

Blockchain-enabled Ports: the Experience of the "PLANET" H2020 project and Blockchain Interoperability

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Agenda

- Project overview
- Objectives of the project
- The EGTN environment The expected impacts
 - ► The EGTN platform
- The Complete visibility of the supply chain
 - The TrackOne solution by NGS
- The Blockchain interoperability
- Conclusions

PLANET Vision

Advance the European Commission's strategy for Smart, Green and Integrated Transport and Logistics by

- **efficiently interconnecting infrastructure** (TEN-T, Rail-Freight Corridors) with geopolitical developments (e.g. future New Silk Road and emerging trade routes)
- optimising the use of current & emerging transport modes and technological solutions
 - ensuring equitable inclusivity of all participants
 - increasing the prosperity of nations
 - preserving the environment
 - enhancing citizens quality of life
 - The realization of this vision is what PLANET calls the Integrated Green <u>EU-Global T&L</u> <u>Network (EGTN)</u>.

PLANET Objectives

Simulation Capability for analysing the impact of new trade routes and emerging innovations for the TEN-T and European logistics operations, and for designing a geo-economics aware and PI inspired Integrated EU Global Trade Logistics Network Cloud-based Open EGTN ICT Infrastructure, leveraging interorganisational workflows and smart contracts linked with IoT and federated Blockchains

Set up and operate **3 global corridor-Living Labs**, interconnected into a Digital Clone, to provide an experimentation/ innovation environment and testbed for EGTN EU Roadmap and Capacity Building program to steer innovation towards EGTNs aligning with global T&L blockchain initiatives and the ALICE

Dissemination, Commercialisation, Strategy Impact Assessment and Policy recommendations endorsed through consultation, harmonising project experiences from the LLs with DTLF

EGTN Platform

- Architecture: A blueprint architecture to enable collaboration in an open, secure and inclusive environment
 - **EGTN** service integration diagrams
 - Security methodologies and best practises for trusted sharing of data
 - ► Guidelines for ingesting data and for T&L services integration
- Prototype: A cloud-based instantiation of the architecture to enable the integration of PI services and the deployment in the PLANET LLs
 - Cloud-based deployment for data storage and data processing
 - Interfaces for admins to enable monitoring and managing the EGTN infrastructure
 - Interfaces for data scientists to enable data analytics
 - Scripts/interfaces for stakeholders to easily upload data

EGTN Platform Impact

- ► An open, inclusive platform to engage even small-sized T&L actors
- Increases the visibility across the supply chain
- Enables transparent collaboration between the stakeholders
- Provides an open, secure and scalable infrastructure for technology providers to deploy PI services



planet The Complete visibility of the supply chain

Key Drivers

PLANET vision and environment

- Optimised integration with the emerging trade routes as Northern Sea Route, Silk Road routes, and Chinese One Belt One Road
- Involvement of different stakeholders from different nations and cultures, that must cooperate in the realisation of optimised logistics transactions

Key drivers



Real-time, accurate and secure E2E visibility of the whole SC by multiple actors

Complete visibility of the supply chain (both last-mile and cargo)

- Improved granularity
- E2E visibility and monitoring

Interoperable, competitive & cooperative, horizontal and "as a service" environment in the premises

 Coexistence of different IoT Service providers (different business models) **Enhanced Data Sharing interoperability** (up to organisational – EPCIS 2.0)

- Secure and ad-hoc access
- Seamless integration with EGTN with services from different providers

Generalised as a service architecture for EGTN IoT Infrastructure

Innovative





Complete visibility of the supply chain

Transport

Mode agnostic IoT solution capable to identify and T&T&M the goods along the supply chain

Transport

Port or Harbour

Pallet

Manufacture

- Logistics Unit (LU) oriented T&T&M services
- Standardised identification and consolidation (GS1 coding)
- Logistics unit dedicated monitoring

Concepts

Port or Harbour

Customs

 Smart Pallet/Basket. IoT device to identifies the LU and provide a dedicated monitoring

Container

Transport

► Smart

Container/Mean/Warehouse. IoT device that identifies the container, provides general purpose connectivity, positioning, remote communication 3 use cases to cover the supply chain

Transport

Logistic Service Provider Distribution Centre Pallet

Retaile







Use cases implementation

- Application scenarios
 - China-Spain corridor: vessel and truck use cases
 - China-Poland corridor: train use case

► Key features

- T&T&M of the logistics units from the shipper toward the receivers
- Logistic units consolidation: Smart Pallets and Smart Container/means/warehouse
- ► GS1 EPCIS data sharing







The TrackOne solution

Trusted and secure environment for the supply chain E2E complete visibility

The TrackOne solution

- Complete and goodsoriented E2E visibility of the whole supply chain
 - Improve the security for goods
 - Support the logistics optimization
 - Standardised representation GS1 EPCIS 2.0
- Components:
 - IoT devices
 - Cloud application and dashboard



The TrackOne solution

- Connected reusable pallet/basket
- Logistics units automatic characterization (weight and size)
- Unique identification (e.g., GS1 GRAI code)
- Presence notification
- Added values sensors (e.g., evaluation vibration, external temperature)
- Improved granularity monitoring
- Feature extraction, to simplify the supply chain understanding







North

Macedonia

-0

Italy

Rome

Ajaccio

DITECEER DISTRET VELOCITA E LA SICUREZZA DELLE RET VALTA VELOCITÀ E LA SICUREZZA DELLE RET

Stop

Zaragoza

Burgos

Spain

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Way forward: IW-NET project

- Intermodal logistics considering IW -Smart Barge
 - Complete visbility E2E of the supply chain at improved granularity
 - Fleet management and monitoring
- Innovation-driven Collaborative European Can we apply the same concepts to trains?



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IM-UEL

Inland Waterways Transport Network

Way forward: TrackLog project DIGIFED OC2 - Ended May 2022

- Improved security in data collection
 - Secure by design gateway
 - Secure communication, maintaining visible LU identification





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Way forward: TrackOne project ATLAS OC2 - Ended May 2022

- Complete E2E visibility of the perishable goods supply chain
 - Ad-hoc sensors
 - GS1 EPCIS 2.0 blockchain ledger to store critical events
 - Creating a meeting point between the logistics and the agricolture interoperability



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Way forward: Decarbomile project Start in Sept. 2022

- Last mile multimodal logistics
 - GS1 EPCIS 2.0 trusted interoperable repository
 - Large testbed around the EU

Blockchain Interoperability in the T&L domain

The EGTN Interledger Service provides secure and standardized interfaces to enable interoperability among existing blockchain networks

Motivation

- Blockchain features and functionalities have the potential not only to meet PI implementation requirements but also to overcome key PI barriers and deficiencies
- T&L stakeholders have already joined Blockchain consortia and/or deployed their own private, permissioned networks => Disconnected networks
- Blockchain interoperability is a chief enabler for the PI enabling existing disparate Blockchain systems to interoperate and share data regarding shipping manifests, smart contracts, customs declarations, transport events

EGTN Interledger Service

- Connects with the individual Blockchain networks/communities
- Listens for logistics events
- Forwards them to other Blockchain communities
- EGTN Data Lake provides an event-streaming service that ingests logistics events and IoT data from sensors, following the latest GS1 standards
- EGTN Analytics provide predictive analytics, e.g. forecasted number of incoming containers/pallets in a port/warehouse
- Smart contracts:
 - consume data within the EGTN Platform (Data Lake)
 - combine these with other information sources (e.g., outputs from AI predictive models)
 - automatically trigger actions, such as the creation of trusted metadata that can be used as a single source of truth
 - generate new smart contracts that monitor and safeguard Service Level Agreements (SLAs) between logistic communities (e.g., carriers and freight forwarders)



EGTN Smart Contracts

ID	Data & If condition	Then Description
IT01	Cargo Departure event reported from Shipper = Cargo Dep. from Carrier	Enhanced-trust Departure
IT02	PoD reported by Carrier = PoD reported by Consignee	Enhanced-trust Delivery
IT03	Delivery point/time = Unloading IoT coordinates/time	Contract fulfilled
IT04	System defined vibration/temperature tolerance = IoT sensors measurements	Contract violated
IT05	AI forecasts & System events	New Contract Generation

- Aim to standardise and streamline interorganisational T&L workflows
- ► 3 categories of smart contracts
 - Enhanced-trust events (based on IoT data or other BC events)
 - Contracts/Agreements monitoring
 - New Contract generation



Planet Use Case

- Simulate a Merchant scenario where:
 - COSSP manages shipments from Asia to Spain (Valencia port) Shippers community Blockchain
 - Inland transport is managed by DHL Spain Freight Forwarders community Blockchain

COSSP/PoV info DHL info



Conclusion

- PLANET is developing an open and interoperable platform supporting PI
- Complete visibility of the supply chain, exploiting a securev
- Interoperability at every level, up to organisation interoperability exploiting GS1 EPCIS
- Blockchain interoperability, to enable trusted communication between stakeholders



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