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EXECUTIVE SUMMARY

The project SENSE, chch g ch m g G ch ch, has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 769967.

SENSE strategic objective is to accelerate the path towards the Physical Internet (PI), so advanced pilot implementations of the PI concept are well functioning and extended in industry practice by 2030, and hence contributing to at least 30 % reduction in congestion, emissions and energy consumption.

In this document we focus on assessing the state of play on the path towards the Physical Internet Implementation taking the ch gch m m ch g G ch ch as the baseline structure. Reference to main projects and initiatives contributing to the Physical Internet development as well as key reference documents are included.

This document is complementary to other main developments within SENSE project:

- The I I that describes the concept foundations, sketches a path from now to 2040 showing important milestones, needed technologies and first implementation opportunities for the PI in five main development streams: Logistics Nodes, Logistics Networks, the Systems of Logistics Networks, Access and Adoption and Governance.
- The I I I [2] aiming at reaching a broader audience for those companies and organizations willing to get an overview of the concept and the expected evolution.
- The I I I I h [3] that includes SENSE project outcomes in a wider perspective (i.e. the potential contribution of Physical Internet towards freight transport and logistics decarbonization).
- The I N that allows the Physical Internet Community and interested stakeholders to find relevant information on the Physical Internet (i.e., the market initiatives and companies, projects and programmes supporting Physical Internet implementation, main physical internet reference documents as well as the contributions to the International Physical Internet Conferences). It facilitates the engagement of individual stakeholders to share their experiences and projects in the field of Physical Internet. The main projects, companies and references gathered and included in this document form part of the Knowledge Platform.
- The I I I
- A strengthen I I (www.pi.events). SENSE has supported IPIC conference in 2018 and has been heavily involved in the organization of IPIC 2019 in London (9th to 11th

[1] SENSE project Deliverable D2.3 m m ch g G ch ch:

[2] The roadmap is available at http://www.etp-logistics.eu/?p=3980

[3] ALICE and LEARN EU project (2019). m m chm g gn m g g . https://www.etp-logistics.eu/?p=3152

[4] Physical Internet Knowledge Platform: https://knowledgeplatform.etp-logistics.eu/

[5] SENSE Project Deliverable D4.7 Recommendations to the Research & Innovation Programs calls after H2020 and CEF (TEN-T) Innovation Part

of July) (https://www.pi.events/IPIC2019/). SENSE has supported and boosted 7th edition in Shenzhen (China & online) with an unprecedented record of attendance (1500 + participants).

- A collection of ı ı ı ı ı of the Physical Internet concept that serve as an introduction to the concept as well as to understand the meaning and purpose of the concept in different contexts such as cities and ports.

This g chm m g G ch ch chchm ch m gmg includes a comprehensive overview of logistics and freight transport market initiatives, research projects and European and national programmes and calls contributing to the Physical Internet development.

The document includes in Chapter 1 an introduction and summary of the links of the Physical Internet Concept and Roadmap. In Chapter 2, the Methodology for the assessment of the PI initiatives.

The contribution of the initiatives to the Physical Internet implementation is structured according to the detailed g G ch ch m [1] developed by SENSE and it is focussed on the five specific areas of development:

- From Logistics Nodes to PI Nodes.
- From Logistics Networks to Physical Internet Networks.
- Developing the System of Logistics Networks towards the Physical Internet.
- Access and Adoption.
- Governance

As a conclusion, several projects, companies and initiatives are linked to the development of Logistics Nodes and Logistics Networks linked to the Physical Internet concepts as described in this document. Still, the examples and projects addressing the aspects to be developed for the system of logistics networks, access and adoption and governance are scarce. However, new PI related projects such as DISpaTch, ePIcenter, LEAD, PHYSICAL, PLANET or ULaaDs are expected to work on these concepts. Additionally, the Digital Transport and Logistics Forum and the related projects FEDERATED, and FENIX are addressing specific aspects on data sharing and connectivity including access and adoption and governance aspects.

Additionally, in Annex 1, the prioritized companies, and start-ups as per their relation to the PI concept and in Annex 2, the most relevant R&I projects can be found. Most of them have been developed in the last 5 years showing a growing interest in the concept. This is also supported by the increased number of mentions in articles and publications addressing the PI concept that have tripled in the last 4 years.

[6] Physical Internet videos: https://www.youtube.com/watch?v=14wAEP1nXBY&list=PLxdsc7eCmCO55wBV0Wm6v1Rk7OEjHNi2m

[7] SENSE Project Deliverable D4.6 Report on Dissemination, Communication and Stakeholders Engagement Activities and reviewed Communication and Dissemination Plan.

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The SENSE project consortium consists of:

Part. No	Participant organisation name (short name)	Country
1 (Coordinator)	Alliance for Logistics Innovation through Collaboration in Europe, ALICE AISBL (ALICE)	BE
2	Procter & Gamble Services company NV (PGBS)	BE
3	FM Logistic Corporate (FM)	FR
4	Dutch Institute for Advanced Logistics (DINALOG)	NL
5	Posteitaliane (POSTE)	IT
6	Interporto Bologna SPA (IPBO)	IT
7	Vlaams Instituut voor de Logistiek VZW (VIL)	BE
8	Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung E.V. (IML)	DE
9	Centro Nacional de Competencia en Logística Integral (CNC)	ES
10	Instytut Logistyki I Magazynowania (ILIM)	PL
11	Technische Universiteit Delft (TUD)	NL
12	Association pour la Recherche et le Développement des Méthodes et Processus Industriels (ARMINES)	FR
13	Kühne Logistics University GMBH (KLU)	DE
14	Bluegreen Strategy SRL (BG)	IT
15	FIT Consulting SRL (FIT)	IT
16	VNL – Verein Netzwerk Logistik	AT

Version	Date	Modification reason	Modified by
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2nd Draft	15.12.2019	Final Structure and First Draft	ALICE
Final	30.11.2020	Final version and submission	ALICE

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Contents

1 INTRODUCTION 6

1.1 ch g G ch ch m ch g ch

1.2 ch m m g G ch ch

2 ASSESSMENT METHODOLOGY FOR PI INITIATIVES 10

2.1 ch ch gn

2.2 G mch ch gn

3 WHERE ARE WE IN THE PATH TOWARDS THE PHYSICAL INTERNET IMPLEMENTATION? 12

3.1 m g g m ch

3.2 m g g ch m

3.3 ch m m g g ch m

3.4 ch m gn

3.5 m ch ch

This document provides an extensive overview of market developments, initiatives and research and innovation knowledge related to PI, aiming at giving a good starting point for all those stakeholders interested in having a broad overview of the concept and related examples.

In this chapter, we will include a short description of the Physical Internet concept and Roadmap, the main areas addressed and possible evolutions for which the different contents have been mapped.

1.1

The Physical Internet is probably the most ambitious concept towards efficiency and sustainability in transport and logistics. It stands for a far-reaching reorganisation of freight transport and logistics. The model for the new concept is the Internet.

When data is exchanged via the Internet, neither the sender nor the recipient is concerned about the path data packets take. The fact is data finds a way - without human intervention. This is ensured by both, autonomous networks, which are interconnected, and technically standardised Internet protocols.

The Physical Internet transfers the principles of data exchange on the Internet to goods transport in the real world in terms of technical and operational standardised protocols and automatic transport control. The objective is to make optimum use of vehicles, assets and the existing infrastructure through open and shared logistics networks and flexible goods routing making freight transport more efficient overall for companies and for society by reducing energy use and emissions.

The concept of the Physical Internet aims at realising full interconnectivity (information, physical and financial flows) of freight transport and logistics services and make them ready to be seamlessly usable as part of one large heterogeneous logistics network involving seamlessly truly interconnected subnetworks. The seamless physical, digital and process connectivity of the logistic networks will include transport, storage and physical handling operations of load units like containers, swap-bodies, pallets, boxes, etc., as well as associated processes to ensure correct execution of contracts in end-to-end supply chains.

For the Physical Internet, (existing) transhipment- and distribution-centres, roads, railways, waterways, and airway services are digitally connected to each other and services are visible and accessible to all users. Companies register transports needs from A to B through their own network or to its logistics service provider who transfers these requirements into their network. Shipments are then automatically planned and executed through PI services taking the best route through the fully networked transport and services infrastructure and accessing seamlessly external resources available to fulfil the assignment.

In this new open logistics system, goods can be routed in a similar way as data on the Internet. Of course, data packets on the Internet are boxes, pallets or containers in the Physical Internet and, contrary to the digital Internet, the cost of losing packets is important and non-negligible. The movement of “packets” in the PI is much slower, which allows in-transit management and higher flexibility in terms of information and financial flows management.

The Physical Internet is a logical evolution of existing approaches for increased efficiency in goods transport. This transformational change does not require heavy investments in infrastructure or other types of capital investments, but it does require a change in how business operations are arranged.

In today's logistics world, most of the logistics companies still need to develop proprietary logistics solutions

4. – This area describes the main requirements to access the Physical Internet through a logistics network part of it. It also includes different steps and mind shift required to adopt Physical Internet concepts.
5. – Governance includes the developments needed to evolve the Logistics Nodes, logistics networks and the System of Logistics Networks into the Physical Internet, i.e., the rules defined by the stakeholders forming or using them as well as the trust building processes and mechanisms.

Developments in each of the areas have already started (2015-2020). The roadmap shows the possible developments in " ch ch gn " until 2040. Generations define possible evolutions towards the PI and can be scenarios or parts of PI-like implementations. Generations at medium- and long-term involve more technical, operational, and business complexity. In some cases, generations can be jumped (i.e., stakeholders or companies may directly jump into the 3rd or 4th generation without necessarily passing through the previous one).

PI-like operations will be well established by 2030. The shown developments from 2030 to 2040 focus on improvements on the way to achieve autonomous, open, and shared PI operation.

The five areas with the defined generations will be explained in detail in the following sections.

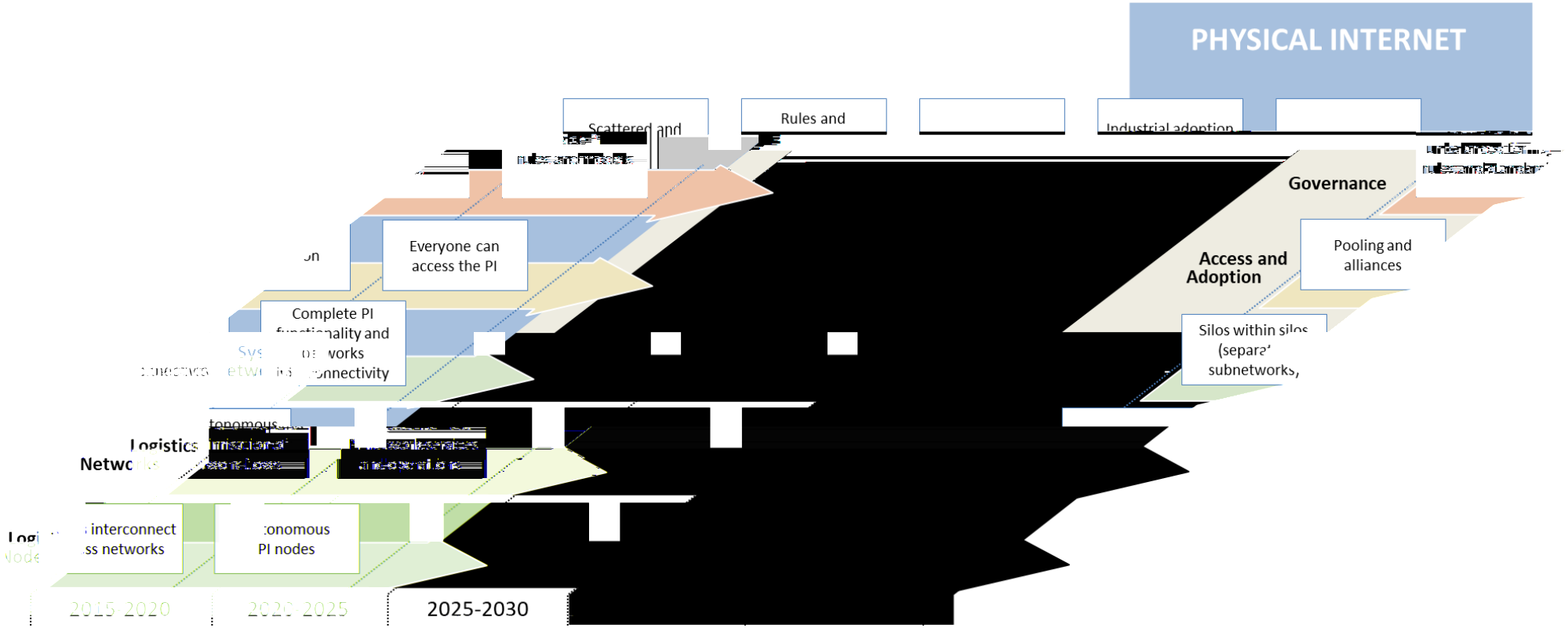


Figure 1. The Physical Internet roadmap

This document provides an extensive overview of market developments, initiatives and research and innovation knowledge related to PI aiming at giving a good starting point for all those stakeholders interested in having a broad overview of the concept and related examples.

The methodology defined to identify and evaluate PI initiatives is described in detail in the Sense Deliverable D3.3 g m g G ch ch chchm ch m g m g and summarized here.

2.1

The market observation has the objective to monitor start-ups acting in the logistics market and having relevancy with the PI development.

The process is presented in Figure 2. After the initial large collection of start-ups from specialised magazines and databases, in the earlier period of the project, a shorter list was produced (141 companies) to be further analysed and classified according to the areas of interest in relation to the roadmap. After this analysis, 44 companies were short-listed, and a deeper analysis was conducted by experts within the SENSE partnership. Based on those experts' assessments 30 start-ups were included in the PI Knowledge Platform. The selection was made according to:

- Start-ups that received higher scores (rated "Very High" relevance) for any of the PI areas by the experts.
- Start-ups that received higher total scores, calculated by adding the overall scores of the individual categories.
- "Pioneer" Start-ups that framed their value proposition linked to the physical Internet concept.

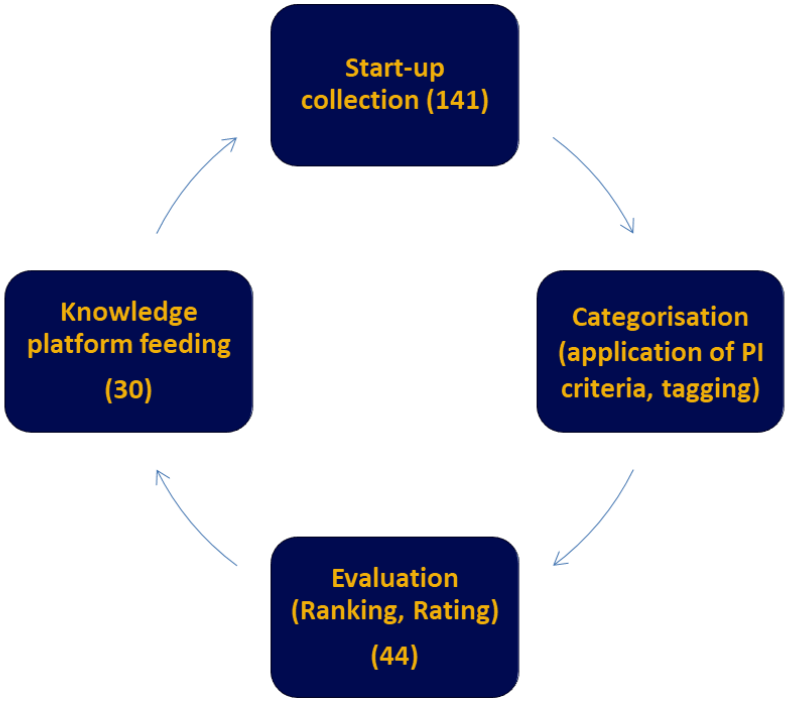


Figure 2. Market observation process

2.2

SENSE is building upon of the assessment methodology for projects developed in Projects WINN[9] and SETRIS[10]. On top, SENSE is adding the following elements:

- New projects have been identified (i.e., those ones started after 2017 and not included in previous projects) being the final database composed by 237 with 70 new projects identified.
- ALICE programme of liaison with projects[11] and initiatives has been reinforced and 40 projects have been part of that programme so far.

Moreover, SENSE project has considered past and present R&D projects at national/regional level, taking advantage of the involvement of partners from Member States funded projects on this area, starting from: Austria (VNL), Belgium (VIL), France (ARMINES) and the Netherlands (DINALOG) that are in the forefront of Physical internet development.

Similarly, to the Start-ups, the projects have been assessed and those ones addressing key aspects for the Physical Internet Development have been included as part of the Knowledge Platform this includes 33 projects.

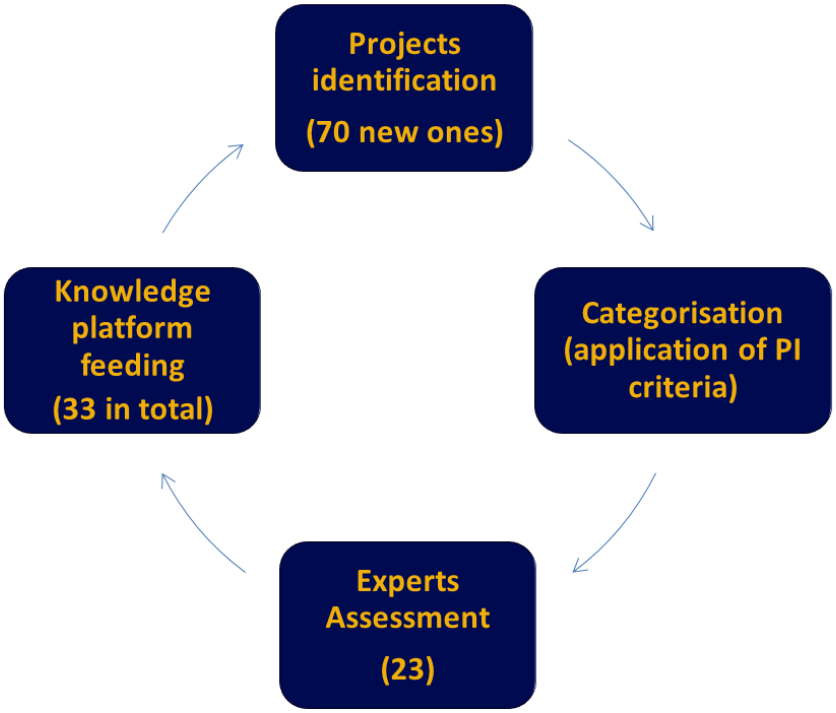


Figure 3. Projects observation process

[9] WINN, European Platform Driving KnoWledge to INNovations in Freight Logistics Deliverable D3.4 "Status of EIRAC, EGCI and ALICE research and innovation agendas report" https://cordis.europa.eu/project/rcn/105756_en.html

[10] SETRIS, Strengthening European Transport Research and Innovation Strategies D3.3 ALICE Research Roadmaps Implementation Plan and Monitoring follow up https://cordis.europa.eu/project/rcn/194894_en.html

[11] ALICE Programme of Liaison with Projects and Initiatives: http://www.etp-logistics.eu/?page_id=998

The Physical Internet Concept was outlined by Prof. Benoit Montreuil in the Physical Internet Manifesto in 2009, elaborated in the OpenFret project[12] between 2009 and 2010 with Profs Eric Ballot and Rémy Glardon and first published in 2011 by Prof. Benoit Montreuil[13]. The Physical Internet Manifesto evolved until 2012[14] when it was finalised.

The Physical Internet concept and its foundations have been evolving[15]. In 2014, ALICE, the Alliance for Logistics Innovation through Collaboration in Europe, developed its research and innovation roadmaps[16] aiming to achieve a 30% improvement in efficiency and sustainability of logistics by 2030. During this process, there was a growing convergence within the ALICE network on the following statement: *ch ch g gn g ch ch gn m G m m ch m g g ch g ch g G ch ch m ch :*

In parallel, there has been a growing interest in the Physical Internet by researchers and companies. In 2017, the first published literature review, based on publications from 2016 and earlier, found 46 articles[17]. In early 2020, ScienceDirect's scientific publications database found 300 published articles about the "Physical Internet", most of them in the last 5 years and growing year after year.

Moreover, research and innovation projects (e.g., ATROPINE, CLUSTERS 2.0, DIsPatch, ePIcenter, ICONET, LEAD, MODULUSHCA, PHYSICAL, PLANET, SENSE and ULaaDS), various companies and numerous start-ups (e.g., CONTAI, CRC-Services, FREIGHTERA, LastMile-Team, MixMove, OGOSHIP, PONERA, Stockbooking or VINTURAS) are addressing or are founded on the Physical Internet concept[18]. To the best of our knowledge, all the companies who started operations related to the PI concept are still in the market, even if none of them is yet a game-changer.

Numerous other companies, building on sharing and platform economy business models (e.g., ALIBABA, AMAZON, FLEXE, FLEXPORT, UBER), are potential service providers delivering Physical Internet like services. Additionally, developments in which retailers such as El Corte Ingles or INDITEX have launched "omnichannel" programmes where online orders can be fulfilled from any location including the full store network and distribution centres are steps towards a PI like models. SONAE, through the ICONET project, is developing and testing a dynamic multi delivery fulfilment network strategy. Another interesting example is www.todostuslibros.com, a platform in which 600+ Spanish book shops owners are pooling their book stock

12 E. Ballot, R. Glardon and B. Montreuil (2010) OPENFRET report, PREDIT, FRANCE.

13 Montreuil, B. (2011) 'Toward a Physical Internet: meeting the global logistics sustainability grand challenge', Logistics Research, 3(2–3), pp. 71–87.

14 Montreuil, B. (2012) *g G ch ch gch m*

and making this pooled stock accessible to their customers in their networks with the support of a courier company.

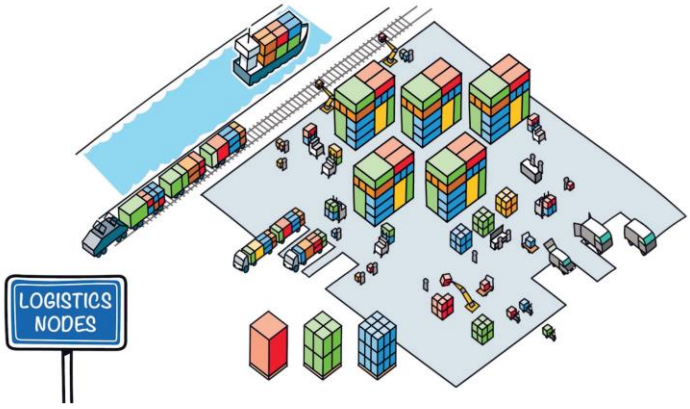
Additionally, the World Economic Forum recently published the article m g g g ch m g g mm ch referring to the term Logistic Internets. m g g G ch ch: ch ch ch ch G ch ch g m gn m g g chgg ch ch G m ch g mgg m chgg ch ch ch m chg m ch ch ch ch m ch mm ch m ch gn g G ch ch g ch g m m ch m ch ch ch g ch ch m ch ch ch ch ch m ch g m ch g ch g ch g ch m m m m g g G ch ch ch ch g ch g chg m g ch gg g g m g g m ch ch ch ch g ch g ch g ch ch ch ch ch ch ch m ch chg g ch m m ch m g g ch m g m ch Indeed, the concept of the Logistics Internet as defined is a synonym of the Physical Internet as it is understood in SENSE roadmap.

The Physical Internet has developed sufficient interest that annual conferences[20] are held for the international Physical Internet community involving hundreds of participants. Several explanatory videos are also available online[21].

Although the original timeframe for the realisation of the Physical Internet was the year 2050, the acceleration of digitalisation, the fast-growing sharing and platform economy, as well as the urgent need to increase transport and logistics efficiency to meet the climate change objectives, indicate that the process must be accelerated. The year 2030 is now the timeframe to have advanced implementations of the Physical Internet and 2040 the timeframe for full Physical Internet realisation.

The following sections include main examples found on Companies, Initiatives and Projects Contributing to the Roadmap realization.

3.1



Logistics Nodes are physical locations, such as depots, warehouses, Distribution Centres, ports, airports, inland hubs, and terminals or even cities in which goods are consumed, stored, transformed, handled, or transhipped from one transport mode to another. These nodes have different characteristics and settings that determine the operations and services provided (e.g., execute customs, sanitary, or other procedures, co-packing, etc.).

The roadmap defines five generations for the development of Logistics Nodes into PI nodes (see figure 4).

19 Hvid Jensen, H. (2020) m g g g ch m g g mm ch World Economic Forum.

20 www.pi.events

21 ALICE Youtube channel includes several explanatory videos. https://www.youtube.com/channel/UC-1_szlCtw6ZTQC9PmfK9Ag

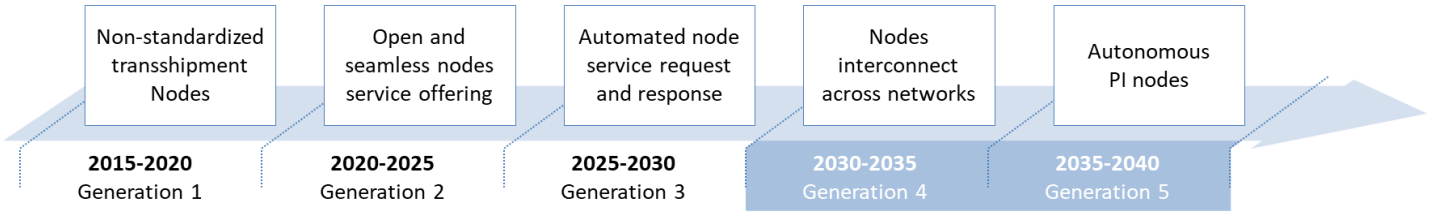


Figure 4. Overview on generations (possible development steps) for Logistics Nodes

In the following table, the current state of play in terms of projects and initiatives is benchmarked against the expected evolutions.

One of the main key enablers for a successful realization of the Physical Internet (PI) scenario is a modular box that meets all requirements of an interconnected logistical network[22]. The Physical Internet envisions the usage of the PI-containers that are universal[23] and can be easily combined. Nowadays, the logistics nodes are characterised by structured processes dealing with a multitude of well-known and used standard loading units. Pallets and containers have enabled huge efficiency gains at the levels they can be used (e.g., maritime transport, palletised goods transport). However, the interaction between different units (e.g., pallets and maritime containers, maritime containers and road transport) as well as transhipment operations between transport modes (e.g. non-crane proof trailers and swap bodies, lack of alternative transhipment technologies) is far from being standard and seamless creating inefficiency and barriers for a truly integrated transport system[24]. In FMCG and retail, different boxes and trays are used currently in proprietary networks of retailers. It is crucial to achieve a harmonized and interconnected family of different modular load units and transport carriers that can be smartly used and combined (see CLUSTERS 2.0 project). Indeed, CLUSTERS 2.0 project has further investigated this subject and proposed the New Modular Logistics Unit (NMLU)[25]. Additionally, AEROFLEX project is exploring how to better link European Modular Systems for Road and Intermodal transport as highlighted in a project webinar facilitated by SENSE project[26]. Additionally, PONERA has developed a unique logistic solution based on an innovative design of pallets' system which decreases packing costs by minimizing the transport inefficiencies. The flexibility of this innovation makes it applicable to a wide range of industries. The company's modular

[22] Landschützer, C., Ehrentraut, F. & Jodin, D. (2015) "Containers for the Physical Internet: requirements and engineering design related to FMCG logistics" Logist. Res. 8: 8. doi:10.1007/s12159-015-0126-3

[23] Montreuil, B. Ballot, B. Tremblay, W. (2015) m chg m g G ch ch m g g m g ch Progress in Material Handling Research: 2014, 13, MHI, 2015, International Material Handling Research Colloquium, 978-1-882780-18-3. ffhal-01487239f

[24] ACARE, ALICE, ERTRAC, ERRAC and WATERBORNE. (2017) A truly Integrated Transport System for Sustainable and Efficient Logistics. http://www.etp-logistics.eu/?p=1298

[25] Clusters 2.0 project D.4.1 Specification sheet of designated NMLU

[26] AEROFLEX – Aerodynamic and Flexible Trucks for Next Generation of Long Distance Road Transport webinar http://www.etp-logistics.eu/?p=3703

pallets can be connected in 4 directions which enables them to form any configuration to provide a unit with a desired surface area.

Out of the Modulushca[27] project, the concept of modular logistics units in shared co-modal networks was developed. Promising market implementations (i.e. Smart Box[28]) that could lead to developing a market standard for boxes in shared multi retailers multi manufacturers networks are to be launched in 2021. Additionally, in the urban delivery environment, several modular solutions are being used by the different courier companies in connection with cargo bikes and other modular systems[29].

There are several systems in use for transhipment of goods across transport modes being the use of cranes the more common ones used for transhipment of containers even in an automated way[30].

However, for other transport units used in the intra-European transport, the use of cranes is extended but not enough, as most of the trailers for intra-European transport in Europe are not craneable. This poses further complexity to use intermodality. To address this, multiple solutions have been developed[31] but still with no wide adoption. Less than Wagon Load[32] and CLUSTERS 2.0[33] projects are addressing this challenge.

In the urban domain, CONTAI is proposing a system for easy transhipment but still not in production and Rydle is proposing a modular system for urban delivery hubs.

Additionally, Mixmove X-Dock is an innovative solution for digital cross-docking operations, making it possible to handle the increase in volume with the same capacity you have today.

There is limited literature and initiatives on this topic for which still complex interoperability and integration processes are required. FENIX and FEDERATED projects are however developing the concept of a federated network of platforms as defined by the DTLF[34].

Under this line of action, different initiatives are in place for different applications:

Ports have developed their Port Community Systems (PCS) as tools for connecting processes in the cluster ports and are evolving these PCS as platforms to integrate services offered in the cluster community[35]. Additionally, and connected to PCS or the cluster community, Data Platforms

[27] m m g g g g ch m m ch m https://cordis.europa.eu/project/id/314468 and https://knowledgeplatform.etp-logistics.eu/course/view.php?id=210

[28] The GS1 SMART-Box in manufacturers to retail. Matthias Haubenreißer. IPIC 2019. (link)

[29] https://rytle.de/?lang=en to be further developed in ULaaDs project

[30] https://www.porttechnology.org/news/ect_the_worlds_first_automated_terminal/ for more information: (www.ect.nl)

[31] Innovatrain http://www.innovatrain.ch/, Cargo Beamer: http://www.cargobeamer.eu/, Mobile transhipment with Flexiwaggon: http://www.flexiwaggon.se/news/92-video.html, Compact Terminal with horizontal transhipment platforms: http://www.intermodallogistics.co.uk/wpcontent/uploads/2010/07/terminal_gate_verona_englisch-v2.pdf, Nikrasa: http://www.nikrasa.eu/en/home.html and Metrocargo: http://metrocargoautomazioni.it/index.php/en/metrocargo/technology

[32] LessthanWagonload project Deliverable: 2.2 Presentation of the pro&contra's of the different options.

[33] Clusters 2.0 Deliverable 4.4 Reliable train-truck horizontal transhipment Prototype – Interim Evaluation Report

[34] See DTLF (www.dtlf.eu)

[35] See for example Port Base (https://www.portbase.com), Valencia Port (https://www.valenciaportpcs.com/en/), Barcelona (http://www.portic.net/),

are created in both ports and airports[36]. However, these services relate to the main activities in which the Port/airport authority participates or has a mandate around (e.g. access, slot bookings, customs processes) but do not include the services provided by the variety of stakeholders in the node.

It is unusual to have these systems in hinterland hubs unless they are connected to the maritime/waterways segment. However, an example in this direction to be taken as reference model, is represented by the Cluster Community System (CluCS) that has been developed by Clusters 2.0 project and that will be implemented in the market through the FENIX project. CluCS is a platform that supports Logistics Nodes to offer services to their users in an open and digital way. This platform aims at establishing co-ordination and collaboration between different stakeholders and nodes in a proximity network providing the required visibility and operations management capabilities to all services offered by the nodes. To become part and partner of the CluCS network, each stakeholder involved in the node, such as LSPs, shippers and terminal operators, needs to:

- integrate the existing IT systems with CluCS (collaboration IT platform)
- Send/share their service catalogues
- Send/share their demand for transport needs

agreements provide companies (customers of logistics companies) an opportunity to reduce their logistics costs by as much as 12 to 15%[37]. According to the World Economic Forum white paper, companies implementing these agreements could save close to $500 billion in operating costs. This could have a negative impact to the tune of $35 billion in operating profits for logistics companies. However, shared warehouse capacity could benefit the society through a reduction in emissions by 1.3 billion metric tons. The study assumed that 20% of the market could move into shared warehouse agreements by 2025. As an example, FLEXE, Stockspots and Stockbooking are platforms for open and shared warehouse space. However, the integration of new partners and users is still time consuming due to the lack of established protocols and standardised APIs and procedures. Moreover, ES3 developed the concept of open access to warehouse space. ICONET project[38] has further defined the process steps for subletting of warehouse space, the Business Model Canvas and including some additional examples.

Additionally, it is worth to mention Eco2city[39], a group that has been working on connecting local city logistics initiatives in Europe. Today, Eco2city is the coordinator of the Goodhubs connection between the local initiatives in Europe. The founding principle of Eco2City is to decouple and rearrange information, financial flows and physical flow, in order to generate optimisation especially for small volumes in a network of shared warehouses in the city context.

No examples have been found to date.

[36] Nxtport (https://www.nxtport.com/), BRUCLOUD (https://brucloud.com/)

[37] Global Logistics by Donald Walters referenced in WEF (2016) Digital Transformation of Industries Logistics Industry White Paper

[38] ICONET project Deliverable D1.2 PI business and governance models (2019).

[39] https://www.eco2city.eu/ See Good Hubs 500: https://www.pi.events/IPIC2019/sites/default/files/downloads/d3-plenary-20190711--ipic-eco2city.pdf

3.2

Logistics Networks include the Logistics Nodes and the (transportation) links and services connecting them. Logistics Networks are currently mostly under the direct control of a single company whether a shipper, a retailer, a logistics service provider, or a freight forwarder reaching their value chain (i.e., customers and suppliers) but with no visibility beyond the boundary of its supply network. Logistics Networks may involve many companies under the orchestration of a single company in charge of inventory management, transport planning, routing, and capacity management. Networks are expected to build seamless, agile, flexible and resilient, door-to-door services consolidating and deconsolidating all shipments within a logistics network in which all assets, capabilities and resources are seamlessly visible, accessible and usable within the logistics network to make the most efficient and effective use of resources. These logistics networks could be potential physical intranets (or PI based logistics networks) if they are compliant to PI fundamentals (e.g., full visibility and accessibility of resources and capabilities) to serve a pooled demand from a broad portfolio of customers.

The roadmap defines five generations for the development of Logistics Networks into PI networks (see Figure 5).

Figure 5. Overview on generations (possible development steps) for Logistics Networks

The emergence of platforms such as INNTRA for booking shipping services has been consolidated recently in the shipping industry. More than 850,000 container orders per week are initiated on the INTTRA platform, representing over one quarter of global ocean container trade. The platform offered by INNTRA is suitable to relate to Transport Management Systems, Port Systems, Freight Forwarding tools, therefore paving the way for potentially global protocols for shipping thus strengthening flexibility and resilience of transport networks.

Other companies, examples of freight transport and logistics platforms are:

full digitalisation of the processes and the usage of artificial intelligence allow to dynamically react to demand changes or disruption of network status. Macingo is a marketplace for freight transport, combining demand and offer for road transport in Italy. Easy2trace is a digital platform for freight tracking, providing full visibility of transport status and real time alerts, thus enabling optimisations of flows and co-loading as initial milestone to horizontal cooperation. Similarly, TRANSPOREON[40] is a cloud-based transportation sourcing and management platform providing real time visibility through SIXFOLD and integrating 1200 shippers and 100.000 carriers in 100 countries. Other examples are: OGOship and Shipcloud (cloud based shipping platform connecting retailers to all carriers), Roadie (matching transport demand with idle capacity), Bringg (Multi-fulfilment last mile delivery platforms) and Lastmile Team (that offers a platform for last mile e-commerce fulfilment based on their partnership with many different last mile services providers). The common aspect of these companies is to deliver aggregation platforms able to support the digitalisation of logistics processes (booking, planning, administration) of a supply chain. Turvo is a multi-enterprise collaborative platform specifically designed for the global supply chain. The Turvo platform connects people and organizations across the supply chain, allowing shippers, logistics providers and carriers to digitally transform their workflows with cloud-based software and mobile applications.

Additionally, Flash is a company working on the concepts of the Physical Internet to reduce dead mileage as also does CONUNDRA. From the point of view of PI Network, the full digitalisation of the processes and the usage of artificial intelligence allow to dynamically react to demand changes or disruption of network status.

In the following table, the current state of play in terms of projects and initiatives is benchmarked against the expected evolutions towards the Physical Internet.

m ct Most logistics service providers, multimodal transport carriers and freight forwarders could leverage their actual networks to provide these services. The limitation is most of the times imposed by the requirements of the shippers that predefine or determine certain constraints in which the services are provided (e.g., mode of transport, etc.). There are only a few examples of shippers working with flexible lead times and transportation volumes against a monthly/annual demand but not yet reported in the literature. Moreover, some freight carriers apply flexible services but in a rudimentary way so they can advance time sensitive transport products reaching agreements with users upon a discount. m m r c t r m Some companies are developing the so-called Control Towers (e.g. DHL, GEODIS or SESE)[42] providing customers: Online & real time visibility, cargo monitoring, contingency plans, network optimization, performance management and full product visibility. This is however offered as a service for individual

[40] https://www.transporeon.com/en/

[41] Service quality should be understood in a broad manner as a set of requirements to apply to the unit load : it covers not only lead-time, but also chock, temperature, packaging…

[42] DHL (https://www.resilience360.dhl.com/solutions/logistics-control-tower/), GEODIS (https://geodis.com/us/vertical-market/industrial/control-tower), SESE (https://www.gruposese.com/en/about-us/control-tower-en/)

companies their demands are not pooled with the demand of other companies, in the logistics network of the logistics service provider, that could bring further benefits.

3. ı ı m ı ı ı ı ct ı ct ct ı ct ı ct ıct ı ı ı ct ı This development will follow the current synchromodal systems of forerunners like ECT-Rotterdam European Gateway Services (EGS). EGS can be considered as pioneer solution for logistics network generation 2 (operational Synchromodality).

g ch g g g ch ch m ch ch g chg mg ch m g ch chch g ch g ch chh ch g ch chch m ch ch g ch gch m ch m m ch g ch mmg gn m ch ch g ch g gh chg ch m Advanced services are offered in pooling networks (e.g. FM LOGISTIC[43]).

However, the reach and scope as well as the capability to pool offer and demand in the logistics network is very limited and arranged in non-standardized processes.

G ch m g mggm ch mch m m gn m g g ch m m ch m ch ch ch chg m chch g ch g ch m mggm g ch mmch m g g ch m m g m chh m m ch mggm g m chch chg m ch ch g ch g mch m m ch g ch m mggm ch g g g g m g ch m mggm g ch g ch m ch ch ch m gh m g g ch g ch m g ch

Some advanced models combining several of these elements above, still in a very limited scope, are provided by Mutual Logistics, providing supply chain management, co-packing and transport services and the development model based on the mutualisation of logistics assets in an open logistics network in which customers are pooled. These innovative schemes for sharing Storage and Transport capacities allow customers to structurally reduce their costs and benefit from high-quality service. Similarly, MIXMOVE is a cloud logistics solution that enables an open and collaborative network across multiple systems. The MIXMOVE match solution offers intelligent, horizontal collaboration between shipper, carrier, hub, distributor, and the end customer. It does not require any changing in the existing systems. The Match solution aims at increasing load factors to increase efficiency and reduce costs, while at the same time creating more sustainable supply chains. This logistics process is based on splitting logistics units down to parcel level so that cross-docking can be used to produce logistics units with vastly improved load factors. It provides the necessary functionalities to run the logistic network, such as TMS, WMS, and a supply chain dashboard. The solution is suitable for shippers and logistics service providers with complex logistics operations and high volume. CRC Services allows industrials of all sizes to consolidate their orders for batches of 1 to 15 pallets, already prepared and intended for several of their customers (multi-distributors) of the same geographical area, on a feed router, physical platform called "CRC", close to the final delivery sites. The manufacturer thus delivers all its flows for a given region, to a single point of consolidation. It decreases by a factor of 10 to 30 the number of lines to deliver, while increasing the loading factors and reducing inventory levels due to the more frequent deliveries. CRC can be seen both as a new service provider and as a network. CRC has integrated a freight consolidation model in its cross-dock activities as a network flow model for optimising outbound vehicle tours based on the flow of goods handled in the cross-dock operations. The combination of

43 More information: https://www.fmlogistic.com/eng-gb/Our-business/Supply-Chain-Optimisation/Pooling

these two models leads to greater efficiency in freight operations and lower carbon emissions. These models are now integrated into CRC's IT system.

OGOship is an easy and flexible logistics solutions for growing online stores. It makes possible for small companies to easily outsource their entire physical goods warehousing and logistics. The company provides the entire warehousing and logistics package: warehouse and maintain stock, send goods globally with the best possible freight forwarders, and provide a variety of added value services usually available only for larger retailers by pooling smaller retailers into their logistics network. Additionally, allows small retailers to position inventory close to the consumption markets, similarly to the first PI video[44]

SONAE, through the ICONET project, is developing and testing a dynamic multi-delivery fulfilment network strategy. Another interesting example is www.todostuslibros.com, a platform in which 600+ Spanish book shops owners are pooling their book stock and making this pooled stock accessible to their customers in their networks with the support of a courier company.

Additionally, companies playing a role in freight and logistics such as Brambles are leveraging collaborative solutions to reduce the cost and impact of their operations in combination with customers and partners[45].

3.3

System of Logistics Networks towards the Physical Internet involves individual logistics networks that are interconnected. Therefore, the assets, services and resources of the individual logistics networks can be accessed by the logistics networks owners and users. The System of Logistics Networks forms the backbone of the Physical Internet and require secure, efficient and extensible services for the flow of goods, information and finances across logistics networks.

The roadmap defines five generations for the development of System of Logistics Networks Towards the Physical Internet (see Figure 6).

[44] https://www.youtube.com/channo ref0.008871 0 595.32 841.92 re W n BT/F1 11.04 Tf1

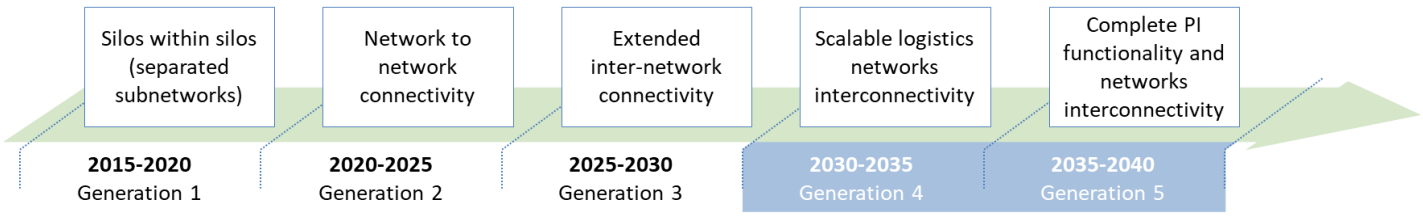


Figure 6. Overview on generations (possible development steps) for System of Logistics Networks

The current "as is" state of global freight transport is highly fragmented with individual organisations either forced to develop their own transport networks or outsource this activity to a freight forwarder. Freight forwarders, in turn, have either developed their own global networks to manage multiple customer requirements for transport or bonded together to form partnership networks in which local partners perform parts of the transport operation and then hand over the shipment to a partner organisation for further movement of the freight. Still, these global networks are not interconnected, and the goods cannot seamlessly flow across them. Asset owners, who may also be freight forwarders or shippers, generally partner with other asset owners to extend their services to different modes or regions. The complexity of these overlapping and interwoven networks demonstrates both the difficulty in moving freight on an international scale and the opportunity for rationalising linkages through the development of agreed protocols and their adoption by existing international network organisations.

Other network operators, such as the smaller freight forwarders and asset owners that join in what are called groupage networks[46]or pallet networks[47], parcel companies, and even large e-commerce companies such as Amazon[48], JD.com, and Alibaba. Once more, each of these entities has developed inward focused and proprietary approaches to addressing these problems precluding the more open interconnection service envisioned by the PI.

. The Universal Postal Union, the oldest UN agency, oversees the definition and implementation of rules for all parties involved. This system works very well across the world and is notably and widely used by Chinese suppliers to ship items sold on marketplaces all over the world. However, it also suffers from several major drawbacks. It is limited to state-owned operators (in most cases) and a limited set of universal services not at all designed to cope with the needs of today's businesses.

In the following table, the current state of play in terms of projects and initiatives is benchmarked against the expected evolutions towards the Physical Internet. As is highlighted, very little initiatives and projects are addressing this area of work in practice. Numerous projects have addressed this issue by proposing platforms to connect stakeholders and services (i.e. AEOLIX, CO-GISTICS, ICARGO, ICONET, LOGISTAR and SELIS) with promising research and innovation results but not yet implemented in practice. CEF projects FENIX and FEDERATED are running and aim to fill in the gap between R&I and real operations under the umbrella of DTLF.

[46] See for example: http://www.dgs-transports.fr/en/domestic-and-international-network

[47] See for example: (https://www.palletways.com/about-us

[48] See for example: https://services.amazon.com

I ch chchm ch mch ch I I m m g g ch m chg chm ch ch chm ch ch ch g ch m ch ch g ch ch

COBILITY is a decentralized platform for transport logistics, where both data and governance are organized using blockchain technology. The value brought to business processes of logistics companies is secure data exchange, guarantee for the authenticity of data as well as process automation. In addition, users (which may be a community of logistics companies working within as supply chain) can regulate and control the platform, meaning implement governing rules. The COBILITY platform offers standardized “plug & play” usable service, while legacy services of the participants can be connected via standard interfaces. This is a good example of a product enabling internal connectivity to a network, standardising and therefore opening processes and services of a logistics company to a logistics network, therefore constituting the initial milestone for PI System development.

T-Mining offers a Decentralized Technologies Framework (DTF), to build decentralized applications (dApps) fast and cost-efficiently and to set up and run decentralized platforms more easily. This Framework is tailored for Supply Chain use-cases, including Maritime, Port, Logistics, Insurance, and Transport.

T-Mining successfully implemented several use-cases applying decentralized technologies such as Blockchain, together with international customers like MSC, PSA and the Port of Antwerp, improving and securing the physical and document flow. The company therefore rather than providing services (like platforms described in PI Network section), supports the conceptualisation and the design of decentralised platforms, where data exchange is managed innovatively (with distributed ledger), therefore ensuring trusted and secure digital flows. This is a very relevant example of PI System enabling vertical inter-network connectivity.

The interconnection and operational protocols being developed by the ICONET project are expected to demonstrate the foundational management and control approaches appropriate for PI paradigm in the movement and storage of freight. The ICONET protocols may form the basis for future work on PI system level control necessary for the rapid, secure, and robust rollout of the PI on a broad geographic basis". Additionally, projects such as PROKAPA, SELIS were also investigating secure protocols and services.

I chg ch mch ch I I m chg m ch ch g ch ch g chm m ch m m ch gm chg chg g mg ch ch chch g gch ch ch g ch ch g chm m ch m m g g ch

CLUSTERS 2.0 had the ambition to achieve a significant step forward in the European Transport performance through a hyper connected network of logistics hubs and clusters and worked for overcoming barriers and enabling collaboration in the Logistics domain. The overall project concept is focused on communities grouped into clusters which is interesting for PI System Level functionality roadmap. The CargoStream solution works on bundling of freight volumes ch g ch m g ch g ch chg ch ch ch m g ch mm introducing the concept of a neutral and open platform.

By providing a (virtually) successfully demonstrated scalable and transferable tool, DISpATch project will provide one of the pivotal building blocks to realize a swift and data-based decision-making tool

supporting the PI concept that is based on the nodal efficiency and ability to route goods onto the most suitable next leg in the network.

ıcht ı chg ch m chch ch ch ch g ch m ch ch ch g ch m ch ch m ch ch m chg gch chggh m m g g m g ch chg m g g m ch

4. ı ı ı ı ı mmm ch g ch chg ch m ch m m ch ch ch ch ch m m g mm m ch m m g m gm ch g ch m ch ch m m ch m ch m ch ch ch mm ch m ch chchg ch ch

3.4

This area describes the main requirements to access the Physical Internet through a logistics network. It also includes different steps and mind shifts required to adopt Physical Internet concepts.

In current practice, we see relatively small networks exist with a limited scope of activities (pooling of cargo, limited to sectors, etc.). Many companies are not able to organise networks on their own or get access to existing networks. This especially is true for SMEs. For big companies, there are still many silos in terms of access to services and offerings.

One of the main objectives is to show companies within their current business setting that cooperation, is not only a good idea but it is also easy to execute and implement directly or through logistics service providers. It is also important to help companies to make first steps in this respect. There are new ways of sharing assets, services and resources between stakeholders in vertical integrated supply chains and horizontal collaborative networks.

Platforms are evolving fast and the need for further integration of networks is already clear and not alien to logistics. It is important to develop mechanisms to support companies in defining their role and their business model in a connected society.

This requires insight into new business models, easily accessible tools that enable integration in networks, new skills for personnel that is able to understand the access to new forms of integrated networks in the logistics sector.

Access and adoption of PI refers to the concept of facilitating the uptake of large cooperative initiatives, demonstrating increased efficiency than isolated businesses. The initial experimentation of PI was conducted in analysing combined flows of large retailers , in France. Similar initiatives take place in the Benelux: TransMission a joint venture of independent transport and distribution companies in the Benelux, consisting of 18 partners working together under one name and with one joint IT system. In the Netherlands, Stockspots, the marketplace for warehousing & fulfilment

services. In particular, OGOship is an excellent example of how a company can provide access to SMEs (retailers in this case) to a broader network. project is developing 3 pilots demonstrating specific applications of the Physical Internet. New projects ePIcenter and PLANET have started recently and will further develop this area.

The I N allows the Physical Internet Community and interested stakeholders to find relevant information on the Physical Internet (i.e., the market initiatives and companies, projects and programmes supporting Physical Internet implementation, main physical internet reference documents as well as the contributions to the International Physical Internet Conferences). It facilitates the engagement of individual stakeholders to share their experiences and projects in the field of Physical Internet. The main projects, companies and references gathered and included in this document form part of the Knowledge Platform.

A collection of videos[50] and dissemination materials[51] of the Physical Internet concept that serve as an introduction to the concept as well as the meaning of the concept in different contexts such as cities and ports.

A _____ was developed by MINES-ParisTech to represent a transport market where players try to win transport orders based initially on a traditional market. Players are next given the possibility to reallocate their orders to a central node that represents the simplest type of interconnection. The game demonstrates the advantage in terms of gains for those who practice interconnection[52]. A study of players' behaviour and the reduction of barriers to interconnection has been undertaken with TU-Delft.

The roadmap defines five generations for the development of Access & Adoption Towards the Physical Internet (see Figure7).

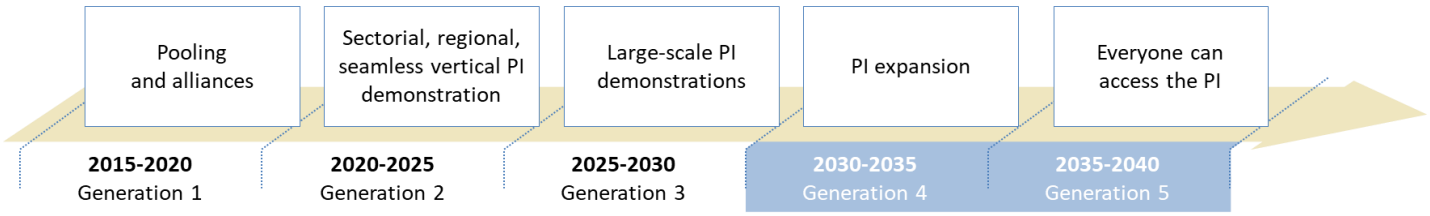


Figure 7. Overview on generations (possible development steps) for Access and Adoption

1. _____ I m m m g g ch m ch m m g g ch m _____ I I m ch m ch mg m m g g ch m ch g ch

[49] Physical Internet Knowledge Platform: https://knowledgeplatform.etp-logistics.eu/

[50] Physical Internet videos: https://www.youtube.com/watch?v=14wAEP1nXBY&list=PLxdsc7eCmCO55wBV0Wm6v1Rk7OEjHNi2m

[51] SENSE Project Deliverable D4.6 Report on Dissemination, Communication and Stakeholders Engagement Activities and reviewed Communication and Dissemination Plan.

[52] Lafkihi, M., Pan, S., Ballot, E., 2019. The Price of Anarchy for Centralising or Decentralising Freight Transport Organisation Through Serious Gaming. IFAC-PapersOnLine. 52 (13), 1657-1662. https://doi.org/10.1016/j.ifacol.2019.11.438.

Document elaborated with the support of SENSE project has received funding from *ch m ch gn m g m chch*
No 769967

- Public lead. A central body plans and organises the Physical Internet under the supervision of governments that consider transport and logistics as a universal and public service/infrastructure, even if services are provided by companies in a fully regulated framework.
- Industry lead. Big corporations integrate with each other's and/or build strong logistics networks capabilities that afterwards open to other stakeholders as a service. More details on potential development scenarios are described by Dans (2019)[55].

The bottom-up approach is considered as the only viable one for organic growth of the PI, as it will ensure a more gradual and business-driven creation of the Logistics Network. It is also the approach that mirrors the PI progressive evolution through the generations as explained above that we can envision for the moment. It is also likely that other forms of governance appear (e.g., mixed models compared to the ones described above).

The roadmap defines five generations for the development of Access & Adoption Towards the Physical Internet (see Figure 8).

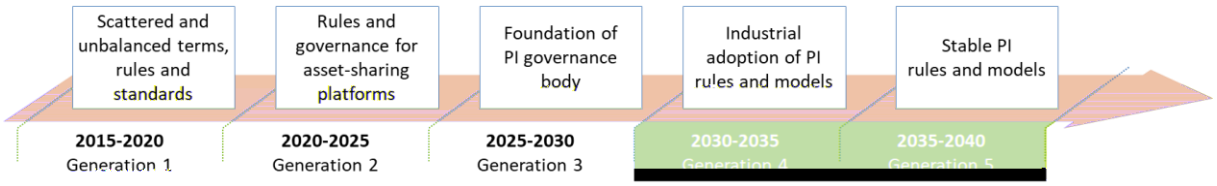


Figure 8. Overview on generations (possible development steps) for Governance

The current state of play concerning governance of Logistics Nodes, logistics networks and Systems of Logistics Networks is characterised by a scattered and unbalanced set of terms, rules, standards and regulations. There is not yet a harmonised and agreed reference governance framework. However, the Digital Transport and Logistics Forum[56] (DTLF) is developing governance models for the creation of a federated network of platforms that could indeed be a seed for a potential Physical Internet governance structure together with other initiatives such as the International Data Spaces Association. FENIX and FEDERATED Projects are working on this under the supervision of DTLF.

These initial Logistics Networks will emerge from the existing asset-sharing or service platforms that are currently growing and developing their business models, see VINTURAS for example. ATROPINE developed a "PI platform" calculating transport proposals and order-related value-added services (e.g. to compare and conclude general and long-term insurances). In ICONET, basic PI node and inter-node operational models are being developed to enable testing of the cloud-based interconnection platform and protocols. These models include basic governance forms that can serve as foundations for more robust PI governance models in the future. NEXTRUST project addressed the development of a legal framework in different scenarios (e-commerce, C-ITS / ICT), which represent a starting point to take into account in the definition and design of governance models in networks with a high level of Physical Internet development.

[55] Dans, E. (2019) The Battle For The Physical Internet https://www.forbes.com/sites/enriquedans/2019/05/17/the-battle-for-the-physical-internet/#68092e883baa

[56] www.dtlf.eu

ı ch m ch gn m g g ch g ch ch ch ch m ch ch m ch m ch g m g ch ch m ch As described, organizations and partnerships such as the International Data Spaces Association, the Digital Transport and Logistics Forum and the Digital Containers Shipping Association among others are working in this direction. Projects FENIX and FEDERATED are expected to bring some governance frameworks to practice.

2. ı **m** m g m m

ANNEX 1– START-UP SUMMARY

(http://www.amia-systems.com/) AMIA Systems is an IT company developing its own software, SIMOGGA, to visualize, quantify and optimize the operations of Production plants, Maintenance sites, Their goal is to remove the complexity of the analysis. Involve customers' teams to facilitate the change management, Accelerate the process of change and Simplify the work. AMIA Systems helps companies to improve their performance and results by triggering and championing change thanks to easy-to-use software solutions and consultancy. AMIA Systems is a Belgian-based spin-off from Université libre de Bruxelles which has developed SIMOGGA software. AMIA Systems in the PI Knowledge Platform	Logistics Nodes	Brussels, Belgium	2014	1-10
https://www.bringg.com/ Bringg is a leading delivery logistics solution, providing enterprises with the most efficient way to manage their complex delivery operations. Their powerful SaaS platform offers the real-time capabilities they need in order to achieve logistical excellence across their delivery ecosystem. Companies from the retail, grocery, restaurant, consumer goods, logistics, healthcare and services industries trust Bringg's technology to help them streamline their logistical operations for peak efficiency and create perfect delivery experiences for their customers. The platform can establish successful cost-effective operations that balance the needs of all the participants in their delivery ecosystem - from management at headquarters, through the teams in the field, and all the way to the end-customers who are at the heart of the entire process. Bringg in the PI Knowledge Platform	Logistics Networks	Tel Aviv, Israel	2013	51-200
(www.cargonexx.com) Cargonexx has completely digitalised the transport process chain and developed modern machine learning algorithms and neural	Logistics Networks	Hamburg - Germany	2016	51-200

networks to predict individual truck tours. The technology enables to minimize unused capacities by matching transports and requests reasonably. In terms of system design the platform has impact on multimodal logistics networks interconnectivity because platforms need by definition standardization that the different stakeholders could be interconnected, and this is the basis for speed, transparency and additional Services. Most impact is expected on the Network Services, Terms of Supply Chain Visibility, Operational protocols, visible mode capacity available, especially for collaboration / bundling flows / shared assets. Cargonexx in the PI Knowledge Platform				
(https://www.cobility.org/) Cobility offers blockchain solutions that enables smart contracts and information flows without any central middleman being involved. Indeed, blockchains are based on distributed network structures and transaction data is stored securely and unchangeably in a decentralized manner. This is completely controlled by the participants themselves, and therefore does not involve a new intermediary. The responsibility then lies with the users. COBILITY in the PI Knowledge Platform	System of Logistics Networks	Hamburg – Germany	2018	2-10
(www.conundra.eu) Company's mission is to help companies crack complex distribution puzzles, and to make measurable cost reductions while respecting service constraints. Conundra has only one focus: distribution optimization. This enables Conundra team to provide the solution which companies needs, starting with the OptiFlow planning and routing solution. CONUNDRA in the PI Knowledge Platform	Logistics Networks (services)	Oosterzele, Belgium	2013	11-50
(http://www.crc-services.com/) CRC Services allows industrials of all sizes to consolidate their orders for batches of 1 to 15 pallets, already prepared and intended for several of their customers (multi-distributors) of the same geographical area, on a feed router , physical platform called "CRC", close to the final delivery sites. The manufacturer thus delivers all of his flows for a given region, to a single point of consolidation. It decreases by a factor of 10 to 30 the number of lines to deliver live. CRC Services in the Knowledge Platform	Logistics Networks & Access and Adoption	France	2015	11-50

(www.easy2trace.com/) Easy2Trace is a dedicated delivery app (tracking and monitoring) designed by and for logistics professionals. Easy2trace in the PI Knowledge Platform	Logistics Networks	Paris - France	2015	11-50
https://www.linkedin.com/company/es3/about/ The company offers collaborative warehousing; its network spans the entire US. The company claims to include the world's largest automated multi-manufacturer warehouse. With revolutionary consolidation and D2S programs, ES3 is redefining customer expectations by reinventing how grocery distribution works. ES3 in the PI Knowledge Platfrom	Logistics Nodes	Keene, USA	2001	501-1000
(https://www.flash.global/en/blog/implementing-physical-internet/) Flash Creates predictability, consistency and visibility into service parts supply chain. Flash manages critical inventories and same day (2-4 hours; 90 minutes in Japan), NBD, 2nd day; 3rd day; scheduled replenishments; and NFO deliveries. Flash offers a full suite of flexible and innovative solutions including, flexible DCs, transport management, global trade compliance solutions and reverse logistics—all supported by Flash's leading critical parts system, FlashTrac and solution engineers who understand complex, critical-parts supply chain challenges and best-in-class benchmarks required for success. Flash helps companies maximizes cost efficiencies by accelerating transit and customs clearance processes, globally. Customers can meet SLA's with reduced field inventory and improve customer satisfaction, they can extend their reach into new markets with limited capital investment and no fixed cost. Flash services are provided with in-country / in-region management with local expertise to ensure quality results. Flash Global in the PI Knowledge Platform	Logistics Networks	Mountain Lakes, USa	1982	201-500
(https://www.flexe.com/) FLEXE is a warehousing company that connects organizations in need of additional space to organizations with extra space. The company's cloud-based platform powers unified warehouse sourcing and set up, while also streamlining material handling operations. FLEXE requires no technology investments, long-term leases, or process interruptions. As a result, adding storage capacity is now easier, more flexible, and more cost effective than ever before.	Logistics Nodes	Seattle - USA	2013	50-100

It reinvents warehousing and fulfillment to optimize the global delivery of goods. The company's team is dedicated to changing the logistics industry and helping clients develop structural flexibility in businesses. FLEXE in the PI Knowledge Platform				
(https://www.flexport.com/) Flexport is a licensed customs brokerage and freight forwarder built around a modern web application. Its freight service includes an online dashboard for businesses to easily understand, purchase, manage, and track the services required for global trade. Its team of logistics experts lets focus on core business by ensuring goods arrive at fulfillment/distribution centers on time and at the lowest cost. Flexport's mission is to fix the user experience in global trade and bring the world free trade through technology. FLEXPORT in the PI Knowledge Platform	Logistics Networks	Parsippany - USA	2013	1001-5000
(https://www.freightera.com/) Freightera is an online freight marketplace that makes freight shipping transparent and easy. It allows manufacturers, distributors and wholesalers to instantly find the best all-inclusive rates from hundreds of LTL and FTL carriers in Canada and US, online, 24/7. It matches empty trucks with shippers looking for great deals and removes inefficiencies of traditional broker freight, eliminating untold amounts of wasted time, money and energy. Freightera in the PI Knowledge Platform	Logistics Networks	Vancouver, Canada	2014	11-50
(https://www.inttra.com) INTTRA is ocean shipping's leading e-marketplace where companies go to ship efficiently and gain insights to grow. Backed by over 50 carriers and the world's largest network of ocean shippers, INTTRA technology changes the way our industry connects and does business with one another. More than 22% of the world's trade begins at INTTRA – and with unique visibility into 35% of global container traffic, only INTTRA users can access the big picture insights needed to better collaborate, share knowledge, and manage shipments around the world. INTTRA in the PI Knowledge Platform	Logistics Networks (services)	Parsippany - USA	2000	101-250

(https://www.lastmile.team/) The company provides technology solutions to urban goods distribution congestion, emissions and cost problems. Tools that help cities and companies to design, implement and manage disruptive and sustainable urban goods distribution models. Manage any public-private entities partnership, cooperative, collaborative and/or coopetitive formula of current transport service providers. Bridge the digital divide and favors the inclusion of entities of the Social and Solidarity Economy. Last Mile Team in the PI Knowledge Platform	Logistics Networks	Madrid- Spain	2010	1-10
(https://www.macingo.com/) Macingo is the Italian community of sharing of bulky goods transport. Macingo.com is a free platform allowing to easily and cheaply organize and purchase a transport of any kind. By favoring the groupage of goods, Macingo helps reduce fuel consumption and CO2 emissions into the atmosphere. Macingo in the PI Knowledge Platform	Logistics Networks	Reggio Calabria - Italy	2014	11-50
https://www.mixmove.io/) MIXMOVE provides a suite of logistics solutions for intelligent, horizontal collaboration between shippers, carriers, hubs, distributors and the end customers. The MIXMOVE solution facilitates increased load factors by enabling logistics hubs to consolidate/reconstruct unitized cargo (parcels, pallets, etc.) for best possible use of transportation resources. The solution offers a dashboard for visibility and performance assessment. The solution is suitable for shippers and logistics service providers with complex logistics operations and high volume. MIXMOVE in the PI Knowledge Platform	Logistics Nodes & Logistics Networks	Fornebu - Norway	2017	10-50
(http://mutuallogistics.com/) The company offers solutions related to supply chain, transport, and co-packing by applying multi-customers operations able to share asset and to create economy of scale. Mutual Logistics in the PI Knowledge Platform	Logistics Networks	Caen - France	2007	201-500

(https://ogoship.com/) OGOship is an easy and flexible logistics solutions for growing online stores. It makes it possible for small companies to easily outsource their entire physical goods warehousing and logistics. The company provides the entire warehousing and logistics package: warehouse and maintain stock, send goods globally with the best possible freight forwarders and provide a variety of added value services usually available only for larger retailers. OGOship in the PI Knowledge Platform	Logistics Networks & Access and Adoption	Vantaa – Finland	2011	11-50
(www.poneragroup.com) Ponera Group produces modular pallets that can be connected in 4 directions which enables them to form any configuration to provide a unit with a desired surface area. PONERA in the PI Knowledge Platform	Logistics Nodes	Lausanne - Switzerland	2019	1-10
(https://www.roadie.com/) Roadie is the first on-the-way delivery network. The app-based community utilizes unused capacity in passenger vehicles, connecting people with stuff to send with drivers already heading in that direction. Roadie works with top retailers, airlines, and grocers to provide them with a faster, more efficient, and more scalable solution for same-day and last-mile deliveries nationwide. Since the launch in 2015, the company delivered everything from cupcakes to couches to customers in more than 9,000 cities nationwide — a larger footprint than Amazon Prime.	Logistics Networks	Atlanta, USA	2014	11-50
(http://www.sennder.com) Sennder is a leading digital road freight forwarder in continental Europe, linking large commercial shippers with small freight carriers. With its in-house-developed platform, Sennder provides a new level of automation, transparency and efficiency to the European €300 billion road freight market, which until now has been dependent on paper, phone and fax and characterized by multi-layer subcontracting. Sennder's digital connection to over 10,000 vehicles in all segments allows for almost unlimited capacities, no matter what time of the day. Sennder digitalizes the truckload-shipping ecosystem by providing mobile apps to drivers, fleet management tools to carrier managers and logistics management solutions to shippers. Real-time booking, a designated contact person always on hand,	Logistics Networks	Berlin, Germany	2015	501-1.000

as well as precise live tracking, bring full transparency to any logistics supply chain. By integrating directly with the shippers' Transport Management and Freight Management Systems via APIs and by cutting the multiple middlemen, Sennder increases efficiency and reduces cost for all stakeholders. Sennder in the PI Knowledge Platform				
(https://www.shipcloud.io/) Shipcloud offers a simple and uniform interface to all relevant carriers in Germany. Thanks to the modern RESTful API and 50+ integrations into the leading store, ERP and inventory management systems, all shippers can easily integrate services into their shipping process. Shipcloud offers total freedom in the choice of carriers, while saving time and money. Shipcloud in the PI Knowledge Platform	Logistics Networks	Hamburg, Germany	2013	11-50
(https://sixfold.com/) Sixfold is Europe's leading real-time logistics visibility platform. Shippers and carriers seamlessly integrate their transport and fleet management systems with Sixfold to know where their goods are and when they will arrive — with minimal manual work from either party. The core of Sixfold's platform is the prediction engine that augments incoming raw telemetry, map and weather data with powerful machine learning algorithms, providing proactive alerts on any shipment delays. Up to € 500 million worth of goods are monitored each day using the Sixfold platform, enabling customers and shippers to gain business advantage and to better plan operations. Sixfold supports customers in more than 25 European languages and data distributed on its platform is fully secure and GDPR-compliant. Sixfold in the PI Knowledge Platform	Logistics Networks	Vienna, Austria	2017	51-200
(https://portal.stockspots.eu/index.html) Stockspots is a Warehousing Network specialised in on-demand warehousing. Its marketplace connects shippers looking for warehouse capacity and fulfilment services with logistics service providers who have it available. The logistics service provider thus makes extra returns from its (temporary) vacancy and thereby contributes to the fight against warehouse waste. Shippers can organize their warehouse and fulfilment needs quickly and cost-efficiently without long-term contracts or fixed prices. Based on pay-per-use and simple	PI Nodes	Breda, (The Netherlands)	2007	2-10

technology, the company makes the collaboration between shipper and logistics service provider more reliable, flexible and faster. Stockspots in the PI Knowledge Platform				
(https://www.stock-booking.com/) Stockbooking is a professional marketplace designed for on demand logistics services. They connect storage place suppliers with any company in need of temporary or long-term storage services. StockBooking in the PI Knowledge Platform	PI Nodes	France	2016	1-10
(https://t-mining.be/) The company enables logistic platforms to develop blockchain-enabled software solutions easier & faster by leveraging a number of ready-made components. The smart contract framework allows platforms to implement the benefits of decentralization and thus enable innovative applications. Existing platform operators can therefore extend their service package to their community, based on the T-Mining framework. T-MINING in the PI Knowledge Platform	System of Logistics Networks	Antwerp – The Netherland	2016	2-10
(https://turvo.com/) Turvo is the world's multi-enterprise collaborative platform specifically designed for the global supply chain. The Turvo platform connects people and organizations across the supply chain, allowing shippers, logistics providers and carriers to digitally transform their workflows with cloud-based software and mobile applications. The technology unifies all systems, internal and external, providing one end-to-end system of record set for all operations and analytics, while eliminating redundant manual tasks and automating business processes. Turvo customers include some of the world's largest, fortune 500 logistics service providers, fast growth shippers and many brokers large and small all rely on Turvo. Turvo in the PI Knowledge Platform	Logistics Networks	Sunnyvale, USA	2014	201-500
(https://vericrea.com/) Member of Finnish CONTAI Team, CONTAI develops last-meter city logistics and mobile city hub concepts and IPRs. CONTAI has readiness for full autonomy based on the capability to self-load smart containers and EUR pallets from the ground level. Any vehicle can be used	PI Nodes	Sastamala, Finland	2019	2-10

CONTAI in the PI Knowledge Platform				
(https://www.vinturas.com) Vinturas traces and shares vehicle information in order to significantly improve business processes, make a meaningful contribution to the reduction of fraud, and contribute to a more sustainable world. By sharing reliable data with each other in a trusted environment, all contributors to their platform will benefit from the value collectively generated. Vinturas in the PI Knowledge Platform	Logistics Networks System of Logistics Networks PI Governance	Leek, The Netherlands	2019	2-10

ANNEX 2 PROJECTS ASSESSMENT

NEW PROJECTS TO EVALUATE 81

AEOLIX

Architecture for EurOpean Logistics Information eXchange

Grant agreement ID: 690797

Start date: 1 September 2016 - End date: 31 August 2019

Funded under: H2020-EU.3.4.

Overall budget: € 16 220 106,25 - EU contribution: € 16 220 106,25

http://aeolix.eu/

https://cordis.europa.eu/project/id/690797

how to standardise and scale-up such an architecture provided that similar concepts have already been experienced in previous research efforts and still remain applied in limited clusters.

Most relevant features developed by the project and relevant for Logistics Networks are Enhanced supply chain visibility, Automation of data flow, CO2 calculation at supply chain level; a general presentation is reported in the AEOLIX project vision (https://aeolix.eu/wp-content/uploads/sites/11/2018/11/AEOLIX-Vision-Document-Nov-2018.pdf).

AEOLIX worked on a platform business model (PBM) for identifying how to create value from the developed solutions. In addition, the consortium is claimed to initiating a "AEOLIX Not-for-profit legal entity" (https://aeolix.eu/wp-content/uploads/sites/11/2018/03/Vision-Document-February-2018-updated.pdf) in charge to supervise the overall management of the IT and operational infrastructure but no information is available about this body after the termination of the project (June 2019).

The AEOLIX experience leverages on the bottom-up model to create logistics networks and systems of logistics networks.

AEROFLEX

Aerodynamic and Flexible Trucks for Next Generation of Long Distance Road Transport

Grant agreement ID: 769658

Start date: 1 October 2017 - End date: 31 March 2021

Funded under: H2020-EU.3.4.

Overall budget: € 11 818 561,25 - EU contribution: € 9 534 778,64

https://cordis.europa.eu/project/id/769658/es

The transport sector contributes to about 25% of total CO2 emissions in the EU and is the only sector where the trend is still increasing. Taking into account the growing demand on the road transport system and the ambitious targets of the EC's Transport White Paper, it is paramount to increase the efficiency of freight transport.

The vision of the AEROFLEX project is to support vehicle manufacturers and the logistics industry to achieve the coming challenges for road transport. The overall objective of the AEROFLEX project is to develop and demonstrate new technologies, concepts and architectures for complete vehicles with optimised aerodynamics, powertrains and safety systems as well as flexible and adaptable loading units with advanced interconnectedness contributing to the vision of a "physical internet". The optimal matching of novel vehicle concepts and infrastructures is highly important, requiring the definition of smart infrastructure access policies for the next generation of trucks, load carriers and road infrastructure.

The specific technical objectives, main innovations and targeted key results are:

1. Characterise the European freight transport market (map, quantify and predict), the drivers, the constraints, the trends, and the mode and vehicle choice criteria

2. Develop new concepts and technologies for trucks with reduced drag, which are safer, comfortable, configurable and cost effective and ensure satisfaction of intermodal customer needs under varying transport tasks and conditions.

3. Demonstrate potential truck aerodynamics and energy management improvements with associated impact assessments of the new vehicle concepts, technologies and features developed in the AEROFLEX project.

4. Drafting of coherent recommendations for revising standards and legislative frameworks in order to allow the new aerodynamic and flexible vehicle concepts on the road.

To achieve an overall 18-33% efficiency improvement in road transport / long haulage by 2025+.

Develop and demonstrate new technologies, concepts and architectures for complete vehicles with optimised aerodynamics, powertrains and safety systems as well as flexible and adaptable loading units with advanced interconnectedness contributing to the vision of a PI.

One of the most relevant aspects raised by this project is the "Smart Loading Units" concept. It aims to design cargo units that can be used interchangeably in different transport modes (road, rail and sea), and to enable both vertical and horizontal handling. In short, what is intended with this standardization is to simplify the

modal exchanges that take place in the logistic nodes, reducing friction and increasing efficiency. Therefore, it implies a higher level of transport modes harmonization.

As mentioned, the definition of standard cargo units for their use in different transport modes in the simplest way is the first step to a harmonisation along with the transport network (including nodes operation). (Generation 0)

The design and development of standardised intermodal cargo units can define and establish the infrastructural and equipment requirements to handle them in a cost-efficient and sustainable way. (Generation 1)

A step further, this cargo harmonisation will lead to defining standard operation procedures (and policy frameworks) to implement in all different nodes along with the network, resulting in a much more compact and fluid transport chain. (Generation 2)

Currently, there is some automated equipment to handle standard cargo units (i. e. containers). In this context, a higher level of automation is foreseen related to the equipment used to handle the “Smart Loading Units” defined in this project. At the same time, imminent and future technological progress in areas such as artificial intelligence and machine learning provides a certain degree of autonomy in the operation of the equipment used. (Generation 3)

Currently, there is some automated equipment to handle standard cargo units (i. e. containers). In this context, a higher level of automation is foreseen related to the equipment used to handle the “Smart Loading Units” defined in this project. At the same time, Technological progress in areas such as artificial intelligence and machine learning provides a certain degree of autonomy in the operation of the equipment used. (Generation 4)

"The project addresses three important aspects to consider in multimodal / synchromodal freight transport: the development of load units for indistinct and flexible use in different modes (road, rail and sea); the load space optimization (including the double floor trailer concept), and its monitoring; and, the modularization of the loading units, to simplify the loading / unloading operation. All of them are critical for developing and achieving optimized transport and operational services, with high levels of integration between them.

Therefore, the results to obtain by the project are foreseen with a great impact on the concept of Physical internet."

The development of both flexible load units for different modes and modular load units allows to optimize all the freight transport operations, and especially those which are carried out in logistics platforms related to modal exchange and load consolidation / deconsolidation. (Generation 0)

In line with the above, any process that entails higher levels of load unit standardization and modularization considerably simplifies the operations associated with the modal exchange, and therefore, paves the way towards the concept of real synchromodality. (Generation 1)

The next step will be the establishment of operational protocols related to the new load units will be critical to optimize the intermodal exchange activities and to simplify the traceability process. (Generation 2)

The use of standardized and modularized cargo units would be supported by the use of machine learning technologies in order to facilitate the automated planning and design of transport operations (dispatch, assignment, etc.). (Generation 3)

The development of load unit standards and their modularization make it possible to define clear protocols for handling, reducing the possible casuistry, and, consequently, allowing a greater degree of operation automation. (Generation 4)

In the same way, the criteria considered for the development of this technology may be established as critical factors in the automotive sector (freight transport vehicles manufacturers). Therefore, in short, it could involve a general and basic protocol for freight vehicles design.

ATROPINE

Fast Track to the Physical Internet

Start date: January 2016 - End date: December 2017

Funded under: Innovatives OÖ 2020

Budget: € --

ATROPINE aims to join forces with research and corporate partners to create a Physical Internet model region in Upper Austria. Partial areas of this concern, for example, 'smart' load carriers, which can communicate with means of transport and/or shippers and transporters, and innovative business models, which promote the idea of a 'Sharing Economy' Overall, the benefits of a Physical Internet system lie in the development of a more efficient and sustainable cooperation model for the transport of goods in order to minimise transport costs, increase productivity and reduce energy consumption at the same time. The ATROPINE project gives companies and research institutions in the Upper Austrian economic region the opportunity to be among the first in the new research field 'Physical Internet' and to develop expertise.

ATROPINE dealt with a so-called 'intelligent container', a charge carrier equipped with radio and sensor technology, which could record quality and general monitoring data for the loaded goods.

ATROPINE developed a "PI platform" calculating transport proposals and order-related value-added services (e.g. to compare and conclude general and long-term insurances).

Demonstration and evaluation (via a simulation with data from shippers by the end of 2017) revealed a significant optimization. The total mileage in the ATROPINE network was reduced by up to 25% and costs by up to 15%.

ATROPINE developed a "PI platform" calculating transport proposals and order-related value-added services (e.g. to compare and conclude general and long-term insurances)

BACKBONE PI: RAIL

Digital transformation of railroad-car planning to establish rail as the backbone of the Physical Internet

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Start date: 01 January 2019 - End date: 31 December 2020

Funded under: Mobilität der Zukunft, Mobilität der Zukunft, MdZ - 10. Ausschreibung (2017)

Budget: € --

The proposed project aims to establish the rail system as a backbone within the increasingly volatile environment of the Physical Internet (PI). By early anticipation of uncertainties (order quantities, follow-up transports, waiting times etc.) the wagon transforms to a flexible, modular and profitable core element of the fully integrated and dynamic transport system. To ensure high capability to service increasingly spontaneous transport orders ("sharing platform" etc.) and smaller batches ("industry 4.0" etc.), lead times have to be minimized and modularization of transports has to be promoted. Thus, the objective is to continuously and proactively adjust capacities and distribute resources through an extensive data usage ("intelligent wagons", horizontal/vertical cooperation, "intelligent traffic systems") and a (semi-)automatic processing of these data. In this way, an economic added value for additional shippers (smaller batches with increasing urgency) can be generated and thus, a modal shift from road to rail will be obtained.

Collaboration within nodes

- Shared vehicles and infrastructures, and data

Collaboration between nodes

- Common Communication infrastructure

Harmonising transport modes

- Standard containers to handle
- Cargo Flow visibility

Supporting the way to Generation 1:

- Definition of infrastructural requirements (storage area characteristics) and PI cargo handling procedures that can be used as reference (or standards) by a PI Node
- Definition and publication of services (nodes will publish and allocate capacity to PI)"

Information and data: Supply Chain Visibility / network visibility

- Visibility of mode capacity available
- Load and mode data decoupled

Definition of rules, services (and protocols). (Generation 0)

Capacity forecasting and assignment algorithms). (Generation 1)

Make rail useful and accessible for PI services

Show benefits for different stakeholders of PI

- Shared assets, vehicles and infrastructure

- Sustainability
- Standardisation and harmonisation

Mapping and analysis of current asset-sharing networks, their forms and business models will contribute to Generation 0.

CLUSTERS 2.0

Open network of hyper connected logistics clusters towards Physical Internet

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Grant agreement ID: 723265

Start date: 1 May 2017 - End date: 30 April 2020

Funded under: H2020-EU.3.4.

Overall budget: € 6 329 618,75 - EU contribution: € 5 998 743,75

http://www.clusters20.eu/

https://cordis.europa.eu/project/id/723265

“If we want to reach the EU objective on modal shift for all transportation beyond 300 km and attract and
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CLUSTERS 2.0 worked on developing solutions for networking freight operations such as the Symbiotic Network of Logistics Clusters (more information available at http://www.clusters20.eu/?cpo_portfolio=symbiotic-network-of-logistics-clusters). Data sharing platforms and a framework for inter-cluster cooperation along intermodal transport chains were developed and tested for improving the visibility of supply chains and promote collaboration.

The services deployed at cluster level (grouped in 5 different Living Labs) are relevant for Generation 1.

CLUSTERS 2.0 had the ambition to achieve a significant step forward in the European Transport performance through a hyper connected network of logistics hubs and clusters and worked for overcoming barriers and enabling collaboration in the Logistics domain. The overall project concept is focused on communities grouped into clusters which is interesting for PI System Level functionality roadmap

The CargoStream solution works on bundling of freight volumes (details are provided in the deliverable D2.4 Cluster Community System Tool) introducing the concept of a neutral and open platform. this example can be taken as horizontal collaboration and is relevant for Generation 3.

CO-GISTICS

Grant agreement ID: 621112

Start date: 1 January 2014 - End date: 30 June 2017

Funded under: H2020-EU.3.4.

Overall budget: € 7 369 689 - EU contribution: € 3 684 840

https://cordis.europa.eu/project/id/621112

Key logistics stakeholders from seven European cities/logistics hubs (Bordeaux, Frankfurt, Thessaloniki, Trieste, Arad, Bilbao and Vigo) have joined forces to deploy, validate and set-up after project life of five piloted cooperative logistics services combining cooperative mobility services and intelligent cargo with real-life logistical aspects. CO-GISTICS services will increase energy efficiency and equivalent CO2 emissions, bringing additional benefits in road safety and cargo security. To achieve these goals public authorities, fleet operators, freight forwarders, industrial partners and other stakeholders will jointly implement five services: CO2 Footprint Estimation and Monitoring, Cargo Transport Optimisation, Intelligent Truck Parking and Delivery Area Management, Eco-Drive Support, Priority and Speed Advice. These services will be piloted over one year of real-life driving. Each of the pilot sites have full stakeholder chain in their partnership for successful after-project life. The user groups will include commercial users, such as truck and van drivers, as well as logistics and fleet operators. In total the consortium aims to pilot 330 vehicles with about 230 users, 300 intelligent cargo items. The service components used have already been developed and extensively trilled. Some of the components are already operational since a number of years while others have been implemented and trialled through research projects. In addition to proving the benefits, the project aims at identifying deployment opportunities, barriers and finding solutions for those. Furthermore, clear business models and exploitation plans will be developed. Last but not least, CO-GISTICS will also take an active role in the relevant standardization bodies, primarily ETSI and CEN. All these aspects hold a promise that CO-GISTICS services will prove extensive benefits to all key stakeholders and prove that sustainable implementation is possible.

Cooperative logistics services combining cooperative mobility services and intelligent cargo with real-life logistical aspects, Multimodal Cargo. CO2 Footprint estimation and Monitoring, Energy efficiency and equivalent CO2 emissions improvement, additional benefits in road safety and cargo security.

The time spent in different logistics hubs will be reduced, enabling remote truck accreditation at the port entrance without the need for additional control operations. This way, a priority lane is created in order to identify approaching trucks and to allow them access into the port based on the automated information of their registration number.

CO-GISTICS will contribute to increasing hubs efficiency (Generation 1)

The Eco-drive Support service supports drivers in adopting an energy efficient driving style in order to reduce fuel consumption and CO2, avoiding hard accelerating and breaking which are also one of the major cause of emissions. The Cargo transport optimization service provides information on real time synchronisation among different modes.

The Cargo transport optimization service specifies choices, considering the real-time information about real traffic, positioning, weather, delays, etc. (Generation 1)

The Eco-drive Support service provides truck drivers with on a trip, pre- and post-trip advice regarding their total fuel consumption". (Generation 3)

CO-GISTICS relies on a single, horizontally integrated platform for CO2 estimation. AEON is a platform that creates and manages real time communications infrastructures. It is used in the CO-GISTICS pilot in order to manage bidirectional, asynchronous communication over the untrusted and heterogeneous network, between systems, entities and devices

The implementation of Cargo Transport Optimisation includes the adaptation of the NOSCIFEL platform in collaboration with the local logistics needs, proposing interoperability (reference: Bordeaux case, slide n. 12). (Generation 2)

COG-LO

COGnitive Logistics Operations through secure, dynamic and ad-hoc collaborative networks

Grant agreement ID: 769141

Start date: 1 June 2018 - End date: 31 May 2021

Funded under: H2020-EU.3.4.

Overall budget: € 4 999 922,50 - EU contribution: € 4 999 922,50

http://www.cog-lo.eu/

https://cordis.europa.eu/project/id/769141

The main goal of COG-LO is to create the framework and tools that will add cognition and collaboration features to future logistics processes by: 1) Introducing the Cognitive Logistics Object (CLO) by adding cognitive behaviour to all involved Logistics actors and processes; 2) Developing the environment that will allow CLOs to exchange information through ad-hoc social secure networks. The main objectives of COG-LO are: (a) Definition of a Future Cognitive Logistics Objects reference implementation model that supports cognitive logistics behaviour; (b) Design and develop the necessary analytics and cognitive tools that enable complex event detection, context awareness and multi-criteria decision support. (c) To design and develop the collaboration platform based on hybrid ad-hoc social networks of CLOs. (d) To design and develop the COG-LO tools (Cognitive Advisor, which realizes the cognitive behaviour of CLO based on the reference implementation model, and Tweeting CLOs, allowing CLOs to exchange information in ad-hoc Social IoT networks); (e) To evaluate the COG-LO results via intermodal, cross-country and urban logistics pilot operations. (f) To introduce new business models for ad-hoc collaborations affecting all logistics stakeholders and create a community of Logistics, ICT and urban environment stakeholders. The consortium is led by SingularLogic and consists of 14 partners from 8 countries.

Definition of new collaborative models integrating the Digital and Physical Internet and using the new concepts of Cognitive Logistics Objects, Cargo Hitchhiking and Cognitive Advisor. Artificial Intelligence and data analytics tools (APIs). Collaboration platform powered by Social IoT.

COG-LO will result in more responsive supply chains and load efficiency.

Consequently, more resilient and flexible use of transport modes (Generation 1) and better combinations of part loads and better control of parts of the load (Generation 2) will result.

CO3

Collaboration Concepts for Comodality

Grant agreement ID: 284926

Start date: 1 September 2011 - End date: 31 August 2014

Funded under: FP7-TRANSPORT

Overall budget: € 2 293 287,60 - EU contribution: € 2 000 000

https://cordis.europa.eu/project/id/284926

Collaboration Concepts for Co-modality, CO3 is a business strategy enabling companies throughout the supply chain to set up and maintain initiatives to manage and optimise their logistics and transport operations by increasing load factors, reducing empty movements and stimulate co-modality, through Horizontal Collaboration between industry partners, thereby reducing transport externalities such as greenhouse gas emissions and costs. The CO³ consortium, which is made up of logistics specialists, manufacturing industry and transport service providers, has been working on the topic of collaboration and co-modality for two years and already produced a first draft of a model framework with legal and operational guidelines for collaborative projects in the supply chain. The 18 partners of the consortium in seven EU countries will coordinate studies and expert group exchanges over a period of three years and build on existing methodologies to develop European legal and operational frameworks for freight flow bundling, (WP2) -. We will come up with joint business models for inter- and intra-supply chain collaboration (WP3) to deliver more efficient transport processes, increase load factors and the use of co-modal transport. The results of the studies and expert group exchanges will be applied and validated in the market via case studies (WP4). The aim is to set up at least four different real-life applications of collaboration across the supply chain by using road transport, multimodal transport, regional retail distribution and collaboration for warehousing activities. We will also promote and facilitate matchmaking and knowledge-sharing through CO³ conferences and practical workshops to transfer knowledge and increase the market acceptance of the CO³ results. This will be done through discussions with a High-Level Board of European Industry supply chain Leaders, (WP5).

DYNAHUBS

DynaHUBs is a new application designed to kick start the development of the Physical Internet using a crowd-sourced approach

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Grant agreement ID: 720657

Start date: 1 August 2016 - End date: 31 July 2018

Funded under: H2020-EU.3. / H2020-EU.2.

Overall budget: € 1 873 862,50 - EU contribution: € 1 420 041,25

https://cordis.europa.eu/project/id/720657

DynaHUBs is a project designed to kick start the development of the Physical Internet using a crowd-sourced approach. Starting with motorcycles, we will test the technology and the business model to provide a new way of connecting routes and increasing capacity for door-to-door cargo and freight logistics. Once proven on motorcycles this capability will be used for all vehicles and existing transportation systems for not only freight but also for people. At the technological core of the project is the virtual exchange nodes called DynaHUBs. They provide an exchange mechanism to form a Physical Internet on the existing transportation infrastructure enabling users to I) switch between different modes of transport, ii) cancel unnecessary journeys, iii) shorten routes and iv) share capacity between vehicles, goods and people. DynaHUBs are living mechanisms and change dynamically according to users' needs, traffic patterns, weather conditions, and extreme situations such as natural or manmade disasters.

DISPATCH

Digital twin for synchromodal transport in Flanders

Start date: 01 September 2019 - End date: 31 August 2023

Funded under: cSBO through VLAIO – collaborative Fundamental Research through Flanders Agency for Innovation and Entrepreneurship

Budget: € 1 281 620

http://dispatch-project.be/

The DISpATchproject will focus on organizational and technical enablers for seamless synchromodal transport services in Flanders and beyond. Given the real-time dynamics and flexible nature of synchromodal transport, different actors and transport modalities need to work together and adapt according to unexpected events as well as contextual information that affect transport processes. These events and contextual information can be positive or negative perturbations that shape freight movement and transport mode selection, such as newly incoming orders, transport delays, cancellations, collaborative bundling opportunities, accidents, water levels, strikes and many more. Crucial elements in this regard are situational awareness of the current system state and projections of how the system will evolve once different actors take different actions.

Development of a platform represented by a Digital Twin component in order to provide a testbed for synchromodal opportunities within a risk-free environment. The Digital Twin will serve as an interface where different models, their data, granularities as well as processes are integrated. The Digital Twin will contain necessary information and models that can solve different tasks related to inventory management, freight transport and network planning. It will measure the real-time synchromodal complexity and evaluate various decisions and offer alternatives by making use of mathematical, simulation and machine learning models.

The DISpATch project will leverage the harmonisation of transport in the sense that it will improve seamless transhipment by higher visibility on alternative realities mirroring various alternative future scenarios. This will improve cargo flow visibility and improves and increases the use of different nodes and inter-operability between nodes and transport modes. The project itself is transport unit neutral and focusses on synchromodality as such

Generation 1 - Hub Service Offering

DISpATch will demonstrate the increased performance of intermodal operations leveraged by improved real-time planning support in comparison to traditional planning.

Generation 2 - Automated Service Request and Response

DISpATch will demonstrate modal shift possibilities of fragmented flows by using decentralized route-finding and identification of nearby handling points.

Generation 3 - Nodes Interconnect between networks

DISpATch will demonstrate potential bundling opportunities of sharing open logistics networks between service providers (through case study)

"DISpATch's core is to develop routing algorithms tapping into different data sources provided by LSPs, shippers, port authorities and infrastructure managers in liaison with, or independent from, port authorities.

It will build on current SoA on Digital Twin concept, SoA on Synchromodality and define research gaps to move onto new thinking and modelling approaches to bridge academic models with physical transport processes. The main objective is to develop a model that will measure the real-time synchromodal complexity and evaluate various decisions and offer alternatives."

Generation 1 - Operational Synchromodality

The primary objective is to work on specific use cases in which the Digital twins will effectively prove the working of the model and leverage operational synchromodality in real operations.

Generation 2 - Multiple Shipment join/split

DISpATch wants to contribute to new theories by developing and combining modelling paradigms and the Digital Twin Concept in which effectively increased/decreased fill rates will be affected and better planned.

Generation 3 - Objective of the project consists of creating a scalable and transferable tool and assess resilience measures and future state estimations. Thus the basis is laid down for "Sense and Respond Capabilities for Network Flows".

By providing a (virtually) successfully demonstrated scalable and transferable tool DISpATch will provide one of the pivotal building blocks to realize a swift and data-based decision making tool supporting the PI concept that is based on the nodal efficiency and ability to route goods onto the most suitable next leg in the network.

By focussing on a scalable and transferable tool and the integration of maritime, continental and retail supply chains into one holistic application DISpATch will contribute to a more holistic understanding of supply chains by not using reductionist approaches that decompose system components into separate parts which are consequently assessed individually.

Sectorial, Regional, Seamless Vertical Integration DISpATch aims to match academic theories against real-life problems faced by the logistics industry. It will virtually showcase potential benefits of synchromodal transport by addressing tactical and operational planning horizons in close dialogue with consortium partners in maritime, continental and retail supply chain use cases. (Generation 1)

ELETA

Sharing of train tracking & estimated time of arrival information

Grant agreement ID: 2016-EU-TA-0185-S

Start date: September 2017 - End date: December 2019

Funded under: CEF Transport

Overall budget: € 2 858 152 - EU contribution: € 1 429 076

https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/2016-eu-ta-0185-s

The Action will implement a real demonstration of a tracking information and Estimated Time of Arrival (ETA) sharing software in a series of existing rail freight services run by intermodal operators, mainly in the Rhine-Alpine Core Network Corridor.

Increased sharing of real-time tracking information and ETA among railway infrastructure managers, railway undertakings, intermodal operators, terminals and end-users (shippers) is essential to improve the efficiency of the logistics chain and the competitiveness of railway with respect to road transport.

The results of the Action will underpin the work done by Member States and European institutions for eliminating legal, operational and technical obstacles in the electronic exchange of information in road-rail combined transport.

Develop a smart specialized logistics cluster for the chemical industry in the Port of Antwerp in order to shift transport volumes from road to rail freight. Launching a rail transport solution for 'less than wagon load'. New added value rail freight services for the chemical industry.

The technology developed in this project provides a real-time monitoring system for any type of train movements, regardless of the different signaling systems in service. This fact represents an important step in improving the management and planning of supply chains, especially those that include different modes. In short, it allows the design of optimized synchromodal transport chains, with a high level of integration between the different modes used and the agents involved in them.

Any improvement in the management of railway services and its integration with the other modes means an increase in its efficiency, and therefore, renders it more attractive to potential users. In this context, it boosts the use of this mode and its participation in freight transport. (Generation 0)

The development of this real-time traceability system will allow the definition and establishment of communication protocols between the different railway networks involved, as well as the participating agents, simplifying the current systems, and increasing their effectiveness.

Simultaneously, this communication improvement can result in better integration between the different modes (better coordination of modal exchange operations), which lead the way to a higher degree of synchromodality. (Generation 1)

After implementing specific communication protocols (including the rules for data sharing between different agents in a trusty and security framework) a digital shipment system could be developed based on the

information provided and with the aim of dumbing services operation and management down. Hence, a computer module could be implemented to plan and manage different transport and logistics activities (e.g. load assignment to specifics services and schedules). The result of all these activities would give rise to a definition of network operational protocols in the different nodes. (Generation 2)

The evolution of the system implemented in the previous phase would include the development of predictive models. In this context, the treatment of available information, coming from different scenarios (incidents, peak & low-capacity periods, etc.) by using technologies such as Big Data and genetic algorithms, would allow optimizing the network operation and services. This way some contingency protocols could be developed and implemented. (Generation 3)

A step further, by using artificial intelligence or machine learning technologies, the implemented system would allow the autonomous operation design (synchromodal chain, dispatches, etc.) and the establishment and automatic update of performance protocols in a borderless scenario. (Generation 4).

GDP4PI

Generic data integration platform for the Physical Internet

Start date: 01 October 2018 - End date: 30 September 2020

Funded under: Mobilität der Zukunft, Mobilität der Zukunft,MdZ - 10. Ausschreibung (2017

Budget: € --

https://projekte.ffg.at/projekt/3028225

The overall project goal is to conceptualize and prototypically implement a generic data integration platform for services and applications of the Physical Internet using blockchain technology and taking into account industry-specific requirements. To this end, the needs and requirements of practical partners from three representative industries are recorded and - based on the generic data platform - covered by services to be created. In addition, the actual potential benefits of blockchain technology for PI topics will be investigated. In practical terms, the experimental development is to serve as a significant contribution to the further development of existing transport management systems and contribute to the practical implementation of the Physical Internet concept, as envisaged if the project is successful.

- Open Network / living network

Standard operational protocols

E-transport documents

- Information and data: Supply Chain Visibility / network visibility

Visibility of mode capacity available

Shipment needs knowing at system level

Load and mode data decoupled

Generic data integration platform enables seamless and integrated use of booking platforms. (Generation 0)

- PI Operating System
- Functional building blocks of PI including basic functionalities and services of PI
- Federative platform for documents and data sharing
- PI ISO/OSI model
- Systems design should have good flexibility to adapt (layered structure)
- Digitalisation/Virtualization of supply chains
- Visualization of PI
- Multimodal Logistics Networks interconnectivity protocols covering communications, load sizes, track and trace, reporting, etc.
- Smart and automated contracting

With the data integration platform, several different Transport management systems could be connected. (Generation 0)

Generation 1

- Definition of PI building blocks, functions and processes
- Definition of PI Reference Architecture
- Definition of PI Protocol Stack
- Definition of PI data requirements, security processes, and reporting requirements

Generation 2

- Definition of inter-company communications protocols
- Definition of inter-company routing processes

ICARGO

Grant agreement ID: 288383

Start date: 1 November 2011 - End date: 30 April 2015

Funded under: FP7-ICT

Overall budget: € 16 886 573 - EU contribution: € 11 146 496

https://cordis.europa.eu/project/id/288383

iCargo IP aims at advancing and extending the use of ICT to support new logistics services that: (i) synchronize vehicle movements and logistics operations across various modes and actors to lower CO2 emissions, (ii) adapt to changing conditions through dynamic planning methods involving intelligent cargo, vehicle and infrastructure systems and (iii) combine services, resources and information from different stakeholders, taking part in an open freight management ecosystem. To achieve the above targets, iCargo will design and implement a decentralized ICT infrastructure that allows real world objects, new planning services including CO2 calculation capabilities and existing systems to co-exist and efficiently co-operate at an affordable cost for logistics stakeholders. iCargo infrastructure will include Intelligent Cargo items to facilitate automated reactive decision-making and to integrate information obtained from on-going execution (all modes) into planning processes to optimize environmental performances, including real-time information about traffic and transport infrastructure conditions. iCargo involves representatives of the main stakeholders in three main areas of activity: (i) research and technological development, involving leading ICT companies and institutes to integrate in iCargo the necessary technology components, including results from key related EU projects, and to develop innovative approaches and business models for co-modal transport environmental optimization and dynamic planning; (ii) implementation, demonstration and validation of three extensive pilots in end-to-end multi-actor intermodal chains, involving users from logistics companies, shippers and public authorities; (iii) extensive dissemination of research results, demonstration and pilot cases validation activities, aimed at transferring iCargo results to the international transport logistics community and supporting take-up and extensive exploitation immediately after the project

Design and implement a decentralized ICT infrastructure that allows real world objects, new planning services including CO2 calculation capabilities and existing systems to co-exist and efficiently co-operate at an affordable cost for logistics stakeholders Real time planning services including CO2 calculations and intelligent cargo.

One of the main concepts developed and piloted in the iCargo project has been that of exposing the different kinds of logistic services and integrating them on the supply network level, based on common semantics and IT protocols. Although the iCargo services are defined at the service provider level, these are standardised and harmonised in a potentially global network. Thus, the concept could be extended to include PI nodes as services providers.

The iCargo concept, services semantics and access-point technology have been deployed in some existing supply network pilots and have been applied to develop commercial software products such as www.MixMove.io. (Generation 0)

ICargo has developed a very comprehensive set of logistics services specifications, applying and extending existing standards. Most iCargo services definitions refer to network-level services, namely transport services across logistics nodes, including intermodal services.

The iCargo concept, services semantics and access-point technology have been deployed in some existing supply network pilots and have been applied to develop commercial software products. (Generation 0)

iCargo has defined a system architecture, based on access points, to allow publishing and integration of logistic-service data and functionalities in a distributed network of services providers. This has been a first and important contribution to the PI system level architecture.

The main reference documents outlining the results produced by iCargo in this area are the following Deliverables (classified as Public):

- Deliverable D2.2 - iCargoCloud Resources, Semantic Web & Composition Tools (Release date: 30/04/2013)
- Deliverable D2.3 – Knowledge Base Infrastructure and Tools (Release date: 01/05/2013)

The iCargo system architecture has been developed and piloted only on single supply chains, not on PI level (Generation 0)

ICONET

New ICT infrastructure and reference architecture to support Operations in future PI Logistics NETworks

Grant agreement ID: 769119

Start date: 1 September 2018 - End date: 28 February 2020

Funded under: H2020-EU.3.4.

Overall budget: € 3 078 698,75 - EU contribution: € 3 078 698,75

https://www.iconetproject.eu/

https://cordis.europa.eu/project/id/769119/es

ICONET will significantly extend state of the art research and development around the PI concept in pursuit of a new networked architecture for interconnected logistics hubs that combine with IoT capabilities and aiming towards commercial exploitation of results. ICONET strives to achieve the end commercial goal of allowing shipments to be routed towards final destinations automatically, by using collaborative decisions inspired by the information centric networking paradigm and optimizing efficiency and customer service levels across the whole network. According to this vision, cargo regarded as smart physical packets will flow between hubs based on 'content' of the cargo influencing key commercial imperatives such as cost, optimisation, routing, efficiency and advancing EU's Green agenda. Consequently, the consortium are discernibly aimed at three (3) avenues of commercialisation and exploitation from the ICONET innovation, specifically targeted in the areas of (a) Warehousing as a service, (b) E-commerce fulfilment as a service, and (c) Synchromodality as a service.

PI based logistic configurations will be simulated, prototyped and validated in the project. Modelling and analysis techniques will be combined with serious game type simulation, physical and digital prototyping, using living lab (LL) requirements scenarios and data. With analyses and simulations, optimal topologies and distribution policies for PI will be determined. The project implementation will be based on a succession of phases of modelling and design/prototyping, learning and experimentation and feedback and interaction with the wider business community, including the ALICE logistics platform as well as members of the partner Associations ESC, UIRR and ELUPEG. Through its Living Labs, the project will address under the PI paradigm both Supply Network Collaboration and Supply Network Coordination.

Networked architecture for interconnected logistics hubs that combine with IoT capabilities and aiming towards commercial exploitation of results. PI models for the Physical Internet that optimise on multiple axes such as for throughput, speed, green/environment, utilisation, efficiency, multi-modality. Simulation, network optimisation, IoT semantics, blockchain, optimisation engine, controller management and APIs and External interfaces.

The ICONET project focuses specifically on node and node interconnection in a PI transport and logistics model. The project is developing an architecture and a preliminary protocol structure for node and inter-nodal transport service management. The successful development of this architecture and protocol structure will aid in the advancement of the PI concept and help demonstrate what benefits can result from a PI like transport and logistics operation.

As this is a development project, only prototypical node impacts are anticipated. However, it will demonstrate in several use cases how following the node and protocol architectures that are being developed a PI set of services can be deployed. (Generation 0).

Adoption, adaptation and advancement of the ICONET project deliverables will facilitate the deployment of more sophisticated PI node and inter-node linkages. One objective of the project is for the involved software and node operators work together after the project completes to further develop the deliverables so that they are robust enough to entice other potential PI node operators to adopt them for internal and inter-node freight operations". (Generation 1).

The protocols being developed by the ICONET project are proposed as a first generation set of models for managing a PI network. To the extent that they provide guidance to the PI community they will enable the actual beginning of a true PI enabled network.

The initial set of protocols being developed in the project should provide guidance and direction for current generation experimenters to establish their service development efforts. (Generation 0)

Based on the protocols and pilot infrastructure that the project is developing, first generation adopters will have a workable PI pseudo-standard upon which to build operations and services. (Generation 1)

The protocols and services being examined and developed by the ICONET project will form the foundation for future generations of PI system management and control

The interconnection and operational protocols being developed by the ICONET project will demonstrate the foundational management and control approaches appropriate for PI paradigm in the movement and storage of freight. (Generation 0)

The ICONET protocols will form the basis for future work on PI system level control necessary for the rapid, secure, and robust rollout of the PI on a broad geographic basis".

The ICONET project's deliverables should provide innovative industry participants with tools and approaches that facilitate true PI enabled approaches to node operations and inter-node connections.

Successful demonstration of the technologies and protocols being developed by the ICONET project will enable current node operators to begin testing PI based services. (Generation 0)

Depending on the outcome of actual operational demonstrations using the ICONET deliverables, enhancements and more reliable tools will be developed by the ICONET partners. These robust and tested second generation tools should facilitate further adoption of the PI paradigm by node operators". (Generation 1)

"The business models being testing by the project are: eCommerce fulfilment as a service and warehousing as a service. Additional operational testing will be conducted concerning PI node operations and PI IoT enabled corridor operations."

"Basic PI node and inter-node operational models are being developed to enable testing of the cloud-based interconnection platform and protocols that will form a major portion of the ICONET deliverables. These models include basic governance forms that can serve as foundations for more robust PI governance models in the future". (Generation 0)

LESSTHANWAGONLOAD

Development of 'Less than Wagon Load' transport solutions in the Antwerp Chemical cluster

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Grant agreement ID: 723274

Start date: 1 May 2017 - End date: 30 April 2020

Funded under: H2020-EU.3.4.

Overall budget: € 3 994 318,75 - EU contribution: € 3 994 318,75

http://lessthanwagonload.eu/

https://cordis.europa.eu/project/id/723274/es

The LessThanWagonLoad project has the objective to develop a smart specialized logistics cluster for the chemical industry in the Port of Antwerp in order to shift transport volumes from road to rail freight. This objective will be realised by developing: (i) a new rail transport solution for single pallets (we call this LWL 'less than wagon load' in analogy with existing LTL 'less than truck load' transport) and (ii) new added value rail freight services for the industry within the Antwerp chemical cluster. These potential new services consist of parking, repair, picking and cleaning for chemical wagons, rail connected cross docking of pallets and improved rail connections by setting up mixed trains with conventional and maritime container volumes.

The project primarily focuses on Antwerp and the chemical industry. But the new concepts can also be leveraged to other logistical hubs with other industries. This will be demonstrated at a second logistical hub Nola, in the south of Italy. This broad implementation potential increases the impact on European society.

Realising the LessThanWagonLoad project will contribute in a substantial way in realizing the EC's ambition to shift 30% of road freight over 300km to low-emission modes by 2030. The potential benefits of the project for European society are very important and diverse: (i) environmental improvements (less GHG emissions), (ii) reduced costs of rail freight, (iii) increased inter-modality and higher resilience of the transport system, (iv) local economic growth and employment, (v) less congestion and traffic casualties and (vi) less risk on social dumping.

Develop a smart specialized logistics cluster for the chemical industry in the Port of Antwerp in order to shift transport volumes from road to rail freight. Launching a rail transport solution for 'less than wagon load'. New added value rail freight services for the chemical industry.

Within LTWL an automated wagon loading system is being developed (AWLS). This AWLS is designed and engineered as an automated wagon loading system to load and unload pallets on wagons. Within the project, there will be a full technical design including a bill of material and execution plan. Also, first demonstrations of the AWLS will still be performed within the duration of the project.

As such this is the first step to Generation 3 and Generation 4 but does not yet qualify as such as it is not a fully automated system (mechanical transhipment).

The implementation of such AWLS should attract road transport (via shunting) to the hub (Main Gate Antwerp) where transhipment could be performed in an automated manner thus facilitating a modal shift to rail

Description: Hub Service Offering. By attracting volume to the hub, new added value rail freight services for the chemical industry could be offered. Current rail freight solutions do not offer this. Consolidation in the hub could allow for:

- Cross docking services for pallets in a rail connected warehouse
- Specialised parking, repair and picking services for chemical wagons
- Advanced cleaning & repair services for chemical wagons & tank trucks
- Improved rail connections by combining conventional and intermodal volumes

LTWL offers the first step up to Generation 2 since “less than truck load” volumes are bundled in the logistical hub and transported by rail freight.

LTWL allows “less than truck load” volumes to be bundled in the logistical hub and transported by rail freight. The smallest loading unit actually in rail freight is a single-wagon-load or a container put on an intermodal train. LTWL will allow for a competitive and green solution for transport of single pallets through Europe in realising a modal shift to low-emission rail freight whereas such volumes have currently almost exclusively travelled over the road.

Description: Sectorial, Regional, Seamless Vertical Integration. The Automated Wagon Loading System will demonstrate how these single pallets or less than truckloads of various shippers can be consolidated into full wagon loads, thus successfully demonstrating within the chemical cluster of the Port of Antwerp a successful modal shift through automation. (Generation 1)

LOGISTAR

Enhanced data management techniques for real time logistics planning and scheduling

Grant agreement ID: 769142

Start date: 1 June 2018 - End date: 31 May 2021

Funded under: H2020-EU.3.4.

Overall budget: € 4 997 548,75 - EU contribution: € 4 997 548,75

https://logistar-project.eu/

https://cordis.europa.eu/project/id/769142/es

The EU faces the challenge to maintain and increase its economic growth and cope with the problem of freight transport efficiency in Europe. Integration of transport volumes and modes, better use of capacity, flexibility, resource efficiency and cooperation between all actors along the logistic chain are required.

Aligned with the European policies and the ALICE roadmap, LOGISTAR objective is to allow effective planning and optimizing of transport operations in the supply chain by taking advantage of horizontal collaboration, relying on the increasingly real-time data gathered from the interconnected environment. For this, a real-time decision-making tool and a real-time visualization tool of freight transport will be developed, with the purpose of delivering information and services to the various agents involved in the logistic supply chain, i.e. freight transport operators, their clients, industries and other stakeholders such as warehouse or infrastructure managers.

LOGISTAR will address several advances beyond the State of the Art in the interdisciplinary field of the smart algorithms for data processing: Artificial Intelligence focussed on prediction, parallel hybrid metaheuristics for optimization, automated negotiation techniques, and constraint satisfaction problem solving techniques. The resulting platform will outperform other market products and services such as Freight Exchange Systems, Collaborative Platforms, Transport Control Towers or Routing Systems.

LOGISTARS involves RTD organisations (DEUSTO, UCC, CSIC), technology developers (DNET, SWC), consultancy firms (MDST, PRESTON), ICT services developers (SAG, DBH, GENEGIS) and stakeholders from different stages of the supply chain (AHLERS, ZAILOG, NESTLÉ, PLADIS, CODOGNOTTO).

Real-time decision-making tool and a real-time visualization tool of freight transport for delivering information and services to the various agents involved in the logistic supply chain (horizontal and co-loading collaboration - synchromodality - real time logistics)

LOGISTAR aims to develop a real-time effective planning and optimization tool for transport operations. Also taking advantage of Horizontal Collaboration with real-time data.

For this, real-time information on inbound and outbound flows and collaboration possibilities are needed, creating a faster response time.

The objective of PI Logistics Networks is to adjust routings to satisfy changes in demand and react on and absorb disturbances in performance.

The digitalization of logistics processes has spurred the automation of planning, booking and administration processes. (Generation 0)

LOGISTAR aims to shorten by 10% delivery routes by relying on Synchromodality through an increase in the reliability and efficiency of services by predicting events and incidents and facilitating the management of logistics operations. (Generation 1)

MODULUSHCA

Modular Logistics Units in Shared Co-modal Networks

Grant agreement ID: 314468

Start date: 1 October 2012 - End date: 31 January 2016

Funded under: FP7-TRANSPORT

Overall budget: € 4 164 045 - EU contribution: € 2 899 663

https://cordis.europa.eu/project/id/314468

The objective of Modulushca is to achieve the first genuine contribution to the development of interconnected logistics at the European level, in close coordination with North American partners and the international Physical Internet Initiative. The goal of the project is to enable operating with developed iso-modular logistics units of sizes adequate for real m odal and co-modal flows of fast-moving consumer goods (FMCG), providing a basis for an interconnected logistics system for 2030.

Modulushca integrates five interrelated working fields: (1) developing a vision addressing the user needs for interconnected logistics in the FMCG domain, (2) the development of a set of exchangeable (ISO) modular logistics units providing a building block of smaller units, (3) establishing digital interconnectivity of the units, (4) development of an interconnected logistics operations platform leading to a significant reduction in costs and CO2 emissions that will be (5) demonstrated in two implementation pilots for interconnected solutions.

Modulushca will establish a robust and replicable methodology to develop and evaluate solutions for interconnected logistics looking at other elements of the supply chain. Two implementation pilots will be executed integrating key Modulushca developments in significantly different supply chains: (1) a closed pilot evaluating the benefits on a inter-site supply chain addressing handling and transportation of iso-modular logistics units within one company, and (2) an open network pilot will evaluate the impact of iso-modular logistics units in cross docking and transshipment processes.

Modulushca efforts will lead to the development of a road map towards a fully interconnected logistics system in 2030. The road map will address the changes and necessary steps to change the logistics system gradually, exploiting progresses in digital, physical and operational interconnectivity, building on current players, assets and infrastructures.

NEXTRUST

Building sustainable logistics through trusted collaborative networks across the entire supply chain

Grant agreement ID: 635874

Start date: 1 May 2015 - End date: 31 October 2018

Funded under: H2020-EU.3.4.

Overall budget: € 18 106 750 - EU contribution: € 18 000 000

https://cordis.europa.eu/project/id/635874

https://nextrust-project.eu/

NEXTRUST objective is to increase efficiency and sustainability in logistics by developing interconnected trusted collaborative networks along the entire supply chain. These trusted networks built horizontally and vertically, will fully integrate shippers, LSPs and intermodal operators as equal partners. To reach a high level of sustainability, we will not only bundle freight volumes, but shift them off the road to intermodal rail and waterway. NEXTRUST will build these trusted networks ideally bottom up, with like-minded partners, adding multiple layers of transport flows that have been de-coupled and then re-connected more effectively along the supply chain. We will develop C-ITS cloud based smart visibility software to support the re-engineering of the networks, improving real-time utilization of transport assets. NEXTRUST will focus on research activities that create stickiness for collaboration in the market, validated through pilot cases in live conditions. The action engages major shippers as partners (Beiersdorf, Borealis, Colruyt, Delhaize, KC, Mondelez, Panasonic, Philips, Unilever) owning freight volumes well over 1.000.000 annual truck movements across Europe, plus SME shippers and LSPs with a track record in ICT innovation. The pilot cases cover the entire scope of the call and cover a broad cross section of entire supply chain (from raw material to end-consumers) for multiple industries. The creation and validation of trusted collaborative networks will be market oriented and implemented at an accelerated rate for high impact. We expect our pilot cases to reduce deliveries by 20%-40% and with modal shift to reduce GHG emissions by 40%-70%. Load factors will increase by 50%-60% given our emphasis on back-load/modal shift initiatives. NEXTRUST will achieve a high impact with improved asset utilization and logistics cost efficiency, creating a sustainable, competitive arena for European logistics that will be an inspirational example for the market.

Development of interconnected trusted networks (horizontally and vertically) that collaborate along the entire supply chain: shippers, LSPs and intermodal operators as equal partners. To reach a high level of sustainability, NEXTRUST will not only bundle freight volumes but shift them off the road to intermodal rail and waterway. It will build trusted collaborative networks bottom up adding multiple layers of transport flows that have been de-coupled and then re-connected more effectively along the supply chain.

NEXTRUST addresses fundamental aspects for the development of optimized transport operations: vehicles load factor improvement, reducing empty journeys, and therefore the number of kilometres travelled; multimodal service design (road, rail, maritime), which allows the definition of railway services better adapted to customer needs; last mile distribution optimisation, reducing the associated costs and increasing user satisfaction. The pillar on which all the mentioned objectives and challenges are based on the active collaboration between the different agents/stakeholders involved the supply chain. This collaboration is

essential for the definition/development transport services with a high level of integration, efficiency, profitability and sustainability along with the different operations that comprise them.

In this context, the development of collaborative networks is an important step to achieve the Physical Internet paradigm.

The business and operational models defined in the project, based on the collaboration between stakeholders in, can be shifted and adapted to multi-agent platforms in order to improve their operation (higher performance, lower costs), and thus, encourage the increase of their activity. (Generation 0)

The definition of clear frameworks for operations in multimodal networks (road, train and maritime), in which different stakeholders involved and their tasks are identified, will enhance the development of real synchromodal networks, with high levels of integration. (Generation 1)

The treatment of the information coming simultaneously from different agents and their activities will allow better management of the operation. To this end, some technologies such as Big Data and predictive models should be used. (Generation 2)

The use and implementation of artificial intelligence and machine learning systems, based on the analysis of data from different operational scenarios, will allow the definition of action patterns and protocols against network incidents (congestion, unscheduled stops, etc.). (Generation 3)

The greater the number of supply chain agents participating in the definition of collaborative models, the greatest integration will be achieved. In this context, the availability of a management and regulation framework for sharing information will be necessary, which, together with the use of technologies such as Big Data or machine learning, will allow the autonomous and dynamic configuration of the entire operation. (Generation 4)

The design of operational models based on the development of interconnected collaborative networks implies the definition of protocols of action and governance among the different participating agents. In this sense, the NEXTRUST project addressed the development of a legal framework in different scenarios (e-commerce, CTIS / ICT), which represent a starting point to take into account in the definition and design of governance models in networks with a high level of Physical Internet development.

As indicated, the establishment of legal frameworks for collaboration between agents in some specific scenarios is a starting point for defining trustworthy action/governance protocols in a wider way. (Generation 0)

The legal frameworks defined in the project can be used as a basis for the definition of new ones related to current platforms where there are collaborative networks in operation. (Generation 1)

Once again, and in line with the multimodal networks and legal frameworks implemented in the project, the results achieved can provide a basis for the definition of rules and governance models that include all agent profiles involved in the supply chain (from shipper to customer), with the aim of creating a trustworthy scenario that simplifies and speeds up the operation. (Generation 2)

To this aim, it will be essential:

- to define a new operational/business model, in a liable, secure and gain sharing environment
- to identify and establish tasks, rights & responsibilities for each stakeholder involved, and the interactions between them
- ratify the regulations and terms previously established

The next step will consist in the definition of regulations and action protocols considering the interaction between agents at the horizontal level, which will require the creation of an activity framework based on the principles of trust, security, responsibility, open market, equality of opportunities and gain sharing. (Generation 3)

Finally, it will be necessary to extrapolate the legal frameworks and protocols to all types of activities, processes and stakeholders, in a scenario of interaction between the multiple operational networks. (Generation 4)

PROKAPA

Dynamic forecast-based capacity management for the implementation of physical Internet conditions

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Start date: 01 October 2017 - End date: 31 January 2020

Funded under: Mobilität der Zukunft, Mobilität der Zukunft, MdZ- 7. Ausschreibung GM (2016)

Budget: € --

https://projekte.ffg.at/projekt/1828241

The objective of ProKapa is to support logistic service providers with suitable methods and enable them to react flexibly and adaptably to markets becoming more and more dynamic. They are to be enabled to adjust to challenges and innovations of the "Physical Internet ". Expected results of ProKapa are suitable methods and tools for the preliminary planning of transportation needs. Results are a stronger interconnection between data sources and recommendations of actions concerning the adjustment of capacity, the allocation of resources and pricing.

"Collaboration within nodes

- Shared vehicles and infrastructures, and data

Collaboration between nodes

- Bundling flows between different nodes"

With methods and tools for the preliminary planning of transportation needs for bundling of flows of goods could be managed. (Generation 0)

With methods and tools for the preliminary planning of transportation needs for bundling of flows of goods could be managed.

As part of booking platforms, the developed methods and tools are essential for goods booking platform to determine needed capacity and prices. This suitable methods and tools for the preliminary planning of transportation needs. Results are a stronger interconnection between data sources and recommendations of actions concerning the adjustment of capacity, the allocation of resources and pricing. (Generation 0)

Definition of rules, services (and protocols), Routing algorithms to search for "best" route". (Generation 1)

- Functional building blocks of PI including basic functionalities and services of PI (bundling, routing & calculation of costs)
- General tasks of nodes and links (e.g., routing responsibility, etc.)
- Definition of PI, functions and processes
- Definition of PI data requirements, security processes, and reporting requirements

Show benefits for different stakeholders of PI

- shared vehicles and infrastructure

New and changed roles of companies and stakeholders in PI:

- New role of LSPs in value chains
- User perspective

Modelling and visualization of PI

With methods and tools for the preliminary planning of transportation ecologically and economically as also sociocultural to sustainable potential could be highlighted. (Generation 0)

Description of convincing business case including revenue models, gain sharing and description of different stakeholders. Simulation model to understand the practicality of PI. (Generation 1)

PROTOPI

Model development for a regional physical Internet using the example of transports between Upper Austria and Styria

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Start date: 01 September 2016 - End date: 31 August 2018

Funded under: Smart Mobility 2015

Budget: € --

https://projekte.ffg.at/projekt/1713183

Based on existing supply chains a smart logistics system according to the visions of the Physical Internet will be designed and modelled for the economic regions Styria and Upper Austria.

The research focuses on intelligent networking of senders, carriers and receivers using innovative web technologies (logistics 4.0) as well as a future-oriented, cooperative business model (asset sharing in coopetition). This shall lead to resource efficiency, measurable traffic reduction and increased competitiveness of the region.

- Collaboration within nodes

Shared assets, vehicles and infrastructures, and data

- Collaboration between nodes

Bundling flows between different nodes

Common Communication infrastructure

- Harmonising transport modes

Standard containers to handle Cargo Flow visibility

Asset & Business sharing, Pooling of orders. (Generation 0)

Definition of nodes characteristics (like different type of nodes, collaboration community services, capabilities and requirements). Creation of a PI Nodes Registry. Definition of IT solutions to connect LSPs with a PI Node and PI Nodes with PI system. Definition of infrastructural requirements (storage area characteristics) and PI cargo handling procedures that can be used as reference (or standards) by a PI Node. (Generation 1)

- Open Network / living network

Standard operational protocols

Operational protocol stack

- Information and data: Supply Chain Visibility / network visibility

Visibility of mode capacity available

Shipment needs known at system level

Load and mode data decoupled

- Routing algorithms

Dynamic routing based on different parameters (time, money, emissions etc.)

- Network management services

Prediction

Load/capacity monitoring

Model of cooperation (coopetition). (Generation 0)

Definition of rules, services (and protocols), Routing algorithms to search for “best” route (Generation 1)

- Show benefits for different stakeholders of PI

Shared assets, shared warehouse, shared vehicles and infrastructure

- New and changed roles of companies and stakeholders in PI:

New role of LSPs in value chains

Show benefits of asset & business sharing for LSP. (Generation 0)

Description of convincing business cases including revenue models, gain sharing and description of different stakeholders. Simulation model to understand the practicality of PI. (Generation 1)

- Regulation/Legislation
- Including multiple layers (arrangements, contracts)
- Build trust among users,
- Clear rules on accountability, Liability
- Business model and security standards
- Clear governance
- Rights and Responsibilities
- Define the common interests and goals of stakeholders
- New Competition Rules & principles
- Cooperation / Business model of PI
- Roles (PI-Sender, Receiver, Forwarder, …)
- Clear definition of tasks and responsibilities
- Gainsharing among partners
- Identification and definition of risks and rewards

Rules for Asset- and Business-sharing defined. (Generation 0)

Mapping and analysis of current asset-sharing networks, their forms and business models. Consensus on core rules for individual platforms’ administration, expansion, liability, … (Generation 1)

SELIS

Towards a Shared European Logistics Intelligent Information Space

Grant agreement ID: 690588

Start date: 1 September 2016 - End date: 31 August 2019

Funded under: H2020-EU.3.4.

Overall budget: € 17 719 375 - EU contribution: € 17 719 375

http://www.selisproject.eu/

https://cordis.europa.eu/project/id/690588

SELIS is aimed at delivering a 'platform for pan-European logistics applications' by:

- Embracing a wide spectrum of logistics perspectives and creating a unifying operational and strategic business innovation agenda for pan European Green Logistics.

- Establishing an exceptionally strong consortium of logistics stakeholders and ICT providers, that can leverage EU IP from over 40 projects so as to create proof of concept Common Communication and navigation platforms for pan-European logistics applications in month 18 deployed in 8 living labs (LLs) representing the principal logistics communities.

- Establishing a research and innovation environment using the LLs to provide data than can be used for discovery of new insights that will enable continuous value creation supporting the large-scale adoption of SELIS.

The proposed Shared European Logistics Intelligent Information Space, SELIS, is a network of logistic communities' specific shared intelligent information spaces termed SELIS Community Nodes (SCN). SCNs are constructed by individual logistics communities to facilitate the next generation of collaborative, responsive and agile green transportation chains. SCNs link with their participants' existing systems through a secure infrastructure and provide shared information and tools for data acquisition and use, according to a 'cooperation agreement'. Connected nodes, provide a distributed common communication and navigation platform for Pan European logistics applications. Each Node decides what information wishes to publish and what information wants to subscribe to.

The SELIS Community Node (SCN) concept represents the evolution of a longline of research in this area. The fundamental principle is that it provides a 'lightweight ICT structure' to enable information sharing for collaborative sustainable logistics for all at strategic and operational levels.

Delivering a 'platform for pan-European logistics applications' by: Embracing a wide spectrum of logistics perspectives and creating a unifying operational and strategic business innovation agenda for pan European Green Logistics; Establishing a consortium of logistics stakeholders and ICT providers; Establishing a research and innovation environment using the living labs.

Although the SELIS Community Nodes, created by SELIS, in the project are intended as logistics communities not necessarily centred on a physical node, the concept has been applied and tested to a hub in north Germany and demonstrated the suitability to develop features such as connection to several resources, data sharing, supply chain visibility. These features are relevant for PI Roadmap.

The conceptual architecture developed by SELIS addresses requirements for logistics nodes and could be an interesting asset for Generation 1.

Visibility, resource publishing/subscription, consolidation are main themes addressed by SELIS concerning network services both short-distance (including urban distribution) and long-distance.

An interesting Pipeline Data Exchange Structure providing common structure and scalability and facilitating many actors to play in the supply chain was built and tested in the project contributing to Generation 1.

The modular approach of the SELIS Community Nodes makes the project contribution to system level functionality limited, being the focus on interoperability among diverse communities rather than identifying common conceptual structures.

The “SELIS identity and access management services” were developed as part of the communication layer and also foresee the use of Blockchain technology for facilitating the trusted federation of multiple nodes. These achievements are interesting to be explored for Generation 1.

STANDPI

Cross-system control of transport and intralogistics for sustainable distribution in the physical Interne

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Start date: 01 January 2019 - End date: 31 December 2021

Funded under: Mobilität der Zukunft, Mobilität der Zukunft, MdZ - 10. Ausschreibung (2017)

Budget: € --

https://projekte.ffg.at/projekt/3028217

StandPI enables the efficient usage of Crowdsourcing Delivery for the loading industry. Therefore, internal and external system parameters will be continuously monitored and these real-time data will be further processed by a machine learning algorithm. By the means of this algorithm, the matching of the loader's product supply and the dynamically available transportation capacities concerning Crowdsourcing Delivery will be optimized. Eventually, in contrast to the nowadays commonly used sequentially controlling and optimization of the transportation and inner logistics systems, the aim of this research project is a self-learning controlling, which acts at the interface of this system, concerning a cross-system optimization. Hence, consistent exploitation of the remaining capacities of vehicles on route will significantly contribute to economical, ecological and social sustainability concerning physical distribution.

The usage of private cars to deliver goods need new coordination and routing protocols, which could have an impact on PI Network Services. The coordination of different networks is foreseen but was not visible from the current results of Stand PI.

Collaboration between different networks contributes to Generation 0.

SYNCHRO-NET

Synchro-modal Supply Chain Eco-Net

Grant agreement ID: 636354

Start date: 1 May 2015 - End date: 31 October 2018

Funded under: H2020-EU.3.4.

Overall budget: € 7 569 195 - EU contribution: € 7 301 194,50

https://www.synchronet.eu/

https://cordis.europa.eu/project/id/636354

SYNCHRO-NET will demonstrate how a powerful and innovative SYNCHRO-modal supply chain eco-NET can catalyse the uptake of the slow steaming concept and synchro-modality, guaranteeing cost-effective robust solutions that de-stress the supply chain to reduce emissions and costs for logistics operations while simultaneously increasing reliability and service levels for logistics users.

The core of the SYNCHRO-NET solution will be an integrated optimisation and simulation eco-net, incorporating: real-time synchro-modal logistics optimisation (e-Freight-enabled); slow steaming ship simulation & control systems; synchro-modal risk/benefit analysis statistical modelling; dynamic stakeholder impact assessment solution; and a synchro-operability communications and governance architecture.

Perhaps the most important output of SYNCHRO-NET will be the demonstration that slow steaming, coupled with synchro-modal logistics optimisation delivers amazing benefits to all stakeholders in the supply chain: massive reduction in emissions for shipping and land-based transport due to modal shift to greener modes AND optimised planning processes leading to reduced empty kms for trucks and fewer wasted repositioning movements.

This will lead to lower costs for ALL stakeholders – shipping companies and logistics operators will benefit from massive reduction in fuel usage, faster turnaround times in ports & terminals and increased resource utilisation/efficiency. Customers and end users will have greater control of their supply chain, leading to more reliable replenishment activity and therefore reduced safety stocks and expensive warehousing. Authorities and governmental organisations will benefit from a smoother, more controlled flow of goods through busy terminals, and reduction of congestion on major roads, thus maximising the utilisation of current infrastructure and making the resourcing of vital activities such as import/export control, policing and border security less costly.

Integrated optimisation and simulation eco-net, incorporating: real-time synchro-modal logistics optimisation (e-Freight-enabled); slow steaming ship simulation & control systems; synchro-modal risk/benefit analysis statistical modelling; dynamic stakeholder impact assessment solution; and synchro-operability communication and governance architecture.

A route choice model allows considering many different global intermodal route options at the tactical level, supporting dynamic planning. The suggested multimodal route changes when the inputs change (connection to real time streaming data possible). The focus is on the demand side - routes to be chosen are the subject of optimization, given the available services, and services themselves are not optimized. The system works at

planning level, no connection with (re-)booking systems. The system works at the level of a grouped shipment of containers; splitting and re-joining of shipments is not included; loads below container level are not considered.

The models provide visibility of planning options, support decision making for intermodal route planning and use (assumed) visibility of supply at operational level to adjust the planned route. Possible impact on requirements for hinterland systems through an increase of execution visibility on the sea leg (Perboli et al., 2017; Giusti et al., 2018; Giusti et al., 2019). (Generation 0)

The models support the demand side of synchromodality, i.e. the ability to plan the use of a new route in response to disturbances. (Generation 1)

Impact on PI Access and Adoption: A step towards vertical integration, at the level of a single transport chain.

Impact on multi-modal, multi-tier, vertical integration at global level (Generation 2)

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EPICENTER

Grant agreement ID: 861584

Start date: 1 June 2020 - End date: 30 November 2023

Funded under: H2020-EU.3.4.

Overall budget: € 7 373 575 - EU contribution: € 6 848 575

https://cordis.europa.eu/project/id/861584

ePIcenter will create an interoperable cloud-based ecosystem of user-friendly extensible Artificial Intelligence-based logistics software solutions and supporting methodologies that will enable all players in global trade and international authorities to co-operate with ports, logistics companies and shippers, and to react in an agile way to volatile political and market changes and to major climate shifts impacting traditional freight routes.

This will address the ever-increasing expectations of 21st century consumers for cheaper and more readily available goods and bring in Innovations in transport, such as hyperloops, autonomous/robotic systems (e.g. “T-pods”) and new last-mile solutions as well as technological initiatives such as blockchain, increased digitalisation, single windows, EGNOS positional precision and the Copernicus Earth Observation Programme.

ePIcenter thus addresses MG-2-9-2019 of H2020 Mobility for Growth “InCo Flagship on Integrated multimodal, low-emission freight transport systems and logistics”, particularly in what refers to new logistics concepts, new disruptive technologies, new trade routes (including arctic routes and new Silk routes) and multimodal transfer zones. ePIcenter will speed up the path to a Physical Internet and will benefit peripheral regions and landlocked developing countries.

ePIcenter will reduce fuel usage (and corresponding emissions) by 10-25%, lead to greater utilisation of greener modes of transport reducing long distance movements by trucks by 20-25% and ensure a smoother profile of arrivals at ports which will reduce congestion and waiting/turnaround times.

EPIcenter has recently started and its evaluation will be performed once the project progresses as in a separate section.

FEDERATED

Funded under: Connecting Europe Facility

The FEDeRATED project is an EU Member States driven initiative to contribute to the establishment of a viable federated network of platforms for data sharing in the freight transport and logistics domain at EU level (and beyond). The main objective is to enable a smooth and effective public involvement with logistic chains for the execution of public duties. The FEDeRATED project shall run from 01/01/2019 ("the starting date") until 29/12/2023 ("the completion date").

The FEDeRATED project builds upon the work and recommendation of the Digital Transport and Logistic Forum (DTLF), and in particular its subgroup 2, to create such viable and valid federative network of platforms as an enabler for Business to Administration (B2A), Administration to Business (A2B), and Business to Business (B2B) data exchange and sharing.

Among the various stakeholders of a logistic chain (shipper, forwarders, transport operators, stevedore, etc.) data sharing is already existing, for instance Electronic Data Interchange (EDI) replaced paper-based business documents with electronic messages. Enterprises are also already sharing booking and order data with their business partners to optimise their supervision of cargo flows. This data sharing is, to some extent, already supported by existing standards, platforms and IT solutions. But all these systems and initiatives have been designed and developed independently and in an uncoordinated manner. There are still too many bilateral agreements, proprietary solutions, and different platforms preventing a data sharing solution similar to the Internet functionality: one registration and connection to only one platform.

Interconnecting the stakeholders within one common data sharing environment to exchange information would improve the performance of the supply chain processes. In its agreed report, within its first mandate, DTLF concluded that an interoperable data sharing system based on existing (or innovative new) interoperable platforms and solutions will enhance the supply chain visibility and the bundling capacity, and will enable synchronised operation planning for a responsive, resilient and multimodal transport ecosystem. At the same time, the administrative burden will be reduced, and authorities will better monitor dangerous and illegal transport. Finally, such system will improve traffic flows of all transport modes, thus contributing to more sustainability, safety and security.

In practical terms, the FEDeRATED project will design and validate a federated network of platforms concept to enable data sharing in the logistics chain while providing interoperability and harmonisation between individual platforms. This concept will allow for:

- smooth interaction between and among the different logistic chain operators and public administrations involved.
- enterprises to optimise the use of supply chains.
- dynamic planning to enable various ways of collaboration and optimize capacity utilization.
- recognizing existing (partial) systems.
- streamlining multimodal transport.
- decreasing or removing costs derived from lack of interoperability.

This federated network of platforms will be designed based upon:

- open and de facto standards based on a common semantic model.

- the definition of organisational, functional and technical specifications for a federated network of platforms for the entire Core Network in real life operational conditions.
- the development and validation of the federative network of platforms along various EU transport Core Network Corridors in the form of Pilots and Living Labs.
- the collaboration with relevant stakeholders including standardization bodies, software developers and platform providers.

FENIX

A European FEderated Network of Information eXchange in LogistiX

Funded under: Connecting Europe Facility

FENIX will 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 in order to offer interoperability between any individual existing and future platforms.

The idea of FENIX comes from the work and recommendations of the European Commission's Digital Transport and Logistic Forum (DTLF) to create a viable and valid federative network of platforms as enabler for Business to Administration (B2A) and Business to Business (B2B) data exchange and sharing by transport and logistics operators.

FENIX main objectives:

- establish a federated network of transport and logistics actors across Europe, enabling sharing of information and services needed to optimise TEN-T (A2&A3)
- demonstrate the operational feasibility and benefits through the organised national pilots –focus on testing the achieved interoperability capabilities (A4)
- set up the EU corridor community building programme and to promote the benefits to the participants in terms of reduced costs and GHG emissions (A5&A6)

LEAD

Low-Emission Adaptive last mile logistics supporting 'on Demand economy' through digital twins

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Grant agreement ID: 861598

Start date: 1 June 2020 - End date: 31 May 2023

Funded under: H2020-EU.3.4.

Overall budget: € 3 999 750 - EU contribution: € 3 941 625

www.leadproject.eu/

https://cordis.europa.eu/project/id/861598

LEAD will create Digital Twins of urban logistics networks in six cities, to support experimentation and decision making with on-demand logistics operations in a public-private urban setting. Innovative solutions for city logistics will be represented by a set of value case scenarios, that address the requirements of the on-demand economy while aligning competing interests and creating value for all different stakeholders. Each value case will combine a number of measures (LEAD Strategies):

a. innovative business models,
b. agile urban freight storage and last-mile distribution schemes,
c. low emission, automated, electric or hybrid delivery vehicles, and
d. smart logistics solutions.

Scenarios will incorporate opportunities for shared, connected and low-emission logistics operations by considering four innovation drivers: Sustainability - Zero Emission Logistics, the Sharing Economy, Technology Advancements and the emerging Physical Internet (PI) paradigm.

Cost, environmental and operational efficiencies for value cases will be measured in 6 Living Labs (Madrid, The Hague, Budapest, Lyon, Oslo, Porto). Evidence-proven value cases and associated logistics solutions will be delivered in the form of exploitable Digital Twins (TRL-7), incorporating the models that support adaptation to different contexts and that provide incentives for PPPs. The long-term vision of LEAD is to design an Open PI-inspired framework for Smart City Logistics that incorporates the Digital Twins created in the project, thus setting the foundations for the development of large-scale city Digital Twins.

The LEAD consortium comprises 22 partners, all of whom are involved in the Living Labs, supported by 5 international partners for knowledge transfer. This incentivises the co-creation of solutions by city authorities, logistics industry leaders, start-ups and research experts in freight modelling, complex simulation and logistics optimisation.

LEAD has recently started and its evaluation will be performed once the project progresses as in a separate section.

PHYSICAL

Physical Internet through Cooperative Austrian Logistics

Grant agreement ID:

Start date: 1 June 2020 - End date: 31 May 2023

Funded under: FFG

Overall budget: € - EU contribution: €

https://physical-project.at/

The PhysICAL project will create the basis for exploiting the existing potential of logistical structures. To this end, rigid chains will be broken and replaced by flexible, cooperative and open networks. At the same time, digitization and Logistics 4.0 will be driven forward, because only by exchanging the necessary information will it be possible to make the logistics chain as efficient as possible and reduce any inefficiencies that may occur due to a lack of information. PhysICAL therefore focuses on providing open tools that enable horizontal and vertical digital networking between the players in a transport chain and in the logistics network.

Until 2024, the project partners will demonstrate that cooperative logistics brings economic advantages to shippers and the transport industry in Austria and also ecological and socio-economic benefits to Austrian and European society.

PHYSICAL has recently started and its evaluation will be performed once the project progresses as in a separate section.

PLANET

Progress towards Federated Logistics Through the Integration Of TEN-T into A Global Trade Network

Grant agreement ID: 860274

Start date: 1 June 2020 - End date: 31 May 2023

Funded under: H2020-EU.3.4.

Overall budget: € 7 097 670 - EU contribution: € 7 097 670

https://cordis.europa.eu/project/id/860274

PLANET addresses the challenges of assessing the impact of emerging global trade corridors on the TEN-T network and ensuring effective integration of the European to the Global Network by focusing in two key R&D pillars: • A Geo-economics approach, modelling and specifying the dynamics of new trade routes and its impacts on logistics infrastructure & operations, with specific reference to TEN-T, including peripheral regions and landlocked developing countries; • An EU-Global network enablement through disruptive concepts and technologies (IoT, Blockchain and PI, 5G, 3D printing, autonomous vehicles /automation, hyperloop) which can shape its future and address its shortcomings, aligned to the DTLF concept of a federated network of T&L platforms. PLANET goes beyond strategic transport studies, and ICT for transport research, by rigorously modelling, analysing, demonstrating & assessing their interactions and dynamics thus, providing a more realistic view of the emerging T&L environment. The project employs 3 EU-global real-world corridor Living Labs including sea and rail for intercontinental connection and provides the experimentation environment for designing and exploiting future PI-oriented Integrated Green EU-Global T&L Networks [EGTN]. To facilitate this process, PLANET delivers a Symbiotic Digital Clone for EGTNs, as an open collaborative planning tool for TEN-T Corridor participants, infrastructure planners, and industry/technology strategists. PLANET also delivers an Active Blueprint and Road Map, providing guidance and building public & private actor capacity towards the realisation of EGTNs, and facilitating the development of disadvantaged regions. The project engages major T&L stakeholders, contributing to both strategy and technology and (importantly) has the industry weight and influence to create industry momentum in Federated Logistics and TEN-T's integration into the Global Network.

PLANET has recently started and its evaluation will be performed once the project progresses as in a separate section.

ULAADS

Designing a zero emissions urban logistics sector

Grant agreement ID: 861833

Start date: 1 September 2020 - End date: 31 August 2023

Funded under: H2020-EU.3.4.

Overall budget: € 3 150 390 - EU contribution: € 3 149 515

https://cordis.europa.eu/project/id/861833

The EU-funded ULaaDS project sets out to offer a new approach to system innovation in urban logistics. Its vision is to develop sustainable and liveable cities through re-localisation of logistics activities and re-configuration of freight flows at different scales. Specifically, ULaaDS will use a combination of innovative technology solutions (vehicles, equipment and infrastructure), new schemes for horizontal collaboration (driven by the sharing economy) and policy measures and interventions as catalysers of a systemic change in urban and peri-urban service infrastructure. This aims to support cities in the path of integrating sustainable and cooperative logistics systems into their sustainable urban mobility plans (SUMPs). ULaaDS will deliver a novel framework to support urban logistics planning aligning industry, market and government needs, following an intensive multi-stakeholder collaboration process. This will create favourable conditions for the private sector to adopt sustainable principles for urban logistics, while enhancing cities' adaptive capacity to respond to rapidly changing needs. The project findings will be translated into open decision support tools and guidelines.

A consortium led by 3 municipalities (pilot cities) committed to zero emissions city logistics (Bremen, Mechelen, Groningen) has joined forces with logistics stakeholders, both established (e.g. UPS) and new comers (e.g. ViaVan) as well as leading academic institutions in EU to accelerate the deployment of novel, feasible, shared and ZE solutions addressing major upcoming challenges generated by the rising on-demand economy in future urban logistics.

To do so, the ULaaDS project will work on 3 key focus pillars: i) co-creation process to model future on-demand scenarios for urban logistics and definition of relevant ULaaDS delivery solutions through novel toolkit; ii) deployment of 2 ULaaDS solutions co-created (combining new delivery vehicles and novel horizontal collaboration models) through a total of 6 multi-stakeholder research trials in the 3 pilot cities; iii) assessment of feasible value cases towards urban planning integration (SUMP/SULP).

The ULaaDS solutions will be designed complying with a framework of requirements highly aligned with the call topic and ETP ALICE research priorities. The 3 pilot cities propose 2 preliminary ULaaDS solutions building upon their SotA activities solutions to be further concretised through first project pillar: 1) modular innovative cargobikes operated by crowdsourced couriers to enhance logistics efficiency and multimodality in city centres; 2) integration of urban dual transport services (high on-demand distribution requirements of small goods with on-demand shared personal transport - eVans offering pooling for cargo, semi-AGVs, public transport).

Finally, ULaaDS also involves 4 other satellite cities (Rome, Edinburgh, L'Hospitalet, Bergen) which will also apply the novel toolkit created in ULaaDS as well as the overall project methodology to co-create additional ULaaDS solutions relevant to their cities as well as outlines for potential research trials. ULaaDS is a project proposal part of ETP ALICE Liaison program.

ULaaDs has recently started and its evaluation will be performed once the project progresses as in a separate section.