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Business requirements for end-to-end visibility of logistics flow

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Visibility of logistics traffic flow and finding the precise logistics information in a simple and trusted way are very important for the logistics processes in international trade.

However, the logistics data to be obtained by the logistics operator is often provided by several logistics information service systems (LISS) and other logistics and/or trade parties. Although international standards (such as UN/EDIFACT) have existed for decades and many national and regional systems have been implemented based on such international standards, LISSs are often developed in isolation and fragmentation based on their individual business requirements; and this has led to many different and non-interoperable interpretations of standard messages. In order to realize the visibility of logistics traffic flow, data from different LISSs should be interchanged with each other by using a standardized method to establish an LISS network.

This document specifies three business requirements of a future LISS network. The purpose of including the network architecture in this document is to support the business requirements of data exchanges between different LISSs on the application layer. Existing international standards ([Annex B](#)) can be reused in a standardized way and any gaps filled by new international standards where identified. This document is an important reference and guideline to related logistics parties such as LISS providers, single window/SSP operators, logistics data providers and logistics data users.

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Business requirements for end-to-end visibility of logistics flow

1 Scope

This document specifies three business requirements for the visibility of logistics traffic flow based on the use cases and gap analysis in [Annex A](#). It includes

- 1) LISS network architecture requirements,
- 2) visibility data interchange requirements between LISSs, and
- 3) visibility data interface and process requirements for an LISS network.

These three business requirements are described further in [Clause 6](#), [Clause 7](#) and [Clause 8](#) respectively.

Furthermore, [Clause 8](#) describes the requirement for a guideline for business participants and stakeholders in an LISS network such as logistics information service providers, single window/SSP operators, data providers and logistics data users.

This document does not include standardization

- 1) at the level of logistics devices (areas of standardisation covered by ISO/TC 104, ISO/TC 204),
- 2) for ships, navigation and marine technologies (areas of standardisation covered by ISO/TC 8), or
- 3) related to international data exchange such as standards developed, published and maintained by UN/CEFACT, GS1, WCO which are referenced as appropriate in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

UN/CEFACT Multi Modal High-Level Business Requirements Specification (BRS)¹⁾

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

¹⁾ This high-level BRS describes the requirements for a generic reference data model supporting the trade and transport-related processes involved in the cross-border supply chain and covering, at a high-level, the involved business areas, the main parties and the information involved. It provides the framework for any cross-border transport-related business and government domains to specify their own specific information exchange requirements whilst complying with the overall processes and data structures. Reference: https://www.unece.org/fileadmin/DAM/cefact/brs/BRS_T_L-MMT.zip.

3.1 logistics information service system LISS

trusted third party that provides the services of a platform for the electronic exchange of logistics information in the supply chain for increased efficiency and effectiveness

3.2 single window SW

facility that allows parties involved in trade and transport to lodge standardized information and documents with a single-entry point to fulfil all import, export, and transit-related regulatory requirements

Note 1 to entry: If information is electronic, then individual data elements should only be submitted once.

Note 2 to entry: See UN/CEFACT Recommendation 33 (currently under revision).

3.3 single submission portal SSP

portal that allows traders to submit all of the information related to a specific activity to a single electronic platform, which then redistributes the information to all participants within that portal

Note 1 to entry: A single submission portal differs from a *single window* (3.2) in that it can or cannot handle regulatory procedures and it can or cannot be the only portal within a market.

4 Abbreviated terms

API	application programming interface
B2B	business to business
B2G	business to government
CCS	cargo community system
G2B	government to business
LSP	logistics service platform
MEP	message exchange pattern
MMT RDM	multi-modal transport reference data model
MSME	micro, small and medium enterprise
OGA	other government agency
PCS	port community system
PPP	public-private partnership
SCRDM	supply chain reference data model

5 Business requirements overview

Based on the use cases and gap analysis in [Annex A](#), the three business requirements include:

- 1) logistics information service system network architecture requirements;

- 2) visibility data interchange requirements between LISSs;
- 3) visibility data interface and process requirements for an LISS network.

The major related business requirements for each use case and gap analysis are summarized in [Table 1](#).

Table 1 — Major related business requirements for each use case and gap analysis

Sub-clause	Use cases	Issues and gaps	Gap analysis	Business requirements		
				1)	2)	3)
A.1	Data connection between non-harmonised partners	The logistics information is disseminated and fragmented in the logistics chain, including both logistics status information and administrative data.	Global logistics information networks should be established to provide one-stop logistics information service. The reasons for the fragmentation need to be investigated as they are often commercial or international contractual reasons which technical solutions cannot solve alone.	Y		
A.2	Basic logistics data with non-harmonised technical and data format standards	It is difficult to form closed loop data link because of non-harmonised technical and data format standards.	It is vital to harmonize the differences of industry-level and country-level standards by providing solutions to achieve mutual recognition. The differences in terminology and data rules set by the international contractual conventions in the different modes of transport are a barrier which needs to be addressed.		Y	
A.3	Same logistics data query with different return information from different LISSs	For the same data query from user side, the required parameters and return information of LISSs are not in a simply and uniform way.	Uniform user management and authorization should be standardized for LISSs recognising the importance of harnessing international data standards.			Y
A.4	Public or private data connection	No clear rules and steps for public or private data connection.	Public/private authorization and management should be standardized to set up a trust and controlled LISS network.		Y	Y

1) Logistics information service system network architecture requirements

LISS networks should be multi-party connected logistics networks including national and regional LISS operators, national, regional single window/SSP operators, data providers and trade and data users.

Data connections should be established between national and regional LISSs to realize visibility of logistics flow geographic regions and multi-modal transport modes such as maritime, air, rail, road, inland water, etc. National and regional single window/SSP operators can connect to corresponding national and/or regional LISSs for data connections to an LISS directly and to other LISSs indirectly.

Data providers can share/obtain data to/from connected LISS directly and to/from other LISSs indirectly. Data users can obtain data from multi-LISSs directly or indirectly.

The detailed network architecture requirements are specified in [Clause 6](#).

2) Visibility data interchange requirements between LISSs

Data interchange should be neutral, trusted and controlled. Event data should be classified with regard to commercial and other data security considerations; and data security access levels should be specified for different entities linked to an LISS network in order to assure data owners that their data will at all times only be made available to parties they trust, that they themselves determine which data will be shown, and how, and that they can block access to this data at any time. Data owners should be able to maintain access control to their individual data ownership at all times.

The detailed visibility data interchange requirements are specified in [Clause 7](#).

3) Visibility data interface and process requirements for LISS network

Data interface and process should be open and based on unified user management and authentication. There should be a single way of working that is suitable for all modalities, large and small organizations, public and private-sector parties, bodies requesting data and those supplying it, and their software suppliers, so that data can be shared in a simple manner across the whole sector. As a result, logistics efficiency will be improved; time and costs will be saved.

The detailed visibility data interface and process requirements are specified in [Clause 8](#).

6 Logistics information service system network architecture requirements

6.1 Network architecture requirements overview

An LISS network should be a multi-party connected logistics network including national and regional LISS operators, national plus regional single window/SSP operators, data providers and data users. The network architecture of a LISS is shown in [Figure 1](#). In an LISS network, there are three roles:

- 1) LISS, the third-party logistics data service system, such as a port community system, a cargo community system etc.
- 2) Data providers, who provide the data to an LISS, such as port and sea data providers.
- 3) Data users, who access logistics data from LISS network, such as buyers, sellers and logistics agencies.

An LISS has its own data providers and data users, and the logistics data can be interchanged within the LISS area. Data connection can be established among LISSs. Furthermore, LISS can connect to national and regional single window/SSP to exchange government data. Single window/SSP has the major role of providing government data to LISS, such as custom clearance data. Therefore, data can be interchanged between LISS area to form a multi-party connected logistics network.

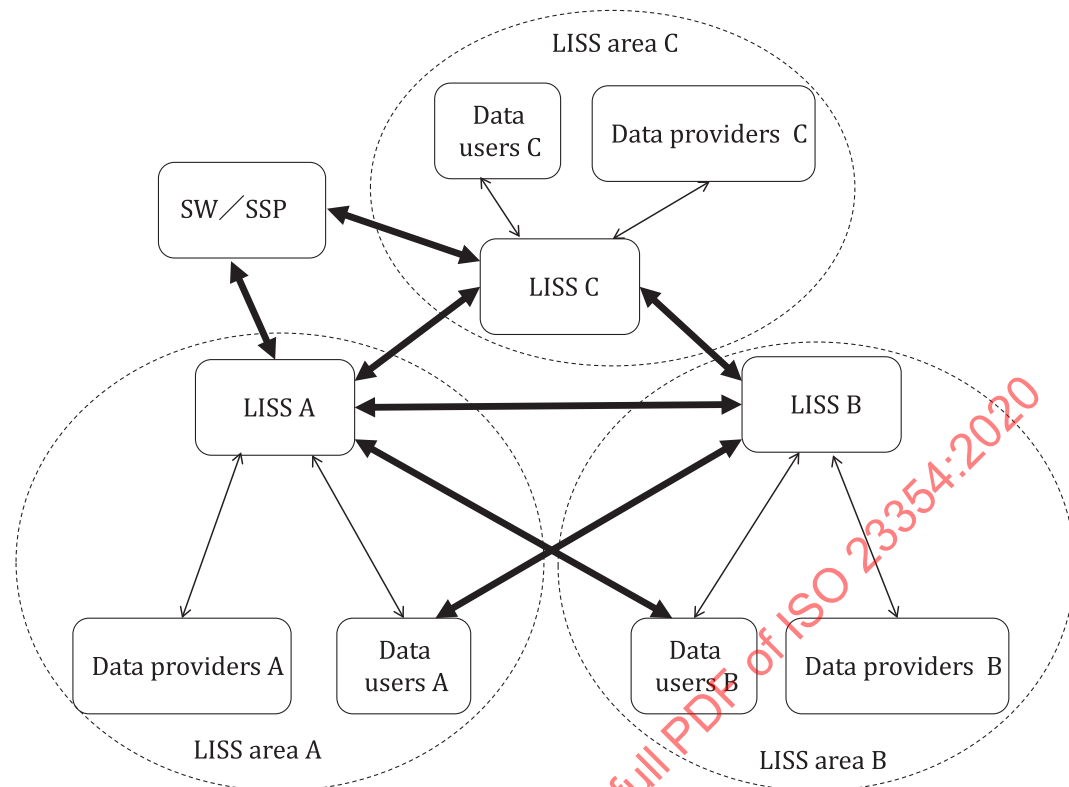


Figure 1 — Network architecture of a logistics information service system (LISS)

6.2 LISS network entities

6.2.1 Logistics information service system (LISS)

Most logistics information service systems (LISS) serve the entire logistics chain: maritime transport, land transport, warehousing to support international trade eBusiness and internet platform-based e-commerce sales transactions. Some LISSs also support administrative functions and provide information services relating to international trade regulations.

Data providers and data users can interact or exchange data with an LISS. Data can be interchanged between data providers and LISS. Besides, users can obtain specific data from LISS by exchanging messages between users and LISS.

Sometimes, users require data exchange from multiple LISSs. This can be enabled via a data communications connection (such as an APIs) between users and other LISSs. Similarly, data sharing among LISSs can be enabled, as well as B2G and G2B data interchanges between an LISS and a SW. Therefore, national or regional LISSs could enable data exchange among LISSs and SWs to establish a global logistics network.

The types of LISS include:

- Port community system (PCS)

A port community system is a neutral and open electronic platform enabling intelligent and secure exchange of information between public and private stakeholders in order to improve the competitive position of the sea and airports' communities (sometimes referred to as port user groups).

— Cargo community system (CCS)

A cargo community system is an information technology platform linked to the freight flows (import/export/transit) of any kind of cargo passing through identified port, airport, or multi-modal site(s) at a local or national level. A CCS is open to all parties involved in cargo freight and logistics including customs administrations. It handles a database in which information is collected, processed, stored and exchanged aiming to enhance freight optimization, trade safety and security, cargo tracking and tracing, and the facilitation of customs and administrative procedures.

— Logistics service platform (LSP)

A logistics service platform is an information technology platform that optimizes the logistics network to be more efficient and convenient. An LSP can provide smart logistics data analysis and visibility data track and trace, especially provide logistics service to micro, small and medium enterprises (MSMEs) by cooperation with logistics and transport companies.

6.2.2 Single window

Single window (SW) allows parties involved in trade and transport to lodge standardised information and documents. In this document, single windows have the major role of providing government data to LISS such as custom clearance data.

B2G and G2B data interchange can be enabled via the connection (such as APIs) between LISS and SW. It is an entry for national or regional LISSs interchange data outside.

6.2.3 Data providers

Data providers are the logistics data providers such as ports, airline and transport companies, who are authorized to provide the logistics data to LISS.

6.2.4 Data users

Data users are the logistics parties that are authorized to access logistics data from LISS network, such as buyers, sellers and logistics agencies involved in international trade. They can obtain the data via the connection (such as APIs) between LISS and users.

6.3 Network architecture requirement between different LISSs

The data provided by an LISS is national or regional, or limited to one transport method such as port data or air data. The data interchange between different national/regional LISSs should be established to provide the data service about visibility of logistics flow among multi-regions and multi-modal transport methods such as maritime, air, train, inland, etc.

6.4 Network architecture requirement between LISS and SW/SSP

Single window/SSP operators can share/obtain data to/from connected LISS directly and to/from other LISSs indirectly.

6.5 Network architecture requirement between LISS and data providers

Data providers can share/obtain data to/from connected LISS directly and to/from other LISSs indirectly.

6.6 Network architecture requirement between LISS and data users from other LISSs

Data users can obtain data from multi-LISSs directly or indirectly.

7 Visibility data interchange requirements between LISSs

7.1 Event data classification

The LISS network should classify the types of interchanged logistics data from different views:

1. Event data relating to the mode of transport i.e. to maritime, air, train, road, rail or inland waterway.
2. Event data relating to cargo and means of transport such as logistics status data or administrative data.
3. Event data relating to B2B, G2B, or B2G.

LISS systems typically have a wide array of data exchange stakeholders, e.g. governmental agencies, port community systems, import and export companies, manufacturers, and transport service providers etc. LISS systems need to satisfy their diverse needs. B2B, G2B and B2G data interchanges are therefore a usual part of the systems' daily operations.

Harmonized and standardized data sets and electronic messages incorporating international code standards are keys for effective and efficient B2B, B2G, G2B interchanges and information sharing. Thus, efforts shall be made to build better pipeline data exchange standards (PDES) i.e. the UN/CEFACT Multi Modal High-Level Business Requirements Specification (BRS) and the data pipeline project based on that specification shall be reused to support a more seamless flow of trade data.

4. Event data relating to public or private interests.

Most of the LISS systems are non-profit, neutral and open to both the public and private parties, such as government departments and enterprises involved in international trade. LISS systems can also provide public information services, such as statistical data reporting and relevant information on policies and regulations.

Private information is also stored in the LISS systems given that port community systems, 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.

The 5Ws (Whom, What, When, Where, Why) framework can be used to abstract all elements of different event data objects as shown below.

1. Whom: With whom to interchange information (Role definition).
2. What: What event object (also known as resource) such as vessel, vehicle, flight, train and cargo.
3. When: The occurrence or recording time of an event.
4. Where: The location details of where an event occurs.
5. Why: The type of an event and its reason where relevant (status condition and reason codes such as listed in UNECE Recommendation 24 - Transport and Logistics Status Code List).

Reported event examples include:

1. Vessel and Cargo events during maritime transport;
2. Vehicle and Cargo events during road transport;
3. Flight and Cargo events during air transport;
4. Train and Cargo events during railway transport;
5. Customs, Quarantine & Inspections and OGA during cargo clearance control processes.

7.2 Data control for different entities in the LISS network

For each data interchange event, a corresponding event data control process will be implemented by related two entities in the LISS network. Different entities in the LISS network can retrieve different types of event data based on the data control scheme. This will assure data owners that their data will at all times only be made available to parties they trust, that they themselves determine which data will be shown, and how, and that they can block access to this data at any time. Data owners shall be supported to maintain control at all times. Therefore, the data subset and the information key to access data should be clearly defined for each data interchange event. Multiple-level data sharing policies and data authorization mechanism should be used between different stakeholders in the LISS network.

8 Visibility data interface and process requirements for LISS network

8.1 Unified user management and authentication process requirements

8.1.1 Federation authentication among LISSs

Valid token information should be interchanged among LISSs. Mechanisms should be used for the federation authentication and synchronous communication between LISSs.

8.1.2 Enable users log in to multiple LISSs and query services by single sign-on

Mechanisms should be used for registration process, user token generation and authentication process among different LISS areas.

8.2 Open data access

An open data access scheme shall be specified to support multiple data access technical specification among LISSs. Request-response MEP (required parameter, query message, responding parameters, responding message) should be used for open data access. Multiple access technologies and standards can be used, such as JSON and Webservices. This requirement does not include batch data exchanges and only support for interactive cargo or conveyance visibility status queries.

9 Guideline for business participants and stakeholders

9.1 LISS operator

An LISS operator can have a single LISS or a networked organization of multiple LISS operators. There can be public LISS operators, private LISS operators or operators supporting both private and public LISSs. By being connected with other LISSs, optimized logistics data sharing services can be provided by networked LISS operators.

Public LISS operators can be of benefit to both government and businesses. They support governments to deploy their resources more effectively and efficiently, increasing integrity and transparency of administration and regulations processes, and enhancing security by supporting trusted trader schemes and traders' compliance. Benefits for legitimate businesses include faster clearance and release, cutting costs through reduced delays, increased visibility of supply chain data throughout the transport operations and improved transparency of rules and predictability of administrative procedures.

Government agencies cannot be the best option for running the operation of LISSs. It could be better to choose other parties as operators and service providers in which case a PPP mode could be considered. 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, LISSs could be entirely developed and operated by a selected semi-governmental organization while being funded by the government. Another possibility could be for government to open its information infrastructure

such as an interchange network and basic services to third parties so that they can build up their own LISSs to provide value-added services and to support supply chain operations.

9.2 Single window operator

A single window operator is an organization that has the legal responsibility for implementation and operation of a single window within a country or region and which operates the single window within that remit, whereby the single window allows parties involved in trade and transport to lodge standardised information (B2G) and to receive responses (G2B).

The government involvement should include:

1) Setting information standards

Government agencies should organize and coordinate all participants to clarify harmonised information requirements for the business process, information models and data exchange models. These harmonised standards should be set as national standards which as far as possible should be based on international standards ([Annex B](#)) for semantic concepts, data structures and codes. It should also be 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 the single window's system operation.

2) Establishing and managing the information system

An information infrastructure can be very costly and thus, often MSMEs 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 services, e.g. data interchange and information inquiry for users.

3) Initiation of data sharing

Companies are usually required by government departments to submit significant amount of information, e.g. details related to customs, transportation, and taxation etc., particularly in the case of cross-border international trade. In order to encourage stakeholders of both public and private parties to participate in facilitating the required business processes, relevant government departments should initiate projects to develop information systems such as Single Windows to simplify and harmonize procedures and standardize data flow on the government side. This improvement should lead to smoother processes and decreases in costs, which could benefit both the government and the business community.

9.3 Data providers

Data providers should provide related certified identification and any other information as required by the LISS, to ensure that the data they provide to the LISS are authorized and qualified.

9.4 Data users

Data users should provide related certified identification and other information as required by the LISS, to register in the LISS and request data from LISS network. The data can be used to track their cargo, package and vessels to improve their own business. It is presupposed that data users obey related rules about the data use and sharing.

Annex A (informative)

Use cases and gap analysis

A.1 Non-harmonised trading partner data

A.1.1 Issues and gaps

Logistics operators need to be informed about relevant events reported from other data sources in order to obtain the logistics information via maritime, air, railway, road, and customs, quarantine & inspections and OGA clearance processes etc. However, the real situation is as follows.

- 1) Non-harmonised trading partner data from different national countries and regions results in costly multiple different data connection interfaces having to be developed and maintained over time.
- 2) They can't find the relevant information service provider for acquiring specific required logistics data.
- 3) Some data information cannot be provided directly, and some specific cargo or conveyance visibility status data queries are not currently available. For example, a query relating to a specific container status by container identification number or master bill of lading (B/L) reference number could be provided, but cannot be available if only a house B/L (HBL) reference number is provided.
- 4) Regulatory related data services are also needed. For example, cargo can be released when it has been cleared by customs, and this is a key trigger event for logistics operations. Another example is that, the offloading of a container is a key trigger event for temporary storage.

The gap identified from this use case is that the logistics information is disseminated and fragmented across the logistics chain, including logistics status, supply chain shipment (trade delivery), consignment and administrative data. Understanding the relationships between these data sources with regard to data ownership and data structures are key to resolving these logistics challenges, as analysed by UN/CEFACT Buy/Ship/Pay (BSP) deliverables (the BPS Business Requirements Specification (BRS) and the BPS Reference Data Model (RDM)).

A.1.2 Gap analysis

Logistics data generated by different parties are largely unharmonized as far as semantics, data exchange structures and codes are concerned. Existing logistics information service providers (LISSs) are often developed in isolation, both on national and regional level. The logistics data required from a logistics operator cannot be provided totally by an LISS. Private data couldn't be obtained freely. This leads to different interpretations of standard messages.

For example, some of LISSs can provide only maritime or air tracking or custom clearance information. LISSs need to be connected into a network to realize multi-modal track and trace. For example, as it is shown in [Table A.1](#), by providing B/L, the whole container status information could be provided step by step: Empty Container Pickup, Train arrival, Cargo Stuffed to Container, Port Gate in, Unload.

Therefore, global logistics information network should be established to provide one-stop logistics information service, as specified by the UN/CEFACT Multi Modal High-Level Business Requirements Specification (BRS).

Table A.1 — Example of multi-modal transport track and trace

Items	Information
Required parameters	The number of B/L
B/L status	M/B, Carriers, From, To, Latest status, Time
Event information	Empty Container Pickup, Train arrival, Cargo Stuffed to Container, Port Gate in, Unload
Detailed information	H/B, Logistics Status, Locations, Time, Transport mode
Key B/L Bill of lading M/B Master bill of lading H/B House bill of lading NOTE Event information is the new logistics states information changed in each node.	

A.2 Basic logistics data with non-harmonized technical and data format standards

A.2.1 Issues and gaps

The logistics data obtained by the logistics operator is often provided by several LISSs and other logistics related parties. The data provided by each logistics party needs to be collated and therefore needs to be clarified and recognized in a uniform format. However, LISSs are often developed in isolation and this leads to different interpretations of standard messages.

The gap identified from this use case is that it is difficult to form closed loop data link because of non-harmonised technical and data format standards.

A.2.2 Gap analysis

This use case reflects the issues of standardization and mutual recognition. 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 and localised information systems and code lists. These have traditionally lacked international synergy with regard to the harmonised 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. It is over time improved; for example, it is largely only customs administrations that are harmonising their data exchange specifications based on the WCO data model.

Efficient and seamless data supply chains are important to all parties involved in international trade. Supply chain partners need to interchange business documents and relevant data with each other across the world. They are legally obliged to submit large volumes of information and documents to different governmental stakeholders 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. For example, the UN/CEFACT Multi Modal High-Level Business Requirements Specification (BRS) offers the potential to support the:

- elimination of modal data and terminology differences,
- harmonization of cross-industry trade data, and

- c) matching (mapping and aligning) of the data structures, terminology and data/message structures between the trade and government sides of a Single Window.

A.3 Same logistics data query with different return information from different LISSs

A.3.1 Issues and gaps

The logistics operator often requests the same data requirements from different LISSs, but the required data that the logistics operator has been asked to provide are interpreted differently with the result that the returned information provided by different LISSs are not harmonised and cannot be combined.

For example, as shown in [Table A.2](#), the logistics operator can request a dynamic vessel position status from LISS A and LISS B.

For LISS A, the logistics operator could provide Port Call ID, IMO Vessel and ETD, Vessel Name and ETA, but for LISS B, the logistics operator could only provide Vessel Name, Vessel Call Number and Port ID (UNLOCODE).

In this case, only 6 pieces of data are provided in common and the rest of the 14 requested data elements are provided differently.

Another example is shown in [Table A.3](#). The logistics operator requests a container status from LISS A and LISS B.

For LISS A, the logistics operator could provide Container Number and B/L Number, or Container Number and Vessel Booking Number, but for LISS B, the logistics operator could only provide Container Number or B/L Number, Port Code.

In this case, 8 pieces of returned data are provided in common, and the rest of the 19 requested data elements are provided differently.

The gap identified for this use case is that, for the same data query from the user side, the requested data elements and return information of LISSs are not harmonised.

Table A.2 — Return information comparison (dynamic vessel status)

Items	LISS A	LISS B	Same return	Different return
Name	PORTCALL_INFO: Vessel tracking information	NEAL-NET Dynamic vessel status	/	/
Data format	JSON	XML	/	/
Required parameter	Port Call, or IMO Vessel and ETD, Vessel Name and ETA	Vessel Name or Vessel Call Number Port number	/	/
Key ETA Estimated time of arrival ETD Estimated time of departure RTA Returned time of arrival RTD Returned time of departure				

Table A.2 (continued)

Items	LISS A	LISS B	Same return	Different return
Return information	Port Code Vessel Name IMO Number ETA ETD Carrier (SCAC code)	Port Code Vessel Name IMO Number ETA ETD ShippingCompanyCode Event Time Record Time EventTimeZoneOffset ActionTypeDescription Voyage Number CourseLine CyOpenDateTime CyCutDateTime LastPortCode NextPortCode JobOrderStatusCode	6 Carrier includes ShippingCompany-Code	/
	RTA RTD Port Call		/	14
Service type	Query, subscription, unified certification	Query, unified certification	/	/
Key ETA Estimated time of arrival ETD Estimated time of departure RTA Returned time of arrival RTD Returned time of departure				

Table A.3 — Return information comparison (container status)

Items	LISS A	LISS B	Same return	Different return
Name	PORTCALL_INFO: Container information	NEAL-NET Container status	/	/
Data format	JSON	XML	/	/
Required parameter	Container Number and B/L Number, or Container Number and Vessel Booking Number	Container Number or B/L Number, Port Code	/	/

Table A.3 (continued)

Items	LISS A	LISS B	Same return	Different return
Return information	Port Code Container Number B/L Number Gate In Time, Gate Out Time, Loaded Time, Discharged Time Empty (Y/N) Gross Weight/Net Weight Equipment Type Main Carrier (SCAC code)	Port Code Container Number B/L Number Event Time ContainerLoadingStatus ContainerGrossWeight ContainerSizeType ShippingCompanyCode	8 LISS A divide Event Time into four parts (Gate In Time, Gate Out Time, Loaded Time, Discharged Time). Main Carrier includes shippingcompany-code	/
	Port Call Vessel Booking Number Dangerous Goods(Y/N) Transshipment (Y/N) Customs Status Customs Clearance Date Empty Delivered Time Inbound transport type Inbound transport name Outbound transport type Outbound transport name	ActionTypeDescription JobOrderStatusCode Record Time EventTimeZoneOffset VoyageNumber IMO Number ContainerSealNumber ContainerOperatorCode Vehicle License Plate Number	/	19 LISS A has more customs data
Service Type	Query, subscription, unified certification	Query, unified certification	/	/

A.3.2 Gap analysis

Different LISSs have individual limitations on the logistics data they can provide. Even if the basic logistics data could be based on harmonised international data standards, i.e. the UN/CEFACT Multi Modal High-Level Business Requirements Specification (BRS), the requested data elements, which can be returned, are often different in each case because of, but not limited to, the following aspects:

- LISS's different capabilities regarding the data that they can provide;
- LISS's users' diverse requirements;
- impact of national or regional legal requirements and policy;
- diversity of public/private data rules for business profit.

On the user side, uniform baseline and standardization is needed to support their LISS user experience and end-to-end supply chain data visibility. Diversity will almost certainly still exist between LISSs but could become much more uniform from the user perspective.

Therefore, uniform user management and authorization should be standardized for LISSs.

A.4 Public or private data connection

A.4.1 Issues and gaps

LISSs and original data owners worry about whether they have complete control of their own data during any data sharing processes. They will need to control their own data especially to whom it can

be shared and how this is achieved. Even for the regulatory data, the owners will also want to know every detail of any data sharing.

On the user side, open and neutral data sharing schemes are very important. They need to be aware of which data is public and which data is private and whether the data can be trusted including who was the source of the data. Furthermore, for the private data, clear rules and steps for obtaining the data should be clearly defined and agreed between the relevant partners.

The gap identified from this use case is that there are currently no clear rules and steps for public or private data sharing. It might be addressed by the emerging blockchain technology implementations potentially.

A.4.2 Gap analysis

The different LISSs have different service capabilities related to data information sharing. Different users need to have different access rights allocated for specific data information. Therefore, public/private authorization and management should be standardized to set up a trust and controlled LISS network.

A.5 Summary of use cases and gap analysis

Use cases and gap analysis based on above sections are summarized in [Table A.4](#).

Table A.4 — Summary of use cases and gap analysis

Sub-clause	Use cases	Issues and gaps	Gap analysis
A.1	Data connection between non-harmonised partners	The logistics information is non-harmonised and fragmented across the logistics chain, including trade and logistics status information as well as regulatory and administrative data.	Global logistics information network should be established to provide one-stop logistics information service and this should be based on multi-modal, cross industry global data and message standards which support the complete cross-border supply chain and logistics processes, i.e. the UN/CEFACT Buy/Ship/Pay reference data model and its children the SCRDM (supply chain) and the MMT (Multi Model Transport) RDM.
A.2	Basic logistics data with non-harmonised technical and data format standards	It is difficult to form closed loop data link because of non-harmonised technical and data format standards.	It is vital to harmonize the differences of industry-level and country-level standards by providing solutions to achieve mutual recognition and this should be based on multi-modal, cross industry global data and message standards which support the complete cross-border supply chain and logistics processes. The differences in terminology and data rules set by the international contractual conventions in the different modes of transport are a barrier which needs to be addressed.
A.3	Same logistics data query with different return information from different LISSs	For the same data query from user side, the required parameters and return information of LISSs are not in a simply and uniform way.	Uniform user management and authorization should be standardized for LISSs recognising the importance of harnessing international data standards.

Table A.4 (continued)

Sub-clause	Use cases	Issues and gaps	Gap analysis
A.4	Public or private data connection	No clear rules and steps for public or private data connection.	Public/private authorization and management should be standardized to set up a trust and controlled LISS network. It might be addressed by blockchain.

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Annex B (informative)

Related standards and organizations

B.1 Key challenges for the standardization

1) Legacy software and institutions

There are many different systems and software that are widely used by the public and private sectors.

The harmonization and simplification of data and documents used by different participants in their legacy systems is one of the biggest challenges for automated data interchanges. Its principal focus is on facilitating national and international transactions, through the simplification and harmonization of processes, procedures and information flows, and so contributing to the growth of global commerce. This is achieved by:

- analysing and understanding the key elements of international processes, procedures and transactions and working for the elimination of constraints;
- developing methods to facilitate processes, procedures and transactions, including the relevant use of information technologies;
- promoting both the use of these methods, and associated best practices, through channels such as government, industry and service associations;
- coordinating its work with other international organizations including UN/CEFACT, the World Trade Organization (WTO), the World Customs Organization (WCO), the Organization for Economic Co-operation and Development (OECD), the United Nations Commission on International Trade Law (UNCITRAL) and the United Nations Conference on Trade and Development (UNCTAD), notably in the context of a Memorandum of Understanding for a Global Facilitation Partnership for Transport and Trade;
- securing coherence in the development of standards and recommendations by co-operating with other interested parties, including international, intergovernmental and non-governmental organizations. In particular, for UN/CEFACT standards, this coherence is facilitated by cooperating with the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), the International Telecommunication Union (ITU) and selected non-governmental organizations (NGOs), especially in the context of the ISO/IEC/ITU/UNECE Memorandum of Understanding (MoU). These relationships have been established and maintained in recognition of the broad application that UN/CEFACT work has in areas beyond global commerce and the key objectives of interoperability between applications and the ability to support multilingual environments.

Replacing existing systems require considerable investment and therefore, cost-benefits ratio should be carefully considered. Although sometimes it is necessary to replace these systems, they are often well-established and working well which means that 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 or 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 is inevitable to develop a methodology to migrate the existing data exchange structures and adapt these to the international standards.

2) Lead agency issues

National and regional logistics information systems (LISSs) and single windows are information aggregation platforms for trade and transport operations. Any leading agency plays a vital role in coordinating with participating stakeholders to ensure effective system's operation. A lead agency should be government appointed considering legal, political and organizational aspects within the respective country or region plus its technical capability to lead the establishment and operation of the proposed system.

Customs or port community systems can be appropriate to lead development and implementation of LISSs or single windows/SSPs, given that these agencies are the entrance points to receive and coordinate the flow of information related to the regulatory and business requirements.

A 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.

3) Data confidentiality

Data confidentiality and transmission security are core elements in both domestic and cross-border 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 the protection of personal data privacy and business data confidentiality in transnational environments. In this respect, the adoption of international legal standards and best practice are essential.

4) Input language

Cross-border and international logistics information systems involve the use of different languages. To ensure smooth and accurate data interchange and information sharing, it is recommended to use English in all transaction to avoid inaccurate translation to/from different languages.

Besides, there is another issue of supporting different time zones when exchanging dates and times. This is a particular challenge for any XML standards, which adopt the W3C DateTime schema data type, which includes a mandatory requirement for a time to be specified. In maritime this is an issue when times are not available and midnight is specified as a dummy time value to satisfy this W3C syntax requirement. Such a dummy value can cause an incorrect interpretation at the receiving end when a message is sent from one time zone to another. One recommendation is to use the ISO 8601-1 date time representation formats, which include time zone information provided in a string data type.

This challenge is completely avoided and overcome in the UN/CEFACT and WCO XML naming and design rules by using string data types for date/times so that the UN/CEFACT code list (UNECE Recommendation 7) which codifies ISO 8601 (all parts) aligned date time formats as deployed in UN/EDIFACT.

B.2 Related international standards and codes

LISS network should be based on the use of existing IT Infrastructure. Related international standards and codes include ISO, UNECE Recommendations, UN/CEFACT Reference Data Models, UN/XML, UN/EDIFACT, UNTDED, IMO ID number/call sign, IMO FAL, GS1/EPC Global, UBL, etc.

The related standards and gap analysis can be shown in [Table B.1](#) and [Table B.2](#).

Table B.1 — The related standards and gap analysis in ISO

ISO TCs	Related projects	Gap analysis	Conclusion
ISO/TC 104 Freight containers www.iso.org/committee/51156.html	ISO 9897 (all parts): Freight containers — Container equipment data exchange (CEDEX) ISO/TS 18625:2017: Freight containers — Container Tracking and Monitoring Systems (CTMS): Requirements	TC 104 focuses on the data exchange functions of container equipment including the movements and management of empty containers and doesn't include the data exchange between different logistics data information systems.	No overlap
ISO/TC 204 Intelligent transport systems www.iso.org/committee/54706.html	ISO/TS 24533:2012: Intelligent transport systems — Electronic information exchange to facilitate the movement of freight and its intermodal transfer — Road transport information exchange methodology ISO 15638 (all parts): Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV)	TC 204 focuses on the communication and transfer technologies for specific logistic related equipment (such as freight vehicles), doesn't include how to realize the data exchange between different logistics data information systems.	No overlap
ISO/TC 8 Ships and marine technology www.iso.org/committee/45776.html	ISO 28005-1:2013: Security management systems for the supply chain — Electronic port clearance (EPC) — Part 1: Message structures ISO 28005-2:2011: Security management systems for the supply chain — Electronic port clearance (EPC) — Part 2: Core data elements	TC 8 focuses on the ships, navigation and marine technologies themselves, doesn't include the data exchange between different logistics data information systems.	No overlap
ISO/IEC JTC 1 Information technology www.iso.org/committee/45020.html	ISO/IEC 19845:2015: Information technology — Universal business language version 2.1 (UBL v2.1)	UBL can be a reference for the data exchange process	No overlap, Reference