Digital Twins in a Federated Architecture

UNCEFACT 11 November 2020
Technology Developments: Potential for impacting Cross-Border Trade

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Co-financed by the Connecting Europe Facility of the European Union
Focus on multi-modal supply chain integration

**UN/CEFACT, WCO, DG Move DTLF**

**Fine Art and Luxembourg Freeport**

**e-CMR BeNeLux, eFTI Luxembourg**

**Digital Europe for Transport and Logistics**

Belarus, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Iran, Latvia, Lithuania, Luxembourg, Moldavia, Poland, Portugal, Romania, Slovakia, Slovenia, Netherlands, Norway, Oman, Russia, Spain, Sweden, Switzerland, Tajikistan, Turkey, Ukraine, UK and Uzbekistan
Objectives of this presentation

1. Digital twins: create a common understanding
2. The emerging role of digital twins in cross-border trade and supply chains
3. Digital twins in a federated architecture
4. EU-Gate living lab
An ideal situation
Digital twins defined

A digital twin is a digital mirror of a physical entity.

By combining the physical and the virtual world, data is provided enabling the virtual entity to exist at the same time with the physical entity.

- Share data with multiple eco systems
- Real-time analysis, prediction and exception management
- IoT, big data and cloud computing, AI, augmented reality provide intelligence to simulate and steer the behavior physical objects
digital twins are evolving over time

Apollo 13: the first digital twin


Smart City as a Digital Twin

[Image: https://www.arcweb.com/ja/node/149]

Digital Twins for the Maritime Sector


IATA OneRecord Virtual Shipment Record


La Blanca 24/7/2018 11:17
Itinerary  RTM-DUIS-MRT-THI
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       ATA  14/7/2018 14:20
LEG 2  DUI  MRT  ATD  15/7/2018 10:00
       ETA  16/7/2018 16:00
LEG 3  MRT  THI  ETD  18/7/2018 07:00
       ETA  18/7/2018 16:00
MAN 1  RTM  MRT  LOAD  11/7/2018 21:00
       ATD  12/7/2018 08:30
       ETA  16/7/2018 16:00

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72,760,274
A digital twin for inland navigation

A digital twin dataset to capture all data that will be shared between the barge operator, trusted supply chain partners and government authorities.

- Data owner keeps access control
- Trusted certified private and public service providers

![Diagram showing the connection between digital twins, APIs, and various supply chain partners including shipper, forwarder, barge operator, port operator handling agent, road services operator, public infrastructure manager, and customs and other agencies with AI integration for data exchange.]
A digital twin for road transport

e-CMR service providers offer their customers with a direct online access to latest updated information

- Data owner keeps access control
- Trusted certified private and public service providers
## Business Opportunity

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 Belgian e-CMR Survey (2019)

[link to analysis of survey](#)
The impact from AI adoption

The bottom line
Average cost decrease and revenue increase from AI adoption, % of respondents* reporting

Costs decreasing
- More than 20%
- 10-19%
- Less than 10%

Revenues increasing
- Less than 5%
- 6-10%
- More than 10%

Marketing and sales
Product and service development
Supply-chain management
Manufacturing
Service operations
Strategy and corporate finance
Risk
HR

Source: McKinsey & Company
The Economist

*Surveyed November 2019
The role of a data sharing infrastructure
Sharing data between the logistics chain, barge operator and IWT infrastructure managers. We need standards that are global, open, neutral and multimodal
FEDeRATED EU-CEF Funded Consortium (2019-2023)

Project partners
- Netherlands
- Finland
- Sweden
- Spain
- Italy

Active observers
- Germany
- Estonia
- Latvia
- Portugal
- Benelux

Non-EU pilots
- IATA
- OneRecord
- 51Biz-PPMB
- Luxembourg

Co-financed by the Connecting Europe Facility of the European Union

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FEDeRATED reference architecture

- Digital Twins
  - Owner/users
  - Services
  - Capability
  - Legal constraints
  - Describing Characteristics

- Event
  - Milestone
  - Time

- Custom item
- Cargo
- Equipment
- Transport means
- Business service
- Node/Hub/Place
- Product
- Person
- Status changes
- Legal constraints
- Describing Characteristics

- Digital Twin

- Custom item
- Cargo
- Equipment
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- Status changes
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- Describing Characteristics
Towards an Internet of Logistics

Each logistics object has a unique ID and a URI (Unique Resource Index)

GET https://api01.eu-gate.eu/companies/LU51000025/los/cmr_LU123456TFY

ID of document, dataset
Search “logistics objects”
Unique ID of the issuer/owner of a document/dataset
access point storing meta data required to find source of data

Each logistics object has a unique ID and a URI (Unique Resource Index)
Towards an Internet of Logistics
EU-Gate e-CMR/eFTI Access Point Living Lab

- EU-Gate Access point
- Living lab of EU-Funded FEDeRATED consortium
- Pilot project of IATA OneRecord
- Use real-world multi-modal reference supply chains
- Create a common understanding about eFTI
- Version “minus 27”
Conclusions

1. Digital twins in cross border supply chains
   • Mirror of physical logistics objects
   • Share data with multiple data eco systems
   • Enable intelligent and autonomous transport
   • Share events by publish/subscribe

2. FEDeRATED data sharing infrastructure
   • Internet of logistics
   • Unique ID and IRI
   • API share events by publish/subscribe
   • Common language integrates multiple vocabularies and ontologies

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http://www.federatedplatforms.eu