
**Intelligent transport systems —
Electronic information exchange to
facilitate the movement of freight and
its intermodal transfer — Governance
rules to sustain electronic information
exchange methods**

*Systèmes intelligents de transport — Échange d'informations
électroniques pour faciliter le mouvement du fret et son transfert
intermodal — Règles de gouvernance pour soutenir les méthodes
d'échange d'informations électroniques*



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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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.

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

This second edition cancels and replaces the first edition (ISO/TS 17187:2013), which has been technically revised.

The main changes compared to the previous edition are as follows:

- [Clause 7](#) and [Annexes A](#) to [D](#) have been updated to include ISO 19845:2015 (UBL 2.1);
- subclause [7.4](#) has been updated for Freight-X document exchange standards;
- subclause [7.5](#) has been updated for Freight-X communication exchange standards.

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

Electronic commerce offers new opportunities to improve the efficiency of business operations and to reduce costs associated with trade procedures, providing increased competitive advantages to the commercial actors ready to embrace new methods of work and trade. Emerging electronic commerce platforms and the use of the internet provide users with a combination of technologies to communicate data, to contract electronically, as well as to manage new business processes leading to new business models.

Improved information sharing among supply chain partners is one of the key business objectives which enable the participants to improve their operational efficiency and optimize their enterprise resource allocations. Due to the existence of heterogeneous IT environments among supply chain partners, it is a challenge for the implementer to seamlessly integrate information from multiple data sources and in different data formats. Each data source is typically designed for a single, stand-alone purpose within an enterprise, not to be part of an integrated data collection. These disparate data repositories tend to be silos, independent of one another, and not working well together. Business entities wishing to engage with other business partners to facilitate certain standards of practice for information interchange will need to abide by certain rules, otherwise the efficiencies sought using the methodologies in this document will be diminished.

Within this context, and within this document, governance is defined as being the rules, processes, and behaviour that affect the way in which powers are exercised, particularly as regards openness, participation, accountability, effectiveness, and coherence. As discussed in ISO/TS 24533, there needs to be a governance process to tie loose ends together and allow the supply chain partners to keep their data exchange standards viable and effective. Governance is key to this process of maintaining the structures that allow for a high degree of supply chain productivity and for holding together the community partnerships that make such an arrangement economically advantageous. A governance specification is critical to making the process described in this document effective. There is an expectation that this document will provide the guidance that will keep the supply chain standards viable and useful for the community of users wishing to maximize their returns on investment.

The processes and process tools include web services technologies to improve the operating efficiency, safety, and security of freight movement. These technologies are used for sharing information between supply chain partners in a commonly understood manner by capturing it only once and sharing it many times, and by giving all partners the same view of the data.

A service-oriented architecture leverages the web services functionality and necessitates the requirement for data exchange standards. These tools hinge on the successful definition and adoption of data standards published in open and accessible forums. The advantages of using information technology tools are undeniable and their use is now widespread across industry. The freight transport and logistics industry is no exception with all businesses using e-business to some extent.

This document does not address liability of any kind as this is considered within the domain of each participating party. However, liability issues can be lessened by following the tenants of this document as a result of cooperating partners actively managing the data and communication transfer protocols.

Intelligent transport systems — Electronic information exchange to facilitate the movement of freight and its intermodal transfer — Governance rules to sustain electronic information exchange methods

1 Scope

This document provides governance rules to be used for executing an organized process for business entities to connect to one another electronically for the conduct of electronic trade in a secure and open environment through a standardized framework for information exchange. This standardized framework includes processes and process tools to ease connections between trading partners, to provide full visibility, and to reduce the time goods spend in transit. The application of these rules and attendant standards and technology applications are expected to allow business entities to engage their legacy systems without the cost of upgrades.

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.

ISO/IEC 19845:2015, *Information technology — Universal business language version 2.1 (UBL v2.1)*

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/>

3.1

bill of lading

document which evidences a contract of the carriage and the taking over or loading of the goods by the carrier, and by which the carrier undertakes to deliver the goods against surrender of the document

Note 1 to entry: A provision in the document that the goods are to be delivered to the order of a named person, or to order, or to bearer, constitutes such an undertaking. The document has the following functions: 1) a receipt for goods, signed by a duly authorized person on behalf of the carriers, 2) a document of title to the goods described therein, 3) evidence of the terms and conditions of carriage agreed upon between the two parties.

[SOURCE: ISO/TS 24533:2012, 2.5]

3.2

carrier

person or organization, which owns and/or operates a transport means, engaged in the transportation of passengers or property by land, rail, air or water

[SOURCE: ISO/TS 24533:2012, 2.7]

3.3
consignee
receiver

person or company to whom goods are shipped

[SOURCE: ISO/TS 24533:2012, 2.11]

3.4
consignor
shipper
transport service buyer

party which, by contract with a carrier, consigns or sends goods with the carrier, or has them conveyed by him

Note 1 to entry: It is the party that gives instructions for the transportation services required for a consignment of goods.

[SOURCE: ISO/TS 24533:2012, 2.13, modified — The third term “transport service buyer” has been added and Note 1 to entry has been added.]

3.5
customs broker

party that is licensed to enter and clear goods through customs

Note 1 to entry: The responsibilities of a broker include preparing the entry form and filing it, advising the importer on duties to be paid, advancing duties and other costs, and arranging for delivery to the importer.

3.6
forwarding instructions

document issued to a forwarder, giving instructions regarding the action to be taken for the forwarding of goods described therein

Note 1 to entry: See [Clause A.1](#).

3.7
freight forwarder
transport service provider

party arranging the carriage of goods, including connected services and/or associated formalities, on behalf of a consignor or consignee

Note 1 to entry: It is the party that is contracted to provide the transportation services.

[SOURCE: ISO/TS 24533:2012, 2.25, modified — The second term “transport service provider” has been added and Note 1 to entry has been added.]

3.8
Freight-X

system through which the national and international freight communities' demand for and supply of electronic business services to support freight operations is directed and controlled

EXAMPLE The Electronic Freight Management (EFM) programme in the US; the eFreight programme and its affiliates in Europe.

3.9
Freight-X community
Freight-X participant
Freight-X user community

community of organizations that has formally agreed to collaborate to operate using the principles defined in this document by joining a Freight-X consortium

3.10**Freight-X community provider**

organization that implements mechanisms for managing demand and supply of available Freight-X services supporting freight transportation management operations

3.11**Freight-X consortium**

organizations that have formally agreed to form a formal association which has established rules and governance procedures to collaborate to operate using the principles defined in this document

3.12**Freight-X community provider agreement**

formal agreement by Freight-X community provider in respect of representation rights, access to specifications and services, data and document provision, specification, management, and access and maintenance

3.13**Freight-X governance****Freight-X governing body**

system through which national and international freight communities' demand for and supply of electronic business services to support freight operations is directed and controlled

3.14**Freight-X message profile**

specification of how one or more Freight-X business processes are executed by specifying the Freight-X business rules governing its business collaborations and the information content of the electronic business transactions exchanged

3.15**Freight-X service**

web service created specifically to address business processes related to electronic freight management

EXAMPLE Receive order; confirm booking; obtain status.

3.16**Freight-X specifications**

explicit set of requirements to be satisfied by Freight-X

3.17**friends of the shipment**

collection of parties whose role in a particular shipment has been established and documented in the Freight-X registry enabling access to the shipment information

3.18**governance**

rules, processes, and behaviour that affect the way in which powers are exercised, particularly as regards openness, participation, accountability, effectiveness, and coherence

3.19**level of service**

measure to determine the effectiveness of elements of the Freight-X transportation infrastructure

3.20**logistic service provider**

party providing logistic services such as warehousing, repacking products, distribution, and assembly

EXAMPLE Third-party logistic provider; container freight station.

3.21

message profile

content of the electronic business transactions exchanged described with an aim to function as part of a formal agreement

3.22

packing list

document stating the distribution of goods in individual packages, such as shipping document issued by shipper to carrier, customs and consignee serving the purposes of identifying detail information of package count, products count, measurement of each package, and weight of each package

3.23

small and medium-sized enterprises

SMEs

entities engaged in an economic activity, irrespective of their legal form, that are characterized by a number of employees, an annual turnover, and/or an annual balance sheet which fall below established limits

3.24

terminal operator

party with operational responsibilities at origin or destination nodes for freight transport journeys

Note 1 to entry: The responsibilities can include overseeing the unloading of goods, checking the quantity of goods against the manifest, transferring of the goods, checking documents and authorizing a carrier to pick up goods.

3.25

transport status document

document issued on individual specific request or through an agreed status reporting procedure by a freight forwarder to communicate to the consignee or consignor or notify party the status of shipments that are currently under the freight forwarder's management

3.26

waybill

document issued by the party that provides the physical transportation services to the party that gives instructions for the transportation services (i.e. shipper, consignor)

Note 1 to entry: A waybill states the details of the transportation, charges, and terms and conditions under which the transportation service is provided. Unlike a bill of lading, a waybill is not negotiable and cannot be assigned to a third-party transport document describing a shipment. It states the instructions for the beneficiary and can contain the details of the transportation, charges, and terms and conditions under which the transportation service is provided.

4 Abbreviated terms

BBIE	Basic business information entity
BIE	Business information entity
CCT	Core component type
CCTS	Core Components Technical Specification
ebXML	Electronic Business Extensible Markup Language
ESB	Enterprise Service Bus
ICT	Information and Computer Technologies
RBAC	Role-based Access Control

SOA	Service-Oriented Architecture
UBL	Universal Business Language
UDDI	Universal Description Discovery and Integration
XML	Extensible Markup Language
XSD	XML Schema Definition (language)

5 Freight-X governance

5.1 General

Governance of Freight-X is defined as the system through which the national and international freight communities' demand for and supply of electronic business services to support freight operations (referred to as Freight-X) is directed and controlled.

Governance involves directing and evaluating the implementation and operations of Freight-X communities among collaborating organizations and monitoring its employment to achieve planned business objectives. It includes the strategy and policies for using Freight-X among those collaborating communities. For example, governance controls would ensure that changes to Freight-X Profiles are minimal, reached by consensus, and driven by strong business needs.

5.2 Strategic governance requirements

Strategic governance requirements include the following:

- a standardized governance model for all Freight-X implementations based on collaborative levels of responsibilities;
- a recommended implementation process within a community of users, identifying the relationships between all parties to the governance model and the cooperation needed between them to realize the full benefits of adoption. Full benefits will be realized when Freight-X best practices are adopted by all supply chain partners. It is critical that partners serving multiple shippers, like forwarders and brokers and logistics firms adopt Freight-X and perpetuate it with partners in other supply chains to further spread the benefits;
- each Freight-X community to adopt Freight-X profiles (and related standards) that not only promote integration with other services but also capture data coherence and semantic consistency of the information between these services. A Freight-X profile should:
 - identify core set of information bundles,
 - identify how you communicate the information bundles to your partners,
 - include generic rules and procedures for refining a tool for use within your organization, and
 - can include code lists and message schemas;
- to keep the Freight-X standards in a form that will not be altered without the user community's consent. This will also ensure the proper operation and utilization of the standard set of messages for all future adopters;
- a standards-based coherence model that can also be used to pre-qualify incoming participants and set required levels of engagement as dictated by the governance model;
- the Freight-X governance model can be promoted as an international trade facilitation framework standard (similar to initiatives such as "single window", which is the implementation of a single

window system that enables international (cross-border) traders to submit regulatory documents at a single location and/or single entity).

5.3 Management

This open community model covers the policies, systems, and procedures laid down to guide the development and operations of Freight-X communities.

5.4 Ownership

Freight-X shall, to the extent possible, be implemented using an open-source solution and shall not rely on any third-party, proprietary solution that requires purchase of software licenses by the deploying party.

5.5 Central services/registry

For the Freight-X communities to interoperate, a single master registry identifying the various Freight-X communities in operation is essential and shall be given strong consideration by the governing body.

This central service can also be expanded to include publication of specifications, code lists, and other supporting materials.

The registry is vital to the establishment of the Freight-X governance model. Members of the Freight-X consortium shall post their available web services and necessary instructions on the registry for viewing to all other participants of Freight-X. Participants shall be able to view the services available and from which company, then proceed to download the necessary services to begin electronically communicating with the other participants/trading partners.

5.6 Intellectual property rights

The intellectual property of the Freight-X solution shall be offered on a nonexclusive, worldwide, non-sub licensable, perpetual patent license on fair, reasonable, and non-discriminatory terms without payment of royalties or fees to make, have made, use, market, import, offer to sell, and sell, and to otherwise directly or indirectly distribute licensed products that implement the Freight-X specifications. These are the terms for open standards and would be most likely to encourage wider adoption.

5.7 Information security

Only authorized parties involved in the consignment can access certain shipment records. The rules as to who can access the data and what data can be accessed are determined by the shipment owner on a permission basis. Under the terms of the “friends of the shipment” rule, a partner does not have access to information that it does not have a need to know, that is business sensitive, or that can be used against a competitor.

6 Policy

6.1 General

Business entities wishing to engage with other business partners to facilitate electronic trade using the tools described in this document shall follow certain standards of practice for information interchange and shall include the major recognized freight transport data standards, e.g. the Electronic Data Interchange For Administration, Commerce and Transport (EDIFACT), Global Standards One (GS1), and UBL transport data standards for information exchange developed by the Organization for the Advancement of Structured Information Standards (OASIS) that are based on ISO/IEC 19845:2015. It shall not be required for all participating business entities to incorporate ISO/IEC 19845 into their core operation, but if it is not totally adopted, it is possible that some manner of translation/transformation will need to be incorporated to allow the standards to operate as the common language between business entities.

The value of implementing a governance model is twofold: to keep the standard aligned to prevent runaway customization, and to assist users to obtain maximum benefit from Freight-X by promoting involvement among a larger group. It is expected that participation with users in one or two supply chains can reap benefits of 5 % to 10 %, but a community of users can realize benefits on the order of three or four times greater.

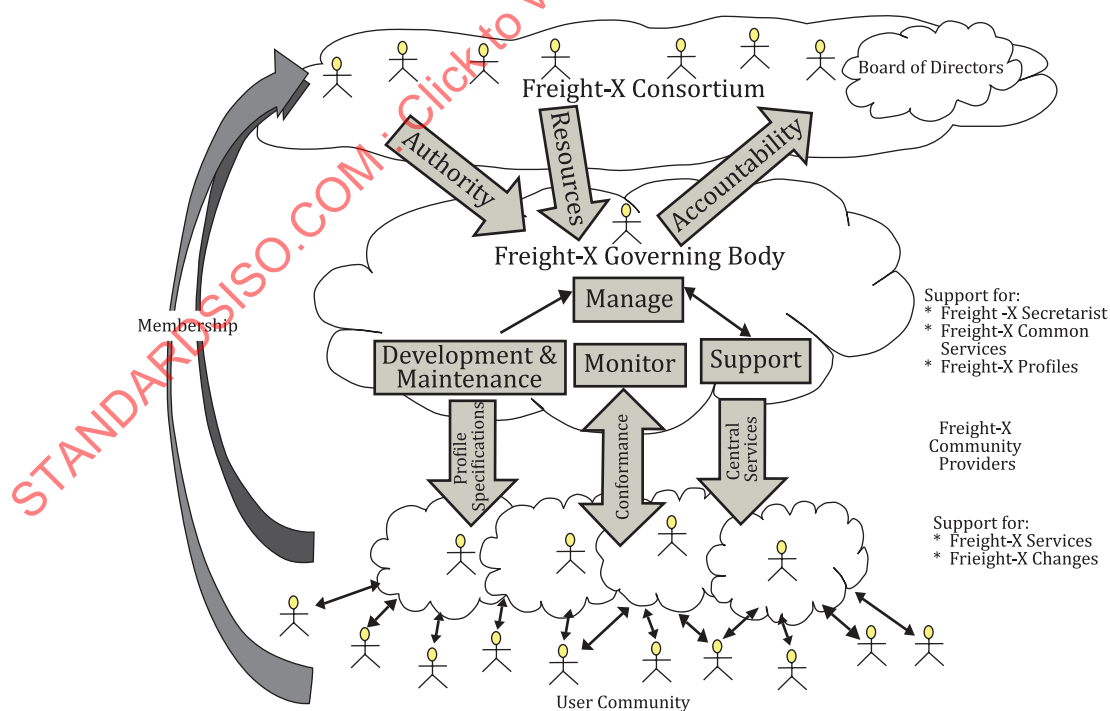
6.2 Governance model

This model has been inspired by other initiatives, including ISO/IEC TR 38502, but reflects the uniqueness of the Freight-X approach to create an open community where interoperability is achieved through common specification and not point-to-point arrangements.

The guiding principle for the Freight-X governance model is that a variety of solutions to support supply chain communities exist, and will continue to exist, into the future. In addition, privately operated supply chain communities exist within and across borders. Freight-X does not replace these solutions; it complements them and aims to coordinate information exchange between different communities.

To satisfy these requirements, several potential governance models have been considered. The recommended model is based on communities operating their own solutions and registering these with a common central service. As a result, the proposed governance model for the Freight-X approach is built around two levels of governance:

- global coordination, providing governance over all common components, standards and registries of accredited Freight-X solutions — this is managed by the Freight-X consortium and shown in [Figure 1](#);
- community coordination, providing governance over the implementation and use of Freight-X services within a common community — these communities can be based around a single supply chain, a logistics community, or a service provider, shown as Freight-X community providers in [Figure 1](#).



NOTE Based on ISO/IEC TR 38502.

Figure 1 — Freight-X governance model

Executing this model and the two levels of governance mentioned above involves the actions and interactions of four entities.

- a) Freight-X consortium;
- b) Freight-X governing body;
- c) Freight-X community providers;
- d) Freight-X user communities.

[Figure 1](#) illustrates the relationships among the various parties operating with the governance model. An explanation of each group and its role is given in [6.3](#) to [6.7](#).

6.3 Freight-X consortium

The Freight-X consortium is a non-profit legal entity that will own the Freight-X brand. It shall have the authority to issue license agreements for Freight-X services that shall enable organizations to become Freight-X community providers. The composition of the Freight-X consortium shall include transportation stakeholders and other interested parties willing to share in the expenses of the organization.

Constitutionally, the Freight-X consortium shall be an open community based on the following policies.

- Membership criteria: Membership criteria should be no more restrictive than necessary to ensure an efficient process.
- Costs of participation: To the extent possible while still spreading costs fairly and accomplishing objectives, dues required to participate in all meaningful activities should be made acceptable to all classes of stakeholders and users.
- Member acceptance: All applicants that meet the established criteria should be automatically admitted in any category to which they choose to apply.
- Governance: The board or other governing body should not be controlled in the long term by the founders, although founding members will typically hold the initial seats. The board should also represent all classes of stakeholders, regardless of whether each class can afford a top-level membership.
- Technical participation: All members of eligible classes shall be entitled to participate equally in technical and other activities.
- Transparency: At a minimum, all standards shall be posted for public comment prior to adoption. Some consortia make all the minutes and other proceedings of their working groups public from the beginning of a technical process.
- Adoption: All standards shall be available for implementation by non-members as well as members on a non-discriminatory basis.

NOTE Candidate Freight-X stakeholder organizations can include those involved in the Northeast Asian Logistics Network (NEALNET), the World Customs Organization (WCO), the International Air Transport Association (IATA), the International Federation of Freight Forwarders Association (FIATA), and regional freight forwarder associations.

The Freight-X consortium shall establish the Freight-X governing body as the accountable entity for ensuring that its interests, as well as those of the participating communities, obtain value from its investment in Freight-X while managing its risk. The agreed level of authority and boundaries on the scope of the Freight-X governing body shall be documented in the form of a charter or terms of reference.

6.4 Freight-X governing body

6.4.1 General

The Freight-X governing body, with its supporting resources (secretariat) shall be an elected body responsible for achieving the overall objectives of the Freight-X, while taking into account in its decisions the legitimate expectations and interests of its consortium. It shall act to guide the adoption and use of Freight-X through policy making, strategy formulation, supervision of the Freight-X community providers, and accountability to the Freight-X consortium. The governing body shall address policy making and strategy topics such as

- consortium commitment to the Freight-X user communities,
- certification agreements for Freight-X community providers, including terms and conditions of registration and accreditation, and
- future requirements or new functionality for Freight-X:
 - adoption;
 - development and maintenance;
 - support.

Within the context of its operation, the Freight-X governing body functions shall include development, support, and monitoring.

6.4.2 Development and maintenance

This function shall include the development and maintenance of the documents, specifications, and implementation guides. Typical categories of changes can include

- modifications to existing specifications,
- addition of new specifications,
- modifications to existing support data (e. g. business rules, code lists), and
- addition of new support data (e. g. business rules, code lists).

Development and maintenance tasks should be project-driven. Specific tasks shall be nominated through the Freight-X consortium with project teams appointed from its members.

6.4.3 Support

Support covers the secretariat functions, publication of documents, specifications and implementation guides for community providers. It also includes the provision of statements in respect to the strategies and policies affecting the data model, such as upgrades or new services. Services can include websites, registries, and repositories.

The recommendation is that one member of the consortium shall volunteer to function as the secretariat, providing most (or all) administrative and other services, either without charge, or for payments derived from the fees of other members, as agreed by the majority of the members of the consortium.

6.4.4 Monitoring

Monitoring is the on-going reporting and assessment of the Freight-X service performance against expected outcomes as well as reporting of Freight-X communities' conformance with established criteria.

NOTE A Freight-X service is a web service created specifically to address business processes related to electronic freight management. Examples include "receive order", "confirm booking" and "obtain status".

Regarding supervision of the Freight-X community providers, the Freight-X governing body shall address topics such as

- implementation package for communities,
- performance monitoring,
- conformance compliance, and
- ensuring that Freight-X community providers comply with the minimum requirements defined by a community provider agreement.

6.5 Freight-X community providers

6.5.1 General

Freight-X community providers should be responsible for ensuring that the Freight-X consortium achieves required outcomes within the strategies and policies established by the Freight-X governing body.

Within the proposed governance model, each accredited Freight-X community provider shall implement mechanisms for managing demand and supply of available Freight-X services supporting freight transportation management operations. This includes

- transforming its community's information exchange requirements into the Freight-X context,
- startup testing and validating of new participants entering the community, and
- monitoring on-going operations to ensure performance, quality, and security requirements are maintained.

In addition, each accredited Freight-X community provider shall implement mechanisms for managing demand and supply of change initiatives to Freight-X services. Changes can include

- modifications to existing Freight-X services,
- addition of new Freight-X services,
- modifications to existing Freight-X profile schemas:
 - addition of new Freight-X profile schemas,
 - modifications to existing Freight-X support data (e.g. business process rules, code lists), and
 - addition of new Freight-X support data.

Finally, each accredited Freight-X community provider shall monitor and assess the performance and conformance of the on-going operations and report to the Freight-X governing body on an established schedule basis.

6.5.2 Freight-X community provider agreements

The Freight-X solution requires that a number of parties work together in a trusted environment based on common specifications and standards. The development and maintenance, as well as the

implementation and use, of these common specifications and standards need to be governed across the full Information and Communication Technologies (ICT) infrastructure. In order to clearly determine the roles and responsibilities of each party in the Freight-X solution, a set of agreements should be established.

A Freight-X community provider agreement shall be enacted between individual Freight-X community providers and the Freight-X governing body for the purpose of defining the terms and conditions under which the parties shall provide governance for the different levels of the Freight-X service.

The intent of this agreement, as with the overall governance model, is to ensure that the role and responsibilities of each party are clearly described and openly available, thus making Freight-X an open and transparent community.

The Freight-X community provider agreement shall be based on

- compliance with governmental requirements within the jurisdictions the transactions are taking place.
- global coordination over all common components of the Freight-X solution,
- local coordination and supervision of the implementation and use of the Freight-X services operating within a community, and
- open and transparent provision of services based on a common set of agreements as well as common definition of services and levels of service.

The main aspects determined in this agreement shall include the following:

- that the Freight-X community provider is given the authority to represent Freight-X within its domain/community of interest of responsibility;
- that the Freight-X community provider is responsible for ensuring adequate performance by the Freight-X services established within its domain/community of interest, including their compliance to the Freight-X specifications;
- that the Freight-X community provider is guaranteed access to the Freight-X specifications in a timely manner;
- that the Freight-X community provider is responsible for maintaining the data about its registered Freight-X users in a timely manner;
- that Freight-X users are guaranteed open access to the Freight-X services according to specification in a timely manner;
- that all other Freight-X community providers are guaranteed open access to the community providers Freight-X services in order to deliver business documents to the Freight-X users according to specifications;
- that the Freight-X community provider guarantees to deliver any business document received from another Freight-X community provider to the stated receiving Freight-X user in a timely manner;
- that the Freight-X community provider guarantees to deliver any business document received from an Freight-X user to the stated receiving Freight-X community provider according to Freight-X specifications in a timely manner.

6.5.3 Freight-X community provider accreditation

Freight-X community providers shall become accredited by entering into a Freight-X community provider agreement that commits them to certain levels of service.

NOTE The Freight-X community provider agreement is required in order to ensure consistency of the technical standards, specifications, and procedures across the entire Freight-X solution.

6.6 Freight-X user communities

The Freight-X user communities shall include a spectrum of transport involved parties including small and medium-sized enterprises (SMEs) as well as larger business entities. Business entities can include private sector entities doing business with private sector entities, as well as public sector entities doing business with private sector entities. This document enables multiple businesses engaged in freight movement to have a common foundation agreement on a B-B basis for realizing optimized efficiencies. A Government agency, such as Customs, would only be expected to enter into an agreement on a business basis, not as a representative of the government. Any business or groups of businesses can operate outside the framework of this document, but they would not be able to realize the benefits accorded to parties abiding by the principles embodied in this document. This is a governance contract for those parties wishing to realize the full benefits of moving freight through a Freight-X arrangement.

Each participant shall join the Freight-X consortium through a formal process of engagement. Each participant shall affiliate with one or more Freight-X community service providers depending upon the set of services consistent with the joining organizations as well as the focus of the Freight-X community provider. Each participating organization shall continue to function as its own standalone entity with its normal business and security responsibilities (e.g. administration, security, liability).

6.7 Open forum

To promote even wider collaboration, an open forum for non-consortium members can also be provided as a communication channel for wider industry review and comment on the activities of the Freight-X approach.

NOTE Promoting the wide-scale use of Freight-X gives the Freight-X user communities a broader community to work with and offers them a wider choice of partners to choose among related to contractual agreements among the partners.

7 Freight-X Standards

7.1 General

Data exchange standards are at the heart of these rules of governance. The basic premise is that there shall be a common semantic model for data required by Freight-X participants. All standards shall be treated as one through a common semantic interoperability process where a common interchange format is mapped to the other major formats in a cloud-like environment. Since selected US projects and comparable EU projects have been working together on a common framework for data exchange, ISO/IEC 19845 shall be the Freight-X interchange format. To assure interoperability, the Freight-X community needs to formalize a process whereby mapping to any other format takes place rapidly, and then once mapped, the translation is immediate for anyone participating in the governance community of users. Each community (e.g. EDIFACT, NEALNET, GS1, SMDG) can continue to operate using its own formats as required.

Collaboration between European and Asian stakeholders has already demonstrated connectivity and interoperability between independent transportation system networks. The interoperability vision illustrated in [Figure 2](#) is of interconnecting many transportation projects found worldwide using UBL ISO/IEC 19845 as an internationally standardized common document format.

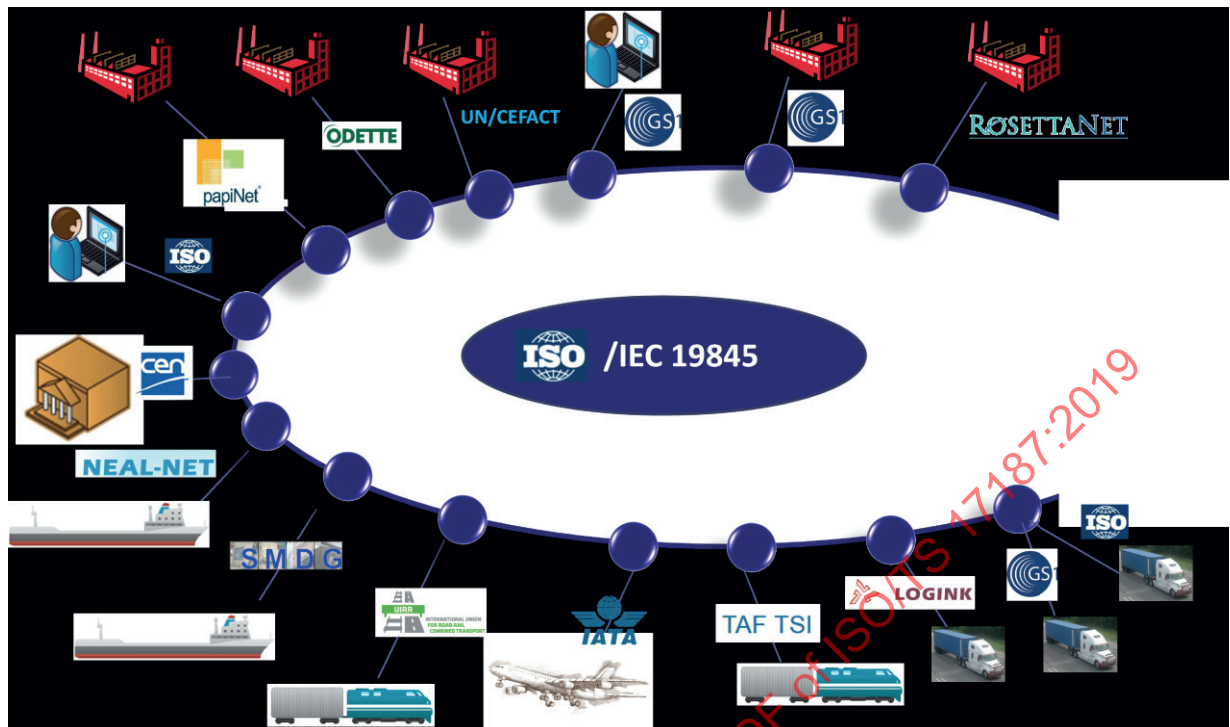


Figure 2 — Freight-X interoperability vision

7.2 Semantic Freight-X standards

Regarding the semantics of the information exchanged, the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) supports activities dedicated to improving the ability of business, trade, and administrative organizations to exchange products and relevant services effectively. UN/CEFACT's principal focus is on facilitating national and international transactions through the simplification and harmonization of processes, procedures, and information flows.

A foundation work of UN/CEFACT is the Core Components Technical Specification (CCTS), ISO/TS 15000-5:2005. The CCTS provides a way to identify, capture and maximize the re-use of business information to support and enhance information interoperability across multiple business situations.

The central concept of the CCTS is the core component. The core component shall be a building block for the creation of a semantically correct and meaningful information exchange package. It shall contain only the information pieces necessary to describe a specific concept. There are four different categories of core components:

- Basic Core Component (BCC);
- Association Core Component (ASCC);
- Core Component Type (CCT);
- Aggregate Core Component (ACC).

When a core component is used in a real business circumstance it shall serve as the basis of a business information entity (BIE). The BIE is the result of using a core component within a specific business context.

NOTE A specific relationship exists between core components and BIEs. Core components and BIEs are complementary in many respects. Core components are intended to be indispensable for creating interoperable business process models and business documents using a controlled vocabulary.

There are three different categories of BIE:

- Basic Business Information Entity (BBIE);
- Association Business Information Entity (ASBIE);
- Aggregate Business Information Entity (ABIE).

The most primitive of these is the BBIE. A BBIE is a basic core component when used in a specific business context.

7.3 Syntactic Freight-X standards

7.3.1 General

The Universal Business Language (UBL) is the product of an international effort to define a royalty-free library of standard, electronic business documents built upon a set of internationally recognized common information components based upon the Core Components Technical Specification, Version 2.01. As one of the first implementations of Electronic Business Extensible Markup Language (ebXML) Core Components Technical Specification, Version 2.01, the UBL library is based on a conceptual model of BIEs. These components are assembled into specific document models such as “waybill” and “transport status documents”.

UBL Version 2.1 in ISO/IEC 19845:2015 defines “a generic XML interchange format for business documents that can be restricted or extended to meet the requirements of particular industries”. Specifically, ISO/IEC 19845 provides the following:

- a suite of structured business objects and their associated semantics expressed as reusable data components and common business documents;
- a library of XML schemas for reusable data components such as “Address”, “Item”, and “Payment”, the common data elements of everyday business documents;
- a set of XML schemas for common business documents such as “Order”, “Despatch Advice”, and “Invoice” that are constructed from the UBL library components and can be used in generic procurement and transportation contexts.

The complete ISO/IEC release package is available at <http://standards.iso.org/ittf/PubliclyAvailableStandards/>. The softcopy package includes an overall specification for ISO/IEC 19845 along with a collection of subfolders each containing a particular kind of information such as document models, schemas, code lists, and test material.

The UBL XML schema library of ISO/IEC 19845 is based on BIEs. These BIE components are first collected into specific document assembly models such as for waybill and transportation status. The document assembly models are then processed against a set of naming and design rules to produce a set of UBL 2 XML schemas. The UBL 2 XML schemas are the only normative representations of the UBL 2 document types and library components. All of the UBL 2 XML schemas are contained in the xsd subdirectory of the ISO/IEC release package. All UBL schemas are modular, reusable, and extensible in XML-aware ways.

The ISO 19845 UBL 2 documents and library are designed to support typical transport business processes such as “initiate transport services process” and “report status of goods process”. These processes define the ordering of logistical services for international trade. With receipt of an order and acknowledgement by the supplier party that the goods are available and ready to be shipped, the consignor or consignee initiates the transportation arrangements. This includes booking the consignment with a “transport service provider” such as the “freight forwarder” or “carrier” and advising the delivery party of the arrangements as needed. UBL document types in these processes are “forwarding instructions”, “packing list”, “waybill”, “bill of lading”, and “transport status”.

[Annexes A](#) to [D](#) present a summary of the transport related documents within ISO/IEC 19845.

7.3.2 Specific Freight-X implementation guidelines

The UBL TC has also offered a document entitled, UBL Guidelines for Customization <http://docs.oasis-open.org/ubl/guidelines/UBL-Customization1.0.pdf>. Those guidelines are intended to aid users in developing custom solutions based on UBL. The goal of these UBL customization guidelines is to maintain a common understanding of the meaning of information being exchanged between specific implementations.

A set of these guidelines shall be created for Freight-X implementations.

7.3.3 Freight-X code lists and code list schemas

Code lists are sets of values valid for a given information entity. A significant feature of the UBL approach to code lists is their separation from the schemas within which the coded information element is employed. With this arrangement, code lists are managed independently from the schemas and can be maintained, updated, and documented on their own schedule. By default, UBL uses several lists of standard codes published by agencies such as ISO and the United Nations Economic Commission for Europe (UNECE), as well as various codes that are specific to UBL. Additional detail is provided in [Annex E](#).

7.4 Freight-X document exchange standards

Document exchange standards for Freight-X define the specifications for a lightweight and coherent messaging and trust ICT infrastructure for reliable data exchange, messaging, and web services interoperability between domains. Here, a domain can be any community whose members

- a) are connected through a shared system, and
- b) can interact with others across domains.

These standards are based on a service-oriented approach to business web service interfaces using functionality and messaging protocols being developed in the OASIS Business Document eXchange Technical Committee. See https://www.oasis-open.org/committees/documents.php?wg_abbrev=bdxr.

As stated in the TC overview:

“The OASIS BDXR TC advances an open standards framework to support public e-procurement and e-invoicing. The group defines specifications for a lightweight and federated messaging infrastructure that supports a 4-corner model for secure and reliable exchange of electronic documents.”

7.5 Freight-X communication exchange standards

Freight-X communication exchange standards support a 4-corner model for secure and reliable exchange of electronic documents. In a 4-corner network, entities are exchanging business documents through intermediary gateway services. To successfully send a business document in a 4-corner network, an entity needs to be able to deliver critical metadata about the recipient (endpoint) of the business document such as types of documents the endpoint is capable of receiving and methods of transport supported. The recipient makes this metadata available to other entities in the network through a Service Metadata Publisher service.

From OASIS BDXR TC:

“Service Metadata Publishing (SMP) Version 1.0” describes the request/response exchanges between a Service Metadata Publisher and a client wishing to discover endpoint information. A client can either be an end-user business application or a gateway/access point in the 4-corner network.

“Business Document Metadata Service Location Version 1.0” defines service discovery method values for use in DNS Resource Record service fields. The methods defined are instances of the

generic pattern defined within IETF RFCs for Dynamic Delegation Discovery Services (DDDS). This specification therefore defines DDS applications for metadata and metadata-registration services.

Freight-X communications exchange standards also include Web Service Description Language to describe the web service interface, and other Service-Oriented Architecture (SOA) Protocol standards. ISO 24097-1 offers a collective set of guidance as an ITS profile supporting ITS web services.

8 Governance of Freight-X standards

8.1 General

The proposed governance model for Freight-X standards is based on the Freight-X governance framework described by the following diagram (Figure 3). This framework depicts the process in which new standards are developed and accepted within the Freight-X consortium.

The key points to this framework are as follows:

- the Freight-X governance model shall be an implementation of this framework;
- the Freight-X messages themselves shall be conformant customizations of the OASIS UBL standard documents;

NOTE These are known as Freight-X message profiles (see Figure 3).

- the Freight-X governance model shall define and establish the maintenance processes for the Freight-X message profiles;
- every implementation of Freight-X shall support the Freight-X message profiles in order to ensure data coherence and semantic consistency.

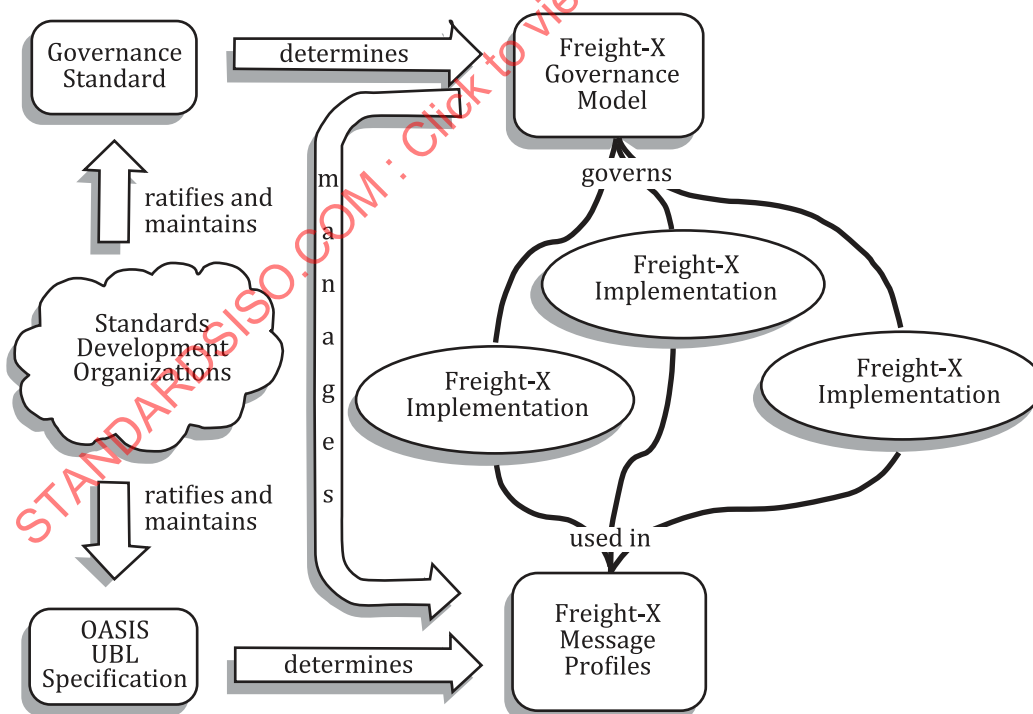


Figure 3 — Framework for Freight-X governance of standards

8.2 Governance of Freight-X message profiles

Freight-X shall employ ISO/IEC 19845 Universal Business Language (UBL) as the basis for its XML messages (see 7.3). Freight-X shall employ these message types as services. The services employed include those necessary to manage International Freight Processes (INAT-PRO) as well as Intermodal Freight Processes (IMOD-PRO).

EXAMPLE 1 Examples of INAT-PRO include receive order, consignment, booking service, confirm booking, load shipment, consignment partners, subscription, receive status, query status, divert shipment, request clearance, and receive clearance.

EXAMPLE 2 Examples of IMOD-PRO include establishing a transport execution plan, providing an itinerary for a transport service, and reporting transport means progress status.

The subset of information elements for UBL documents used in Freight-X web services shall be known as Freight-X message profiles.

While the Freight-X programme has evolved with its particular strategy, it has parallels in associated domains that have formalized the definition of profiles. Based on the European Committee for Standardization (CEN) Workshop Agreement CWA 16558, a profile can be defined as a specification of how one or more Freight-X business processes are executed by specifying the Freight-X business rules governing its business collaborations and the information content (message profile) of the electronic business transactions exchanged.

In order to support the exchange of Freight-X business documents in an open and interoperable manner, the message profiles within Freight-X shall be described with an aim to function as part of a formal agreement. This shall be done in order to lower one of the main barriers to the efficient and effective implementation of Freight-X that is the need to entering into bilateral agreements with each business partner. By publishing profile descriptions, organizations implementing Freight-X can claim conformance to the profile. In doing so, the organization is committing to all aspects of the message profile and thus limiting the need for further bilateral agreements.

A Freight-X message profile shall provide a description of the information content of the electronic business transactions exchanged by pointing to a given data model for each of the business transactions.

Not all implementations can use the same information elements for the UBL documents used in their electronic transactions. A core profile of the common elements which can be used in every pilot implementation has been prepared. Adherence to these Freight-X message profiles shall form part of the Freight-X community agreement.

8.3 Governance of Freight-X support data/code lists

Governance of support data such as code lists employed in Freight-X implementations, shall be the responsibility of the Freight-X governing body.

8.4 Governance of Freight-X communication exchange standards

Governance of Freight-X communication exchange standards employed in Freight-X implementations shall be the responsibility of the Freight-X governing body. Where web services are employed, they shall be based upon a profile of standards agreed upon by the Freight-X consortium. Standards to be considered include ISO 24097-1 as well as OASIS SOA specifications.

9 Freight-X security

This document incorporates by reference other guiding standards related to the security of freight operations (see ISO 28000). Changes to accommodate this issue have been made in 6.6. Freight-X user communities. Role-based Access Control (RBAC) should be the means by which the ability to access system resources is explicitly enabled or restricted by the Freight-X user's assigned role information. In a Freight-X community, each Freight-x user will be assigned one or multiple roles and each role is

mapped to a set of pre-defined functions that can be performed by that role. The access control manager is responsible for extracting user credentials as well as the service that is being requested. It also interacts with two other security modules in order to determine whether the request should be granted or denied:

- the resource permission module helps determine the required roles for a given resource by consulting a resource-to-roles mapping table;
- the authorization table module consults a role-to-user mapping table to determine whether a client is granted one of the required roles.

For the Freight-X environment, the following high-level user roles have been identified:

- a) consignor — the party consigning goods as stipulated in the transport contract;
- b) consignee — the party receiving a consignment of goods as stipulated in the transport contract;
- c) transport service provider — the provider of transport services (i.e. freight forwarder);
- d) carrier — a company which provides transport services (i.e. airlines, trucking companies);
- e) terminal operator — the party with operational responsibilities at origin or destination nodes for freight transport journeys (i.e. overseeing the unloading of goods, checking the quantity of goods against the manifest, transferring of the goods, checking documents, authorizing a carrier to pick up goods);
- f) logistic service provider — the party providing logistic services such as warehousing, re-packing products, distribution, and assembly (i.e. third-party logistic provider, container freight station);
- g) customs broker — the party that is licensed to enter and clear goods through customs, whose responsibilities include preparing the entry form and filing it, advising the importer on duties to be paid, advancing duties and other costs, and arranging for delivery to the importer.

Each of the above user roles shall also be mapped to a set of pre-defined functions that can be performed by that role.

By implementing RBAC, effective granular security can be enforced so that each supply chain partner can only perform those functions that are associated with its user roles. A shipment is handled by only a small set of supply chain partners and shipment visibility and status updates shall be restricted to this set as well; therefore, it is crucial to be able to manage the supply chain partner list for each shipment.

NOTE Supply chain partners on this list are not necessarily known. For example, freight forwarders can need to know shipment details such as container weight, container dimensions, end delivery locations, and desired arrival schedule before they contract with one of the multiple trucking companies with which they regularly do business. In the case of expediting late shipments, or handling split shipments, the next supply chain partner can need to be changed dynamically while the shipment is on its way.

Since the authentication function in a supply chain partner's web service shall first determine if the requestor is a member of this list before granting read and/or update access, the following services and access controls shall be implemented:

- for a given shipment, create a partner list repository;
- provide a service which takes as input a supply chain partner's identity and a shipment's identifier, and which returns an indication of whether that supply chain partner is a partner for that shipment.

In general, read access shall be granted to all partners on the list, but write access shall be restricted to only those partners serving in the capability of a user role with appropriate write/update privileges. The following role-based access control logic should be applied when a web service request is received by a supply chain partner:

- a) perform a message integrity check by using the attached requestor's public key to verify the digital signature on the message;

- b) check the signing certificate's validity by validating the signer's certificate to ensure that it has not been reported as revoked by the issuer, and ensuring the signer's certificate is issued from a trusted Certificate Authority;
- c) check to ensure that the requestor is a member of the "friends of the shipment" registry;
- d) determine the requestor's user role and whether the requestor's role permits the execution of the requested web service.

10 Engagement scenario

10.1 General

A business entity shall become engaged in the Freight-X process through the following steps:

- a) application to the consortium;
- b) registration/identification;
- c) authentication;
- d) authorization;
- e) operation.

10.2 Maintenance and support policy

The key component of Freight-X governance is establishing a registry to host all the participant services and necessary instructions on how to connect with other Freight-X participants. A Freight-X service provider to the Freight-X consortium would be a logical option to set up the registry.

10.3 Maintenance tools

When developing specifications for Freight-X, the tools used should not restrict its design or lock-in community providers to also use that tool. This means artefacts produced shall be portable across different tools and technologies.

With respect to Freight-X maintenance, there are specific requirements for any tools used for its maintenance:

- allow the production of compatible and conformant UBL customizations;
- approved organizations can produce conformant standard UBL adaptations;
- access to community providers to produce national customizations of Freight-X standards (which are either compatible or conformant);
- allows developers to generate output in interoperable formats for standard adaptations and national customizations;
- allow other non-member organizations to produce their own customizations;
- maintain code lists and code list extensions;
- allows user access to different layers for viewing.

10.4 Intellectual property policy

Any intellectual property rights (IPR) held related to Freight-X can be licensed to the consortium under a reasonable and non-discriminatory license. The annual fee would be established by negotiations between the consortium and the IPR holder.

The consortium members shall be allowed to distribute sub-licenses to their community participants at no charge. In effect the license fee per member is covered by part of the cost of membership to the consortium.

The next major release of Freight-X will be owned by the Freight-X consortium and can be offered to the members under a royalty free license.

10.5 Financial model

For Freight-X to flourish in the industry the overall process to join and use any of the services available shall be easy and relatively inexpensive to use. There will need to be an initial investment from organizations that have established a business model/plan to implement a Universal Description, Discovery and Integration (UDDI) registry and/or repository. The Freight-X registry is analogous to the "yellow pages" for those participating in the Freight-X programme. Any partner/user wishing to advertise an available web service can post its web service instructions on the registry for a fee.

11 Implementation plan

11.1 General

The Freight-X community provider plays a key role in the area of facilitating transactions, caching transaction information, maintaining supply chain partner lists and managing the UDDI registry. The implementation responsibilities for a Freight-X community provider lie in the following key areas.

11.2 Set up ICT infrastructure

The first step in implementation is to establish the necessary information and communications technology infrastructure. In order to do so, the Freight-X community provider needs to gather requirements, identifying the business objectives for the needs of each supply chain partner (Freight-X user). Some of the key questions that need to be answered to help in capacity planning and technology adoption are the following.

- a) What is the size of the platform? (e.g. expected number of Freight-X users, estimated volume of transactions)
- b) What are the goals of service-level agreement in terms of availability and response time of the implemented web services?
- c) How secure and flexible does the platform need to be? (e.g. types of data formats supported, security standard compliance requirements)
- d) What type of ICT infrastructures do Freight-X users have?

11.3 Implement Freight-X data model

The Freight-X data model is the repository place for caching transactional data and providing transport status information related to each Consignment. A high-level logical data model (reference data model) should be developed by the Freight-X governing body and the Freight-X community provider should download a copy of it to use as a baseline. The logical data model identifies most of the key entities and their attributes within the supply chain domain. It also gives implementers the flexibility to extend the data model in order to accommodate requirements that are unique and specific to a particular supply chain. The implementation of the logical data model also requires that a caching mechanism is put in

place so that transactional data are not permanently stored in a central place yet the efficiency and convenience of executing collaborative queries is preserved.

11.4 Implement UDDI registry

The UDDI registry is the central repository place for web service information published by different supply chain partners. Administering and maintaining a UDDI registry enables supply chain partners to publish, discover and invoke web services developed by their business partners. One of the key benefits of having a UDDI registry is that it allows seamless and easy system integrations because it provides the flexibility and reusability to dynamically discover and bind web services.

11.5 Implement ESB component

Enterprise Service Bus (ESB) is an evolving integration architecture pattern used to integrate different incompatible business systems. It allows different business systems to have a uniform mechanism to communicate across environments and provides a plug-and-play capability for any new systems. ESB has become one of the main technologies supporting SOA-based solutions. Two major functionalities provided by ESB are message translation and message routing (either itinerary-based routing or content-based routing). Leveraging the features of an ESB component alleviates the burden on supply chain partners to provide end-to-end integration with their business partners. It also gives the Freight-X community provider the ability to monitor the performance of the system as well as provide better error handling. However, because of the cost and complexity associated with implementing an ESB component, whether the operator needs to adopt ESB technology really depends on the specific business requirements and needs of the platform.

11.6 Define message profiles

In order to seamlessly integrate different types of systems within the supply chain domain, a message profile needs to be defined so that all the systems can communicate through the same message format. The Freight-X governing body is responsible for defining and publishing the message standard for use among its user community.

11.7 Implement Freight-X consortium portal

The main purpose of the portal is to give SMEs an easy way of participating in partner transactions. Since SMEs can have insufficient IT infrastructure and resources to fully implement a SOA-based solution, the portal will allow them to exchange data with their supply chain partners through a web-based graphic user interface. Besides developing a web interface for SMEs to manually input transactional data, the Freight-X governing body is also responsible for developing file templates for SMEs to download from the portal. File templates are intended to assist SMEs with data entry by allowing them to fill data offline and upload it back to the portal.

11.8 Implement consortium ICT infrastructure services

Based on the architecture design, a number of infrastructure services need to be implemented by the Freight-X community provider in order to facilitate transactions among Freight-X users. Those ICT infrastructure services should include, but not be limited to, the following services.

- a) Registration service: The registration service shall provide functionality that allows supply chain partners to register their business information with the consortium operator. During the initial registration process, the supply chain partners should, at a minimum, provide information such as business entity name, address, point of contact and role(s).
- b) Authentication and authorization services: Security interfaces shall be used to effectively protect the information assets of each supply chain partner. The consortium operator needs to implement robust and secure authentication and authorization services.

- c) Subscription and notification services: As an event-driven, service-oriented architecture, the operator shall implement subscription as well as notification services that will enable it to notify interested supply chain partners of real-time events.
- d) Configuration service: The configuration service provided by the consortium operator shall allow supply chain partners to easily establish business relationships among each other, which simplifies the process of defining the supply chain partner list for each transaction.
- e) Messaging service: In order to achieve maximum flexibility and greater adoption, the operator shall implement a messaging service that can support and transform different data formats from each partner into messages based on the selected data standard.

11.9 Implement Freight-X business services

In addition to providing the infrastructure services the Freight-X community provider should develop some business services that are related to supply chain operations. One of the key responsibilities for the Freight-X community provider is to populate the caching store with near real-time data received from different Freight-X users throughout the lifecycle of a transaction. A Web Service Description Language (WSDL) specification for each service shall be available for download from the consortium website.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 17187:2019