UN/CEFACT Smart Container Project
UN/CEFACT Smart Container Project

T & L Domain - Status Update

Hanane BECHA, Project Leader
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02/04/2019
Outline

I. Project Status Timing

II. Project Steps
   - Step 1. White Paper - completed
   - Step 2. BRS Development – in process
   - Step 3. Messaging Development – in process
   - Step 4. API Development – planned

III. Summary
I. Project Status Timing
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, Marseilles, FR
- UN/CEFACT Forum – 4/19, Geneva, CH

PLANNED:
- Interim – 6/19, Messaging and API Work Session, TBD
- UN/CEFACT Forum – 10/19, TBD
- API Development – date TBD
- BRS document, publication target – 4/20
- UN/CEFACT Forum – 10/19, TBD

NOTE: Between face-to-face meetings we have been conducting weekly conference calls to continue progress
II. Project Steps
UN CEFACT T&L Domain Smart Container Project
Step by Step: from Data Elements to APIs

**Steps**

1. Share a common understanding of the Smart Container Business use cases & stakeholders: **SCOPE**
2. Define structured data elements generated by smart container and their qualifiers: **TERMINOLOGY /SEMANTIC**
3. Select the data elements for a given use case
4. Choose the **SYNTAX** (language) to be used to communicate

**Deliverables**

- **Smart Container White Paper**
- **Business Requirements Specifications (BRS) & Entities Relationship Diagrams**
- **Generic message structure** (Technology Neutral!)
- **APIs**

**Resources**

- Project Working Group from different backgrounds
- UN/CEFACT CODES Lists & Multi Modal Transport Reference Model (MMT)
- Contextualized Notification Messages Structures
- Multi Syntax World

Current efforts
UN/CEFACT Smart Container Modeling

SEMANTIC MODEL
MultiModal Transport (MMT)
(subset of BSP)

MultiModal (MMT)
Master message structure

Smart Container message model

API
Smart Container Data schema

Buy/Ship/Pay (BSP)
Semantic model
Subset of CCL

BUY SHIP PAY
Master message structure

MMT subset
Exchange Syntax-neutral data exchange structure
Step 1: White Paper on real time Smart Container data for supply chain excellence

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.
### 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.

<table>
<thead>
<tr>
<th>Case Number/Type</th>
<th>Use Case</th>
<th>Description &amp; Trigger</th>
<th>Receiver</th>
<th>Value Proposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Operational</td>
<td>ETA Update</td>
<td>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.</td>
<td>Supply chain stakeholder (Carrier, Terminal, Forwarder, Authorities etc.)</td>
<td>Receiver can react proactively and plan container operations or cargo logistics accordingly</td>
</tr>
<tr>
<td>2 Operational and Security Awareness</td>
<td>Actual Executed Transit Time</td>
<td>Monitoring the execution of completed transports. For any leg of the trip, compare used time with initial estimation (e.g., the initial trip plan).</td>
<td>Supply chain stakeholder (Carrier, Terminal, Forwarder, Authorities etc.)</td>
<td>Determine bottlenecks / Delay causes along the trip for operations excellence. Collect historic data as basis for future trip calculation / prediction.</td>
</tr>
</tbody>
</table>
Contributors - Smart Container White Paper

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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

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.

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

This was a start on defining the semantic, currently in progress, for the Smart Container Project. This is based on the Multi-Modal Transport Data Model.

BRS Excerpts

ZOI (Zone Of Interest are the places in “the itinerary/trip plan” for geofencing/facility) ??
Place Type Enum {Depot pick-up, Master Contract Consignor Place Of Acceptance, POL, POT, POD, FDD, Depot return} (optional)
Indicator Public information OR Private information (optional)
Place Code (optional)
Place Name (optional)

Booking Reference??
Booking Reference ID (optional, example empty container)
Transport Equipment Operator (optional)
Transport Equipment ID
Trip plan {ordered set of legs (start ZOI + end ZOI) + mode of transport + Party+ ETD/ETA)}??
House Transport Contract Reference(s)
Indicator Smart Booking
Requested/Expected measurements for the different sensors (e.g., humidity, temperature settings)
# 4. Shipment/Booking

Data elements related to the shipment context (synonyms: booking, conveyance) that the container belongs to at the time of event reporting.

*Definitions – proposal:*
- **Trip** = end-to-end routing from first pick-up to last drop-off e.g. from Shanghai to Gothenburg
- **Leg** = single route from one point in the trip to the next point e.g. from SGSIN to LKMB

One trip consists of many legs.

Synonym could be “Segment”

➤ *to be aligned with CCL/MMT wording, or with Data Pipeline*

<table>
<thead>
<tr>
<th>Data Element</th>
<th>Description</th>
<th>Format</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Booking number</strong></td>
<td>Booking reference issued by the container operator, typically the shipping line. Synonym: Trip-ID. Leave empty if container not in mission at time of event reporting</td>
<td>Char(15)</td>
<td>12345678</td>
</tr>
<tr>
<td><strong>Container Operator</strong></td>
<td>The party that issued the booking reference and that operates the</td>
<td>Char(3)</td>
<td>HLC</td>
</tr>
</tbody>
</table>
## Data Elements Matrix

### BRS Excerpt

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Data Elements</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device position</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Device lifetime indicator</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

2. Sensor

| 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 lifetime 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 | X | X | X | X | X | X | X | X | X | X |
| Temperature | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Humidity | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Shock | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Gases | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Door Latch | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Active | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
**Relationship Diagrams**

**BRS Excerpt**
Component Library Approach: Reduction of complexity through reusable document building blocks

Contextualization by omitting non-used elements
Contextualized messages structures

Bill of Lading/IFTMCS

Operational Manifest/IFCSUM

Container BayPlan/BAPLIE

Pipeline Data Exchange Structure (CORE/SELIS)
Step 3: Example Smart Container Message layout (work in progress)
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).
API based on Generic Master Message structure to serve the whole ecosystem

highly cross-compatible Smart Container API

New data Elements

Multimodal Transport Reference Data Model

UN/Core Component Library

Smart Container Data Elements/message
APIs: JSON, REST, SOAP, etc.
Multi Syntax world
III. Summary
Summary

• CCL as semantic building blocks for the definition 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 and build a composite service.