D2.1.2

High level specifications for each T&L corridor

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AEOLIX	Architecture for European Logistics Information exchange
A2B	Administration to Business
API	Application Program Interface
B2A	Business to Administration
B2B	Business to Business
BAA	Business Associate Agreement
CE	Connectivity Engine
CEF	Connecting Europe Facility
C-ITS	Cooperative Intelligent Transport Systems
DG	Dangerous Goods
DG MOVE	Directorate-General Mobility Transport, MOVE
DIH	Data Intelligence Hub
DSS	Decision Support System
DTLF	Digital Transport and Logistic Forum
e-CMR	Electronic Convention des Merchandises par Route
e-seal	Electronic seal
EC	European Commission
ERP	Enterprise Resource Planning
ERTICO	European Road Transport Telematics Implementation Coordination Organisation – Intelligent Transport Systems & Services Europe
ERTMS	European Rail Traffic Management System
EU	European Union
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
FENIX	A European FEderated Network of Information eXchange in Logistics
GHG	Greenhouse Gas

GLOSA	Green Light Optimal Speed Advice
GTFS	General Transit Feed Specification
HPCS	Hinterland Port Community System
ICT	Information and Communication Technologies
IDS	International Data Spaces
INEA	Innovation and Networks Executive Agency
ITS	Intelligent Transport Systems
ITU	Intermodal Transport Unit
IWW	Inland waterways transport
LCA	Logistik Center Austria
LCC	Load Control Center
LCMM	Low Carbon Mobility Management
MCTO	Multimodal Cargo Transport Optimisation
MQTT	Message Queue Telemetry Transport
NAP	National Access Point
NLP	Nonlinear Programming
OTP	Open Trip Planner
PCS	Port Community System
PS	Pilot Site
PNAEAS	Port Network Authority of the Eastern Adriatic Sea
SELIS	Shared European Logistics Intelligent Information Space
SMIP	Smart Multimodal Information Platform
Swagger	Open API or OAS—is a type of framework that was designed to describe, produce, visualise, and consume RESTful web services. Referred to "language-agnostic," it has been developed to be read using a common language
QAT	Quality Assurance Team
REST	Representational State Transfer
SOAP	Simple Object Access Protocol
TEN-T	Trans-European Transport Network

T&L	Transport and Logistics
TMS	Transport Management System
TRL	Technology Readiness Levels
TM2.0	Traffic Management 2.0 is focused on multimodality and logistics
UC	Use Case
V2I	Vehicle to Infrastructure
YTM	You Truck Me

1. INTRODUCTION

1.1 Purpose of the document

The purpose of the FENIX Deliverable D2.1.2 "High level specifications for each T&L corridor" is to provide the description of the specifications of the services available in the Pilot Sites.

D2.1.2 is part of FENIX Activity 2, which is titled "Strategic dialogue, cross-corridors collaboration and Pilot roll out preparation". The main objective of this activity is to implement an iterative approach to develop "corridor information systems" as a federative network of information exchange platforms and in line with DTLF recommendations.

In particular, the objective of Sub-activity 2.1 "High level specifications for the L&T corridor information systems services" to which D2.1.2 belongs, is to specify the set of the relevant service and the types of data used and exchanged in the federated ecosystem through different information systems.

This document will provide the technical framework for the services that each FENIX Pilot Site is going to develop, test, pre-deploy and deploy during the project.

Interoperability across the TEN-T corridors is proving to be absolutely crucial, and it will be developed taking into account three main lines: technology, services and implementation, specification and recommendations for standards.

In this document, Chapter 3 presents a description of the FENIX Pilot Sites and the list of the service typology that each FENIX Pilot Site will deploy during the project.

In Chapter 4, the focus is then shifted to the nine TEN-T Corridors. A comprehensive review is presented and describes the technical specifications of the services that will be available in each aforementioned corridor.

1.2 Contractual references

FENIX stands for "A European **FE**derated **N**etwork of **I**nformation e**X**change in Logistics". FENIX is an action 2018-EU-TM-0077-S under the Grant Agreement number INEA/CEF/TRAN/M2018/1793401 and the project duration is 35 months, effective from 01 April 2019 until 31 March 2022. It is a contract with the Innovation and Networks Executive Agency (INEA) under the powers delegated by the European Commission.

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2. EXECUTIVE SUMMARY

The aim of this deliverable, which belongs to Activity 2 "Strategic dialogue, cross-corridors collaboration and Pilot roll out preparation", is **to present the technical services specifications of the FENIX Pilot Sites within the TEN-T corridors.**

The FENIX pilot sites are listed below:

- Austria, Fürnitz Pilot Site (south Austria) on the Baltic-Adriatic corridor;
- Belgium, Air Cargo Pilot Site;
- Belgium, multimodal inland hub-Procter & Gamble-Mechelen-Willebroek Pilot Site;
- France, French Mediterranean – North Sea Pilot Site;
- Germany, Rhine-Alpine corridor;
- Greece, Greece Balkan-TEN-T network, Adriatic-Ionian corridor-Cyprus multimodal Pilot Site;
- Italy, Trieste Pilot Site: Mediterranean and Baltic-Adriatic and the Motorway of the Sea of South-East;
- Italy, Milan/Genova: the Italian Rhine Alpine Pilot Site – Dynamic Synchromodal Logistic Modules;
- Dutch Pilot Site, Smart Multimodal Operations Platform (SMIP);
- Slovakia, all TEN-T corridors and multimodal Pilot Site;
- Spain, the Spanish-Atlantic Corridor Pilot.

It is also important to underline that this analysis takes place in collaboration with each Pilot Site, which has provided a detailed description of their planned FENIX activities. These contributions have been collected in this document.

Then, in every Pilot Site section, a description of the services with their current status (already deployed, ongoing, or willing to be developed, tested and deployed during the FENIX project) is presented.

For each planned service, in the section dedicated to the corridors, a very detailed description of the provided functionalities is presented, including data formats and data exchange protocols wherever already defined.

3. PILOTS GENERAL OVERVIEW

3.1   Austria, Fürnitz Pilot Site (South Austria) on the Baltic-Adriatic Corridor

The terminal in Villach/Fürnitz is the most important intermodal node in the south Austrian region, perfectly connecting the Baltic Adriatic corridor with other major traffic routes and serving as a hub for industrial regions in the catchment area as well as the urban areas of Villach and Klagenfurt. The terminal is integrated into the Logistics Hub "Logistics Centre Austria South" which is located at two main transport axes: The Tauern (Munich – Istanbul) and the Baltic-Adriatic (Gdańsk - Bologna) axis.

In order to provide the link between maritime shipments and European supply chains, the section of VILLACH/Fürnitz – UDINE – TRIESTE on the Baltic Adriatic corridor is crucial. The aim is to provide an improved modal split by taking advantage of rail freight services and reducing emissions in the freight transport sector. Several NAPA-ports are important for this region, especially when it comes to intermodal shipments. The forecast for those ports is showing enormous growing rates regarding containerised freight. These enormous rates are leading to capacity problems in specific ports, which can be solved through dry ports in the Hinterland and enormous transport potential for rail freight.

The actions and business opportunities of the Austrian pilot site are the following:

- the implementation of information services for intermodal transport;
- further work on establishing a customs corridor between Austria and Italy.

The Pilot Site has proposed the following Use Cases:

- UC1: Information services;
- UC2: Customs corridor.

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO

Real-time vehicle traces		x				x	
B2A, A2B services like customs		x		x		x	

3.2 Belgium, Air Cargo Pilot Site

The Air Cargo Belgium Pilot Site will focus on the implementation and the roll-out of an application that will allow trucking companies, who are doing airport to airport transport, to book a flexible time slot at the ground handling agents.

Today the waiting times for freight delivery or pick-up by trucking companies from outside BRUcargo and coming to the premises of Brussels cargo's ground handling agents appears to be one of the biggest bottlenecks. Moreover, there is no standard procedure to support the process of slot bookings, resulting in inefficiencies. The information exchange is done manually, via email or phone. Mismatching in supply and demand, waiting times and inefficient staff planning result in spillage of resources for all stakeholders.

The implementation of this new application should reduce the waiting times for the trucking companies because it will allow ground handlers to optimise their personnel planning for pick-up and delivery of freight of trucking companies coming from outside BRUcargo.

The current pick-up and delivery process result in:

- Idle times: the trucking companies sometimes need to wait for hours at the truck parking before they can pick or deliver freight;
- No transparency: no transparency regarding which trucking company will pick-up or deliver the freight, resulting in a reactive approach at the GHA and operational inefficiencies;
- No information exchange between partners.

The proposed use cases will allow more data exchange between trucking companies and ground handling agents, which will lead to the optimisation of the current process.

The Pilot Site has proposed the following Use Cases:

- UC1: Reservation of time slot;
- UC2: ETA service;
- UC3: Capacity management;
- UC4: Elimination of waiting times;
- UC5: Parking service;
- UC6: Driver security check Integration.

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Real-time vehicle traces			x			
Booking of a parking slot					x	
Integration with driver security check at the facilities of the ground handling agent					x	
Slot Reservation			x			
Capacity Management			x			

Table 2: Belgium, Air Cargo Pilot Site, services status

3.3 Belgium, Multimodal Inland Hub-Procter & Gamble-Mechelen-Willebroek Pilot Site

The strength of this pilot is characterised by the fact that it develops a centralised data hub to coordinate and visualise the movement of both empty and full containers between the Port of Antwerp, the Willebroek barge terminal and the Willebroek distribution centre.

The overall aim of this Pilot Site is to provide several tools to optimise the Coordination and the Visualisation of container movements across the chain.

Specific focus will be set on the implementation of Data Driven and Situation Specific Messaging and Exchange of Date among Stakeholders, securing the optimal execution of activities. Due to the fact that current existing process are non-synchronised, these actions shall result in a significant reduction in inefficiencies in operations. Due to the nature of the pilot and to the customs data exchange potentially involved, a great potential of collaboration with the The FEDeRATED (IT) project can be foreseen.

The interaction and fulfilment of the existing platform and its enhancement for the purposes of

FENIX will be performed by the Technical Partners of the Project OIA Global.

The scope is the transport by barge and truck of ocean containers loaded with P&G products, between P&G's distribution centre and the Port of Antwerp, for both international import and export purposes.

The problem is the lack of integrated visibility on ocean carrier bookings, empty container depot, container loading, barge capacity planning and sailing details to the Port of Antwerp. Linked activities such as dangerous goods notifications and customs clearance are negatively impacted by this situation.

This results in multiple manual checks, stand-alone reports, inefficiencies in operation and customs conflicts due to non-synchronised processes.

The proposed solution is to create central data hub to coordinate and visualise the movement of empty and full containers between the Port of Antwerp, the Willebroek barge terminal and the Willebroek distribution centre.

The Pilot Site has proposed the following Use Cases:

- UC1: ETA;
- UC2: Reduction of CO_2 & NO_x emission;
- UC3: Track & trace vehicle/shipment;
- UC4: B2A, A2B services like Customs;
- UC5: Dangerous Goods.

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Expected time of arrival (ETA)	x		x		x	
Reduction of CO_2 & NO_x emission		x		x	x	
Track & trace vehicle/shipment		x		x	x	

B2A, A2B services: Customs		x		x	x	
Dangerous goods		x		x	x	

<div align="center">**Table 3: Belgium, P&G Pilot Site, services status**</div>

3.4 France, French Mediteranean – North Sea Pilot Site

The French Pilot Site has two important hubs which are in Marseille and in the North of France. This Pilot Site will demonstrate intelligent Multi Modal Transport on the Mediterranean and the North Sea – Mediterranean TEN-T corridors. Marseille and Fos-sur-Mer are among the biggest ports in the Mediterranean and Dunkerque, Lille, Dourges, Eurotunnel are all important hubs in the North. All of these ports are Multimodal (barges, trains, trucks, and ships). This Pilot Site will demonstrate multimodality and interoperability between all of these ports, with focus also on the Port of Strasbourg, which is an important hub on the North Sea - Mediterranean corridor.

Northern France ("Hauts-de-France") benefits from an ideal geographical position for a logistics hub in Europe. In close proximity to major economic regions (Paris Île-de-France, Dutch Randstad, Ruhr area, greater London), Hauts-de-France is the second most densely populated region in France and provides a full range of transport infrastructure:

- Ports: an international seaport (Dunkirk), two regional ports (Calais & Boulogne) specialised in traffic with the UK and fishery, the unique Channel tunnel;
- IWW: ca. 1,000 km of inland waterways and the mega project of the Canal Seine – Nord extension from Western France to the Benelux and German networks, 27 inland ports (of which Lille Ports, the third biggest in France);
- Rail: circa 2,800 km of railways, the biggest trimodal freight hub North of Paris (Delta 3 Platform in Dourges);
- Road: eight major highways (French A1, A2, A16, A21, A22, A25, A26, A29).

The regional authority has launched in 2013 an ambitious development plan elaborated with J. Rifkin along the lines of his "third industrial revolution" concept (Plan REV3). All C-ITS and related optimisation-efforts will be welcome under this scheme.

The French Pilot Site will provide end to end visibility by integrating the innovative solutions of the partners with the final goal of service integration for Multimodal delivery optimisation.

Finally, a strong collaboration with several C-ITS deployment projects will be initiated, permitting data and service exchange thanks to connections with the French national node. These existing projects are Scoop, InterCor, C-Roads and InDiD, which is the next C-ITS deployment project led by

the French Ministry in objective 8. It adds a Mediterranean Pilot Site around Marseille Metropolis to deploy several Day1&1.5 C-ITS services and prepare the infrastructure for autonomous driving. This will permit to demonstrate the benefits of C-ITS for logistics but also the benefits of data provided by logistics companies for the management of traffic.

The French Pilot Site will continue integrating the AEOLIX platform and more specifically the MyAEOLIX connectors, the Data Transformation service and the toolkit. NeoGLS being a partner and Living Lab leader in AEOLIX will take care of this integration and will complete the platform by continuing the adaptation of its IT logistics tool Noscifel by proposing an intelligentDashboard MCTO (Multimodal Cargo Transport Optimisation). This generic tool will be available for all Living Labs in order to provide interoperability and data visibility.

Furthermore, MGI will adapt its innovative Cargo Community service called AP+/CI5, which is currently used in most of the ports, and will make it interoperable with the AEOLIX platform. They will also integrate the use cases developed in the SELIS project in the global FENIX architecture.

FENIX will also consider the results of European CORE and French GeoTransMD projects, which have demonstrated the feasibility of the architecture agreed by the UNECE-Working Party on the Transport of Dangerous Goods - Joint Meeting RID/ADR/ADN (WP.15/AC.1).

This architecture and its data exchange format will permit to digitalise the mandatory transport documents describing the dangerous goods loaded on the transport unit (road, rail and waterway). On voluntary basis, Transport Companies involved in DG Transport from and to the port will have the opportunity to electronically declare the transport. Through AP+/CI5 and the AEOLIX platform, data exchange with the IT solutions of these Transport Companies will receive the DG description. In case of control, authorities can access directly the data by request through the architecture.

With the deployment of C-ITS equipment at port gates and on board of trucks, the French Living Lab will lay the first stone of the general C-ITS network and will cooperate with local road operators, especially the Mediterranean Road Directorate (DIR), to install C-ITS equipment on the road network.

This architecture will help to study the capability of combining road management for dedicated transport, managing statistics on the route of goods, allowing green lanes and extra authorisation for road transport.

The Pilot Site has proposed the following Use Cases:

- UC1: Dynamic status slot verification;
- UC2: Slot management;
- UC3: Multimodal ETA for cargo optimisation;
- UC4: Dangerous goods;

- UC5: CO_2 reduction;
- UC6: Customs optimisation;
- UC7: C-ITS for logistics.

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Real-time vehicle traces	x					
Multimodal route planning and re-routing						x
Parking availability (locating the parking slot on the maps)			x			
Traffic Light Assistance and speed recommendations	x					
Relation Service Provider (forwarder) – carriers & terminals (operators)			x			
Integration with driver security check at the facilities of the ground handling agent			x			
CO_2 calculation	x					
Multimodal ETA			x			
Slot management	x					
Slot verification	x		x			
Customs container verification			x			
Emergency management of dangerous goods	x					
Dangerous goods control	x					

DATEX2 for dangerous goods transformation tool	x					
Data visibility			x			
Barge service			x			
Truck service			x			
C-ITS for terminal access			x			

Table 4: France Pilot Site, services status

3.5 Germany, Rhine-Alpine Corridor

The German Pilot Site / "CCP" will demonstrate an integrated intermodal capacity and corridor management along the Rhine-Alpine corridor in the context of FENIX.

For the dynamic freight management resulting from volatile freight demand, digital approaches to optimise freight capacity will be demonstrated within a federated architecture context. This comprises the visualisation of available freight capacities, both on intermodal trains and for first/last mile terminal trucking services.

With regards to corridor management, available status data information from already existing platforms (e.g. RNE-TIS) will be integrated into the FENIX setup. Thorough visibility and multi-layered data analytics will be provided as dashboard enabling process, leading to transparency and optimisation of freight operations.

Both, capacity and corridor management will allow to apply sophisticated services for an enhanced corridor setup by introducing the concept of synchro modality.

The Pilot Site has proposed the following Use Cases:

-   UC1: Multimodal Freight Capacity (first/last mile);
-   UC2: Intermodal Railway Capacity;
-   UC3: Intermodal Corridor Data Hub;
-   UC4: Mode free capacity planning (Synchro modality).

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Capacity Management for intermodal transport (TX Logistik)					x	
A communication system between mutually interacting software applications (internal/external) (TX Logistik)	x					
Interface to operational railway management, incl. Track&Trace of intermodal trains (TX Logistik)			x			
Integrate train and road (pre/post haulage) status information end-to-end (TX Logistik)			x			
Exchange of status information with intermodal terminals (TX Logistik)			x			
Exchange of status information with intermodal customers (TX Logistik)			x			
Data Analytics (TX Logistik)					x	
ETA calculation for rail (TX Logistik)					x	
Multimodal route planning and re-routing (PTV)			x		x	
Parking availability (locating the parking slot on the maps) (PTV)	x					
Relation Service Provider (forwarder) – carriers & terminals (operators) (PTV)	x					
Urban & interurban integration environment (PTV)			x		x	
ETA provisioning (PTV)	x					

Real-time vehicle traces and Urban & interurban integration environment (T-Systems)	x					
DIH.Identity provider: Identification and Access Management based on reference architecture of International data space (T-Systems)	x					
DIH.Broker: Register of data, data sources, content, structure quality, etc. (T-Systems)	x					
DIH.Connector Connectivity Layer: Connectivity and usage control (T-Systems)	x					
DIH. Apps Store: Provision of Data App use DIH.Connector (T-Systems)	x					
DIH.Clearing House: clearing and settlement for financial and data exchange transactions (T-Systems)	x					
DIH.Vocabulary (T-Systems)	x					
DIH.Corridor Data Hub dashboard (T-Systems)		x		x	x	
Real-time vehicle traces (JdR)	x					
Multimodal route planning and re-routing (JdR)			x		x	
Parking availability (locating the parking slot on the maps) (JdR)			x		x	
Booking of a parking slot (JdR)					x	
Relation Service Provider (forwarder) – carriers & terminals (operators) (JdR)			x		x	
ETA (JdR)	x		x		x	
Carrier Capacity planning (JdR)			x		x	

Table 5: Germany Pilot Site, services status

3.6 Greece, Greece Balkan - TEN-T Network, Adriatic - Ionian Corridor - Cyprus Multimodal Pilot Site

The Greek Pilot Site will operate as an open innovation community – a Living Lab – within which private enterprises, public authorities and research institutions collaborate to facilitate research-practice integration, and develop solutions for real-life, transport and logistics (T&L) business scenarios and use cases.

The Greek Pilot Site foresees the enhancement of the competitiveness and ecological footprint of the Greek part of the Orient/East-Med Corridor emphasising in the part of the corridor that connects the biggest and busiest port of Greece, Piraeus, the capital city Athens and the Thessaloniki to borders area. This will be achieved through the digital transformation of logistics operations and the provision of smart supply chain solutions for real time information and data exchange -that refer to both rail and road operations- along the corridor.

More specifically, the Greek Pilot Site's main goal is to achieve integrated T&L operations along the Greek part of the Orient/East-Med Corridor and to the rest of TEN-T corridors towards North and Central Europe. At the same time, the goal is also to focus on the interoperability of three logistic platforms – Port Community Node, Corridor Monitoring Platform & Collaborative meta-services Platform – and various services for the exchange of on-demand and real time information along two main strategic axes:

- Terminal and Corridor operations status: Real time information exchange about the logistics processes that take place in and out of the Port of Piraeus and along the Corridor i.e. cargo monitoring, alerts, truck and rail availability, status of customs etc.;

- Added value Services and Infrastructure: Real time Information about the availability and traffic status of logistics services along the Greece-Balkan Corridor i.e. rail and truck availability, directory of logistics and transport services and on-demand warehousing.

This will be facilitated through the provision of interoperable planning and optimisation tools i.e.: ETA, Big data analytics tools, etc.

To achieve this, the Greek Pilot Site will benefit from the results of previous projects such as AEOLIX and SELIS, while undertaking new activities to harmonise the operations of existing/new, public and private T&L platforms with the FENIX federated infrastructure. The goal is to establish a federated pan-European Logistics network of platforms.

Figure 1 presents an overview of the services that will be provided by the Greek Test Site and will be federated to the FENIX network of platforms.
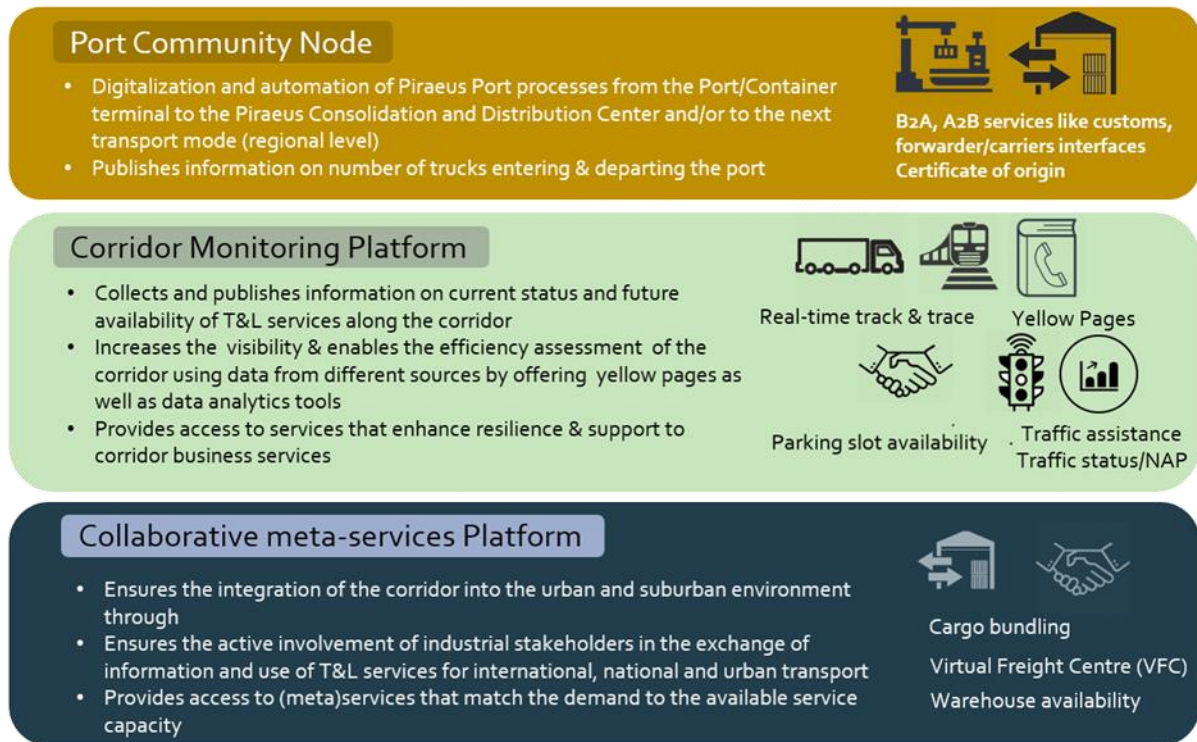
Figure 1: Greek Pilot Site architecture

The Pilot Site has proposed the following Use Cases:

- UC1: Digitalisation of port processes (A2B, B2B, B2A processes);
- UC2: Balanced use of modal availability along the corridor – Intermodality;
- UC3: Monitoring of status of transport operations;
- UC4: Traffic management & parking availability;
- UC5: Yellow Pages & KPIs;
- UC6: End-to-end provision of logistics services for SMEs along the corridor.

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Road traffic along TET-T corridors and in urban – interurban environment/ National Access Point -			x		x	
Digital inventory of services					x	
Real-time vehicle traces			x			
Parking availability (locating the parking slot on the maps)			x			
Relation Service Provider (forwarder) – carriers & terminals (operators)		x		x	x	
Cargo bundling	x					
B2A, A2B services like customs	x		x		x	
Certificate of origin	x		x		x	
Virtual Freight Centre - warehouse booking	x					
Slot/Rail availability and notification			x			
Availability of trucks along the corridor			x		x	
Terminal-transport-warehouse operations monitoring			x		x	
Cargo status			x			
ETA for logistics with Machine Learning	x					
Big Data Descriptive Analytics Service	x					
Big Data Prediction Service	x					
Normalisation of Data	x					

Table 6: Greek Pilot Site, services status

3.7   Italy, Trieste Pilot Site: Mediterranean and Baltic-Adriatic and the Motorway of the Sea of South-East

The Trieste Pilot Site will operate as a Living Lab, with all the Implementing Bodies collaborating in a systematic co-creation approach and with integrated innovation and research processes.

Specifically, Trieste is a cosmopolitan city of 207800 inhabitants and is the capital of the autonomous region Friuli-Venezia Giulia, a north eastern Italian region of about 1.2 million inhabitants.

Figure 2: Italy, Trieste Pilot Site corridors

Trieste is one of the main Italian Ports, positioned into two TEN-T EU corridors:

-    Mediterranean corridor;
-    Baltic-Adriatic corridor.

In this area, the following important logistics assets are located: the Motorway of the Sea of south-east Europe and the Port of the Silk Road.

It is important to underline the presence of strategic cross border issues in the area. Slovenia is far

just 10 km, while Croatia is 50 km and Austria is 100 km away.

Trieste has appeared as Pilot in Co-GISTICS (PF7) and Living lab in AEOLIX (H2020); in these contexts, the role of the following operators has been crucial:

- the Port of Trieste;
- the inland terminal;
- the highway.

The Trieste Pilot Site is developed by 9 Use Cases and 11 implementing bodies. The Trieste Pilot Site will contribute to the federation IT platform with AEOLIX, developed within the H2020 project framework, of which Trieste has already been Living Lab, acquiring experience and ability to work in collaboration with European partners.

The Pilot scope can be outlined as follows:

- Platform integration: integration of the existing Pilot platforms in FENIX IT federation;
- Intermodal transport services: Synchronisation of vessels, trucks and railway transport;
- Cross border interoperability: interoperability with the Austrian Pilot;
- Improving Custom procedures: PCS involvement;
- Dangerous goods transport management and monitoring;
- Parking services;
- CO_2 & NO_x emissions monitoring.

The Pilot Site has proposed the following Use Cases:

- UC1: Expected time of arrival (ETA);
- UC2: Reduction of CO_2 & NO_x emissions;
- UC3: Multimodal route planning;
- UC4: Track & trace vehicle/shipment;
- UC5: TM2.0 for multimodality;
- UC6: Parking booking service;
- UC7: B2A, A2B services like Customs;
- UC8: Dangerous goods/eCall EGNOS/Galileo;
- UC9: Carrier certification & eCMR testing.

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Real-time vehicle traces (POLIBA)	x					
Dangerous goods/eCall EGNOS/Galileo (POLIBA)		x	x		x	
Multimodal route planning and re-routing (PNAEAS)					x	
Relation Service Provider (forwarder) – carriers & terminals (operators) (PNAEAS)	x					
B2A, A2B services like customs (PNAEAS)					x	
Track and trace of trains (PNAEAS)					x	
CO$_2$ & NO$_x$ monitoring (DBA Lab)					x	
TM2.0 for multimodality (DBA Lab)					x	
Track & trace vehicle/shipment (DBA Lab)					x	
B2A, A2B services like customs (DBA Lab)					x	
RORO Intermodal Transport Monitoring (Info.era)			x		x	
Real-time vehicle traces (MATRAS)			x			
Multimodal route planning and re-routing (MATRAS)			x			
Parking availability (locating the parking slot on the maps) (MATRAS)			x			
Booking of a parking slot (MATRAS)			x			
Smart payment for parking points (MATRAS)					x	
Traffic Light Assistance and speed recommendations (MATRAS)			x			
Relation Service Provider (forwarder) –			x			

carriers & terminals (operators) (MATRAS)						30
Integration with driver security check at the facilities of the ground handling agent (MATRAS)					x	
B2A, A2B services like customs (MATRAS)					x	
Certificate of origin (MATRAS)			x			
Urban & interurban integration environment (MATRAS)			x			
Multimodal route planning and re-routing (Pluservice)	x					
Parking availability (locating the parking slot on the maps) (Pluservice)			x		x	
Booking of a parking slot (Pluservice)			x		x	
Smart payment for parking points (Pluservice)			x			
Parking booking service (Pluservice)			x			

Table 7: Italy, Trieste Pilot Site, services status

3.8 Italy, Milan/Genova: The Italian Rhine Alpine Pilot Site – Dynamic Synchromodal Logistic Modules

This Pilot Site is divided into two different but complementary types of transport, positioned in the same corridor. Its strength is the sound connection between the objectives and needs that encourage the conception and the development of effective, efficient, secure and sustainable solutions by creating new ways of approaching the different obstacles.

The overall aim of this Pilot Site is to provide several tools to optimise the planning and the real-time operation of the maritime, aerial, logistics and transport operators of the Italian northwest regions. The aim is to achieve the effective and sustainable use of the whole northwest infrastructure in the three regions of Liguria, Piedmont and Lombardy. For the Liguria Region, in particular, the pilot needs to cope with the actual infrastructural deficit due to the collapse of the Morandi bridge.

Specific focus will be given to the implementation of the monitoring of the traffic routes along the Rhine Alpine Corridor, with a view also on traffic flows through the Scandinavian Mediterranean Corridor. All the tools will be further exploited in terms of logistic optimisation, even once the new bridge will be available.

The Milan Malpensa and the Genova Pilot Sites will operate as Living Labs: all the involved stakeholders will collaborate for the creation of real use cases where both implementing bodies and user communities will play an active role and complement each other in all the activities of the project.

An initial analysis will be performed in order to implement the scenario with all the elements needed for the selected use cases. In particular, the focus will be on the general trends characterising the transport of goods in Europe, with special attention to road transport, intermodality and air transport, including aspects such as safety, security and climate change.

In addition to this initial analysis, a constant relationship of comparison and inspiration will be present from the beginning with the other Rhine-Alpine Corridor Pilots and with the air cargo Belgium Pilot. This particular connection is given by the close similarity between the types of places, obstacles and difficulties that exist between the Belgian and the Italian Milan/Genova Pilot. In fact, both Pilots start from the assumption that it is essential to create a project that supports not only to the airports, but also the communities that surround them. The two Pilots will develop their new strategies and tools in close contact so that they can be a source of enrichment and inspiration for each other. Both Pilot Sites will work on the importance of the optimisation of the pick-up and delivery of freight, focussing on the digitalisation of different documentation to make the various steps faster and easier.

The Pilot Site has proposed the following Use Cases:

- UC1: Expected Time of arrival (ETA);
- UC2: CO_2 & NO_x emission monitoring and reduction;
- UC3: Dangerous goods transportation monitoring;
- UC4: B2A /A2B services like Customs;
- UC5: Safety and eCustoms operations monitoring;
- UC6: Digital synchro modal information dashboard;
- UC7: Synchro modality;
- UC8: Real-time Road optimisation in ports;
- UC9: Real-time Rail optimisation in ports;
- UC10: FENIX scale-up and transferability plan.

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Sharing of the Shipments data - existing - for Export only B2A /A2B services like Customs - Export to be implemented and Import to be developed	x				x	
Sharing of the data goods contained in the "borderò" - Export	x					
Booking time for shipments unloading - Export	x					
Arrival/Departure of the vehicles at Cargo	x					

City - Export						
ETA App service development - Export and Import				x	x	
CO_2 & NO_x emission monitoring and reduction App service development - Export and Import				x	x	
Monitoring and management of the transport of dangerous goods - Export and Import				x	x	
Safety and eCustoms operations monitoring - Export and Import				x	x	
Vessel Loading List		x	x		x	
Vessel manifest and Customs data		x	x		x	
Vessel tracking		x	x		x	
Vessel ETA ETD		x	x		x	
Vessel unloading list		x	x		x	
Cargo position in the terminal		x	x		x	
Cargo booking requests		x	x		x	
Cargo delivery on trucks		x	x		x	
Train composition		x	x		x	
Shunting requests		x	x		x	
Train path allocation		x	x		x	
Train loading list		x	x		x	
Port gate in (road and rail)		x	x		x	
Port gate out (road and rail)		x	x		x	
Train ETA		x	x		x	
Inland Terminal Gate in (road and rail)		x	x		x	
Inland Terminal Gate out (road and rail)		x	x		x	
e-seal status		x	x		x	

Table 8: Italy, Milan/Genova Pilot Site, services status

3.9   Dutch Pilot Site, Smart Multimodal Operations Platform (SMIP)

"Smart door-to-door multimodal T&L services across TEN-T corridors" (SMIP) will introduce the digitalisation for the "door-to-door" multimodal transport operations of goods in Europe. The ambition is for forwarders to offer more attractive and competitive transport services to shippers, also where the long-haul transport will be provided via rail.

The reinforced multimodal transport supply chain will contribute to the policy of the European Committee, especially for a modal shift from road to rail.

The multimodal goods transport service (see Figure 3) is delivered to shippers by supply chain organisations of forwarders (Logistics operator), carriers (road, rail, water transport operators) and cargo handling operators (terminals) under one contract. The rail mode will provide the long-haul transport for distances over 300 km. The multimodal transport often starts in the seaports to provide the hinterland of their goods in an efficient and sustainable way.
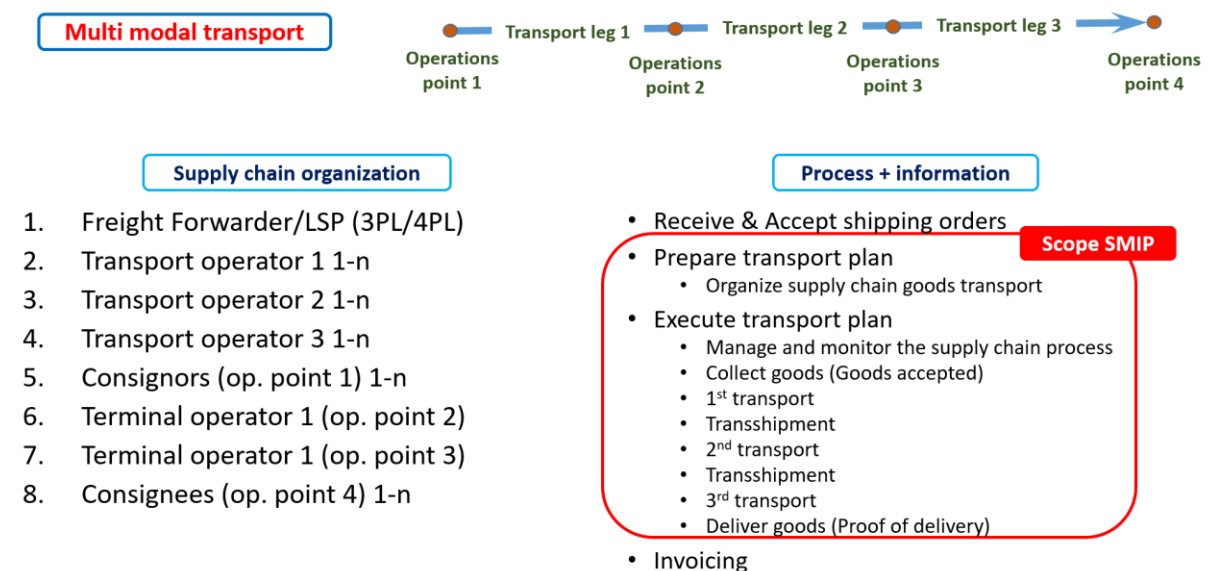
Figure 3: Dutch multi-modal "door-to-door" goods transport

The actions and business opportunities of the SMIP Pilot Site are the following:

-    A digitalised information flow via a common digital information platform for the "door-to-door" multimodal transport operations of goods in Europe;

-    Forwarders are to have flexibility in forming supply chains for the desired delivery of transport services;

-    A seamless cooperation of forwarders, carriers and terminals as key actors in the supply chain to deliver multimodal transport services for goods as planned;

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- The automatic exchange of information between key actors in the supply chain process during transport operations;
- In-time availability of the necessary information for actors and stakeholders in the supply chain;
- Real-time monitoring of the transport means during transport operations, reporting about the performance and progress of the service delivery, together with the use of e-consignment notes for goods handover procedures by means of digital field and monitoring equipment;
- Real-time information available for the visibility of the service delivery performance for all stakeholders.

The scope of SMIP is to accomplish these goals by building a common digital information platform, field equipment and a freight train monitoring network. These systems will be interconnected and facilities for connecting local applications of stakeholders will be built. Pilots in the real-life environment will demonstrate the feasibility of the deployment on large scale of the system.

The Pilot Site has proposed the following Use Cases:

- UC1: Paperless Transport in Road-Rail combined transport;
- UC2: Digitalisation transformation of terminal gate-in/out processes;
- UC3: B2A data exchange in intermodal transport.

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Freight Forwarder (supply chain management)						
Providing transport information to the actors in the supply chain		x		x	x	
Providing specific information for road transport		x		x	x	
Providing specific information for the rail		x		x	x	

transport					
Providing information for cargo handling at terminals	x		x	x	

Carriers (transport legs)					
On-board monitoring in real-time the moving of the goods by the various transport modes	x		x	x	
On-board monitoring in real-time the progress and status of freight trains	x		x	x	
Real-time exchange of reports about the progress and status of the transport for the various transport modes	x		x	x	

Terminals (cargo handling)					
Monitoring the terminal operations	x		x	x	
Providing reports of cargo handling at terminals	x		x	x	

Connectivity (data exchange)					
Providing connectivity to actors of a supply chain	x		x	x	
Forming supply chains	x		x	x	

Freight Forwarder					
Providing information about the multimodal goods transport service (transport route, transport modes, time schedule, etc.)	x		x	x	
Providing information about the multimodal transport plan of goods to carriers (transport route, time schedule, etc.) and terminals (time schedules of transport modes)	x		x	x	
Providing information for the transport of goods by carriers (transport order, consignment notes, origin and destination	x		x	x	

location)						
Providing information for the transport of rail goods		x		x	x	
Providing location information of operation points (customer locations, terminals)		x		x	x	
Providing information for cargo handling at terminals (inbound, outbound, store, forward goods lists)		x		x	x	
Providing information for customs		x		x	x	
Carriers (general)						
Providing information about transport orders (confirmation, transport plan)		x		x	x	
Providing information about the execution of the transport order		x		x	x	
Rail carrier						
Providing information about the execution of rail transport orders		x		x	x	
Providing information about rail transport plans following TAF procedures (collaboration with other RU's)		x		x	x	
Providing information about the execution of rail transport plans		x		x	x	
Terminals						
Providing information about cargo handling orders (confirmation of time slot, goods lists for inbound, outbound, store, forward)		x		x	x	
Proving information about the execution of the cargo handling		x		x	x	
Customs						
Providing information about the clearance of goods	x		x	x		

Use cases						
A communication system between mutually interacting software applications (internal/external) (TX Logistik)	x					
Operational Railway Management, incl. Track&Trace of intermodal trains (TX Logistik)			x			
Integration of train and road (pre/post haulage) status information, end-to-end (TX Logistik)			x			
Exchange of status information with intermodal terminals (TX Logistik)			x			
Exchange of information with intermodal freight forwarders (road) (TX Logistik)					x	
Exchange of regulated documents (customs, waste, dangerous goods) with authorities (TX Logistik)			x			
A communication system between mutually interacting software applications (internal/external) (JdR)	x		x			
TSP portal carrier management service (JdR)			x			
Electronic Transport Documents (eCMR) (JdR)			x		x	
Exchange of status information with handling locations / intermodal terminals (JdR)			x		x	
Exchange of status information with intermodal freight forwarders (road) (JdR)			x			
Exchange of regulated documents (customs, waste, dangerous goods) with authorities (JdR)			x		x	

Table 9: Dutch Pilot Site, services status

3.10 Slovakia, all TEN-T Corridors and Multimodal Pilot Site

Mondelez is one of the largest producing manufacturing companies across Europe. With 55 production sites across Europe, Mondelez employs 30.000 people. Today, the company is shipping around 200.000 loads from production plants to the warehouses. Its own international inbound transport control and optimisation operation is based in Bratislava (SK), named Load Control Center (LCC). LCC's operational scope covers the whole European continent and is extensively using all the nine TEN-T core network corridors on road, rail and short-sea. The Bratislava site of the LCC team is structured around these TEN-T corridors as follows: Central Europe and Eastern Europe (Baltic-Adriatic, North-Sea-Baltic Orient/East-Med, Rhine-Alpine, North Sea-Mediterranean, Rhine-Danube) South and North Europe (Scandinavian-Mediterranean, Mediterranean).

The LCC is one of the frontrunner projects in the manufacturing industries (shippers) and is one of the first internal Logistic Towers own and managed by the shippers itself. Mondelez was the first manufacturing company responding to the latest transport need, that shippers need to source back their responsibility and try to enhance the efficiency of freight transport themselves as much as possible, in order to give to the carriers and freight forwarders a more efficient freight transport order for delivery.

The actions and business opportunities of the Slovakian Pilot Site are the following:

- Increased efficiency and interoperability (horizontal and vertical level) with Supply Chain partners (e.g. production plants, raw, pack and pallet material suppliers, warehouses, co-packers, carriers, forwarders, third party manufacturers, customer's distributions centres, customs agencies and relevant public authorities).

- Peer pooling with other stakeholders in a collaborative environment. Mondelez is planning to implement Pilot activities in different supply chain processes, such as inbound finished goods deliveries from plants to warehouses; connectivity of raw and pack material (RMP) transport in to the TMS; connectivity of integrated multimodal services; outbound customer delivery operations based on a pre-planning process for all transports; improving the direct plant shipment (DPS) deliveries; digital freight billing for all transports. The main demonstration of this activity should be to show interoperability with real time communication, which is enhancing ETA (Estimated Time of Arrival) and ATA (Actuals Time of Arrival) parameters and transport modalities, including change of temperature control requirements or mode of transports.

- Increased legally compliant operational data sharing layer to achieve:

- o The reduction of waiting time and optimise logistics transit time for hundreds of European carriers by improving the efficiencies of the plant and warehousing loading and unloading operations.
  - o The optimisation of the carrier capacity management to enhance full truck load shipments.
- - Interconnect different digital platforms: the IT architecture landscape of Pilot Site Slovakian is composed of various stakeholders and only few interfaces, which are not connected and are partially and manually in operation.

The first pillar of key platforms is the ERP (Enterprise Resource Planning), which is a business process management software that allows manufacturing companies like Mondelez to plan the production. In addition, the suppliers who are delivering the raw & pack materials for the production are also using their own ERP systems, with which they are planning business operations in warehouses across Europe.

The second pillar of key platforms is the TMS (Transport Management System), which is using the information provided by the ERP to plan the actual transport shipments. Today, there are hundreds of different TMS platforms available on the market which are not connected with the ERP. Mondelez needs to be connected with the carriers to organise the transport execution and the pallet shipments, which are an important part in the FMCG industry.

The third pillar of platforms are the added value services, such as real time transport information or GHG emission monitoring.

The Pilot Site has proposed the following Use Cases:

- - UC1: Supplier's shipments to the manufacturing plants;
- - UC2: Warehouse to Customer ERP "WHS" -> TMS -> ERP "customer";
- - UC3: Direct Plant shipments to Customer -> ERP "MDLZ" -> TMS -> ERP "customer";
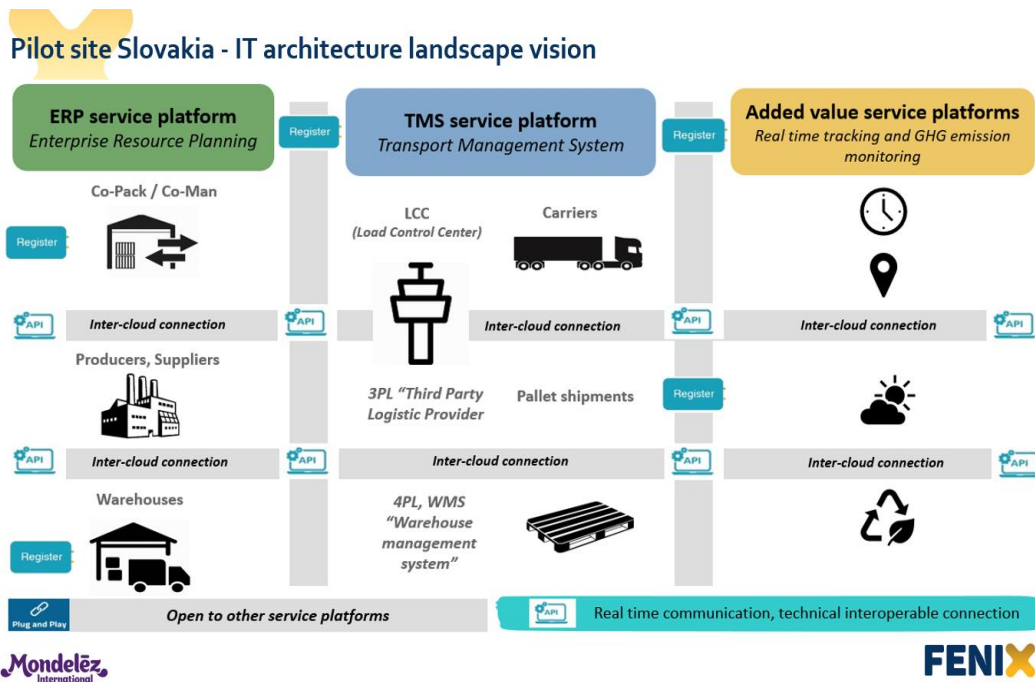- - UC4: Track & trace vehicle/shipment, Multimodal transportation.

Figure 4: Slovakia Pilot Site architecture

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Real-time vehicle traces		x			x	
Multimodal route planning and re-routing			x		x	
Parking availability (locating the parking slot on the maps)		x			x	
Booking of a parking slot		x			x	
Smart payment for parking points		x			x	
Traffic Light Assistance and speed		x				x

recommendations						42
Relation Service Provider (forwarder) – carriers & terminals (operators)			x		x	
Integration with driver security check at the facilities of the ground handling agent		x			x	
B2A, A2B services like customs		x			x	
Certificate of origin		x			x	
Urban & interurban integration environment		x				x
Order management		x	x		x	
Shipment planning and execution		x	x		x	
DPS (Direct Plant Shipment)		x	x		x	
Dock booking information at warehouses		x	x		x	

Table 10: Slovakia Pilot Site, services status

3.11 Spain, the Spanish-Atlantic Corridor Pilot

In the FENIX project, the Spanish-Atlantic corridor's main goal is to increase the efficiency and traceability of the rail cargo operation in the Logistic Corridor by improving the service of the import and export of goods in the intermodal modes. The Spanish Pilot is especially focused on the entrance and exit of container train operations in the port with origin/destination in a dry port and the connection with other means of transport such as roads, airports or another port in the corridor. Therefore, the Pilot will improve the hinterland connectivity with more efficient links and connections between the ports and their extended hinterland.

The Atlantic Corridor connects ports from Portugal (Oporto, Aveiro, Lisbon, Sines) and Atlantic Ports in Spain (Bilbao, Huelva, Algeciras), with ports in France and Germany, including three EU capital cities (Lisbon, Madrid and Paris), as well as other population concentrations as Bilbao (Spain), Mannheim (Germany) and Strasbourg (France), connecting with other TEN-T corridors.

To ensure the smart and efficient integration of the port with its extended hinterland, a new solution (CARGO2RAIL solution) and new functionalities integrated with Port Authorities Systems will be developed with a clear focus in rail connectivity. The functionalities are the following:

- Management of train schedules provided by rail infrastructure operators;
- Storage of train composition and Braking Bulletins;
- Consultation of historical data and generation of reports and statistics based on previous rail operations;
- Management of loading lists, loading instructions and unloading lists associated with a declared train call;
- Registration of ATA / ATD of Vessel and Train calls involved in Ship2Rail operations and its extension to the hinterland;
- Time indicators of logistic processes related to Ship2Rail operations and its extension to other means of transport.

Such hinterland connectivity is being considered on a functional basis and will be achieved by establishing more efficient links and connections between the port and its extended hinterland. Through an interoperable corridor information system between the port and the Rail network (Ship2Rail interface), the Pilot will facilitate the integration of the south-west Europe intermodal clusters and it will re-engineer the multimodal port operational processes.

The actions and business opportunities of the Spanish Pilot Site are the following:

- Business Intelligence;
- Rail Planning;

- End to End Track & Trace;

- Federative IT Tool;

- Intermodal Operations;

- B2A, A2B services like Customs;

- Dangerous Goods Authorisation;

- Booking of containers and Hazmat cargo in remote rail terminal;

- Loading & Discharge list Management of cargo by train.

The Pilot Site has proposed the following Use Cases:

- UC1: Rail Planning;

- UC2: B2A & A2B services with Customs;

- UC3: Dangerous Goods Authorization;

- UC4: Booking of slots for operations in Dry Port;

- UC5: Loading & Discharge Lists Management

- UC6: End-to-End Track & Trace;

- UC7: Business Intelligence applied to intermodal operation.

In the following table, the list of the relevant types of services is reported with their current status, highlighting if the services have already been deployed, if they are under development or if the Pilot Site is willing to develop during the FENIX project.

Type of service	Already deployed		Ongoing		needs/ would like to develop during FENIX project	
	YES	NO	YES	NO	YES	NO
Real-time vehicle traces	x					
Multimodal route planning and re-routing		x				X
Parking availability (locating the parking slot on the maps)		x				X
Booking of a parking slot		x				x
Smart payment for parking points		x				x
Inform the truck drivers about the type of		x				x

jack, charge power, rates, access mode						
Traffic Light Assistance and speed recommendations		x				x
Relation Service Provider (forwarder) – carriers & terminals (operators)		x				x
Integration with driver security check at the facilities of the ground handling agent		x				x
B2A, A2B services like customs	x				x	
Certificate of origin		x				x
Urban & interurban integration environment		x				x
Multimodal route planning and re-routing					x	
Terminal Slot Reservation					x	
Loading & Discharge lists management of cargos by train					x	
Train ATA/ATD					x	
Vessel ATA/ATD					x	

Table 11: Spain Pilot Site, services status

4. FENIX SERVICES WITHIN EUROPEAN CORRIDORS

4.1 TEN-T overview

The transport infrastructure policies are crucial to enhance the connectivity and the accessibility of outermost and peripheral regions in Europe. In view of the cross-border nature of the transport infrastructure, policies and subsequent investments have to be harmonised in order to address existing bottlenecks and keep the Union accessible and competitive.

The European Union coordinates and finances supra-national transport infrastructure investments in the Trans-European Transport Network (TEN-T), which is composed by roads, railroads, inland waterways, seaports, airports, and rail-road terminals.

TEN-T is structured in two network 'layers':

- the **Core Network,** which includes the most important connections, linking the most important nodes, and is to be completed by 2030;
- the **Comprehensive Network**, covering all European regions and to be completed by 2050.

Two horizontal priorities complement these networks: the European Rail Traffic Management System (ERTMS) and the Motorways of the Sea.

The Core Network will form the backbone for transport in Europe's single market. It is represented by Core Network Corridors, which were identified to facilitate the coordinated development of the Core Network. The adoption of the backbone will remove bottlenecks, upgrade the infrastructure and streamline cross border transport operations for passengers and businesses throughout the EU. Its implementation will be pushed ahead by the setting up of nine major transport corridors that will bring together Member States and stakeholders and will allow to concentrate tight resources and achieve results.

The new Core TEN-T Network will be supported by a comprehensive network of routes, feeding into the Core Network at regional and national level. The aim is to ensure that progressively, and by 2050, the great majority of Europe's citizens and businesses will be no more than 30 minutes travel time away from this comprehensive network. The new transport network will deliver safer and less congested travel and smoother and quicker journeys.

The current TEN-T policy is based on Regulation (EU) No 1315/2013, where nine TEN-T core network corridors have been identified as follows:

(1) Baltic – Adriatic 🔵	(2) North Sea Baltic 🔴	(3) Mediterranean 🟢
(4) Orient/East Mediterranean 🟤	(5) Scandinavian Mediterranean 🟣	(6) Rhine – Alpine 🟠
(7) Atlantic 🟡	(8) North Sea – Mediterranean 🟣	(9) Rhine – Danube 🔵

Figure 5 depicts the map of the TEN-T Core Network Corridors.
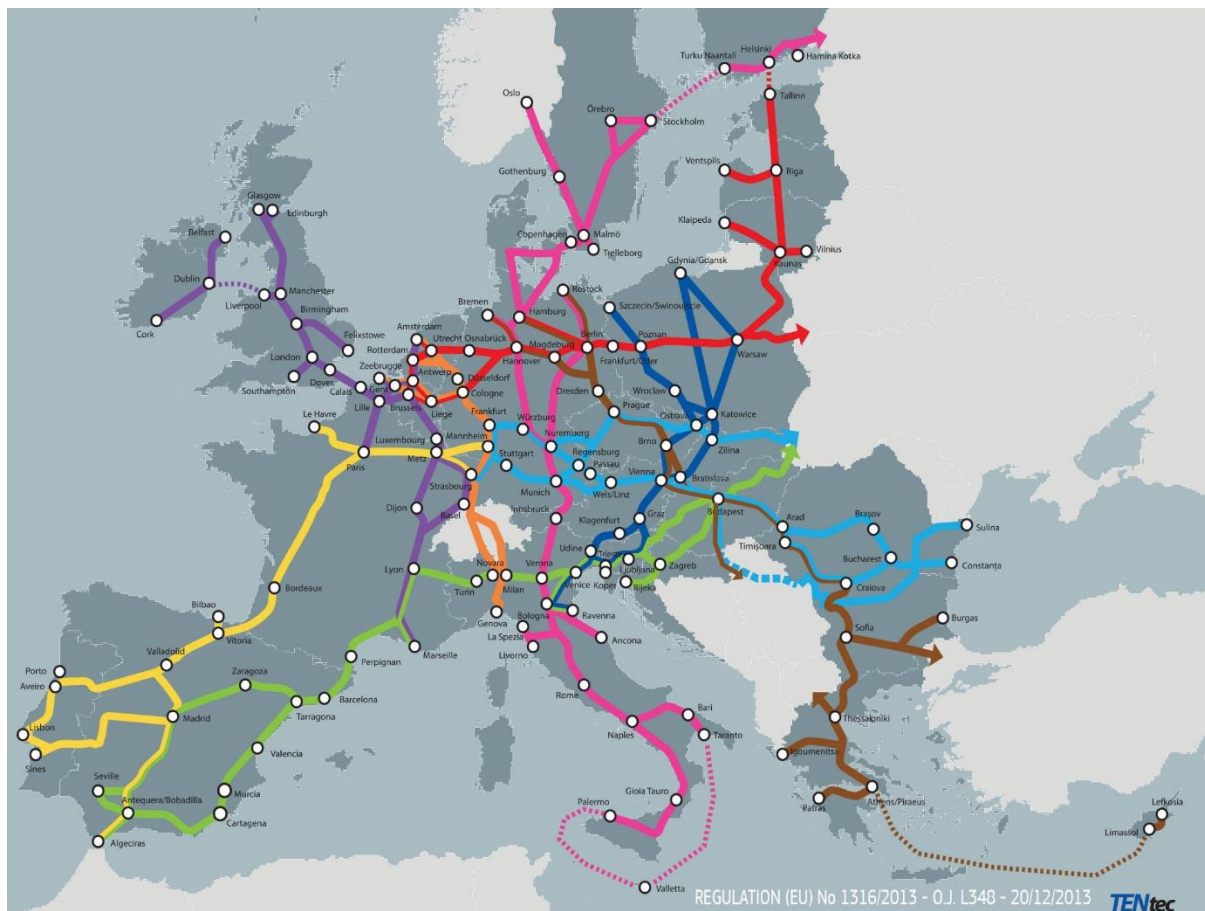
Figure 5: TEN-T Core Network Corridors

In the following paragraphs, an overview of the TEN-T Corridors is presented by describing the geographical location and the availability of the services provided by the Pilot Sites, which are located in the corridors.

4.2   Baltic-Adriatic Corridor

The Baltic-Adriatic Corridor is one of the most important trans-European railway and road axes. This 1,800 km-long corridor runs from North to South, i.e. from Poland through the Czech Republic, Slovakia, from Austria to Italy and Slovenia, connecting core Baltic ports in Poland with core ports of the Adriatic Sea in Italy and Slovenia. It runs through the industrialised areas of Southern Poland, Vienna and Bratislava, the Eastern Alpine region and Northern Italy, linking major transport nodes through key rail, road, maritime and air transport connections.

It includes around 4,600 km of rail network and 3,600 km of road network as well as 13 urban nodes and airports, 10 ports and 24 rail-road terminals. The corridor also crosses, or runs in parallel with five other corridors: the North-Sea Baltic in Poland, the Orient-East Med and the Rhine-Danube in the Czech Republic, Austria and Slovakia, the Mediterranean in Italy and Slovenia, and the Scandinavian-Mediterranean in Italy.

Pilots:
- PS AT   Austria
- PS IT1   Italy, Trieste
- PS NL   Netherlands
- PS SK   Slovakia
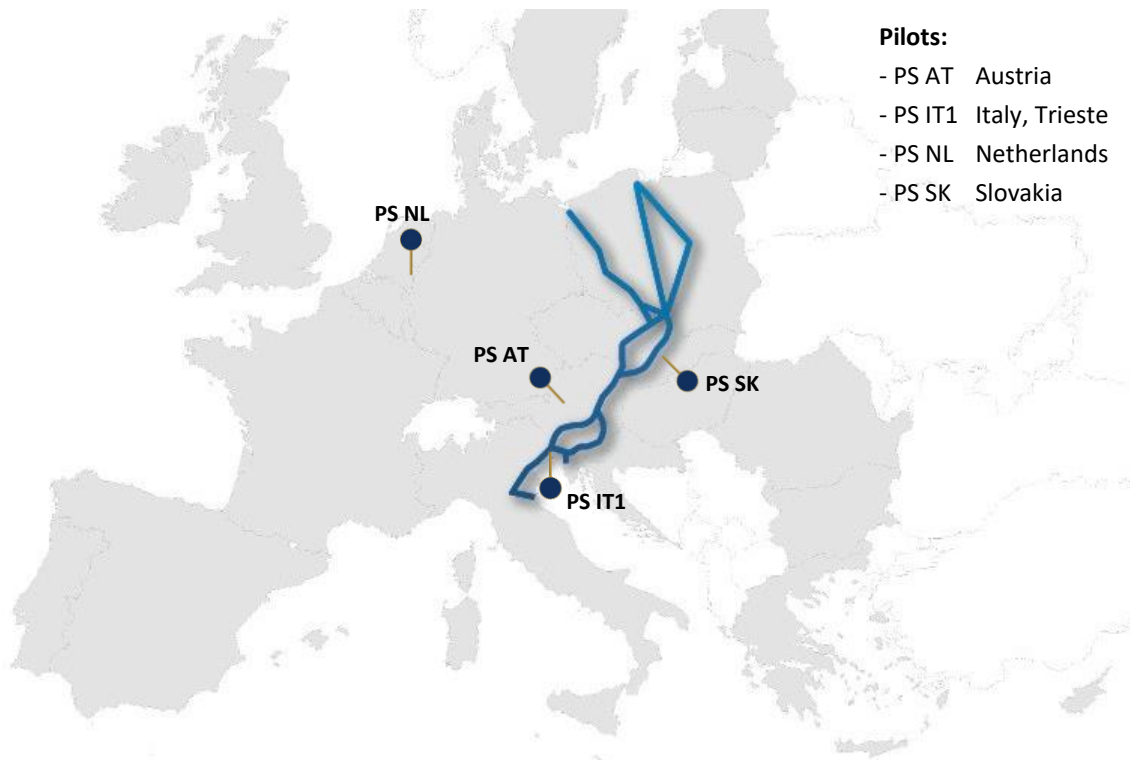
**Figure 6: Baltic-Adriatic Corridor**

The services available in the Baltic-Adriatic Corridor result from the presence of multiple Pilot Sites: Austria, Italy (Trieste) and the Netherlands. In this corridor, also the Slovakia Pilot Site will operate. Section 4.10 provides the list of the services of this Pilot.

The following tables present more detailed information about the services in the Baltic-Adriatic Corridor, giving the indication of the Pilot providing the services, along with a description of the required functionalities, the data formats and the exchange protocols.

AUSTRIA	
Type of service	**Service name and description**
Real-time vehicle traces	-Tracking inbound and outbound container flows to the inland Terminal of Fürnitz. -Monitoring the position, movement, ambient temperature, door opening and shocks. -Identification of bottlenecks along the transport route. -Integration of the service in LCA web. **Data format:** XML **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC2
B2A, A2B services like customs	-Several systems are involved – none of them part of the FENIX network. -Proof of integration of data. **Data format:** XML **Data exchange protocols:** Web Service **Use Cases affected:** UC1, UC2
ITALY, TRIESTE	
Multimodal route planning and re-routing (PNAEAS)	The PNAEAS App is to be developed allowing truck drivers to receive real-time information about the status of their planned trip from the port to the final destination. **Data format:** to be defined **Data exchange protocols:** to be defined **Use Cases affected:** UC3, UC4
Relation Service Provider (forwarder) – carriers & terminals (operators) (PNAEAS)	-Sinfomar: the PCS (Port Community System) now evolved into HPCS (Hinterland Port Community System), which is owned by PNAEAS. -The web services is to communicate with external platforms and proprietary systems (e.g., of freight forwarders, terminal operators, Rus, MTOs, etc.). -User authentication is enabled (user account, login/logout,

	Single Sign On for all the HCS modules). -A Log File, allows to trace all the Web Service operations executed through the platform and to confirm the operation related to the vessel's loading/unloading taxes. **Data format:** XML **Data exchange protocols:** WS SOAP, SFTP **Use Cases affected:** UC4, UC5
B2A, A2B services like customs (PNAEAS)	ICT tools (e.g., based on QR codes, OCR) are to smoothen bureaucratic operations at gates and leave the gate guards the only task of maintaining security. **Data format:** to be defined **Data exchange protocols:** to be defined **Use Cases affected:** UC7
Track and trace of trains (PNAEAS)	Implementation of full interoperability with the HERMES/H30 standard, commonly used among railway undertakings for exchange of information regarding trains (most probably based on Web Services). **Data format:** H30 Hermes **Data exchange protocols:** Hermes VPN **Use Cases affected:** UC3, UC4
CO_2 & NO_x monitoring (DBA Lab)	Estimation of the CO_2 emissions of trucks visiting the port facilities. The data will be collected from VBS system. **Data format:** JSON, XML and raw data from sensors **Data exchange protocols:** Web services **Use Cases affected:** UC2
TM2.0 for multimodality (DBA Lab)	Services to book time slots and to reserve ITU for delivery to pick-up. **Data format:** JSON **Data exchange protocols:** Publish/subscribe approach (RabbitMQ), Identity Management (JWT) **Use Cases affected:** UC3, UC5

Track & trace vehicle/shipment (DBA Lab)	-Grant access to haulier to the terminal for pick-up or drop-off of ITU (Intermodal Transport Unit). -Gather information about the status of accessibility to the port gate and terminal gate. -Manage a possible delay with respect to the slot appointment. -Data exchange with other port applications regarding i.e. ETA of Truck at the Terminal gate and Vehicle to infrastructure (V2I). **Data format:** JSON **Data exchange protocols:** Publish/subscribe approach (RabbitMQ), Identity Management (JWT) **Use Cases affected:** UC4
B2A, A2B services like customs (DBA Lab)	Data exchange services with Sinfomar (Trieste PCS) to: a) support the pre-gate procedure between the Terminal, the Port of Trieste and the Fernetti inland terminal in order to reduce the number of operations necessary at port gates and minimise queues; b) dematerialisation of the CH30 module, exchanging information about the status of trains and of the goods transported through the free trade zone in the Port of Trieste, supporting local customs procedures and even supporting external corridors to the Turkish ports connected with the Terminal. **Data format:** XML **Data exchange protocols:** Web services **Use Cases affected:** UC7
RORO Intermodal Transport Monitoring (Info.era)	The concept is centred in ports and will be specifically exploited by implementing an "international fast trade lane" on specific door to door logistic chains connecting the Adriatic-Baltic Corridor, the ports of Trieste and Turkey. The

	aim is to support the digitalisation in ports as key nodes of the multimodal logistics chain, piloting advanced IT solutions to improve transport monitoring with a particular focus on RORO trade traffics. **Data format:** XML **Data exchange protocols:** Web services SOAP (pull and push mode) and FTP **Use Cases affected:** UC7c
Real-time vehicle traces (MATRAS)	Via the YTM App one can see the maps of trucks and clicking on a specific truck one can know and see where they are and check the possibility to load. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4
Multimodal route planning and re-routing (MATRAS)	Via the YTM App it is possible to check the date of arrival to a destination and the volume of goods on board. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC3
Parking availability (locating the parking slot on the maps) Booking of a parking slot (MATRAS)	Via the YTM App and partners' apps the parking areas dedicated to truck drivers for mandatory rest can be monitored. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4, UC6
Traffic Light Assistance and speed recommendations (MATRAS)	Via the YTM App one can see the traffic, the weather and other truck drivers' alerts. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4

Relation Service Provider (forwarder) – carriers & terminals (operators) (MATRAS)	The YMT App can be used by forwarders to search a truck but at the same time by carriers (operators) to search a load. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4
Urban & interurban integration environment (MATRAS)	By reducing fuel consumption through a rational use of movements to find loads, the tools of the App allow the user to find neighbours and services at the best price through notifications. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4
Multimodal route planning and re-routing (Pluservice)	A multimodal travel planner has already been developed and provided to several cities/public transports operators to connect addresses or cities including trains, buses, foot and long-haul lines. In some scenarios the system includes ferries, planes and bike-sharing services. The technology used is the OTP (open trip planner) and the GTFS format for the collection of mobility data. **Data format:** GTFS **Data exchange protocols:** HTTPS **Use Cases affected:** UC3
Parking availability (locating the parking slot on the maps) (Pluservice)	A smart parking service with gate access control is already developed within the myCicero platform and in different specific apps such as AVM Venezia. This is possible through the API integration provided by Project Automation (they send the status of each sensor installed). The platform is in progress to improve the existing functionalities and to realise new integrations and features. **Data format:** JSON

	Data exchange protocols: The API is provided by service providers such as Project Automation, Skidata, Faac-Hub, Designa; Proprietary protocols to provide data on parking lots through Pluservice APIs. **Use Cases affected:** UC6
Booking of a parking slot (Pluservice)	This function has been already developed and available on line. The parking slot in the off-street parking area is managed by Grandi Stazioni Rail (Parkin'Station App, integration with API provided by Skidata and Faac-Hub). The booking is available on myCicero App and ASPO App for the Municipality of Olbia (through integration with Designa API). For parking areas close to the airports of Venice, Bologna and Verona, the booking can be done on myCicero App. A feature is being developed and improved to allow new integrations. **Data format:** JSON **Data exchange protocols:** an API is provided by service providers such as Project Automation, Skidata, Faac-Hub and Designa. Proprietary protocols are in place to provide data on parking lots through Pluservice's APIs. **Use Cases affected:** UC6
Smart payment for parking points (Pluservice)	Payment Gateway already developed and in use for the following payment methods: credit card, SisalPay, PayPal, Masterpass, Satispay, Postepay, myCicero e-wallet. In progress for further payment methods to include/integrate. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC6
Parking booking service (Pluservice)	The visualisation of free parking lots (or occupancy rate) through the integration with cameras. **Data format:** JSON

	Data exchange protocols: An API is provided by service providers such as Project Automation, Skidata, Faac-Hub and Designa; Proprietary protocols to provide data on parking lots through Pluservice APIs. **Use Cases affected:** UC6
	NETHERLANDS
Providing information for cargo handling at terminals (Van Looveren Consultancy, Pionira, Transfollow)	Cargo handling information in Interporto Bologna. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Monitoring the terminal operations (Van Looveren Consultancy, Pionira, Transfollow)	Reporting transport performances (a general service for all transport modes inInterporto Bologna). **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information about cargo handling orders (confirmation of time slot, goods lists for inbound, outbound, store, forward) (Van Looveren Consultancy, Pionira, Transfollow)	Cargo Handling plan in Interporto Bologna **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Proving information about the execution of the cargo handling (Van Looveren Consultancy, Pionira, Transfollow)	Cargo Handling reports (Interporto Bologna) **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases

Table 12: Baltic-Adriatic Corridor, list of services

4.3   North Sea Baltic Corridor

The North Sea-Baltic Corridor is located in the Northern part of Europe and it is connecting eight Member States (four Cohesion and four non-Cohesion countries): Finland, Estonia, Latvia, Lithuania, Poland, Germany, the Netherlands and Belgium.

The Corridor joins the Baltic Sea Region with the Low Countries and the main ports of the North Sea Region. It links East and West with approximately 5,000 km of railways, 4,000 km of roads and 2,000 km of inland waterways. It crosses or has common sections with the Baltic-Adriatic, Scandinavian-Mediterranean, Orient East-Med, Rhine-Alpine and North Sea–Mediterranean Core Network Corridors.

The objective of the Corridor is to link some of the most important ports in Europe not only by sea but also by all other available transport modes including rail, roads, inland waterways and air, ensuring multi-modal links and relevant traffic and information management systems.

Figure 7: North Sea Baltic Corridor

The services available in the North Sea-Baltic Corridor are those operated by the Slovakian Pilot Site. Section 4.10 provides the list of the services of this Pilot.

4.4 Mediterranean Corridor

The Mediterranean Corridor is the main east-west axis in the TEN-T network south of the Alps, linking the Iberian Peninsula with the Hungarian-Ukrainian border. It follows the Mediterranean coastlines of Spain and France, crosses the Alps towards the east through Northern Italy, leaving the Adriatic coast in Slovenia and Croatia towards Hungary.

This Corridor, running for about 3,000 km, integrates former Priority Projects 3 and 6, ERTMS Corridor D and corresponds to the Mediterranean Rail Freight Corridor.

Apart from the Po River and some other canals in Northern Italy, the Mediterranean Corridor mainly consists of road and rail. Ports represent the main gateways for passengers and freight transport to core network corridors, and freight traffic is expected to double by 2030 as compared to 2010 levels. Ports also lie within very important global trade routes, such as traffics from the Sea of China through the Suez Canal, traffic of short sea shipping and RoRo (Roll-on/Roll-off) services among the Corridor's countries and between Europe and Northern Africa.

Pilots:
- PS IT1   Italy, Trieste
- PS SK   Slovakia

Figure 8: Mediterranean Corridor

The services available in the Mediterranean Corridor result from the presence of two Pilot Sites: Italy (Trieste) and Slovakia, which services are reported in section 4.10.

The following tables present more detailed information about the services in the Mediterranean Corridor, indicating the Pilot providing the services and describing the required functionalities, the data formats and the exchange protocols.

ITALY, TRIESTE	
Type of service	**Service name and description**
Real-time vehicle traces (POLIBA)	ETA Service: through an App (named Guide.me App), the ETA service allows truck drivers to receive real-time information about traffic and the status of their trip from the port to their final destination, also in collaboration with the Road Authority. The App is a component of the POLIBA Decision Support System (DSS). The truck's position is monitored in real-time on the Trieste DSS dashboard along with historical data of trips, providing an accurate analysis of the trip and including the speed profile. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC4
Dangerous goods/eCall EGNOS/Galileo (POLIBA)	Services for the management of dangerous good will be provided. The aim of the services will be two: 1) monitoring the HAZMAT transport in highways; 2) suggesting parking in order to limit the risk. In order to realise these services, an analysis of the risk evaluation for hazmat transport will be performed. The suggestions for the drivers will be provided by a suitable application which is a component of the POLIBA Decision Support System (DSS). DSS matches trip data (coordinates) of trucks with the ones coming from the Road companies (the plate number of the trucks going through the road tutors). In this way, it is possible to check the validity of the

	trip. Galileo, i.e. Europe's Global Navigation Satellite System (GNSS), will be used as localisation tool, providing improved positioning and timing information. **Data format:** JSON/DATEX II **Data exchange protocols:** Web service SOAP; HTTPS **Use Cases affected:** UC8a
Multimodal route planning and re-routing (PNAEAS)	The PNAEAS App allows truck drivers to receive real-time information about the status of their planned trip from the port to the final destination. **Data format:** to be defined **Data exchange protocols:** to be defined **Use Cases affected:** UC3, UC4
Relation Service Provider (forwarder) – carriers & terminals (operators) (PNAEAS)	-Sinfomar: PCS (Port Community System) now evolved in HPCS (Hinterland Port Community System) owned by PNAEAS. -Web Services are to communicate with external platforms and proprietary systems (e.g., of freight forwarders, terminal operators, Rus, MTOs, …). -User authentication (user account, login/logout, Single Sign On for all the HCS modules). -A Log File is available, in order to trace all the Web Service operations executed through the platform and the confirmation operation related to vessel's loading/unloading taxes. **Data format:** XML **Data exchange protocols:** WS SOAP, SFTP **Use Cases affected:** UC4, UC5
B2A, A2B services like customs (PNAEAS)	ICT tools (e.g., based on QR codes, OCR) are to smoothen bureaucratic operations at gates and leave the gate guards the only task of maintaining security.

	Data format: to be defined
	Data exchange protocols: to be defined
	Use Cases affected: UC7
Track and trace of trains (PNAEAS)	Implementation of full interoperability with the HERMES/H30 standard, commonly used among railway undertakings for exchange of information on trains (most probably based on Web Services).
	Data format: H30 Hermes
	Data exchange protocols: Hermes VPN
	Use Cases affected: UC3, UC4
CO_2 & NO_x monitoring (DBA Lab)	Estimation of the CO_2 emissions of trucks visiting the port facilities. The data will be collected from VBS system.
	Data format: JSON, XML and raw data from sensors
	Data exchange protocols: Web services
	Use Cases affected: UC2
TM2.0 for multimodality (DBA Lab)	Services to book time slots and to reserve ITU for delivery or to pick-up.
	Data format: JSON
	Data exchange protocols: Publish/subscribe to an approach (RabbitMQ), Identity Management (JWT).
	Use Cases affected: UC3, UC5
Track & trace vehicle/shipment (DBA Lab)	-Grant access to haulier to the Terminal for pick-up or drop-off of ITU (Intermodal Transport Unit);
	-Gather information about the status of accessibility to the Port gate and Terminal gate;
	-Manage a possible delay with respect to the slot appointment.
	-Data exchange with other port application regarding i.e. ETA of Truck at the Terminal gate and Vehicle to infrastructure (V2I).
	Data format: JSON

	Data exchange protocols: Publish/subscribe to an approach (RabbitMQ), Identity Management (JWT). **Use Cases affected:** UC4
B2A, A2B services like customs (DBA Lab)	Data exchange services with Sinfomar (Trieste PCS) are to: a) support the pre-gate procedure between the terminal, the Port of Trieste and the Fernetti inland terminal in order to reduce the number of operations necessary at port and minimise queues; b) dematerialisation of the CH30 module, exchanging information about the status of trains and goods transported through the free trade zone in the Port of Trieste, supporting local customs procedures and even supporting external corridors to the Turkish ports connected with the Terminal. **Data format:** XML **Data exchange protocols:** Web services **Use Cases affected:** UC7
Real-time vehicle traces (MATRAS)	Via the YTM App one can see the maps of trucks and clicking on a specific truck one can know and see where they are and check the possibility to load. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4
Multimodal route planning and re-routing (MATRAS)	Via the YTM App it is possible to check the date of arrival to a destination and the volume of goods on board. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC3
Parking availability (locating the parking slot on the maps)	Via the YTM App and partners' apps the parking areas dedicated to truck drivers for mandatory rest can be monitored.

Booking of a parking slot (MATRAS)	**Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4, UC6
Traffic Light Assistance and speed recommendations (MATRAS)	Via the YTM App one can see the traffic, the weather and other truck drivers' alerts. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4
Relation Service Provider (forwarder) – carriers & terminals (operators) (MATRAS)	The YMT App can be used by forwarders to search a truck but at the same time by carriers (operators) to search a load. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4
Urban & interurban integration environment (MATRAS)	By reducing fuel consumption through a rational use of movements to find loads, the tools of the App allow the user to find neighbours and services at the best price through notifications. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC4
Multimodal route planning and re-routing (Pluservice)	A multimodal travel planner has already been developed and provided to several cities/public transports operators to connect addresses or cities including trains, buses, foot and long-haul lines. In some scenarios the system includes ferries, planes and bike-sharing services. The technology used is OTP (open trip planner) and GTFS format for mobility data collection. **Data format:** GTFS **Data exchange protocols:** HTTPS **Use Cases affected:** UC3

Parking availability (locating the parking slot on the maps) (Pluservice)	A smart parking service with gate access control is already developed within the myCicero platform and in different specific apps such as AVM Venezia. This is possible through the API integration provided by Project Automation (they send the status of each sensor installed). The platform is in progress to improve the existing functionalities and to realise new integrations and features. **Data format:** JSON **Data exchange protocols:** An API is provided by service providers such as Project Automation, Skidata, Faac-Hub, Designa; Proprietary protocols to provide data on parking lots through Pluservice APIs. **Use Cases affected:** UC6
Booking of a parking slot (Pluservice)	This function has been already developed and available on line. The parking slot in the off-street parking area is managed by Grandi Stazioni Rail (Parkin'Station App, integration with API provided by Skidata and Faac-Hub). The booking is available on myCicero app and ASPO App for the Municipality of Olbia (through integration with Designa API). For parking areas close to the airports of Venice, Bologna and Verona, the booking can be done on myCicero App. A feature is being developed and improved to allow new integrations. **Data format:** JSON **Data exchange protocols:** an API is provided by service providers such as Project Automation, Skidata, Faac-Hub and Designa. Proprietary protocols are in place to provide data on parking lots through Pluservice's APIs. **Use Cases affected:** UC6
Smart payment for parking points (Pluservice)	Payment Gateway already developed and in use for the following payment methods: credit card, SisalPay, PayPal,

	Masterpass, Satispay, Postepay, myCicero e-wallet. In progress for further payment methods to include/integrate. **Data format:** JSON **Data exchange protocols:** HTTPS **Use Cases affected:** UC6
Parking booking service (Pluservice)	Visualisation of free parking lots (or occupancy rate) through integration with cameras. **Data format:** JSON **Data exchange protocols:** An API is provided by service providers such as Project Automation, Skidata, Faac-Hub, Designa; Proprietary protocols to provide data on parking lots through Pluservice APIs. **Use Cases affected:** UC6

Table 13: Mediterranean Corridor, list of services

4.5 Orient/East Mediterranean Corridor

The Orient/East-Med Corridor connects central Europe to the North, Baltic, Black and Mediterranean Seas, allowing the optimisation of the use of the concerned ports, including the Motorways of the Sea.

It will foster the development of key ports as major multimodal logistic platforms and will improve the multimodal connections of major economic centres in Central Europe to the coastlines, using rivers such as the Elbe. Its southern part extends, across the Mediterranean Sea, from Greece to Cyprus while its northern part ends in Germany, in the North and Baltic seas.

The Orient/East-Med Corridor is connecting nine Member States (from north to south): Germany, the Czech Republic, Slovakia, Austria, Hungary, Romania, Bulgaria, Greece and Cyprus.

Several segments of the corridor overlap with other Core Network Corridors, especially with the Rhine-Danube Corridor (approximately 1,000 km) and on shorter sections, the North Sea - Baltic Corridor, the Scandinavian-Mediterranean Corridor and the Baltic - Adriatic Corridor.

Pilots:
- PS GR   Greece
- PS SK   Slovakia
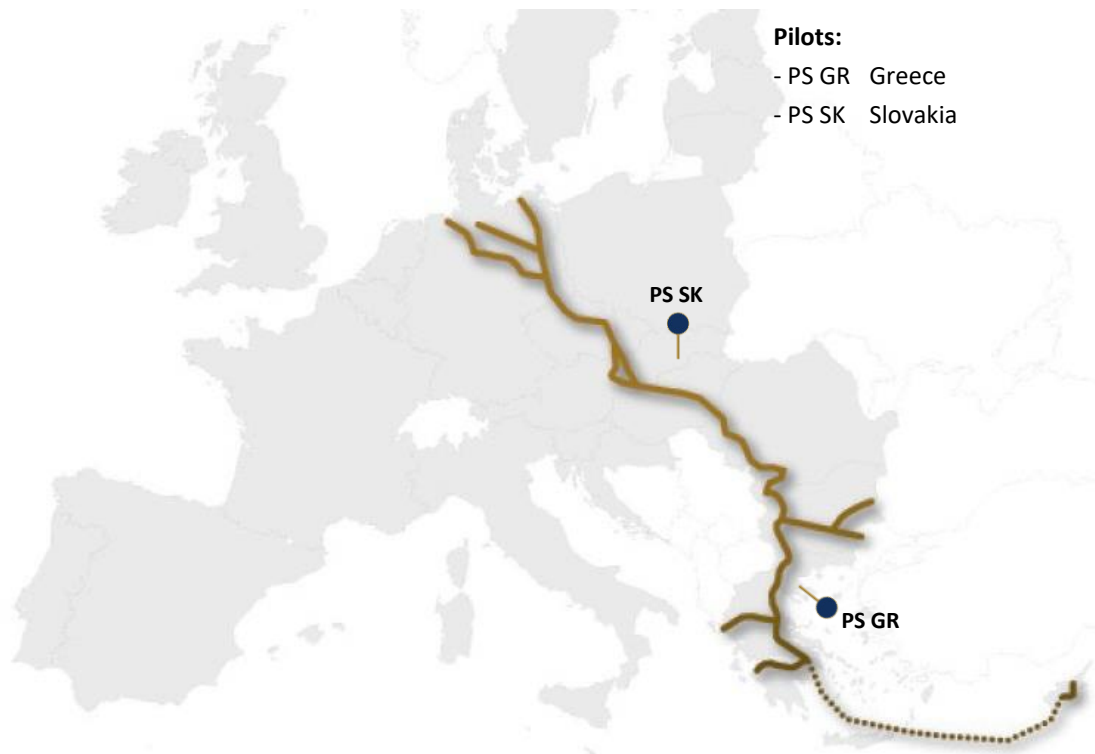
Figure 9: Orient/East Mediterranean Corridor

The services available in the Orient/East Mediterranean Corridor result from the presence of two Pilot Sites: Greece and Slovakia, which services are reported in section 4.10.

The following tables present more detailed information about the services in the Orient/East Mediterranean Corridor, giving the indication of the Pilot providing the services, along with a description of the required functionalities, the data formats and the exchange protocols.

GREECE	
Type of service	**Service name and description**
Road traffic along the TEN-T corridors and in urban – interurban environment/ National Access Points	Traffic control & monitoring/ National Access Point: Interconnection with the National Access Point as well as real time traffic management platforms to exchange real time information about the traffic status of monitored nodes across the corridor. **Data format:** Transport related data (flows, traffic status, congestion etc.), TMCC/NAP proprietary format or DATEX II. **Data exchange protocols:** RESTful API and JSON calls. **Use Cases affected:** UC4

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Digital inventory of services	Content management system for available logistics & transport services. **Data format:** not applicable **Data exchange protocols:** not applicable **Use Cases affected:** UC5
Real-time vehicle traces	Real-time cargo status tracing and monitoring based on integration with existing platforms and geo-fences. **Data format:** Status messages from legacy platforms, geo-fences triggers. **Data exchange protocols:** Restful API and JSON calls. **Use Cases affected:** UC1, UC3
Parking availability (locating the parking slot on the maps)	Interconnection with existing public platforms in order to exchange real time information about the parking availability along the Orient-East/Med Corridor. **Data format:** JSON **Data exchange protocols:** RESTful API and JSON calls. **Use Cases affected:** UC4
Relation Service Provider (forwarder) – carriers & terminals (operators)	Digital submission and notifications regarding the import/export process of cargo via the Free Zone of the Port of Piraeus. **Data format:** Freight transport data, proprietary format **Data exchange protocols:** to be defined **Use Cases affected:** UC1, UC3
Cargo bundling	Matching of the demand and supply for freight transport services. Digital submission and notifications regarding the cargo availability and the willingness for cargo bundling. **Data format:** Proprietary data format of cargo transport requests and XML format of loading list. **Data exchange protocols:** SOAP API and JSON calls towards Aeolix CE. **Use Cases affected:** UC2

B2A, A2B services like customs	Partially developed for containerised cargo, will be improved and developed for other cargo types. **Data format:** Freight data (origin, type, HSCODE, qty, etc.) **Data exchange protocols:** RESTful API and JSON calls with current HPCS modules. **Use Cases affected:** UC1, UC3
Certificate of origin	Certificates of Origin/Custom Status related to containers are submitted digitally to the relative Customs Authorities via the Hellenic Port Community System. The same functionality needs to be extended to other cargo types. **Data format:** Digital Certificates of Customs Status for cargo types other than containers. **Use Cases affected:** UC1
Virtual Freight Centre-warehouse booking	Matching the demand and supply of inventory services and warehouses along the corridor. Digital submission and notifications regarding the warehouses availability and the needs for inventory services. **Data format:** Proprietary data format of warehouse availability. **Data exchange protocols:** RESTful API and JSON calls towards Aeolix CE. **Use Cases affected:** UC3, UC6
Slot/Rail availability and notification	The service aims to provide availability of the slot on a train composition. **Data format:** Proprietary data format of available slots. **Data exchange protocols:** batch files **Use Cases affected:** UC2
Availability of trucks along the corridor	The service will provide availability of space on trucks for optimal route planning and will publish the availability through the FENIX federation **Data format:** Trucks availability

	Data exchange protocols: web application
	Use Cases affected: UC2
Terminal-transport-warehouse operations monitoring	Status creation throughout the value chain of the corridor including last mile and publishing of the statuses through the FENIX federation.
	Data format: simple ASCII files or xml
	Use Cases affected: UC2, UC3
Cargo status	Provision in real time of the cargos status: location and proof of delivery.
	Data format: simple ASCII files or xml
	Data exchange protocols: web application
	Use Cases affected: UC1, UC3
ETA for logistics with Machine Learning	Calculation of train ETAs, i.e. predicting when the train will reach the terminal station.
	Split the travel time into two components:
	* Time spent travelling through the rail network;
	* Time spent waiting at intermediate stations.
	The sum of the two results in total travel time.
	Using machine learning and statistical analytics to estimate the total travel time. Results: 12.5% divergence from the Actual Time of Arrival.
	Data format: Proprietary data format
	Data exchange protocols: JSON calls and REST interface.
	Use Cases affected: UC1, UC3, UC6
Big Data Prediction Service	-Calculation of cargo ETAs, i.e. to predict when the cargo will reach the terminal station by taking into account multiple stops along the way (multi-leg trip).
	-Using machine learning and statistical analytics to estimate the total travel time. The service requires as input historical data with previous deliveries along with their times. The service then is automatically trained to extract a trained

	machine learning model that is used to perform the predictions. The Historical data is consumed by the service using a REST call where the necessary JSON text (historical data) is being uploaded. When the model is created, it is used to predict delivery times upon message arrivals. The service can be called with specific JSON messages where information about the cargo is given (i.e., when it has left, etc.) and returns a prediction about the arrival time in a JSON format. The communication is done through a REST interface, for both the training and the inference steps. **Data format:** Proprietary data format **Data exchange protocols:** JSON calls and REST interface. **Use Cases affected:** UC1, UC3, UC4, UC6
Big Data Descriptive Analytics Service	Provides analytics on operational/historical data according to user-defined criteria. Takes as input the incoming message flow and combines it with existing stored information about message exchanges (i.e., streaming data) and master-data information (i.e., static data). The analytics include typical operations such as summarisations, filtering, etc., and the output will be both a visual representation (in the form of graphs, etc.) and a textual representation (in the form of RESTFul Json messages). **Data format:** Proprietary data format **Data exchange protocols:** JSON calls and REST interface. **Use Cases affected:** UC1, UC3, UC4, UC6
Normalisation of Data	Normalises data by employing NLP techniques and references to various external data sources. Currently supports the normalisation of delivery addresses coming from multiple systems by using NLP, a combination of reverse geocoding and a known address database enriched with user feedback. Can be extended to support other

types of structured data.

Data format: Proprietary data format, CSV files.

Data exchange protocols: JSON calls and REST interface.

Use Cases affected: All

<div align="center">

Table 14: Orient/East Mediterranean Corridor, list of services

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4.6   Scandinavian Mediterranean Corridor

The Scandinavian-Mediterranean Corridor is a crucial north-south axis for the European economy. It is the largest corridor in terms of the core network length. From the border with Russia in Finland, the Corridor crosses major urban centres in Scandinavia (Oslo, Stockholm and Copenhagen), passes through Germany, Austria and Italy and extends across the Mediterranean Sea to Malta.

The length of the Corridor accounts for 9,277 km of core rail and 6,279 km of core road sections. It includes 25 core ports, 19 core airports, 45 core intermodal terminals and 19 core urban nodes.

Rail and road are the dominant modes across the Corridor. Maritime transport dominates Southern and especially Northern ends of the Corridor. The most important Actions in this Corridor are the Fehmarnbelt fixed link and the Brenner Base Tunnel (BBT), including their respective access routes.

Pilots:
- PS BE2 Belgium, P&G
- PS SK   Slovakia
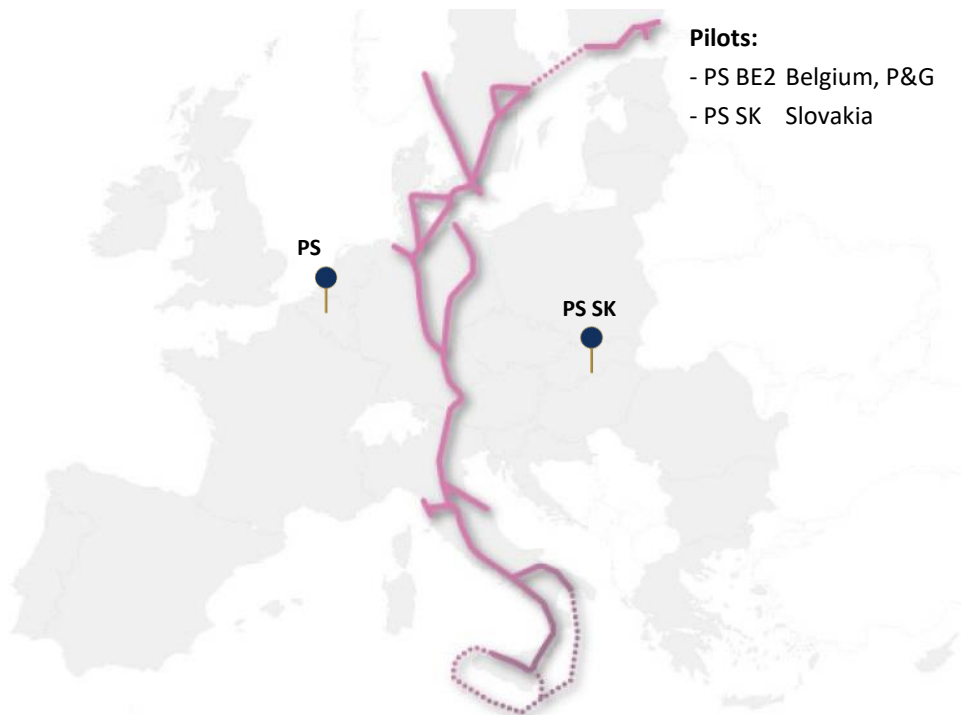
Figure 10: Scandinavian Mediterranean Corridor

The services available in the Scandinavian-Mediterranean result from the presence of two Pilot Sites, Belgium (P&G) and Slovakia, which services are reported in section 4.10.

The following tables present more detailed information about the services in the Scandinavian-Mediterranean Corridor, giving the indication of the Pilot providing the services, along with a description of the required functionalities, the data formats and the exchange protocols.

BELGIUM, P&G	
Type of service	**Service name and description**
Expected time of arrival (ETA)	-Pro-active guidance and promotion of data exchange within all parties involved smoothens operations planning and the execution for export & import containers. -Real-time location and sharing details about goods allow for movement of (DG) product processed for export from the EU in compliance with Customs and Port Authorities regulations. **Data format:** SQL, PostgreSQL, JSON, XML **Data exchange protocols:** Amazon Web Services, Microsoft and Google applications, CargoWise and Power BI. **Use Cases affected:** UC1
Reduction of CO_2 & NO_x emission	-Emission Reduction by providing full visibility and situation specific messaging to stakeholders involved. -Full visibility of location of goods, vessel schedules and transit updates allow for less use of trucks and more use of barge for short timeframe container movements. **Data format:** SQL, PostgreSQL, JSON and XML. **Data exchange protocols:** Amazon Web Services, Microsoft and Google applications, CargoWise and Power BI. **Use Cases affected:** UC2
Track & trace vehicle/shipment	Creates visibility to all involved stakeholders on the status of shipments, milestones and progress updates, pro-active alerts and adds alerts where necessary.

	-Connects with multiple partners creating a "single source of truth" for visibility and decision making. **Data format:** SQL, PostgreSQL, JSON and XML. **Data exchange protocols:** Amazon Web Services, Microsoft and Google applications, CargoWise and Power BI. **Use Cases affected:** UC3
B2A, A2B services: Customs	-Triggers customs clearance instructions to Customs Broker for clearance at port or sites, based on the true location of goods for export & import containers. -Uses real-time planning & location of containers from a Barge Operator and Terminal to allow an accurately timed customs clearance. **Data format:** SQL, PostgreSQL, JSON and XML. **Data exchange protocols:** Amazon Web Services, Microsoft and Google applications, CargoWise and Power BI. **Use Cases affected:** UC4
Dangerous goods	-Automatic notification to port authorities (harbour captain process) of details related to dangerous goods. Based on the cargo details provided by the distribution centre and the initial planning and real-time vessel schedule details from the Barge Terminal and the Operator, the service informs the Port Authority with plan and updates on actual scheduled arrival at The Port of Antwerp. **Data format:** SQL, PostgreSQL, JSON and XML. **Data exchange protocols:** Amazon Web Services, Microsoft and Google applications, CargoWise and Power BI. **Use Cases affected:** UC5

Table 15: Scandinavian Mediterranean Corridor, list of services

4.7   Rhine-Alpine Corridor

The Rhine-Alpine Corridor is situated in one of the most densely populated and economically strongest regions in Europe. This region includes major EU economic centres such as Brussels and Antwerp in Belgium, the Randstad region in the Netherlands, the German Rhine-Ruhr and Rhine-Neckar regions, the Basel and Zürich regions in Switzerland and the Milan and Genova regions in Northern Italy.

This multimodal Corridor constitutes one of the busiest freight routes in Europe, connecting the main North Sea ports of Rotterdam and Antwerp to the Mediterranean basin in Genoa, while providing connections to several east-west axes.

It runs through five EU Member States (BE, NL, DE, FR, IT) and Switzerland. Eleven sections and nodes of the Corridor overlap with five other corridors, more specifically with the North Sea-Baltic (7 sections), North Sea-Mediterranean (4), Rhine-Danube (1), Atlantic (1) and Mediterranean (1) Corridors.

Pilots:
- PS BE1 Belgium, Air Cargo
- PS DE   Germany
- PS IT2 Italy, Milano/Genova
- PS NL   Netherlands
- PS SK   Slovakia
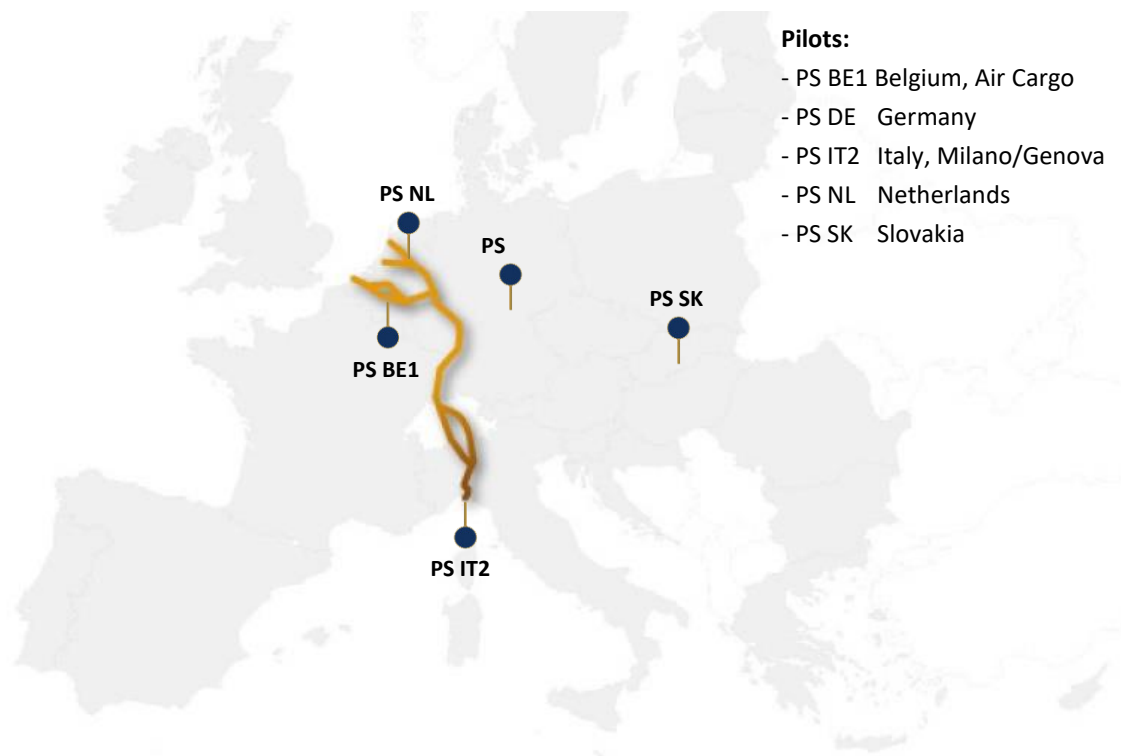
Figure 11: Rhine-Alpine Corridor

The services available in the Rhine-Alpine Corridor result from the presence of multiple Pilot Sites, Belgium (Air Cargo), Germany, Italy (Milano/Genova) and the Netherlands. Also the Slovakian Pilot

Site will operate in this corridor.

Section 4.10 provides the list of the services of this Pilot.

The following tables present more detailed information about the services in the Rhine-Alpine corridor, giving the indication of the Pilot providing the services, along with a description of the required functionalities, the data formats and the exchange protocols.

BELGIUM, AIR CARGO	
Type of service	**Service name and description**
Real-time vehicle traces	ETA Service: through BeMobile's App, the ETA service allows truck drivers to receive real-time information about traffic, the status of their trip to their final destination, BRUcargo. The App is a component of the Road Feeder Management App implemented by the Air Cargo Belgium Pilot Site. **Data format:** JSON **Data exchange protocols:** API calls **Use Cases affected:** UC2
Booking of a parking slot	Parking availability: via a connection with the Road Feeder Management App, one can monitor who has reserved a slot, and based on the reserved slots, parking spaces can be assigned to trucking companies. **Data format:** JSON **Data exchange protocols:** API calls **Use Cases affected:** UC5
Integration with driver security check at the facilities of the ground handling agent	Central Driver database: via a link (API call) between the central driver database and the road feeder management App, the application is developed in the Air Cargo Belgium Pilot Site. The ground handler can see the security status of the truck driver that is picking-up or delivering the cargo. **Data format:** JSON **Data exchange protocols:** API calls **Use Cases affected:** UC6

Slot Reservation	Slot reservation system: via a web application or mobile application, trucking companies external to BRUcargo will be offered the opportunity to reserve a time slot at the ground handling agent to pick up or deliver their freight. **Data format:** JSON **Data exchange protocols:** API calls **Use Cases affected:** UC1
Capacity Management	Capacity management system Via a web application or mobile application, ground handling agents will be able to offer capacity/gates to trucking companies that can be reserved for freight pick-up or delivery **Data format:** JSON **Data exchange protocols:** API calls **Use Cases affected:** UC1

GERMANY	
Type of service	**Service name and description**
Capacity Management for intermodal transport (TX Logistik)	Capacity Management for intermodal transport and visualising available capacity in real-time / near-time. **Data format:** to be defined **Data exchange protocols:** HTTPS, Restful Services and FTP. **Use Cases affected:** UC2
A communication system between mutually interacting software applications (internal/external) (TX Logistik)	Talend Enterprise Service Bus is a communication system between mutually interacting software applications (internal/external). **Data format:** File based supported with Oracle Database in the background for logging / setting etc. **Data exchange protocols:** SOAP, Restful, FTP and File Exchange. **Use Cases affected:** UC2, UC3 and UC4.
Interface to operational	Maintrack, Track&Trace of intermodal trains.

railway management, incl. Track&Trace of intermodal trains (TX Logistik)	**Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use Cases affected:** UC3
Integrate train and road (pre/post haulage) status information end-to-end (TX Logistik)	TX core: ordering and booking management for intermodal loading units **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use Cases affected:** UC2
Exchange of status information with intermodal terminals (TX Logistik)	TX core: exchanging status information with terminals, e.g. pre-alert, gate-in, loaded, gate-out. **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use Cases affected:** UC3
Exchange of status information with intermodal customers (TX Logistik)	TX core: exchanging status information with customers, pre-booking, order confirmation and loading confirmation. **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use Cases affected:** UC3
Data Analytics (TX Logistik)	Data Analytics to identify useful information and to support decision-making. This could encompass e.g. (dynamic) route planning, deviation management, capacity planning, etc. **Data format:** XML, JSON, CSV and FixedLength. **Data exchange protocols:** HTTPS **Use Cases affected:** UC3 and UC4.
ETA calculation for rail (TX Logistik)	Real-time ETA calculation for rail based on state of the art algorithms and taking into account various events like congestions, security controls, strikes and bad weather conditions. **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use Cases affected:** UC3 and UC4.

Multimodal route planning and re-routing (PTV)	PTV xIntermodal with data management tool; intermodal routing and planning service based on line schedules. **Data format:** JSON **Data exchange protocols:** Proprietary PTV API **Use Cases affected:** UC1, UC2, UC3 and UC4.
Parking availability (locating the parking slot on the maps) (PTV)	Truck Parking Europe **Data format:** JSON **Data exchange protocols:** REST API **Use Cases affected:** UC3
Relation Service Provider (forwarder) – carriers & terminals (operators) (PTV)	Arrival Board, Table of scheduled arrival times of trucks at a certain location (e.g. terminal) frequently actualised via the backend ETA calculation service. **Data format:** JSON **Data exchange protocols:** Web application **Use Cases affected:** UC1, UC3 and UC4.
Urban & interurban integration environment (PTV)	PTV platform, standardised offering for PTV geographical and logistics services with reference to PT- provided digital maps and content. **Data format:** JSON **Data exchange protocols:** Proprietary PTV API **Use Cases affected:** UC1, UC2, UC3 and UC4.
ETA provisioning (PTV)	Drive and Arrive, ETA calculation for road vehicles: a Cloud-based backend-service for ETA calculation, during trip execution provisioning of frequently actualised ETA for ETA consumers. An additional App for tracing and tracking is available (during trip execution). The implementation for the AEOLIX platform is also available. **Data format:** JSON and XML. **Data exchange protocols:** Proprietary PTVAPI **Use Cases affected:** UC1, UC2, UC3 and UC4.
Real-time vehicle traces	LCMM@AEOLIX: The CO_2 calculation and driving behaviour

and Urban & interurban integration environment (T-Systems)	evaluation of the LCMM service was integrated into the AEOLIX toolkit. Through various in-field tests it was derived that it is possible to evaluate driving behaviour and fuel consumption only by using GPS positions collected by e.g. a smartphone App. By sharing AEOLIX member's position data, the LCMM@AEOLIX Toolkit service is able to apply several algorithms based on the Newtonian physics. The toolkit delivers a close approximation of the different physical forces in place, combining them to determine the work that is being carried out. Using this result, it is possible to retrace the consumed fuel, which also stands in direct correlation with the produced emissions. Furthermore, LCMM@AEOLIX Toolkit services compare the calculated data to a normalised trip based on the New European Driving Cycle to assess the driving behaviour. Such behaviour can be used as feedback to foster a sustainable driving culture. The service calculates CO_2 values and indices the based-on-trip data of vehicles. The trip data are defined as position data, speed and time. Based on additional data provided by the vehicle, such as mass, roll friction, etc., the service can calculate an estimation of fuel consumption and a directly related CO_2 value. **Data format:** XML **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC2, UC3 and UC4.
DIH.Identity provider: Identification and Access Management based on reference architecture of	DIH.Identity provider: Identification and Access Management on identity information (create, maintain, manage and validate). **Data format:** JSON

International data space (T-Systems)	**Data exchange protocols:** Webservices, e.g. https, MQTT, REST and Multi Part Messages. **Use Cases affected:** UC1, UC2, UC3, UC4 and UC5.
DIH.Broker: Register of data, data sources, content, structure quality, etc. (T-Systems)	DIH.Broker: Registration of data, data sources, content, structure quality, etc. **Data format:** JSON **Data exchange protocols:** Webservices, e.g. https, MQTT, REST and Multi Part Messages. **Use Cases affected:** UC1, UC2, UC3 and UC4.
DIH.Connector Connectivity Layer: Connectivity and usage control (T-Systems)	DIH.Connector Connectivity Layer: a trustworthy connectivity and usage control tool. **Data format:** JSON **Data exchange protocols:** Webservices, e.g. https, MQTT, REST the Multi Part Messages. **Use Cases affected:** UC1, UC2, UC3 and UC4.
DIH.Apps Store: Provision of Data apps use DIH.Connector (T-Systems)	DIH.Apps Store: Provision of Data apps use DIH.Connector **Data format:** JSON **Data exchange protocols:** Webservices, e.g. https, MQTT, REST and Multi Part Messages. **Use Cases affected:** UC1, UC2, UC3 and UC4.
DIH.Clearing House: clearing and settlement for financial and data exchange transactions (T-Systems)	DIH.Clearing House: clearing and settlement for financial and data exchange transactions. **Data format:** JSON **Data exchange protocols:** Webservices, e.g. https, MQTT, REST, Multi Part Messages **Use Cases affected:** UC1, UC2, UC3 and UC4.
DIH.Vocabulary (T-Systems)	DIH.Vocabulary: Manages and offers vocabularies to annotate and describe datasets. **Data format:** JSON **Data exchange protocols:** Webservices, e.g. https, MQTT, REST and Multi Part Messages.

	Use Cases affected: UC1, UC2, UC3 and UC4.
DIH.Corridor Data Hub dashboard (T-Systems)	DIH.Corridor Data Hub dashboard **Data format:** JSON **Data exchange protocols:** Webservices, e.g. https and REST. **Use Cases affected:** UC3
Real-time vehicle traces (JdR)	Position updates truck and logistic activity status **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC3 and UC4.
Multimodal route planning and re-routing (JdR)	Intermodal routing and planning services. **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC3 and UC4.
Parking availability (locating the parking slot on the maps) (JdR)	Truck Parking Europe **Data format:** to be defined **Data exchange protocols:** to be defined **Use Cases affected:** UC1, UC3, UC4
Booking of a parking slot (JdR)	APS slot booking service **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC3 and UC4.
Relation Service Provider (forwarder) – carriers & terminals (operators) (JdR)	Arrival times of trucks for the terminal, based on the ETA service. **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use cases affected:** UC1, UC3 and UC4.
ETA (JdR)	JDR APS (Jplexs): Shipment ETA **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use cases affected:** UC1, UC3 and UC4.

Type of service	Service name and description
Carrier Capacity planning (JdR)	JDR APS (Jplexs): Carrier Capacity Planning. **Data format:** XML and JSON. **Data exchange protocols:** HTTPS **Use cases affected:** UC1, UC3 and UC4.
ITALY, MILANO/GENOVA	
Type of service	**Service name and description**
Sharing of the Shipments' data - existing - for Export only. B2A /A2B services such as Customs - Export to be implemented and Import to be developed.	Digital transmission of some of the essential data for airport operations contained in the waybill. Freight Forwarders and handlers outside the airport will be able to transmit to the airport handler the information relating to the configuration of departing shipments (airline, packages, weight, security checks carried out, customs MRN, special cargo, etc.). **Data format:** XML / JSON **Data exchange protocols:** Web Services, SOAP, REST, and SFTP. **Use Cases affected:** UC4
Sharing of the data goods contained in the "borderò" - Export	This service allows the out-of-airport shipper or handler to transmit the "borderò" of the freight contained in the means of transport used for the delivery at the airport, thus significantly accelerating the physical and documentary check-in of goods at the airport. **Data format:** XML / JSON **Data exchange protocols:** Web Services, SOAP, REST and SFTP. **Use Cases affected:** Existing services correlated to the Pilot activities.
Booking time for shipments that are unloading - Export	The availability of data on the goods and the "borderò" of transport, make it possible to book the unloading service at the airport's warehouse, drastically reducing waiting times. **Data format:** XML / JSON **Data exchange protocols:** Web Services, SOAP, REST and

	SFTP. **Use Cases affected:** Existing services correlated to the Pilot activities.
Arrival/Departure of the vehicles at Cargo City - Export	The handlers are informed of the arrival of the vehicle at their warehouses through the reading of the vehicle's plates at the entrance gate. The information is combined with the previously received "borderò" data and/or with the booking of the unloading. **Data format:** XML / JSON **Data exchange protocols:** Web Services, SOAP, REST and SFTP. **Use Cases affected:** Existing services correlated to the Pilot activities.
ETA App service development - Export and Import	Development of an App for optimisation of operations related to export activities (trucks leaving the warehouse with outbound shipments to be delivered to Cargo City Malpensa) and import activities (trucks with inbound shipments leaving Cargo City Malpensa towards the warehouse). This App will allow both truck drivers and the warehouse to receive real-time traffic information concerning the itinerary to their final destination. **Data format:** XML / JSON **Data exchange protocols:** Web Services, SOAP, REST and SFTP. **Use Cases affected:** UC1
CO_2 & NO_x emission monitoring and reduction App service development - Export and Import	The ETA App will guarantee smooth travels, that will contribute to decreasing the CO_2 & NO_x emissions. The journey data will permit the monitoring of the fuel consumption and of the related emissions. **Data format:** XML / JSON

	Data exchange protocols: Web Services, SOAP, REST and SFTP. **Use Cases affected:** UC1 and UC2.
Monitoring and management of the transport of dangerous goods - Export and Import	Monitoring and management of the transport of dangerous goods with a focus on safety and security requirements. The tool aims at: 1) ensuring the compliance of the documents with the standards required from aviation; 2) monitoring the transport of the dangerous goods along the whole journey in real-time. **Data format:** XML / JSON **Data exchange protocols:** Web Services, SOAP, REST and SFTP. **Use Cases affected:** UC1 and UC2.
Safety and eCustoms operations monitoring - Export and Import	Integration of the "ecosistema cargo Malpensa" platform with the customs system in order to reduce costs and interaction times among the actors, taking also in consideration a trend analysis on safety/security processes. Updates the status of the shipment in terms of operational issues due to safety-related problems. **Data format:** XML / JSON **Data exchange protocols:** Web Services, SOAP, REST and SFTP. **Use Cases affected:** UC1 and UC5.
Vessel Loading List	Provides Vessel Loading List to interested parties. **Data format:** XML / JSON **Data exchange protocols:** Web Services and SOAP. **Use Cases affected:** UC6, UC7, UC8 and UC9.
Vessel manifest and Customs data	Provides Vessel manifest and Customs data List to interested parties. **Data format:** XML / JSON

	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6
Vessel tracking	Provides Vessel Tracking List to interested parties
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6
Vessel ETA ETD	Provides Vessel ETA ETD List to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6 and UC7.
Vessel unloading list	Provides Vessel unloading List to interested parties
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7, UC8 and UC9.
Cargo position in the terminal	Provides Cargo position to interested parties
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7, UC8 and UC9.
Cargo booking requests	Provides Cargo booking request to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP**.**
	Use Cases affected: UC7 and UC8.
Cargo delivery on trucks	Provides Cargo Delivery on trucks to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP**.**
	Use Cases affected: UC6, UC7 and UC8.
Train composition	Provides train composition to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7 and UC9.
Shunting requests	Provides shunting requests to interested parties.

	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7 and UC9.
Train path allocation	Provides train path allocation to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7 and UC9.
Train loading list	Provides train Loading List to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7 and UC9.
Port gate in (road and rail)	Provides port gate in to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7, UC8 and UC9.
Port gate out (road and rail)	Provides port gate out to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7, UC8 andUC9.
Train ETA	Provides train ETA to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7 and UC9.
Inland Terminal Gate in (road and rail)	Provides Inland Terminal Gate in (road and rail) to interested parties.
	Data format: XML / JSON
	Data exchange protocols: Web Services and SOAP.
	Use Cases affected: UC6, UC7, UC8 and UC9.
Inland Terminal Gate out (road and rail)	Provides Inland Terminal Gate out (road and rail) to interested parties.
	Data format: XML / JSON

	Data exchange protocols: Web Services and SOAP. **Use Cases affected:** UC6, UC7, UC8 and UC9.
E-seal status	Provides E-seal to interested parties. **Data format:** XML / JSON **Data exchange protocols:** Web Services and SOAP. **Use Cases affected:** UC6

NETHERLANDS	
Type of service	**Service name and description**
Providing transport information to the actors in the supply chain (Van Looveren Consultancy, Pionira, Transfollow)	Providing transport information to the actors in the supply chain. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing specific information for road transport (Van Looveren Consultancy, Pionira, Transfollow)	Providing information (road transport) to meet the requirements of the Combined Transport Directive. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing specific information for the rail transport (Van Looveren Consultancy, Pionira, Transfollow)	Providing the required information for moving goods by the Rail transport mode **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
On-board monitoring in real-time the moving of the goods by the various transport modes (Van Looveren Consultancy, Pionira, Transfollow)	Monitoring the transport performance (general service for all transport modes). **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
On-board monitoring in real-time of the progress	Condition Monitoring on-board of freight trains (special for rail transport).

and status of freight trains (Van Looveren Consultancy, Pionira, Transfollow)	**Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Real-time exchange of reports about the progress and status of the transport for the various transport modes (Van Looveren Consultancy, Pionira, Transfollow)	Reporting from the transport performance (general service for all transport modes). **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing reports of cargo handling at terminals (Van Looveren Consultancy, Pionira, Transfollow)	Reporting the terminal's performance. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing connectivity to the actors of a supply chain (Van Looveren Consultancy, Pionira, Transfollow)	Connection to transport operations platform. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Forming supply chains (Van Looveren Consultancy, Pionira, Transfollow)	Supply chain collaboration. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information about the multimodal transport service of goods (transport route, transport modes, time schedule, etc.) (Van Looveren Consultancy, Pionira, Transfollow)	Supply chain collaboration. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information about the multimodal	Supply chain collaboration. **Data format:** to be developed

transport plan of goods to carriers (transport route, time schedule, etc.) and terminals (time schedules of transport modes) (Van Looveren Consultancy, Pionira, Transfollow)	**Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information for the transport of goods by carriers (transport order, consignment notes, origin and destination location) (Van Looveren Consultancy, Pionira, Transfollow)	Transport of goods (all transport modes). **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information for the transport of rail goods (Van Looveren Consultancy, Pionira, Transfollow)	Rail transport of goods. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing location information of operation points (customer locations, terminals) (Van Looveren Consultancy, Pionira, Transfollow)	Operation points. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information for cargo handling at terminals (inbound, outbound, store, forward goods lists) (Van Looveren Consultancy, Pionira, Transfollow)	Cargo Handling **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information for	Customs documents

customs (Van Looveren Consultancy, Pionira, Transfollow)	**Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information about transport orders (confirmation, transport plan) (Van Looveren Consultancy, Pionira, Transfollow)	Transport planning **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information about the execution of the transport order (Van Looveren Consultancy, Pionira, Transfollow)	Transport reports **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information about the execution of rail transport orders (Van Looveren Consultancy, Pionira, Transfollow)	Rail transport order **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information about rail transport plans following TAF procedures (collaboration with other RU's) (Van Looveren Consultancy, Pionira, Transfollow)	Rail transport plan **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
Providing information about the execution of rail transport plans (Van Looveren Consultancy, Pionira, Transfollow)	Rail transport reports **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases

Providing information about the clearance of goods (Van Looveren Consultancy, Pionira, Transfollow)	Customs clearance **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** all Use Cases
A communication system between mutually interacting software applications (internal/external) (TX Logistik)	Talend Enterprise Service Bus: communication system between mutually interacting software applications (internal/external). **Data format:** File based supported with Oracle Database in the background for logging / setting. **Data exchange protocols:** SOAP Restful, FTP, File Exchange **Use Cases affected:** UC1 and UC3.
Operational Railway Management, incl. Track&Trace of intermodal trains (TX Logistik)	Maintrack, Track&Trace of intermodal trains. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** UC1
Integration of train and road (pre/post haulage) status information, end-to-end (TX Logistik)	Order and booking management for intermodal loading units. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** UC1
Exchange of status information with intermodal terminals (TX Logistik)	Exchanging status information with terminals, e.g. pre-alert, gate-in, loaded, gate-out. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** UC2
Exchange of information with intermodal freight forwarders (road) (TX Logistik)	Exchanging consignment note information with intermodal freight forwarders. **Data format:** to be developed **Data exchange protocols:** to be developed

	Use Cases affected: UC1
Exchange of regulated documents (customs, waste, dangerous goods) with authorities (TX Logistik)	Exchange of regulated documents (customs, waste, dangerous goods) with authorities. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** UC3
Communication system between mutually interacting software applications (internal/external) (JdR)	JDR Connect ESB: Communication system between mutually interacting software applications (internal/external). **Data format:** File based supported with Oracle Database in the background for logging / setting. **Data exchange protocols:** SOAP Restful, FTP, File Exchange **Use Cases affected:** UC1, UC3
TSPportal carrier management service (JdR)	Freight Orders, Carrier execution reporting and tracking, Transport documents. **Data format:** XML **Data exchange protocols:** Web based **Use Cases affected:** UC1 and UC3.
Electronic Transport Documents (eCMR) (JdR)	JDR Jplexs (multi node), eCMR **Data format:** XML and JSON. **Data exchange protocols:** HTTP **Use Cases affected:** UC1, UC3
Exchange of status information with handling locations / intermodal terminals (JdR)	JDR Jplexs (multi node): exchanging status information with terminals, e.g. pre-alert, gate-in, loaded, gate-out **Data format:** XML and JSON. **Data exchange protocols:** HTTP **Use Cases affected:** UC1 and UC3.
Exchange of status information with intermodal freight forwarders (road) (JdR)	JDR Jplexs (multi node): exchanging consignment note information with Rail operators **Data format:** XML and JSON. **Data exchange protocols:** HTTP

	Use Cases affected: UC1 and UC3.
Exchange of regulated documents (customs, waste, dangerous goods) with the authorities (JdR)	JDR Connect ESB: exchange of regulated documents (customs, waste, dangerous goods) with the authorities. **Data format:** XML and JSON. **Data exchange protocols:** HTTP **Use Cases affected:** UC1 and UC3.

Table 16: Rhine-Alpine Corridor, list of services

4.8   Atlantic Corridor

The Atlantic Corridor connects Europe's South Western regions towards the centre of the EU linking the Iberian Peninsula's from the ports of Algeciras, Sines, Lisbon, Leixões and Bilbao, Western France to Paris and Normandy and further to the East to Strasbourg and Mannerheim. The corridor provides both inland and maritime connections between the Iberian Peninsula with France and Germany, crossing regions.

The length of the Corridor accounts for more than 7,800 km of core rail network, more than 4,400 km of core road sections. It includes 8 core ports, 7 core airports, 10 core Rail Road Terminals and 7 core urban nodes. The maritime dimension plays a crucial role in this corridor, with a parallel connection of the inland modes and with seaports, thus ensuring the connectivity to world trade routes. Furthermore, there are five core network branches which provide connectivity between the Corridor and the Atlantic coastlines (Nantes–Saint Nazaire and North West Spain–Gijon/ A Coruña), Inner Portugal (Douro), the Atlantic Ocean with world-wide routes (Canary Islands) and complements the Inland Waterways Network (Seine branch South of Paris).

Pilots:
- PS SP   Spain
- PS SK   Slovakia

Figure 12: Atlantic Corridor

The services available in the Atlantic Corridor result from the presence of two Pilot Sites: Spain and Slovakia, which services are reported in section 4.10.

The following tables present more detailed information about the services in the Atlantic Corridor, giving the indication of the Pilot providing the services, along with a description of the required functionalities, the data formats and the exchange protocols.

SPAIN	
Type of service	**Service name and description**
Real-time vehicle traces	Cargo traceability: it is a service that notifies the delivery or pick-up of containers. **Data format:** COPINO - Container pre-notification message **Data exchange protocols:** Web Interface/Mobile App **Use Cases affected:** UC6
B2A, A2B services like customs	Automatic Clearance: a service to provide the automatic clearance of the cargo. **Data format:** CUSREP/CUSCAR

	Data exchange protocols: Web Services **Use Cases affected:** UC2
Multimodal route planning and re-routing	Train Calls: this service will provide accurate information of rail planning to logistics stakeholders in order to coordinate and prepare in advance all the loading and discharge of container operations. This will consequently accelerate the flow of the rail processes in the Maritime and Inland Terminals (Dry Port) and Port Authority Systems. **Data format:** XML **Data exchange protocols:** Secured Web Services **Use Cases affected:** UC1
Terminal Slot Reservation	Terminal booking slot: a service for trucking companies to carry out the reservation of slots for pick up or delivery of freight. The service will be available via web or mobile application. **Data format:** to be developed **Data exchange protocols:** to be developed **Use Cases affected:** UC4
Loading and Discharge list management of cargo by train	Rail Cargo List: a service that communicates the loading and discharge lists of cargo travelling by train between port and dry ports. **Data format:** XML **Data exchange protocols:** Secured Web Services **Use Cases affected:** UC5
Train ATA/ATD	Train ATA/ATD: a service that announces the departure of the train (ATD) indicating its composition, load and destination, and the arrival in destination. **Data format:** XML **Data exchange protocols:** Secured Web Services **Use Cases affected:** UC6

Vessel ATA/ATD	Vessels ATA/ATD: a service that announces the arrival and departure of vessels involved in rail operations. **Data format:** XML **Data exchange protocols:** Secured Web Services **Use Cases affected:** UC6

Table 17: Atlantic Corridor, list of services

4.9   North Sea-Mediterranean Corridor

The North Sea-Mediterranean Corridor is a multimodal corridor stretching from Glasgow, Edinburgh and Belfast in the north, to Cork in the west, Paris and Lille in the centre, Marseille in the south, extending north-east through Luxembourg, Belgium and the Netherlands towards Amsterdam.

It covers six countries, namely Belgium, Ireland, France, Luxembourg, the Netherlands and the United Kingdom, and leads to the Swiss and German borders in Basel. Several sections of the corridor are shared with the Rhine-Alpine, North Sea-Baltic, Atlantic and the Mediterranean corridors.

The Corridor includes 6,723 km of railway tracks, 3,765 km of waterways, 4,210 km of roads, 21 core seaports and 25 core inland ports.
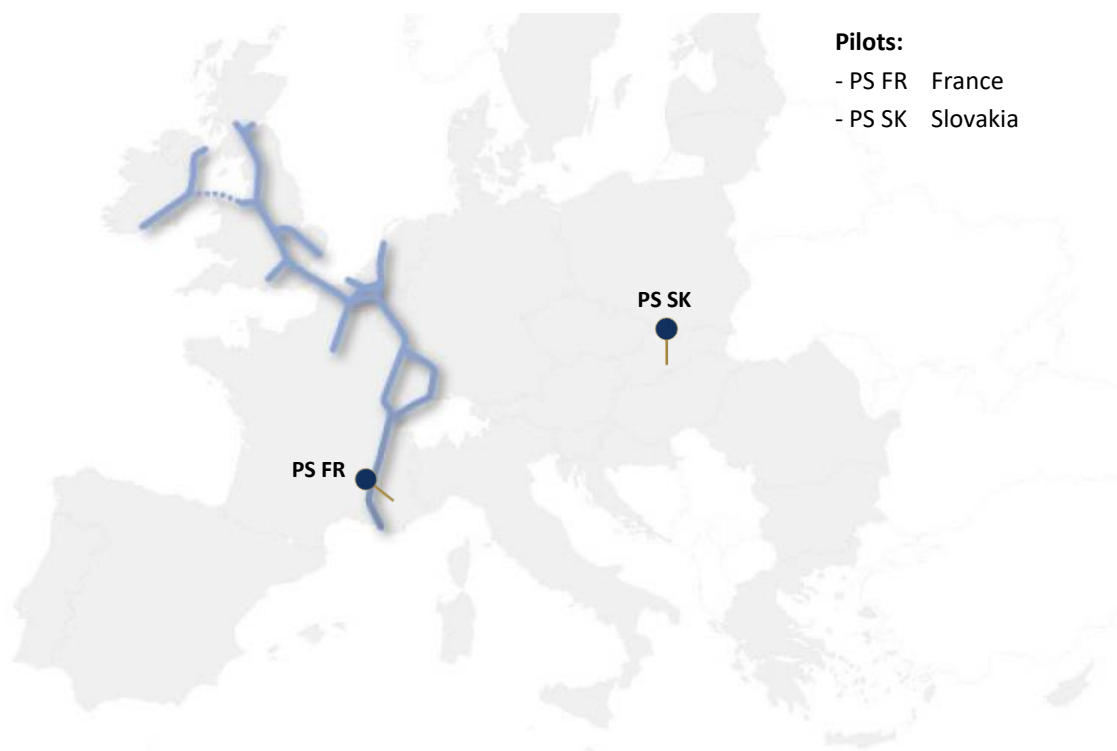

Pilots:
- PS FR   France
- PS SK   Slovakia

The services available in the North Sea-Mediterranean Corridor result from the presence of two Pilot Sites: France and Slovakia, which services are reported in section 4.10.

The following tables present more detailed information about the services in the North Sea-Mediterranean Corridor, giving the indication of the Pilot providing the services, along with a description of the required functionalities, the data formats and the exchange protocols.

FRANCE	
Type of service	**Service name and description**
Real-time vehicle traces	iMCTODashboard: The service proposes the display on a map of the positions in real time of the vehicles. The positions are sent from the installed smartphones, beacons or management platforms. The type of vehicle, its ID and its positions are displayed and updated in real time on the dashboard. **Data format:** XML, Json **Data exchange protocols:** ASN/GeoNet **Use Cases affected:** UC5, UC3 and UC2.
Parking availability (locating the parking slot on the maps)	Truck parking: C-ITS platform is connected to the road operator or the National node and the information on truck parking is recovered. This information is then displayed on the system and diffused in C-ITS format to vehicles. **Data format:** Json, CAM, POI, DATEX2, XML, csv **Data exchange protocols:** GeoNet **Use Cases affected:** UC7
Traffic Light Assistance and speed recommendations	GLOSA: the Green Light Optimal Speed Advice service provides an advice to the driver when approaching a traffic light. The advice is to slow down or to reach a specific speed in order to get a green light. **Data format:** Json, CAM, SPAT/MAP, DATEX2, XML and csv. **Data exchange protocols:** GeoNet

	Use Cases affected: UC5, UC3 and UC7.
Relation Service Provider (forwarder) – carriers & terminals (operators)	Noscifel: a platform for the optimisation of logistics by data and service sharing via connectors. **Data format:** DATEX2, XML, EDIFACT and Json. **Data exchange protocols:** ASN/GeoNet **Use Cases affected:** UC5 and UC3.
Integration with driver security check at the facilities of the ground handling agent	TP1: a Trusted Party 1 is a secured platform allowing data on the transport of dangerous goods to be shared with authorities and emergency services. The authority receives the necessary information allowing the security check of the truck. **Data format:** DATEX2 **Data exchange protocols:** SOAP and HTTP. **Use Cases affected:** UC5 and UC3.
CO_2 calculation	Noscifel-CO_2C: the CO_2 calculator is based on European and French standard and provides multimodal CO_2 value on a given transport mode or per item in the container. **Data format:** DATEX2, XML, EDIFACT and Json. **Data exchange protocols:** ASN/GeoNet **Use Cases affected:** UC5 and UC3.
Multimodal ETA	iMCTODashboard-META The M-ETA service calculates ETA for every transport mode including truck, barge, train and ship and visualises the information in real time on a dashboard. **Data format:** XML, Json **Data exchange protocols:** HTTP **Use Cases affected:** UC5 and UC3.
Slot management	iMCTODashboard-SM: a tool which permits the terminal or refinery manager to indicate the loading possibilities to the truck companies. The tool then permits truck companies to select the convenient slot for their transport.

	Data format: XML and Json. **Data exchange protocols:** HTTP **Use Cases affected:** UC5, UC3 and UC2.
Slot verification	iMCTODashboard-SV: a tool that allows to verify that all paperwork and authorisations are cleared for a specific transport. This is done in advance to prevent the loss of time at the arrival at the terminal. The tool sends the necessary information to the Port community System, which provides the necessary information for the service. **Data format:** XML and Json. **Data exchange protocols:** HTTP **Use Cases affected:** UC5, UC3 and UC1.
Customs container verification	Noscifel-CV: a tool that allows to list the containers which should be controlled with priority. Data concerning the containers on a ship are sent to the Port Community system which sends back in return the containers be checked depending on the algorithms. **Data format:** DATEX2, XML, EDIFACT and Json. **Data exchange protocols:** ASN/GeoNet **Use Cases affected:** UC6
Emergency management of dangerous goods	TP1-EM: a tool providing information on the type of dangerous goods transported in the truck in case of an accident, so that the emergency service can be prepared and limit risks. **Data format:** DATEX2 **Data exchange protocols:** SOAP and HTTP. **Use Cases affected:** UC4
Dangerous goods control	TP1-CM Tool providing necessary information on dangerous goods type in the container for a police control **Data format:** DATEX2

	Data exchange protocols: SOAP, HTTP Use Cases affected: UC7, UC4
DATEX2 transformation tool for dangerous goods	TP1-DATEX2-TT: a tool that allows the exchange of data on the transport of dangerous goods between countries and actors following a validated DATEX2 format. Data format: DATEX2 Data exchange protocols: SOAP and HTTP. Use Cases affected: UC4
Data visibility	IMCTODashboard: a modular intelligent Multi Modal Cargo Transport Optimisation Dashboard that allows the visibility of data in real time to optimise a specific transport mode. Data format: Json, XML Data exchange protocols: HTTP Use Cases affected: UC3 and UC5.
Barge service	Noscifel-Barge: an application that allows to transfer the transport ID, the destination and the position of a barge in order to calculate and display ETA. Data format: DATEX2, XML, EDIFACT and Json. Data exchange protocols: ASN/GeoNet Use Cases affected: UC3.
Truck service	Noscifel-Truck Data format: DATEX2, XML, EDIFACT, Json Data exchange protocols: ASN/GeoNet Use Cases affected: UC3 and UC5.
C-ITS for terminal access	CITS-VMS-TA Data format: Json, CAM, IVI, Geonet, DATEX2, XML, csv Data exchange protocols: GeoNet Use Cases affected: UC7 and UC4.

Table 18: North Sea-Mediterranean Corridor, list of services

4.10 Rhine-Danube Corridor

The Rhine-Danube Core Network Corridor is the transport backbone linking Central and South-Eastern Europe. Running from the Strasbourg area and South-West Germany to the Romanian ports of the Black Sea and the Slovak-Ukrainian border (in two distinct branches), it comprises intermediate sections in nine Member States, and connects them to the neighbouring countries of Serbia, Bosnia-Herzegovina, Moldova and Ukraine.

The Member States covered by this corridor are France, Germany, Austria, the Czech Republic, Slovakia, Hungary, Croatia, Bulgaria and Romania. Several segments of the Rhine-Danube Core Network Corridor are shared with the Orient-East Med Corridor.

The Corridor includes around 5,800 km of rail network, 4,500 km of roads and 3,900 km of waterways.

Pilots:
- PS SK   Slovakia

PS SK
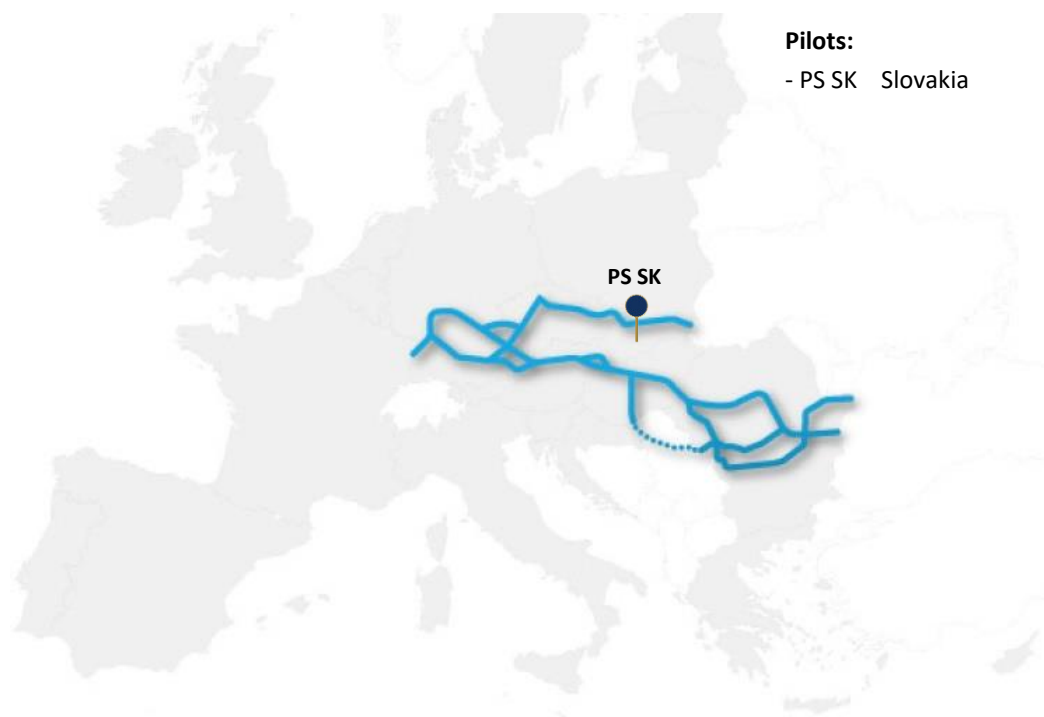
Figure 14: Rhine-Danube Corridor

The Slovakian Pilot Site operates in this corridor and the following table presents more detailed information about the services available, providing the description of the required functionalities, the data formats and the exchange protocols.

Due to the peculiarity of the activities performed by the Slovakian Pilot Site, the services listed in the Rhine-Danube corridor will be also made available on all the remaining TEN-T corridors.

SLOVAKIA	
Type of service	**Service name and description**
Real-time vehicle traces	TMS, APIs (carrier telematics, track trace tool): TMS (Java application), interfaced with each carrier track and trace tool, will connect to these track and trace tools, will trigger relevant data and report them back into the TMS system. **Data format:** XML, IOD/PO message and EDIFACT. **Data exchange protocols:** HTTPS **Use Cases affected:** UC4
Multimodal route planning and re-routing	TMS (Java application) collects all the actual transport and short-term-future transport requirements. Through the interface, the future transport requirements are selectively communicated to the multimodal service provider to access multimodal opportunities. **Data format:** XML, IOD/PO message and EDIFACT. **Data exchange protocols:** HTTPS **Use Cases affected:** UC4
Relation Service Provider (forwarder) – carriers & terminals (operators)	TMS, B2B, APIs: Through GS1 EDIFACT standards all the information to the carriers, the terminals and the service providers are exchanged **Data format:** XML, IOD/PO message and EDIFACT. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC2, UC3 and UC4.
Integration with driver security check at the facilities of the ground handling agent	TMS, APIs (carrier telematics): a core requirement to receive and share the driver's information and an additional option to receive information related to a high risk situation. **Data format:** XML, IOD/PO message and EDIFACT. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC2, UC3 and UC4.

B2A, A2B services like customs	TMS, APIs (administration bodies): this service is not part of the core activity. A better connection and interface with public authorities and administrations is needed to better expedite the transport flows. **Data format:** XML, IOD/PO message and EDIFACT. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC2 and UC3.
Certificate of origin	TMS, APIs (administration bodies): this service is not part of the core activity. A better connection and interface with public authorities and administrations is needed to better expedite the transport flows. **Data format:** XML, IOD/PO message and EDIFACT. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC2 and UC3.
Order management	TMS, ERP, (APIs cloud connection): communication between ERP, TMS, 3PLs, other stakeholders like Suppliers, Co-Manufacture, Co-Packer, etc. without adding new layers of communication, ideally with direct interface connection. **Data format:** XML, IOD/PO message and EDIFACT. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC2 and UC3.
Shipment planning and execution	TMS, ERP, (APIs cloud connection): communication between ERP, TMS, 3PLs, other stakeholders like Suppliers, Co-Manufacture, Co-Packer, etc. via EANCOM messages, without adding new layers of communication, ideally with direct interface connection. **Data format:** XML, IOD/PO message and EDIFACT. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1, UC2 and UC3.
DPS (Direct Plant Shipment)	TMS, ERP, (APIs cloud connection): communication between ERP and TMS to define the most efficient route for

	the customer.
	Data format: XML, IOD/PO message and EDIFACT.
	Data exchange protocols: HTTPS
	Use Cases affected: UC3
Dock booking information at warehouses	DB to LS / DB from LS: an interoperability of systems that allows the understanding and efficient management of loading or unloading capacities, without adding new layers of communication, ideally with direct interface connection. **Data format:** XML, IOD/PO message and EDIFACT. **Data exchange protocols:** HTTPS **Use Cases affected:** UC1

Table 19: Rhine-Danube Corridor, list of services

4.11   Services categorisation

On the basis of the analysis performed for each corridor in the previous paragraphs, FENIX Pilot Sites have declared a wide and significant range of services within the TEN-T Corridors. On one hand, every Pilot has provided its own services and described the related functions, while on the other hand it is necessary to have the same understanding, creating harmonisation on the terminologies used.

Due to the nature of these services, often defined in different ways in the Pilots, the comprehensive list can be summarised in five discrete categories, as follows:

1) Real-time track & trace
    a. Estimated Time of Arrival (ETA);
    b. Track & trace vehicle/shipment.

2) Terminal/node operations management
    a. Monitoring the terminal operations;
    b. Parking points availability and smart payments;
    c. Warehouse availability.

3) Transport management
    a. Dangerous goods;
    b. Multimodal route planning and re-routing;
    c. TM2.0 for multimodality.

4) Traffic management
    a. Road / Rail / Maritime traffic statistics;
    b. CO_2 & NO_x monitoring;
    c. Light Assistance and speed recommendations.

5) B2A, A2B services
    a. Customs procedures;
    b. Certificate of origin;
    c. e-CMR.

Each service category is generic enough to cover the variety of the services defined by the Pilot Sites, in order to facilitate the comparison and the future cross-site evaluation activities in FENIX.

CONCLUSIONS

The scope of FENIX is to develop the first European federated architecture for data sharing serving the European logistics community of shippers, logistics service providers, mobility infrastructure providers, cities, and authorities by developing and implementing digital corridor information systems based on the DTLF I SG2 requirements.

Corridor information systems facilitate data sharing between the stakeholders along the transport and logistics chains in given corridors by stimulating the adoption and use of open and de-facto standards for interoperability in the logistics domain.

Each Pilot Site has presented a detailed description of the services, with regard to the specific functionalities that will be available in the Trans-European Transport Network Corridors, explaining the data formats and the exchange protocols in detail.

It is also important to underline that, although a detailed description of the action plan of each Pilot Site has been provided in most of the cases, some partners have faced difficulties in the description of their services.

It is well-known that it is not possible to launch all the Pilot Sites with all their scenarios and use cases at the same time, as the launch of the activities relies on the degree of readiness of each Pilot. Based on the categorisation of the services made in the previous paragraph, the conclusion can be that the resulting situation leads to the presence of a certain set of services, commonly used in the Pilot Sites and evenly distributed along the corridors. In fact, all the five service categories will be covered in the nine TEN-T Corridors on a consistent basis.

The following tables provide an overall view of the availability of these common services in the TEN-T Corridors, pointing out the Pilots actually involved.

The 9 TEN-T Corridors are reported below:

(1) Baltic – Adriatic ●	(2) North Sea Baltic ●	(3) Mediterranean ●
(4) Orient/East Mediterranean ●	(5) Scandinavian Mediterranean ●	(6) Rhine – Alpine ●
(7) Atlantic ●	(8) North Sea – Mediterranean ●	(9) Rhine – Danube ●

FENIX Pilot Sites:

AT – Austria	**BE1** – Belgium, Air Cargo	**BE2** – Belgium, P&G	**FR** – France
DE – Germany	**GR** – Greece	**IT1** – Italy, Trieste	**IT2** – Italy, Milano/Genova
NL – Netherlands	**SK** – Slovakia	**SP** - Spain	

Service category	Corridors and Pilots				
	1	**2**	**3**	**4**	**5**
- Estimated Time of Arrival (ETA)	AT, IT1	SK	IT1	GR, SK	BE2, SK
- Track & trace vehicle/shipment	AT, IT1	SK	IT1	GR, SK	BE2, SK
Real-time track & trace ->	✓	✓	✓	✓	✓
- Monitoring the terminal operations	IT1, NL	SK	IT1, SK	GR, SK	BE2, SK
- Parking points availability and smart payments	IT1		IT1	GR	
	NL	SK	SK	GR, SK	SK
- Warehouse availability					
Terminal/node operations management ->	✓	✓	✓	✓	✓
- Dangerous goods	IT1		IT1		BE2
- Multimodal route planning and re-routing	IT1	SK	IT1, SK	GR, SK	SK
- TM2.0 for multimodality	IT1		IT1		
Transport management ->	✓	✓	✓	✓	✓
- Road / Train / Maritime traffic statistics	IT1	SK	IT1, SK	GR, SK	BE2, SK
- CO_2 & NO_x monitoring	IT1		IT1		BE2
- Light Assistance and speed recommendations	IT1		IT1		
Traffic management ->	✓	✓	✓	✓	✓
- Customs procedures	AT, IT1	SK	IT1, SK	GR, SK	BE2, SK
- Certificate of origin	IT1	SK	IT1, SK	GR, SK	SK
- e-CMR	IT1		IT1		
B2A, A2B services ->	✓	✓	✓	✓	✓

Table 20: Summary of the services on the corridors (1)

Service category	Corridors and Pilots			
	6	7	8	9
- Estimated Time of Arrival (ETA)	BE1, DE, IT2, SK	SP, SK	FR, SK	SK
- Track & trace vehicle/shipment	BE1, DE, IT2, NL, SK	SP	FR, SK	SK
Real-time track & trace ->	✓	✓	✓	✓
- Monitoring the terminal operations	BE1, DE, IT2, NL, SK	SP, SK	FR, SK	SK
- Parking points availability and smart payments	BE1, DE		FR	
	BE1, SK	SK	FR, SK	SK
- Warehouse availability				
Terminal/node operations management ->	✓	✓	✓	✓
- Dangerous goods	IT2		FR	
- Multimodal route planning and re-routing	DE, NL, SK	SP, SK	FR, SK	SK
- TM2.0 for multimodality				
Transport management ->	✓	✓	✓	✓
- Road / Train / Maritime traffic statistics	DE, IT2, NL, SK	SP, SK	SK	SK
- CO_2 & NO_x monitoring	DE, IT2		FR	
- Light Assistance and speed recommendations			FR	
Traffic management ->	✓	✓	✓	✓
- Customs procedures	IT2, NL, SK	SP, SK	FR, SK	SK
- Certificate of origin	SK	SK	SK	SK
- e-CMR	NL			
B2A, A2B services ->	✓	✓	✓	✓

Table 21: Summary of the services on the corridors (2)

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