14 May 2020

DCSA Interface Standard for Track and Trace
1.2

Data and Interface Standards
Digital Container Shipping Association

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Preface

The vision of the Digital Container Shipping Association (DCSA) is to shape the digital future of container shipping by being the industry's collective voice, working towards alignment and standardization, setting the frameworks for effective and universally adoptable solutions, exploring possibilities of innovation, and moving the industry forward through standards for IT and non-competitive business practices. The DCSA aims at paving the way for interoperability in the container shipping industry through digital transformation and standardization. It is the DCSA's mission to represent, lead and serve the container shipping industry for safer, more secure and more efficient operations of container shipping companies.

The DCSA has five key objectives:

Figure 1. The DCSA's key objectives

The objective of the DCSA's Data and Interface Standard project workstream is to strengthen the container shipping industry's ability to send and receive data across the parties in the industry. Furthermore, it aims at enhancing intercarrier cooperation based on shared requirements, and ensuring interoperability by using a shared data language, preferably inspired by existing standards and aligned with the industry process definitions in the DCSA Industry Blueprint 1.0.

The standards published by the DCSA are technology agnostic. The DCSA does not point to the use of specific vendor's technologies or systems but relies on open-source shared requirements for the industry that can be used by all parties, regardless of the choice of technology.

This document

This document is the publication related to the DCSA Interface Standard for Track and Trace. The aim of the DCSA Interface Standard for Track and Trace 1.2 is to ensure that all members and partners in the container shipping industry can base their interfaces on a common understanding of the data and processes of the industry to enable consistency, simplicity, and timeliness in the solutions for tracking and tracing across the industry, supporting the interoperability in container shipping.

This document is supported by a range of supplementary publications by the DCSA, which will be referenced in the relevant sections. The supporting publications are:

- **DCSA Industry Blueprint 1.0**
  Provides insights on as-is carrier processes. The DCSA Industry Blueprint 1.0 comprises processes related to the movement of a container from one location to another, processes that are linked to shipment processes that are considered critical for industry digitization and standardization efforts, and finally processes that are not considered commercially sensitive or of competitive advantage.

- **DCSA Information Model 1.0**
  The DCSA Information Model 1.0 organizes and catalogs the information being generated or consumed in connection with the processes described in the DCSA Industry Blueprint 1.0. The DCSA Information Model 1.0 is also a collective term that describes all the products that model the data needed to meet the interface requirements. Further, the DCSA Information Model 1.0 also includes a diagrammatic representation of entities and their interrelationships.

- **DCSA Glossary of Terms 1.1**
  This publication promotes alignment between terms across all DCSA stakeholders in the container shipping industry. The first version of the glossary was published on the DCSA website in the summer of 2019, in the context of the Industry Blueprint.

- **Reading Guides on the DCSA Information Model 1.0, and on the DCSA Interface Standard for Track and Trace 1.2**
  The two reading guides on the DCSA Information Model 1.0 and the DCSA Interface Standard for Track and Trace 1.2, respectively, should help set the context around the DCSA initiatives. The guides provide insight into the different concepts and methods utilized in the production of the documents, and they suggest ways on how the documents can be used as a foundation for future implementations.

- **DCSA Event Naming Convention 1.0, and Event Structure Definitions 1.0**
  Throughout the years, track and trace solutions have become a commonly seen service in the container shipping industry. However, due to misalignment of terminology and ways of working, each carrier has designed its own events that have been published on the carriers' websites. To align this across the industry, the DCSA has developed a naming convention that sets the standards for naming as well as understanding customer-facing track and trace events.

Document ID & Version history

The below table contains the introductory information regarding the project workstream.

Name	Description
Project name	Data and Interface Standards
Project workstream	Interface Standard for Track and Trace
Project number	1
Version 1.0	DCSA Interface Standard for Track and Trace 1.0
Version 1.1	DCSA Interface Standard for Track and Trace 1.1 Amendments: - OpenAPI definitions, - Versioning markdown on DCSA GitHub, - Error handling guideline on DCSA GitHub.
Version 1.2	DCSA Interface Standard for Track and Trace 1.2 Major changes compared to 1.0: - Addition of Push Model (Subscribe & Publish) - Addition of 'Event Type' in 'Events' outputs - Addition of 'Mode of Transport Code' in 'Transport' and 'Transport Equipment' event outputs - Addition of 'Booking Reference' as optional to track and trace events outputs

Table 1. Document ID

Referenced documents

- DCSA Industry Blueprint 1.0
- DCSA Glossary of Terms 1.1
- DCSA Information Model 1.0
- DCSA Information Model 1.0 Reading Guide
- DCSA Interface Standard for Track and Trace 1.2 Reading Guide
- DCSA Event Naming Convention 1.0
- DCSA Event Structure Definitions 1.0

The above-mentioned documents can be found on the DCSA.org website.

Legal disclaimer

1   Introduction

1.1   Objective

The objective of the DCSA Interface Standard for Track and Trace is to standardize the fundamental information provided across the carrier liner domain through track and trace interfaces. Focus is to ensure agreement within the industry on the shared requirements and standards that the industry must follow to streamline inter-operational functionality and data sharing across parties within the industry. This agreement should be further supported by use-cases or designated subject areas.

This agreement on standardization is made to ensure that the interfaces, including the functionality and the data provided via the interfaces, are and will be defined and designed in the same way so that the end-user experience remains consistent across all industry partners using these standards. This means that it should not matter whether an interface is built using EDI messages, interactive UIs, APIs, manual data exchanges or any other interface technology, the interface elements must remain consistent regardless of the technology adopted.

The DCSA Interface Standard for Track and Trace 1.2 extends the existing DCSA Interface Standard for Track and Trace 1.0 and the publications on error handling and versioning (release 1.1). While the DCSA Interface Standard for Track and Trace 1.0 supported a synchronous pull model of an interface, DCSA Interface Standard 1.2 includes an asynchronous push model of an interface.

1.2   Overview

In defining a technology-agnostic interface standard, the interface describes all exchanges of information between any two parties. For tracking and tracing, the primary parties are
- The sender or receiver (shipper or consignee) of goods wanting to maintain information about the goods being transported
- The main party contracting the movement of the goods, which, from the DCSA's point of view, is the ocean carrier.

Many other parties may be involved in the movement of goods, such as haulers, freight forwarders, feeder operators and barge operators, though the DCSA considers the ocean carrier to be the main party acting as the provider of track and trace information to the parties interested in that information.

The DCSA Interface Standard for Track and Trace 1.2 is meant to describe a standard for the exchange of information in the form of inputs and outputs. Figure 2 shows how this interface interplays with the different technology elements.
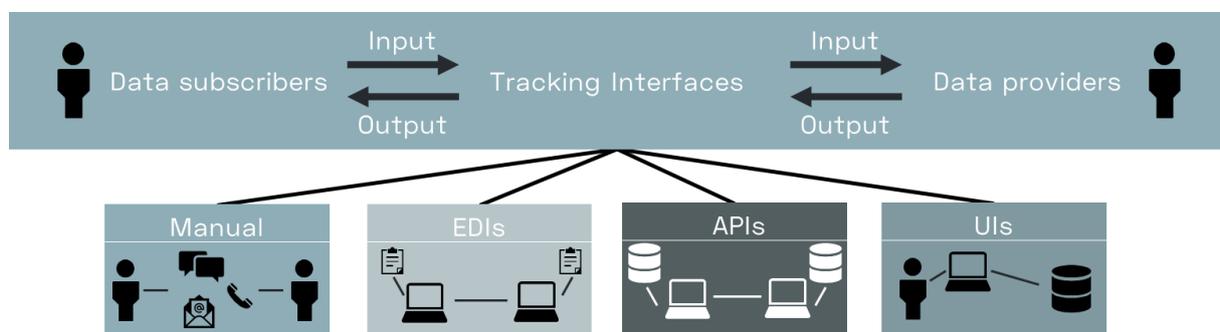
Figure 2. Interface illustration of input and output

To define the DCSA Interface Standard for Track and Trace 1.2, the DCSA is inspired by the Unified Modeling Language (UML) methodology.

1.3 Conformance

All parties in the container shipping industry are encouraged to implement and follow the data and interface requirements outlined and specified in this document. The requirements are linked to the UML version 2.0 diagrams for design requirements as well as the DCSA Logical Data Model and data definitions for information requirements, which must be implemented in order to conform to the agreed standards within the DCSA framework.

1.4 Normative references

The documents listed below constitute the normative references for publication of the DCSA Interface Standard for Track and Trace 1.2:

- DCSA Industry Blueprint
- DCSA Glossary of Terms
- DCSA Information Model
- DCSA Information Model Reading Guide
- DCSA Interface Standard for Track and Trace Reading Guide
- DCSA Event Naming Convention
- DCSA Event Structure Definitions

2   User stories

The user stories in the table below illustrate potential ways of using the interface, within the context of tracking and tracing of shipments. Please note that the below-mentioned user stories relate to the use case definition in the next section. User stories that take a glance at the wider container shipping universe and other actors such as service providers or forwarders are out of scope for this publication. The user stories described here are examples and they do not constitute a comprehensive list.

ID	As a [persona]	I [want to]	[so that]
1	As a carrier	I want to share information about certain track and trace shipment events with my clients	so that I have a smooth communication experience with my clients.
2	As a shipper or consignee	I want to receive information for all shipments that I have booked	so that I can track my own shipments in an optimal manner.
3	As a shipper or consignee	I want to be able to receive events related to shipment(s) limited to a specific location (region, port)	so that I know if the shipment is on track and so I can carry out operational activities in an optimized manner.
4	As a shipper or consignee	I want to be able to receive events related to my shipments as soon as they are available	so that I know if my shipments are on track and so I can carry out operational activities in an optimized manner.
5	As a shipper or consignee	I want to be able to receive information on delays on my shipment	so that I know if my shipment is on track and so I can carry out operational activities in an optimized manner.
6	As a shipper or consignee	I want to be able to choose how often I receive events related to my shipment	so that I know if my shipment is on track and so I can carry out operational activities in an optimized manner.
7	As a shipper or consignee	I want to be able to subscribe to receive events about shipments that are relevant to me	so that I do not need to retrieve information about each shipment separately.

Table 2. Examples of user stories

Following these user stories, the DCSA Interface Standard for Track and Trace 1.2 pertains to these use cases:
1. Use case - Retrieve track and trace information for shipment(s)
2. Use case - Subscribe to track and trace information for shipments
    a. Use case - Create a subscription
    b. Use case - Update a subscription
    c. Use case - Cancel a subscription
3. Use case - Publish track and trace information for shipment(s)

The following sections of this document describe these use cases.

3 Pull Model

3.1 Retrieve track and trace information for shipment(s)

3.1.1 Use case definition

This section describes the use case 'Retrieve track and trace information for shipment(s)' from carriers section via an exemplified interaction between the shippers, consignees and carriers. The UML (use case) diagram below supports the use case displaying the interactions between the different actors involved.
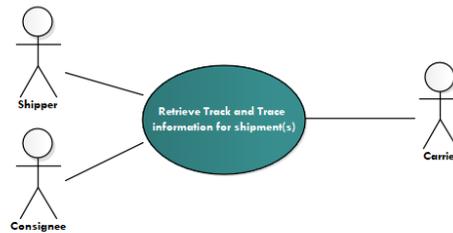
Figure 3. Use case diagram - Retrieve track and trace information for shipment(s)

Name of use case	Retrieve track and trace information for shipment(s)		
Created by	DCSA	Last updated by	DCSA P1
Date Created	11 November 2019	Last revision date	19 December 2019
Description	Provide shipment track and trace information in the form of events		
Actors	Shipper, Consignee, Carrier		
Preconditions	• Shipper has made a booking request • Carrier has confirmed shipper's booking request • Shipper/consignee has the Booking Reference, Bill of Lading number or equipment reference from carrier		
Postconditions	None applicable		
Flow	1. Shipper/consignee requests track and trace details with a Booking Reference/ Bill of Lading number. 2. Carrier prepares a response containing all events for the shipment 3. Shipper/consignee gets response from the carrier		

Alternative flows	1a. Shipper/consignee requests track and trace details with equipment reference.
	  o Carrier prepares a response containing all events for the active shipment that the equipment is allocated to. Furthermore, these events are specific to the equipment in question
	  o Shipper/consignee gets response from the carrier		

Exceptions	1a. Carrier identifies that the Booking Reference/ Bill of Lading number/ equipment reference is invalid or does not exist o Shipper/consignee gets a response with an output error suggesting that the Booking Reference/ Bill of Lading number/ equipment reference is invalid		

Table 3. Use case definition – Retrieve track and trace information for shipment(s)

3.1.2 Activity diagram

The purpose of the activity diagram is to capture dynamic behavior in the system to demonstrate a message flow. Figure 4 provides the activity flow of the interface for retrieving track and trace information for shipment. The activity begins when a user requests track and trace details in relation to a shipment. The request contains input, which is validated against the active shipments available to the interface: an active shipment is a shipment that has an active relevant identifier. An active shipment in this sense refers to the latest shipment which can comprise both future or completed shipments.

The interface's activity flow can follow two paths: the main success path or the exception path. The main success path is followed if the input ID corresponds to that of an active shipment. If that is not the case, the exception path is followed. The main success path results in the application returning track and trace information related to the input ID. The exception path results in an error message.
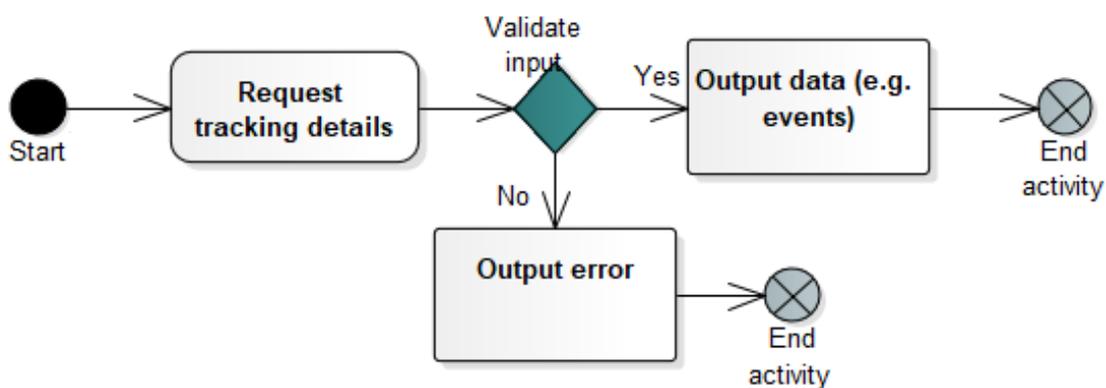
Figure 4. Activity diagram - Retrieve track and trace information for shipment(s)

Error messages should be implemented based on an underlying technology standard. For instance, HTTP error codes should be used in case implementation is in the form of REST APIs. They are defined in RFC2616. Similarly, for EDI based implementations, error codes should follow an existing standard, i.e., UN/EDIFACT.

3.1.3 Inputs

Booking Reference, Bill of Lading number or equipment reference individually are identifiers that link to a shipment per carrier. At least one of these identifiers must be provided to constitute a valid request.

When equipment reference is used, the output only consists of events that correspond to an active shipment to which the equipment has been allocated. Additionally, only events connected to the equipment are to be returned. Furthermore, it must be highlighted that certain security considerations must be given in relation to the implementation and usage of the interface. When the interface allows tracking and tracing (active) of shipment by means of the equipment reference alone – and not in conjunction with either a Booking Reference or Bill of Lading number – the risk of unintended usage occurs. Carriers are recommended to ensure that only diligently defined information, respectively events, are returned to the requester in this case. Carriers are encouraged to take care of access management and specific roles in this respect and it remains an individual carrier decision how to handle this security aspect. For detailed descriptions of the properties, please refer to the DCSA Information Model 1.0.

Input Name	Type	Description	Example
Booking Reference	String	**OPTIONAL.** The identifier for a shipment, which is issued by and unique within each of the carriers.	Booking Reference: "CAX698840"
Bill of Lading Number	String	**OPTIONAL.** Bill of Lading number is an identifier that links to a shipment. Bill of Lading is the legal document issued to the customer, which confirms the carrier's receipt of the cargo from the customer acknowledging goods being shipped and specifying the terms of delivery.	Bill of Lading number: "855230418"
Equipment Reference	String	**OPTIONAL.** The unique identifier for the equipment, which should follow the BIC ISO Container Identification Number where possible. If a container is not yet assigned to a shipment, the interface cannot return any information when an equipment reference is given as input. If a container is assigned to an (active) shipment, the interface returns information on the active shipment.	"CARX4812090"

Table 4. List of inputs – Retrieve track and trace information for shipment(s)

3.1.4   Outputs

The interface output is built around the events that occur for a shipment. This means that every shipment contains multiple events. An event can be categorized as a shipment, transport or an equipment event. An event can be linked to both a transport and an equipment at the same time: this has been listed as a separate transport equipment event to provide clarity.

The list of events supported by this standard is specified in Table 13. A list of track and trace events.

The sections below describe the different entities that facilitate the tracking and tracing of a shipment. The information presented here is one way to organize all information to be produced by this interface. The entities themselves and how they are organized in relation to each other can be mapped directly to an implementation, but there are potentially multiple different ways in which the entities can be organized in an implementation. A class diagram is also presented below to display how the different entities relate to each other.

Class diagram
The class diagram presented below provides an overview of all entities described in the previous sections and how they work together to support the functionality around the tracking and tracing of shipment. Following the DCSA Information Model 1.0, these interface standards assume a limited scope for the first publication with a one-to-one relationship between shipment and Bill of Lading.

Even though this class diagram can be directly translated to an implementation, it should ideally be used as a reference and the actual implementation should be carried out using an arrangement that best supports the underlying technology and methodology used.

In the description of entities and the class diagram, the choice has been made to distinguish between events that correspond to only a shipment, a transport or an equipment, in addition to events that correspond to both a transport and an equipment. This is because it should be possible to classify an event in either one of those four categories. Making this classification is important when thinking of the implementation, where abstraction of data and functionality is a key concept. At the same time, this classification also helps in translating the requirements in an optimal manner into an actual implementation, for instance, in the form of an API. Please look at Table 13. A list of track and trace events. for further clarification on how the different event entities represent the events in scope for this publication.

Shipment

+ Bill Of Lading Number
+ Booking DateTime
+ Booking Reference
+ Carrier Code
+ Collection DateTime
+ Collection Origin
+ Consignee Name
+ Delivery DateTime
+ Delivery Destination
+ Estimated Arrival DateTime
+ Events
+ Shipper Name

Legend: Facilitating / descriptive classes

Event

+ Booking Reference
+ Event Classifier Code
+ Event DateTime
+ Event ID
+ Event Type
+ Event Type Code

Shipment Event

+ Information Type Code

Transport Event

+ Facility Code
+ Facility Type
+ Mode of Transport Code
+ Other Facility
+ Transport Leg Reference
+ Transport Reference
+ UN Location Code

Transport Equipment Event

+ Empty Indicator Code
+ Equipment Reference
+ Facility Code
+ Facility Type
+ Mode of Transport Code
+ Other Facility
+ Transport Leg Reference
+ Transport Reference
+ UN Location Code

Equipment Event

+ Empty Indicator Code
+ Equipment Reference
+ Facility Code
+ Facility Type
+ Other Facility
+ UN Location Code

Transport

+ Mode Of Transport Code
+ Transport Leg Reference
+ Transport Name
+ Transport Reference

Equipment

+ Active Shipment Booking Reference
+ Equipment Reference
+ ISO Equipment Code

Figure 5. Class diagram - Retrieve track and trace information for shipment(s)

Shipment

The shipment entity is a reference entity in the context of tracking and tracing of shipment. For detailed descriptions of the properties, please refer to the DCSA Information Model 1.0.

Property Name	Type	Description	Example
Booking Reference	String	**REQUIRED.** The identifier for a shipment, which is issued by and unique within each of the carriers.	"ABC709951"
Bill of Lading Number	String	**OPTIONAL.** Bill of Lading number is an identifier that links to a shipment. Bill of Lading is the legal document issued to the customer which confirms the carrier's receipt of the cargo from the customer acknowledging goods being shipped and specifying the terms of delivery.	"ABCD421911263977"
Booking DateTime	DateTime	**REQUIRED.** The local date and time of the booking request in ISO 8601 format.	"2019-10-30T07:41:00+08:30"
Carrier Code	String	**REQUIRED.** A unique carrier identifier, currently sourced from either the National Motor Freight Traffic Association (NMFTA) SCAC list or the Shipplanning Message Development Group (SMDG) Master Liner Codes list.	"NMFTA-CARX"
Shipper Name	String	**OPTIONAL.** The name of the shipper, who requested the booking.	"Computer Corp."
Consignee Name	String	**OPTIONAL.** The name of the consignee.	"Computer Corp."
Collection Origin	String	**REQUIRED.** The location through which the shipment originates. It can be defined as a UN Location Code value or an address. The customer (shipper) needs to place a booking in order to ship the cargo (commodity) from an origin to destination.	"USNYC"
Collection DateTime	DateTime	**REQUIRED.** The local date and time in ISO 8601 format that the shipment items need to be collected from the origin.	"2019-11-12T07:41:00+08:30"
Delivery Destination	String	**REQUIRED.** The location to which the shipment is destined. It can be defined as a UN Location Code value or an address. The customer (shipper) needs to place a booking in order to ship the cargo (commodity) from an origin to destination.	"NLAMS"
Delivery DateTime	DateTime	**OPTIONAL.** The local date (and when possible time) in ISO 8601 format that the shipment items need to be delivered to the destination.	"2019-11-24T07:41:00+08:30"
Estimated Arrival DateTime	DateTime	**OPTIONAL.** Calculated estimated local date and time in ISO 8601 format for a shipment based on estimated and planned events for that same shipment at final port of discharge.	"2019-11-12T07:41:00+08:30"
Events	List	**REQUIRED.** List of events.	List of events for shipment journey

Table 5. Shipment entity properties

Transport

The transport entity is a reference entity that describes a transport in the context of tracking and tracing of shipment. For vessels, the transport entity essentially represents a transport leg, where the transport reference and transport leg reference together identify the entity. For other types of transports, if the references are not available, then a dummy value can be used. An event can contain a reference to the transport entity if it belongs to the appropriate event category. For detailed descriptions of the properties, please refer to the DCSA Information Model 1.0.

Property Name	Type	Description	Example
Transport Reference	String	REQUIRED. The reference for the transport, e.g. when the mode of transport is a vessel, the transport reference will be the vessel IMO number.	"9648714"
Transport Leg Reference	String	REQUIRED. The transport leg reference will be specific per mode of transport: - Vessel: Voyage number as specified by the vessel operator - Truck: Not yet specified - Rail: Not yet specified - Barge: Not yet specified.	"025E"
Mode of Transport Code	String	REQUIRED. The code specifying the mode (e.g. transport by rail) for the transport.	"1"
Transport Name	String	OPTIONAL. The name of the particular transport instance, e.g. for a vessel this is the vessel name.	"CARX VESSEL"

Table 6. Transport entity properties

Equipment

The equipment entity is a reference entity that describes an equipment in the context of tracking and tracing of shipment. An event can contain a reference to the equipment entity if it belongs to the appropriate event category. For detailed descriptions of the properties, please refer to the DCSA Information Model 1.0.

Property Name	Type	Description	Example
Equipment Reference	String	REQUIRED. The unique identifier for the equipment, which should follow the BIC ISO Container Identification Number where possible.	"CARX278 5124"
ISO Equipment Code	String	REQUIRED. Unique code for the different equipment size/type used for transporting commodities.	"10G0"
Active Shipment Booking Reference	String	OPTIONAL. Shipment Booking Reference of the active shipment that the equipment is currently allocated to.	"ABC7099 51"

Table 7. Equipment entity properties

Event

The event entity is described as a generalization of all the specific event categories. An event always takes place in relation to a shipment and can additionally be linked to a transport or an equipment.

Property Name	Type	Description	Example
Event ID	String	REQUIRED. The unique identifier for the Equipment Event ID/Transport Event ID/Shipment Event ID.	"1"

Property Name	Type	Description	Example
Booking Reference	String	**OPTIONAL.** The identifier for a shipment, which is issued by and unique within each of the carriers.	"ABC709951"
Event DateTime	DateTime	**REQUIRED.** The local date and time, where the event took place, in ISO 8601 format.	"2019-11-12T07:41:00+08:30"
Event Classifier Code	String	**REQUIRED.** Code for the event classifier, either PLN, ACT or EST.	"ACT"
Event Type Code	String	**REQUIRED.** Unique identifier for Event Type Code.	"ARRI"
Event Type	String	**REQUIRED.** Parameter that differentiates between different kind of events. The possible values can be one of the following four Event Types: • Shipment event • Equipment event • Transport event Transport equipment event	"Shipment event"

Table 8. Event entity properties

Shipment event

The shipment event entity is a specialization of the event entity to support specification of data that only applies to a shipment event.

Property Name	Type	Description	Example
Shipment Information Type Code	String	**REQUIRED.** The code to identify the type of information that is related to the shipment.	"SRM"

Table 9. Shipment event entity properties

Transport event

The transport event entity is a specialization of the event entity to support specification of data that only applies to a transport event. For detailed descriptions of the properties, please refer to the DCSA Information Model 1.0.

Property Name	Type	Description	Example
Transport Reference	String	**REQUIRED.** The reference for the transport, e.g. when the mode of transport is a vessel, the transport reference will be the vessel IMO number.	"9648714"
Transport Leg Reference	String	**REQUIRED.** The transport leg reference will be specific per mode of transport: - Vessel: Voyage number as specified by the vessel operator - Truck: Not yet specified - Rail: Not yet specified - Barge: Not yet specified.	"025E"

Property Name	Type	Description	Example
Facility Type Code	String	**REQUIRED.** Four-character code to identify the specific type of facility.	"POTE"
UN Location Code	String	**REQUIRED.** The UN Location Code identifies a location in the sense of a city/a town/a village, being the smaller administrative area existing as defined by the competent national authority in each country.	"USNYC"
Facility Code	String	**REQUIRED.** The code used for identifying the specific facility.	"USNYCGTC"
Other Facility	String	**OPTIONAL.** An alternative way to capture the facility details, when no standardized DCSA facility code can be found.	"Depot name and location or address"
Mode of Transport Code	String	**REQUIRED.** The code specifying the mode (e.g. transport by rail) for the transport.	"1"

Table 10. Transport event entity properties

Equipment event

The equipment event entity is a specialization of the event entity to support specification of data that only applies to an equipment event. For detailed descriptions of the properties, please refer to the DCSA Information Model 1.0.

Property Name	Type	Description	Example
Equipment Reference	String	**OPTIONAL.** The unique identifier for the equipment.	"CARX2785124"
Facility Type Code	String	**REQUIRED.** Four-character code to identify the specific type of facility.	"POTE"
UN Location Code	String	**REQUIRED.** The UN Location Code identifies a location in the sense of a city/a town/a village, being the smaller administrative area existing as defined by the competent national authority in each country.	"USNYC"
Facility Code	String	**REQUIRED.** The code used for identifying the specific facility.	"USNYCGTC"
Other Facility	String	**OPTIONAL.** An alternative way to capture the facility details, when no standardized DCSA facility code can be found.	"Depot name and location or address"
Empty Indicator Code	String	**REQUIRED.** Code to denote whether the equipment is empty or laden.	"Empty"

Table 11. Equipment event entity properties

Transport equipment event

The transport equipment event entity is a specialization of the event entity to support specification of data that applies to both transport and equipment events.

Property Name	Type	Description	Example
Transport Reference	String	**REQUIRED.** The reference for the transport, e.g. when the mode of transport is a vessel, the transport reference will be the vessel IMO number.	"9648714"
Transport Leg Reference	String	**REQUIRED.** The transport leg reference will be specific per mode of transport: - Vessel: Voyage number as specified by the vessel operator - Truck: Not yet specified - Rail: Not yet specified - Barge: Not yet specified.	"025E"
Equipment Reference	String	**OPTIONAL.** The unique identifier for the equipment, which should follow the BIC ISO Container Identification Number where possible.	"CARX278512 4"
Facility Type Code	String	**REQUIRED.** Four-character code to identify the specific type of facility.	"POTE"
UN Location Code	String	**REQUIRED.** The UN Location Code identifies a location in the sense of a city/a town/a village, being the smaller administrative area existing as defined by the competent national authority in each country.	"USNYC"
Facility Code	String	**REQUIRED.** The code used for identifying the specific facility.	"USNYCGTC"
Other Facility	String	**OPTIONAL.** An alternative way to capture the facility details, when no standardized DCSA facility code can be found.	"Depot name and location or address"
Empty Indicator Code	String	**REQUIRED.** Code to denote whether the equipment is empty or laden.	"Empty"
Mode of Transport Code	String	**REQUIRED.** The code specifying the mode (e.g. transport by rail) for the transport.	"1"

Table 12. Transport equipment event entity properties

3.2 A list of track and trace events

The table below lists the track and trace events standardized in the DCSA Event Naming Convention 1.0 and Event Structure Definitions 1.0. It further outlines how the output data attributes defined in this section together constitute the different events. Furthermore, all events listed here can be used either as planned, estimated or actual events depending on the situation. This classification is defined through the attribute "Event Classifier Code". It should be stated here that the interface can also be applied to any future additions or amendments to the current selection of standardized events.

Event	Description	Entity	Event Type Code	Empty Indicator Code	Transport Type Code	Facility Type Code	Shipment Information Type
Gate out of empty equipment from depot	The point in time where the empty equipment is picked up from the depot. Depending on incoterms, there might be a change of possession from the carrier to the shipper.	Equipment Event	GTOT (Gate Out)	EMPTY		DEPO (Depot)	
Gate in of empty equipment at customer location	The point in time where the empty equipment arrives at the customer location (stuffing site). Depending on incoterms, there might be a change of possession from the carrier/depot to the shipper.	Equipment Event	GTIN (Gate In)	EMPTY		CULO (Customer Location)	
Gate in of laden equipment at port terminal	The point in time where the laden equipment passes through the gate at the port terminal. At this point, possession of the equipment will be transferred to the terminal operator.	Equipment Event	GTIN (Gate In)	LADEN		POTE (Port Terminal)	
Load of laden equipment to vessel at port terminal	The point in time where the laden equipment is loaded onto the vessel. At this point, possession of the equipment will be transferred from the terminal operator to the carrier.	Transport Equipment Event	LOAD	LADEN	VESSEL	POTE (Port Terminal)	
Vessel departure from port terminal	The point in time where the vessel leaves the berthing slot at the port terminal. Some use the term *last line released*.	Transport Event	DEPA (Departure)		VESSEL	POTE (Port Terminal)	
Vessel arrival at port terminal	The point in time once the vessel has berthed at the port terminal. Some use the term *first line secured*.	Transport Event	ARRI (Arrival)		VESSEL	POTE (Port Terminal)	
Discharge of laden equipment from vessel at port terminal	The point in time where the laden equipment is discharged from the vessel to the quay. At this point, possession of the equipment will be transferred from the carrier to the port terminal.	Transport Equipment Event	DISC (Discharge)	LADEN	VESSEL	POTE (Port Terminal)	
Shipment release message issued	The document sent to the consignee and/or notify party informing, that the shipment can now be released from its current location and transferred to the consignee on gate-out.	Shipment Event	ISSU (Issued)				SRM (Shipment Release Message)
Gate out of laden equipment from port terminal	The point in time where the laden equipment passes through the gate at the port terminal. At this point, possession of the equipment will be transferred from the port terminal to the customer/hauler.	Equipment Event	GTOT (Gate Out)	LADEN		POTE (Port Terminal)	
Truck arrival at customer location	The point in time where the truck arrives at the customer location (stripping location). Depending on incoterms, there might be a transfer of possession.	Transport Event	ARRI (Arrival)		TRUCK	CULO (Customer Location)	

Event	Description	Entity	Event Type Code	Empty Indicator Code	Transport Type Code	Facility Type Code	Shipment Information Type
Gate in of empty equipment at depot	The point in time where the possession of the empty equipment is transferred back to the carrier.	Equipment Event	GTIN (Gate In)	EMPTY		DEPO (Depot)	
Load of laden equipment to barge at port terminal	The point in time where the equipment is loaded onto a barge. This is a conditional milestone that will only occur if barge transportation is needed.	Transport Equipment Event	LOAD	LADEN	BARGE	POTE (Port Terminal)	
Discharge of laden equipment from barge at port terminal	The point in time where the equipment is discharged from a barge. This is a conditional milestone that will only occur if barge transportation is needed.	Transport Equipment Event	DISC (Discharge)	LADEN	BARGE	POTE (Port Terminal)	
Load of laden equipment to rail at port terminal	The point in time where the equipment is loaded on a railcar. This is a conditional milestone that will only occur if rail transportation is needed.	Transport Equipment Event	LOAD	LADEN	RAIL	POTE (Port Terminal)	
Discharge of laden equipment from rail at port terminal	The point in time where the equipment is discharged from a railcar. This is a conditional milestone that will only occur if rail transportation is needed.	Transport Equipment Event	DISC (Discharge)	LADEN	RAIL	POTE (Port Terminal)	
Load of laden equipment to truck at port terminal	The point in time where the equipment is loaded on truck. This is a conditional milestone that will only occur if truck transportation is needed.	Transport Equipment Event	LOAD	LADEN	TRUCK	POTE (Port Terminal)	
Discharge of laden equipment from truck at port terminal	The point in time where the equipment is discharged from truck. This is a conditional milestone that will only occur if truck transportation is needed.	Transport Equipment Event	DISC (Discharge)	LADEN	TRUCK	POTE (Port Terminal)	
Truck departure from port terminal	The point in time where the truck leaves the port terminal.	Transport Event	DEPA (Departure)		TRUCK	POTE (Port Terminal)	
Truck arrival at port terminal	The point in time where the truck arrives at the port terminal.	Transport Event	ARRI (Arrival)		TRUCK	POTE (Port Terminal)	
Barge departure from port terminal	The point in time where the barge leaves the docking area at the port terminal.	Transport Event	DEPA (Departure)		BARGE	POTE (Port Terminal)	
Barge arrival at port terminal	The point in time where the barge arrives at the port terminal.	Transport Event	ARRI (Arrival)		BARGE	POTE (Port Terminal)	
Rail departure from port terminal	The point in time where the rail leaves the loading facility at the port terminal.	Transport Event	DEPA (Departure)		RAIL	POTE (Port Terminal)	
Rail arrival at port terminal	The point in time where the rail arrives at the port terminal.	Transport Event	ARRI (Arrival)		RAIL	POTE (Port Terminal)	

Table 13. A list of track and trace events

4   Push Model

4.1   Subscribe to track and trace information for shipment(s)

4.1.1   Use case - Create a subscription

4.1.1.1   Use case definition

This section describes the use case of 'Create a subscription' via an exemplified interaction between the shippers, consignees and carriers. The respective UML diagram below supports the use case displaying the interactions between the different actors involved: shipper, consignee and carrier.
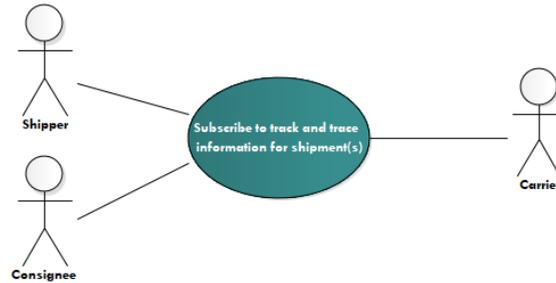

Figure 6. Use case diagram - Create a subscription

Name of use case	Create a subscription to track and trace information for shipment(s)		
Created by	DCSA	Last updated by	DCSA P1
Date Created	21 February 2020	Last revision date	14 May 2020
Description	Create a subscription to track and trace shipment information in the form of events		
Actors	Shipper, Consignee, Carrier		
Preconditions	Not applicable		
Postconditions	A subscription is created by the carrier for the shipper or consignee		
Flow	1 Shipper or consignee sends request to carrier to create subscription to track and trace information for shipment(s) 2 Carrier creates subscription for the shipper or consignee 3 Carrier sends confirmation of creation of subscription with subscription ID to the shipper or consignee		
Alternative flows	Not applicable		
Exceptions	2a. Carrier identifies that subscription criteria are invalid or do not exist 2b. Shipper or consignee receives a response with an output error suggesting that the subscription option is invalid 3a. Carrier is unable to create subscription for shipper or consignee due to unforeseen circumstances 3b. Shipper or consignee receives a response with an output error including the reason for the failure		

Table 14. Use case definition - Create a subscription

4.1.1.2   Activity diagram

The purpose of the activity diagram is to capture dynamic behavior in the system to demonstrate a message flow. Figure 7 describes the activity flows that the interface for subscribing to track and trace information for shipments provides. The activity flow for 'Create a subscription' can follow two paths: the main success path or the exception path. The main success path for 'Create a subscription' begins when a user sends a request to a carrier to subscribe to track and trace events. If the request is valid, the carrier creates a subscription for the shipper or consignee. If the subscription is created, the carrier sends a subscription ID to the subscriber (shipper or consignee). If that is not the case or if the request from the subscriber is invalid, the exception path is followed.
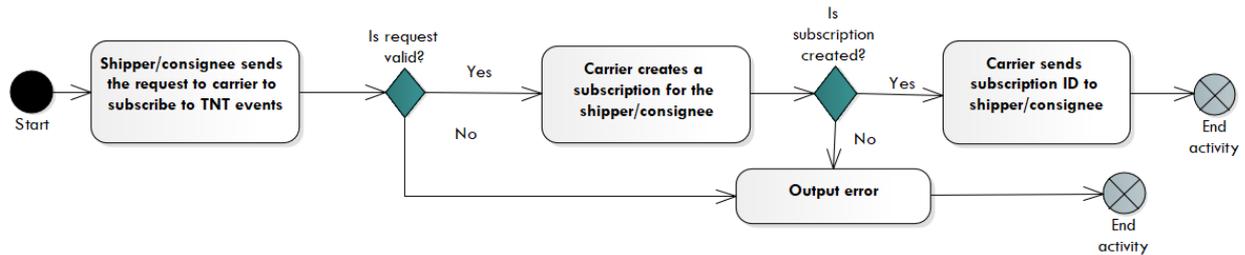

Figure 7. Activity diagram - Create a subscription

4.1.1.3   Inputs

By default a subscription request has no filtering parameters, indicating that the carrier should send all events that are considered relevant for the subscriber organization, such as events where the subscriber organization is a party. The set of data that is provided in the published event messages is described in section 4 Use case - Publish track and trace information for shipment(s).

Carriers may wish to offer subscription filters that allow subscribers to limit the amount of data they receive, however the set of filters will not be standardized and it will be a carrier decision whether or not to implement such filters.

Furthermore, certain security considerations must be given in relation to the implementation and usage of the interface. An authentication of clients and, if applicable, users is required. Carriers are encouraged to take care of access management and specific roles in this respect and it remains an individual carrier decision how to handle this security aspect.

Finally, being technology agnostic, this interface standard does not indicate which channel should be used for receiving published events. It is assumed the event messages use the same channel as the subscription message.

4.1.1.4   Outputs

After a shipper or consignee has subscribed to a carrier's track and trace interface, the carrier issues a unique subscription ID. Besides, it is assumed that when a subscription interface is implemented there will be the ability to read, cancel or update the subscription.

Output Name	Type	Description	Example
Subscription ID	String	**REQUIRED.** The carrier issues a unique ID to the shipper or consignee for that subscription.	jlke213j

Table 15. List of outputs - Create a subscription

4.1.2   Use case - Update a subscription

4.1.2.1   Use case definition

This section describes the use case of 'Update a subscription' via an exemplified interaction between shippers, consignees and carriers. The UML diagram below supports the use case displaying the interactions between the different actors involved.
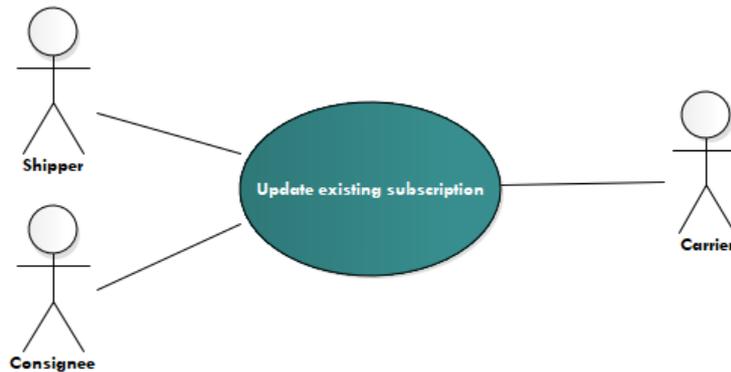

Figure 8. Use case diagram - Update a subscription

Name of use case	Update a subscription		
Created by	DCSA	Last updated by	DCSA P1
Date Created	14 April 2020	Last revision date	14 May 2020
Description	Update a subscription for track and trace shipment information in the form of events		
Actors	Shipper, Consignee, Carrier		
Preconditions	A subscription exists		
Postconditions	An updated subscription is created by the carrier for the shipper or consignee		
Flow	1. Shipper or consignee - using its subscription ID - sends update request regarding subscription to carrier to filter differently on track and trace information for shipment(s) 2. Carrier creates updated subscription for the shipper or consignee 3. Carrier sends confirmation of updated subscription to the shipper or consignee		
Alternative flows	Not applicable		
Exceptions	2a. Carrier identifies that new subscription criteria are invalid or do not exist 2b. Shipper or consignee receives a response with an output error suggesting that the new subscription option is invalid 3a. Carrier is unable to update a subscription for shipper or consignee due to unforeseen circumstances 3b. Shipper or consignee receives a response with an output error including the reason for the failure		

Table 16. Use case definition - Update a subscription

4.1.2.2   Activity diagram

The purpose of the activity diagram is to capture dynamic behavior in the system to demonstrate a message flow. Figure 9 describes the activity flows that the interface for updating a track and trace subscription for shipments, provides. This activity flow for 'Update a subscription' can follow two paths: the main success path or the exception path. The main success path for 'Update a subscription' begins when a user sends a request to a carrier to update the subscription for track and trace events. If the request is valid, the carrier creates an updated subscription filter scheme for the shipper or consignee. If the updated subscription is created, the carrier sends a confirmation of the updated subscription to the subscriber (shipper or consignee). If that is not the case or if the request from the subscriber is invalid, the exception path is followed.
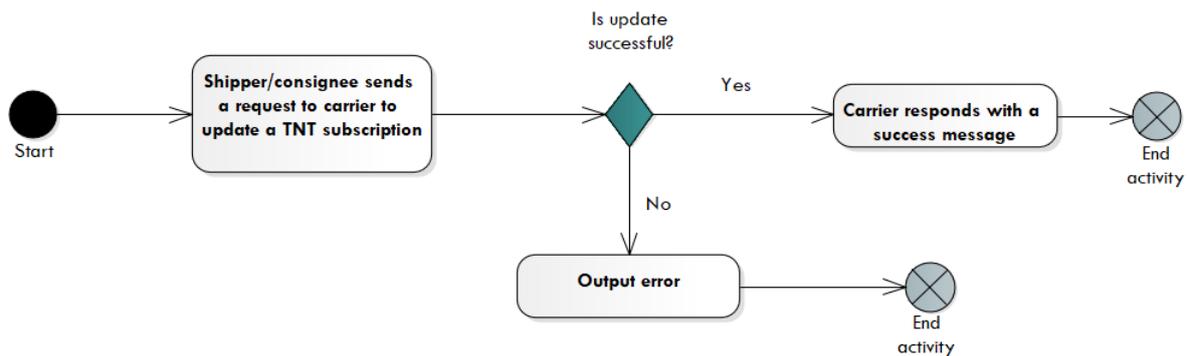

Figure 9. Activity diagram - Update a subscription

4.1.2.3   Inputs

The input is the subscription ID that was generated by the carrier for the subscription.

Property Name	Type	Description	Example
Subscription ID	String	**REQUIRED**. The subscription ID of the subscription to be updated.	jlke213j

Table 17. List of inputs - Update a subscription

4.1.2.4   Outputs

The output is a message confirming the updated subscription with the new, carrier-specific parameters.

4.1.3   Use case - Cancel a subscription

4.1.3.1   Use case definition

This section describes the use case of 'Cancel a subscription' via an exemplified interaction between the shippers, consignees and carriers. The UML (use case) diagram below supports the use case displaying the interactions between the different actors involved.
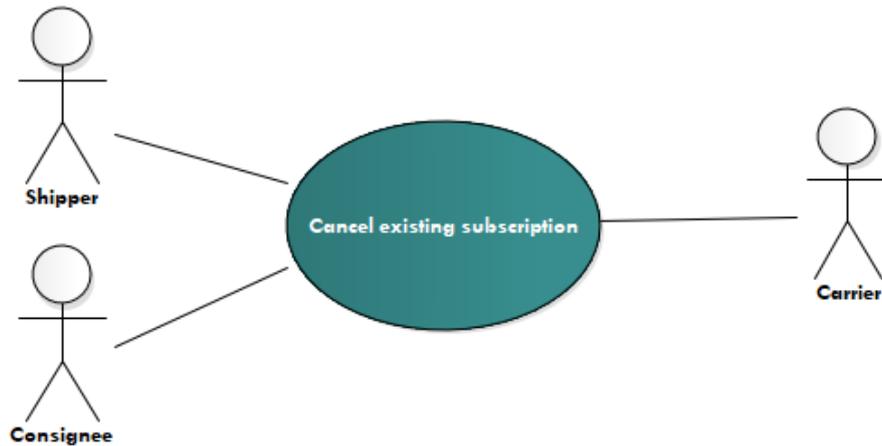

Figure 10. Use case diagram - Cancel a subscription

Name of use case	Cancel a subscription		
Created by	DCSA	Last updated by	DCSA P1
Date Created	14 April 2020	Last revision date	14 May 2020
Description	Cancel a subscription for track and trace shipment information in the form of events		
Actors	Shipper, Consignee, Carrier		
Preconditions	A subscription exists		
Postconditions	A subscription is cancelled by the carrier for the shipper or consignee		
Flow	1. Shipper or consignee sends cancellation request regarding subscription to carrier to 2. Carrier cancels subscription for the shipper or consignee 3. Carrier sends confirmation of cancellation for subscription to the shipper or consignee		
Alternative flows	Not applicable		
Exceptions	2a. Carrier is unable to cancel a subscription for shipper or consignee due to unforeseen circumstances 2b. Shipper or consignee receives a response with an output error including the reason for the failure		

Table 18. Use case definition - Cancel a subscription

4.1.3.2   Activity diagram

The purpose of the activity diagram is to capture dynamic behavior in the system to demonstrate a message flow. Figure 11 describes the activity flows that the interface for canceling subscriptions for track and trace information for shipments provides. This activity flow for 'Cancel a subscription' can follow two paths: the main success path or the exception path. The main success path for 'Cancel a subscription' begins when a user sends a request to a carrier to cancel the subscription for track and trace events. If the request is valid, the carrier creates cancels the subscription for the shipper or consignee. After the subscription is canceled, the carrier sends a confirmation of the cancelled subscription to the subscriber (shipper or consignee). If that is not the case or if the request from the subscriber is invalid, the exception path is followed.
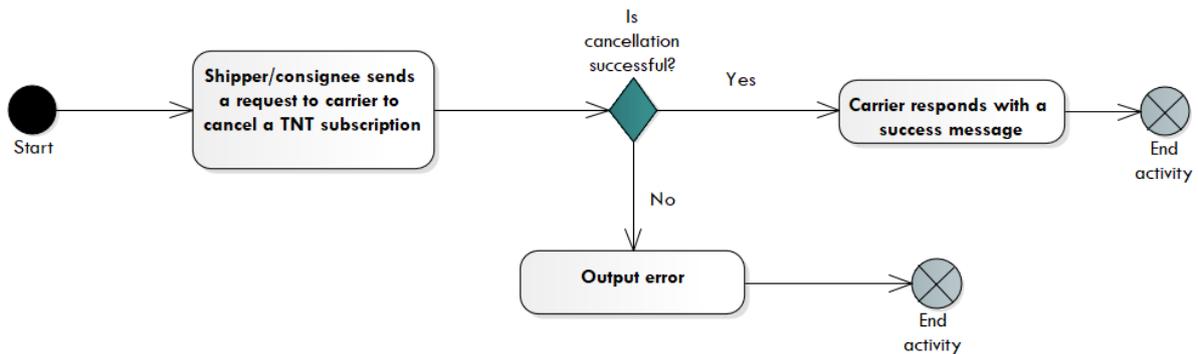
Figure 11. Activity diagram - Cancel a subscription

4.1.3.3   Inputs

The input is the subscription ID that was generated by the carrier for the subscription.

Property Name	Type	Description	Example
Subscription ID	String	**REQUIRED.** The subscription ID of the subscription to be cancelled.	jlke213j

Table 19. List of inputs - Cancel a subscription

4.1.3.4   Outputs

The output is a message confirming the success of the cancellation operation.

4.2   Use case - Publish track and trace information for shipment(s)

4.2.1   Use case definition

This section describes the use case 'Publish track and trace information for shipment(s)' to shippers or consignees section via an exemplified interaction between the shippers, consignees and carriers. The UML (use case) diagram below supports the use case displaying the interactions between the different actors involved.
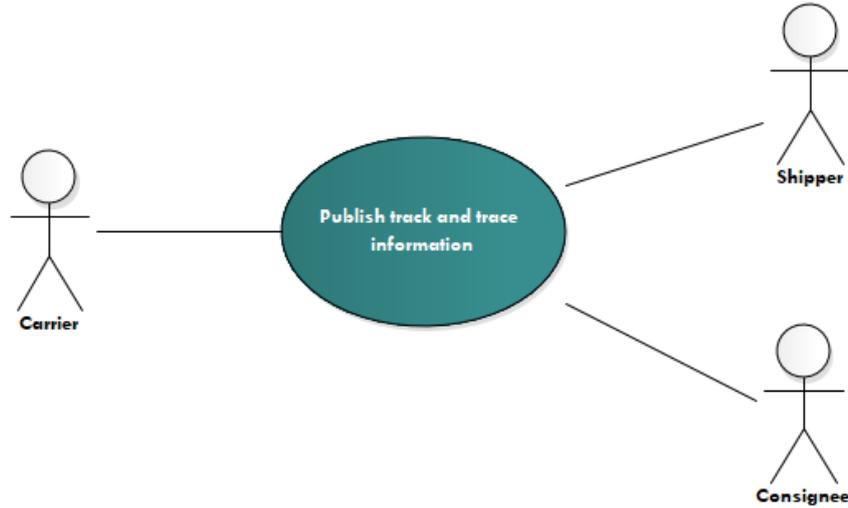

Figure 12. Use case diagram - Publish track and trace information for shipment(s)

Name of use case	Publish track and trace information for shipment(s)
Created by	DCSA **Last updated by** DCSA P1
Date Created	21 February 2020 **Last revision date** 14 May 2020
Description	Publish track and trace shipment information in the form of events
Actors	Shipper, Consignee, Carrier
Preconditions	A subscription is created by the carrier for the shipper or consignee
Postconditions	None applicable
Flow	4. Carrier receives new event(s) 5. Carrier publishes track and trace information in accordance with chosen subscription criteria
Alternative flows	Not applicable
Exceptions	2a. Carrier fails to publish track and trace information to shipper or consignee due to unforeseen circumstances

Table 20. Use case definition - Publish track and trace information for shipment(s)

4.2.2 Activity diagram

The purpose of the activity diagram is to capture dynamic behavior in the system to demonstrate a message flow. Figure 13 provides the activity flow of the interface for publishing track and trace information for shipment(s). The main path for 'Activity diagram - Publish track and trace information for shipment(s' begins when a carrier receives new events. The carrier then publishes the received events to the subscriber (shipper or consignee).
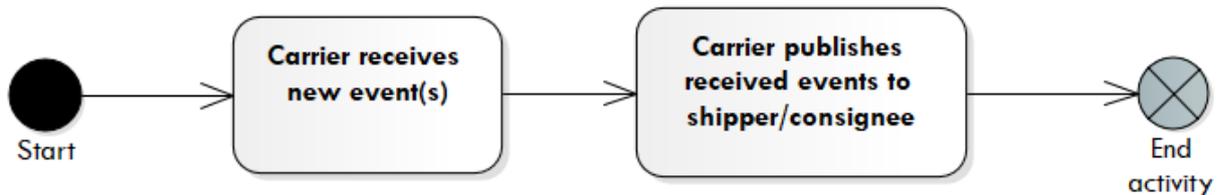

Figure 13. Activity diagram - Publish track and trace information for shipment(s)

4.2.3 Inputs

The previously created subscription is considered as an input.

4.2.4 Outputs

At least one change must occur to create a push message. All relevant parties in the container shipping industry should aim at having the event data configured and available in their interfaces.

The shipper or consignee as receiver of the published messages should consider the relevant security implications, and implement authentication and access management to ensure that messages are coming from a trusted source and have not been modified in transit.

The assumption is that each published message will only contain the most recent change.

Subscription identifiers

Property Name	Type	Description	Example
Subscription ID	String	**OPTIONAL.** The subscription ID for which this published message is intended.	jlke213j
Organization ID	String	**OPTIONAL.** The identifier of the organization for which the published message is intended	1acb3

Table 21. Subscription identifiers

In the following, the event structure of the outputs is outlined. A list of possible track and trace events can be found in the DCSA Interface Standard for Track and Trace 1.2 including a class diagram on tracking and tracing of shipments. The full description of all events can be found in the DCSA Information Model Standard 1.0.

Event

The event entity is described as a generalization of all the specific event categories. An event always takes place in relation to shipment(s) and can additionally be linked to a transport or an equipment.

Property Name	Type	Description	Example
Event ID	String	**REQUIRED.** The unique identifier for the Equipment Event ID or Transport Event ID or Shipment Event ID.	"1"
Booking Reference	String	**OPTIONAL.** The Booking Reference is the identifier for shipment(s), which is issued by and unique within each of the carriers.	"ABC709951"
Event DateTime	DateTime	**REQUIRED.** The local date and time, where the event took place, in ISO 8601 format.	"2019-11-12T07:41:00+08:30"
Event Classifier Code	String	**REQUIRED.** Code for the event classifier, either PLN, ACT or EST.	"ACT"
Event Type Code	String	**REQUIRED.** Unique identifier for Event Type Code.	"ARRI"
Event Type	String	**REQUIRED.** Parameter that differentiates between different kind of events. The possible values can be one of the following four Event Types: • Shipment event • Equipment event • Transport event • Transport equipment event	"Shipment event"

Table 22. Publish - Event entity properties

Shipment event

The shipment event entity is a specialization of the event entity to support specification of data that only applies to shipment(s) event.

Property Name	Type	Description	Example
Shipment Information Type Code	String	**REQUIRED.** The Shipment Information Type Code is the code to identify the type of information that is related to the shipment.	"SRM"

Table 23. Publish - Shipment event entity properties

Transport event

The transport event entity is a specialization of the event entity to support specification of data that only applies to a transport event. For detailed descriptions of the properties, please refer to the DCSA Information Model 1.0.

Property Name	Type	Description	Example
Transport Reference	String	**REQUIRED.** The Transport Reference is the reference for the transport, e.g. when the mode of transport is a vessel, the transport reference will be the vessel IMO number.	"9648714"
Transport Leg Reference	String	**REQUIRED.** The Transport Leg Reference is specific per mode of transport: - Vessel: Voyage number as specified by the vessel operator - Truck: Not yet specified - Rail: Not yet specified - Barge: Not yet specified.	"025E"
Facility Type Code	String	**REQUIRED.** The Facility Type Code is a four-character code to identify the specific type of facility.	"POTE"
UN Location Code	String	**REQUIRED.** The UN Location Code identifies a location in the sense of a city or a town or a village, being the smaller administrative area existing as defined by the competent national authority in each country.	"USNYC"
Facility Code	String	**REQUIRED.** The code used for identifying the specific facility.	"USNYCGTC"
Other Facility	String	**OPTIONAL.** An alternative way to capture the facility, when no standardized DCSA facility code can be found.	"Depot location or address"
Mode of Transport Code	String	**REQUIRED.** The code specifying the mode (e.g. transport by rail) for the transport.	"1"

Table 24. Publish - Transport event entity properties

Equipment event

The equipment event entity is a specialization of the event entity to support specification of data that only applies to an equipment event. For detailed descriptions of the properties, please refer to the DCSA Information Model 1.0.

Property Name	Type	Description	Example
Equipment Reference	String	**OPTIONAL.** The unique identifier for the equipment.	"CARX2785124"
Facility Type Code	String	**REQUIRED.** The Facility Type Code is a four-character code to identify the specific type of facility.	"POTE"
UN Location Code	String	**REQUIRED.** The UN Location Code identifies a location in the sense of a city or a town or a village, being the smaller administrative area existing as defined by the competent national authority in each country.	"USNYC"
Facility Code	String	**REQUIRED.** The code used for identifying the specific facility.	"USNYCGTC"
Other Facility	String	**OPTIONAL.** An alternative way to capture the facility, when no standardized DCSA facility code can be found.	"Depot location or address"
Empty Indicator Code	String	**REQUIRED.** Code to denote whether the equipment is empty or laden.	"Empty"

Table 25. Publish - Equipment event entity properties

Transport equipment event

The transport equipment event entity is a specialization of the event entity to support specification of data that applies to both transport and equipment events.

Property Name	Type	Description	Example
Transport Reference	String	**REQUIRED.** The Transport Reference is the reference for the transport, e.g. when the mode of transport is a vessel, the transport reference will be the vessel IMO number.	"9648714"
Transport Leg Reference	String	**REQUIRED.** The Transport Leg Reference will be specific per mode of transport: - Vessel: Voyage number as specified by the vessel operator - Truck: Not yet specified - Rail: Not yet specified - Barge: Not yet specified.	"025E"
Equipment Reference	String	**OPTIONAL.** The unique identifier for the equipment, which should follow the BIC ISO Container Identification Number where possible.	"CARX278512 4"
Facility Type Code	String	**REQUIRED.** The Facility Type Code is a four-character code to identify the specific type of facility.	"POTE"
UN Location Code	String	**REQUIRED.** The UN Location Code identifies a location in the sense of a city or a town or a village, being the smaller administrative area existing as defined by the competent national authority in each country.	"USNYC"
Facility Code	String	**REQUIRED.** The code used for identifying the specific facility.	"USNYCGTC"
Other Facility	String	**OPTIONAL.** An alternative way to capture the facility, when no standardized DCSA facility code can be found.	"Depot location or address"
Empty Indicator Code	String	**REQUIRED.** Code to denote whether the equipment is empty or laden.	"Empty"
Mode of Transport Code	String	**REQUIRED.** The code specifying the mode (e.g. transport by rail) for the transport.	"1"

Table 26. Publish - Transport equipment event entity properties

5   Conclusion

This DCSA Interface Standard for Track and Trace 1.2 defined in this document is meant to serve as a foundation for all interfaces implemented, henceforth by the entire shipping industry in relation to the tracking and tracing of shipment(s). It is a cooperative effort that has been backed and supported by invaluable input from many of the major shipping carriers around the world.

Furthermore, this document brings into focus the data and the content of the DCSA Interface Standard for Track and Trace 1.2, which is supported by DCSA SwaggerHub and OpenAPI definitions. Users of other technologies are required to adopt the standards in other channels, for example, the data delivered through EDI interfaces, manual interfaces, and GUI-based interfaces.

This document also intends to facilitate discussions around the exchange of track and trace data between the different counterparts involved in shipment(s) and should lead to better accountability and traceability of activities in relation to the shipment of goods.