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INTERNATIONAL SUPPLY CHAIN PROGRAMME DEVELOPMENT AREA
TRANSPORT AND LOGISTICS DOMAIN

**BUSINESS REQUIREMENTS SPECIFICATION
(BRS)**

DATA PIPELINE CARRIER
PIPELINE DATA EXCHANGE STRUCTURE
(PDES)

FINAL AFTER PUBLIC REVIEW

Approved: UN/CEFACT Bureau on 17 February 2020

Version: 1.0

Table of Contents

Document History

Phase	Status	Date Last Modified
Draft development	Initial	22-AUG-2017

Figure 01: PDES Document History

Change Log

Date of Change	Version	Paragraph Changed	Summary of Changes
August 2017	0.1		Initial Creation
September 2017	0.2		After sending for internal review, added feedback around the link to the eCMR project and commonality of the waypoints.
October 2017	0.3		Feedback from forum in Rome on wording, difference between MMT and Pipeline
January 2018	0.4		Feedback from Interim Meeting in Paris
April 2018	0.5		Overview of the BRS and feedback from Geneva Forum
April 2019	0.6		Feedback from Geneva Forum
July 2019	0.7		Berlin working group to finalize draft for review. Updated use cases.
August 2019	0.8		Updating BRS required segments
August 2019	0.9		Draft for Public Review
February 2020	1.0		Updates from the public review

Figure 02: PDES Document Change Log

1.0 Preamble

Easing modern trade flow requires improvements across the entire supply chain, including commercial and regulatory management. Key to managing these new demands and making optimum choices is to capture and use the right data at the right time from the right source. With this objective in mind, a number of pilot projects has led to the development of an end to end data carrier that describes the data to be sent between trading partners and to regulatory authorities through a "seamless integrated transaction." This process has necessitated a major rationalization of current business requirements and approaches in order to ensure capturing accurate data at its source.

In today's global supply chain business processes, information about transactions resides in siloed business and government systems. The information which is shared is often reinterpreted or filtered. As a result, the flow of goods is accompanied by information streams of poor quality. The lack of reliable, accurate and complete data makes it hard to achieve supply chain visibility. This, in turn, makes decision making, risk detection, efficient risk management, supply chain optimization by companies and supervision by regulatory inspection agencies very difficult.

The concept of a Data Pipeline allows data that originates at its source to be provided once and used multiple times throughout the supply chain, regardless of the mode of transport, party or regulatory agency that needs to access the data.

In the Data Pipeline concept, information is structured around waypoints when information is injected into the Data Pipeline ("input waypoints") or when information is extracted from the Data Pipeline ("output waypoints"). Various events take place in the process and movement of goods and these can potentially be "input waypoints", "output waypoints" or both.[1]

Connectivity infrastructures for information sharing such as Data Pipeline environments enable better quality data, supply chain visibility and information sharing. They open new possibilities for system-based audit and the development of smart software applications to offer value-added services to business, such as automated planning and scheduling, and for regulatory agencies, such as automated monitoring and targeting.

In such a Data Pipeline approach, the quantity of data in the pipeline therefore grows as the goods move from seller and/or consignor to consignee and/or buyer while at the same time ensuring the quality of the data as it is coming from its source. These Data Pipelines will need to have a sequence of generic waypoints, but these will be constructed individually based on customer needs or mode of transport meaning that each one may be different.

2.0 References

- UN/CEFACT Multi-Modal Transport Reference Data Model (MMT-RDM)
- UN/CEFACT Buy-Ship-Pay Reference Data Model (BSP-RDM)
- EU CORE Project, http://www.coreproject.eu/
- EU Cassandra Project, http://www.cassandra-project.eu/
- eCMR Project https://uncefact.unece.org/pages/viewpage.action?pageId=9601458
- White Paper on Data Pipeline Concept for Improving Data Quality in the Supply Chain http://www.unece.org/fileadmin/DAM/cefact/GuidanceMaterials/WhitePaperDataPipeline_Eng.pdf

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[1] See UNECE « White Paper on Data Pipeline Concept for improving Data Quality in the Supply Chain", April 2018.

- Smart Containers Whitepaper
  http://www.unece.org/fileadmin/DAM/cefact/GuidanceMaterials/WhitePaperSmartContainers.pdf

3.0 Objective

The objective of this document is to outline and standardize the information entities of the Data Pipeline Carrier, which is based on the Multi Modal Transport Reference Data Model (MMT RDM). Data Pipelines in general may operate independently of each other, but should be interoperable in respect of the data, with the goal that the intended recipients can receive data in a standardized format that reduces the integration effort of data into their systems. Data Pipelines may be entirely private to a specific entity or eventually open (public) and accept complimentary data from any source that provides accurate and accountable information relevant to the transport process.

4.0 Scope

4.1 Description

The project scope is to standardize and harmonize messages related to the cross-border exchange of goods for any mode of transport to be exchanged between multiple actors within a supply chain, either directly within one or between corresponding Data Pipelines. The Data Pipeline works on the principle that advance data from trusted sources is made available at the earliest opportunity to those that need and require the data.

The Data Pipeline can be used in conjunction with documents, but the primary focus is on process-driven data exchange.

Events that take place at key points in time during the process are known as "waypoints." The definition of all possible waypoints is not within the scope of this document as these may vary depending on the needs of the business partners and the mode of transport.

Future waypoints may be defined for specific modes of transport or business processes to suit as appropriate. The White Paper "Data Pipeline Concept for Improving Data Quality in the Supply Chain" outlines multimodal waypoints that could be used in international supply chains.

This document describes a typical scenario in all modes of transport, using these 4 key waypoints:

1. Consignment Completion Point
2. Departure from the Country of Export
3. Arrival Declaration
4. Delivery of Consignment

4.2 Context

Context Category	Description
Business Process	Data exchange via Pipeline Data Exchange Structure BUY-SHIP-PAY / Multi Modal Transport RDM / PDES
Product Classification	All
Industry Classification	All
Geopolitical	Global
Official Constraints	None
Business Process Role	Sender of information; user of information

Context Category	Description
Supporting Role	Buyer, Seller, Transport Service Buyer, Transport Service Provider, Declarant, Customs, Regulatory Agency, Consignor, Consignee, IoT device.
System Capabilities	No limitations

Figure 03: Context Categories for PDES

5.0 Business Requirements Elaboration

5.1 Business Requirements List

In the Date Pipeline concept, information is structured around waypoints when information is injected into the Data Pipeline ("input waypoints") or when information is extracted from the pipeline ("output waypoints"). Various events take place in the process and movement of goods and these can potentially be "input waypoints", "output waypoints" or both.

The definition of all possible waypoints is not within the scope of this document as these may vary depending on the needs of the business partners and the mode of transport.

Future waypoints may be defined for specific modes of transport or business processes to suit as appropriate. The White Paper "Data Pipeline Concept for Improving Data Quality in the Supply Chain" outlines multimodal waypoints that could be used in international supply chains.

The injection of information can have multiple sources just as the users of the information in the pipeline could be multiple. For this reason, using a clear semantic standard based on the UN/CEFACT MMT RDM is very important.

This document describes a typical scenario relevant to all modes of transport, using these 4 key OUTPUT waypoints:

1. Consignment Completion Point
2. Departure from the Country of Export
3. Arrival declaration
4. Delivery of Consignment

Number	Business Requirement Statement	Business Transaction Name
A.1	The point that the goods are physically loaded into a container, a unit load device (ULD) or into the packaging for its main transport. The Consignor or Transport Service Provider should have all information concerning the commercial aspects of the goods and the scheduled main transport.	Consignment completion point
A.2	The point at which the goods have actually left the port of loading, confirming the transport has taken place. The Transport Service Provider should have all information concerning the actual transportation. This information can be transmitted to the Consignee or Buyer as well as to Regulatory Agencies in the country of arrival in order to plan their arrivals.	Departure from the country of export
A.3	The point at which the required customs declaration for the arrival of the goods takes place.	Arrival declaration

Number	Business Requirement Statement	Business Transaction Name
	The information can be transmitted directly to the relevant Regulatory Agency or alternatively to the declarant who uses the information for these regulatory procedures.	
A.4	The point at which the consignment is actually delivered to the consignee or Delivery Party under the transport contract. The information can be transmitted to the Consignee, a Transport Service Provider or the Buyer.	Delivery of consignment

Figure 04: PDES Business Requirement List

Number	Data Requirement Statement
B1	The data pipeline specification should provide interoperability with the UN/CEFACT Multi-Modal Transport Reference Data Model (MMT RDM)

Figure 05: PDES Data Requirement Statement Template

5.2 Definition of Business Terms

The main terms are defined in the MMT RDM; the PDES is fully compliant with all of these definitions. The PDES makes reference to the following additional terms:

Term	Definition
Cross Border Agency, Regulatory Agency	An agency operating at the border handling the regulatory aspects of entry of goods into a territory, including relevant security procedures.
eCMR	Contract of carriage by road (eCMR) means a contract in which a transport company, against the payment of freight, undertakes to carry goods from one place to another. In the CMR Convention, a contract of carriage is confirmed by the making out of a consignment note.
IoT Device	An electronic device that may connect to the Internet to exchange information with a software application that collects/receives, stores and communications this information with users with or without the use of an IoT platform.
PDES	Pipeline Data Exchange Structure, the data structure defined in the project to provide the data in a Data Pipeline environment, the PDES is a subset of the Multi Modal Transport Reference Data Model (MMT RDM).
Transport Service Buyer	The buyer of transport services as stipulated in a Transport Service Contract.
Transport Service Provider	The provider i.e. seller of transport services as stipulated in a Transport Service Contract.

Term	Definition
ULD	Unit Load Device. Standardized containers used for transporting cargo in the air mode of transport. ULDs may also be used in the pre-carriage and post-carriage of the cargo, with the main transport being air cargo.
WMS	Warehouse Management System

Figure 06: PDES Definition of Terms

5.3 Business Requirements View

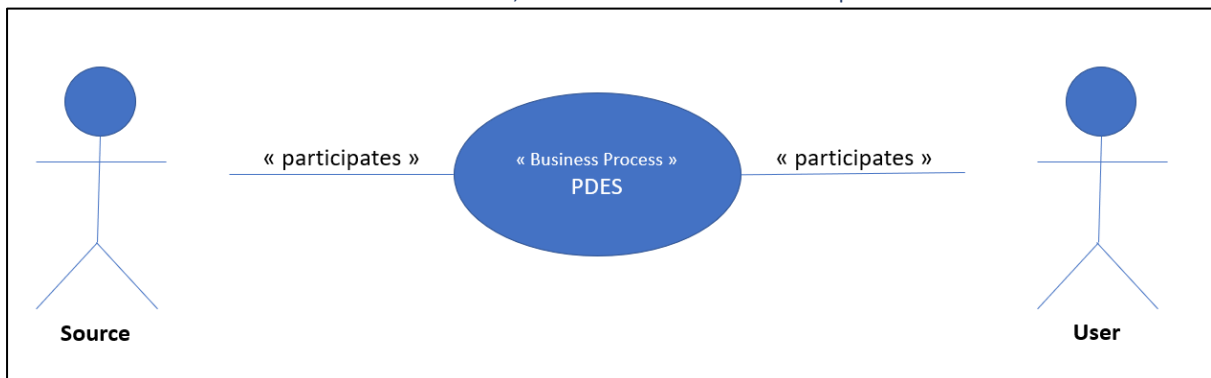### 5.3.1 Overall Business Process Use Case, Partner View and Conceptual Model

Figure 07: PDES Business Process Use Case Diagram

The Data Pipeline is established through "input waypoints" and "output waypoints." Those who provide the information in the input waypoints are the source of the information; the intention is to try to get the information from its source. Those who use the information are the reasons for the output waypoints. Depending on the design of the Data Pipeline itself, only parts of the information may be made available at the output waypoint, i.e. information necessary for a specific procedure. The participants and stakeholders may in some cases be simultaneously both source of some original information and user of other information which preceded their operation. These participants and stakeholders include: Buyer, Seller, Transport Service Buyer, Transport Service Provider, Declarant, Customs, Regulatory Agency, Consignor, Consignee, IoT Device, Insurance Service Provider, Finance Service Provider, WMS…

Figure 08: PDES overall Conceptual Model

5.3.2 Waypoint A.1 – Consignment Completion point

A.1 Consignment Completion Point	
General	
Name	Consignment Completion Point
Description	The point that the goods are physically loaded into its transport equipment such as a container, a unit load device (ULD) or into the packaging for its main transport.
Details	
Classified to Business Areas and Process Areas	Business Area: **Multi-Modal Transport** Process Area: **Ship**
Participants and their interests	Consignee, Consignor, Delivery Party
Stakeholders and their interests	Insurance Service Providers, Finance Service Providers
Reference(s)	
Start / End Characteristics	

A.1 Consignment Completion Point	
Pre-condition	The Despatch Party has a consignment to be transported and knows the mode of transport (air, road, sea or rail). The consignment has been or will be loaded into one or more specific pieces of transport equipment. The Consignor has advised the Transport Service Provider when the consignment will be ready for pick-up. The Transport Service Provider has space available on a specific means of transport. The Transport Service Provider and the Consignor/Despatch Party have a contractual relationship. The Despatch Party knows explicitly the number of items, weight of the consignment loaded into the specific transport equipment along with any transport equipment references or seals. The Despatch process may also trigger payment and could be a useful waypoint in the supply chain.
Post-condition	The Consignment is secured, loaded and departs the Despatch Party to the next location in the movement.
Begins When	Stuffing of the container, the ULD or the packaging for main transport.
Ends When	Doors closed on the container, the ULD or the packaging for main transport. Eventually any seals affixed.
Actions	None
Exceptions	None
Relationships	
Included Business Processes	eCMR The eCMR process shares this waypoint and could compliment the data at this waypoint for cross border road movements. The eCMR needs to provide trust that the data hasn't been changed from this waypoint. Data could be added to the message schema to accommodate this mode of transport requirement.
Affected Business Processes	None

Figure 09: PDES Business Process Worksheet; Consignment Completion Point
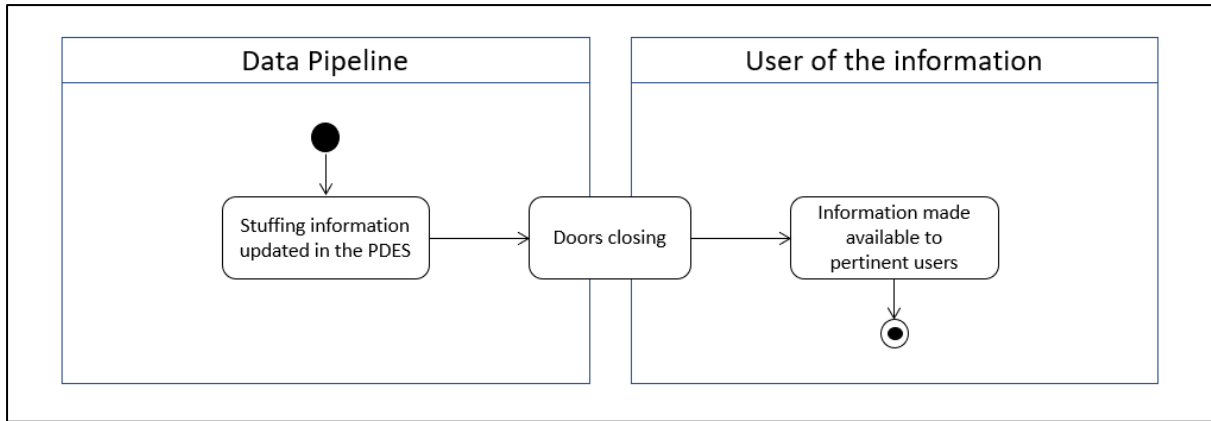
Figure 10: PDES Business Process Activity Diagram; Consignment Completion Point

5.3.3 Waypoint A.2 – Departure from the country of export

A.2 Departure from the country of export	
General	
Name	Departure from the country of export
Description	Departure of the Transport Means from the country of export, which could be the vessel or flight departure to its next or final destination.
Details	
Classified to Business Areas and Process Areas	Business Area: **Multi-Modal Transport** Process Area: **Ship**
Participants and their interests	Transport Service Provider, Carrier, Subsequent Carrier, Despatch Party
Stakeholders and their interests	
Reference(s)	
Start / End Characteristics	
Pre-condition	The consignment has been loaded and delivered to a port for the modes Sea, Air and Rail. In the case of road movements, the consignment maybe going directly from the Despatch party to the Delivery Party, so this would mean that A1 and A2 would be the same. The Transport Service Provider has space available on a specific means of transport, and the consignment has been accepted for carriage on the means of transport. Where applicable any customs and security formalities have been completed and goods are cleared for transport.
Post-condition	The consignment is secured, loaded and departed from the port/place of loading for onward transport to the next location.

A.2 Departure from the country of export	
	The planned itinerary is confirmed. The actual date and time of departure is confirmed.
Begins When	The Carrier or Transport Service Provider has loaded the goods onto the means of transport and departed the country of export.
Ends When	Transportation is en route.
Actions	None
Exceptions	None
Relationships	
Included Business Processes	Departure confirmation Transshipment events
Affected Business Processes	None

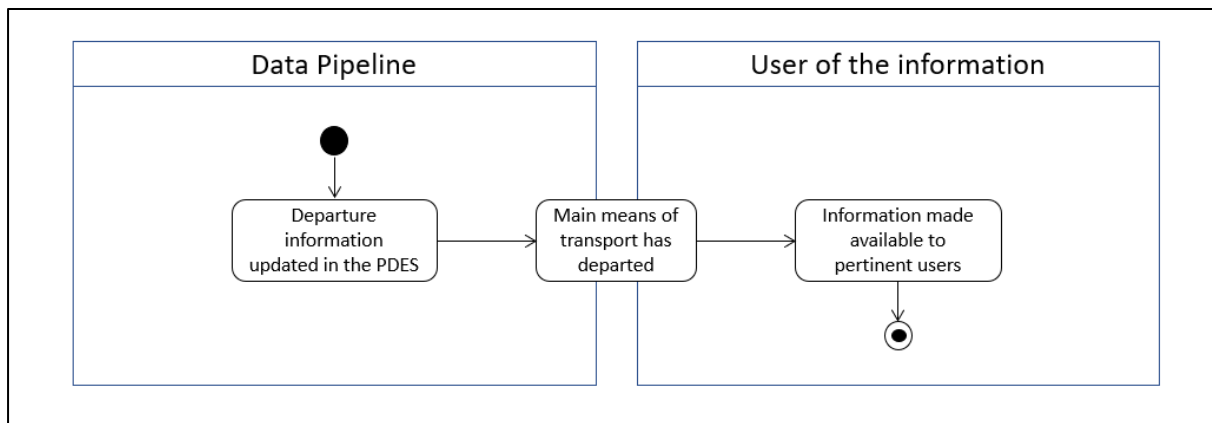*Figure 11: PDES Business Process Worksheet; Departure from the country of export*

Figure 12: PDES Business Process Activity Diagram; Departure from the country of export

5.3.4 Waypoint A.3 – Arrival declaration

A.3 Arrival declaration	
General	
Name	Arrival declaration
Description	The point at which the required customs declaration for the arrival of the goods takes place.
Details	
Classified to Business Areas and Process Areas	Business Area: **Regulatory** Process Area: **Ship**
Participants and their interests	Carrier, Border Agencies
Stakeholders and their interests	

A.3 Arrival declaration	
Reference(s)	
Start / End Characteristics	
Pre-condition	The consignment will need to cross a border into a different country or customs regime and will require a declaration to be made.
Post-condition	The consignment crosses through the border and continues its onward journey to the Delivery Party.
Begins When	Consignment arrives at the border. In some countries, this can be initiated prior to the arrival.
Ends When	Cleared by regulatory authority for entry into the territory.
Actions	
Exceptions	Information in the Data Pipeline could be provided earlier at the request/consent of regulatory agencies. Road transport may need to provide cabotage history for a driver to ensure that he/she transits a country as opposed to working in that country. This history could be linked to the Data Pipeline entries, providing further trust.
Relationships	
Included Business Processes	Customs Goods Arrival Declaration Security clearance Statistical compilation for administrative purposes
Affected Business Processes	eCMR messages could be used to make advanced/on-demand consignment data available to the border agencies.

Figure 13: PDES Business Process Worksheet; Arrival declaration
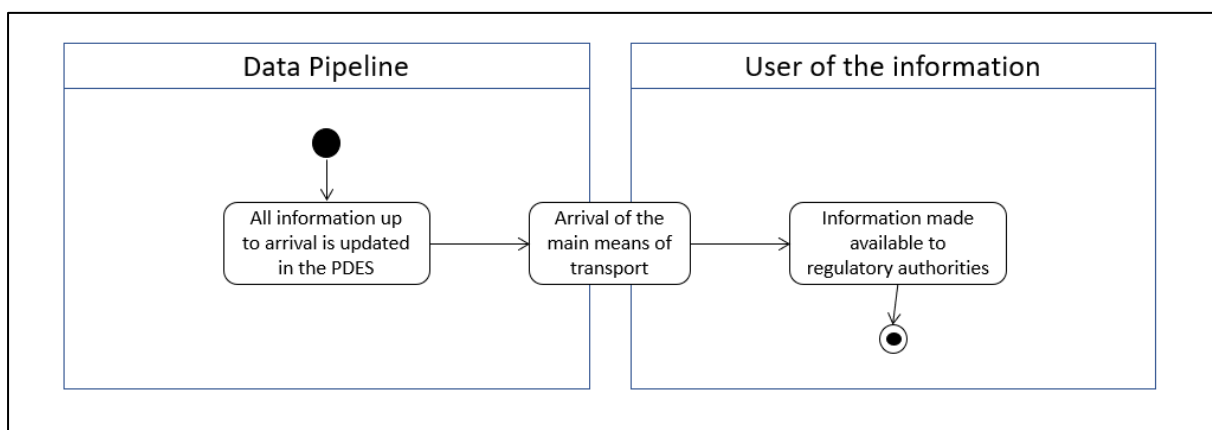

Figure 14: PDES Business Process Activity Diagram; Arrival declaration

5.3.5 Waypoint A.4 – Delivery of Consignment

A.4 Delivery of consignment	
General	
Name	Delivery of consignment
Description	The point at which the consignment is actually delivered to the Consignee or Delivery Party under the transport contract.
Details	
Classified to Business Areas and Process Areas	Business Area: **Multi-Modal Transport** Process Area: **Ship**
Participants and their interests	Consignee, Delivery Party, Transport Service Provider
Stakeholders and their interests	Finance Service Provider
Reference(s)	
Start / End Characteristics	
Pre-condition	The consignment is scheduled to arrive at the Delivery Party location and seal numbers and 'paperwork' will be checked before accepting the consignment.
Post-condition	The Delivery Party accepts the delivered consignment. The consignment is unloaded at the Delivery Party location, the carrier may or may not have empty equipment or goods to be returned.
Begins When	Goods arrive at final destination
Ends When	Consignee accepts the arrival
Actions	The Delivery Party accepts the goods and confirms the correct package count upon delivery from the carrier. This count will be used to confirm safe receipt, advise of any damages and to follow up on any customs declarations that may have taken place in the event of inaccuracy or if further information is required. The Delivery Party may confirm if the container has been opened and re-sealed by checking the seal number or on advice from a customs or border authority or based on modern methods of transmission such as IoT device.
Exceptions	
Relationships	
Included Business Processes	
Affected Business Processes	Customs arrival declarations and import declarations (if the piece count indicates a discrepancy)

A.4 Delivery of consignment	
	Payment to the Transport Service Provider (for completion of the delivery) / potential conclusion of the contract of carriage Payment to the Seller (for delivery of the goods) / potential conclusion of the contract of sale Pre-receipt of goods into a warehouse (by connecting this information to a WMS for example)

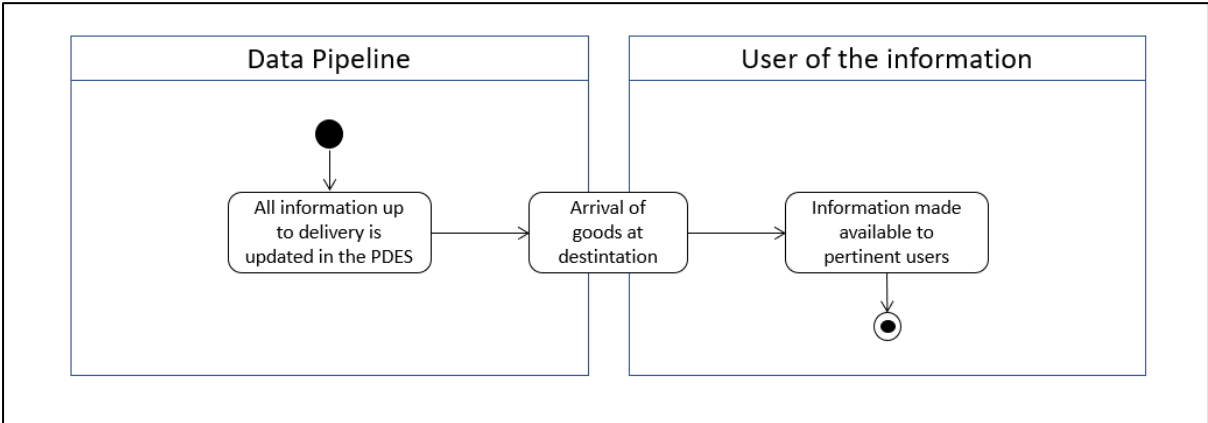*Figure 15: PDES Business Process Worksheet; Delivery of consignment*

Figure 16: PDES Business Process Activity Diagram; Delivery of consignment

5.4 Business Choreography View

5.4.1 Business Transaction View – Transactions and Authorized Roles

This document covers the main output waypoint information of the PDES. The users of the information at each waypoint can be varied depending on their business needs of the data. Furthermore, the various input and output waypoints may vary depending on the needs of the business partners and the mode of transport.

The White Paper on Data Pipeline describes a number of potential input and output waypoints. These are described in the following activity diagram:
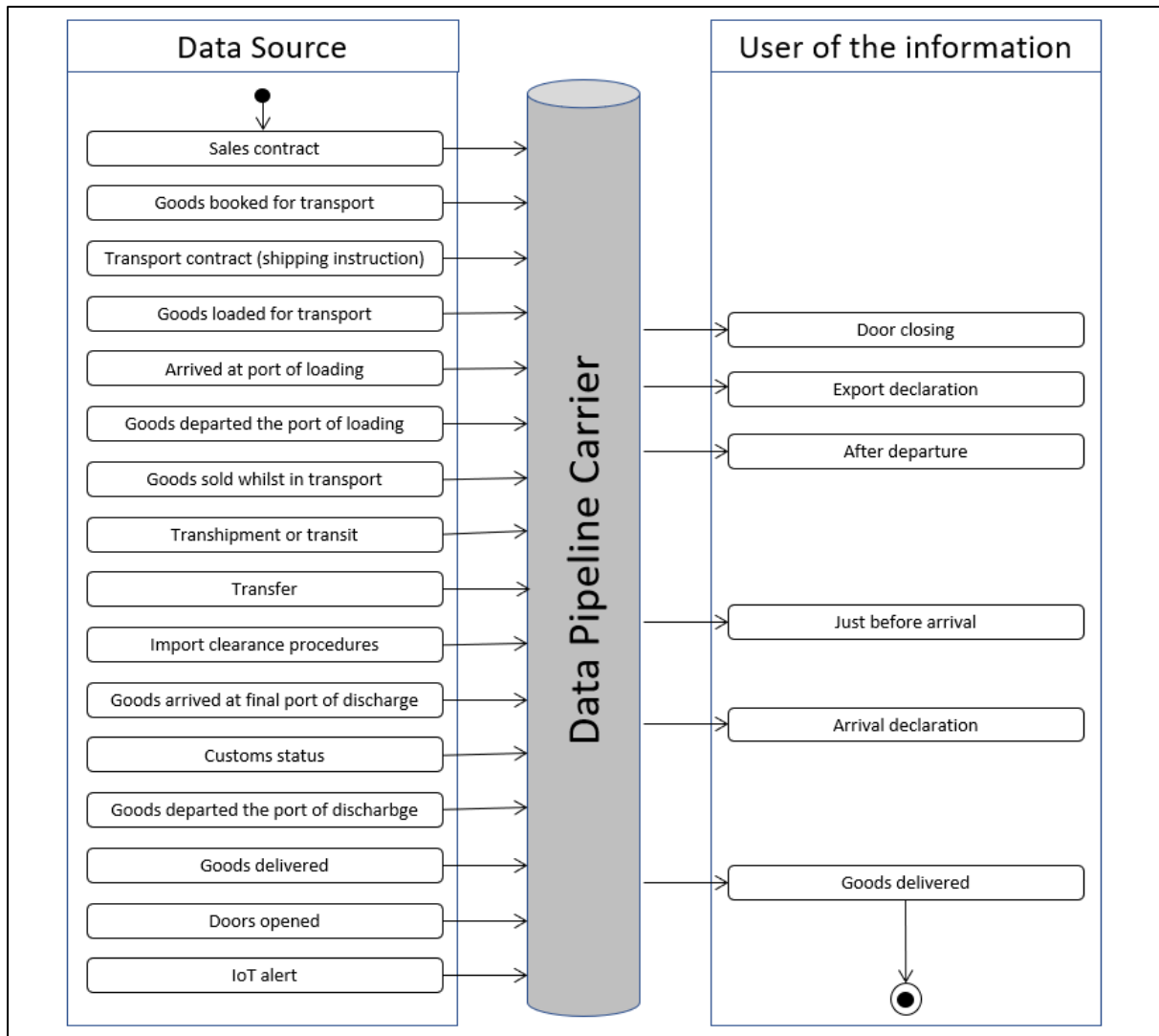
Figure 17: PDES example of potential Business Transaction Activity Diagram

These interactions are between the Data Source (which can be multiple participants) and a platform/database (Data Pipeline Carrier); and between the platform/database (the Data Pipeline Carrier) and the User of the information (which can be multiple participants).

These transactions allow the exchange of small snippets of information instead of transmitting complete documents; the result is that this exchange model can potentially replace these traditional methods of data communication.

For this reason, it is not possible to describe a "requestor" and "responder" view as these do not interact directly with each other but with a platform/database (Data Pipeline Carrier).

5.4.2 Business Collaboration View and Business Realization View

The source of the data and the users of the data in the generic example which was defined in the White Paper are mapped here.
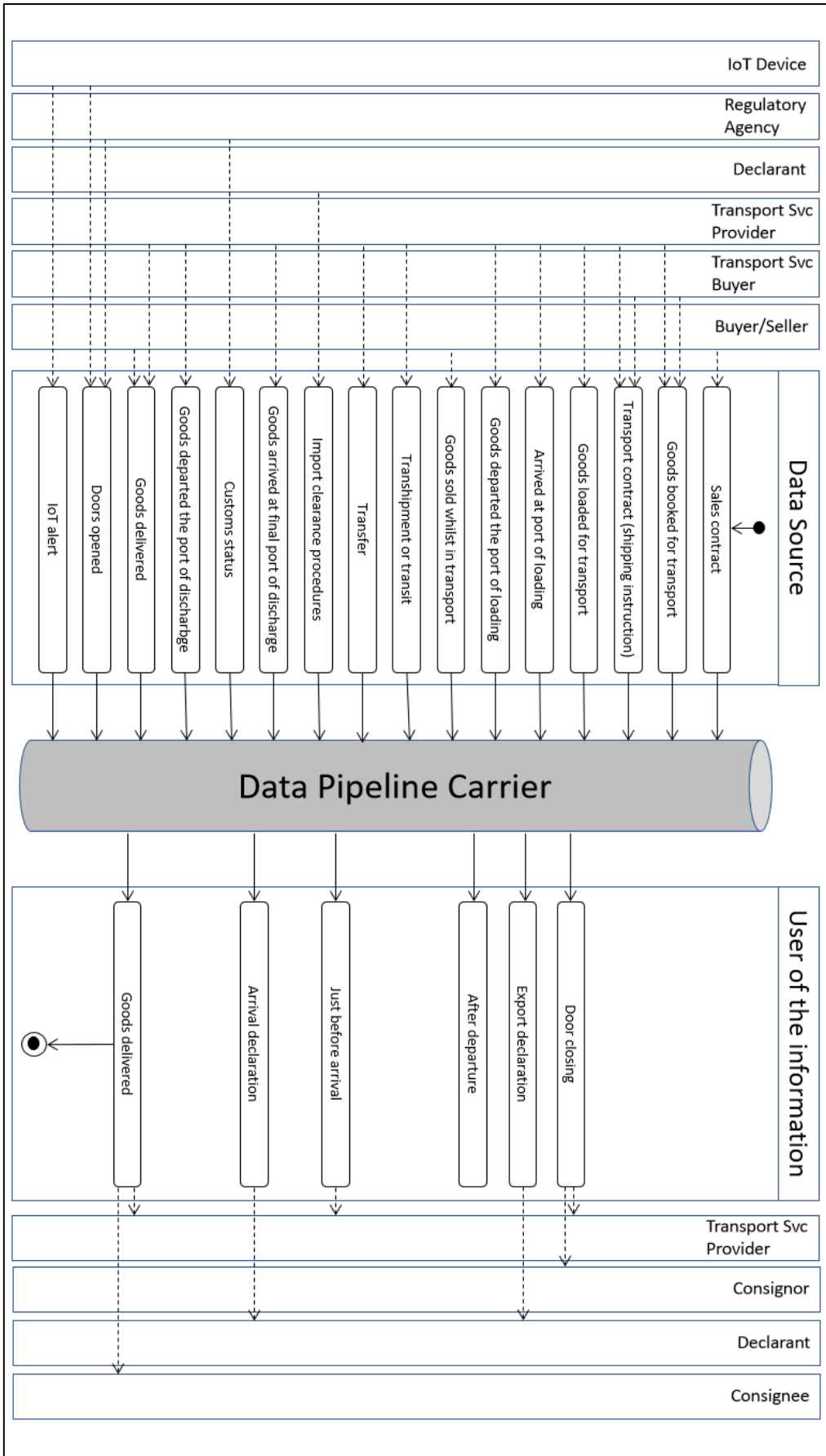
Figure 18: PDES example of Business Collaboration Activity Diagram