FENIX: Applying the federated network of platforms in real transport and logistics operations

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Dr. Eusebiu Catana, ERTICO-ITS Europe, Belgium
Senior Manager I&D

Contents

- What is FENIX?
- Strategic principles and features
- FENIX Architecture & Connector Overview
- Technical Interoperability
- Use case in FENIX Mediterranean Pilot : focus on custom
- FENIX→future of logistics

What is FENIX?

FENIX Federation network is a secure data sharing framework in the form of a federation, where there is not a centralized entity owning the ecosystem, and where all the participants of the federation have the same rights and obligations and follows the federation governance.

Main FENIX federation governance aspects:

- Rules and regulations for the federation: On-Boarding Process to become Member of the FENIX Federation
  - Rules, Legal Issues, Certification, Interoperability
- Rules and regulations for data exchange within the federation:
  - Technical Implementation of the FENIX Connector according to the specification

FENIX NETWORK

OVERVIEW

Overall project overview:

- aims to interconnect the different digital platforms and harmonise the services they offer
- interoperability: common protocols for supporting data sharing services
- data sharing in the form of digital corridor information systems serving the European logistics community
- cloud-based will facilitate horizontal collaboration within the LSC
- overcome today's fragmentation and lack of connectivity around ICT-based systems for logistics decision making
- open-solution and not "privately owned" and technological neutral

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FENIX Test sites

H: Smart door-to-door multimodal T&L services across TEN-T

SL: Mondelez T&L multimodal services across TEN-T corridors

B1: AirCargo pilot site(Be)-implement/pre-deploy/deploy specific use cases for the air cargo community linked to the other transport modes across TEN corridors

B2: Multimodal inland Hub-Procter & Gamble-Mechelen-Willebroek pilot site across TEN-T corridors

A: Customs corridor services for T&L:- Fürnitz Pilot Site (South Austria) on the Baltic-Adriatic corridor

G: Multiple test sites across on Rhine-Alpine in Holland, Germany, Switzerland, Italy

I1: Mediterranean and Baltic-Adriatic and the Motorway of the Sea of South-east corridors

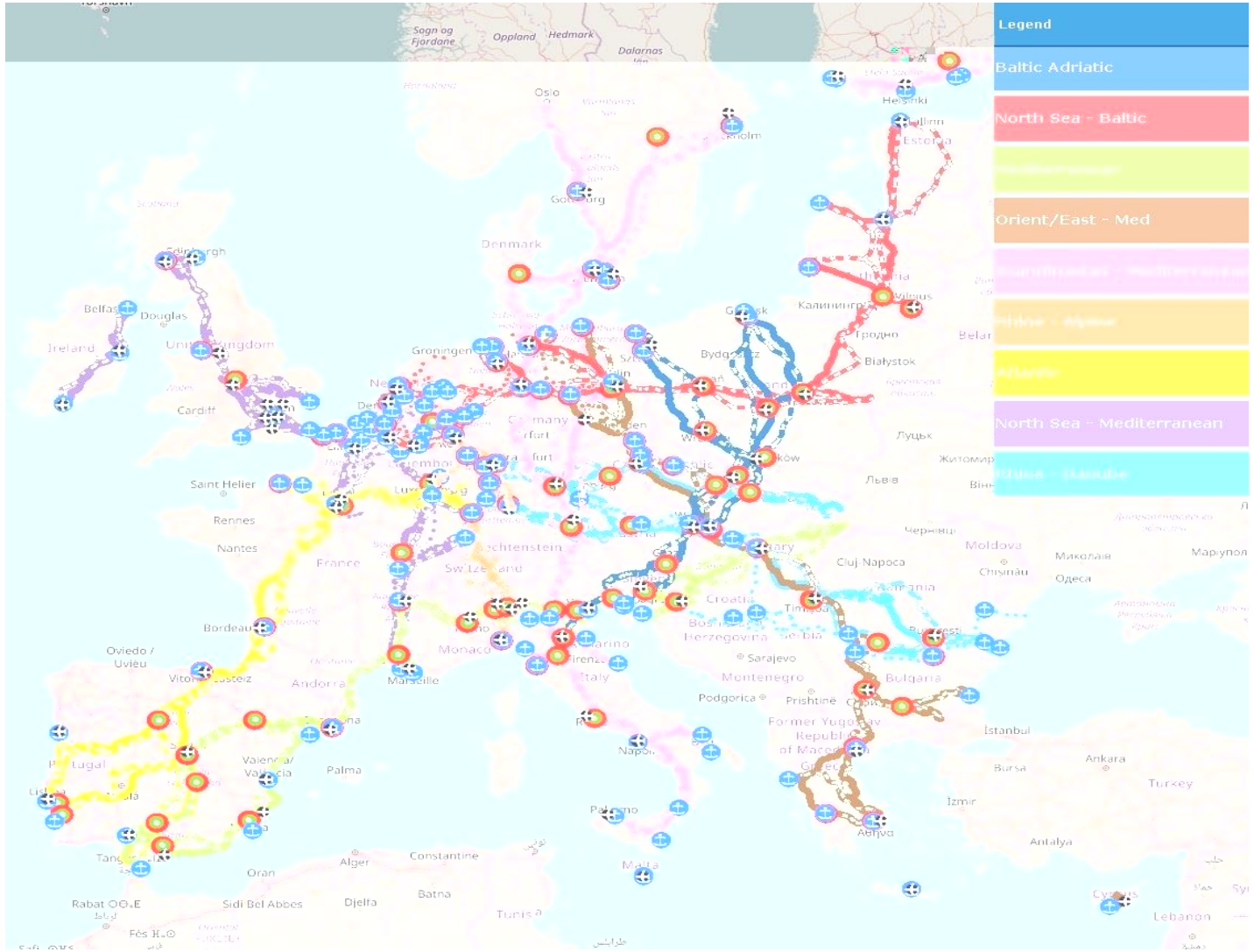
Data visibility T&L services across the Spanish-Atlantic corridor between the main nodes and actors

I2:The Italian Rhine Alpine pilot site – Dynamic Synchro-modal for sustainable multimodal logistic planning and operations

GR: Greece Balkan-TEN-T network, Adriatic-Ionian Corridor-Cyprus multimodal T&L services

AT GLANCE

Test site Austria: Customs corridor -Fürnitz (South Austria) on the Baltic-Adriatic corridor
Test Site Belgium: PS BE 1- AirCcargo (Be)
PS BE2- Multimodal inland Hub-Procter & Gamble-Mechelen-Willebroek (Be)
Test site France: French Mediteranean – North Sea
Test Site Germany: Multiple test sites across on Rhine-Alpine in Holland, Germany, Switzerland, Italy
Test site Greece: Greece Balkan-TEN-T network, Adriatic-Ionian corridor-Cyprus multimodal
Test Site Holland (South Holland): Smart multimodal
Test Site Italy: PS IT1- Mediterranean and Baltic-Adriatic and the Motorway of the Sea of South-east - Trieste
PS IT2: The Italian Rhine Alpine – Dynamic Synchromodal Logistic
Test Site Slovakia: All TEN-T corridors and multimodal
Test site Spain: The Spanish-Atlantic Corridor



- ***Multi/syncromodal Transport***
- ***Intelligent bubs***
- ***Network Optimisation***

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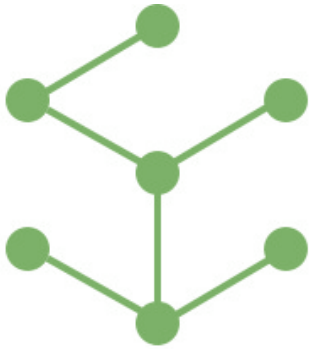
Strategic principles and features

Federation

- According to businessdictionary.com, a federation is an organization that consists of a group of smaller organizations or companies that works to bring attention to issues that are of importance to all of its members. Each organization that comprises the federation maintains control over its own operations.
  - At strategic level, FENIX addressing the vision of a federated network of platforms concept, data sharing, trust and data access control
  - At tactical level, FENIX focus is on the governance model and the regulation (rules, guidelines, standards…)
  - At delivery level, FENIX provides the technological architecture specification for the federation of platforms and a technological demonstration together with project member's platforms

Strategic principles and features

Decentralized approach



- FENIX architecture does not rely on a centralized platform or software approach
- All trusted and certified platforms that are part of the federation are considered nodes of the network and always retain their internal control.
- Is not a single, central system that mandates one way of operating for everything. Instead, it is a framework. It is a networked collection of platforms that join together and understand each other, based on common rules

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Strategic principles and features

Ecosystem of Data and Services

- FENIX is composed of platforms, data assets and services. The data and services are made available for secured consumption or sharing via the federated network.
- FENIX federation enables data sharing between individual platforms, which will be created by means of common protocols for supporting data sharing services (platforms interoperability)
- Stakeholders can communicate with their platform provider of choice, who are held to relevant trust, security, and performance standards by the authorities and FENIX specifications and coordinate with the rest of the network

Strategic principles and features

Trustworthy and Data Sovereignty

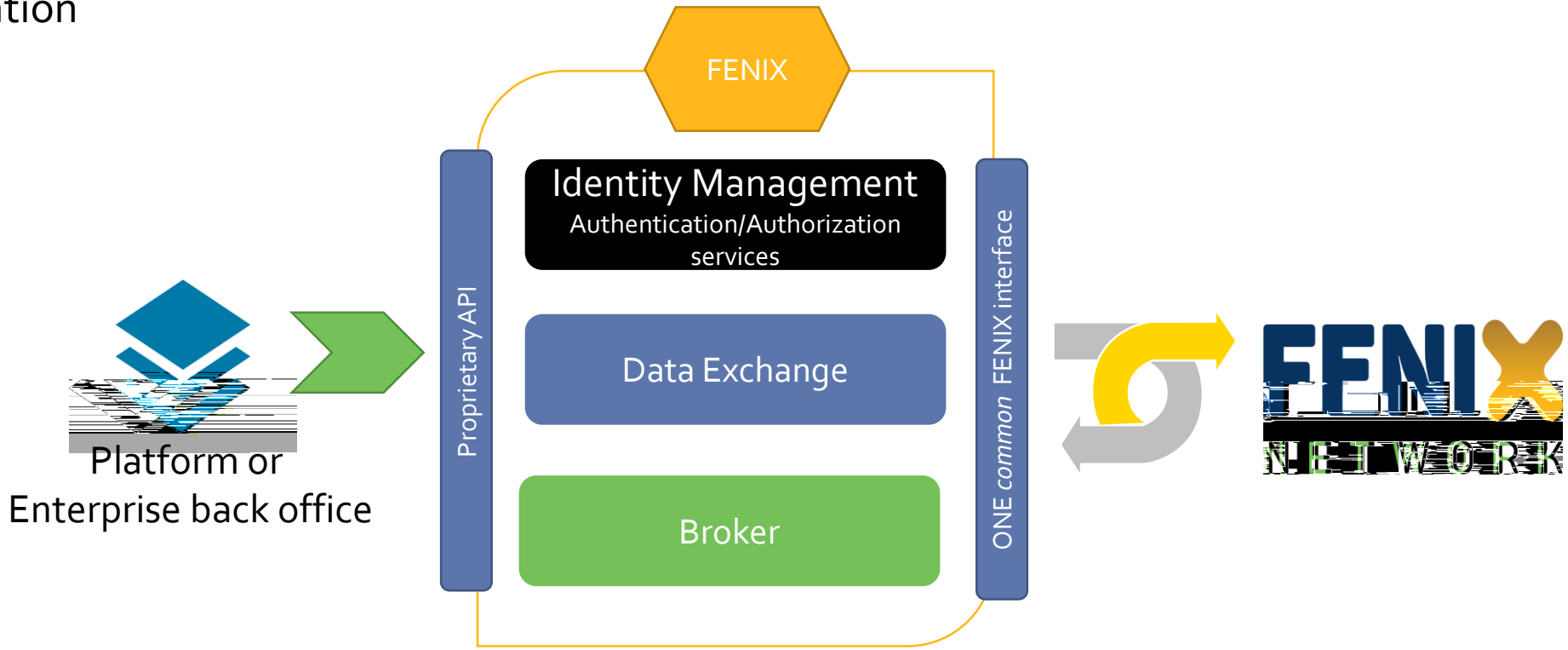
- Trust is essential for digital services, logistics actors will not embrace digital services if they don't trust their data will be protected. FENIX provides guidelines to ensure the trustworthy between the federated platforms and support data sovereignty.

- Data sovereignty means maintaining authority and control of data within jurisdictional boundaries. Together with other security aspects, such as secure communication between nodes of the network: data sovereignty is essential for data security.

- FENIX is federating platforms, is not granting access to each of the fed-platforms.

FENIX Architecture & Connector Overview

- Federated resources will be implemented with 3 main pillars which fits in the business processes based on:
  - ***Identity Management*** **-** to ensure the identities of the participants of the federation, authentication of identities
  - ***Data Exchange-*** data exchange connector to enable the data sharing
  - ***Broker*** **-** Search service of a distributed catalogue of services and data available in each node of the federation



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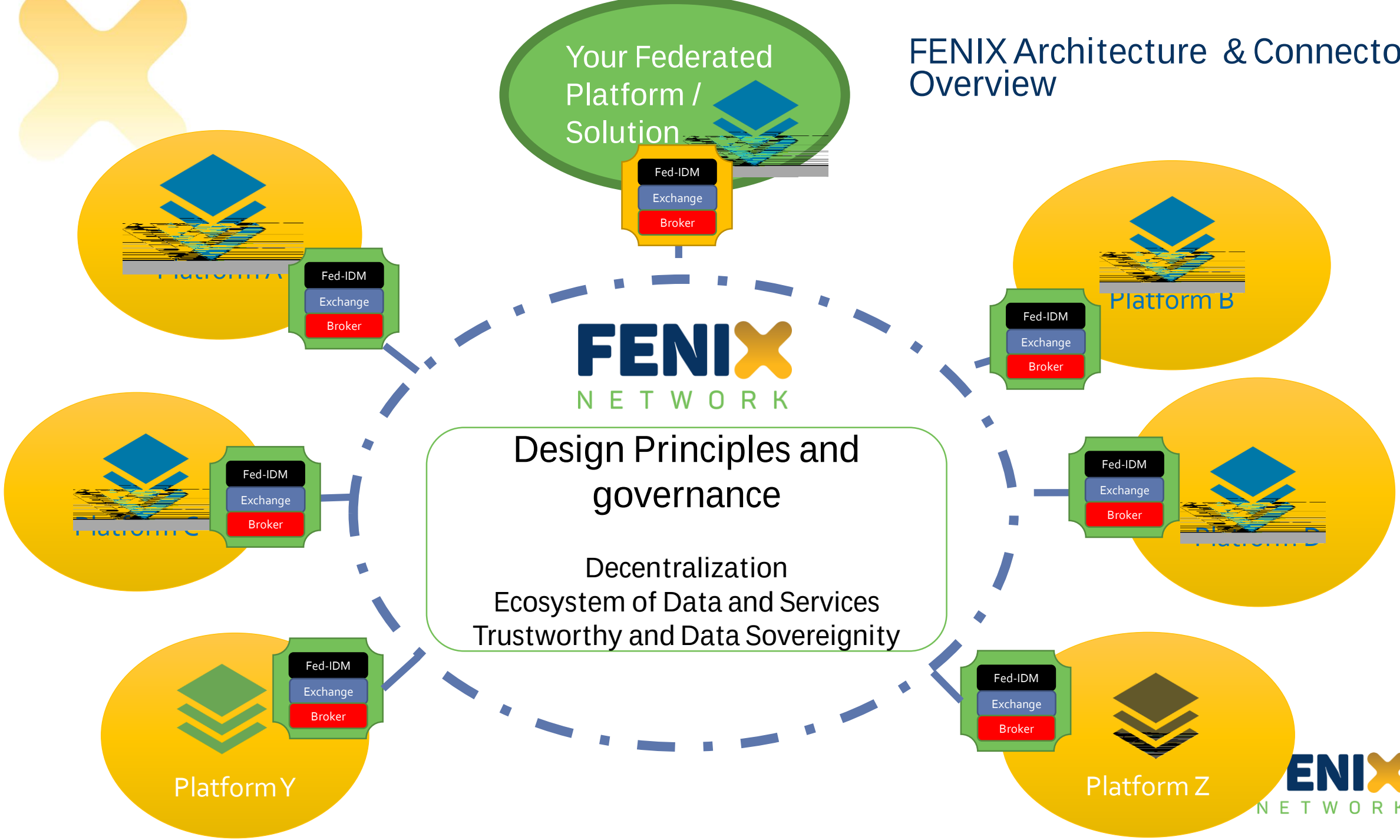
FENIX Architecture & Connector Overview



FENIX Connector Specifics

- Identified User Stories & Use Cases

User Story ID	User Story
F-US-001	Become a member of the FENIX federation
F-US-002	Get available resources from other FENIX members
F-US-003	Request Access to make use of any available resource
F-US-004	Authorize to make use of a resource
F-US-005	Send/Receive Data through the FENIX connector

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The FENIX Connector Specification

- Security
  - Certificates –> Machine to Machine Communication
  - TLS v1.3 and mTLS
- Identification & Authorization – Access Token, Oauth 2.0
- Catalogue of Resources
- Data Exchange
  - Communication Patterns
- FENIX message Structure

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The FENIX Connector Specification - Security

- FENIX provides a Machine to Machine Communication through the FENIX connectors
  - The data platforms remain their operation in the same way
  - No need to identify users between connectors, only platform/services certificates
- Usage of Certificates
- TLS v1.3 and mTLS to provide a secure environment using HTTPS connections and data encryption using RSA ciphers

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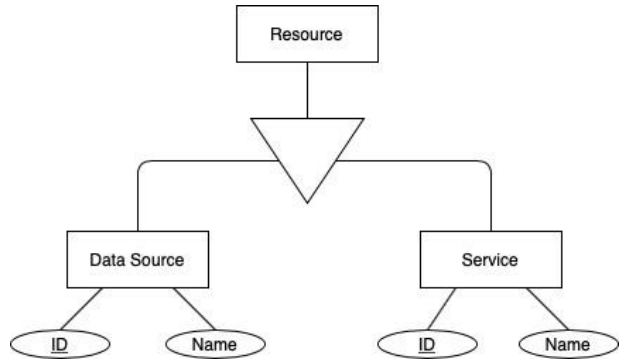
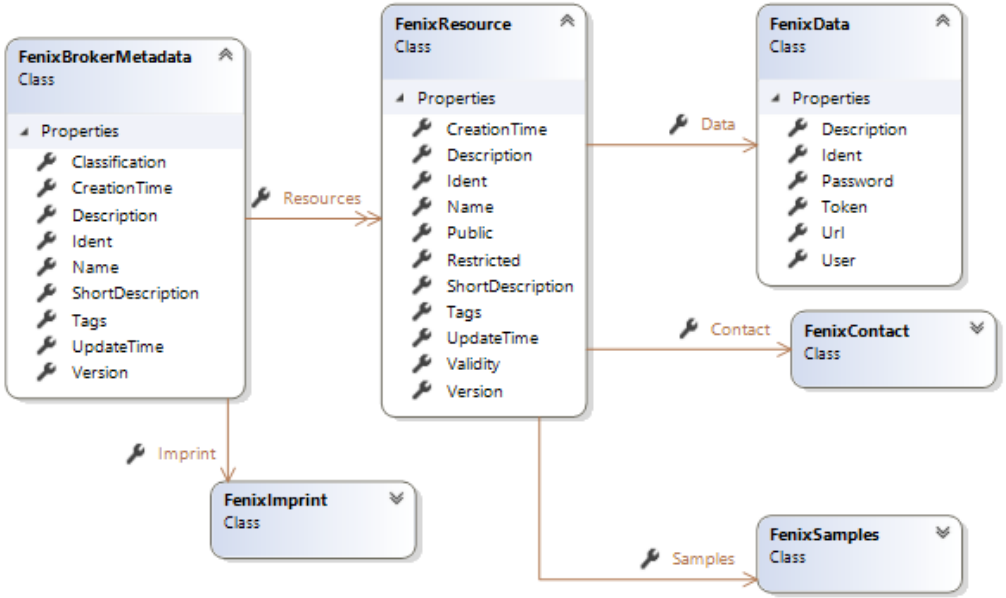
The FENIX Connector Specification – Catalogue of Resources



- Any member of the FENIX federation can share or consume Resources
- Every platform must generate its catalogue of resources following an schema containing different kinds of information about the resource:
  - Identifier
  - Resource name
  - Fenix Classification
  - Description
  - Tags
  - Contact for the resource & Imprint
  - Data, Documentation & Samples
  - Scope: Public or Resticted

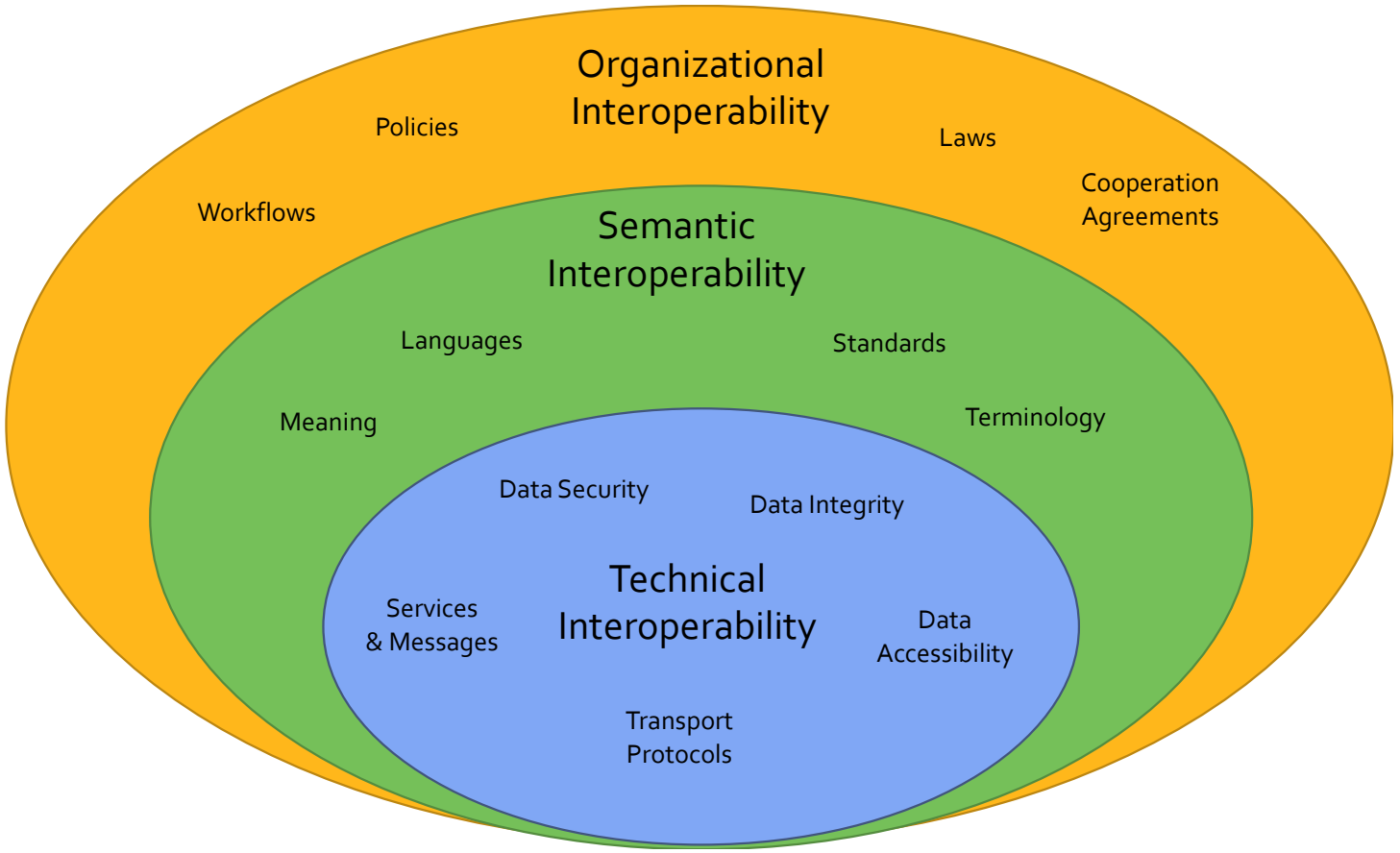


The FENIX Connector Specification – Data Exchange

- To exchange data between FENIX connectors, it has been specified 3 different communication patterns:
  - Request/Response Pattern
  - Publish/Subscription Pattern
  - EDI Pattern
- Definition of the data exchange process for each of them (sequence diagrams)
- Definition of the API needed for the Request/Response Pattern (first version)
- Design of the Publish/Subscription pattern using a common Queueing System

Interoperability Levels

- The FENIX connector is the key technical interoperability enabler in the FENIX federation
- It allows several data platforms to connect to each other in the same way and to consume and exchange data in a common way
- The FENIX connectors use a common message structure to share information (FENIX message)
- The FENIX connector does not deal with content. Therefore, it sends data as the data owner sends it, in its original format. This message is encapsulated within the FENIX message.



FENIX→Future of Logistics

- ***TRUST***: Trust is the basis of the FENIX. To use the data, the data consumer must fully accept the data owner's usage policy.
- ***ECOSYSTEM OF DATA***: pursues the idea of decentralization of data storage, which means that data physically remains with the respective data owner until it is transferred to a trusted party.
- ***STANDARDIZED INTEROPERABILITY***: is implemented in different variants and can be acquired from different vendors.
- ***VALUE ADDING APPS***: includes also services for data processing, data format alignment, and data exchange protocols.
- ***DATA MARKETS***: FENIX enables the creation of novel, data-driven services that make use of data apps.
- ***PI***: FENIX enables the creation of new ICT infrastructure to support operations in future PI logistics networks

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Thank you for your attention!

www.fenix-network.eu

Dr. Eusebiu Catana, Project coordinator

Innovation & Deployment

ERTICO-ITS EUROPE

e.catana@mail.ertico.com

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