Enabling organisations to reap the benefits of data sharing in logistics and supply chain

Executive summary of the final report

The Digital Transport and Logistics Forum (DTLF)
Sub-group 2: corridor information systems

DIGITAL TRANSPORT & LOGISTICS FORUM

June 2018

DTLF is an expert group of the European Commission

1. Data sharing in supply and logistics – opportunities and challenges

1.1 Foreword – communication without barriers

Every day, we exchange data by email, buy and sell goods and services via eCommerce, share assets and capacity with IT platforms (Über and Airbnb), or use other IT services (e.g. Google search or Google maps). We do this via the Internet without reflecting about the necessary underlying technology and the open standards of the Internet. The Internet has become a commodity.

A subscription to one of the several service providers allows us to plug in our devices, download some pieces of software, and share data by using a number of available applications installed on all types of devices (smartphones, tablets, PCs). Technology has enabled a wide range of decentralised services to develop, connections to be established, and interconnectivity between users to be created.

> **innovations were possible through a flexible, open-minded approach, and entrepreneurial spirit based on open standards**

Although most innovations in digitalisation are due to business endeavours, targeted interventions by the public sector are required to create level playing field and enable harmonisation. For the internet connection relevant market regulations have allowed us to easily switch providers without any problem.

The same is applicable to the mobile phone network. Distinct protocols which previously required us to use different mobile phones in different regions and countries have been replaced by an integrated system providing full interoperability. These innovations were possible through a flexible, open-minded approach, and entrepreneurial spirit based on open standards. In order to optimise all types of cargo flows in the supply chain, utilise assets and capacities better, thereby reduce costs, data sharing in transport and logistics has to progress along similar lines.

1.2 Efficient data sharing: opportunities and benefits

Data sharing is becoming an important driver for efficiency, simplification, lowering costs, a better use of resources and existing infrastructures. It creates new opportunities for business, and has the potential to change the way cargo and traffic flows will be organised and managed in the future. Therefore, electronic data should flow seamlessly through supply chains, including the public authorities and businesses, representing all modalities, logistics services, shippers, cargo types and last mile (urban) delivery.

> **interoperability data sharing will enhance supply chain visibility and building capabilities , and enable synchronised operation planning for a responsive resilient, secure, safe , and multimodal transport ecosystem**

If all these stakeholders are able to interconnect within one common data sharing environment to effectively exchange information they require, they can improve their performance and optimise operational processes. Our analyses show that interoperable data sharing will enhance supply chain visibility and bundling capabilities, and enable synchronised operation planning for a responsive, resilient and multimodal transport ecosystem. At the same time, the administrative burden will be reduced, and authorities will be able to improve their risk assessment capability regarding dangerous and illegal transports. Furthermore, it will improve traffic flows of all transport modes, thus contributing to the sustainability goals, as well as to the safer and more secure society.

Potential benefits for individual stakeholders can be summarised as follows:

- Shippers and consignees will exchange products across a reliable, sustainable multimodal logistics network according to goals that they have agreed amongst themselves. They will have full transparency/visibility regarding their product flow according to goods flows that meet their requirements.

- Logistics Service Providers will have full visibility of alternative multimodal transport solutions based on (predicted) available capacity and quality of the underlying physical infrastructure. With this, they can manage logistics chains via a single-sourced system, sharing data electronically with carriers and other players along the entire supply chain.

- Carriers will gain visibility of demand patterns, which will allow them to improve capacity utilisation, align service design and capacity planning as well as advance dynamic chain scheduling. In this way they may optimise positioning of their assets according to predictable demands of shippers and consignees.

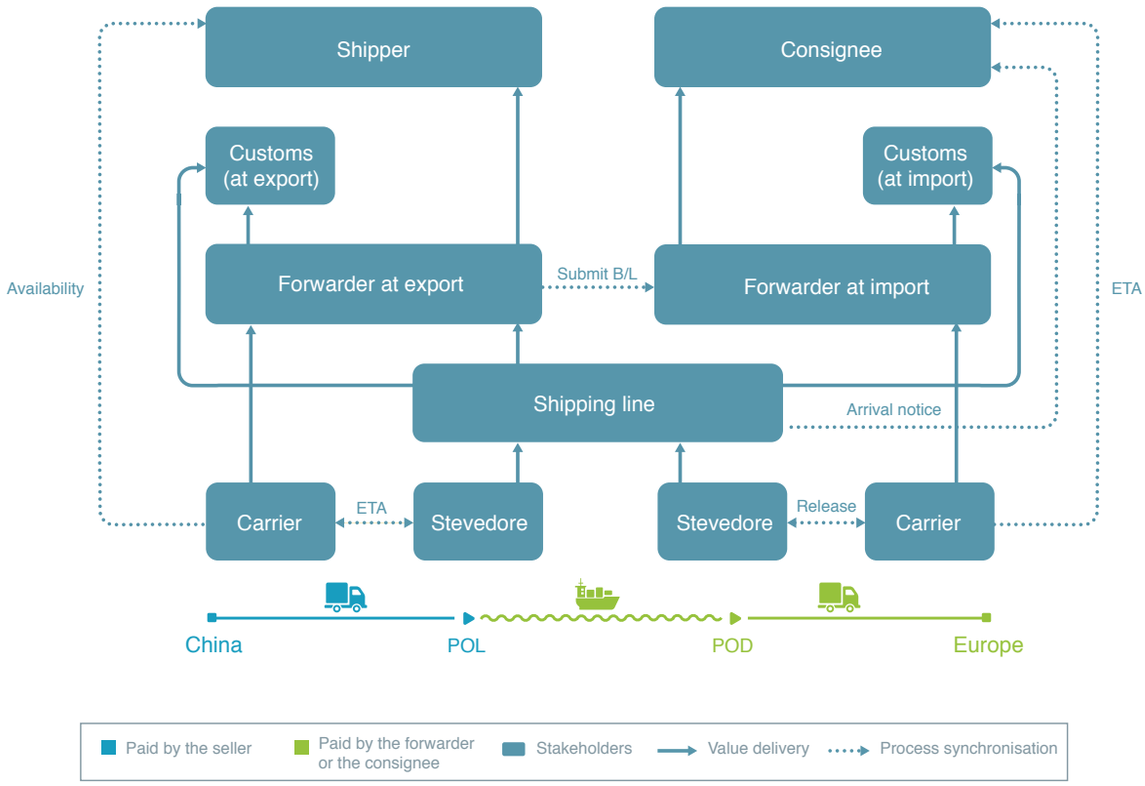


Figure 1 – goods flows via sea according to Incoterms - FOB

- Law enforcement agencies like customs and other inspection authorities will have direct access to and be able to receive (push) or retrieve (pull) relevant data for performing their task.

- Infrastructure providers will be able to optimally predict and coordinate traffic flows, allowing them to make timely investments in upgrading the infrastructure.

- The emergence of multimodal transportation networks with full integration into capacity and production planning systems.

- Multinational companies will be able to effectively integrate multimodal transport systems to their production systems to provide advanced services and lower costs

Data sharing is not a new idea. To facilitate data sharing, various solutions have been developed and implemented over time; for example, Electronic Data Interchange (EDI) replaced paper-based business documents with electronic messages. Enterprises have also for a long time shared booking and order data with their business partners to optimise their supervision of cargo flows. This electronic data sharing between various actors (public and private) operating in a supply chain is to some extent already supported by standards, platforms and IT solutions.

However, it is a sad fact that most of the current initiatives have resulted in costly and uncoordinated solutions, and potential benefits could not be achieved to the extent desirable and possible.

1.3 Business reality – a large variety of chains

Customers of transport and logistics can have many and very different requirements. For example, requirements of individuals ordering products on websites (eCommerce), differ from those of suppliers producing their products in Asia and shipping them to retail stores in Europe, or manufacturers ordering parts from first tier suppliers and shipping their finished products to their customers.

In order to cope with and support this diversity, Logistics Service Providers offer a variety of services, either specialising and/or combining various activities. For instance, same-day delivery services for parcels are offered via so-called hub-spoke networks, container transport services are offered in high- volume multimodal networks, and Vendor Managed Inventory (VMI) services are offered to support on-time delivery of parts to consignees.

> **“organisation and coordination of transport and logistics activities with a large demand variety compliant with (inter)national rules and regulations is complex”**

A specific example of a logistics chain might be the movement of a shipping container from a manufacturer, for instance in China, via sea to a recipient in Eu-

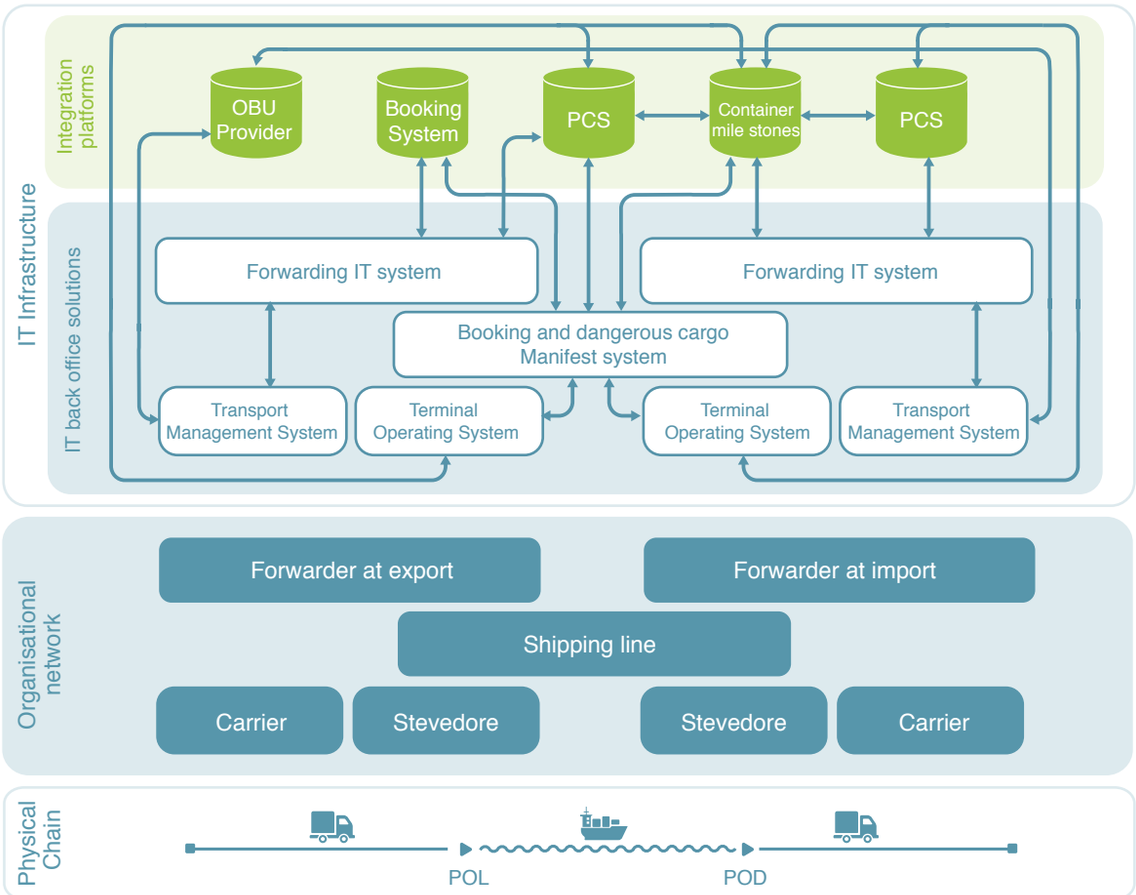


Figure 2 – connections between information systems to support information flows

rope under the FOB (Free On Board) Incoterm. The recipient may be a retailer, a retail chain, a wholesaler, or a manufacturer ordering parts in China.
This chain can consist of inland transport of a container by truck from the shipper's location to a Chinese seaport, loading of the container on a vessel by a stevedore, transport by sea, discharge of the container by the stevedore in a European port, and final transport by rail and/or truck to the consignee. Transport and customs formalities are outsourced by the shipper to a forwarder in the country of origin, in this case China. Figure 1 illustrates the different stakeholders that may be involved in such a chain, where the solid lines show value delivery relations (customer-service provider) and the dotted lines indicate data flows for process synchronisation.

These stakeholders are likely to have relevant information systems to support their activities and will probably have to integrate with external systems like a Port Community System (PCS) in a particular port, utilise solutions like On Board Units (OBU) to provide visibility to their customer(s), and use commercial booking platforms for particular modalities.
Figure 2 shows the complexity of applying and coordinating these various systems, while distinguishing between the physical chain, the organisational network, and the information systems.
Interfaces with customs and systems used for sharing data with infrastructure managers e.g. are not shown deliberately to keep it readable.

Not all chains are this complex, for instance national parcel delivery systems mostly have a simple interface between a shipper requiring to ship parcels and a logistics service provider providing the service. In the case of an international parcel transport, the necessary interfaces with authorities and hubs lead to higher levels of complexity.

The level of complexity may be influenced by:

- Type of goods or commodities – for instance, containers, liquid or bulk cargo, parcels, and pallets, with characteristics like dangerous materials, handling requirements, and physical dimensions.

- Modalities – sea, road, air, inland waterways, and rail each have their particular platforms and solutions. Different modalities in transport chains have to be synchronised.

- Authorities – monitoring of the flow of goods from different perspectives by (air)port authorities, customs, food and safety inspection, infrastructure managers, etc.; optimisation of infrastructure utilisation

- Insurance and payment – insurers and banks provide different supply chain finance, insurance, and payment services according to the value of the goods and the risks involved.

- Delivery terms/Incoterms – specification of re-

sponsibilities of the various stakeholders, including payment conditions.

- Systems innovations – introduction of new (innovative) information systems like visibility solutions integrating with IoT (Internet of Things), OBU (On Board Unit) for road transport to share data between IT back office systems and truck drivers, eTransport Documents platforms, and introduction of innovative technology like autonomous operations, blockchain technology and 5G. In addition, logistics is characterised by a large number of Small and Medium sized Enterprises (SMEs) with relative low investment capacity and IT skills, and a limited number of large (global) players operating their own IT legacy solutions.
This adds to the complexity of data sharing in transport and logistics.

1.4 The challenge: lack of interoperability

Standards for data sharing are considered the way to establish interoperability. There is a variety of open and de facto standards[1] to support supply and logistics. These standards can be grouped as follows:

- Communication standards – standards supporting the exchange of data (across a network) between sender and recipient. Internet standards are an example. Additional protocols can be implemented to increase reliability; for example, message queueing standards.

- Syntax standards – structuring the data shared between the systems of a sender and recipient. XML, eXtensible Markup Language, and EDIFACT (EDI for Administration, Commerce and Transport) are most common to supply and logistics, but JSON (Java Script Object Notation) is one used in software development. On top of structuring the data with the syntax[2] , EDIFACT has developed predefined message structures called United Nations Standard Messages (UNSMs) for representing particular business documents like purchase orders, invoices and transport orders with electronic (EDIFACT) messages.

- Technical paradigm – there are different ways of sharing data, for instance by messaging, web services or Application Programming Interfaces (APIs)[3] , and events to share the latest status information, or providing access to data by optionally providing the links. These paradigms can be applied to any syntax.

- Data semantics – the semantics (meaning) of the data that can be shared with a technical paradigm and syntax is developed and documented separately. The World Customs Organisation (WCO) Data Model and the UN/CEFACT Multi Model Transport model are examples of semantic models.

- Implementation Guides – the syntactical (message) structures and/or the semantic models are applied to construct so-called Implementation Guides. These guides can be specific to a modality (for example, air standards are developed by IATA and rail standards are introduced by the European Rail Agency (ERA)), and its underlying infrastructure (e.g. rail and road). For example, the implementation guides can support national implementations of EU Regulations or Directives by a national authority (e.g. customs).

> **“lack of interoperability between implementation guides, platforms etc. increases interoperability costs for enterprises”**

There are various examples of specific Implementation Guides developed between two or more parties, who have very frequent transactions. The problem is that these guides are not always compatible with each other, even if they are based on the same syntax, UNSM, or semantic model and have the same technical paradigm (e.g. messaging). Having invested in certain solutions, stakeholders may find themselves in the technological lock-in situation, where moving or changing to other standards or other Implementation Guides is very costly. In many cases this may lead to a potential lock-in also at the business level. On the other hand, Implementation Guides developed at a sector/segment level are often too generic to individual (communities of) organisation(s). Furthermore, there is often insufficient time available to construct an Implementation Guide for a transactional relation in a multimodal network.

Overall, these factors lead to one of the following situations:

1. Dominant Player – a dominant player develops Implementation Guides of standards for data sharing

[1] Open standards – those standards that are public available and developed and maintained by a recognised standardisation body; de facto standards – those standards that are common for a particular application area, but not developed by a recognised standardisation body.

[2] Here: the structure, format or order of the elements in the computer language.

[3] Technical solutions by which functionality of software components (applications) can be used by other components

with its suppliers or to support a national implementation of a regulation or Directive. These Implementation Guides are normally incompatible and contain specific process optimisation rules. Large manufacturers or retailers and authorities are examples of dominant players.

2. Community standards – communities develop Implementation Guides as for instance in air-port operations. (Port) Community Systems (PCS) are an example. It is important that Community standards do not differ between communities, because members participating in more than one community would have to implement different standards.

3. Bilateral agreements – in the context of a framework contract, two organisations optimise their processes and develop specific Implementation Guides. To implement another framework contract requires redrafting these guides, which results in a lock-in and high costs.

Various commercial and community platforms feature significant differences in the implementation of standards and their services. The aforementioned PCSs support port operations; other platforms provide visibility of traffic information, for example, for road, rail, sea, and inland waterways; yet others provide particular business functionality like booking, ordering, and visibility with shipping lines or visibility of cross-border rail transport in the EU; etc. There are also some platforms providing data transformation services between various standards and their Implementation Guides.

Besides platforms, there is also a variety of integration software products available, either as open source, freeware or commercial software. The CEF (Connecting European Facility) building blocks are good examples of the free available software components[4].

In general, the lack of interoperability between implementation guides, platforms etc. increases interoperability costs for enterprises[5], although the dominant players most likely will have these costs minimised.

[4] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/About+CEF+building+blocks

[5] Examples of these cost components are the development of implementation guides and their integration with IT back office systems.

2. The solution: a federative network of platforms

2.1 Register, connect and do business in a trusted and secure environment

> **the federative platform offers interoperability for standardised platform services supporting data sharing between different organisations**

To address the challenges and reap the benefits of data sharing in logistics supply chains, the DTLF proposes a federation of decentralised information exchange platforms and peer-to-peer solutions, where organisations and authorities implement functionality of their systems themselves. The concept basically aims to interconnect the existing platforms and to harmonise the services they offer, and does not strive to develop any new, overarching solution (system) managed from a central level.

Specifically, the federative network of platforms (hereafter "federative platform") can offer interoperability for data sharing between individual platforms, which will be created by means of common (platform interoperability) protocols for supporting data sharing services[6]. This solution will enable stakeholders to use any platform of their choice, offering one-time registration and one single point of connection to the entire network of platforms, which would apply a similar logic as it is currently for the access to the Internet.

As mentioned above, in order to establish this interoperability, the federative platform will provide a set of standardised data sharing services as a basis for platform interoperability. The standardisation of platform services will result in important benefits for all the actors operating in the supply chain. For instance, individual platform providers will be able to increase their market share, organisations, enterprises and authorities to select a solution of choice, and innovative companies to develop new functionalities like Estimated Time of Arrival services and innovative applications on smart devices.

The next figure shows the basic design principles of the proposed solution. These can be summarised as follows:

- Registering and connecting to the platform of choice;
- Standardising platform services independent of any technology or platform provider;
- Platform interoperability to support platform services and create the federative platform, where each platform has its governance model;
- Specifying trust, identity, and behavioural rules.

2.2 Federative network of platforms – how does it work?

2.2.1 The semantic model as an open standard

Data semantics, explained in section 1.4, is the core for organisations to register and connect to the fed-

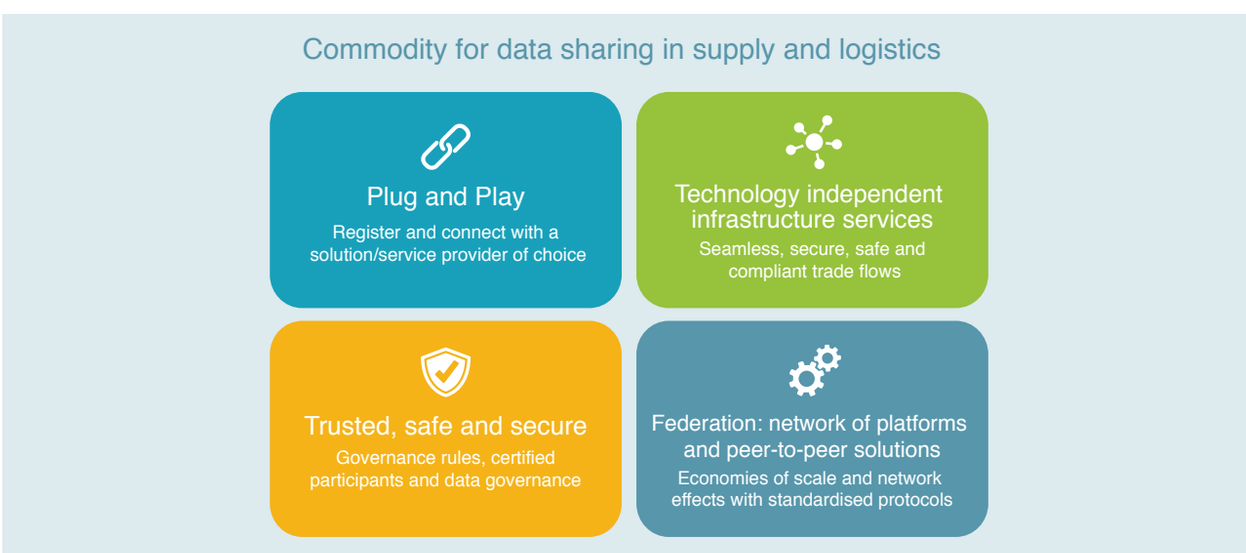


Figure 3 – a commodity for data sharing in logistics

[6] They are independent from the data content and provide means to actually share data in a secure and reliable way.

erative platform, and to take benefit of standardised platform services. In order to establish a common understanding for any piece of information flowing along the supply chain, data semantics is to be shared via an open standard, which would enable to use the same data elements while configuring various software components.

> **the semantic model of the federative platform shall be based on existing open de facto standards, and it shall be developed and maintained in a distributed way**

All data shared amongst stakeholders, for registration and for the different classes of the platform services, need to be standardised by means of a semantic model (available as an open standard) allowing end-users for easy registration and connection to the platform, and platform providers to optimally configure their platform services.

The semantic model shall be based on existing open and de facto standards, and it shall be developed and maintained in a distributed way to meet specific business requirements (e.g. safety, security, paperless), according to defined rules and procedures. Different organisations are able to specify particular (subsets of) data requirements as add-on to the semantic model, for instance IATA[7] in air transport or an eCMR to represent the data set of a CMR[8]. Yet others may develop subsets of these data sets functioning as templates to ease the implementation of the federative platform by enterprises; for example, an eCMR for container transport or booking and transport of (eCommerce) small shipments by air.

To meet the objective of interoperability, this semantic model should be represented as an ontology (using OWL – Ontology Web Language, - an open standard for data semantics developed by the World Wide Web Consortium (W3C)). The ontology enables the sharing of the semantic model between various (open, free, and COTS – Commercial-Off-The-Shelve) software tools and components used by software developers, and has capabilities to develop add-ons and templates as separate semantic models.

2.2.2 Federative platform's building blocks

The key elements of the federative network of platforms are end-users, registries, connection platforms (tools) and platforms for data sharing:

- Shippers, consignees, LSPs, and authorities are end-users actually sharing the data;
- Registries store and publish details of their capabilities and data requirements;
- Connection platforms (or tools) provide support to end-users for connecting their IT back office systems to a platform of choice.
- Platforms actually support the sharing of data by implementing (a subset of) the relevant classes of platform services (e.g. marketplace, booking and ordering, visibility[9]) . Such platforms may contain

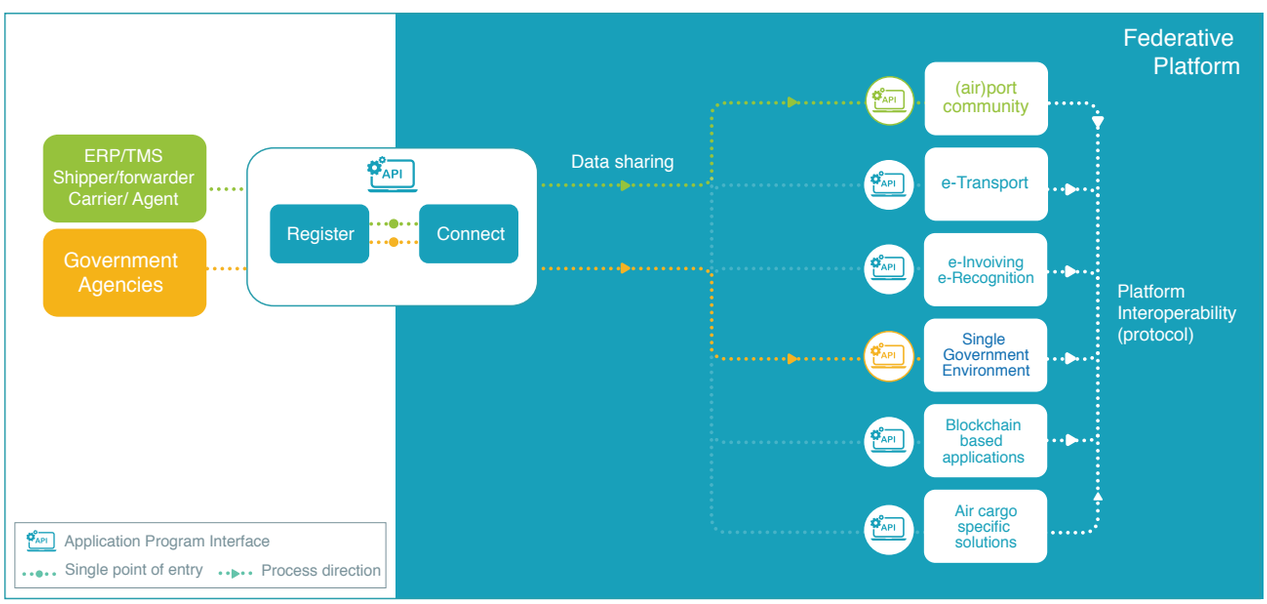


Figure 4 – the federative platform

[7] International Air Transport Association

[8] A United Nations Convention on the Contract for the International Carriage of Goods by Road

[9] The classes of platform services are addressed in detail in section 2.4

(temporary) data storage functionality.

Note that one provider may implement all components of the federative platform: a registry, a connection platform, and a platform for data sharing. Providers may also offer various combinations of these components supporting particular platform services (see 2.4).

2.2.3 How to make use of the federative platform

The federative network of platforms may support a range of specific processes and operations.
These can be aggregated in three main categories:

1. Register – users make themselves known to the network. This process in principle comprises the following elements:

- users receive a validated identity, where a trusted third party in the federative platform can authorise that identity (for trust and security reasons);

- users register and publish their capabilities in terms of their logistics services and/or timetables, including particular data governance policies (access control rules like open data and access limitations). These capabilities are the basis for search and find of a user and share data;

- users select the appropriate platform services (see 2.4) they support for electronic data sharing. The registration will result in identification of an end-point (for example, a Uniform Resource Identifier (URI)) of the registered user for data sharing. The end-point is the single point of connection that can be supported by a platform or an internal solution of the user.

2. Connect – users connect their IT back office systems to the federative platform by configuring their local interface onto their platform of choice for the selected platform services and data governance policies (access control rules). Users can choose how to implement this interface to best fit their internal information IT requirements, for instance as a set of APIs, messaging or a combination (among others this selection will depend on capabilities provided by the platform).

3. Do business – users are able to share data to support their business in compliance with (inter)national regulations. Users will be able to find each other via search services, select the platform services they have in common and perform business with electronic data sharing over the federative platform.

Due to its specific design, the federative platform may be illustrated as follows, where each individual platform may have its particular Application Programming Interface (API) and an enterprise is provided by a federative platform API.

2.3 Data perspective – business concepts for data requirements of organisations

The federative platform approach takes a holistic approach - focussing primarily on customer-service provider relations. Obviously, the integration of any bilateral transaction between a customer and service provider is subject to the strategy of individual enterprises and therefore goes outside the scope of our analysis.

> **“the objective is to hide data sharing complexity to individual enterprises by providing them with business driven tools to easily register and connect”**

Enterprises should be supported by tools based on business concepts, where these tools should support them to register and connect with a platform of choice only once (Single Entry Point). To meet this objective, the federative platform applies the perspective of logistics business activities (e.g. ‘transport’ - and ‘transhipment’), allowing for the formulation of specific data requirements.

Registration Services are based on logistics services like a container transport service, or a global parcel express delivery. A logistics service formulates data requirements of an enterprise, for instance a container transport service requires container data like its size and type and container number. All logistics services have common properties, these are called business activities. A business activity like ‘transport’ has properties to allow enterprises to register and publish all types of transport services, not only container - but also parcel- and bulk transport services with different modalities. These business activity properties will also support the publication of timetables or voyage schemes, transhipment, and ad hoc capacity on particular trips.

The various properties of business activities reflect the variety of supply and logistics chains (section 1.3). Enterprises will be able to publish their logistics services by means of the Registration Services. A Registry is a self-standing platform functioning as component in the federative platform providing these Registration Services.

Connection Services are based on data requirements for all logistics services of an enterprise, including data requirements for compliance. As explained above, a container transport service requires details of the containers to be transported besides other data. Thus, registering logistics services specifies data requirements to be able to provide that particular logistics service. These data requirements have to be complemented by generic data requirements to sup-

port platform services like data elements reflecting delivery conditions and prices (see next section). The data requirements can be mapped to IT back office systems, thus connecting the organisation to a platform of choice (Connection Services).

Customers, like shippers or consignees, can specify their data requirements in a similar way, based on their logistics goals stemming from their supply chain structure, product details, and distribution patterns including for instance warehouses. Authorities need operational data based on specific requirements formulated e.g. by directives, regulations, and their implementation guides.

The semantic model (see section 2.2.1) reflects all these data requirements.

2.4 Platform services – standardising data sharing

A platform participating in the federative platform must be able to (1) provide standardised platform services for data sharing between business processes of different organisations and (2) be interoperable with other platforms for the platform services it provides to its users. If an organisation implements its own solution, it has to support platform interoperability and make sure it translates into the requirements of the federative platform.

> **“a choreography of business processes of any two collaborating organisations is the basis for standardised platform services”**

When collaborating, any two organisations share data by interactions between their business processes. These two organisations are involved in choreography. These interactions can be grouped into patterns supporting particular business processes and are the basis for the classes of (standardised) platform services. Each platform or solution provider can select the relevant platform services class(es) for implementation for a specific market. For instance, there will be platforms providing container visibility services by shipping lines, global booking platforms for air transport, and shipment bundling platforms for rail, all to shippers and forwarders in the EU.
It is up to each platform provider to select the appropriate platform service class and tailor these to their customer demand.

The platform services (and their protocols for platform interoperability) are classified according to the business processes they support, e.g. booking and ordering. Each platform services class consists of a predefined sequence of data sharing interactions between a customer and service provider. The classes of platform service are (figure 5 below), where each of the platform service classes may formulate additional data requirements:

- Marketplace services – the ability to search for logistics services, timetables, and available capacity as published by enterprises in Registries (see before). The search should be carried out across all available Registries and will be formulated as a customer goal (search parameters like locations, commodity type, and dates/times).

- Booking and ordering services – the possibility to support transactional relations (booking and ordering) and framework contracts (ordering with reference to a contract negotiated by for instance a bid book).

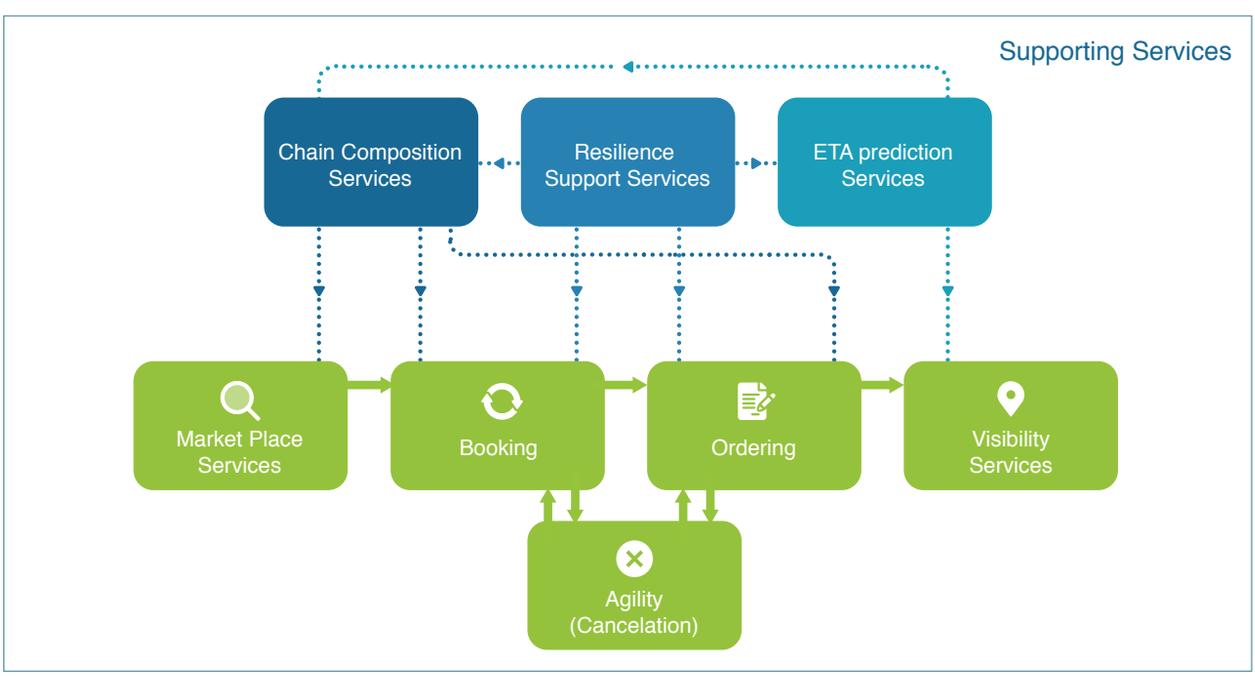


Figure 5 – classes of platform services

- Visibility services – (controlled) transparency of the physical - (for example, a container is loaded on a vessel and proof of delivery) and administrative progress (for example, a particular data set is available for customs or another authority) of an order to enable process synchronisation and seamless, compliant logistics operations. As a general rule, a service provider provides visibility to a customer based on orders and to the adjacent transport leg in a chain (e.g. carrier synchronising with a hub). Asset owners also need to be aware when and where their assets will be available for next operations.

The data sharing interactions of platform services will be specified as rules on the semantic model, thus identifying the minimal data set of a particular interaction. For instance, the booking of container transport should include the number of containers, locations, and times. An order has to contain details of each container like its weight and container number.

Data sharing with these platform services is based on data governance rules that can be applied by stakeholders. These rules can be formulated by a data categorisation, e.g. logistics services are public available and visibility data is only shared with a customer. There will be general data governance rules to which all organisations will adhere and organisation specific rules based on these general rules. Data governance rules specify data access control. Data access might also be negotiated between two organisations where these organisations don't share an order, e.g. a carrier requiring cargo availability provided by a hub.

General data governance rules need to adhere for instance to international rules and conventions like Rotterdam Rules formulating a carrier and stevedore must not know the exact content of a container but only a general description (STC – Said To Contain).

A platform must at least implement one of the aforementioned (subset of) classes of platform services (and its protocols) and support the data governance mechanisms. A subset of a class of platform services can be specified from various perspectives like commodity type and modality (see also the parameters of business scenarios in section 1.3).

Additionally, the following classes of platform services monitor and logging should be provided (mandatory); resilience support - and billing services can be provided (optional):

- Monitor and logging services – a set of services supporting a log and audit trail (a 'ledger') of all data shared by any two stakeholders using platform services and with other platforms. The objective is to monitor (and prevent) unauthorised data sharing and access to individual users of a platform and of other platforms. Authorities could also access this log and audit trail to monitor the behaviour of any two enterprises based on the data they share (similar to the data pipeline approach taken by Dutch Customs or access to e CMR solutions by inspection agencies).

- Resilience support services – all types of information services for decision support by individual stakeholders. Examples are traffic information, weather forecast data, and water depth information, but also services like scheduled infrastructure maintenance, accessibility of city centres, strikes, and disruptions caused by accidents or incidents.

- Billing services – based on the progress of logistics operations or access to particular resilience services, a platform can provide services for billing and payment.

Trust can be implemented by the federative platform with various mechanisms. Monitor and logging services and data encryption for data sharing between platforms and (temporary) data storage by a platform can add to trust. At least identity and authentication is required to assure that stakeholders using a platform are really who they indicate they are. Identity Providers can validate and provide an identity, and Certification Authorities are used to authenticate the identity. In the EU (and globally) several Identity Providers and Certification Authorities will need to be recognised, thus requiring protocols and standards. Potentially, specific mechanisms based on the Decentralised Identity Scheme developed by the World Wide Web Consortium (W3C) can be embraced.

Of course, there are also platforms providing technical services like transformation between any (Implementation Guides of) standards. These and other more technical platform services like temporary data storage services are currently out of scope.
They are required to address for instance availability of IT back office systems, support differences in standards and implementation guides, provide secure data transfer, etc.

3.Development and adoption of the federative platform

3.1 Migration

As presented in the previous chapters, the solution is believed to be an investment in business productivity, resulting in the optimisation of processes, and leading to improved efficiency, sustainability, safety and security of transport and logistic operations. However, it has to be clearly stated, that the development and adoption of the federative platform may require additional efforts from the both individual organisations and platform service providers. On the one hand, users of a platform or solution have to amend their system(s) to implement their local interface. On the other hand, platform service providers may need to change their platform services and to implement the related protocols. Each of the stakeholders needs to develop its own business case, not only considering costs and benefits, but also more soft impacts like improving safety and sustainability.

> **“it is necessary to develop a phased implementation strategy, starting with the core players with high volume and/ or first mover capabilities, and then gradually integrate others”**

Since there are many stakeholders involved, it will not be feasible to migrate all of them to a proposed solution at the same time. Therefore, it is necessary to develop a phased implementation strategy, starting with the core players with high volume and/or first mover capabilities, and then gradually integrate others.

3.2 Quick wins, governance and testing

In order to secure adoption by stakeholders, the concept of the federative platform needs to be validated and implemented in the real world conditions. There are several aspects to be taken in consideration in this context, like platform services, Registration and Connection Services, governance and testbeds for further development.

3.2.1 Quick wins

Most probably, users currently don’t implement all identified platform services. In order to facilitate the uptake of the federative platform we propose so called quick wins - an incremental implementation and adoption of these not yet widely deployed platform services, which meet current user demands, and which, in general, are not subject of specific closed solutions. Visibility services are an example of such a potential quick win: visibility services are not widely implemented by users, and if they are, there is a risk that they will be based on proprietary standards.

A roadmap needs to be developed for the development and incremental implementation of the platform services based on identified quick wins. The roadmap also needs to address the non-functional details of platform services.

3.2.2 Registration and Connection Services

Registration and Connection Services are currently based on proprietary solutions of platforms and don’t create an open logistics organisational network. Therefore they need to be standardised to support the full range of platform services. Complexity of the Registration Service depends on the platform services class(es) (figure 5). For instance, Marketplace Services require the publication of logistics services and timetables and have other requirements to the Registration Services than to the Visibility Services. Connection Services may require the development of a separate online toolset supporting an organisation in developing its local interface, as described earlier.

3.2.3 Governance

Governance for creating a sustainable solution needs to be initiated. Governance has two dimensions, namely technical and legal. The legal dimension can be supported by technical solutions like data standards and supporting platforms. These will be briefly addressed below.

The technical dimension comprises on the one hand specifications of all platform services and platform interoperability and on the other hand the platforms themselves. The specifications can evolve into open standards. Notably, some of the most successful standards have been developed by public authorities, for instance the Internet standards. Each platform has its own governance structure and business model, which can be commercial or community based. Furthermore, these can be private or public. For instance, a Port Community System will most likely have a private community governance model, while the future European Maritime Single Window[10] implementation most probably will have a public governance (and business) model.

The legal dimension refers to privately produced

[10] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-3807523_en

rules (like the Hague-Visby Rules[11]), and public (e.g. EU) directives and regulations. This legal dimension should be supported by public and/or privately governed standards, with an interface between authorities and enterprises (Business-to-Government, B2G). For instance, private conventions might require an interface by which authorities make use of data shared amongst enterprises utilising a platform of choice like the eCMR. In a similar manner, directives like the Union Customs Code (UCC)[12] may be supported by a B2G interface and private and public systems managing that interface.

3.2.4 Testbed projects

Relevant testbed projects need to be initiated to develop the specifications in more detail and validate the proposed solution in a practical setting, before these specifications result in open standards. These projects can build upon existing initiatives demonstrating rapid deployment by stakeholders (on-boarding) for quick wins. Separately, projects can be initiated to develop and validate particular concepts in a controlled environment, i.e. with a limited number of stakeholders. Especially, the Connection Services and supporting tools need to be developed further. All projects have to be plotted against the roadmap, with a clearly specified governance structure to be able to create a federative network of platforms and prevent development of competing standards.

[11] https://www.jus.uio.no/lm/sea.carriage.hague.visby.rules.1968/doc.html#31

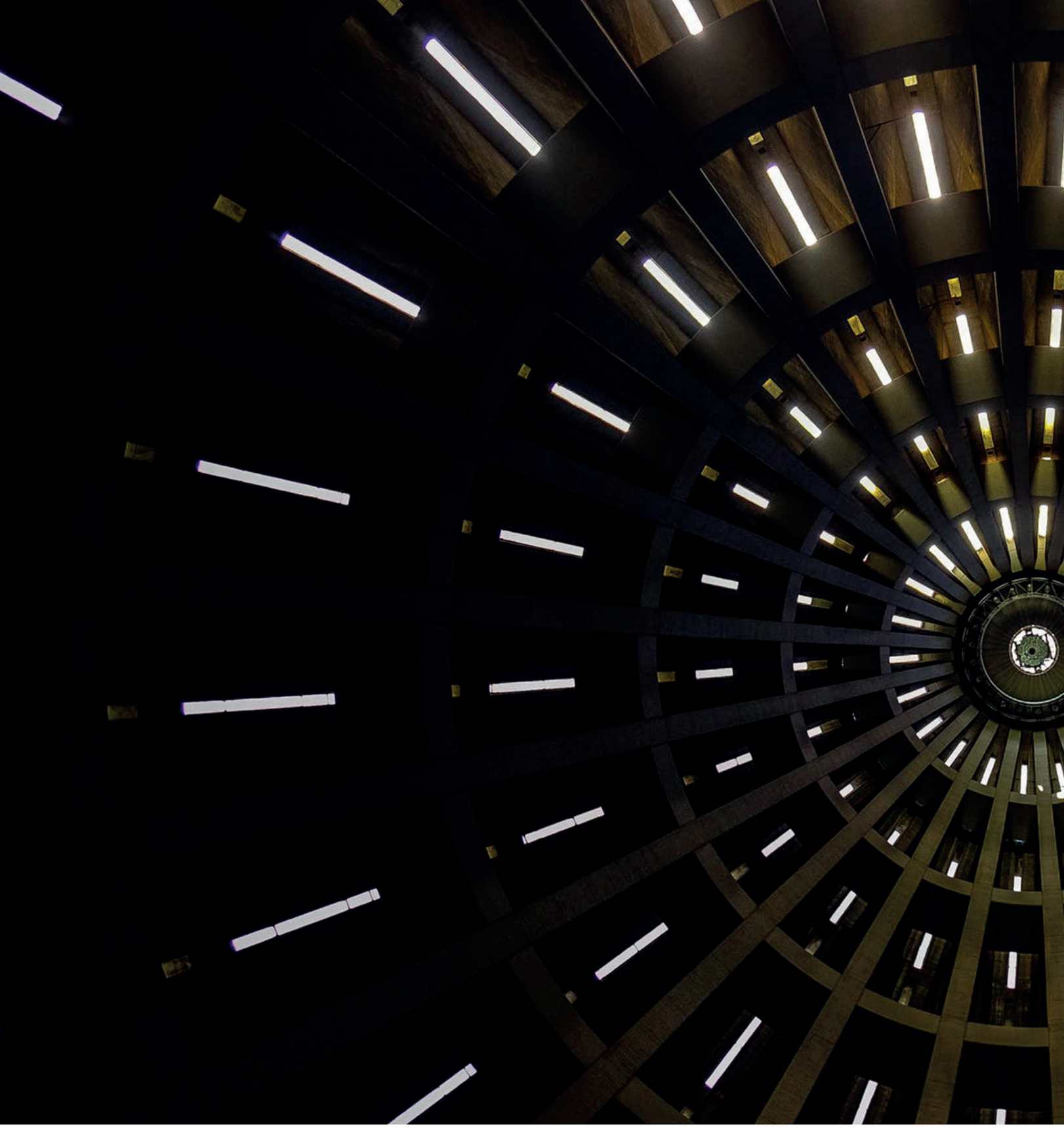
[12] https://ec.europa.eu/taxation_customs/business/union-customs-code_en

4. Next steps

Since the logistics sector consists of a huge number of SMEs and a fair number of large, globally operating enterprises, it is not likely that any of these enterprises is able to act as a dominant player and reach a consensus to use its proprietary solution. Accordingly, the DTLF suggests that is should be the public sector that takes the initiative to develop the federative platform and facilitates its uptake by stakeholders.

The work of the DTLF needs therefore to continue towards the development, consensus building, and adoption of the corridor freight information systems based on the federative platform concept. The DTLF issued a set of specific recommendations aimed to pursue and frame the future process.
These recommendations are available together with the final report[13].

[13] Link to the report and recommendations



Contacts

Digital Transport Logistics Forum website:
www.dtlf.eu

Registry of the European Commission expert group:
http://ec.europa.eu/transparency/regexpert/