# UN/CEFACT Smart Container Project

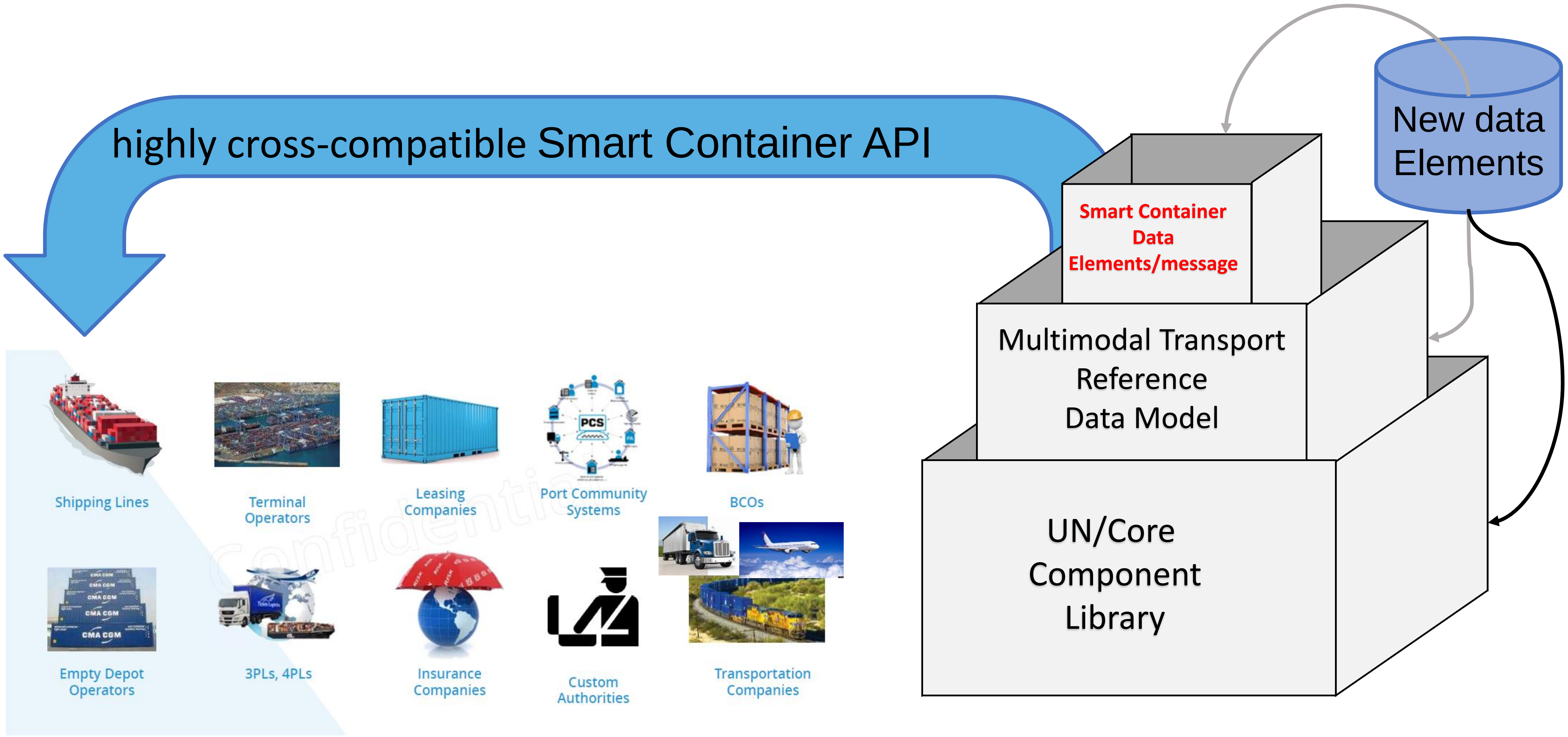
# UN/CEFACT Smart Container Project
# T & L Domain - Status Update

Hanane BECHA, Project Leader
h.becha@traxens.com

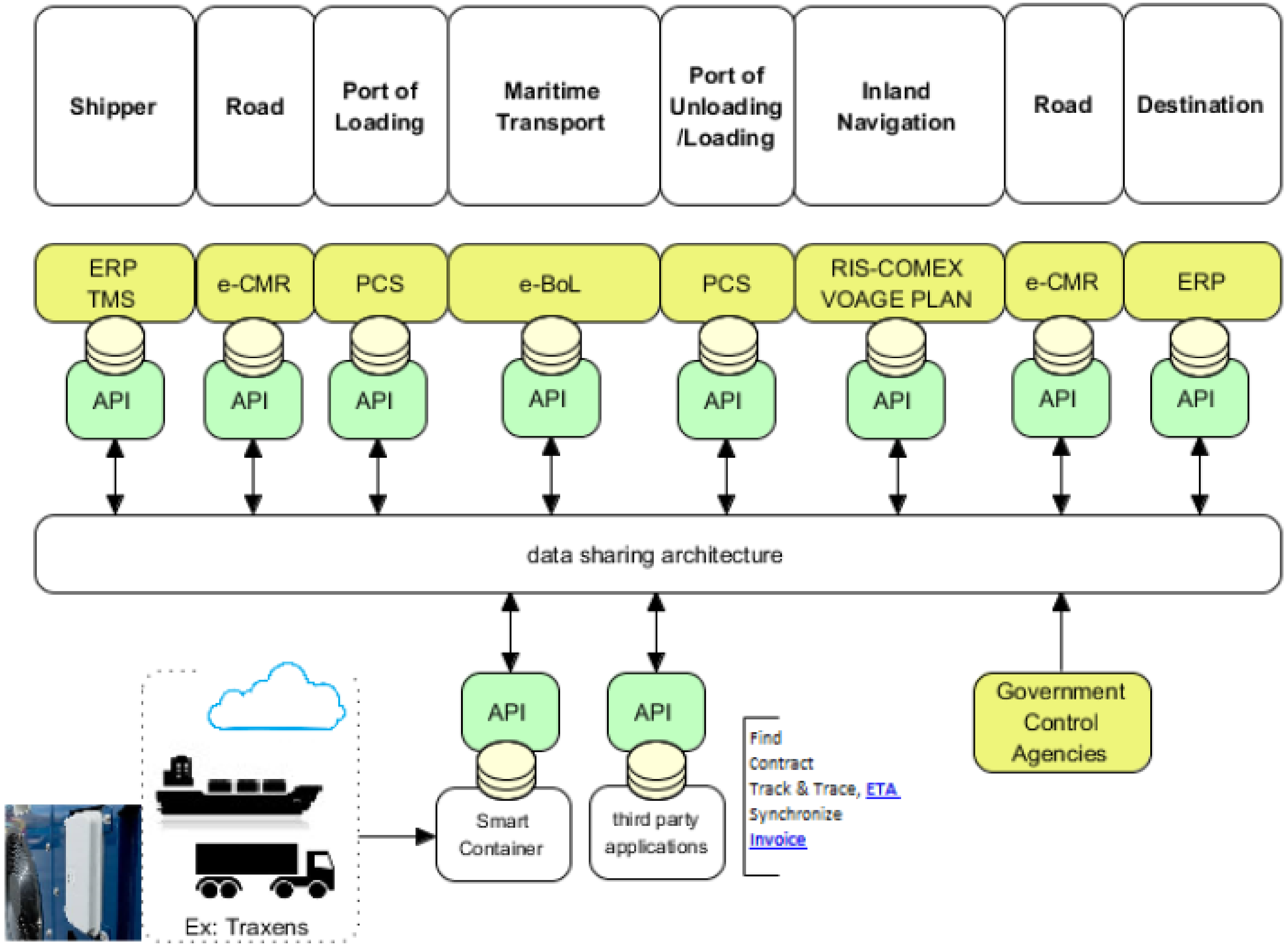
Michael Schroeder, Editor
Todd Frazier, Editor
Jaco Voorspuij, Editor

February 2020

# API based on Generic Master Message structure to serve the whole ecosystem



# APIs: JSON, REST, SOAP, etc.
# Multi Syntax world



# Outline

I. Project Status Timing

II. Project Steps

   Step 1. White Paper - completed

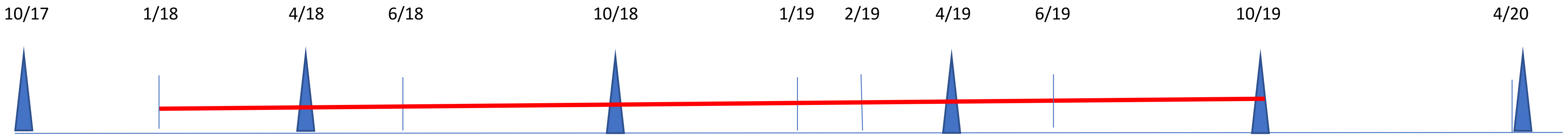
   Step 2. BRS Development – completed

   Step 3. Messaging Development – in process

   Step 4. API Development – planned

III. Summary

# Project Time Line




**PAST**

- **UN/CEFACT Forum – 10/17, Rome, IT - Project proposal and head of delegations approval**
- **Interim – T & L Domain,  – 1/18, Start of the Smart Container Project**
- **UN/CEFACT Forum – 4/18, Geneva, CH**
- Interim – 6/18, Work Session, hosted by CIF/David Roff, Liverpool, UK
- **UN/CEFACT Forum – 10/18, Hangzhou, CN**
- Interim – 1/19 Semantics and Message Structures, Smart container data model review , Paris, FR
- White Paper published, UNECE – 1/19
- Interim – 2/19, Smart Container data model and BRS document, Marseille, FR
- UN/CEFACT Forum – 4/19, Geneva, CH
- BRS document, published – 09/19
- **UN/CEFACT Forum – 10/19, London, UK**

**PLANNED:**

- Interim – 11/19, Messaging and API Work Session, Marseille
- API Development – date TBD

NOTE: Between face-to-face meetings we have been conducting weekly conference calls to continue progress

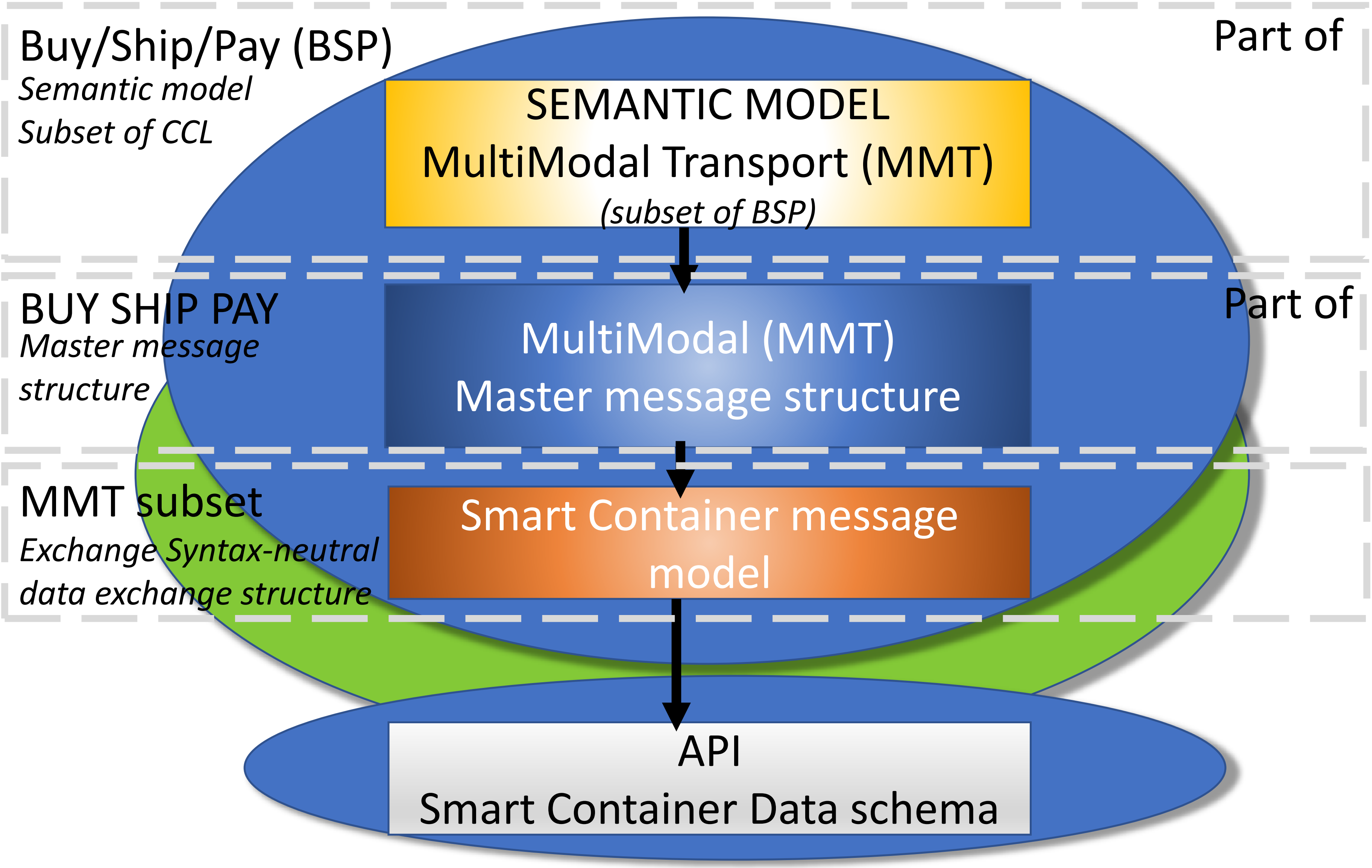
# UN CEFACT T&L Domain Smart Container Project

## Step by Step: from Data Elements to APIs

2 Current efforts

| | Steps | Deliverables | Resources |
|---|---|---|---|
| 1 | Share a common understanding of the Smart Container Business use cases & stakeholders: **SCOPE** | Smart Container **White Paper** | Project Working Group from different backgrounds |
| 2 | Define structured data elements generated by smart container and their qualifiers **TERMINOLOGY /SEMANTIC** | Business Requirements Specifications (BRS) & **Entities Relationship Diagrams** | UN/CEFACT CODES Lists & Multi Modal Transport Reference Model (MMT) |
| 3 | Select the data elements for a given use case | **Generic message structure** (Technology Neutral!) | Contextualized Notification Messages Structures |
| 4 | Choose the **SYNTAX** (language) to be used to communicate | **APIs** | Multi Syntax World |

# UN/CEFACT Smart Container Modeling



# Step 1: White Paper on real time Smart Container data for supply chain excellence

United Nations ECE/TRADE/C/CEFACT/2019/10

**Economic and Social Council**

Distr.: General
17 January 2019

Original: English

**Economic Commission for Europe**

Executive Committee

**Centre for Trade Facilitation and Electronic Business**

**Twenty-fifth session**
Geneva, 8-9 April 2019
Item 7 (c) of the provisional agenda
**Recommendations and standards:**
**Other deliverables for noting**

## White Paper on real-time Smart Container data for supply chain excellence

*Summary*

The Internet of Things (IoT) is the capability of devices to communicate information to a network or to stakeholders directly. Combining this technology with containers in international trade results in "smart" containers that can communicate a great deal of information to the rest of the supply chain and provides a great deal of benefits to all involved such as greater visibility, real-time tracking, less waste (linked to temperature or humidity variations), higher security and potentially faster border clearance. This White Paper outlines the benefits and potential use cases of Smart Container technology and establishes the basis for a future electronic standard on the subject.

Document ECE/TRADE/C/CEFACT/2019/10 is submitted by the UN/CEFACT Bureau to the twenty-fifth session of the Plenary for noting.

White Paper Excerpt

# 4. List of use cases of the smart container potential usage

Below is a summary of the Use Cases put together by the UN/CEFACT Smart Container work group. Each use case will be described in more detail and with the required data elements in a future Business Requirements Specifications (BRS) Document to be developed by the Smart Container Work Group.

| Case Number /Type | Use Case | Description & Trigger | Receiver | Value Proposition |
|---|---|---|---|---|
| 1<br>Operational | ETA Update | Message with new ETA at next point or at final destination can constantly be sent out. ETA calculation is based on comparing planned and actual time and distance. | Supply chain stakeholder (Carrier, Terminal, Forwarder, Authorities etc.) | Receiver can react proactively and plan container operations or cargo logistics accordingly |
| 2<br>Operational and Security Awareness | Actual Executed Transit Time | Monitoring the execution of completed transports. For any leg of the trip, compare used time with initial estimation (e.g., the initial trip plan). | Supply chain stakeholder (Carrier, Terminal, Forwarder, Authorities etc.) | Determine bottlenecks / Delay causes along the trip for operations excellence.<br>Collect historic data as basis for future trip calculation / prediction. |

# Step 2:

- Described Use Cases in More Detail
- Developing Semantic
- Data Elements and Descriptions
- Data Elements Matrix
- Use Case Relationship Diagrams

## Business Use Case 8: Operational - Short-shipped: Forgotten containers on the peer or ramp

**BRS Excerpt**

**Priority 2**

**Value proposition:** It happens that the cargo is manifested but not loaded. It could happen as well during transshipment that the cargo is loaded on the inbound transport means but not unloaded [HB1] at the transshipment location or unloaded from the inbound transport means but not loaded onto the outbound transport means. Smart containers could detect this short-shipped event before arriving to the next port of call or port of discharge.

**How:**

Container is still sending its signal from the port of loading after the vessel has sailed where it should have been loaded. In addition, meshing technology used by smart containers could assist shipper and consignee in understanding which containers are not associated with the ship during its current voyage. A certain range of location from the current ship's position would identify that it is not on that ship. Or if containers are reporting in and a reliable signal is obtained through the use of meshing from containers not on the manifest, it would be known that a container was loaded on the wrong ship.

**Example:**

A ship left Southampton and proceeds 10 nautical miles en route to the Mediterranean, but two containers shown on the manifest are not transmitting a signal from the current ship's position, rather they are identified by position as still in Southampton. Also, one reefer is transmitting a signal from the ship, but it is not recognized as a container that was to have been on that ship's manifest.

**Conclusion/Benefits:**

The stakeholders including the shipper, the Vessel operator can take corrective operational action and correct the manifest or stowage plan.

| Use Case | Short-shipped: Forgotten containers on the peer or ramp |
|---|---|
| Sender | Smart Container Solution Provider |
| Receiver | Shipping lane (vessel operator), Shipper, terminal operator |
| Trigger | Exception Driven: distance between the AIS position of the vessel and GPS position of the container (e.g., over one mile) |
| Preconditions | Trip plan entered, ID and AIS of the vessel |
| Data Transmitted | Container ID, booking ID, GPS, timestamp, Alert |

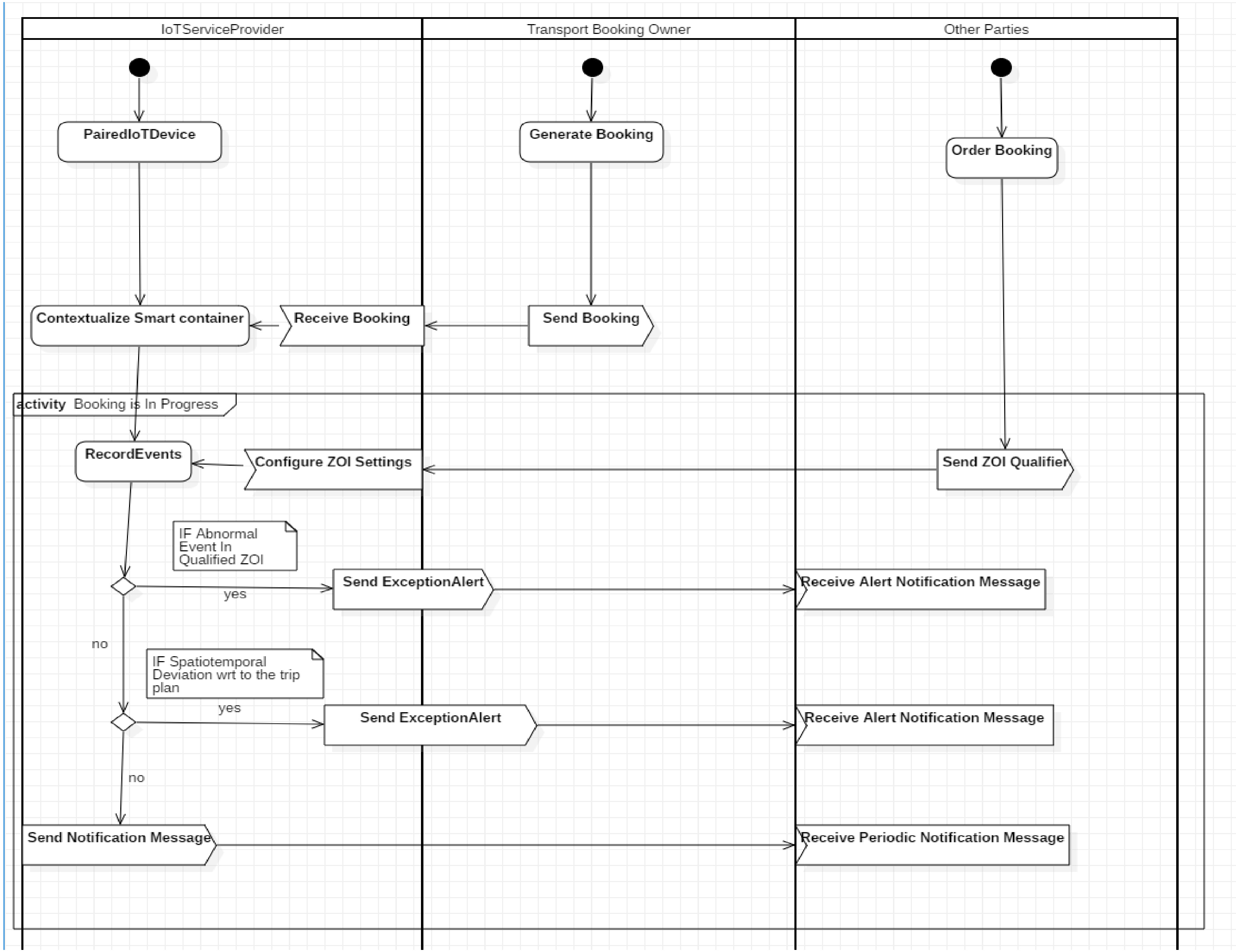
## Data Elements Matrix

## BRS Excerpt

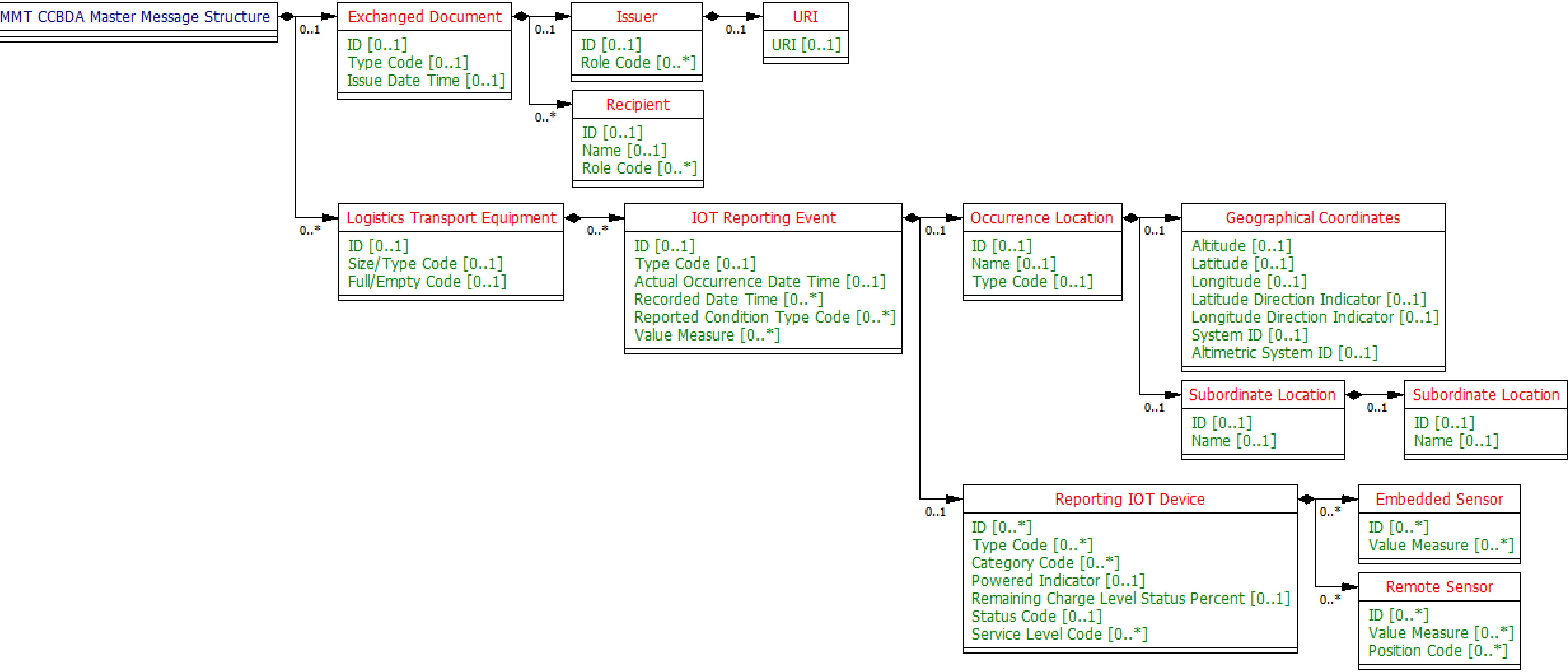
| Use Case # Data Elements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device position | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Device life time indicator | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | | | | | | | | | | | | | | | | | | | | |
| 2. Sensor | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sensor ID | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sensor Manufacturer | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sensor Owner | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sensor position | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sensor life time indicator | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sensor Type | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| GPS | X | X | X | | | | | | | | | X | X | | | X | X | X | X | X |
| Temperature | | | | | X | | | | | | X | | | | | X | | | X | |
| Humidity | | | | | | X | | | | | | | | | | X | | | X | |
| Shock | | | | | | | | | | X | | | | | | X | | | X | |
| Gases | | | | | | | | | | | | | | | | X | | | X | |
| Door Latch | | | | X | | | | | | | | | | | X | X | | | | |
| Active | | | | | | | X | X | X | | | | | X | | | | X | | |

# Relationship Diagrams

## BRS Excerpt



# Step 3: Example Smart Container Message layout (work in progress)



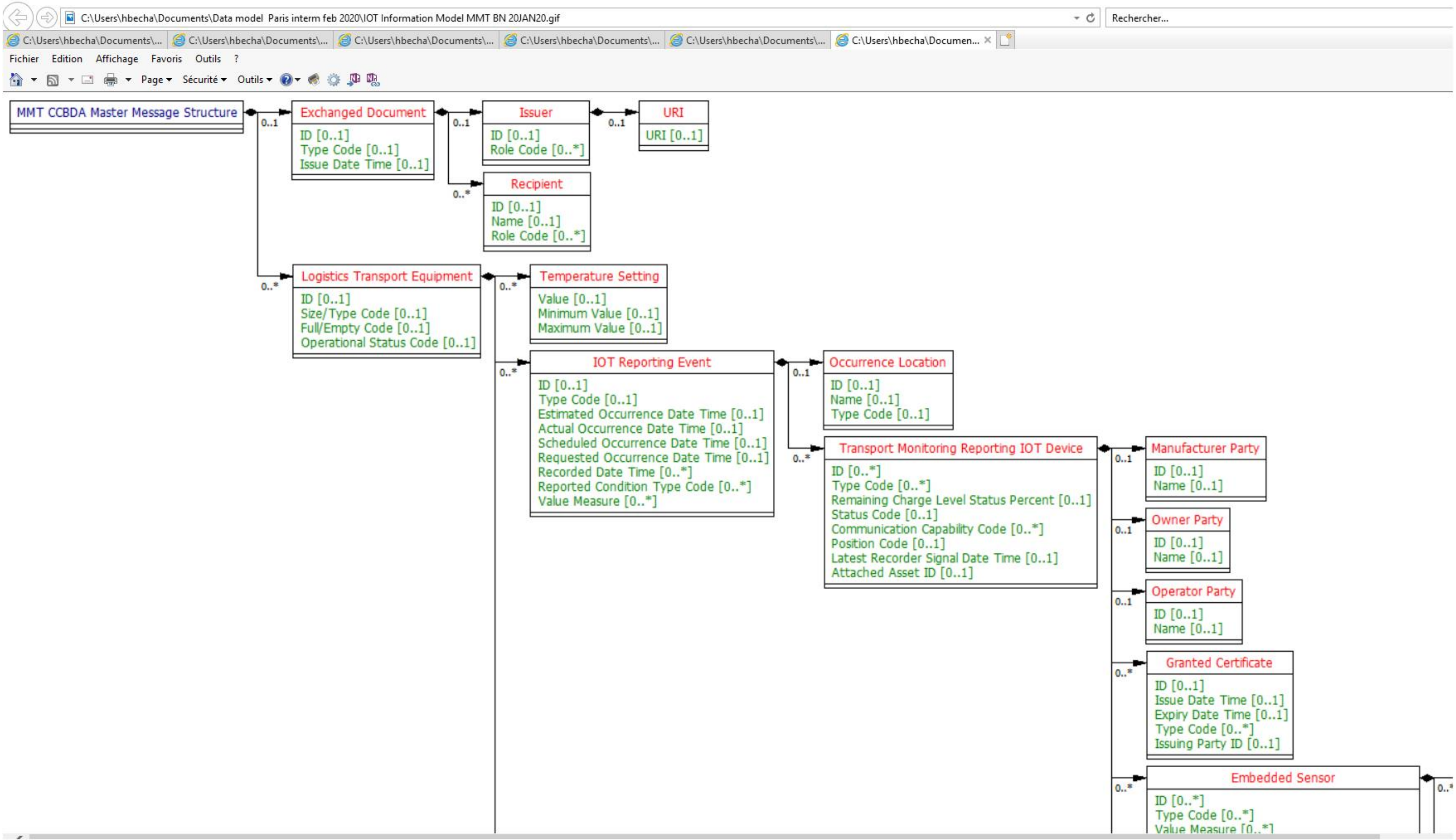
Enregistrement automatique | Copie de CCL19B CCL CC_edit 27JAN20_Michael-Jaco-HB-Gerhard-Sue-Mergedv2 04 02 2020 - Ex... | Rechercher

Fichier | Accueil | Insertion | Dessin | Mise en page | Formules | Données | Révision | Affichage | Aide

Coller | Couper | Copier | Reproduire la mise en forme | Presse-papiers | Arial | 10 | Police | Renvoyer à la ligne automatiquement | Fusionner et centrer | Alignement | Standard | Nombre | Mise en forme conditionnelle | Mettre sous forme de tableau | Styles de cellules | Styles | Insérer | Supprimer | Format | Cellules | Somme automatique | Recopier | Effacer | Édi

E26 | The operational responsible party is the one either taking actions to adress

| | A | B | C | D | E | F | G | I | K | R |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ADD/CHG/ DEP/WDR | Unique UN Assigned ID | ABIE/ BBIE/ ASBIE/ACC/BCC/ASCC/DT/CC/SC | Dictionary Entry Name (auto generated) | Definition Mandatory | Working comments and instructions | Publication comments | Object Class Term | Property Term | R |
| 2 | | | START HERE Press Enter | Keep the rows together Adjust selected rows with Ctrl-a | Enable macro's with Ctrl-e Disable macro's with Ctrl-d | Optional | Optional | Mandatory | Mandatory for BBIE, ASBIE, BCC, ASCC | |
| 81 | ADD | Discuss | ACC | Jaco | Global Navigation Satellite System... | Global Navigation Satellite System (GNSS) refers to a constellation of satellites providing signals from space that transmit positioning and timing data in order to determine location. | Defintion<br><br>Jaco Voorspuij:<br>Geopositions today may be "determined" by a number of very different sources, many of which do not fall under the term Global Navigation Satellite System. Maritime AIS system rely on both satellites as well extensive land-based infrastructures. Collaborative Intelligent Transport Systems (C-ITS) tend to rely entirely on infrastructures installed in and along the road. Geo positions may also be determined via triangulation across mobile phone base stations. And so on. Maybe we need to thoroughly review this class both in terms of its name AND the data elements we need to support also the alternate ways to determine a geoposition. | GNSS | | |
| 82 | ADD | Discuss | BCC | Jaco | An identifier of the system for this GNSS. | | Object Class/Defintion | GNSS | System | I |
| 83 | ADD | Discuss | BCC | Jaco | A code specifying a source type for this GNSS. | | Object Class/Defintion | GNSS | Source Type | C |
| 84 | ADD | Discuss | BCC | Jaco | A measure of the tolerance of this GNSS. | | Object Class/PT | GNSS | Tolerance | M |
| 85 | ADD | Discuss | BCC | Jaco | A quantity of the used signal source of this GNSS. | | Object Class/PT | GNSS | Used Signal Source | Q |
| 86 | ADD | Discuss | BCC | Jaco | A quantity of signal source available for this GNSS. | | Object Class/PT | GNSS | Signal Source Available | Q |
| 87 | ADD | No comments | ACC | | An object or system made or adapted for an IOT (Internet of Things) purpose such to collect, report and autonomously transmit digital data especially when connected to a piece of mechanical or electronic equipment. | | | IOT Device | | |
| 88 | ADD | Reject - CCL general rule | BCC | Jaco Michael | An identifier for this IOT device. | | Restricted to max 1 done by him. JV is ok unbounded | IOT Device | Identification | I |
| 89 | ADD | Reject - CCL general rule | BCC | Michael | A code specifying a type of this IOT device. | A code specifying a type of IOT device. | Restricted to max 1 done by him. JV is ok unbounded | IOT Device | Type | C |
| 90 | ADD | Discuss | BCC | Gerhard | The percentage of the remaining battery charge of this IoT device. | The percentage of the battery charge level of this IOT device. | Gerhard/Sue:<br>Consider reducing PT to Battery Charge Level). See also row 137 | IOT Device | Remaining Charge Level Status | P |
| 91 | ADD | Reject - CCL general rule unbounded | BCC | Michael | A code specifying the operational status, such as broken, stolen, unpaired, inactive, of this IoT device. | A code specifying the status of this IOT device. | Restricted to max 1 done by MS. JV is ok unbounded<br><br>Gerhard: Definition<br>such as examples will be specified in BBIE level. CCs are as neutral and context free as possible. | IOT Device | Status | C |
| 92 | ADD | No comments | BCC | | A code specifying the communication capability of this IoT device. | | | IOT Device | Communication Capability | C |


C:\Users\hbecha\Documents\Data model Paris interm feb 2020\IOT Information Model MMT BN 20JAN20.gif
Rechercher...
Fichier Edition Affichage Favoris Outils ?
Page Sécurité Outils
MMT CCBDA Master Message Structure
Exchanged Document
ID [0..1]
Type Code [0..1]
Issue Date Time [0..1]
Issuer
ID [0..1]
Role Code [0..*]
URI
URI [0..1]
Recipient
ID [0..1]
Name [0..1]
Role Code [0..*]
Logistics Transport Equipment
ID [0..1]
Size/Type Code [0..1]
Full/Empty Code [0..1]
Operational Status Code [0..1]
Temperature Setting
Value [0..1]
Minimum Value [0..1]
Maximum Value [0..1]
IOT Reporting Event
ID [0..1]
Type Code [0..1]
Estimated Occurrence Date Time [0..1]
Actual Occurrence Date Time [0..1]
Scheduled Occurrence Date Time [0..1]
Requested Occurrence Date Time [0..1]
Recorded Date Time [0..*]
Reported Condition Type Code [0..*]
Value Measure [0..*]
Occurrence Location
ID [0..1]
Name [0..1]
Type Code [0..1]
Transport Monitoring Reporting IOT Device
ID [0..*]
Type Code [0..*]
Remaining Charge Level Status Percent [0..1]
Status Code [0..1]
Communication Capability Code [0..*]
Position Code [0..1]
Latest Recorder Signal Date Time [0..1]
Attached Asset ID [0..1]
Manufacturer Party
ID [0..1]
Name [0..1]
Owner Party
ID [0..1]
Name [0..1]
Operator Party
ID [0..1]
Name [0..1]
Granted Certificate
ID [0..1]
Issue Date Time [0..1]
Expiry Date Time [0..1]
Type Code [0..*]
Issuing Party ID [0..1]
Embedded Sensor
ID [0..*]
Type Code [0..*]
0..1
0..*

# Step 4 - APIs for SOA

- **Service Oriented Architecture (SOA)** is an architectural methodology built upon the concept that capabilities should be implemented as services. The ‘Client’ can utilize any software component following the usage specification, irrespective of the technologies upon which the service was developed or upon which the 'calling client' was developed.
- **Application Programming Interface** (**API**) is a source code-based specification to be used as an interface by software components (services) to communicate with each other. Independent SOA services communicate using a common API.
- **APIs** can be created in any chosen syntax (Web Services) based on standardized syntax-neutral data exchange structures (Master data exchange structure)
- **API** is a layer for providing data access. API's should be architected with SOA support in mind (e.g., JSON, REST, SOAP).

# Summary

- UN/CEFACT Core Components Library is a catalogue of semantic definitions of business data for processes - **Context free** – reuse in multiple business sectors

- Customization of generic core components to specific business sectors and application domains

- Specific APIs (code-based specifications) to be used as interfaces by different services (software components) to communicate with each other (exchange data) and build a composite service.

- APIs are syntax definition of interfaces based on semantics definitions of business data.