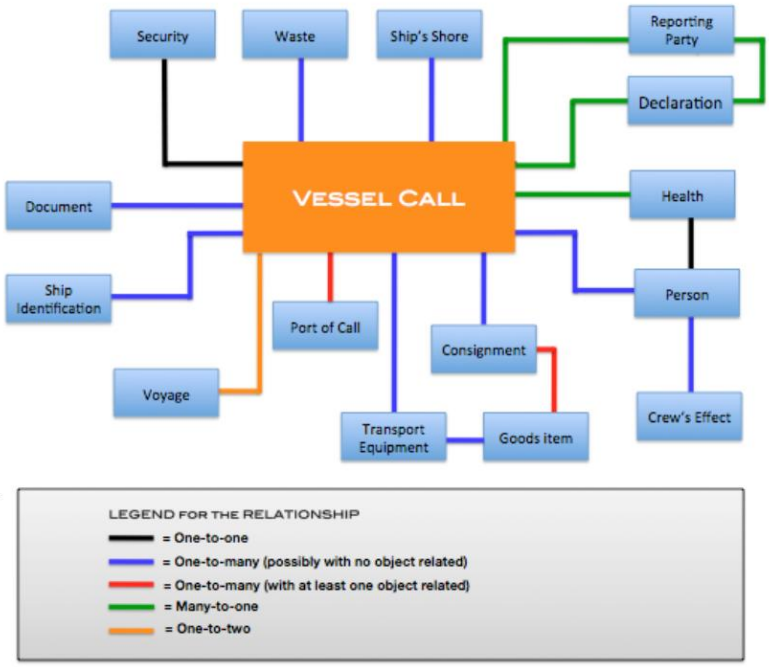
Data Exchange – EU (back office)

The NSW authority in charge with the implementation and operation of the National Single Window, is also responsible for ensuring the distribution (or making available) of the reporting formalities information to the other EU authorities (i.e. via National Competent Authority) or other Member States.

Data model MSW

Based on the WCO Data Model, the following MSW model for a data set has been developed.

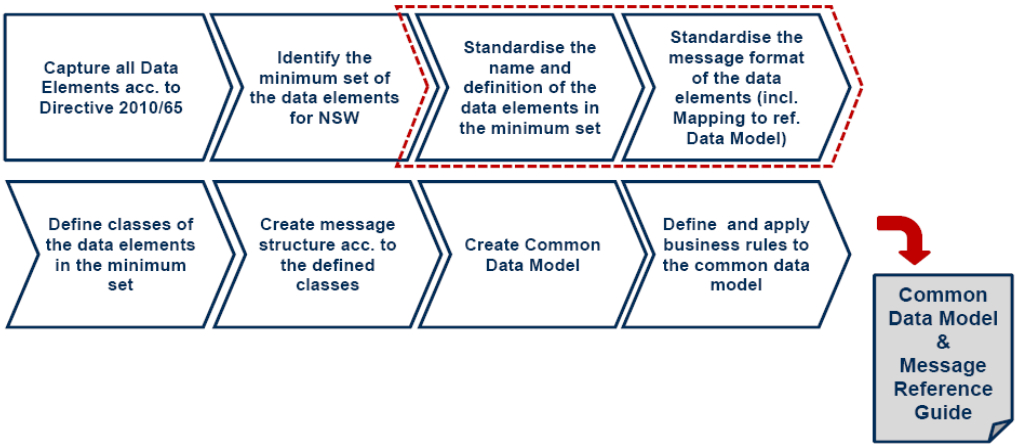
Figure III-25. Data model Maritime Single Window



Source: ANNA Interim Master Plan 2015

- The reporting parties (cross border operators) have to use a WCO format message.
- Receiving parties (Customs, national SSN, immigration, health, fisheries, harbour management systems and port community systems) have to apply the structure of the WCO data model. This can be done through:
  - Incorporating a translator into the existing systems;
  - Upgrading the existing systems (in case the life span of these systems are at end of life;
  - Developing a new system.

Figure III-26. Data Harmonization Process[89]



Explanation of declaration types

The term "Declaration Types" is used in the Leading Principles to distinguish messages derived from reporting formalities containing unique data and providing the basis for harmonization. The main message (all in one) is referred to as the B2MSW message and this contains the declaration of the following types.

Table III-11. Declaration Types

Data class		data elements : business name	Reference format	Standard(incl ID, If valid)
I. Class: Vessel Call (primary data elements)	1	Visit ID	XXXXXYYZZZZZZ	None
II. a Class: Voyage (primary data elements)	1	Estimated Time of Arrival (ETA)	YYYY-MM-DDThh:mm +00:00	ISO 8601UTC
	2	Estimated Time of Departure (ETD)	YYYY-MM-DDThh:mm +00:00	ISO 8601UTC
	3	Actual Time of Arrival (ATA)	YYYY-MM-DDThh:mm +00:00	ISO 8601UTC
	4	Actual Time of (ATD)	YYYY-MM-DDThh:mm +00:00	ISO 8601UTC
	5	Purpose of Call	an..512	UID 4440
	6	Name of Master	an..70	WCO 246 UID 3412
	7	Number of Crew	n..4	WCO 119 UID 6106
	8	Number of Passenger	n..4	WCO 140 UID 7056
	9	Number of Stoways	n..4	None
II.b Class: Voyage	1	Period of Stay	n..21	WCO 027 UID 2351

[89] DocC Methodology of Working Group Of MS On Data Harmonization

Data class		data elements : business name	Reference format	Standard(incl ID, If valid)
(Secondary Data Elements)	2	Number of Persons on Board	n..4	WCO 140 UID 7056
III.a Class: Port of Call (primary data elements)	1	Port Identification	XX YYY	UN/LOCODE
	2	Sequence Number of the Port of Call	n..3	None
	3	Position of the Ship in the Port of Call	[XX YYY]-[n..4]	IMO ISPS Code for Facility Number (as defined in SOLAS regulation XI-2/13.1.9) Extended UN/LOCODE
III. a Class: Port of Call (secondary data elements)	1	Port of Call: Status	None	None
	2	Voyage Information	None	None
	3	Itinerary of Cruise Ship	None	None
IV. Class: Person(Primary Data Elements)	1	Family Name	an..70	None
	2	Given Name	an..70	None
	3	Type of Person on Board	an..3	Code List 3035 in EDIFACT
	4	Nationality	ISO ALPHA-2 code	ISO 3166-1: 2006 and ISO 3166-3:2006 (Code for formerly used names of countries)
	5	Date of Birth	UNTDID 2379 = 102 CCYYMMDD Calendar date: C = Century; Y = Year; M = Month; D = Day.	WCO 028 UID 2491
	6	Place of Birth	an..256	UID 3486
	7	Nature of Identity Document	an..3	EDIFACT Code List 1001
	8	Visa Number	an..35	UID 1194
	9	Number of Identity Document	an..35	UID 1194
	10	Port of Embarkation	XX YYY	UN/LOCODE
	11	Port of Disembarkation	XX YYY	UN/LOCODE
	13	Gender	M F X	None
	14	Age	n..3	None
	15	Duty of Crew	None	None
V. Class: Ship Identification (primary data elements)	1	Identification Type	None	None
	2	Identification Number	an..15	See Business Rule
	3	Current Ship Security Level	Security Level 1 - 3 as Enum	ISPS Code (applied by SSN [CurrentSecLevel])
	4	IMO Company Identification Number		IMO Registered Owner or Company (DOC) number
V.c Class: Ship	1	Ship Name	an..35	(SSN) ShipName

Data class		data elements : business name	Reference format	Standard(incl ID, If valid)
Identification (Reference data elements)				(WCO)NameOfShip
	2	Ship Type	an..8	(WCO) TypeOfShip UID 8179
	3	Flag State of Ship	EDIFACT codes (3229) = ISO 3166-2 2-alpha code an..2	WCO 290 UID 8453
	4	Certificate of Registry: Port	XX YYY	UNLOCODE
	5	Certificate of Registry: Date	UNTDID 2379 = 102 CCYYMMDD Calendar date: C = Century; Y = Year; M = Month; D = Day.	WCO 028 UID 2491
	6	Certificate of Registry: Number	an..35	None
	7	Ship: Gross Tonnage	n..14,3	WCO 132 UID 6300
	8	Ship: Net Tonnage	n..14,3	WCO 133 UID 6302
	9	Inmarsat Call Number	[an..3] + [an..50]	WCO 253 + 240 UID 3155 + 3148
VI. Class: Security (primary data elements)	1	Ship-to-Ship Activities: Port Name	XX YYY	UN/LOCODE
	2	Ship-to-Ship Activities: Activity Name	an..512	UID 4440
	3	Ship-to-Ship Activities: Comment	an..512	UID 4440
	4	Additional Security Measures	an..512	UID 4440
	5	CSO: Name		
	6	CSO: Contact Details		
	7	Security-Related Matter to Report: Short Name	an..35	UID 4440
	8	Security-Related Matter to Report: Details	an..512	UID 4440
VII. Class: Health (primary data)	1	Visited infected area	Yes or No	None
	2	Actual / Suspected Disease on Board	Yes or No	None
	3	Ill Persons greater than expected	Yes or No	None
VIII. Class: Waste (primary data elements)	1	Last Port of Waste Discharged	XX YYY	UN/LOCODE
	2	Waste Disposal Order Type	None	None
	3	Last Disposal: Date	UNTDID 2379 = 102 CCYYMMDD Calendar date: C = Century; Y = Year; M = Month; D = Day.	WCO 028 UID 2491

Data class		data elements : business name	Reference format	Standard(incl ID, If valid)
	4	Waste Type	None	Circular AMPC 1 671. No Code List to be applied.
	5	Amount of Waste to be Discharged	n..4;2	None
	6	Dedicated Storage Capacity on Board	n..4;2	None
	7	Waste to be Retained on Board	n..4;2	None
	8	Port for Disposal of Remaining Waste: Port Name	XX YYY	UN/LOCODE
	9	Waste Amount Generated between Port of Calls	n..4;2	None
VIII.b Class: Waste (secondary data elements)	1	Waste Disposal Order Type	Enum	None
IX. Class: Crew's Effect (primary data elements)	1	Crew's Effects	[an..35] + [an..16]	UID 7410 + UID 6061
X. Class: Ship's Store (primary data elements)	1	Ship's Store: Name of Article	an..35	WCO 258 UID 7002
	2	Ship's Store: Quantity of Article	[n..5] + [Code List of Unit]	WCO 228 UID 6061
	3	Ship's Store: Location on board of Article	an..25	UID 8044 + 8045
	4	Ship's Store: Official Use	an..512	UID 4440
XI. Class: Document (primary data)	1	Type of Document	Enum	None
	2	Date of Issuance	UNTDID 2379 = 102 CCYYMMDD Calendar date: C = Century; Y = Year; M = Month; D = Day.	WCO 028 UID 2491
	3	Date of Expiration	UNTDID 2379 = 102 CCYYMMDD Calendar date: C = Century; Y = Year; M = Month; D = Day..	WCO 028 UID 2491
	4	Issuer	an...70	WCO 246 UID 3412
	5	Document Status	Enum	None
	6	Place of Issuance	XX YYY	UN/LOCODE
	7	Document Number	an..35	??
	8	Valid ISSC on Board	None	None
	9	Reasons for No Valid ISSC	an..512	UID 4440
XII. Class:	1	Port of Loading (C)	XX YYY	UN/LOCODE

Data class		data elements : business name	Reference format	Standard(incl ID, If valid)
Consignment (primary data elements)	2	Place of Loading (C)	XX YYY	UN/LOCODE
	3	Port of Unloading (C)	XX YYY	UN/LOCODE
	4	Place of Destination / Unloading (C)	XX YYY	UN/LOCODE
	5	DG Classification (G)	None	None
	5.1	UN Number (G)	n4	UID 7124
	5.2	UN Class (G)	[an..3]+[an..18]	WCO 337 + 145 UID 8351 or UID 7143 + 7357
	5.3	Packing Group (G)	Enum	UID 8339
	5.4	Textual reference / Product Name / Technical Name (G)	an..512	None
	5.5	Subsidiary risks (G)	an..70	UID 7176
	5.6	Flash Point (G)	an..8	WCO 388 UID 7088
	5.7	MARPOLPollution Code (G)	an..8	MARPOL Annex II
	6	Cargo Volume (G)	an..8	None
	7	Gross Weight (G)	[n..8] + [an..3]	None
	8	Stowage Position of DPG (T, G)	an..25 In SSN Ref Guide it is separated as "LocationOnBoardContainer" and "LocationOnBoardGoods"	UID 8044 + 8045
	9	Bill of Lading Number (Master) (C)	an..35	UID 1188
	10	Bill of Lading Number (House) (C)	an..35	UID 1188
	11	Consignor (C)	an..512	UID 3336
	12	Consignee (C)	an..512	UID 3132
	13	Notified Party (C)	an..512	UID 3180
	14	Number of Packages (G)	n..8	UID 6061
	15	Package Type: Code (G)	an..2 EDIFACT codes (7065) = UN/ECE Recommendation 21 Annex VI	UID 7065
	16	Package Type: Description (G)	an..512	UID 4440
	17	Unique Consignment Reference Number (UCR) (C)	an..35	UID 1202 WCO (ISO15495)
XIII. Class: Reporting Party (primary data elements)	1	Type of Reporting Party	an..3	Modified EDIFACT Code List 3035 on the Roles of Party
	2	Reporting Party: Name	an..70	WCO 246 UID 3412
	3	Contact Detail		

Data class		data elements : business name	Reference format	Standard(incl ID, If valid)
	3.1	EORI-Number	an..17	
	3.1.	Address	an..35	
	3.1.	Postcode	an..8	
	3.1.	Country	ISO-ALPHA-2 Code	ISO 3166-1:2006
	3.2	Contact Person	an..35	WCO 246
	3.3	E-Mail Address	an..50	WCO 253 +240
	3.4	Telephone	an..50	WCO 253 +240
	3.5	Telefax	an..50	WCO 253 +240
XIV. Class: Declaration (primary data elements)	1	First Port of Arrival in EU: Name of Port	XX YYY	UN/LOCODE
	2	First Port of Arrival in EU: Date	See below	See below
	2.1	*Expected Date of Arrival*	UNTDID 2379 = 102 CCYYMMDD Calendar date: C = Century; Y = Year; M = Month; D = Day..	WCO 028 UID 2491
	2.2	*Actual Date of Arrival*	UNTDID 2379 = 102 CCYYMMDD Calendar date: C = Century; Y = Year; M = Month; D = Day.	WCO 028 UID 2491
XV. Class: Transport Equipment (primary data elements)	3	Country of Routing Code	a2	UN/LOCODE (first two digit only) or EDIFACT codes (3207) = ISO 3166-1 2-alpha code
	1	Transport Equipment		
	1.1	*Identification of Transport Equipment*	an..17	WCO 159 UID 8260 ISO 6346
	1.2	*Seal Number*	an..35	WCO 165 UID 9308
	1.3	*Size and Type of Transport Equipment: Code*	an..4	Code List of the Size and Type of Transport Equipment ISO 6346
	1.4	*Size and Type of Transport Equipment: Description*	an..512	Code List of the Size and Type of Transport Equipment ISO 6346
	2	Stowage Position of DPG	an..25 In SSN Ref Guide it is separated as "LocationOnBoardContainer" and	UID 8044 + 8045

Data class		data elements : business name	Reference format	Standard(incl ID, If valid)
			"LocationOnBoardGoods"	

d. Relevant data standards

The NSW receives and processes EDIFACT[90] and XML messages[91]. Messages need to satisfy the NSW message definitions.

Several international standards may be considered as references (e.g. UN/EDIFACT, WCO data model, and the ISO standard on electronic port clearance - ISO 28005). In order to ensure that the same information can be reported to the NSW regardless of the standard used, it is necessary to guarantee the interoperability among the messaging systems implemented by the NSWs.

Applying WCO Data Model as the basis for the MSW would allow for the rationalization of the reporting process (unique data) as well as for identifying reference data. The XML message (i.e. GOVXML) would serve the purpose for the message/ data exchange between the NSW and all other parties.

ISO 28005 has been included as a standard for data exchange. Given that many reporting parties in the shipping industry currently use EDIFACT, this standard should also be considered for inclusion in the NSW for the Data Provision.

Existing Single Windows currently collect information according to all FAL Forms and ISPS although some data is still collected in document format.

4) Institutional arrangements

a. Lead agency

ANNA is being promoted through the planning and funding by the EU. 14 EU Member States and 10 observer countries have joined ANNA project. The ANNA project invited business associations as partners.

b. Cooperation mechanisms

Co-operation was established with Directive 2010/65/EU related projects, like the current MoS MIELE project, and other future EU co-financed projects.

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[90] The UN/EDIFACT standard provides a set of syntax rules to structure data, which contains directories of data elements, composite data elements, segments, and messages; and there are conventions for placing messages in an "envelope" which identifies the sender and receiver and other attributes of a transmission.

[91] Extensible Markup Language (XML) is used to define documents with a standard format that can be read by any XML-compatible application. Electronic Business using eXtensible Markup Language, or ebXML, is focused on concepts and methodologies that can be more broadly applied to allow practitioners to better implement e-business solutions. It applies the UN/CEFACT Core Components Technical Specification (CCTS).

c. Legal framework

In accordance with EU Directive 2010/65/EU on reporting formalities, EU Member States are required to implement National Single Windows by 1st June 2015 at the latest. These NSWs should serve the purpose of the Directive to simplify and harmonize the administrative procedures applied to maritime transport by making the electronic transmission of information standard and by rationalizing reporting formalities.

In the interest of furthering harmonization and coordination of reporting formalities within the Union, the eMS Expert Group have developed "National Single Window Guidelines" to assist the Member States in achieving the maximum level of harmonization and standardization possible whilst respecting the needs and position of an individual Member State.

The following legislative initiatives influence the design of the Maritime Single Window:[92]

- Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues;
- Directive 2002/59/EC establishing a Community vessel traffic monitoring and information system (i.e. SafeSeaNet);
- Regulation 725/2004 on enhancing ship and port facility security;
- Directive 2009/16/EC on port State control; The International Maritime Dangerous Goods Code and its amendments;
- Council Regulation 2913/92 and Commission Regulation 2454/93 (Community Customs Code);
- Regulation 562/2006 establishing a Community Code on the rules governing the movement of persons across borders (Schengen Borders Code);
- Regulation 450/2008 (Modernized Customs Code);
- Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data;
- Regulation 45/2001 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data;
- Decision 70/2008/EC on a paperless environment for Customs and trade.

5) Financing

ANNA uses co-financing method to meet the budget. Participating countries donated the required budget as agreed on 15 February 2013. Countries participating on observer status should sign a letter of support.

6) Security issues

A number of potential threats or risks that need to be taken into account when developing a national Maritime Single Window have been identified:

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- The risk of non-compliance with EC legislation
- Risks related to the data elements and/or data exchange mechanisms
  The MSW will be used for the exchange of data that can have commercial as well as legal importance. For that reason, securing the data and data transmission is the key. Areas that require specific attention include:
  - The availability of the data to end users;
  - The sensitiveness of (sharing) certain data elements from a legal (i.e. privacy) point of view;
  - The sensitiveness of (sharing) certain data elements from a commercial point of view;
  - The overall protection of the integrity and confidentiality of the data elements and data streams; and
  - Non-reproduction and traceability.
- Organizational risks
  The following organizational risks have been identified:
  - The implementation of 2010/65/EU may impact different businesses differently;
  - The involvement in the implementation of 2010/65/EU may not be possible for all businesses concerned;
  - The implementation of organizational changes to IT in ports may lead to conflicting projects schedules; and
  - The commitment to harmonize implementation of 2010/65/EU for all ports may be difficult to achieve.
- Functional risks
  The following functional risks have been identified:
  - Implementation of changes in a port may lead to functional inconsistencies;
  - The implementation of IT changes in central Governments may lead to inconsistencies in the functional component interfaces with port IT.
- Technical risks
  - The maintenance of the system can be regarded as the major technical risk.

7) Costs and benefits

Benefits

The benefits for the reporting parties by participating in the NSW environment include:

- No redundancy for the reported data following the principle of "submitting once";
- Increased data quality and minimization of the irregularities caused by human errors;
- The first step to the harmonisation of the requirements regarding the data sets within Europe.

The benefits of the data exchange via NSW for the Member States include:

- Seamless communication between the administrations at the EU Level;
- Cross-national data exchanges with the standardised message and technology are enabled;

- Possibility to automate the internal process within the authorities by the use of electronic information (no longer manual data enter) received from other countries; and
- Support for trade facilitation, following the vision of the European Single Market Act.

8) Related initiatives

Below is a list of related initiatives.

On national level:

- Administrative Report and Visa (BE)
- Single point of contact (DE)
- ICISnet (Greek eCustoms system
- AIDA (Customs), MAECloud (Ministry of Foreign Affairs) (IT)
- Paperless release of goods , electronic T2L (ES)

On EU level:

- SHIPSAN Act Joint Action (2013)
- VISANET
- Schengen Border Code revision
- EUROSUR
- THETIS (PSC)
- Customs Single Window (DG TAXUD)
- EMSA / SSN
- Blue Belt

On international level:

- FAL revision
- E-navigation

TEN-T:

- MIELE (fully related)
- MOS4MOS (partially related)
- MOS24 (partially related)
- IRIS Europe 3

IV. NATIONAL LOGISTICS INFORMATION SYSTEMS

1) Introduction to/description of the range of systems considered logistics information systems

The reviews of existing logistics information systems in the previous chapters show that systems and platforms have the following overall characteristics:

- National vs transnational/regional
- Single Window vs information platform.

Some national information platforms are connected to national Single Windows and some national Single Windows are linked to regional Single Window. Hence, it is possible to form a global network by connecting these existing systems. These systems can then be linked to service providers to ensure interoperability and improvement of efficiency throughout the logistics supply chain.

Most logistics information service systems serve the entire logistics chain: maritime transport, land transport, warehousing and e-commerce in international trade. Some systems also support administrative functions and provide information service on related regulations.

The reviewed systems have been developed either based on traditional EDI standards or on XML standards. The methodologies of developing standards for the reviewed systems include: (a) developing and adopting own national standards; (b) developing and adopting own national standards in combination with some international standards on e.g. code set, data elements, messages etc.; (c) implementing most international standards.

2) Distinction between private and public logistics information systems

The reviewed systems and platforms are mostly powered and supported by national Governments and regional organizations. The main advantage of public information platforms is the easier coordination among Government departments and other public sectors to open information sources and provide nonprofit public services; the main inconvenient is that it would be difficult for these platforms to focus on unique and enterprise-oriented supply chain solutions.

Private logistics information systems focus on the operation of business processes and provide specific and customized information for users. The advantage is that the private system provides more efficient and more dedicated integrated supply chain solution to their customers from different industries and sectors. However, the inconvenient of private systems is the lack of capability to integrate resources, especially when it comes to regulation and administration requirements. Another inconvenient is it may be difficult for private systems to be accepted as industry or national standards due to the lack of authority and impartiality.

Ultimately, users need integrated supply chain services which include information sharing and exchanging. The optimal solution would be that Government and

nonprofit organizations build an information sharing and exchange network which provides public information service, i.e. allow private information systems and logistics information service providers to integrate all information which could then provide applicable supply chain solutions.

3) The need of Government involvement for

a. Setting information standards

Government agencies need to organize and coordinate all participants to clarify information requirements for logistics system, business process and information model, and ultimately develop widely accepted and approved national standards. It is the Government's responsibility to develop mechanisms related to administration and regulation, strategies for implementation and to set up high quality criteria for participation in system's operation.

b. Establishing and managing the information system/EDI center

Information infrastructure can be very costly and thus, most SMEs cannot afford to build their own information systems. Government departments such as transport, Customs and trade can financially support or help building a logistics information system, which can function as an information network for basic service, e.g. data exchange and information inquiry for users.

c. Initiation of data sharing (Government first mover)

Companies are usually required by Government departments to submit significant amount of information, e.g. details related to Customs, transportation, and taxation etc., particularly related to international trade. In order to encourage stakeholders of both public and private sectors to participate in facilitating business process, relevant Government departments should initiate projects to develop information systems such as Single Window to simplify and harmonize procedures and standardize data flow. This improvement would lead to decreasing in costs and smoothing processes, which benefit both Government and business community.

4) Benefit of public information platform

Public information platform can benefit both to Government and businesses. They support Governments in deploying resources more effectively and efficiently, increasing integrity and transparency of administration and regulations processes, and enhancing security and traders' compliance. Benefits for businesses include faster clearance and release, cutting costs through reduced delays, increased transparency of supply chain and improved transparency of rules and predictability of administrative procedures.

5) System operators

Government agencies may not be the best option for running the operation of logistics information systems. In this case, it will be necessary to choose other parties as operators and service providers. One possibility is to transfer operational rights to a

selected semi-governmental organization after the basic logistics information infrastructure has been built by the Government. Alternatively, logistics information systems can be entirely developed and operated by a selected semi-governmental organization while being funded by the Government. It is also possible for Government to open its information infrastructure such as interchange network and basic services to third parties so that they can build up their own logistics information services to provide value-added services and supply chain management.

V. REVIEW OF STANDARDS RELEVANT FOR LOGISTICS INFORMATION SHARING

A. Key issues in data harmonization

1) The need for data harmonization for system interoperability

a. Issues of standardization and mutual recognition

Trade and transport information systems are often developed in isolation, both on national and regional level. This leads to different interpretations of standard messages. Although international standards such as UN/EDIFACT have existed for decades and many national and regional systems have been implemented based on these international standards, business data elements and message of these systems still need to increase their interoperability and compatibility.

Companies or Government agencies usually have their own administrative rules and requirements, different paper forms as well as information systems which usually lack international synergy in regard to the use of codes, qualifiers, data elements, components, and messages. Extensive administrative and systems differences contribute to the increase of associated compliance cost, creating additional burden to both the business community and the Governments and are barriers to the development of international trade.

Efficient and seamless supply chain is important to all companies, particularly those involved in international trade. Supply chain partners need to exchange business documents and relevant data with each other throughout the world. They have to submit large volumes of information and documents to different governmental authorities regularly to comply with import, export and transit-related requirements. Therefore, it is vital to harmonize the differences of industry-level and country-level standards by providing solutions to achieve mutual recognition.

2) Types of data

a. B2B, G2B, G2G

The national and transnational logistics information systems reviewed in previous chapters indicate a wide array of stakeholders in the systems, e.g. governmental agencies, port authorities, import and export companies, manufacturers, and transport service provider etc. In order to satisfy their diversify needs, So B2B, G2B and B2G data exchange are usually part of the systems' daily operation. The systems reviewed include the response to those needs in different focus.

NEAL-NET, COLINS, GCTs and SP-IDC have implemented B2B data exchange only. TradeNet only captures B2G type of data while ASEAN Single Window only has G2G function. NACCS, PortNet and e-Freight have implemented B2B and B2G data exchange, while ANNA has implemented B2G and G2G.

Examples of systems allowing B2B, G2B and B2G exchanges are LOGINK, E-Port, PORT-MIS, uTtrade and TradeXChange. Examples of national and transnational systems which also provide statistical data are LOGINK, e-Port, NACCS, PORT-MIS, SP-IDC, GCTS, uTrade, PortNet, TradeNet and e-Freight.

Harmonized and standardized data sets and electronic messages incorporating international code standards are keys for effective and efficient B2B, B2G, G2G exchanges and information sharing. Thus, efforts have to be made to build better pipelines to support the seamless flow of trade data.

b. Public and private data/information

Most of the national and transnational systems reviewed are non-profit, neutral and open to both the public and private sectors, such as Government departments and enterprises involved in international trade. The systems or platforms usually also provide public information service, such as statistical data reporting and relevant information on policies and regulations.

Private information is also made available given that port authorities, importers and exporters, manufacturers, transport service providers and other participants in the supply chain use these systems to exchange e-documents and information with their partners.

c. Types of standards

The national and transnational logistics information systems reviewed have either developed their own standards based on internal requirements, or have widely adopted international standards such as UNTDED, UN/EDIFACT, UN/CLL, ebXML and international code lists, supplementing by their own national standards if needed.

d. Deviations from standards

Most commonly used international and national standards have to be compatible in order to allow users to align to specific structures of data and documents. Code list has to be strictly adopted for recognition and identification.

In cases when standards or technical specifications only specify for models information, business process or rules, users can define their own data representation and documents based on the framework of those relevant standards or technical specifications. In such cases, data type that can be used between partners in trade and transport can be defined and agreed by them.

e. Formatted data

The systems reviewed are either using their own standards, or they adopted international standard. Irrespective of the choice of standards, data must be formatted based on the standard selected.

f. EDI vs XML

There are two ways of implementing proprietary systems: through dedicated networks based on UN/EFACT, or through internet based on XML messages. The legacy systems, usually adopted by the maritime and aviation industry as well as big enterprises, are EDI based. As for newly developed logistics information systems and SMEs, web-based systems are commonly adopted.

For example, Port-MIS, LEDIC, PORTNET, TradeNet, uTrade, NACCS, and E-Port are EDI based systems; while LOGINK, COLINS, SP-IDC, e-Freight, NEAL-NET have implemented their web-based systems using XML messages. Most EDI systems also support XML messages.

3) Key challenges

a. Legacy software and institutions

There are many legacy systems and software that are widely used by the public sector e.g. Customs, trade department, seaports and aviation authorities; as well as private sector e.g. big enterprises in manufacturing, trading and transport.

The harmonization and simplification of data and documents used by different participants in their legacy systems are one of the biggest challenges for automated data exchanges. Replacing existing legacy systems may require considerable investment and therefore, cost-benefits ratio should be carefully considered. Although sometimes it may be necessary to replace these legacy systems, a more practical approach for sharing and exchanging information between participants could be to establish a central portal or gateway.

In developing a central portal or gateway, it is essential to ensure that all the information requirements of participants related to existing systems are included in the standard data set for the portal/gateway. The central portal or gateway should have the capability to make conversion and translation between different standards. Existing systems should also be modified to adapt to the latest international standards. Thus, it may be inevitable to develop a methodology to migrate the legacy data, and adapt it to the new standards.

b. Lead agency issues

National and regional logistics information systems are information aggregation platforms for trade and transport operations. The leading agency plays a vital role in coordinating with participating authorities and agencies to ensure effective system's operation. The lead agency should be determined depending on legal, political and organizational aspects within respective country, with due consideration of its technical capability to lead the establishment and operation of the systems.

Customs or port authorities can be appropriate to lead development and implementation of logistics information system, given that these agencies are the entrance points to receive and coordinate the flow of information related to the regulatory and business requirements.

The lead agency/organization does not necessarily have to be a governmental body. It can be a private entity such as company, joint-venture or semi-public organization. However, in general private organizations lack the legal authority to issue and accept information/documents and enforce rules and regulations. Therefore, it is necessary that the private organization receives formal support or empowerment from the Government.

c. Data confidentiality

Data confidentiality and transmission security are core elements in both national and transnational logistics information systems.

A sound legal regime protecting confidentiality, privacy and liability is the most important element to ensure safe and secured data collection, access and distribution and to build trust among stakeholders. Strong data protection mechanism concerning data accessibility, integrity and accuracy are key elements. It is necessary to establish adequate security and access protocols through identification, authentication and authorization mechanisms. It is also important to apply risk analysis techniques in detecting vulnerabilities in the systems to prevent data breaches.

Other challenges are protect of personal data privacy and business data confidentiality in transnational environments. In this respect, the adoption of international legal standards and best practices is an advisable solution.

d. Input language

Transnational and international logistics information systems may involve the use of different languages. To ensure smooth and accurate data exchange and information sharing, it is recommended to use English in all transaction to avoid inaccurate translation to/from different languages.

B. International Standards and Codes

1) UNECE Recommendations, UN/EDIFACT, UNTDED, NEAL-NET, IMO ID number/call sign, IMO FAL, ISO, GS1/EPC Global, ebXML, UBL

a. UNECE Recommendations

The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) is an inter-governmental body of the UNECE Committee on Trade, which is mandated to develop a work program of global relevance to achieve improved worldwide coordination and cooperation in trade facilitation recommendations and electronic business standards for both commercial and Government business processes. The outputs of UN/CEFACT include Recommendations on facilitation of trade procedures, harmonization of documents, electronic data interchange and standardization of Codes.

Table V-1. Recommendation on Facilitation of Trade Procedures

Recommendation No.	Title of Recommendation	Latest version in English
Rec. 4	National Trade Facilitation Organs; Arrangements at the national level to coordinate work on facilitation of trade procedures	October 2001
Rec. 12	Measures to Facilitate Maritime Transport Documents Procedures	June 1993
Rec. 13	Facilitation of Identified Legal Problems in Import Clearance Procedures	March 1979
Rec. 14	Authentication of Trade Documents by Means other than Signature	March 1979
Rec. 15	Simpler Shipping Marks	March 1992
Rec. 18	Facilitation Measures related to International Trade Procedures	September 1982
Rec. 27	Pre-shipment Inspection	June 1999
Rec. 33	Recommendation and Guidelines on establishing a Single Window	July 2005
Rec. 34	Data Simplification and Standardization for International Trade	2013
Rec. 35	Establishing a Legal Framework for an International Trade Single Window	2013
Rec. 40	Consultation approaches Best Practices in Trade and Government Consultation on Trade Facilitation matters	February 2015

UN/CEFACT has developed multiple recommendations to facilitate international trade and transport, addressing a variety of aspects and issues about organizations, legal framework and business process.

- ✓ Recommendation N°4 and 40 emphasize good public-private cooperation as highly necessary to promote the facilitation of trade.

UN/CEFACT Recommendation N°4 "National Trade Facilitation Organs" emphasizes the need for a strong Government-trade partnership to fulfill the trade

facilitation goals of simplification, harmonization, and standardization. It recommends that Governments establish and support national trade facilitation bodies with balanced private and public sector participation in order to identify issues affecting the cost and efficiency of their country's international trade.

UN/CEFACT Recommendation N°40 "Consultation approaches Best Practices in Trade and Government Consultation on Trade Facilitation matters" encourages Governments to develop a consultative approach for trade facilitation that is inclusive of trade and Government stakeholders and which addresses issues such as information sharing, preparations prior to consultations and measures that aim at building a trust-based dialogue.

UN/CEFACT Recommendation N°13 "Facilitation of Identified Legal Problems in Import Clearance Procedures" proposes solutions to various legal problems related to import clearance procedures.

- ✓ Recommendation N°12, 15, 18, 27 provide solutions to make cargo movement smooth, safe and efficient.

UN/CEFACT Recommendation N°12 "Measures to Facilitate Maritime Transport Documents Procedures" encourages the use of sea waybills or other non-negotiable transport documents instead of negotiable transport documents, such as bills of lading.

UN/CEFACT Recommendation N°15 "Simpler Shipping Marks" establishes a Standard Shipping Mark to identify cargo in order to reduce costs, mistakes and shipment delays. This mark can be used on packages moved internationally by all modes of transport, for reproduction in related documents and for data elements in trade related information technology applications.

UN/CEFACT Recommendation N°18 "Facilitation Measures related to International Trade Procedures" proposes a series of measures related to the movement of goods, including the submission of information to Governments. It outlines the procedures and documents covered, according to the phases of an international trade transaction.

UN/CEFACT Recommendation N°27 "Pre-shipment Inspection" encourages using the WTO instrument regarding pre-shipment inspections (PSI) where such inspections are considered necessary as an interim measure.

- ✓ Recommendation N°33 and 35 encourage the development of Single Windows to improve the efficiency of international trade and lower costs.

UN/CEFACT Recommendation N°33 "Recommendation and Guidelines on establishing a Single Window" provides solutions for parties involved in trade and transport to submit standard documents with a single entry point to fulfil all import, export and transit-related regulatory requirements. It draws a framework of models, standards and tools to plan and implement Single Window.

UN/CEFACT Recommendation N°35 "Establishing a Legal Framework for an International Trade Single Window" defines a legal framework for an International

Trade Single Window as a set of measures to be taken to address legal issues related to national and cross-border exchange of trade data required for Single Window operations.

UN/CEFACT Recommendation N°34 "Data Simplification and Standardization for International Trade" provides a methodology to develop data standards internationally accepted for international trade and transport. It defines the necessary tools, processes, and procedures to apply to the national, regional and international simplification and standardization of data requirements to facilitate the automated exchange of data among Government agencies and between trade and Government.

Table V-2. Recommendations on Harmonization of Documents

Recommendation No.	Title of Recommendation	Latest version in English
Rec. 1 - 2	United Nations Layout Key for Trade Documents	March 1981
Rec. 6	Aligned Invoice Layout Key for International Trade	September 1983
Rec. 11	Documentary Aspects of the International Transport of Dangerous Goods	January 1996
Rec. 22	Layout Key for Standard Consignment Instructions	March 1989

UN/CEFACT Recommendation N°1-2 "United Nations Layout Key for Trade Documents" provides standardized documents used in international trade and transport, including the visual representation of such documents, for designing master document in aligned series of forms. It can also be used to design screen layouts for the visual display of electronic documents.

UN/CEFACT Recommendation N°6 "Aligned Invoice Layout Key for International Trade" applies to the design of commercial invoices for international trade in goods. Invoices based on this Recommendation could complement or in certain cases replace existing documents (e.g. Customs invoices, consular invoices, declarations of origin, etc.)

UN/CEFACT Recommendation N°11 "Documentary Aspects of the International Transport of Dangerous Goods" harmonizes information requirements and simplifies documentary procedures for the transport of dangerous goods in order to decrease complexity and increase accuracy and efficiency.

UN/CEFACT Recommendation N°22 "Layout Key for Standard Consignment Instructions" presents a layout key for the design of Standard Consignment Instructions, conveying instructions from either a seller/consignor or a buyer/consignee to a freight forwarder, carrier or his agent, or other provider of service, enabling the movement and handling of goods and associated activities.

UN/CEFACT has also developed Recommendations related to the use of ICT and EDI for international trade.

Table V-3. Recommandations on UN/EDIFACT

Recommendation No.	Title of Recommendation	Latest version in English
Rec. 14	Authentication of Trade Documents by means other than signature	
Rec. 25	Use of the United Nations Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT)	January 1996
Rec. 26	Commercial Use of Interchange Agreements for Electronic Data Interchange (EDI)	January 1996
Rec. 31	Electronic Commerce Agreement	March 2000
Rec. 32	E-Commerce Self-Regulatory Instruments (Codes of Conduct)	October 2004

UN/CEFACT Recommendation N°.14 "Authentication of Trade Documents by means other than signature" encourages Governments to review national and international requirements for signatures on trade documents and also encourages trading community and trade services provider to examine business processes in order to eliminate manual-ink signatures, so that trade documents can be electronically transmitted through authentication methods.

UN/CEFACT Recommendation N°.25 "Use of the United Nations Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT)" recommends coordinated actions by Governments to promote UN/EDIFACT as a single international standard for electronic interchange of data (EDI) between public administrations and private companies in all economic sectors worldwide. UN/EDIFACT is used as an application protocol of data interchange compatible with the Open Systems Interconnection (OSI) model for user application systems. UN/EDIFACT includes International Standard Syntax Rules (ISO 9735 Parts 1-10), Trade Data Interchange Directory (UNTDID), and over 200 UN Standard Messages, which involve all aspects of the transactional links between organizations.

UN/CEFACT Recommendation N°.26 "Commercial Use of Interchange Agreements for Electronic Data Interchange" promotes the use of interchange agreements between commercial parties using EDI in connection with international commercial transactions, in order to increase the legal security of their trading relationship. It includes a Model Interchange Agreement for international use, designed for bilateral agreements between two trading partners, but with adjustments, can easily be implemented in multi-lateral relationships such as in a trade community or association.

UN/CEFACT Recommendation N°.31 "Electronic Commerce Agreement" is a contractual solution for EDI users, considering a framework of basic provisions agreed by business entities combined with the flexibility to conduct day-to-day commercial transactions. It proposes a model for a contractual approach called Electronic Commerce Agreement to electronic commerce operations, which can be concluded by the exchange/combination of the Instruments of Offer and Acceptance without further formality.

UN/CEFACT Recommendation N°.32 "Recommendation on e-Commerce Self-Regulatory Instruments" emphasizes that UN Member States should support and promulgate codes of conduct for voluntary electronic business, and promote and facilitate the development of relevant self-regulation instruments, national and international accreditation schemes, and trust mark schemes.

b. UN/EDIFACT

UN/EDIFACT (the United Nations rules for Electronic Data Interchange for Administration, Commerce and Transport) comprise a set of internationally agreed standards, directories, and guidelines for the electronic interchange of structured data, between independent computerized information systems. The rules are approved and published in the United Nations Trade Directory (UNTDED). UN/EDIFACT has also been published as ISO standards as a result of cooperation between UN/CEFACT and ISO TC 154, as follows:

- ISO 9735-1 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) -- Part 1: Syntax rules common to all parts
- ISO 9735-2 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) -- Part 2: Syntax rules specific to batch EDI
- ISO 9735-3 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) -- Part 3: Syntax rules specific to interactive EDI
- ISO 9735-4 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) -- Part 4: Syntax and service report message for batch EDI (message type -- CONTRL).
- ISO 9735-5 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) -- Part 5: Security rules for batch EDI (authenticity, integrity and non-repudiation of origin)
- ISO 9735-6 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) -- Part 6: Secure authentication and acknowledgement message (message type - AUTACK)
- ISO 9735-7 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) -- Part 7: Security rules for batch EDI (confidentiality)
- ISO 9735-8 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) -- Part 8: Associated data in EDI
- ISO 9735-9 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version

number: 4, Syntax release number: 1) -- Part 9: Security key and certificate management message (message type- KEYMAN)
- ISO 9735-10 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) -- Part 10: Syntax service directories.

c. UNTDED

The United Nations Trade Data Element Directory (UN/TDED), or ISO 7372, is a Directory comprising a set of data elements intended to facilitate an open interchange of data in international trade. These data elements can be exchanged in paper or electronic forms; and they can be used within a certain set of interchange rules, e.g. UN/EDIFACT. The UNTDED is continuously updated, based on reviews by the Maintenance Agency, a joint UNECE - ISO body authorized by UN/CEFACT and by the ISO Council.
UN/TDED contains rules and procedures of maintenance, list of standard data elements etc. Each data element is assigned a four-digit number to be identified and a description that provides the definition of the data element. The value of data element can either be expressed in plain language or in code. The UN/TDED provides an internationally accepted standard repository for the semantic of trade data elements used in international trade.

d. UN/CCL (UN Core Components Library)

UN/EDIFACT standards have been developed for years and accepted worldwide for business partners to transmit electronic documents automatically between their IT systems through dedicated network.

In order to provide simpler and less costly solutions not only for big companies, but also for most SMEs to communicate with their partners though internet and other new ICT technologies such as XML etc., UN/CEFACT has developed a new methodology. The methodology provides more flexibility in the interoperable way of standardizing business semantics by specifying a set of semantic building blocks called core component representing the general types of business data. A common list of core components is maintained as standard UN/CCL in a UN/CEFACT specified registry. The following standards and specifications are relevant for modeling, standardizing and implementing data exchange and information sharing in international trade and transport:

- UN/CEFACT Core Components Technical Specification (CCTS)
  It defines a meta-model and rules necessary for describing the structure and contents of conceptual and logical data models and information exchange models.

- UN/CEFACT Data Type Catalogue
  The collection of UN/CEFACT permissible representation UN/CEFACT terms, primitives, facets, and core data types.

- UN/CEFACT Core Components Library (CCL)
  The library of core component artifacts and relate to UNTDED.

- UN/CEFACT UML Profile for Core Components
  It defines a Unified Modelling Language (UML) profile for expressing core components in UML models.
- UN/CEFACT XML Naming and Design Rules Technical Specification
  It provides an architecture and set of rules to define, describe and use XML to consistently express business information exchanges based on CCTS.
- UN/CEFACT Modelling Methodology (UMM)
  It is business process and information model construction methodology and a UML profile can be used to describe the UMM components to specify the business domain specific stereotyping that supports a complete business process and information definition
- UN/CEFACT Business Requirement Specifications (BRS)
  It is a mechanism for documenting user requirements in business terms and guiding the standards' development process for national, regional and international trade and transport.
- UN/CEFACT Requirements Specification Mapping (RSM)
  RSM represents information requirements of business process in technical terms aligned to syntax specific solutions, using BRS output as the input.

e. International Organization for Standardization

The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organizations.

ISO cooperates with other organizations such as UN/CEFACT and OASIS to develop standards.

TC/154 (Processes, data elements and documents in commerce, industry and administration)

International standardization, registration of business, administration processes and supporting data used for information interchange between and within individual organizations; support for standardization activities in the field of industrial data.

ISO/TC 154/JWG 1 was established in the late 80's as so called "Joint Syntax Working Group (JSWG)" with the UNECE in order to develop and maintain the EDIFACT syntax.

ISO/TC 154/WG 3 was established upon the former "CCTS" ad-hoc group of ISO/TC 154 in March 2006. The purpose is to maintain the ISO/TS 15000-5 "Core Components Technical Specification, V2.01″ in close liaison with UN/CEFACT.

ISO/TC 154/WG 4 was established (formally as JWG 2) in 2006 for the purpose of developing an electronic version of the UN Layout Key (equivalent to ISO 6422:1985).

UNTDED – ISO 7372 Joint Maintenance Agency was established in the late 80's to maintain the Trade Data Element Directory (TDED) issued by UNECE as UNTDED and also by ISO/TC154 as ISO 7372.

TC/104 (Freight Containers)

Standardization of freight containers in terms of terminology, classification, dimensions, specifications, handling, test methods and marking

TC/204 (Intelligent Transport System)
ISO/TC 204/WG 7 works with OASIS to develop Universal Business Language (UBL) to provide ICT solutions for each role in the supply chain by defining business rules and a generic XML interchange format for business documents.

f. ebXML

Electronic Business eXtensible Markup Language (ebXML) is a set of specifications for business-to-business e-commerce via internet using XML. UN/CEFACT and OASIS jointly launched the ebXML Initiative in 1999. UN/CEFACT is responsible for business specifications such as Core Components while OASIS is responsible for the specification of the IT side of Message Service etc.

The first edition of the following key specifications (version 1.0) was published in 2001:

- ebXML Message Service (OASIS's responsibility)
- ebXML Collaboration Protocol Profile and Agreement (OASIS responsibility)
- ebXML Business Process Specification Schema (OASIS responsibility)
- ebXML Registry (OASIS responsibility)
- ebXML Core Components (UN/CEFACT's responsibility)

ebXML aims to develop specification available to all companies regardless of their size, industry or country. It defines a wide range of content, including Registry & Repository (R&R) format of transaction information and business processes, communication protocol, corporate information.

ISO/TC154 published each part of ebXML as ISO / TS 15000 in cooperation with UN/CEFACT and OASIS. However, ebXML is no longer updated. Only ISO 15000-5:2014 ebXML Core Components Technical Specification remains valid.

g. UBL

Universal Business Language (UBL) aims to provide a universally understood and recognized syntax and defines a library of standard electronic XML business documents that can extend the benefits of existing EDI systems to businesses of all sizes, especially small and medium-sized businesses. The XML data constructs in a UBL schema are drawn from a single library of reusable components in conformity with the UN/CEFACT ebXML Core Components Technical Specification (CCTS).

UBL provides a complete, standards-based infrastructure including:

- structured business objects and their associated semantics expressed as reusable data components and common business documents.
- XML schemas for reusable data components such as "Address", "Item", and "Payment"—the common data elements of everyday business documents.

- XML schemas for common business documents such as “Order”, “Dispatch Advice”, and “Invoice” that are constructed from the UBL library components and can be used in generic procurement and transportation contexts.

Within OASIS, UBL is a key component of the contribution of OASIS to the ISO/IEC/ITU/UNECE eBusiness MoU.

h. International Maritime Organization (IMO)

IMO comprehensively addressed the issues related to facilitation of international maritime traffic, such as simplification of formalities, documentary requirements and procedures on the arrival and departure of ships and harmonization of documents required by the public authorities.

To provide solutions to these issues, Facilitation (FAL) Committee has developed a set of standardized IMO FAL Forms including:

- FAL Form 1 General Declaration
- FAL Form 2 Cargo Declaration
- FAL Form 3 Ship’s Store Declaration
- FAL Form 4 Crew’s Effects Declaration
- FAL Form 5 Crew List
- FAL Form 6 Passenger List
- FAL Form 7 DG Manifest

IMO also established and maintains the “International Maritime Dangerous Goods Regulations” which includes the IMDG Code, using four-digit numbers that identify hazardous substances and articles (such as explosives, flammable liquids, toxic substances etc.).

i. International Air Transport Association (IATA)

- Cargo Interchange Message Procedures (Cargo-IMP)

Jointly developed by IATA, its member airlines and Airlines for America (A4A), Cargo-IMP is the official message source for specifications used by airlines as standards for electronic exchange of cargo information with various stakeholders including freight forwarders, ground handling agents, Customs administrations and regulators and security agencies.

These messages were developed based on EDI and include space allocation, air waybill, flight manifest, accounting, status, discrepancy, embargo, Customs, CASS billing, dangerous goods, allotments and surface transportation. The Cargo-IMP also includes encoding and decoding lists of all approved codes and abbreviations.

The 34th edition (2014/2015) of the Cargo-IMP standard is the final edition as IATA and the aviation industry will discontinue supporting Cargo-IMP to focus on the IATA Cargo-XML standard which will eventually replace Cargo-IMP.

- Cargo-XML Standards

IATA Cargo Committee, Cargo Services and Cargo Agency Conferences have endorsed Cargo-XML messages as the new standard for air cargo industry electronic messaging.

This new standard is based on multimodal and cross-border messaging and will facilitate the implementation of e-airway bill, e-Freight and Advance Cargo Information (ACI), compliance with relevant regulations and the standards of other relevant entities, such as WCO.

Cargo-XML messages and standards have been developed by reusing the components from UN/CLL. Cargo-XML messages were published in the Cargo-XML Manual and Toolkit.

Table V-4. Cargo XML Messages

Transport Messages	Acronym
XML Waybill	XFWB
XML House Waybill	XFZB
XML House Manifest	XFHL
XML Flight Manifest	XFFM
XML Freight Booked List XFBL	XFBL
XML Status Message	XFSU
XML Response Message	XFNM
XML Booking Message	XFFR
XML Custom Status Notification	XCSN
XML Shippers Dec for DG	XSDG
XML Generic Request	XGRQ

Commercial messages	Acronym
XML Invoice	XINV
XML Packing List	XPCL
XML Certificate of Origin	XCOO
XML Shippers Letter of Instruction	XSLI

j. World Customs Organization (WCO)

- HS Code

WCO developed and introduced the Harmonized Commodity Description and Coding System, which is used world-wide as the basis for classifying goods and for the collection of duties and taxes.

- WCO Data Model

It is a set of combined data requirements derived from cross-border regulation. These requirements are mutually supportive and are updated on a regular basis to meet the procedural and legal needs of cross-border regulatory agencies such as Customs, controlling export, import and transit transactions.

The Model is based on the UNTDED, applying UN/CEFACT UMM and refers to a range of UN/CEFACT, ISO and other international code standards. The current version is only for UN/EDIFACT but future versions will offer XML specifications as well. WCO Data Model provides a way to harmonize and standardize data sets and

electronic messages for effective and efficient Business-to-Government (B2G), Government-to-Business (G2B) and Government-to-Government (G2G) exchange and sharing of information.

k. GS1/EPC Global

EPC (Electronic Product Code) Global Network has developed a series of standards including: EPC Tag Data Standard v1.9, Tag Data Translation Standard, Air Interface Protocol, Radio-Frequency Identity Protocols, Low Level Reader Protocol and Discovery, Configuration & Initialization Standard, Reader Management, Application Level Events, EPC Information Services Standard (EPCIS), Core Business Vocabulary (CBV) and others.

EPCIS has defined data presentation and business rules in capturing and exchanging trading goods data. CBV specifies various vocabulary elements and their values for use in conjunction with EPCIS and allow system's users to have a common understanding of the semantic meaning of data. EPCIS mainly focus on B2B data exchange.

l. NEAL-NET

NEAL-NET provides standardized query interface for supply chain partners to obtain logistics status data such as Vessel Schedule and Container Status. NEAL-NET Standards adopt EPCIS framework which is suitable for status sharing. The interface uses web service and SOAP message for data transmission. There are intentions to extend NEAL-NET to include other logistics and cargo status such as Customs clearance status by cooperating with other authorities and industry bodies.

2) Review of codes

Codes can present information in fewer characters, quicker and cheaper. Using codes reduces errors in transmission or storage. In addition, it enables clear and concise communication where ordinary spoken or written language is simply impossible or could potentially create misunderstanding. For the system to function well, sender and receiver need to agree on common codes so that information keeps the same content during its transmission and transfer into databases.

Many inter-governmental organizations and international organizations have developed code standards independently or cooperatively. These organizations include the United Nations Economic Commission for Europe (UNECE), International Maritime Organization (IMO), International Organization for Standardization (ISO) and other organizations.

a. Code standards

Several UN/CEFACT Recommendations relate to the use of internationally accepted code standards.

Table V-5. Recommendations on Standardization of Codes

Recommendation No.	Title of Recommendation	Latest version in English
Rec. 3	ISO Country Code: Code for Representation of Names of Countries I	Jan-96
Rec. 5	Abbreviations of INCOTERMS: Alphabetic Code for INCOTERMS 2000	May-00
Rec. 7	Numerical Representation of Dates, Time and Periods of Time	Oct-88
Rec. 8	Unique Identification Code Methodology-UNIC	Jan-92
Rec. 9	Alphabetic Code for the Representation of Currencies	Jan-96
Rec. 10	Codes for the Identification of Ships	Jan-97
Rec. 16	UN/LOCODE: Code for Trade and Transport Locations	Dec-98
Rec. 17	PAYTERMS: Abbreviations for Terms of Payment	Mar-82
Rec. 19	Codes for Modes of Transport	Jan-01
Rec. 20	Codes for Units of Measure Used in International Trade	Mar-06
Rec. 21	Codes for Types of Cargo, Packages and Packaging Materials	Mar-89
Rec. 23	Freight Cost Code-FCC; Harmonization of the Description of Freight Costs and other Charges	Mar-06
Rec. 24	Trade and Transport Status Codes	Jul-04
Rec. 28	Codes for Types of Means of Transport	Apr-03
Rec. 29	Codes for Types of Cargo (Merged with Recommendation 21)	
Rec. 30	Harmonized Commodity Description and Coding System for the Coding of Goods and Commodities (Withdrawn)	

UNCEFACT Recommendation N°1 "ISO Country Code: Codes for the representation of names of countries and their subdivisions"， also known as ISO 3166. ISO 3166 list the names of countries, dependent territories, special areas of geographical interest and their principal subdivisions (e.g. provinces, states).

The codes are presented in two sections, containing a two-letter alphabetic code for international exchange and a three-digit numeric code. A three-letter alphabetic code is listed in the ISO 3166 Standard.

Table V-6. Examples of Countries Codes

Countries Name	Two-letter alphabetic	Three-letter alphabetic	Three-digit numeric
China	CN	CHN	156
France	FR	FRA	250
United States of America	US	USA	840
Monaco	MC	MCO	492
Japan	JP	JPN	392
South Korea	KR	KOR	410

UN/CEFACT Recommendation N°5 "Abbreviations of INCOTERMS: Alphabetic Code for INCOTERMS 2000", recommends the use of agreed abbreviations for the International Chamber of Commerce's (ICC) trade terms, known as INCOTERMS. The purpose of INCOTERMS is to provide a set of international rules for the interpretation of the most commonly used trade terms in foreign trade. Participants in international trade and transport are encouraged to accept and implement the common code list of three-letter abbreviations as an alphabetic code for INCOTERMS.

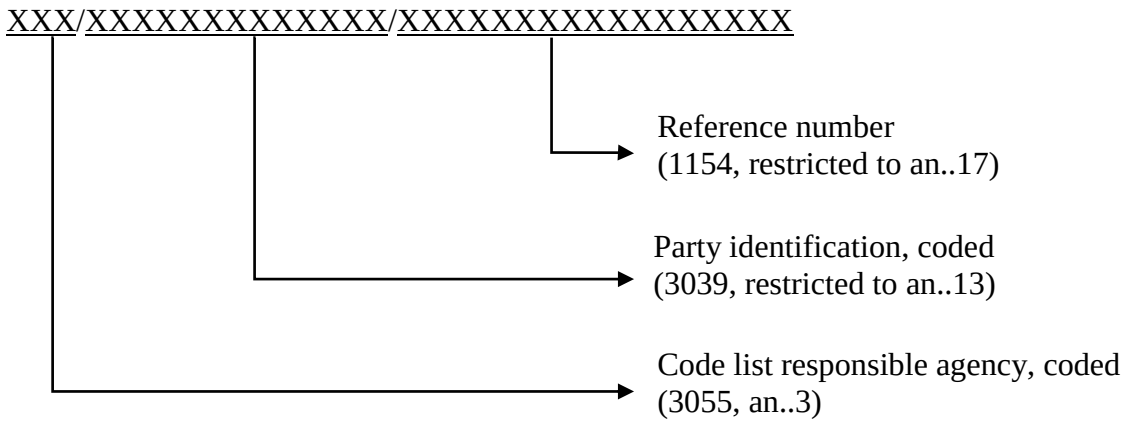
Table V-7. Examples of Abbreviations of INCOTERMS

INCOTERMS FOR ANY MODE OR MODES OF TRANSPORT	
EX WORKS **EXW** (insert named place of delivery)	DELIVERED AT TERMINAL **DAT** (insert named terminal at port or place of destination)
FREE CARRIER **FCA** (insert named place of delivery)	DELIVERED AT PLACE **DAP** (insert named place of destination)
INCOTERMS FOR SEA AND INLAND WATERWAY TRANSPORT	
FREE ALONGSIDE SHIP **FAS** (insert named port of shipment)	COST AND FREIGHT CFR (insert named port of destination)
FREE ON BOARD **FOB** (insert named port of shipment)	COST, INSURANCE AND FREIGHT **CIF** (insert named port of destination)

UN/CEFACT Recommendation N°7 "Numerical Representation of Dates, Time and Periods of Time" establishes a method for standardized and unambiguous all-numerical designation of a given date, a given time of the day and a given period of time. It applies in all cases where these data are presented as separate entries in numerical form by participants in international trade. This Recommendation includes representation method of *Calendar date*, *Ordinal date*, *Time of the day*, *Co-ordinated Universal Time (UTC)*, *Week*, and *Other periods of time*.

UNCEFACT Recommendation N°8 "Unique Identification Code Methodology-UNIC" (originally named "Common Access Reference") provides a unique referencing system for use between parties as a means of referring to a trade transaction and/or consignment at different stages of international trade. The UNIC can be used within a transaction consisting of one consignment, a transaction consisting of more than one consignment, a consignment consisting of more than one transaction. The UNIC consists of a combination of three UNTDED data elements of *3055 Code list responsible agency, 3039 Party identification, and 1154 Reference number*.

The structure is as follows:



UNCEFACT Recommendation N°9 "Alphabetic Code for the Representation of Currencies" encourages the use of the three-letter alphabetic codes of ISO 4217 "Codes for the representation of currencies and funds" for application in international trade and their use in commercial transactions when currencies are expressed in coded or abbreviated form.

Table V-8. Examples of Alphabetic Code for the Representation of Currencies

Name of country	Alpha - 2 Country code (ISO 3166)	Alpha - 3 Currency code(s)
China	CN	CNY
United States	US	USD
Sweden	SE	SEK

UNCEFACT Recommendation N°10 "Codes for the Identification of Ships" recommends that participants, including ship owners, port authorities and other parties involved in maritime transport of goods, use the IMO's Ship Identification Number Scheme for the unique identification of ships. Radio Call Sign and IMO Number are most commonly used. It is recommended to use only the final seven characters of the IMO number in EDI applications because the IMO Number remains unchanged throughout the life of a ship irrespective of changes of name, nationality or ownership. The ship's IMO number should be inserted on certificates and certified copies such as *Passenger Ship Safety Certificate, Cargo Ship Safety Equipment Certificate, and Exemption Certificate* etc. The structure of the IMO number comprises two parts: a variable seven-digit numeric number (the Lloyd's Register number) and a constant alpha prefix "IMO".

UNCEFACT Recommendation N°16 "UN/LOCODE-CODES FOR PORTS AND OTHER LOCATIONS" provides abbreviated names of locations such as ports, airports, inland freight terminals, and other locations such as places of reception and delivery, Custom clearance of goods, and whose names need to be represented unambiguously in data interchange. UN/LOCODE is a five-letter alphabetic code with countries listed in first two-letter alphabetic country code (ISO 3166) and with locations listed in the three remaining characters code for the place name within each country. UN/LOCODE code list is categorized by countries and can be checked on UNECE website: http://www.unece.org/cefact/locode/service/location.html

Table V-9. Examples of UN/LOCODE

LOCODE	Name	NameWoDiacritics	SubDiv	Function	Status	Date	IATA	Coordinates	Remarks
CN PEK	Beijing Shoudu International Apt	Beijing Shoudu International Apt	11	---456--	AS	1407			
CN BJX	Beijingxizhan	Beijingxizhan	11	123-----	AS	1407			
CN SHG	Shanghai Pt	Shanghai Pt	31	1-3-----	AS	1407			
CN SFH	Suifenhegongluzhan/ Suifenhe	Suifenhegongluzhan/ Suifenhe	23	--3-----	AS	1401		4425N 13111E	
US NYC	New York	New York	NY	12345---	AI	401		4042N 07400W	
DE BER	Berlin	Berlin	BE	12345---	AF	207		5231N 01323E	

UNCEFACT RECOMMENDATION N°17 "PAYTERMS: Abbreviations for Terms of Payment" provides abbreviations for certain terms of payment, referred to as "PAYTERMS". "PAYTERMS" apply to commercial transactions relating to the provision of goods and/or services, mostly in international trade. "PAYTERMS" are organized into six groups: *"Group 1 - Documentary Credits", "Group 2 -Collections" "Group 3 -Payment by instalments" "Group 4 -Other types of payment" "Group 5 - Special arrangements", "Group 6 -Without payment".*

UNCEFACT RECOMMENDATION N°19 "Codes for Modes of Transport" establishes common code list for the identification of the modes of transport. It consists of one-digit numerical code for representing the transport mode, e.g. "1 to 4" respectively represent maritime transport, rail transport, road transport, and air transport; "6" represents multimodal transport; "7" is used for fixed transport installation and 8 for inland waterway.

UNCEFACT RECOMMENDATION N°20 "Codes for Units of Measure Used in International Trade" establishes a list of code elements to represent unit of measure for length, mass (weight), volume and other quantities (e.g. units of count), covering administration, commerce, transport, science, technology, industry etc. The code list is divided into three levels:

Level 1

This level is normative, using the International System of Units (SI) specified in ISO 31;

Level 2

This level is normative equivalent, using the units based on the equivalents of the SI units;

Level 3

This is level is informative, using other sets of units:

- units widely used in the international environment;
- units used at regional level, that may have a broader international interest;
- units at regional or sectorial level only.

UNCEFACT Recommendation Nº21 "Codes for Types of Cargo, Packages and Packaging Materials" presents coded representations for the package type names used in international trade.

Table V-10. Examples of Codes for Types of Cargo, Packages and Packaging Materials

Code	Name	Description	Numerical code
1A	Drum, steel		34
1B	Drum, aluminum		34
1F	Container, flexible	A packaging container of flexible construction.	93
2C	Barrel, wooden		44 or 45
43	Bag, super bulk	A cloth plastic or paper based bag having the dimensions of the pallet on which it is constructed.	64
4A	Box, steel		21 to 25
6P	Composite packaging, glass receptacle		23 or 24 or 25 or33 or 34 or 62 or 63
8A	Pallet, wooden	A platform or open-ended box made of wood, on which goods are retained for ease of mechanical handling during transport and storage.	24 or 25

UNCEFACT Recommendation Nº23 "Freight Cost Code-FCC: Harmonization of the Description of Freight Costs and other Charges" establishes harmonized descriptions of freight costs and other charges related to the international movement of goods; It also specifies an unambiguous coded representation of those descriptions. The code list is divided into three levels:

Group

Level 1 code: one digit designation of the main cost heading category.

Subgroup

Level 2 code: two digit designation of the general cost description within a cost heading category.

Detail

Level 3 code: three digit designation of the detailed cost description within a general cost description.

Table V-11. Examples of Codes for Types of Cargo, Packages and Packaging Materials

Group	Subgroup	Detail	Description	Mode/Site Indicator	Duplicate Indicator
1	**00**	**000**	**FREIGHT CHARGES**		
1	00	999	All freight charges		
1	01	000	BASIC FREIGHT		
1	01	021	Airfreight	(FF)	D1
1	02	000	FREIGHT CHARGE ALLOWANCE		
1	02	002	Allowance - wool		
2	**00**	**000**	**GOODS HANDLING CHARGES**		
2	00	999	All goods handling charges		
2	02	000	HANDLING EQUIPMENT HIRE CHARGES		
2	02	001	Use of container crane		
3	**00**	**000**	**DOCUMENTATION CHARGES**		
3	00	999	All documentation charges		
3	01	000	TRADE DOCUMENTATION CHARGES		D1
3	01	001	Additional documentation charge		D2
4	**00**	**000**	**TRANSPORT EQUIPMENT CHARGES**		
4	00	999	All transport equipment charges		
4	01	000	TRANSPORT EQUIPMENT RENT		
4	01	001	Animal container		
5	00	000	CUSTOMS CHARGES		
5	00	999	All Customs charges		
6	**00**	**000**	**MISCELLANEOUS CHARGES**		
6	00	018	Icing or re-icing charge		
6	01	000	TRANSPORT INSURANCE CHARGES		
6	01	001	Insurance - insured capital		

UNCEFACT Recommendation Nº24 "Trade and Transport Status Codes" provides Transport Status Codes for exchanging coded information on the status of consignments, goods or means of transport at a certain time or place in the transport chain. Representation of Transport Status Codes can be given in plain language or in coded form with three character alphanumeric codes.

Table V-12. Examples of Trade and Transport Status Codes

Code	Code Name	Description
1	Arrival, completed	The goods/consignment/equipment/means of transport has arrived.
2	Loading, authorized	Authorization to load has been given.
35	Forwarded to destination	The goods/consignment/equipment has been forwarded to a destination.
353	Delivery not completed, business closed on Saturday	The goods/consignment/equipment could not be delivered as the business was closed on Saturday.

UNCEFACT Recommendation Nº28 "Codes for Types of Means of Transport" establishes a common code list for the identification of the type of means of transport. It has particular relevance to transport organizations and providers, statistical offices,

forwarders, shippers, consignees, Customs and other authorities. The codes are three character alphanumeric code values comprising characters 0 to 9 and upper case A to Z.

Table V-13. Examples of Codes for Types of Means of Transport

Transport Mode	Code-A	Code-B	Name	Description
1	50		General cargo vessel	Vessel designed to carry general cargo.
1	50	1	Grain vessel	Vessel designed to carry grain.
2	10		Train, railroad	One or more rail wagons pulled or pushed by one or more locomotive units, or self-propelled, that move over rail tracks.
2	20	3	Train, passenger, hired group	A chartered train.
3	4	2	Van, light	Automotive vehicle designed for light carriage.
4	0	0	Aircraft, type unknown	Aircraft of unknown type
5	0	0	Mail, type unknown	Mail of unknown type
6	0		Multimodal, type unknown	Multimodal transport of unknown type.
7	0		Fixed transport installation, type unknown	Fixed transport installation of unknown type.
8	2	1	Motor tanker, liquid cargo, type N	Motorized vessel designed for carrying liquid cargo in cargo tanks, type N according to ADN.

UN/CEFACT Recommendations on standards of codes are widely accepted by other international and national organizations. For example, the WCO Data Model recommends the use of UN/CEFACT Recommendations such as Recommendation No.3, 5, 9, 16, 17, 19, 20, and 21. WCO also defines the Unique Consignment Reference (UCR) using ISO 15459 (ISO License Plate) compliant numbering systems or equivalent industry solutions. The UCR establishes an information and documentation link between the supplier and the customer in an international trade transaction and requires this reference to be used throughout the entire supply chain as an unique identification of consignments.

b. Examples of use

An example of UN/EDIFACT message segment (coming from “Implementation Guide for INVOICE / CREDIT NOTE”) is reproduced in Figure V-1. Data element “6345 Currency, coded” is the code type coming from UN/TDED.

Figure V-1. Example of UN/EDIFACT Message Segment

Group: SG2 Status: R Max. Occ.: 99 NAD SE

Segment: FII Seq. No.: 17 Level: 2 **Financial institution information**
Status: D Max. Occ.: 5
Counter: 0140

Name: **Financial institution information**

Description of segment:

UN/EDIFACT			Implementation	
	Name	St Format	St Format	Use / Comments
FII				
3035	Party qualifier	M an..3	M an..3	**RH = Seller's financial institution**
C078	Account identification	C	R	
3194	Account holder number	C an..35	R an..35	Account number at the financial institution where this accountis held.
3192	Account holder name	C an..35	N an..35	Name of the official account holder, as registered with a financial institution.
3192	Account holder name	C an..35	N an..35	
6345	Currency, coded	C an..3	C an..3	
C088	Institution identification	C	N	not used
3433	Institution name identification	C an..11	N	not used
1131	Code list qualifier	C an..3	N	not used
3055	Code list responsible agency, coded	C an..3	N	not used
3434	Institution branch number	C an..17	N	not used
1131	Code list qualifier	C an..3	N	not used
3055	Code list responsible agency, coded	C an..3	N	not used
3432	Institution name	C an..70	N	The name of the financial institution not used
3436	Institution branch place	C an..70	N	not used
3207	Country, coded	C an..3	N	not used

Comment:

Example:

Source: Implementation Guide for Invoice / Credit Note)

c. Limitations

Most code lists are widely accepted by international and national organizations. Hence, even when document structures are not quite aligned to each other, there are fewer barriers for electronic document transmission since most of these documents use the same code list.

C. National standards

1) Codes

Most national logistics information systems and platforms are built with the expectations that they would adopt internationally accepted codes (e.g. UN/CEFACT, IMO etc.) which would not prevent them from also developing their own national standards. In all cases, domestic standards are developed following guidelines and methodologies proposed by international organizations.

For example, in order to fit in the national environment of China, some national specific codes, e.g. such as transport status, service requirements, freight charge and fee identification, have been added to national standards of LOGINK. These national-specific codes have been developed following the coding schemes defined in relevant international standards.

UN/CEFACT Recommendations and UN/TDED (ISO 7372) are the most widely applied international standards and codes for international trade and transport. Many standardized codes are widely adopted by national standards, e.g. Country code (ISO 3166), Currency (ISO 4217), Dates, times, periods of time (ISO 8601), Location (UN/LOCODE), Units of measurement, Mode of transport, Freight, Packaging etc. WCO Harmonized System (Commodity code) and IMO Vessel ID number are also standard codes which are widely adopted.

Among the systems reviewed:

- UNTDED are adopted by national standards of LOGINK, PORT-MIS, SP-IDC, GCTS, PortNet, and TradeNet;
- WCO Harmonized System (Commodity code) are adopted by national standards of E-Port, PORT-MIS, SP- IDC, uTrade, PortNet, and TradeNet;
- IMO Vessel ID numbers are adopted by national standards of LOGINK, E-Port, PORT-MIS, SP- IDC, GCTS, and PortNet.

2) Examples of use

Table V-14 shows an example of code used in LOGINK standard document, in which the data element “WL0800921 PriorityCode” is defined by LOGINK as a code type. The real “consignment note” used by consigner is the value of “PriorityCode” in LOGINK code list.

Table V-14. Example of Code used in LOGINK

Serial Number	Level	Classification Number	English Name	Constraint/ Occurrence	Data Format	Reference	Remarks
10	2		Body	1..1			
11	3	WL0100802	ShippingNoteNumber	1..1	an..20		Document number for shipping Note
12	3	WL0100820	OriginalDocumentNumber	0..1	an..35		Original document number when document transmission from a upstream company to a downstream company
13	3	WL0200805	ConsignmentDateTime	1..1	n14		Starting time of a Consignment
14	3	WL0800903	BusinessTypeCode	0..1	an..7	Adopt GB/T 26820	
15	3	WL0800902	BusinessTypeName	0..1	an..35		
16	3	WL0900896	OperationalRequirement	0..1	an..35		Specific requirements for shipping
17	3	WL0800921	PriorityCode	1..1	an..3		Code for Priority Shipping
18	3	WL0800920	PriorityDescription	0..1	an..17		Description for Priority Shipping
…	…	…	…	…	…	…	…

3) Limitations

National standard code sets are not easily accepted internationally and their development and use increase the implementation cost for data and document exchange. Nevertheless, this can be overcome by mapping and transformation during electronic document transmission

VI. RECOMMENDATIONS

A. General recommendations

The development of logistics information systems as public platforms (a service provided by the public sector), at national and transnational level, is one feasible solution to facilitate cross-border transport and improve the seamlessness of international supply chains, with positive impact on trade. The use of such systems allow for harmonization and simplification of the information exchanged between and among relevant Government agencies and private stakeholders respectively.

However, establishing such systems is a complex endeavor and their effectiveness and efficiency depend on many factors. The present guidelines and recommendations have been prepared by experts who represent national Governments and private sector, for the use of public and private parties interested in establishing or developing logistics information systems. The aim is to help those parties understand the real issues and key challenges, as well as to provide strategies and methods of avoiding unnecessary costs during the implementation and operation. The following general recommendations should be considered by countries with extensive demand for logistics services, when envisaging to develop logistics information systems:

- To utilize logistics information technology systems or other ICT resources related to logistics services, in order to establish logistics information systems as a public platform providing effective and efficient national information services as well as future transnational interchange.
- To establish a regional mechanism promoting cooperation among countries in the development of national logistics information systems; ideally include therein the coordination of standards and the development of cooperation through a legal framework.
- To consider Government investment or public-private partnerships to fund the development of logistics information systems.
- To adopt the ***Standard Model of Logistics Information Systems*** in the development of national system.

B. Standard Model of Logistics Information Systems

1) Introduction

A large volume of information is transmitted between Government agencies and business companies prior, during and after logistics operations. Regulatory and information requirements from Governments in combination with extensive documents and data exchanges among different trade partners may cause tremendous administrative burden on both public and private stakeholders and increase the possibility of data errors. Big companies may cope with the administration through sufficient human resources and internal information systems but most SMEs operate with minimal human resources and do not have the financial capabilities to implement complex information systems.

Single point architecture is a low cost solution to provide single access point to all logistics services, particularly for SMEs. It enhances the accessibility and handling of information, expedites and simplifies information flows, resulting in greater data sharing between companies and Government.

It is strongly recommended that national information systems are established with due consideration of compatible common standards of other countries in the region. This will facilitate the subsequent interconnection of systems.

Political will of the relevant governmental authorities and full support and participation of the business community are the most important prerequisites for the successful implementation of a single access point facility. Equally important is the basic legal framework, which should include regulations on security of data exchange and data protection/privacy.

2) Overall architecture

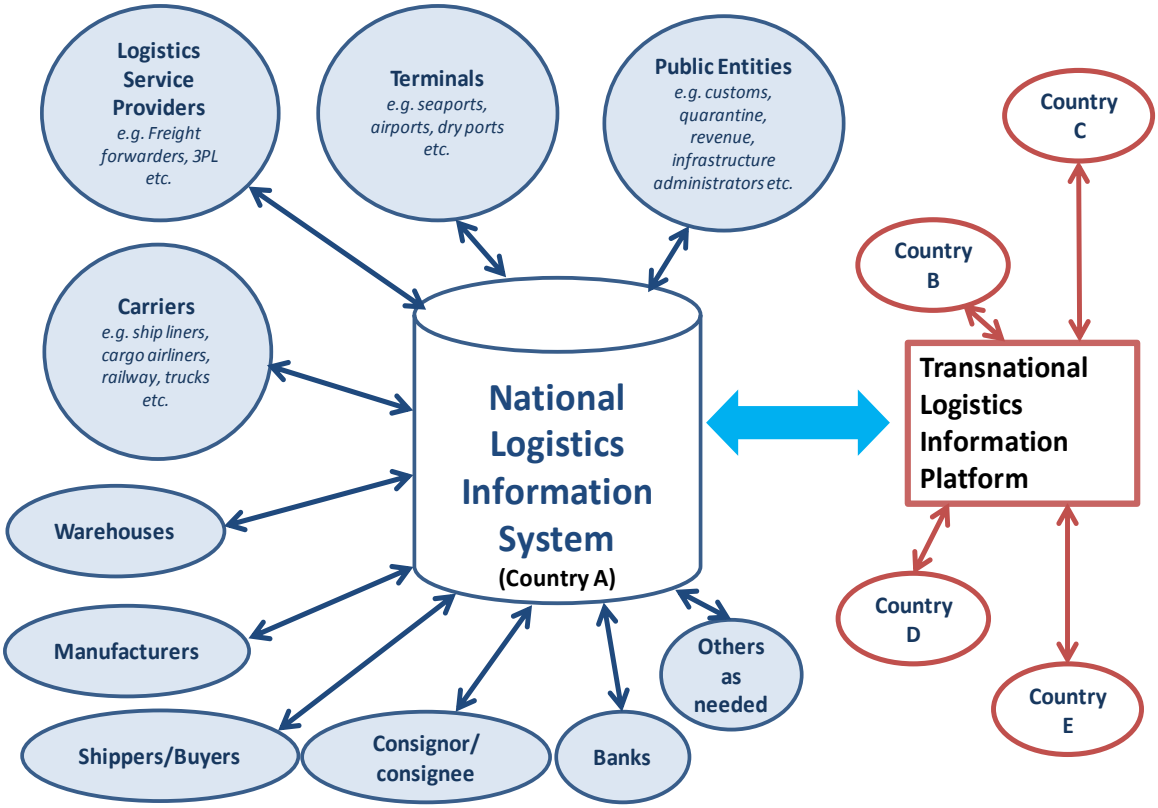
National logistics information systems have to be built as operational infrastructures to fulfill the functions and services that are recommended hereafter, so that these national systems can communicate with each other using unified standards and interfaces based on a common agreement defining the information sharing mechanism.

The single access point facility provides end-to-end solutions to allow business partners transmit trade and transport documents to streamline their business process. Single Window is an example of a single entry point facility that allows parties involved in trade and transport to submit their trade related information and documents only once to Government authorities in order to fulfill import, export and transit-related regulatory requirements National logistics information systems can provide channels for business parties to be able to connect to Single Window by means of internet links or interfaces, allowing parties not just to communicate more efficiently with their partners but also to fulfill easier the cross border procedures required by authorities.

From system architecture point of view, national logistics information systems should be designed having in mind to accommodate the requirements of potential future

transnational level of information sharing mechanism. Data should also be harmonized and standardized between both national and transnational systems.

Figure VI-1: Illustrative Diagram of the Overall Architecture of a Logistics Information System



Source: UNESCAP

Functions

Logistics information systems should be able to perform the recommended core functions presented hereafter, in order to provide the necessary services to their users, including importers/exporters, shippers, Customs brokers, freight forwarders, warehouse operators, carriers and terminal operators.

The system should implement all types of data exchange (B2B, B2G, and G2G), and ought to cover all modes of transport (maritime, road, railway, aviation and inland waterway) to provide multi-modes services. To this end the following main functions are recommended to be built within the system:

- User management

Ensuring data security and confidentiality are paramount for any business process. Thus, user management function should include user and service registration and authentication; and various levels of authority or access to data and services.

- Data interchange

All documents should be transmitted in electronic way. Data exchange network and route are necessary for users to interchange their business data.

- Information queries

The system allows users to access service resources from various service providers through internet by performing web-search or system service call. Information resources directories should be built based on standards, and maintained on regular basis, as these directories allow users to easily access the standardized information across networks.

- Information service

The system provides users with all relevant information related to regulations and laws, administrative services, statistical data etc. through the national platform portal.

- Standardization

Data exchange standards, especially semantic standards should be developed, including data elements, code sets, business documents, business process models. It is strongly recommended to adopt widely used international standards including data harmonization specifications. The maintenance of standards is also necessary.

- Data integrity, security, and confidentiality

The systems should apply adequate information technology and operations management for the guarantee of data integrity, security, and confidentiality. Data owners should take their own responsibilities for data quality and authenticity outside the scope of the systems.

Implementers of logistics information systems should consider the existing information security technologies in order to ensure systems' security; they also need to adopt methods such as electronic signatures to ensure the safety and confidentiality of exchanges and transactions. They should refer to UN/CEFACT recommendations as presented in Table VI-1.

Table VI-1. Recommendations on Electronic Commerce Safety

UN/CEFACT Recommendations Rec.14 Authentication of Trade Documents by means other than signature Rec.31 Electronic Commerce Agreement Rec.32 e-Commerce Self-Regulatory Instruments (Codes of Conduct) Rec.26 Commercial Use of Interchange Agreements for Electronic Data Interchange (EDI)
Universal Business Language Version 2.1,OASIS

These core functions support business partners and Government authorities to share and exchange business documents and regulation information between and among them. The systems can be based on EDI architecture or web service systems, depending on infrastructure's capabilities and financial resources. However, if the burden of legacy infrastructures is not too big and can be overcome, web-based architecture could be a better option for new system implementation. In this case, it is recommended that implementers either develop the systems using existing XML standards such as UBL 2.1 and IATA Cargo-XML, or develop their own XML

standards adopting UN/CEFACT Modeling Methodology and UN/CCL and related standards and specifications.

Table VI-2. Recommended Implementation of UN/EDIFACT

UN/CEFACT Recommendations • Rec.14 Authentication of Trade Documents by means other than signature • Rec.25 Use of the United Nations Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT) • Rec.26 Commercial Use of Interchange Agreements for Electronic Data Interchange (EDI) • Rec.31 Electronic Commerce Agreement • Rec.32 e-Commerce Self-Regulatory Instruments (Codes of Conduct)
Recommended technical specifications
UN/CEFACT technical specifications • Core Components Data Type Catalogue • Core Component Technical Specification • Core Components Business Document Assembly • UML Profile for Core Components • UN/CEFACT Modelling Methodology (UMM) • XML Naming and Design Rules
W3C Recommendations • Extensible Markup Language (XML) 1.0 (Second Edition), W3C Recommendation 6 October 2000 • XML Schema Part 1: Structures. Second Edition • XML Schema Part 2: Data types. Second Edition • XML-Signature Syntax and Processing
Unified Modeling Language Version 1.5
Recommended standards
ISO standards • ISO 9735 Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules (Syntax version number: 4, Syntax release number: 1) Part 1- 10 • ISO/IEC 19757-2, Information technology -- Document Schema Definition Language (DSDL) — Part 2: Regular-grammar-based validation -- RELAX NG , Information technology -- Document Schema Definition Language (DSDL) -- Part 2: Regular-grammar-based validation -- RELAX NG AMENDMENT 1: Compact Syntax • ISO/IEC 11179-1:1999 Information technology - Specification and standardization of data elements - Part 1: Framework for the specification and standardization of data elements
UN/CEFACT standards • United Nations Trade Data Interchange Directory (UNTDID) • Core Components Library (UN/CCL) • Business Requirement Specifications(BRS) • Requirements Specification Mappings (RSM) • XML Schemas
Universal Business Language Version 2.1,OASIS

Logistics information systems may not include all the functions needed by the users. However, the system can make these functions available by providing internet links to other relevant systems, or by automatic connection through system interfaces.

Import/export clearances

The system allows users to query for clearances status and submit declaration documents (cargo manifest, passenger list, crew list) to Government authorities, e.g. foreign trade, Customs, quarantine etc. through internet link or system connection.

Depending on the country, Government authorities involved in import/export regulation may have their own systems or may have Single Window facilities. In these cases, users may be requested to use UN/EDIFACT standard messages or XML schemas, depending on whether these systems are EDI architecture or web service systems.

Implementers of logistics information systems should build up the import/export clearance function referring to the UN/CEFACT recommendations, international conventions, and formalities listed in Table VI-3.

Table VI-3. Recommendations Relevant for Establishing Import/export Clearance Function

Recommended procedures, international conventions, formalities
UN/CEFACT Recommendations • Rec. 1, UN Layout Key for Trade Documents • Rec.12 Measures to Facilitate Maritime Transport Documents Procedures • Rec.13 Facilitation of Identified Legal Problems in Import Clearance Procedures • Rec.18 Facilitation Measures Related to International Trade Procedures • Rec.27 Pre-shipment Inspection • Rec.33 Recommendation and Guidelines on establishing a Single Window • Rec.34 Data Simplification and Standardization for International Trade • Rec.35 Establishing a Legal Framework for an International Trade Single Window
WCO • The International Convention on the Simplification and Harmonization of Customs Procedures (revised Kyoto Convention) • Single Window Compendium • Customs SAFE Framework of Standards • Customs Guidelines on Integrated Supply Chain Management
UN/ESCAP • Business Process Analysis Guide to Simplify Trade Procedures • Data Harmonization and Modelling Guide for Single Window Environment
Recommended data elements standards
UNTDED (ISO7372)
UN/CCL (Core Components Library)
WCO data model
UBL Common Library, OASIS
UN/ CEFACT Recommended codes
Rec.3 ISO Country Code: Code for Representation of Names of Countries
Rec.5 Abbreviations of INCOTERMS: Alphabetic Code for INCOTERMS 2000
Rec.7 Numerical Representation of Dates, Time and Periods of Time
Rec.8 Unique Identification Code Methodology-UNIC
Rec.9 Alphabetic Code for the Representation of Currencies
Rec.16 UN/LOCODE: Code for Trade and Transport Locations
Rec.17 PAYTERMS: Abbreviations for Terms of Payment
Rec.19 Codes for Modes of Transport
Rec.20 Codes for Units of Measure Used in International Trade
Rec.21 Codes for Types of Cargo, Packages and Packaging Materials
World Customs Organization HS code

Table VI-4. Example of an Import/export Clearance Process and Recommended Documents and Standards

Business process		Data and documents	Recommendations standards
Import	**Registration** User: -Shipper, forwarder, importer/exporter -Government authority	**Submit:** • Application Form for business registration numbers(foreign trade, Customs, quarantine, and taxation) • Identification certificate • Other relevant documents or records **Obtain:** • Business registration numbers	**UN/EDIFACT standard messages:** - REGENT Registration of enterprise message - PARTIN Party information message - MEDPID Person identification message
	Obtain Import Licenses/Permits User: -Importer/exporter -Government authority	**Submit:** • Import permit application form • Sales contracts • Proforma invoice • Other relevant documents or records **Obtain:** • Import licenses/permits	**UN/EDIFACT standard messages:** - SANCRT International movement of goods governmental regulatory message - ORDERS Purchase order message - ORDRSP Purchase order response message - INVOIC Invoice message **XML schemas:** - UN/CEFACT XML Schema CrossIndustryInvoice_10p1.xsd - UBL 2.1 schemas: Contract notice, invoice - IATA XML invoice
	Enter seaport/airport	See “seaport/airport clearance”	See “seaport/airport clearance”
	Transfer to import storage facility /bonded warehouse/ CY	See “seaport/airport clearance”	See “seaport/airport clearance”
	Provide import declaration User: -Shipper, forwarder,	**Submit:** • Import licenses/Permits • Import declaration certificate • Bill of lading or delivery order/airway bill	**UN/EDIFACT standard messages:** - CUSDEC (Customs declaration message) - CUSREP (Customs conveyance report message) - CUSCAR (Customs cargo report message) - GOVCBR(Government cross border regulatory message)

	importer/exporter -Government authority	• Packing lists • Commercial invoice • Price declaration certificate • Quarantine certificate • Phytosanitary certificate • Certificate of origin • Other relevant documents or records	- IFTMCS Instruction contract status message - DESADV Dispatch advice message - INVOIC Invoice message - PRIHIS Pricing history message - SANCRT International movement of goods governmental regulatory message **XML schemas:** - UBL 2.1 schemas: Bill of lading, waybill, packing list, invoice, certificate of origin - IATA XML waybill (XFWB),XML house waybill (XFZB) - IATA XML packing list (XPCL) - IATA XML invoice (XINV) - IATA XML certificate of origin (XCOO) - IATA XML Customs status notification (XCSN)
	Clear goods through Customs	Activities in Customs clearance, check the submitted documents and inspect cargo in the field	The International Convention on the Simplification and Harmonization of Customs Procedures (Kyoto), WCO
	Arrange for pick up	See "seaport/airport clearance"	See "seaport/airport clearance"
Export	Registration User: -Shipper, forwarder, importer/exporter -Government authority	**Submit:** • Application form for business registration numbers (foreign trade, Customs, quarantine, and taxation) • Identification certificate • Resident registration certificate • Cooperation registration certificate (office copy) • Other relevant documents or records **Obtain:** • Export licenses/permits	**UN/EDIFACT standard messages:** -REGENT Registration of enterprise message -PARTIN Party information message -MEDPID Person identification message
	Obtain Export Licenses/Permits	**Submit:** • Export permit application Form	**UN/EDIFACT standard messages:** -SANCRT International movement of goods governmental regulatory message

	User: -Importer/exporter -Government authority	• Sales report • Purchase order/sales contracts • Other relevant documents or records **Obtain:** • Business registration numbers	-SLSRPT Sales data report message -ORDERS Purchase order message -ORDRSP Purchase order response message **XML schemas:** -UBL 2.1 schemas: Contract notice, invoice
	Arrange transport	See "seaport/airport clearance"	See "seaport/airport clearance"
	Obtain cargo insurance User: -Importer/exporter, Shipper, forwarder -Insurance agency	**Submit:** • Cargo insurance application form • Business registration certificate • Letter of credit • Commercial invoice • Packing list • Draft bill of lading **Obtain:** • Insurance policy	**UN/EDIFACT standard messages:** -PARTIN Party information message -DOCADV Documentary credit advice message -INVOIC Invoice message -DESADV Dispatch advice message(or IFTMCA) -IFTMCS Instruction contract status message -IPPOAD Insurance policy administration message **XML schemas:** -UBL 2.1 schemas: invoice, packing list, bill of lading - IATA XML Invoice (XINV) - IATA XML Packing list (XPCL)
	Provide customs declaration User: -Shipper, forwarder, importer/exporter -Government authority	**Submit:** • Export declaration certificate • Export quota • Commercial invoice • Bill of lading or delivery order/airway bill • Packing list • Certificate of origin • Inspection and quarantine certificate, • Phytosanitary certificate • Export licenses/permits • Other relevant documents or records	**UN/EDIFACT standard messages:** CUSCAR (Customs cargo report message) CUSDEC (Customs declaration message) CUSREP (Customs conveyance report message) QUOTES Quote message INVOIC Invoice message IFTMCS Instruction contract status message DESADV Despatch advice message SANCRT International movement of goods governmental regulatory message **XML schemas:** - UBL 2.1 schemas: invoice, bill of lading, waybill, packing list, certificate of origin - IATA XML waybill (XFWB),XML house waybill (XFZB)

			- IATA XML Packing list (XPCL) - IATA XML Invoice (XINV) - IATA XML Certificate of origin (XCOO) - IATA XML Customs Status Notification (XCSN)
	Transport to export storage facility /bonded warehouse /CY	See “seaport/airport clearance”	See “seaport/airport clearance”
	Transfer to seaport/airport for departure	See “seaport/airport clearance”	See “seaport/airport clearance”
	Clear goods through Customs	Activities in Customs clearance, check the submitted documents and inspect cargo in the field	The International Convention on the Simplification and Harmonization of Customs Procedures (revised Kyoto), WCO
	Handle cargo and stow on vessel/aircraft	See “seaport/airport clearance”	See “seaport/airport clearance”
	Prepare documents for importer Actor: - Exporter, import - Government authority	**Submit:** • Phytosanitary certificate application form • Certificate of origin application form • Bill of lading • Commercial invoice • Letter of credit • Draft certificate of origin • Other relevant documents or records **Obtain:** • Phytosanitary certificate • Certificate of origin)	**UN/EDIFACT standard messages:** -SANCRT International movement of goods -- governmental regulatory message -IFTMCS Instruction contract status message -INVOIC Invoice message -DOCADV Documentary credit advice message **XML schemas:** -UBL 2.1 schemas: certificate of origin, bill of lading, invoice, - IATA XML Invoice (XINV) - IATA XML Certificate of origin (XCOO)

Seaport/airport clearance

The system allows users to submit documents such as cargo manifest, passenger list, crew list, and ship stowage plan to port authorities through internet link or system connection.

Most seaport/airport authorities have their own systems or may be part of Single Window facilities; users of those systems may be requested to use UN/EDIFACT standard messages or XML schemas, depending on whether these systems are EDI architecture or web service systems.

Implementers of logistics information systems should build up this function referring to the UN/CEFACT recommendations, international conventions, and formalities listed in Table VI-5.

Table VI-5. Recommendations Relevant for Establishing Seaport/Airport Function

Recommended procedures, international conventions, formalities
UN/CEFACT Recommendations • Rec. 1, UN Layout Key for Trade Documents • Rec.12 Measures to Facilitate Maritime Transport Documents Procedures • Rec.15 Simpler Shipping Marks • Rec.27 Pre-shipment Inspection • Rec.33 Recommendation and Guidelines on establishing a Single Window • Rec.34 Data Simplification and Standardization for International Trade • Rec.35 Establishing a Legal Framework for an International Trade Single Window
Revised IMO compendium on facilitation of electronic business, IMO
IATA Cargo Interchange Message Procedures Conversion Guidelines between Cargo-XML and CARGO-IMP
UN/ESCAP • Business Process Analysis Guide to Simplify Trade Procedures • Data Harmonization and Modeling Guide for Single Window Environment
Recommended data elements standards
UNTDED (ISO7372)
UN/CCL (Core Components Library)
WCO data model
UBL Common Library, OASIS
UN/ CEFACT Recommendations codes
Rec.3 ISO Country Code: Code for Representation of Names of Countries
Rec.7 Numerical Representation of Dates, Time and Periods of Time
Rec.8 Unique Identification Code Methodology -UNIC
Rec.9 Alphabetic Code for the Representation of Currencies
Rec.10 Codes for the Identification of Ships
Rec.16 UN/LOCODE: Code for Trade and Transport Locations
Rec.17 PAYTERMS: Abbreviations for Terms of Payment
Rec.20 Codes for Units of Measure Used in International Trade
Rec.21 Codes for Types of Cargo, Packages and Packaging Materials
Rec.23 Freight Cost Code-FCC; Harmonization of the Description of Freight Costs and other Charges
Rec.24 Trade and Transport Status Codes

Table VI-6. Example of a Seaport/Airport Clearance Process and Recommended Standards and Codes

Business process		Data and documents	Recommended standards and codes
Arrival	**Enter seaport/airport** User: -Shipping company -Port authority, terminal operator	**Submit:** • Arrival notification • General declaration • cargo manifest • passenger list • crew list • ship stowage plan • Dangerous goods notification • Certificate of insurance • IMO Certificate of fitness for LNG/LPG • Other relevant documents or records	**UN/EDIFACT standard messages:** -CALINF Vessel call information message -CUSREP Customs conveyance report message -CUSCAR Customs cargo report message -PAXLST Passenger list message -BAPLIE Bayplan/stowage plan occupied and empty locations message -IFTDGN Dangerous goods notification message -IPPOAD Insurance policy administration message -IMO FAL Form 1-7 **XML schemas:** - IATA XML House manifest (XFHL),XML Flight manifest (XFFM) - IATA XML Shippers declaration for dangerous goods (XSDG)
	Transport to import storage facility / CY /bonded warehouse User: -Warehouse, CY operator - Forwarder , Consignor/consignee,	Unloading from vessel: • Discharge instruction • Stowage instruction • Container stack information	**UN/EDIFACT standard messages:** -COPRAR Container discharge/loading order message -MOVINS Stowage instruction message -COEDOR Transport equipment stock and profile report message
	Customs declaration	See “Import/Export clearance”	See “Import/Export clearance”

	Arrange for pick up User: -Warehouse, CY operator - Forwarder, Consignor/consignee, inland haulage	• delivery order, D/O • Container load plan • Equipment interchange receipt	**UN/EDIFACT standard messages:** -IFTMCS Instruction contract status message -COSTCO Container stuffing/stripping confirmation message -CODECO Container gate-in/gate-out report message **XML schemas:** -UBL 2.1 schemas: bill of lading, packing list -IATA XML waybill (XFWB) - IATA XML packing list (XPCL)
Departure	**Arrange transport** User: -Shipping company -Shipper, forwarder	• Booking request • a delivery of empty container • Booking • Booking confirmation	**UN/EDIFACT standard messages:** -IFTMBP Provisional booking message -COREOR Container release order message -IFTMBF Firm booking message -IFTMBC Booking confirmation message **XML schemas:** - IATA XML Booking message (XFFR) - IATA XML Freight booked list (XFBL)
	Customs declaration	See "import/export clearance"	See "Import/Export clearance"
	Transport to export storage facility /bonded warehouse /CY User: -Warehouse, CY operator - Forwarder , consignor/consignee,	• Dock Receipt, D/R • Container load plan • Equipment interchange receipt • Discharge and loading details • Container stack information	**UN/EDIFACT standard messages:** -COPARN Container announcement message -COSTCO Container stuffing/stripping confirmation message -CODECO Container gate-in/gate-out report message -COEDOR Transport equipment stock and profile report message **XML schemas:** -UBL 2.1 schemas Bill of lading, packing list - IATA XML Shippers Letter of Instruction (XSLI)

	Transfer to seaport/airport for departure User: -Warehouse, CY operator -Port authority, terminal operator	Stow on vessel • Stowage instruction • Stowage report Submit to port authority: • General declaration • cargo manifest • passenger list • crew list • ship stowage plan • Dangerous goods notification • Certificate of insurance • IMO Certificate of fitness for LNG/LPG • Departure notification • Other relevant documents or records	**UN/EDIFACT standard messages:** -COPRAR Container discharge/loading order message -MOVINS Stowage instruction message -COARRI Container discharge/loading report message -TANSTA Tank status report message -BAPLIE Bayplan/stowage plan occupied and empty locations message -PAXLST Passenger list message -IFTDGN Dangerous goods notification message -IPPOAD Insurance policy administration message -IMO FAL Form 1-7 **XML schemas:** -IATA XML Shippers declaration for dangerous goods (XSDG)

Payment

The system should allow importers/exporters to perform electronic payment of duties, taxes and other transport related charges to Customs, tax bureau and port authorities etc. through internet link or system connection. Implementers of logistics information systems should build up this function referring to the UN/CEFACT recommendations, international conventions, and formalities listed in Table VI-7.

Table VI-7. Recommendations Relevant for Establishing Payment Function

Recommended procedures, international conventions, formalities
UN/CEFACT Recommendations • UN Rec. 1, UN Layout Key for Trade Documents • UN Rec.12 Measures to Facilitate Maritime Transport Documents Procedures • UN Rec.13 Facilitation of Identified Legal Problems in Import Clearance Procedures • Rec.22 Layout Key for Standard Consignment Instructions • Rec.31 Electronic Commerce Agreement • Rec.32 e-Commerce Self-Regulatory Instruments (Codes of Conduct) • UN Rec.33 Recommendation and Guidelines on establishing a Single Window
WCO • The International Convention on the Simplification and Harmonization of Customs Procedures (revised Kyoto), WCO • WCO Single Window Compendium
UN/ESCAP • Business Process Analysis Guide to Simplify Trade Procedures • Data Harmonization and Modeling Guide for Single Window Environment
Recommended data elements standards
UNTDED (ISO7372)
UN/CCL (Core Components Library)
WCO data model
UBL Common Library
UN/ CEFACT Recommended codes
Rec.3 ISO Country Code: Code for Representation of Names of Countries
Rec.5 Abbreviations of INCOTERMS: Alphabetic Code for INCOTERMS 2000
Rec.7 Numerical Representation of Dates, Time and Periods of Time
Rec.9 Alphabetic Code for the Representation of Currencies
Rec.16 UN/LOCODE: Code for Trade and Transport Locations
Rec.17 PAYTERMS: Abbreviations for Terms of Payment
Rec.20 Codes for Units of Measure Used in International Trade
Rec.23 Freight Cost Code-FCC; Harmonization of the Description of Freight Costs and other Charges

Customs will request for duty payment after receiving and examining the submitted declaration documents. Other possible payment requests during formalities, in accordance with applicable national regulations, can also refer to the processes and recommended standards in Table VI-8.

Table VI-8. Example of a Process and Recommended Documents and Standards

Business Process	Data and Documents	Recommendations Standards
Notify to pay duty for duties, taxes and other related charges User: -Government authority, Port authority -import/export, shipper	• Notice of Payment	**UN/EDIFACT standard messages:** - JUPREQ Justified payment request message **XML schemas:** -
Fulfill payment User: -import/export, shipper -Government authority, Port authority	• Payment Order • The receipt of duties and related taxes • Tax Invoice	**UN/EDIFACT standard messages:** - PAYORD Payment order message - REMADV Remittance advice message - VATDEC Value added tax message **XML schemas:** - UN/CEFACT XML Schema CrossIndustryInvoice_10p1.xsd --UBL 2.1 schemas Invoice, Remittance Advice - IATA XML Invoice (XINV)

Track and trace

The system should provide past and current locations and status of cargo, pallet and container in the process of multi-modal transport and end-to-end logistics. In order to allow users to query for information on the location of their consignments implementers can either build the function in the system or ensure connection or link to related authorities' systems, and also to the cargo tracking and tracing systems run by transport operators and carriers.

Tracking and tracing information can be obtained either by extracting it from data and documents transmitted among business partners or between business companies and Government authorities, or by query for status generated by business and authority systems.

Implementers of logistics information systems should build up this function referring to the following UN/CEFACT recommendations, international conventions, and formalities listed in Table VI-9.

Table VI-9. Recommendations Relevant for Establishing Track and Trace Function

UN/CEFACT Recommendations
Rec. 1, UN Layout Key for Trade Documents
Rec.15 Simpler Shipping Marks
Rec.18 Facilitation Measures related to International Trade Procedures
Recommended data elements standards
UNTDED (ISO7372)
UN/CCL (Core Components Library)
WCO data model
UBL Common Library
GS1/EPC Global: Core Business Vocabulary (CBV, ISO/IEC 19987)
Neal-Net: Dynamic Vessel Status Sharing Service – Vocabulary; Container Status Sharing Service – Vocabulary
UN/CEFACT Recommended codes
Rec.3 ISO Country Code: Code for Representation of Names of Countries (ISO 3166)
Rec.7 Numerical Representation of Dates, Time and Periods of Time (ISO 8601)
Rec.8 Unique Identification Code Methodology-UNIC
Rec.10 Codes for the Identification of Ships (IMO Ship Identification Number)
Rec.16 UN/LOCODE: Code for Trade and Transport Locations
Rec.19 Codes for Modes of Transport
Rec.24 Trade and Transport Status Codes
Rec.28 Codes for Types of Means of Transport
Recommended documents
UN/EDIFACT standard messages • IFTSTA International multimodal status report message • IFTSTQ International multimodal status request message • HANMOV Cargo/goods handling and movement message • CODECO Container gate-in/gate-out report message • CUSRES Customs response message • MEQPOS Means of transport and equipment position message
UBL 2.1 XML schemas • Transport Progress Status Request • Transport Progress Status • Transportation Status Request • Transportation Status
Other standards
GS1/EPC Global EPC Information Services Standard (EPCIS, ISO/IEC 19987)
NEAL-NET • Dynamic Vessel Status Sharing Service – Event Lists • Dynamic Container Status Sharing Service – Event Lists

Service

Based on the functions built within the logistics information system or on internet links to Government authorities or to third party service providers, the system should provide electronic transmission of all relevant business documents and information service throughout the logistics operation, including:

- Application and acceptance of submissions
- Exchange of documentations between buyers and suppliers
- Licenses information
- Common reporting scheme
- Transport service description
- Transport execution plan
- Cargo itinerary
- Transport progress status (about transport means)
- Transport status
- Reporting and statistics

Logistics information systems should be designed and implemented as single gateways that provide services to relevant stakeholders within the logistics industry. The systems should be capable of allowing user to fulfill all the requirements related to a logistics service at one stop, from submitting data and documents, applying for certain licenses and permissions, reporting for formalities, to requesting services. This can be done by providing services like *Application and acceptance of submissions*, *Exchange of documentations between buyers and suppliers*, *Licenses information*, and *Common reporting schema*.

- Application and acceptance of submissions

Business entities should be able to send instruction or request to their partners by electronic means via a web form on the internet.

- Exchange of documentations between buyers and suppliers

Business entities should be able to transmit their business documents in the format of XML schemas and EDIFACT messages.

Implementers of logistics information systems can fulfill services of *Application and acceptance of submissions*, *Exchange of documentations between buyers and suppliers*, by referring to the UN/CEFACT recommendation, international conventions and formalities, and international standards of data elements and documents and codes.

- Licenses information

Users should be able to apply or submit information such as Export License and other certificates issued by Government authorities to relevant authorities.

- Common reporting scheme

Users should be able to report formalities in electronic format and implement their transmission using a link to a Single Window facility.

Implementers of logistics information systems can fulfill services of *Licenses information, Common reporting scheme,* by referring to the UN/CEFACT recommendations,

international conventions and formalities, and international standards of data elements and documents and codes listed under "Function: Import/Export clearance (Table VI-3) and Function: Seaport/Airport clearance (Table VI-5)".

Logistics information systems mainly cover processes of transport planning and execution, tracking and tracing. The systems should be capable of providing services of information flow corresponding to the physical flow of goods, by performing the processes of *Transport service description*, *Transport execution plan*, *Cargo itinerary*, *Transport progress status*, and *Transport status*.

- Transport service description

It is a document that announces the availability of a transport service, usually sent by a transport service provider.

- Transport execution plan

It is a plan agreed between a transport user and a transport service provider meant to document the details surrounding the provision of a required transport service. Business entities can transmit this document to their partners.

- Cargo itinerary

Business entities can transmit the route and time schedule for one or more transported items to their partners; usually the transport service provider informs the transport user.

- Transport progress status (about transport means)

Business partners can report and collect information about the status of the transport means.

- Transport status

It is a document containing reports of transportation status or changes in status (events) shared among a group of participants.
Implementers of logistics information systems can refer to the UN/CEFACT recommendations, international conventions and formalities, and international standards and codes listed under Function: track and trace (Table VI-9).

Table VI-10. Example of a Transport Service Process and Recommended Documents and Standards

Business process	Data and documents	Recommendations standards
Define transport service demand User: -Shipper, consignor/consignee - Forwarder, transport company (each modes of transport)	• Request for transport service description • Transport service description	**UN/EDIFACT standard messages:** - REQDOC Request for document message - IFTSAI Forwarding and transport schedule and availability information message **XML schemas:** - UBL 2.1 XML schema: Transport service Description request, transport service description
Booking transport service - Forwarder, shipper, consignor/consignee - Transport company (each modes of transport)	• Request for transport plan • Transport plan • Goods item itinerary	**UN/EDIFACT standard messages:** - REQDOC Request for document message - IFTRIN Forwarding and transport rate information message - IFTMBP Provisional booking message **XML schemas:** - UBL 2.1 XML schema: transport execution plan request, transport execution plan; goods item itinerary
Transport and monitor - Shipper, consignor/consignee - Forwarder, transport company (each modes of transport)	• Request for transport status • Transport means and equipment status • Transport status	**UN/EDIFACT standard messages:** - IFTSTQ International multimodal status request message - IFTSTA International multimodal status report message - MEQPOS Means of transport and equipment position message - See other messages in “Function: track and trace” **XML schemas:** - UBL 2.1 XML schema: transport progress status request, transport progress status, transportation status request, transportation status **Others standards:** - GS1/EPC Global: EPC Information Services Standard (EPCIS, ISO/IEC 19987) -NEAL-NET: Dynamic Vessel Status Sharing Service – Event Lists; Dynamic Container Status Sharing Service – Event Lists

Logistics information systems should be capable to collect and publish logistics statistics for the use of public users by providing a service of *Reporting and statistics*.

- Reporting and statistics

Logistics related information and statistical data should be accessible to users in Logistics Information Systems.

To build this function up, implementers of logistics information systems can refer to the UN/CEFACT recommendations, international conventions and formalities, and international standards (data elements and documents) and codes as listed in Table VI-11.

Table VI-11. Recommendations Relevant for the Establishment of Reporting and Statistics Function

Recommended data elements standards
UNTDED (ISO7372)
UN/CCL (Core Components Library)
UN/CEFACT Recommended codes
Rec.3 ISO Country Code: Code for Representation of Names of Countries
Rec.5 Abbreviations of INCOTERMS: Alphabetic Code for INCOTERMS 2000
Rec.7 Numerical Representation of Dates, Time and Periods of Time
Rec.9 Alphabetic Code for the Representation of Currencies
Rec.16 UN/LOCODE: Code for Trade and Transport Locations
Rec.19 Codes for Modes of Transport
Rec.20 Codes for Units of Measure Used in International Trade
Rec.21 Codes for Types of Cargo, Packages and Packaging Materials
Rec.28 Codes for Types of Means of Transport
Recommended documents
GESMES Generic statistical message
RDRMES Raw data reporting message
CLASET Classification information set message

Data standards

The international standards recommended as reference for the implementation of data standards:

Table VI-12. Recommendations Relevant for the Implementation of Data Standards

UN/EDIFACT Messages	Standard messages are specified and listed in UN/TDID, issued by UN/CEFACT
UNECE Recommendations on Code	Standard codes are recommended in UN/CEFACT recommendation 3, 5, 7, 8, 9, 10, 16, 17, 19, 20, 21, 23, 24, 28.
UN/TDED and UN/CCL	Standard data elements and user code list are specified and listed in UN/TDED. Standard core components, business entities, data types are specified and listed in UN/CCL.
NEAL-NET	Standardized Vessel Schedule Status, Container Status, and query interface are specified in Neal-Net.
WCO Data Model	WCO Data Model contains business process model, information model, international standard codes, harmonized data sets, and XML schemes/messages.
WCO HS	Commodity code (Harmonized System) is specified in the *International Convention on the Harmonized Commodity Description and Coding System.*
IMO Vessel ID number	IMO Vessel ID number is described in UN/CEFACT Rec. 10.
IMO FAL Forms	IMO FAL Forms are standard FAL Forms, including "General Declaration", "Cargo Declaration", "Ship's Store Declaration", "Crew's Effects Declaration", "Crew List", "Passenger List", "DG Manifest".
IATA: Cargo IMP and Cargo XML	77 EDI messages widely used in the air cargo industry are specified in Message Specifications, including embedded data elements, abbreviation codes, and enhanced search function printing capabilities. Cargo XML is strongly recommended.
SWIFT	Standardized financial messages are defined by SWIFT (the Society for Worldwide Interbank Financial Telecommunication).
GS1/EPC Global	Standard XML events are specified in GS1 EPCIS (ISO/IEC 19987), and standard vocabulary elements are specified in GS1 EPCIS CBV (ISO/IEC 19987).
UBL	UBL consists of a library of XML schemas for data components such as "Address", "Item", and "Payment", and a set of XML schemas for common business documents such as "Order", "Dispatch Advice", and "Invoice".

Cooperation mechanisms

At national level, effective cooperation of Government agencies is fundamental for the implementation of logistics information systems. To support the process, it is important to have a designated agency leading the implementation, with the main role of coordinating all participating authorities and entities to ensure successful implementation.

Cooperation between Governments is paramount for the interconnection of their respective national logistics information systems to establish transnational/international systems. In such cases, the lead agencies from the participating countries will cooperate to implement and maintain the transnational/international platform. The cooperation may take the form of a regional mechanism with regular meetings of experts on various aspects related to the functioning and evolution of the platform.

To ensure the efficient functioning and continuous evolution of the system at both national and transnational/international levels, it is important to allocate sufficient resources: technical expertise, regular working meetings, allowing proactive, constant and regular exchanges between public and private sectors.

C. Important elements for consideration

1) Systems/data harmonization

Harmonization and mutual recognition of standards can enhance the availability and handling of information, simplify information flows between private partners and Governments and reduce compliance complexity by streamlining processes, avoiding redundant and conflicting standards. Effective and efficient logistics lead to overall cost reduction for all parties.

National formalities, procedures, operations and documents should be streamlined and aligned to improve interoperability among systems. Both the public and private sectors should adapt their respective existing systems to comply with international conventions, standards and practices.

At national level, different existing systems from both governmental and private sectors can be linked through a "bridging platform" to create single gateway accessibility. Similarly, such "bridging platform" can be developed to connect national logistics information systems from different countries to ensure international/transnational systems interconnectivity.

Systems/data harmonization implementation involves three broad phases:

- **Analytic framework:** *the first phase is dedicated to considering and developing a broad system framework by outlining target scenarios. Scope, roles and relationships of the scenarios should be identified and defined. Exchanges and collaborations with relevant Government and private sector stakeholders are strongly encouraged so differences between specificities and technicalities of all stakeholders can be identified and considered.*

- **Modelling business process and business rules:** *in the second phase, system developers/implementers should focus on the harmonization of business model, i.e. standardization of business processes and business rules.*

  A business process is a sequence of tasks/activities that contribute (directly or indirectly) to the added value of a service or product. A process can be cross functional and ranges over several business functions. Business rules are lists of statements describing the operations, definitions and constraints which can apply to people, processes, corporate behavior and information systems in an organization.

  Business rules are extracted from the business process and can define activities in a flexible and configurable way for adapting to rapidly changing business environments. A relatively stable business process and flexible business rules allow business modelers and implementers to modify the implementation of a business process more easily, without changing and redeploying it.

"Re-use" can be an efficient and simple way to implement a system or to create the basis for standardization. A set of business rules can be used to conduct standard components for reusable building blocks that allow participants in the supply chain to develop their information systems based on the same standard business process. Standardization of business processes and business rules also simplifies systems/data mapping, enabling the interoperability.

The main reference specifications and tools for modelling business and abstracting business rules are: UN/CEFACT UMM, WCO data model, UN/CEFACT Business Requirement Specifications (BRS) and Requirements Specification Mapping (RSM). Other tools, such as UML developed by international organizations, can also be used.

- **Standardization of information:** *the third level of harmonization involves the standardization of information model. An information model is a conceptual schema of a representation of concepts and the relationships, constraints, rules and operations to specify data semantics for a specific domain of application. It can provide consistent definition to the meanings and interrelationship of data based on semantic in order to share, integrate, and manage the data. Information model needs to be built to transform the work flow into data flow or data exchanges between activities.*

  Information modeling consists of definition of the scope, analysis of information requirements and the transformation of information requirements into a conceptual model. UML and XML schemas are recommended for building an information model.

2) Cooperation between standards setting organizations and industry

In designing, establishing and operating logistics information systems, it is important to consider the existing recommendations, standards and tools developed by intergovernmental agencies and international organizations such as UNECE, UNCTAD, the WCO, IMO, ICAO and the ICC. Cooperation with these organizations is also very important as it (i) ensures all those interested are aware of updates, and (ii) may create the possibility for some emerging regional standards such as e-Freight and NEAL-NET Standards to be incorporated into existing or new ISO and UN standards.

Collaboration between implementers and relevant stakeholders to harmonize standards is key in avoiding divergence or overlapping between national and transnational standards, benefiting all partners in international trade, logistics and supply chain.

ANNEXES

Annex I: Recommended Functions for National Logistics Information Systems

		China		Japan		Republic of Korea				Singapore			Transnational			
Functions	**Recommended national system**	**LOGINK**	**E-Port**	**Colins**	**NACCS**	**PORT-MIS**	**SP-IDC**	**GCTS**	**uTrade**	**PortNet**	**TradeNet**	**TradeXChange**	**E-Freight**	**NEAL-NET**	**ANNA**	**ASEAN Single Window**
User management:																
importers/exporters, shippers, customs brokers	x	x	x		x		x	x	x	x	x	x	x	x		
freight forwarders	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
warehouse operators	x	x		x	x	x	x		x			x				
carriers inc agents	x	x		x	x	x	x	x		x		x	x	x	x	
terminal operators	x	x		x	x	x	x			x		x	x	x	x	
Data interchange and messaging e.g. documents transmission, queries, messages	x	x	x	x	x	x			x	x	x	x	x	x	x	x
Standardizations e.g. data elements, code set, business doc, business process models	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
Imports/exports clearances e.g. customs, quarantine, trade control	link		x		x				x		x					x
Seaport/airport clearance inc. cargo and crew	link				x	x				x			x		x	
Payment :																
Customs duties, taxes etc.	link		x		x				x		x					
transport related charges	link					x				x						
Track and trace	link	x		x	x	x		x	x	x			x	x		
B2G	x	x	x		x	x			x	x	x	x	x		x	
B2B	x	x	x	x	x	x		x	x	x		x	x	x		
G2G	x	x	x			x			x			x			x	x
Statistical data and data information	x	x	x		x	x	x	x	x	x	x		x			
Note: M-All modes; A-Air; S-Sea; R-Road; W-Railway	M	M	M	S	AS	SW	M	SRW	M	S	M	M	A	M	S	M

Annex II: Overview of Data Standards Adopted

	China		Japan			Republic of Korea				Singapore				Transnational		
Data Standard	LOGINK	E-Port	Colins	NACCS	Logistics EDI	PORT-MIS	SP-IDC	GCTS	uTrade	PortNet	TradeNet	E-Freight	TradeXChange	NEAL-NET	ANNA	ASEAN Single Window
UN/EDIFACT: Messages				x		x		x	x	x	x		x		x	x
UNECE Recommendations: Code	x		x	x		x	x		x	x	x	x	x	x	x	x
UNTDED	x					x	x	x		x	x			x	x	x
NEAL-NET	x		x				x							x		
WCO Data Model		x		x					x		x				x	x
WCO HS		x		x		x	x		x	x	x	x	x	x	x	x
IMO Vessel ID number/DG Code	x	x	x	x		x	x	x		x			x	x	x	x
IMO FAL Forms		x		x		x			x	x					x	x
IATA: Cargo IMP and Cargo XML	x			x					x			x	x			
National standards	x	x			x	x	x	x	x		x		x			
SWIFT						x			x							
ISO: RFID and eSeal						x		x								
GS1/EPC Global	x		x				x						x	x		
ebXML				x		x				x		x	x		x	x
UBL				x												
For information:																
Uses EDI to collect information	x	x	x	x		x			x	x	x	x	x		x	

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