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Abstract:

This document depicts the progress achieved concerning the dissemination and communication activities carried out until M39 of the project. In specific, the identified KPIs are monitored and assessed with respect to their target values. All aspects of the project's dissemination strategy are reported, in order to be evaluated in terms of the adoption of potential correction measures during the final year of the project.

Keywords:

Dissemination, Communication, Dissemination and Communication Plan, target groups, KPI monitoring, diffusion channels metrics, key messages, scientific dissemination, on-site dissemination, dissemination package

Revision History

Revision	Date	Description	Author (Organisation)
V0.1	16.01.2023	First version of the document	Anastasios Nikolakopoulos (ICCS)
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V0.3	03.03.2023	Merge document versions with UPV	Anastasios Nikolakopoulos (ICCS), Andreu Belsa (UPV), Matilde Julian (UPV)
V0.4	13.03.2023	Version for internal review	Anastasios Nikolakopoulos (ICCS)
V0.5	29.03.2023	Addressing comments from PRO and UDE	Anastasios Nikolakopoulos (ICCS)
V1.0	30.03.2023	Final version of the document	Anastasios Nikolakopoulos (ICCS)

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More information available at https://DataPorts-project.eu

Copyright Statement

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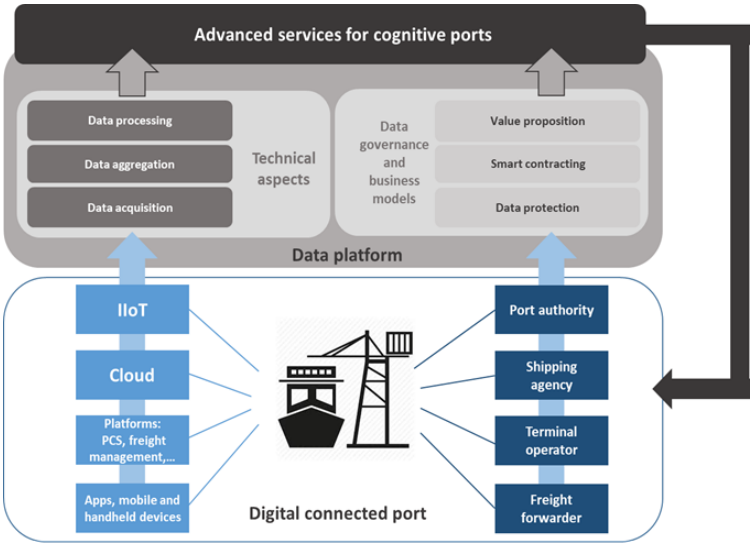
1 INTRODUCTION

1.1 DATAPORTS PROJECT OVERVIEW

DataPorts is a project funded by the European Commission as part of the H2020 Big Data Value PPP programme, and coordinated by the Technological Institute of Informatics (ITI). DataPorts rely on the participation of 13 partners from five different nationalities. The project involves the design and implementation of a data platform, its deployment in two relevant European seaports connecting to their existing digital infrastructures and addressing specific local constraints. Furthermore, a global use case involving these two ports and other actors and targeting inter-port objectives, and all the actions to foster the adoption of the platform at European level.

Hundreds of different European seaports collaborate with each other, exchanging different digital data from several data sources. However, to achieve efficient collaboration and benefit from AI-based technology, a new integrating environment is needed. To this end, DataPorts project is designing and implementing an Industrial Data Platform.



The DataPorts Platform aim is to connect to the different digital infrastructures currently existing in digital seaports, enabling the interconnection of a wide variety of systems into a tightly integrated ecosystem. In addition, to set the policies for a trusted and reliable data sharing and trading based on data owners' rules and offering a clear value proposition. Finally, to leverage on the data collected to provide advanced Data Analytic services based on which the different actors in the port value chain could develop novel AI and cognitive applications.

DataPorts will allow establish a future Data Space unique for all maritime ports of Europe and contribute to the EC global objective of creating a Common European Data Space.

1.2 DELIVERABLE PURPOSE AND SCOPE

Specifically, the Description of Action (DoA) states the following regarding this Deliverable:

This document will describe the dissemination and communication activities carried out in the corresponding period, will monitor the KPIs achieved, and the adoption of potential correction measures.

The purpose of this document is to report on the results of DataPorts overall Communication and Dissemination strategy through various channels until M39 of the project. In scope of this purpose, the present document aims at the monitoring of the dissemination routes of the project.

The project's dissemination activities focus on web presence and the design and production of promotional material such as factsheets, brochures, presentation templates, project presentations, and website content. Moreover, they address social media, publications of scientific papers, as well as the presentation of the project at key stakeholder events.

Moreover, under the scope of the present document falls the documentation of the project's communication to its diverse target groups, which encompass the relevant domains, industry sectors, research and developer communities, and End Users.

Apart from the planned dissemination activities, the progress of the KPIs described in the Grant Agreement needs to be evaluated for potential correction measures to be adopted. Therefore, the present document aims at suggesting those measures based on the reported metrics and dissemination results. The proposed measures are going to be evaluated, in order to be included in the dissemination plan scheduled for the final year of the project.

1.3 DELIVERABLE CONTEXT

Its relationship to other documents is as follows:

Primary Preceding documents:

- D6.1 Dissemination and communication plan (M06): The deliverable describes the initial dissemination plan in terms of the activities that were planned to take place within the project's lifespan, as well as, the target audiences and messages of the project.
- D6.2 Report of dissemination and communication results (M12): The document depicts the progress achieved concerning the dissemination and communication activities carried out in the first year of the project.
- D6.5 Dissemination and communication plan (M18): The second iteration of the D6.1 deliverable that describes the updated dissemination and communication plan, according to the initial results of the dissemination strategy, which are included in the deliverable D6.2. The results and the evaluation reported in D6.6 are based on that plan.
- D6.6 Report of Dissemination and Communication Results (M24): This document states the progress of dissemination and communication activities carried out throughout the first and second year of the project. It includes the information published in the deliverable D6.2. The current document (D6.7) also includes the information published in D6.6.

1.4 DOCUMENT STRUCTURE

This deliverable is broken down in the following sections:

- **Section 1** includes the Introduction of the document, which entails the description of the scope, purpose, and structure of the present document. In addition, document dependencies and context are presented to the reader
- **Section 2** recaps the dissemination activities that were planned and specified during the first six months of the project, were reported in D6.1 and updated in D6.5. Moreover, this section describes the reporting tools that are going to be utilized hereunder, as well as the way to assess the fulfilment of the dissemination KPIs
- **Section 3** includes information about the dissemination activities through the major dissemination channels that include the website of the project, and the social media platforms
- **Section 4** addresses the dissemination package of the project. More specifically, the creation of the project's identity and the diffusion of this identity in a consolidated manner is described through the created material
- **Section 5** contains information about the on-site dissemination events that took place until M39 of the project, including virtual events that diffuse the project's presence and goals
- **Section 6** describes the scientific dissemination of the project, listing the papers that were published in the context of DataPorts project, as well as its educational and open-source contributions
- **Section 7** contains the conclusions that are drawn from the KPI achievement and the reporting of all the dissemination activities until M39 of DataPorts. This section also includes the correction measures that are proposed and can be leveraged during the re-evaluation of the dissemination plan

Annexes

- **Annex 1 (Section 9):** Global Dissemination Matrix presents the aggregated and overall dissemination activity for the DataPorts project

1.5 DOCUMENT DEPENDENCIES

This document is part of an iteration of living deliverables. This is the third version, which is due to M39. The second version (D6.6) of the deliverable was delivered in M29, whilst the first iteration (D6.2) of the deliverable was delivered in M12. Each of these deliverables are destined to report the outcomes and efficiency of the dissemination activities that take place until the corresponding time period.

2 DISSEMINATION PLANNING AND EVALUATION

At the very beginning of the project, it took place the planning of the dissemination strategy and actions that would lead to the fulfilment of the KPIs that are described in the Grant Agreement of the project. Even though this planning is thoroughly described and analysed in the D6.5 Dissemination and communication plan M18 deliverable [1], a short summary of the diffusion foundations described there, is also presented hereunder.

2.1 DISSEMINATION ACTIVITIES PLANNING

The first semester of the project laid the foundations for the creation of DataPorts identity by preparing the dissemination tools to be utilized during the project's lifecycle, as well as, by raising awareness concerning its content and value. To this end, after the creation of the logo, a website was created during the first month of the project. Moreover, a social media strategy was formed during those months, in terms of which, the project's accounts in the respective social media platforms were created, while the presence of the project in various press media was established.

In accordance with D6.5 deliverable, the table that includes all the planned dissemination and communication activities, including their periodicity, responsibility and task division is also depicted in Figure 1 and Figure 2. These activities are considered as a guideline to evaluate and monitor accurately the manifestation of DataPorts dissemination strategy occurring until M39. Moreover, the present document is aligned with the structure of the table included below, in such a way that the reader can gain an insight of the progress and effectiveness of the dissemination strategy of the project.

Type of action	Dissemination action / channel		How often?	Responsibility and task division
COMMUNICATION	Update of the website		Periodically. When there is new information to include (deliverables, news, announcements...). From M1 to after the end of the project.	UPV is the responsible of Website. All partners must provide content and collaborate.
	Dissemination and promotional materials (flyer, roll-up, infographics)		Provide 1 generic version during the first year. This version can be improved during the project. Furthermore, new versions will be provided during the project adapted to promote specific events or milestones of the project.	UPV coordinate the creation of the generic materials. Mainly, with the support of the coordination, impact manager and the leaders of the pilots. Each partner is responsible for adapting the generic material to their needs.
	Creation and use of communication campaigns		When milestones or notable events occur related with the project.	Partners involved in the campaigns. With the supervision of the UPV, coordination and the Impact support group.
	Social networks	Twitter	Post approximately 1 tweet per week. But the frequency may be higher when it is required to promote an event or milestone more strongly.	UPV and ITI manage the social network. All partners must provide content and interact with the DataPorts Twitter account. Direct collaboration with partners who want to promote an event is expected during the six weeks before and the week after the event.
		Linkedin	Provide own content approximately 1 time per month.	UPV manages the social network. All partners must provide content and interact with the DataPorts Linkedin account.
		Youtube	Portal for linking DataPorts' videos or clips or presentations. Not periodically updated.	UPV manages the account and coordinates a plan to provide a video presentation about a milestone achieved in the project. Thematic videos series (e.g. about data sharing, container tracking, blockchain, AI...). All the content (project presentation, architecture, used technologies, pilots ...) must be created by an assigned responsible with the collaboration of the coordination, impact support group and technical committee.
		Researchgate	Portal for linking DataPorts' scientific publications. Not periodically updated.	Any partner who wants to link a scientific publication.
		Slideshare	Portal for linking DataPorts' slide presentations. Not periodically updated.	Any partner who wants to upload a presentation.
		Flickr	Portal for linking DataPorts' photos or pictures. Not periodically updated.	Any partner who wants to upload a picture.
	Dissemination package	Videos	2 videos during the project. A project presentation video will be provided before M18. It will be the official and promotional video of the project. Another video will be provided at the end of the project related with the demonstrations.	UPV coordinates the creation of the official video. Mainly, with the support and supervision of the coordination, impact manager, the leaders of the pilots and technical committee. All partners must provide ideas and content to the video.
		Blogs	Linked to the website. It will be modified when there are milestones to highlight. Its use will increase from the second year of the project on.	All partners must provide at least two news or blog posts during the project related to the project. The UPV will select this news and include it on the DataPorts website.
		Press releases	When milestones or notable events occur related with the project.	
		Newsletters	At least 3 newsletters will be produced during the project (at least one per year). But the desired objective is starting from M12, a new newsletter will be provided approximately every 6-9 months.	Coordinated by UPV. The continuous support and supervision of OTE and ITI. The selection of contents involves all DataPorts managements bodies. All partners must to contribute in the content.

Figure 1 – Activity Planning (i)

Type of action	Dissemination action / channel	How often?	Responsibility and task division
ON-SITE DISSEMINATION	Presentations at industry events	At least 2 per year. But, taking into account that some events of first year are postponed due COVID-19.	Event responsible partner must lead the on-site activity. Innovation manager is the responsible to plan, coordinate and monitor the innovation activities, providing the linking with industry beyond the consortium. UPV provides help in the diffusion and communication of the event and monitors the correct progress of the preparation of the event.
	Presentations at scientific conferences	At least 2 per year.	
	Bilateral discussions with stakeholders	Linked to the impact creation task. Minimum of 5 during the project lifetime.	
	Participation in industry events and fairs	There is no specific periodicity. Periodic attendance at interesting events for the project is recommended.	
	Demos/booths of DataPorts	At least 2 through the project duration.	
	Dissemination workshops organized by DataPorts	2 during the project lifetime.	
	On-site visits to field trials	2 during the project lifetime.	
SCIENTIFIC DISSEMINATION	Publications at top tier conferences	At least 2 per year.	Technical committee support the preparation and organization of papers for conferences identified or proposed by the Dissemination Manager. All partners are continuously analysing whether their technical advances are keen to be published.
	Publications at journals		
	Publications at magazines		
	Open source contributions	At least 1 per year.	WP2, WP3, WP4 and WP5 partners. Some of the project partners involved in those WPs use Open Source code or contribute to the Open Source communities. Alternatively, some of those partners can contribute to Standards, be they open standards or other.
	Training sessions using E-learning platform	At least 1 through the project duration.	Technical committee select and provide the content. Impact support group ensure the impact of the training sessions.
	Organization of webinars	At least 2 per year.	Depending on the content of the webinar (technical, business, impact, innovation ...) there will be a specific role or management body in charge of the webinar and selecting and providing the content of the activity. The dissemination manager will be responsible for helping to disseminate and promote the webinar.
	World-wide dissemination tours and seminars at universities	At least 1 per year.	Coordinated by the UPV. Partners who are university or interested in this field will be mainly involved.

Figure 2 – Activity Planning (ii)

2.2 EVALUATION APPROACH AND MONITORING

2.2.1 Dissemination Matrix

A major tool in monitoring and evaluating the status of the dissemination and impact status of DataPorts is the Excel file named “Events and Dissemination”. This file is shared amongst all partners as a reporting tool that can be utilized to document any dissemination action and milestone.

This file is organized into spreadsheets, each one of them representing a different aspect of the dissemination strategy of the project. Thus, each spreadsheet is structured differently for the reporting of each activity to be tailored to the needs of each dissemination approach. The YouTube spreadsheet, for example, contains a table that describes the type of each video, its title, duration, publication date and link, as well as the partners that were involved in its creation and the rationale behind it.

The visual summary of the "Events and Dissemination" excel file is the Global Dissemination Matrix that can be found in Section 9 (Annex 1). This matrix contains all the dissemination information until M39 in an aggregated manner regarding the aspects of on-site, scientific, and virtual diffusion dissemination.

2.2.2 KPI Assessment

Concerning the assessment of the KPIs' fulfilment, it is measured according to the categories depicted in Table 1. The Task Leader will make use of the Dissemination Matrix tool to update the percentages of completion of the different targeted KPIs. The defined categories aim at monitoring closely the degree of KPI fulfilment and the respective adjustment of the course of action.

Categories		General actions or measures
0	Immediate action necessary	KPI is below the expected value. Improve the dissemination activities relevant to KPI
1	Needs further attention	KPI is slightly below expectations. Further measures for improvement need to be discussed and addressed to partners
2	Good progress	KPI is on track with the dissemination plan and strategy. No corrective actions are necessary. Continue with the monitoring
3	Overachievement	KPI exceeds the expectations! The dissemination plan is possibly under evaluated. Shift or concentrate efforts to other tasks (dissemination or not) with lower performances

Table 1 – Diffusion KPI evaluation

For the rest of the quantitative indicators that are defined by the DataPorts consortium, their progress can be evaluated with the description of achieved milestones without the definition of a strict target value. Each partner elaborates on the progress of each quantitative indicator that addresses their dissemination activities. The additional potential quantitative indicators of the dissemination activities are included in the following paragraphs, as a measure to define the progress of the dissemination strategy and its impact according to a multi-level analysis with an overall documentation.

3 DISSEMINATION CHANNELS

The dissemination channels include the website and all the social media platforms. Moreover, since there is a dedicated section in the project's website that contains the blogposts written by the consortium, the blogposts segment is also reported under the dissemination channels.

3.1 KPI FULFILMENT

Diffusion activity		Target value in Grant Agreement	Status and Category Ranking	Key Performance Indicator (KPI)	Achieved Milestones and Category Ranking	
					Current Value	Evaluation
Website	-	Website up and running until M39	Website went live in the first month of the project	Number of accesses and visitors to the website	153,206 accesses 44,297 visitors	Category 3: Overachievement
Blogposts	-	At least 1 per year per partner	35 Blogposts have been published on the website of the project until M38	-	-	Category 2: Good progress
Social networks	Twitter	At least 100 new followers per year; At least 50 publications per year	The twitter account of the project has 351 followers, and 349 tweets in total	Number of tweets per week	2.1 tweets per week	Category 3: Overachievement
	YouTube		YouTube channel has 12 subscribers, and 12 uploaded videos	Number of views	888 views	
	LinkedIn		DataPorts LinkedIn page has 275followers and 220 posts	Profile views and interactions	2014 profile views and interactions	
	ResearchGate & SlideShare		There are 18 research publications referenced in ResearchGat	Number of reads and views	157 reads in ResearchGate 342 views in SlideShare	

Diffusion activity		Target value in Grant Agreement	Status and Category Ranking	Key Performance Indicator (KPI)	Achieved Milestones and Category Ranking	
					Current Value	Evaluation
			e, and 9 documents in total on SlideShare			
	Flickr		Flickr account has 121 published images	Number of views	2,475 views	

Table 2 – Dissemination Channels KPIs

In Table 2 are included the KPIs mentioned in the Grant Agreement, as well as the additional KPIs that were described in the D6.5 deliverable [1]. According to the evaluation of each diffusion activity, the website of the project overachieved the expected metrics, while the blogposts made good progress. Concerning the social networks, they have shown significance progress in terms of attracting new followers and publishing new content, particularly Twitter, LinkedIn, and YouTube, which serve as the main dissemination media of DataPorts. The views on the project's ResearchGate, SlideShare, and Flickr account pages have been also increased, nevertheless these platforms act as subsidiary tools of the whole dissemination and communication strategy.

3.2 WEBSITE

The website is considered the main diffusion medium that aggregates and exhibits the main information and data associated with the progress of the project. For that reason, the DataPorts website is regularly enriched with new material to document and communicate all the different aspects of the project's results and outcomes. More specifically, the website is updated on a frequent basis with information about new scientific papers that are published under the auspices of the project, as well as public deliverables that exhibit the progress, objectives, and results of each period of DataPorts. Moreover, the website contains frequently updated information and footage from conferences that the project has participated in, dissemination material, as well as information about upcoming events. Lastly, the use cases of the project with the tangible results of the project's framework and innovation are also included in the website's content, along with the description of the objectives of each use case, while being updated in parallel with the implementation of DataPorts Platform.

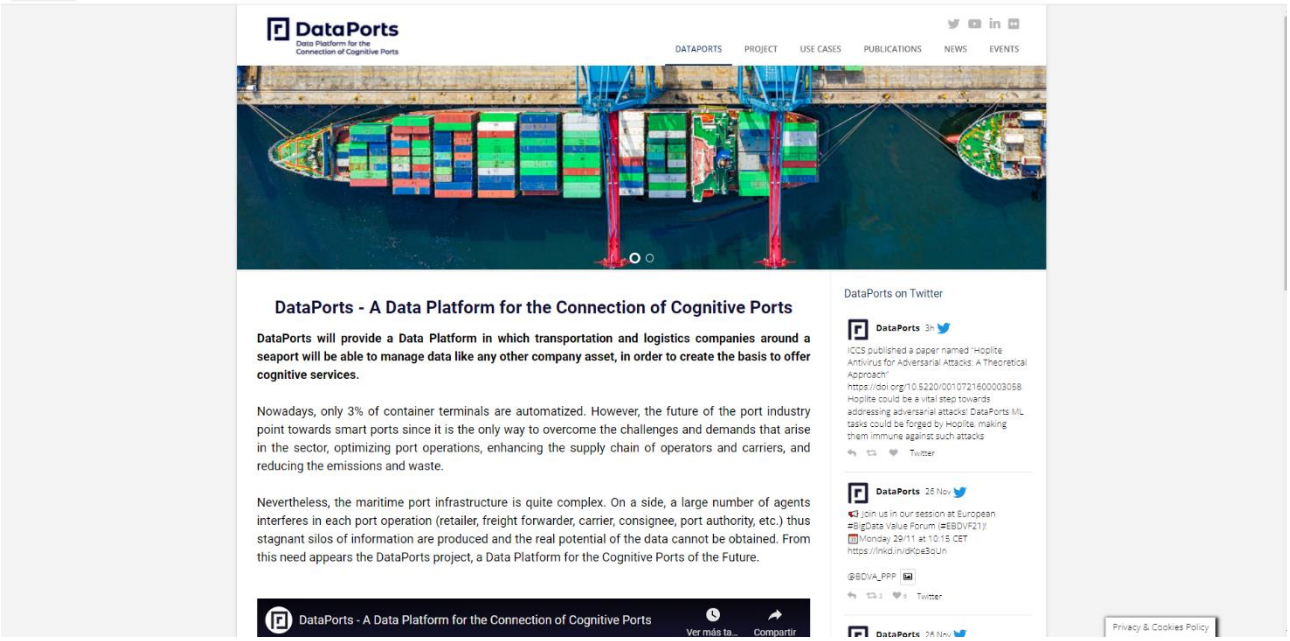


Figure 3 – Screenshot from DataPorts website

Figure 4 – Screenshot from the Publications tab in DataPorts website

3.2.1 Additional Quantitative Indicators

According to the Grant Agreement of the project, the DataPorts website should achieve the target value depicted in the corresponding column of the consolidated Table 2 – Dissemination Channels KPIs. However, since the initial planning of the dissemination actions, and to gain a broader understanding of the

effectiveness of the dissemination, additional quantitative indicators were proposed in the D6.1 deliverable [2]. These indicators were introduced to complete the monitoring of the diffusion influence of the project's website. Hereunder are aggregated the results of these indicative additional metrics in combination with other ones that contribute in the same direction.

Until M38 of the project, its website had 153,206 visits and 44,297 unique visitors.

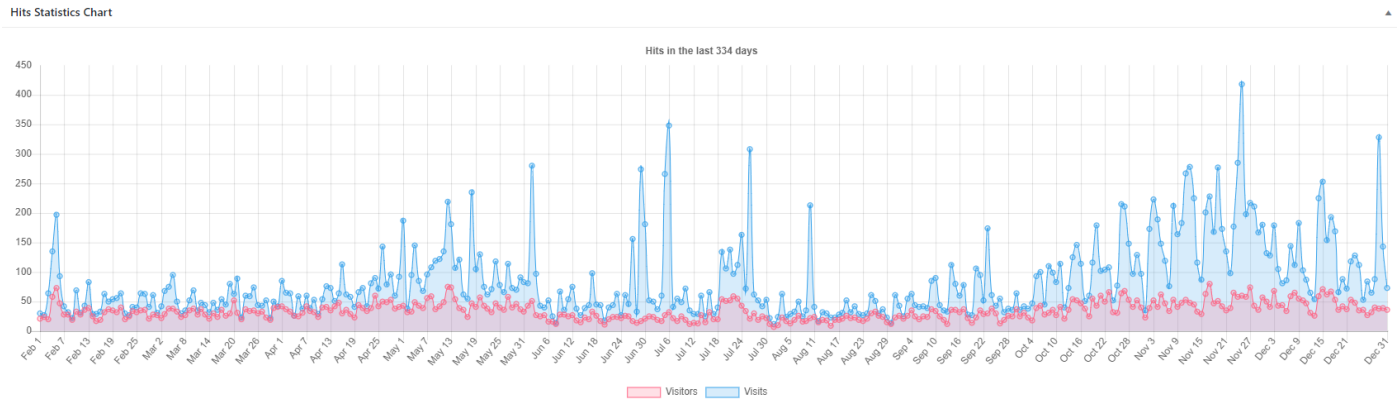


Figure 5 – Visits and unique visitors of the website during 2020

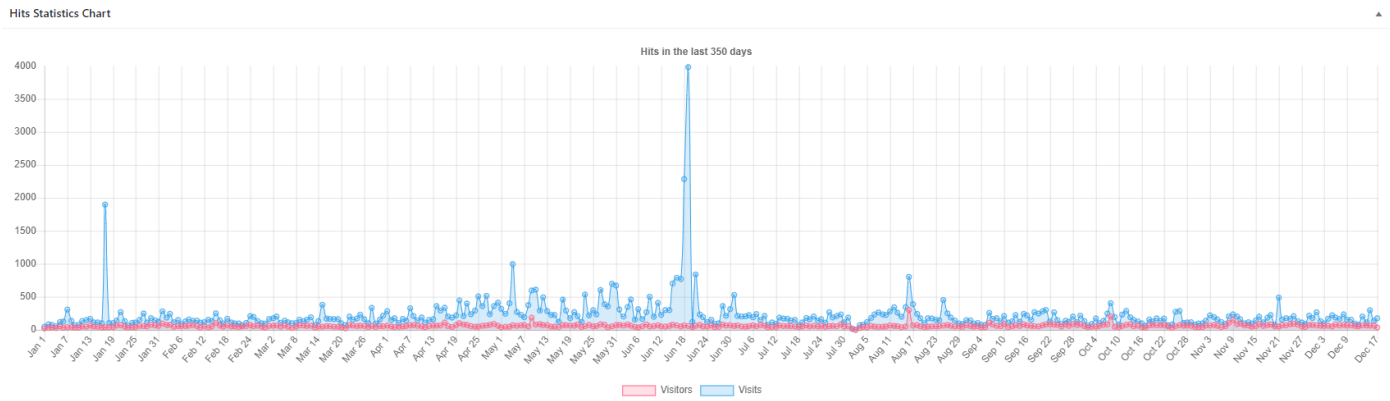


Figure 6 – Visits and unique visitors of the website during 2021

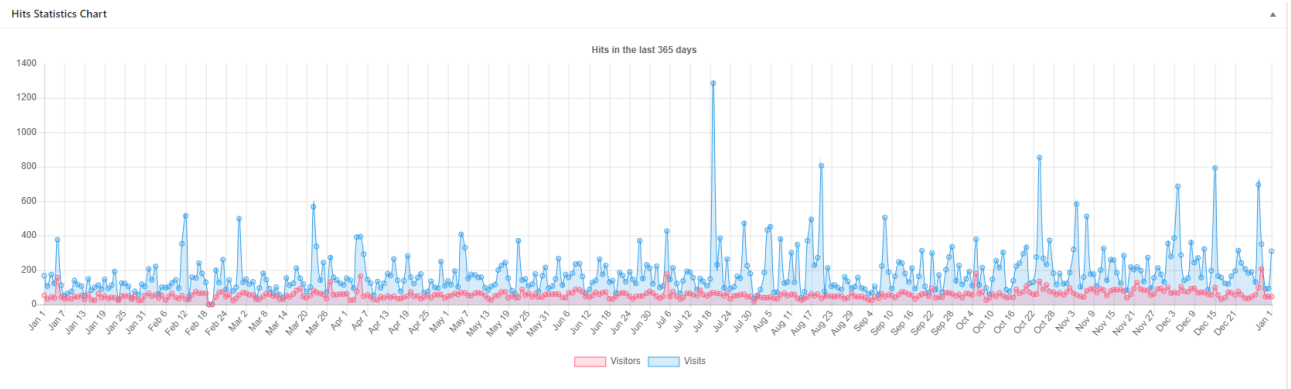


Figure 7 – Visits and unique visitors of the website during 2022

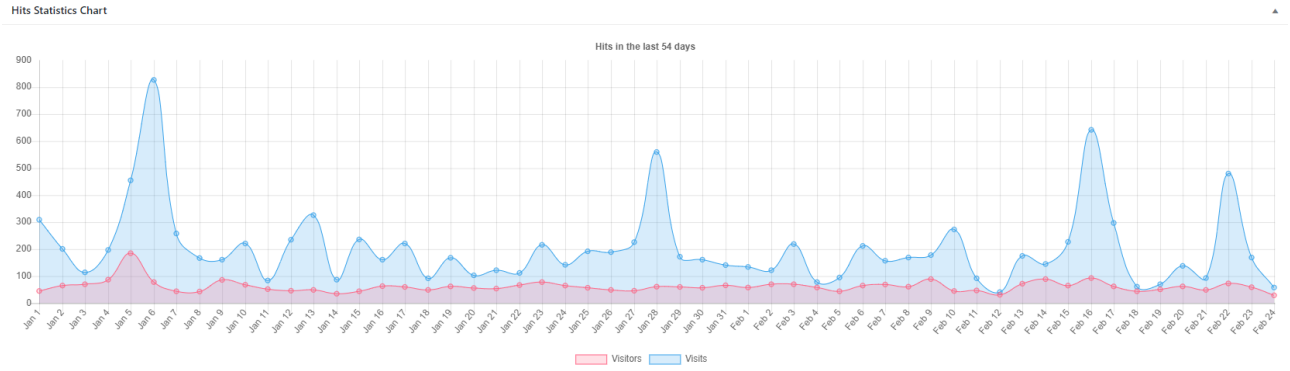


Figure 8 – Visits and unique visitors of the website during 2023

As can be seen in Figure 5, Figure 6, Figure 7 and Figure 8, it is worth noting that the daily visits have been increased in the second year of the project, compared to the first one, especially during time periods when plenty of dissemination activities took place. For example, the peaks that appear in May-June 2021 are related to significant events that DataPorts has organized or participated at that time, such as the RI.Logistica conference or the BDVA/DAIRO Data Week 2021. Nevertheless, a very relevant piece of data that can be extracted is how the visits started to increase the closer it got towards the end of the year, specifically after September, where a project promotion streak took place in the FIWARE Global Summit. After this DataPorts got promoted in events such as TRA, EBDVF and the Digital Transformation Summit that took place in Madeira. Other peaks in visits in June and July can also be attributed to social media publicity based around platform events during the period.

Below are depicted the number of visits for each of the country with the most visits in the DataPorts website. Moreover, the number of views per website component are listed below:

Rank	Country	Visitor Count
1	United States	18,421
2	Germany	4,323
3	China	4,207
4	Spain	3,147
5	France	2,648
6	Greece	2,223
7	United Kingdom	1,841
8	Netherlands	1,694
9	Russian Federation	1,596
10	Ireland	1,311

Table 3 – Visits per country

ID	Title	Visits
1	Home Page	54,641
2	Port of Valencia	3,594
3	Consortium	2,510

ID	Title	Visits
4	Overview	2,203
5	Research papers	2,179
6	Deliverables	2,108
7	Port of Thessaloniki	1,913
8	DataPorts Concept	1,785
9	Smart Containers	1,622
10	Objectives	1,513

Table 4 – Page views

As can be seen in Table 3 many visitors are in countries where the project's consortium does not have any presence, i.e., the United States, China, Russian Federation and United Kingdom. In addition, most of the visitors are interested in the project's consortium and overview, as well as the port of Valencia use case. In particular, the number of views of the Valencia use case has increased dramatically during this period, up to close to three times the number of views reported in the last version of this deliverable.

As far as the number of pages that are accessed during each session, each user accesses 1.279 pages on average. Moreover, there were more than 700 redirections from social media platforms towards the project's website, and 7,922 from online search.

3.3 BLOGPOSTS

Within DataPorts website is located a dedicated tab which leads to blogposts. These blogposts stem from outcomes and deliverables that occur along the lifespan of the project and are written by the same partners that have contributed to the corresponding milestones. Through this section, a reader can be fully informed on a higher level about DataPorts, the technological sectors that the project addresses, as well as the project's vision, goals, and achievements.

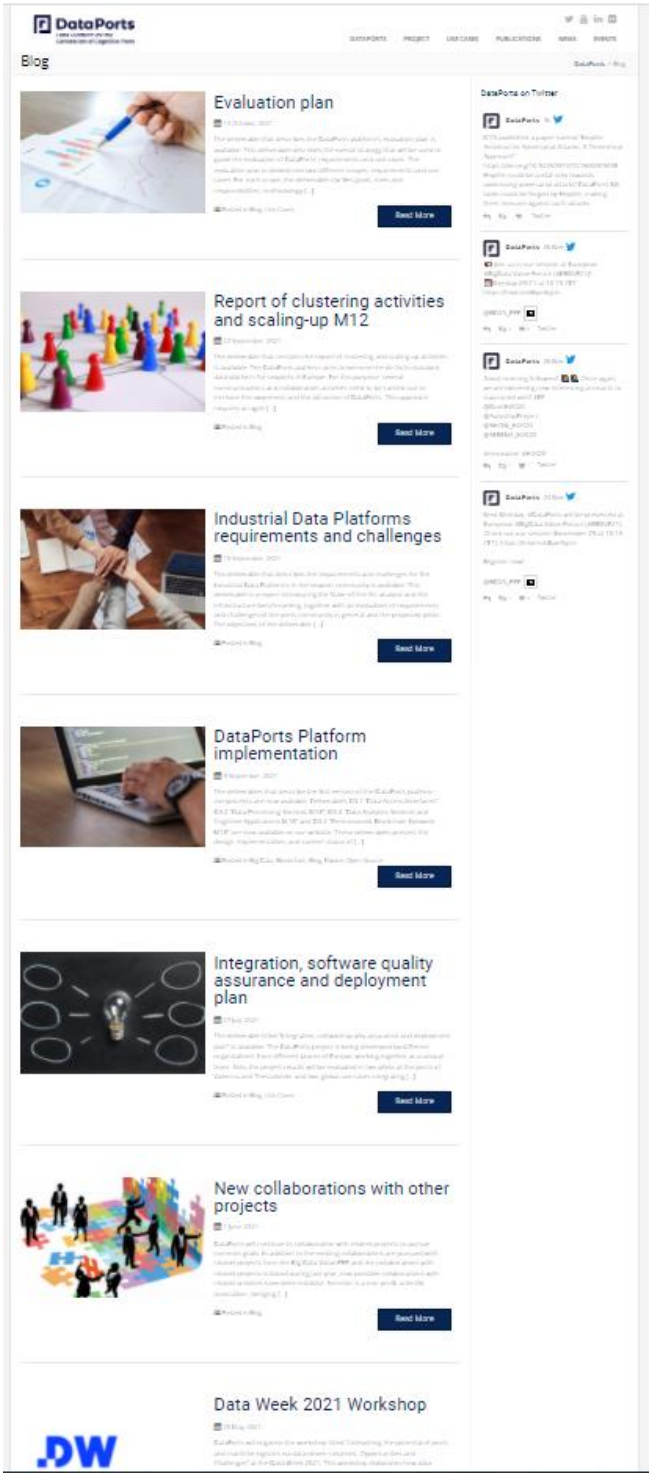
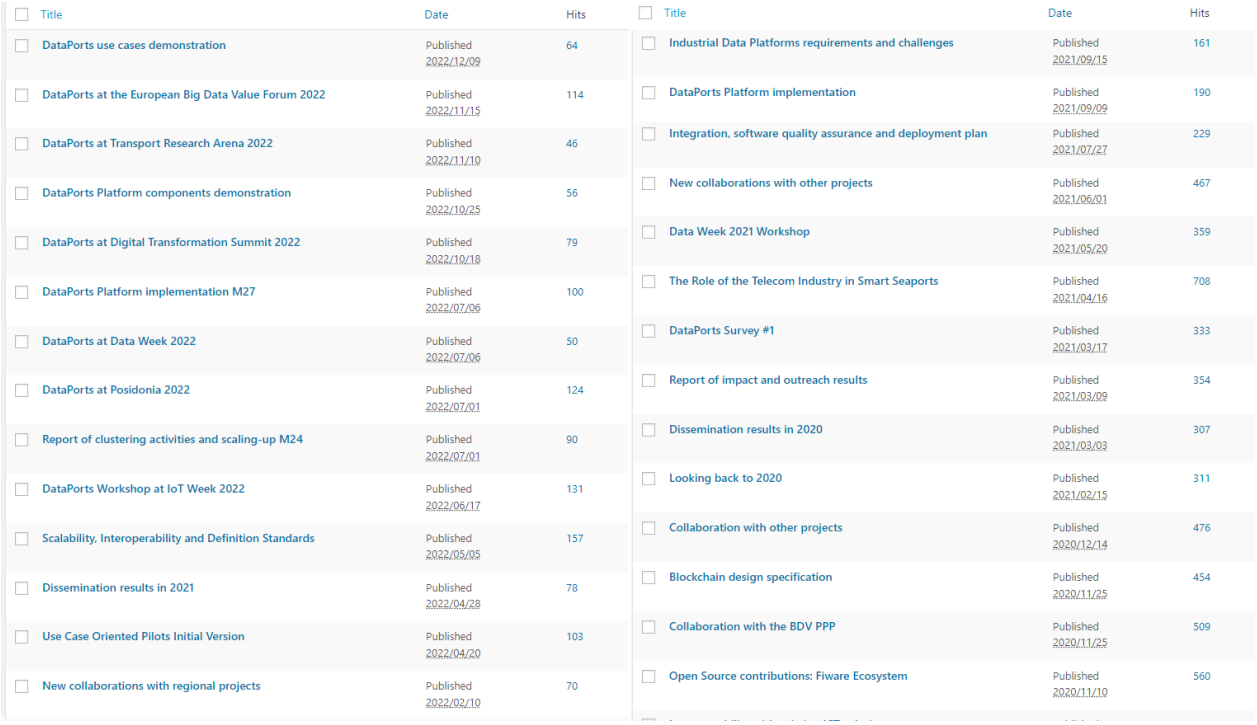


Figure 9 – Screenshot from the Blogpost section in DataPorts website

The publication dates and views of the blogposts on the website are the following:



Title	Date	Hits
DataPorts use cases demonstration	Published 2022/12/09	64
DataPorts at the European Big Data Value Forum 2022	Published 2022/11/15	114
DataPorts at Transport Research Arena 2022	Published 2022/11/10	46
DataPorts Platform components demonstration	Published 2022/10/25	56
DataPorts at Digital Transformation Summit 2022	Published 2022/10/18	79
DataPorts Platform implementation M27	Published 2022/07/06	100
DataPorts at Data Week 2022	Published 2022/07/06	50
DataPorts at Posidonia 2022	Published 2022/07/01	124
Report of clustering activities and scaling-up M24	Published 2022/07/01	90
DataPorts Workshop at IoT Week 2022	Published 2022/06/17	131
Scalability, Interoperability and Definition Standards	Published 2022/05/05	157
Dissemination results in 2021	Published 2022/04/28	78
Use Case Oriented Pilots Initial Version	Published 2022/04/20	103
New collaborations with regional projects	Published 2022/02/10	70

Title	Date	Hits
Industrial Data Platforms requirements and challenges	Published 2021/09/15	161
DataPorts Platform implementation	Published 2021/09/09	190
Integration, software quality assurance and deployment plan	Published 2021/07/27	229
New collaborations with other projects	Published 2021/06/01	467
Data Week 2021 Workshop	Published 2021/05/20	359
The Role of the Telecom Industry in Smart Seaports	Published 2021/04/16	708
DataPorts Survey #1	Published 2021/03/17	333
Report of impact and outreach results	Published 2021/03/09	354
Dissemination results in 2020	Published 2021/03/03	307
Looking back to 2020	Published 2021/02/15	311
Collaboration with other projects	Published 2020/12/14	476
Blockchain design specification	Published 2020/11/25	454
Collaboration with the BDV PPP	Published 2020/11/25	509
Open Source contributions: Fiware Ecosystem	Published 2020/11/10	560

Figure 10 – Blogposts published in the DataPorts website

3.4 SOCIAL MEDIA

Even though the project's website is the main medium for communication and dissemination of the project, social media platforms play a crucial role in leveraging the impact of communication results concerning raising awareness of the project. Social media offer the capability of frequent updates concerning all the content created from the project's progress, while customizing the conveyed message according to the platform and its attributes, as well as the target audience.

3.4.1 Target Audiences Identified and Key Messages

The plurality of the leveraged social media platforms in combination with their broad usage by many different groups contribute to the addressing of all the identified target audiences in scope of DataPorts. More specifically, the target audiences of the project's dissemination strategy are Industry and End Users, Technology Providers, data market actors, and others, such as the academic community and government and regulatory bodies. All these audiences use and interact with more than one social media platform. Therefore, objective of the dissemination strategy, as far as social media are concerned, is the tailoring of the key messages to cater for each social media platform. Nevertheless, some of these platforms address almost exclusively specific target audiences, such as ResearchGate that addresses mainly the academic community.

Following the progress of the project, each milestone and content is presented to more than one social media platforms. In this way, the project's outcomes reach out to more than one target audiences and in different formats. For instance, the project's participation in a Big Data Value workshop was documented and published both in SlideShare and in YouTube. In the first medium, the presentation of the project was uploaded, while in the second the actual footage of the presentation was published. In this way, the exposure of this event is broadened, and the actual event is potentially communicated to all target audiences that might perform a relative search.

3.4.2 Twitter

Twitter is considered a great online communication channel to leverage visibility, generate influence, promote content, and reach out to target audiences, and especially, to capitalize on call to actions included

on campaigns. For these reasons, it has been the preferred channel to communicate the news and events related with the DataPorts project.

Figure 11 – Screenshot from DataPorts Twitter account

DataPorts Twitter account counts 351 followers. Additional indicative metrics that were examined as far as Twitter analytics are concerned follow below:

2020	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Impressions	2.8K	2.0K	792	1.1K	2.9K	1.7K	961	1.1K	1.0K	2.0K	4.2K	4.7K
Engagement rate	1.8%	0.9%	1.0%	1.0%	0.7%	1.5%	0.4%	1.4%	1.8%	1.1%	2.2%	1.1%
Link clicks	4	8	1	0	11	6	2	7	0	2	14	13
Likes	29	9	2	5	2	8	0	4	11	12	30	17
RTs	17	5	1	3	1	4	2	3	5	2	9	9
Mentions	4	3	2	15	1	0	0	2	2	2	6	4
Profile visits	149	91	71	90	44	55	9	61	63	79	456	721

Table 5 – Twitter statistics summary from M1 to M12

2021	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
Impressions	2.1K	3.9K	3.7K	3.0K	6.2K	4.6K	3.4K	1.3K	1.4K	1.2K	1.8K	914
Engagement rate	1.9%	2.0%	1.7%	1.0%	1.4%	1.2%	1.9%	0.1%	1.6%	4.0%	2.9%	1.9%
Link clicks	20	4	4	1	8	7	4	0	3	2	3	2
Likes	8	35	11	16	33	26	17	1	14	17	24	10
RTs	8	12	7	5	16	10	8	0	7	1	7	8

Mentions	0	0	1	0	1	0	0	0	0	3	1	3
Profile visits	290	516	1072	1037	2142	3148	2625	51	1803	1269	2017	894

Table 6 – Twitter statistics summary from M13 to M23

2022	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36
Impressions	773	1209	1526	1126	1304	2888	615	96	541	1008	1296	668
Engagement rate	4.3%	3.5%	1.5%	2.0%	3.9%	2.7%	3.0%	0.6%	5.5%	2.6%	4.8%	1.7%
Link clicks	0	2	2	0	2	7	4	1	1	1	5	6
Likes	10	24	12	11	26	45	10	0	18	15	15	5
RTs	1	8	7	2	13	13	2	0	4	6		
Mentions			4	3	13	13	4	0	2	7	7	1
Profile visits	1284	1511	1625	1150	2683	2996	1568	190	1651	1098	1430	533

Table 7 – Twitter statistics summary from M25 to M36

2023	M37	M38	M39
Impressions	389	412	-
Engagement rate	1.9%	4.5%	-
Link clicks	1	0	-
Likes	7	7	-
RTs	1	0	-
Mentions	1	0	-
Profile visits	235	448	-

Table 8 – Twitter statistics summary from M37 to M39

According to Tables 6 & 7, the months with the highest Twitter statistics are May-June 2021 and May-June 2022. As mentioned in section 3.2.1, during those periods the project was presented in many dissemination events.

3.4.3 YouTube

YouTube constitutes a great dissemination channel to increase visibility with videos, as it is considered as one of the most popular social media channels. With the creation of the project's channel, it is possible for people from different target audiences to watch the corresponding content. Moreover, this platform boosts the project's visibility in search engines and directs more traffic to the other media of the project.

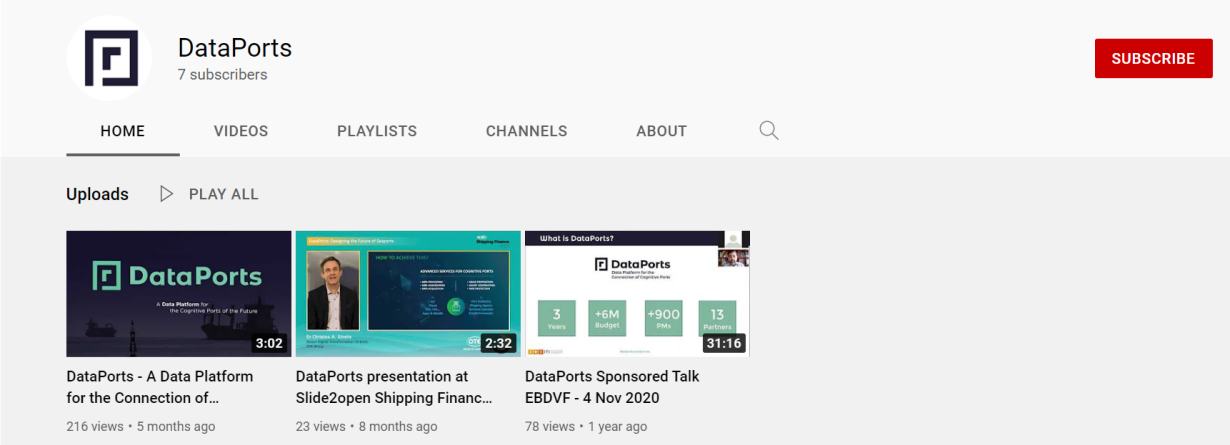


Figure 12 – Screenshot from DataPorts YouTube account

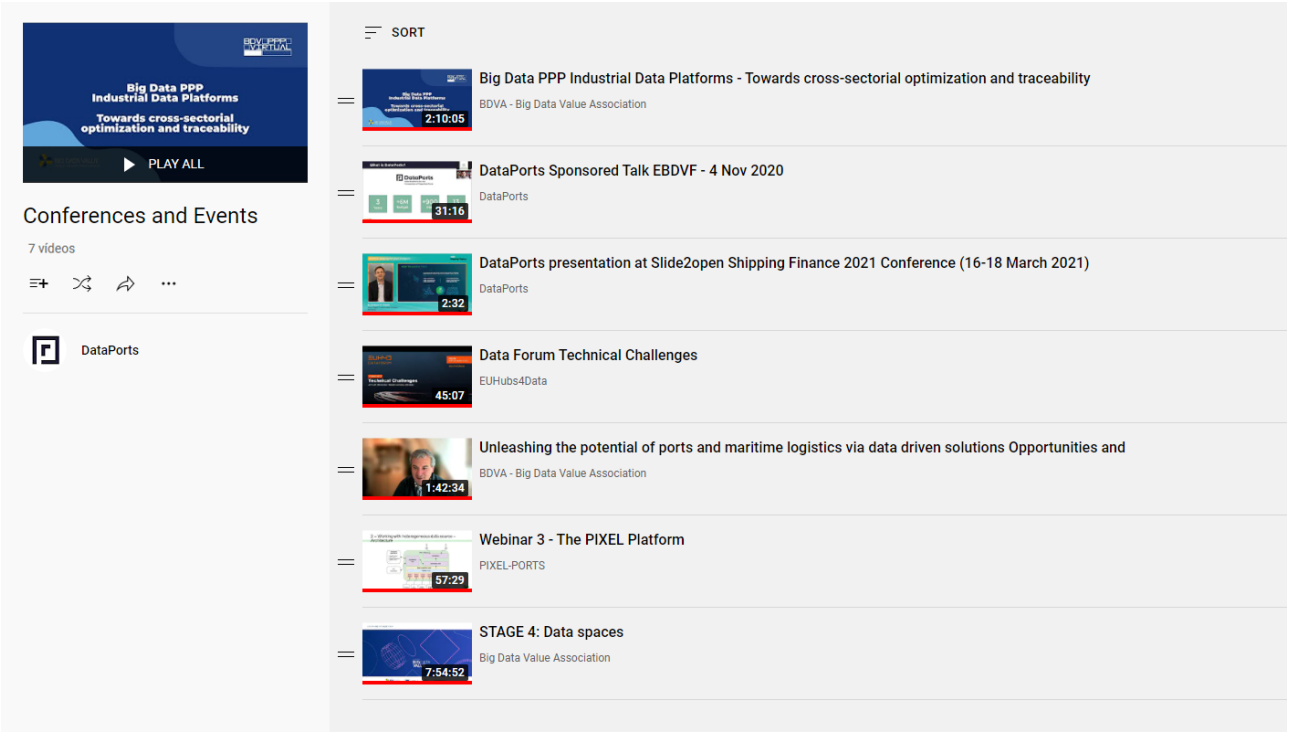


Figure 13 – Playlist available in DataPorts YouTube account

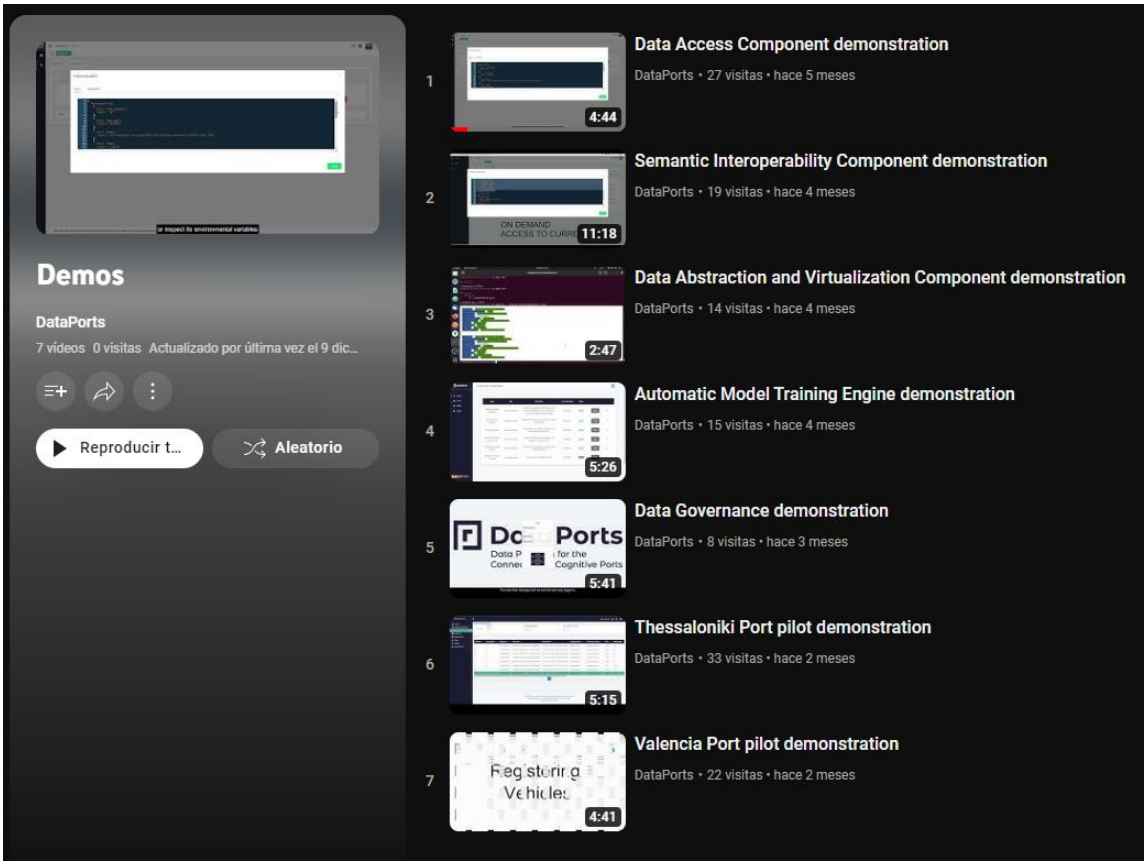


Figure 14 – Playlist available in DataPorts YouTube account

DataPorts YouTube channel counts 12 subscribers and 888 views, while total watch time is calculated as 23.6 hours. Additional YouTube metrics are depicted below:

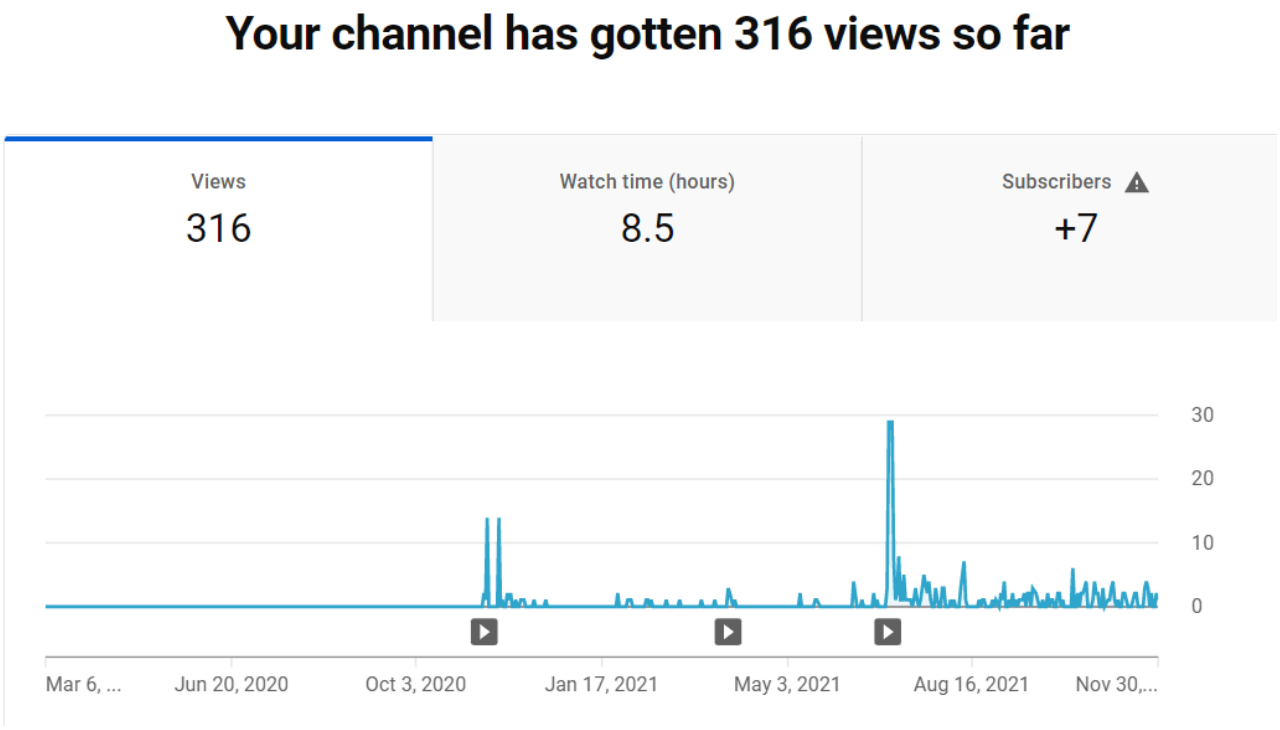


Figure 15 – Views (YouTube Analytics)

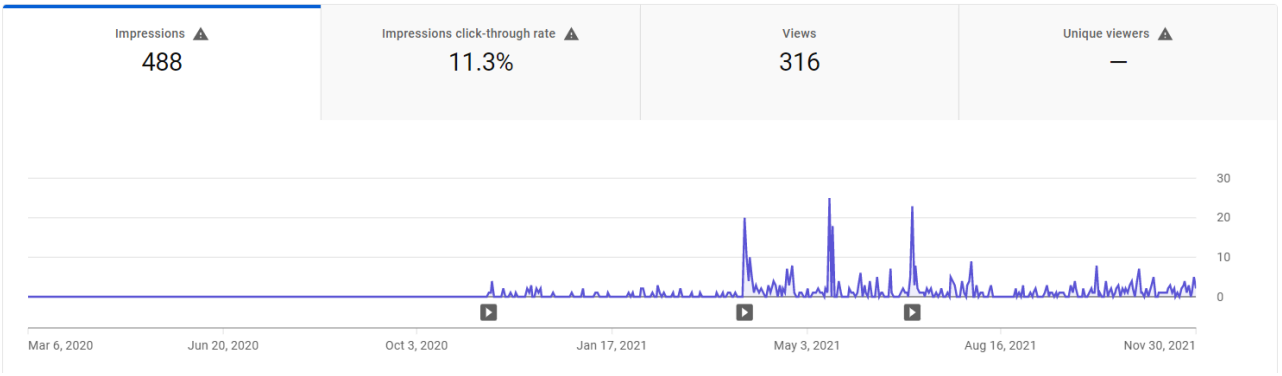


Figure 16 – Most viewed videos (YouTube Analytics)

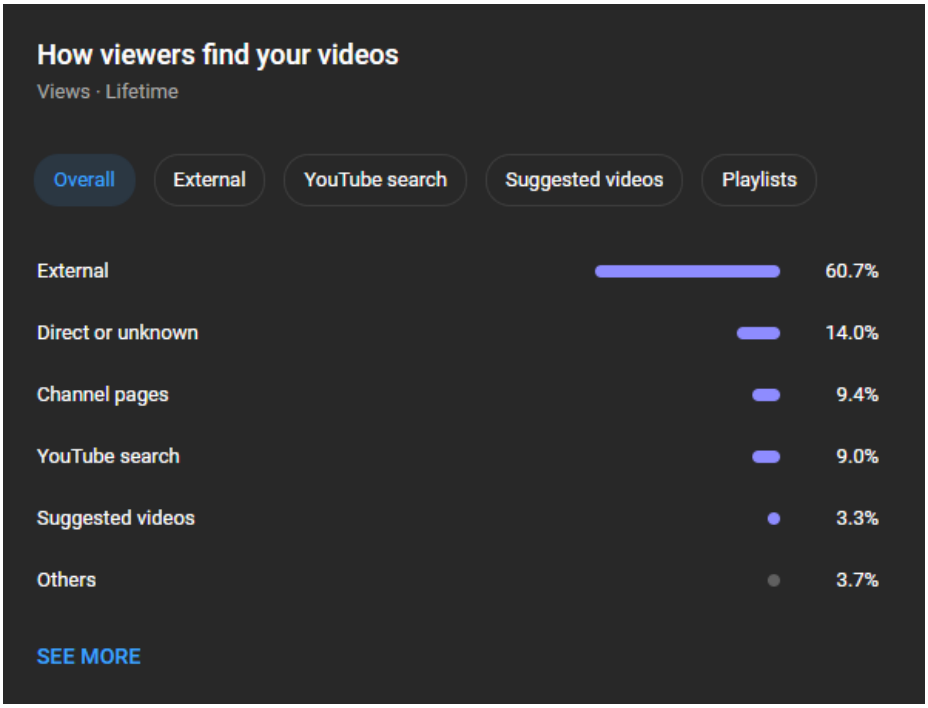


Figure 17 – Traffic sources (YouTube Analytics)

DataPorts YouTube channel obtained content in November 2020. As can be seen in Figure 17, most of the traffic is external because YouTube is used as a support tool for publications on other social networks. It is worth mentioning that the video (Figure 47) promoting the project has been well received (556 views since June 2021). It is also important to note that during 2022 the use of YouTube as a dissemination channel has gained more importance due to the existence of new technical material associated with the results of the project. As a result, the number of views has increased significantly during this period.

3.4.4 LinkedIn

LinkedIn serves as the most significant tool in the outreach of the professional community. This medium represents an effective way to not only support social networking between professionals, but also to actively engage with different existing groups and communities, by contacting professionals, that related to the project's areas of impact, directly. The communication of the DataPorts news, events and relevant information is done using the Company Page. In addition, a personal-like account was created for DataPorts, which serves mainly as a mean to interact with other Users and pages.

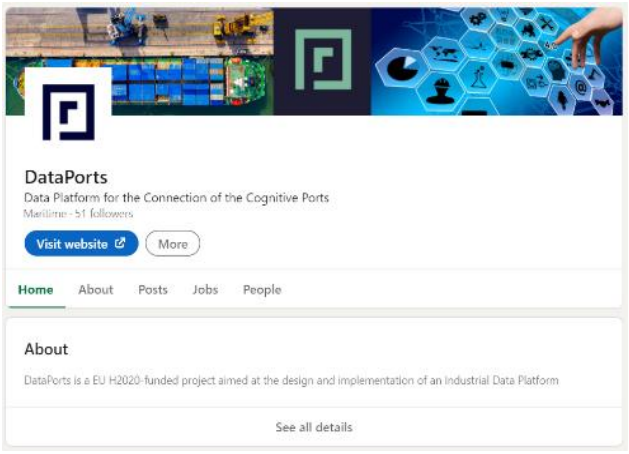


Figure 18 – Screenshot from DataPorts LinkedIn account

DataPorts LinkedIn account has 275 followers, while the engagement metrics for content posted on the platform, as well as analytics and demographics of the followers are depicted below:

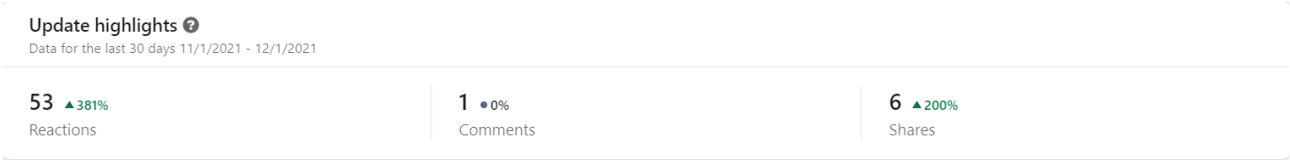


Figure 19 – LinkedIn engagement metrics for last year

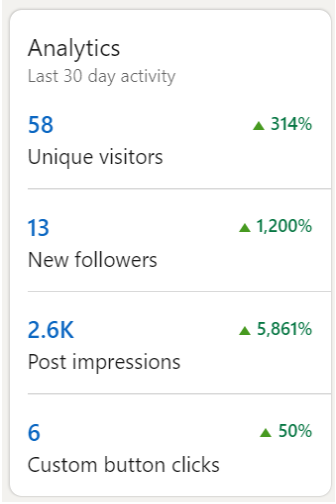


Figure 20 – LinkedIn activity for the last 30 days

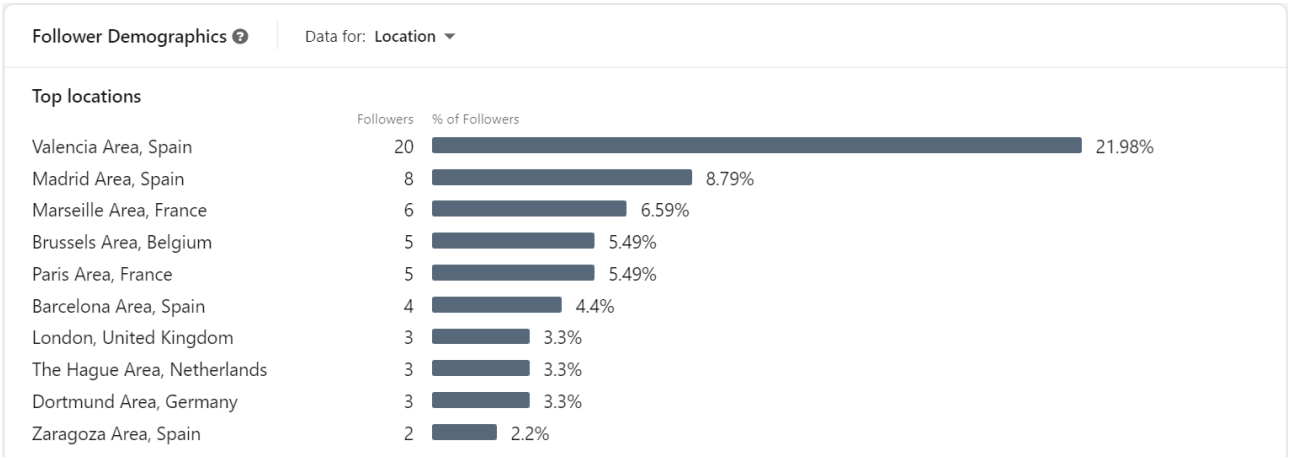


Figure 21 – LinkedIn followers demographics: location (LinkedIn Analytics)

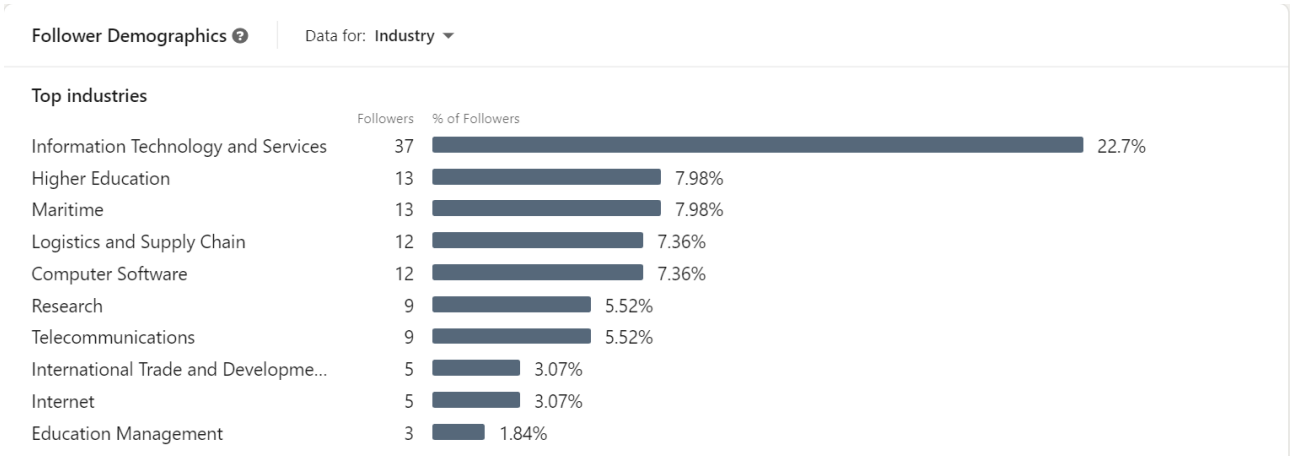


Figure 22 – LinkedIn followers demographics: industry (LinkedIn Analytics)

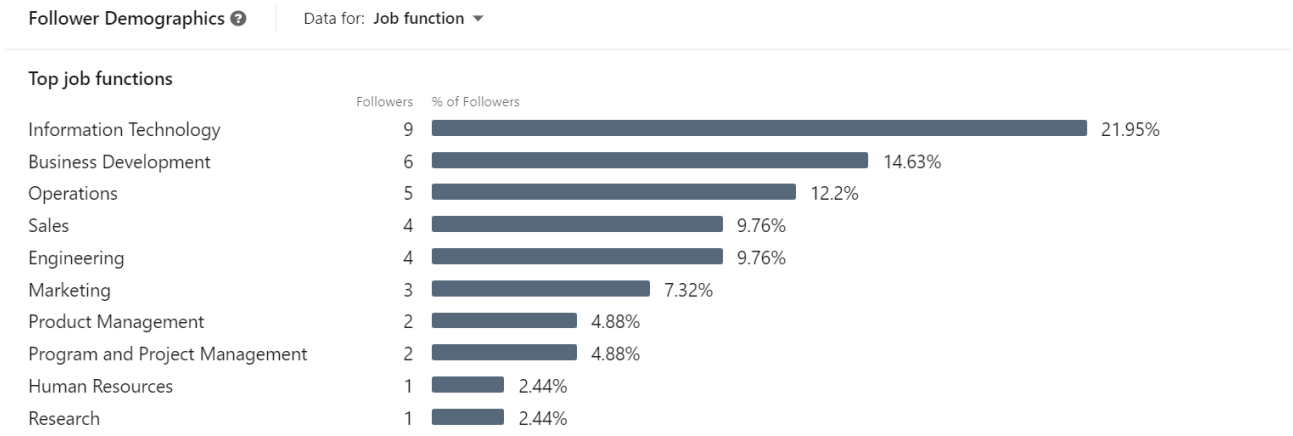


Figure 23 – LinkedIn followers demographics: job function (LinkedIn Analytics)

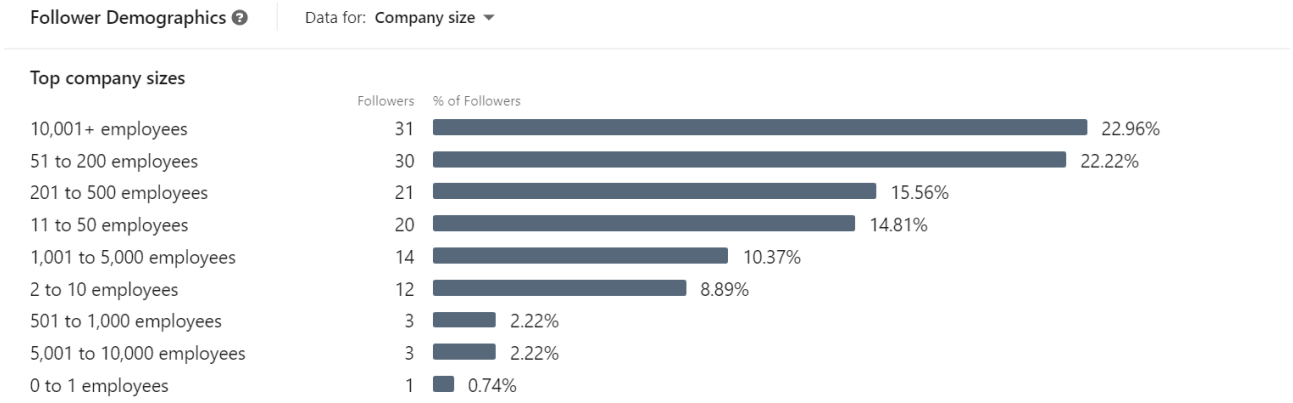


Figure 24 – LinkedIn followers demographics: company size (LinkedIn Analytics)

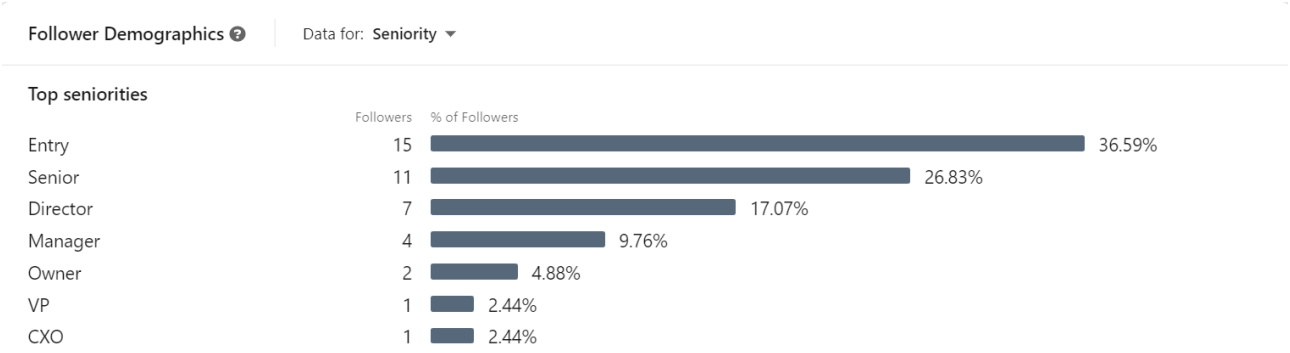


Figure 25 – LinkedIn followers demographics: seniority (LinkedIn Analytics)

According to the demographics presented above, most of the project's LinkedIn followers come from Greece and Spain; they are occupied within the information technology and services, maritime and higher education sectors, while their job function lies within the roles of business developers, research and engineering on entry and senior levels. Concerning the size of the followers' company, the trend detected during 2021 towards a more homogeneous distribution has continued during this period.

3.4.5 ResearchGate and SlideShare

ResearchGate is leveraged to link all scientific publications that are published under the auspices of DataPorts. In this way, the success, and metrics of the scientific publications of the project are going to be aggregated and presented in the project's account in ResearchGate. In the project's ResearchGate account there have been 157 reads.

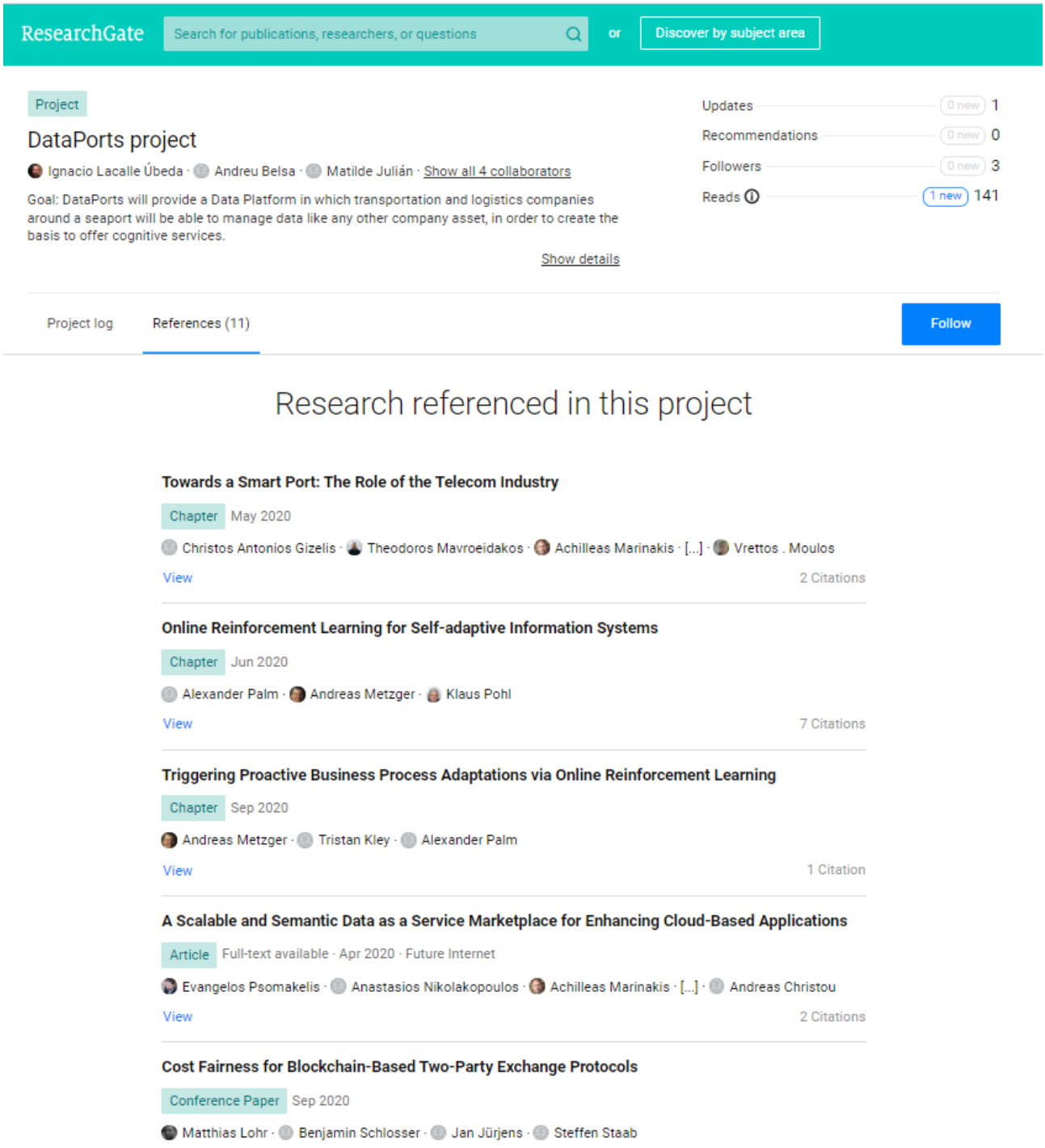


Figure 26 – Screenshot from DataPorts ResearchGate account

SlideShare is utilized as a channel for online distribution of different documentation, content and materials (i.e., presentations) of the project. This social media platform is useful to improve our stakeholder acquisition, since it provides the capability of sharing online content. Moreover, DataPorts content is also available in SlideShare accounts that belong to members of the project's consortium[1].

[1] https://de.slideshare.net/andreasmmetzger/triggering-proactive-business-process-adaptations-via-online-reinforcement-learning

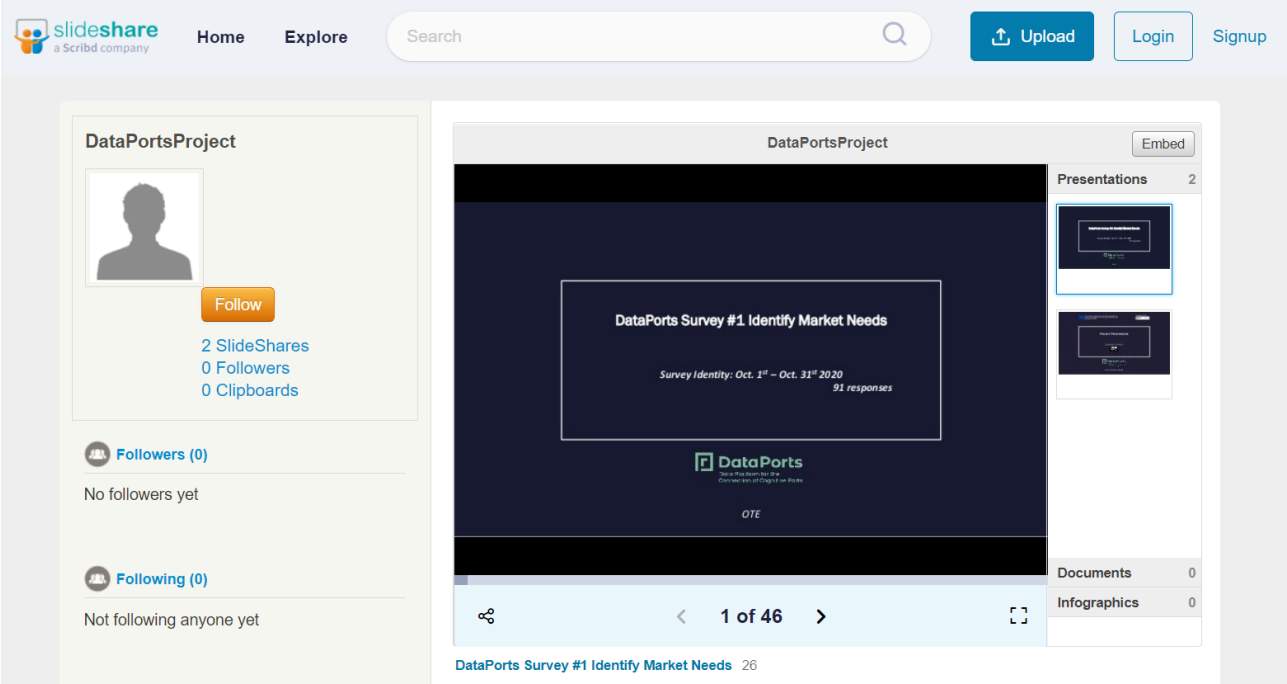


Figure 27 – Screenshot from DataPorts SlideShare

Concerning SlideShare, the views of the project's page are 342, while there have been no likes nor comments. Any additional metrics are presented below:

Top content

Name	Views
DataPorts presentation at "Smart Digital Ports of the Future 2022" conference	49
DataPorts Survey #1 Identify Market Needs	21
Data Governance	14
DataPorts Blockchain Overview	11
DataPorts Project presentation	9

Figure 28 – Most viewed content on SlideShare

Figure 29 – Views timeline for 2020 in SlideShare

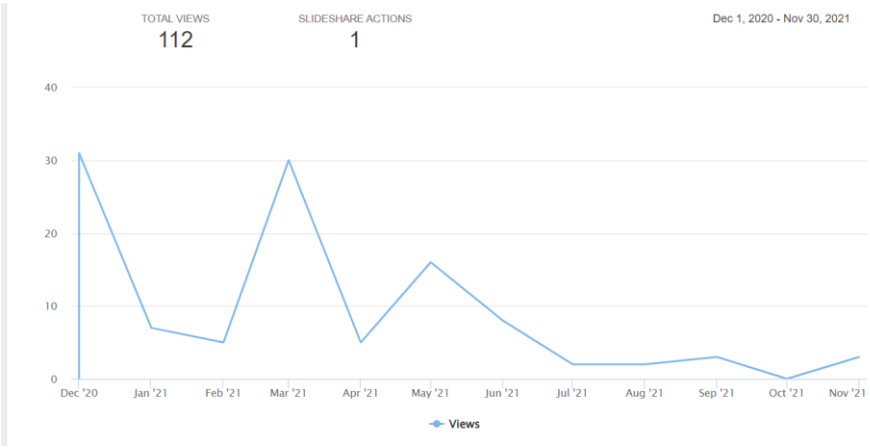


Figure 30 – Views timeline for 2021 in SlideShare

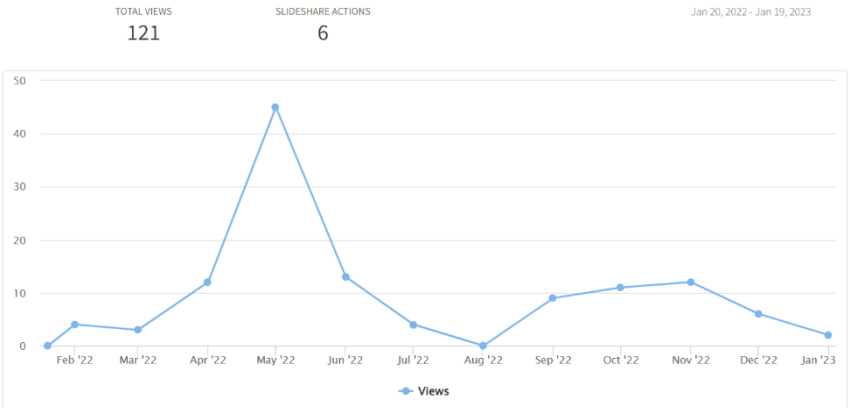


Figure 31 – Views timeline for 2022 in SlideShare

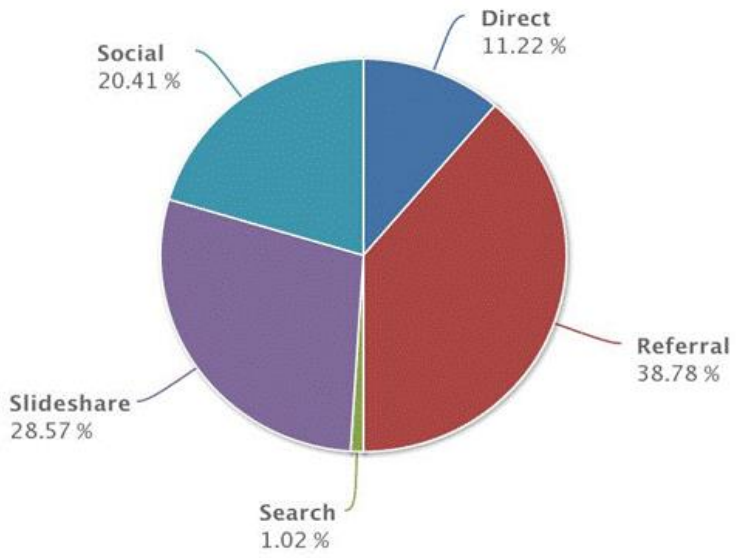


Figure 32 – Top sources that redirected to DataPorts SlideShare content in 2020

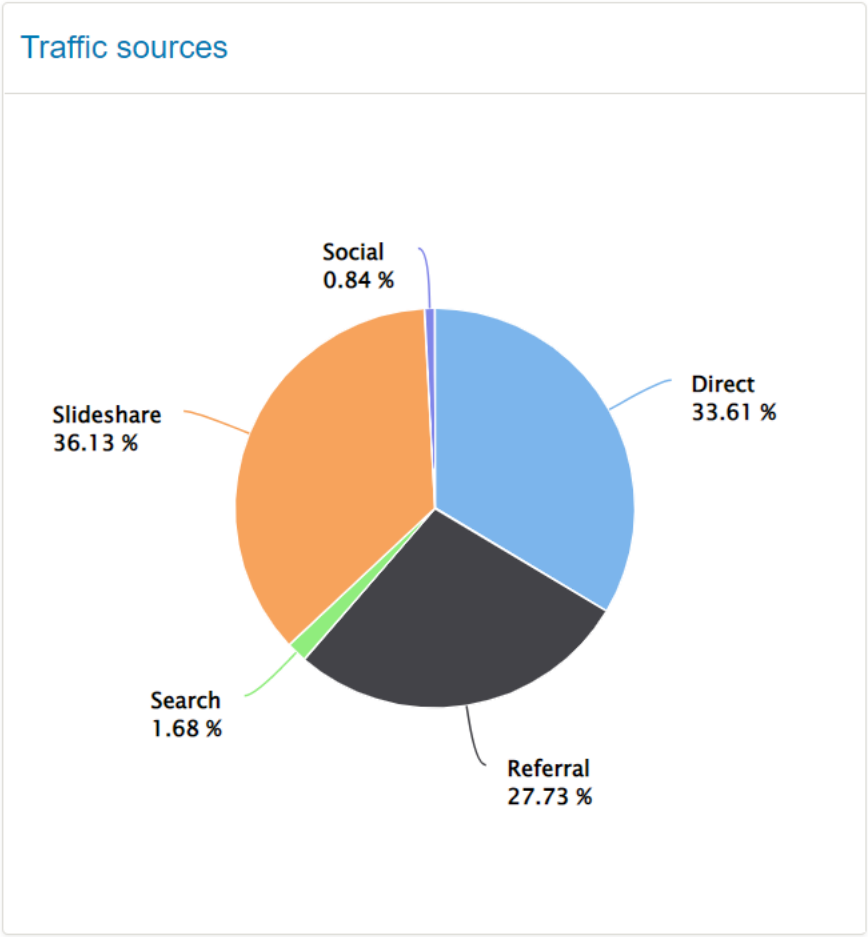


Figure 33 – Top sources that redirected to DataPorts SlideShare content in 2021

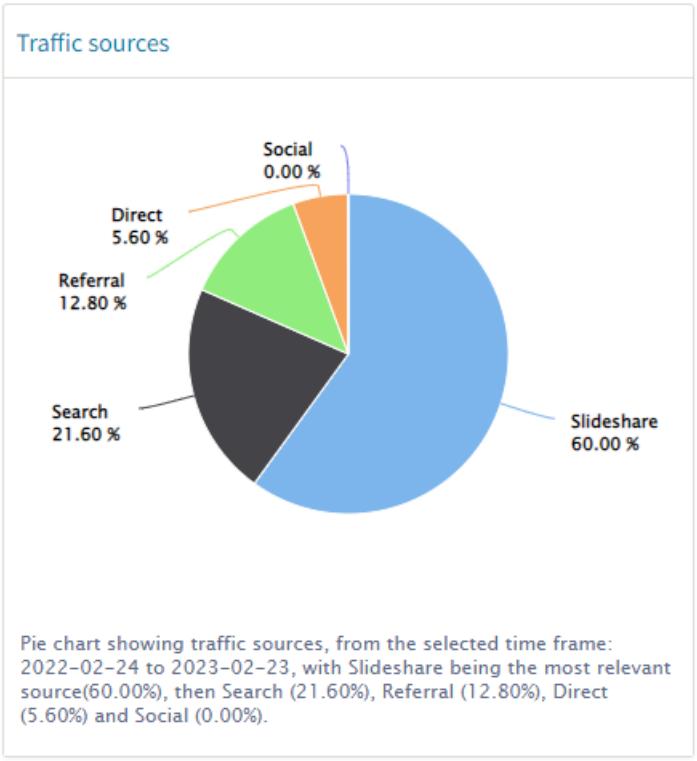


Figure 34 – Top sources that redirected to DataPorts SlideShare content in 2022

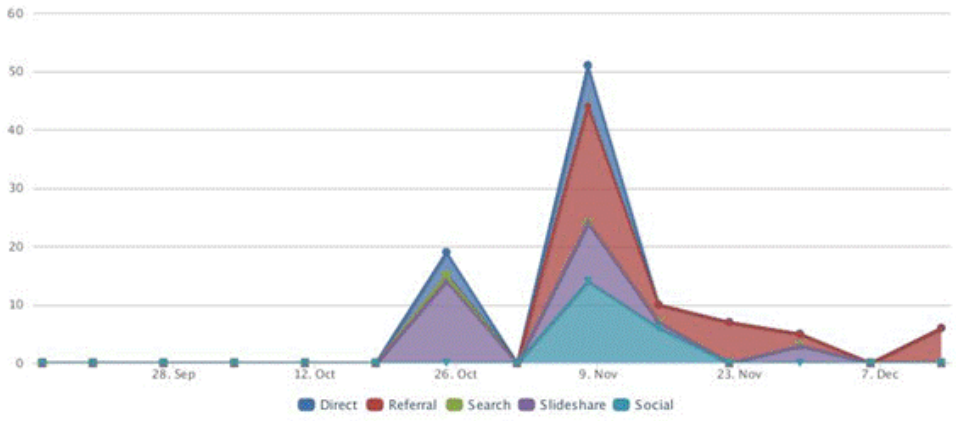


Figure 35 – SlideShare views and sources (2020)

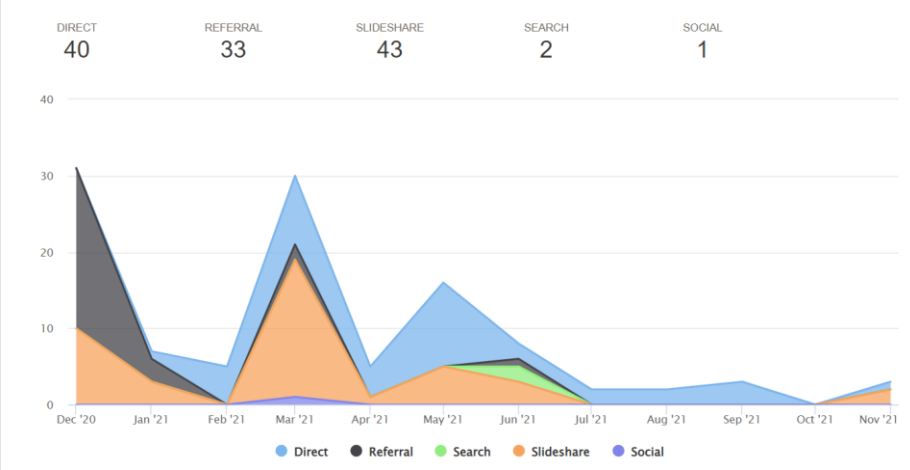


Figure 36 – SlideShare views and sources (2021)

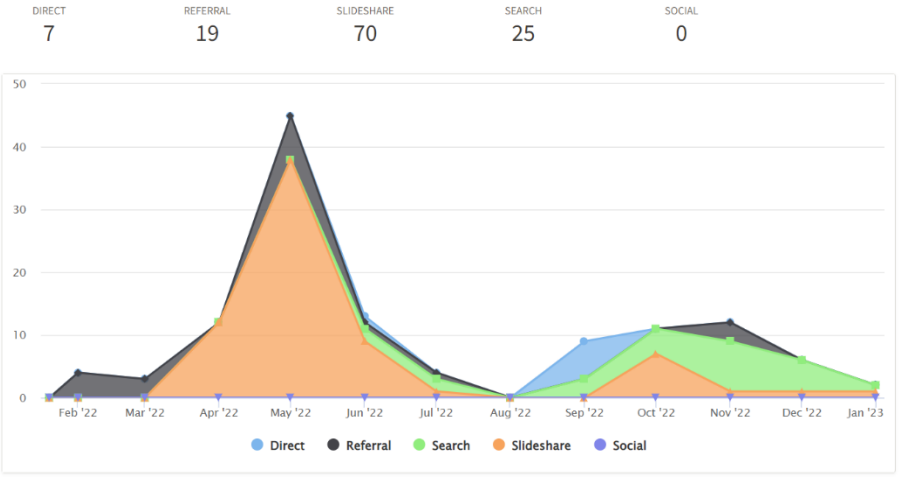


Figure 37 – SlideShare views and sources (2022)

According to Figure 32, Figure 33 and Figure 34 – Top sources that redirected to DataPorts SlideShare content in 2022, the direct visits to the SlideShare page of DataPorts increased significantly during 2021, but during this period a remarkable increase of the visits from SlideShare has been detected. During the past year, SlideShare has become the main source of views for the content of DataPorts. Another important difference from the previous years is the increase of hits from search during this period, which have gone from about 1% of the total to 21.6%, thus becoming the second most important traffic source.

3.4.6 Facebook

The Facebook account has been created and it is available, and the impact achieved through Facebook was evaluated during the first year. The result was that this platform was not one of the more habitual communication channels for DataPorts, due to its target audience, and its use did not produce any relevant impact. For these reasons, after consulting with the partners in a plenary meeting, it was decided to finalize the activities in this platform and focus the communication and dissemination activities on other more suitable channels, such as Twitter and LinkedIn.

3.4.7 Flickr

Flickr is a powerful tool for the creation of visual content regarding DataPorts meetings and events, as well as infographics and other visual material. During the first two years of the project, Flickr has been utilized as a supporting tool for diffusion and not a main dissemination medium because of the lack of physical events during 2020 and 2021 due to the COVID-19 restrictions. Nevertheless, during the last year, as the COVID

restrictions have been lifted, more content related with the events attended by the DataPorts partners has been posted on Flickr. As far as DataPorts content is concerned, there have been 2,475 views in the corresponding Flickr account.

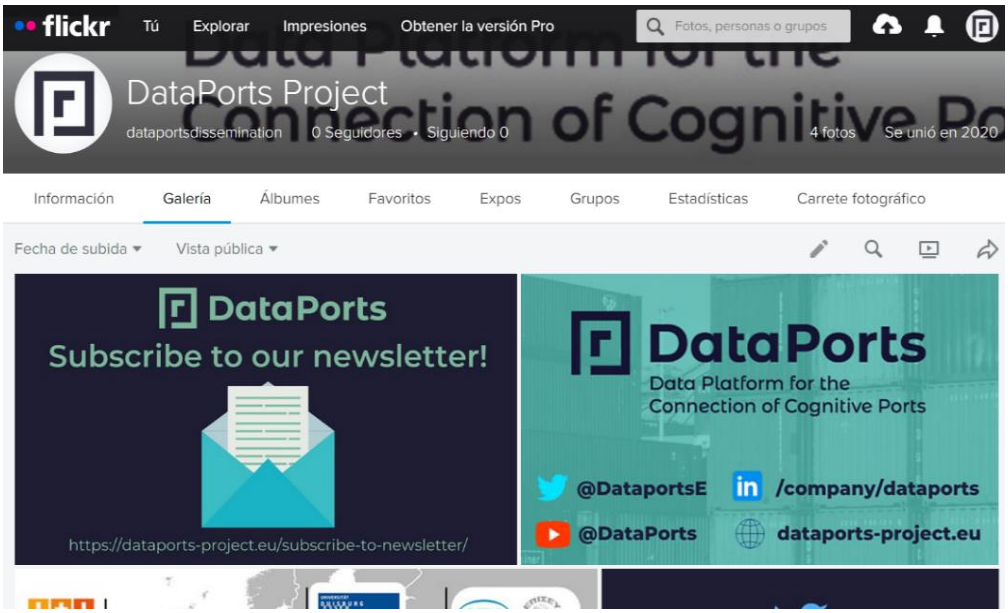


Figure 38 – Screenshot from DataPorts Flickr account

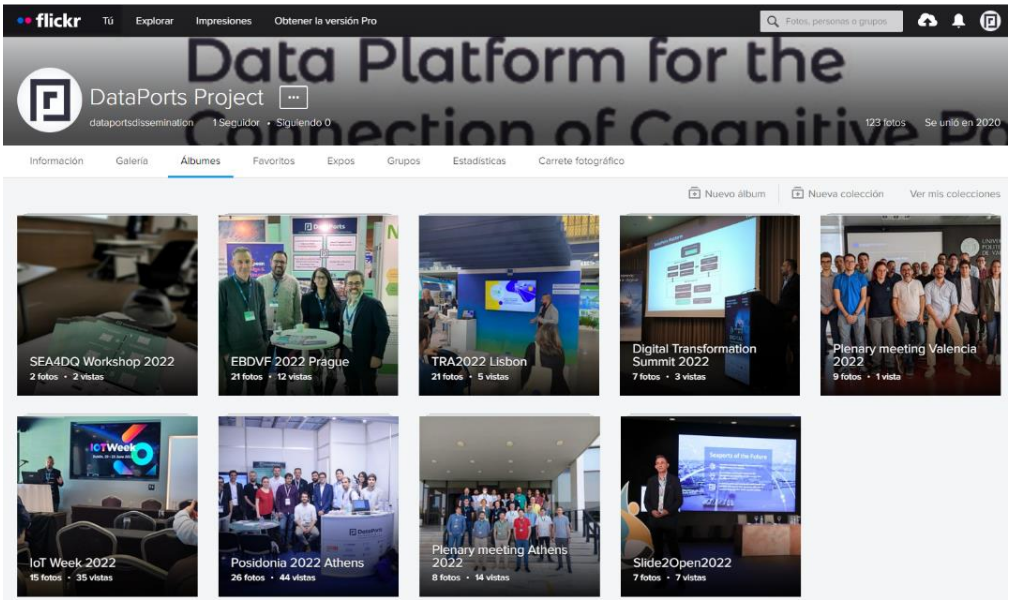


Figure 39 – DataPorts photo albums on Flickr

4 DISSEMINATION PACKAGE

To convey the message of DataPorts identity, the consortium of the project has created a dissemination package that is used in all aspects of the project's diffusion and that is formed by a set of supporting material (flyers, brochures, etc.) and instructions for producing videos, blog entries, infographics, press releases and newsletters. All the components that comprise the dissemination package of the project are presented below.

4.1 KPI FULFILMENT

Diffusion activity	Target value in Grant Agreement	Status and Category Ranking	Key Performance Indicator (KPI)	Achieved Milestones and Category Ranking	
				Current Value	Evaluation
Dissemination package	At least 1 per year	1 dissemination package in M06 for the establishment of the project's identity, plus 1 video in M18	Total number of dissemination package components introduced during the project	15 dissemination components	Category 2: Good progress
Digital newsletters	At least 1 per year	The first newsletter was published in December 2020 (M12) and the second one was published in December 2021 (M24)	Number of subscribers	44 subscribers	Category 2: Good progress

Table 9 – Promotional material KPI fulfilment

Both the dissemination package and digital newsletter of the project have made good progress during the first two years. The KPIs that are described in the Grant Agreement are achieved, and the additional KPIs that were introduced in the D6.1 deliverable [2], indicate that there is significant material, which describes the identity of DataPorts, and there is a growing subscriber list that is being informed about the advances of the project.

4.2 LOGO AND CORPORATE IDENTITY

The logo, that is destined to be included in all the promotional material, was created at the beginning of the project as a significant part of DataPorts identity. After its creation, specific guidelines were provided to all partners, as how it should be used correctly in related documents and materials. This information was also included in the D6.1 deliverable [2]. Alongside DataPorts logo, the DataPorts icon was created in accordance with the focus of the project, which are the Ports in terms of their continuous activity and growth.

Figure 40 – DataPorts logo

4.3 SUPPORTING MATERIAL

The design of the DataPorts brochure aimed at the encapsulation of the vision and the most important objectives of the project, as well as, all the involved partners, contacts, and social media accounts, as well as a brief overview of the pilots. In total, 3 posters, 3 roll-ups and 7 leaflets were designed. From these designs, 5 A1 size posters, 3 rollups, 300 brochures and 68 A4 size leaflets have been printed for the various physical events attended by DataPorts partners.

Figure 41 – DataPorts brochure (2021) (front side)

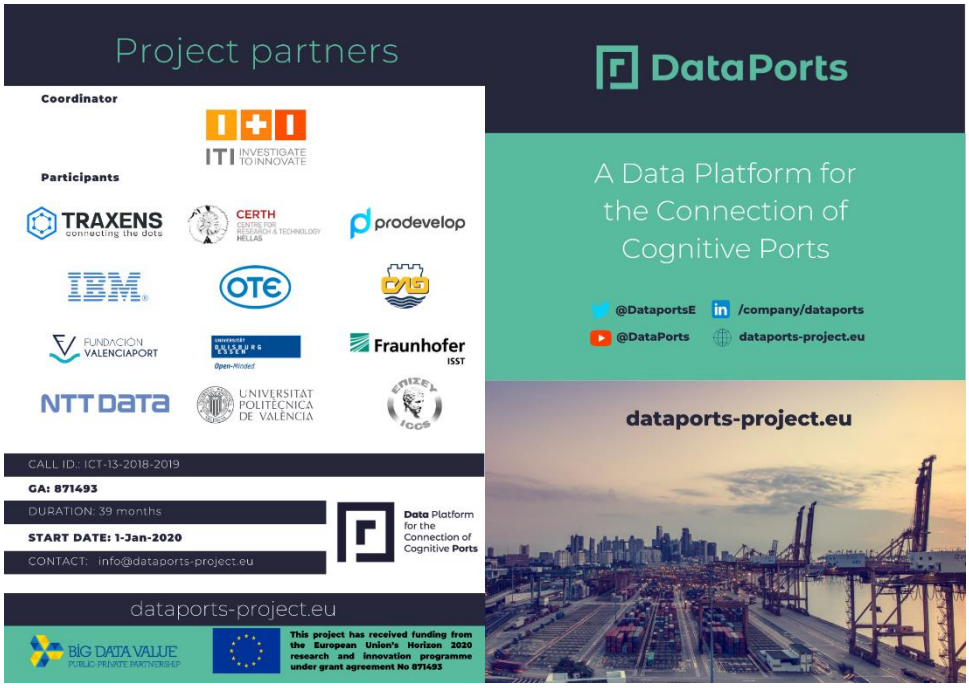


Figure 42 – DataPorts brochure (front side)

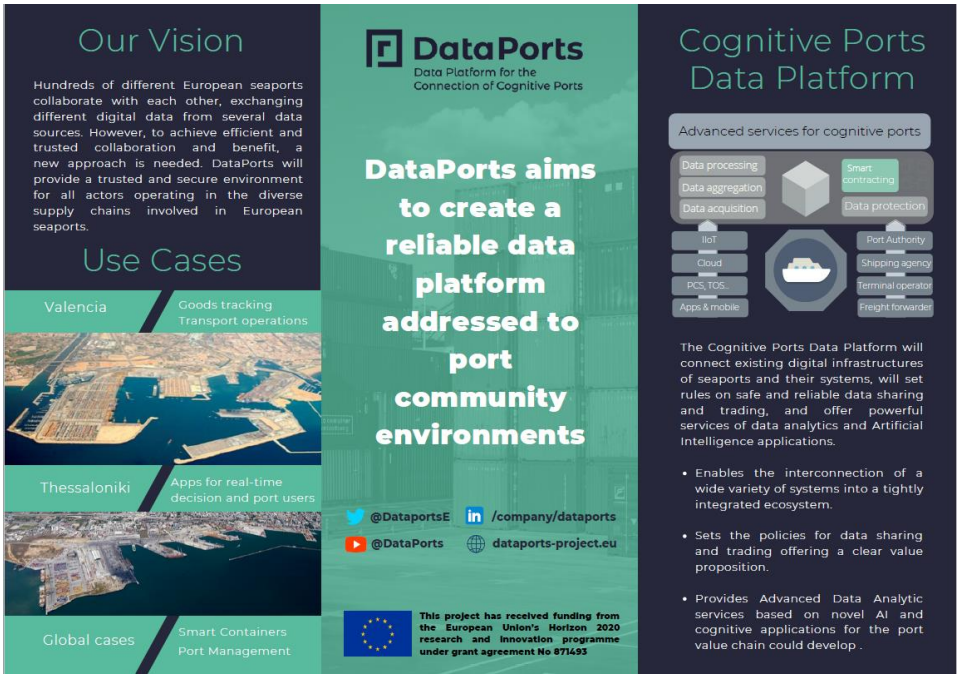


Figure 43 – DataPorts brochure (2021) (back side)

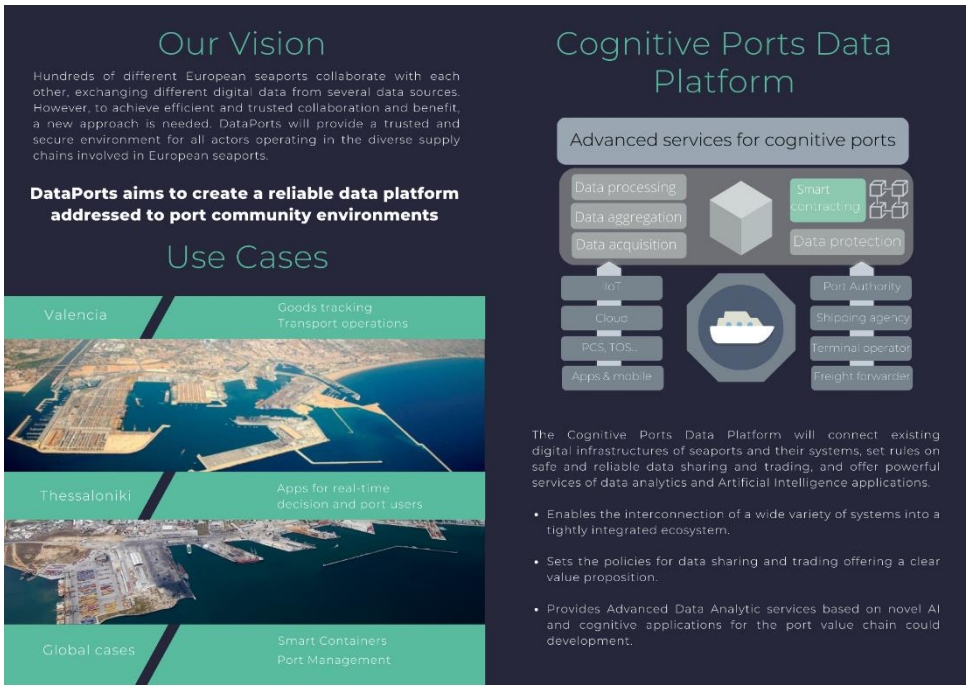


Figure 44 – DataPorts brochure (back side)

The first promotional poster is designed to provide an overview of the project at a first glance.

Figure 45 – DataPorts poster (2021)

Later a new version of the poster was made, restructuring the layout and adding more information.

Figure 46 – DataPorts poster

Moreover, a project presentation video[2] has been produced by an external company. The three minutes video aims to create awareness and interest about the project to a wide audience, through animated scenes accompanied by text.

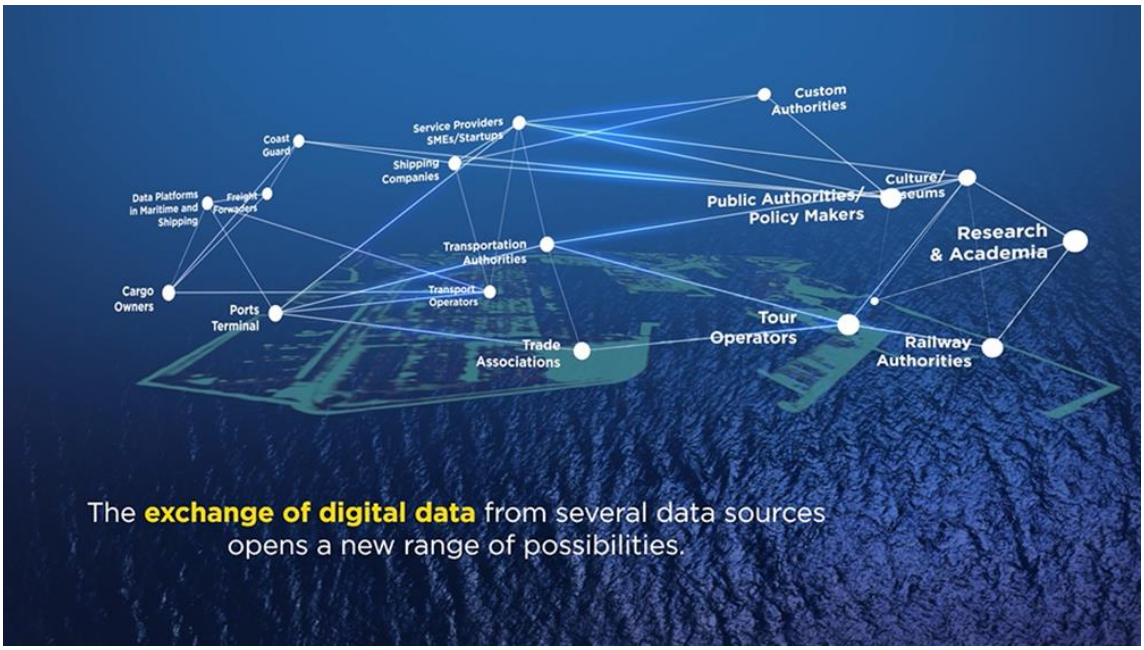


Figure 47 – Screenshot of the DataPorts video

Furthermore, in terms of the project's presentation to the public and all the target audiences that are addressed, presentation templates were also created during the first six months of the project, concerning Word documents and PowerPoint presentations. In this way, the dissemination activities of DataPorts can expose information about the project in a consolidated way.

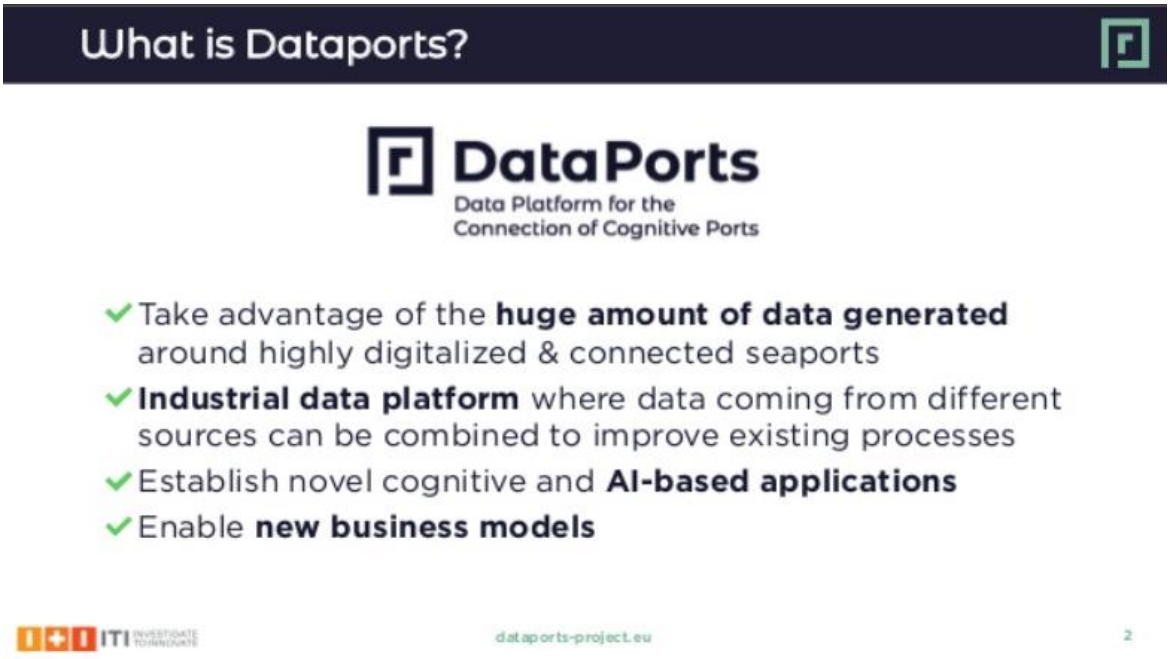


Figure 48 – Example of DataPorts presentation material

[2] https://www.youtube.com/watch?v=4IPiiKdysyU

Some posters for presentation and rollup purposes were also made for the DataPorts project:

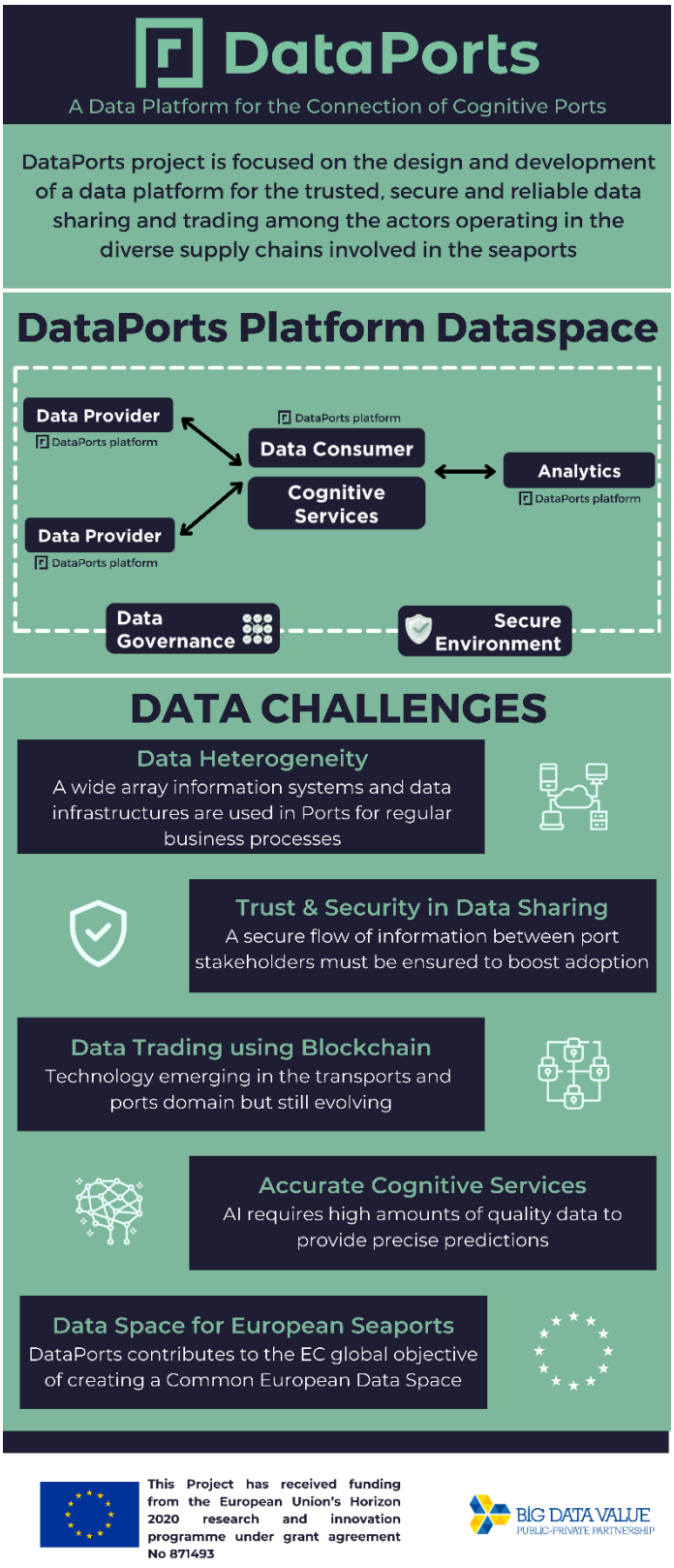


Figure 39 – Example of DataPorts presentation material

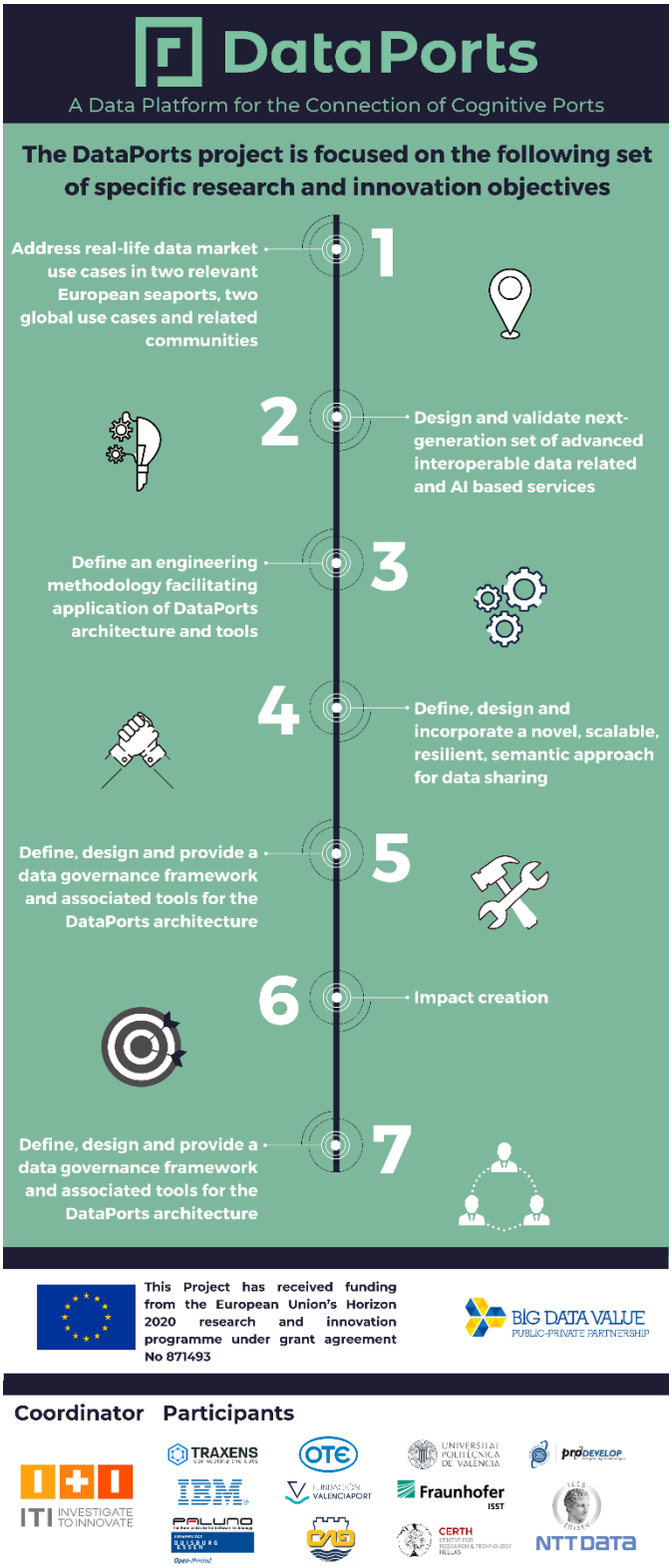


Figure 40 – Example of DataPorts rollup material

Through the project multiple leaflets were made for each and every component of the platform, to be shown and shared at the events, thus making the technologies & frameworks developed within DataPorts known to many tech experts and potential clients.

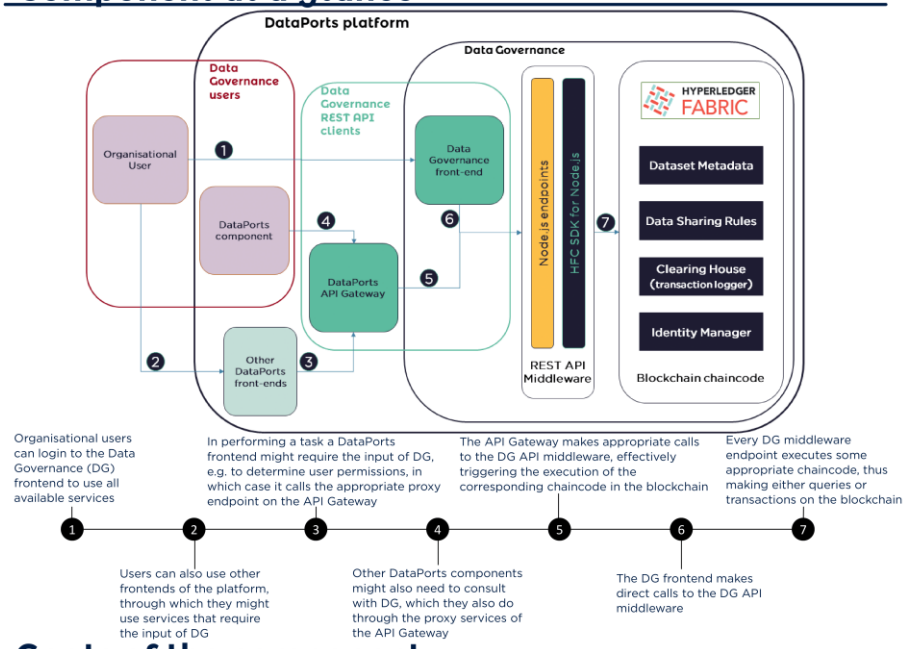
Data Governance

DataPorts
Data Platform for the Connection of Cognitive Ports

Overview

Data governance enables the sharing of datasets, monitoring its complete availability lifecycle, from dataset registration to access requests to its updating or removal from data governance. It increases consistency and confidence in the registered datasets and improves data security. The use of blockchain technology ensures that different participants, with potential conflicting interests, can trust data governance as a means of publishing datasets and managing access to them. Data governance rules are established via smart contracts, which guarantee transparency, verifiability and non-repudiation.

Component at a glance



Goals of the component

Dataset Metadata: stores and manages metadata describing the available datasets. This chaincode offers a great variety of queries on the metadata to find appropriate datasets

Data Sharing Rules: allow definition of access rules, to specify access rights on datasets (who can do what on which dataset), and evaluation of these access rules. This chaincode also allows the revocation of access rights

Clearing House: provides decentralized and auditable traceability of transactions. It receives logging information on metadata updates, dataset access requests, dataset access revocations

Identity Manager: user information is kept in the blockchain; additionally, each blockchain organization defines its own Certificate Authority (CA), which is responsible for issuing crypto material (certificates and public and private keys) for all organisational entities

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871493

Figure 41 – Data Governance leaflet (front page)

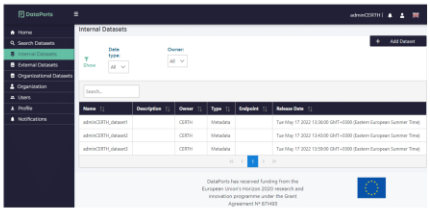
Data Governance

DataPorts
Data Platform for the Connection of Cognitive Ports

About the component

Data Governance (DG) Frontend: friendly UI that enables organisational users to interactively carry out dataset-related tasks, such as making new datasets available by adding their metadata, specifying access rights and accepting access requests

Data Governance API middleware: middleware that exposes a large API for carrying out dataset-related tasks, boasting a rich set of queries on metadata. This API is used by both the DG frontend and the DataPort platform's API Gateway

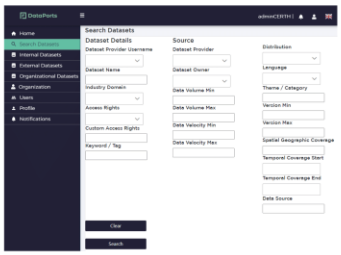


Target users

- Ports business experts
- Internal Platform Components
- Ports Data Users

Use case scenarios

- Fostering secure intra-organisational cooperation through dataset sharing
- Enabling dataset sharing through publication of its metadata
- Enabling secure sharing through the enforcement of access rights
- Enabling productive data exchange by providing extensive querying functionality



Benefits

Decentralisation: Information in a blockchain is replicated multiple times in a network of distributed nodes. This ensures there is no single point of failure in the system

Security: Inadvertent or malicious changes in the blockchain are automatically detected and discarded by the consensus process

Immutability: Blockchain transactions are permanently written in the ledger, which is append-only. Every block in the chain is linked to the previous, ensuring that the transaction flow is non-reversible. Thus proof of ownership is easy to demostrate

Transparency and auditability: Every copy of the ledger is public and identical. Additionally, every block is time-stamped at creation. This combination means that the origin of any asset can be tracked along the chain

Efficiency: Blockchain transactions eliminate the need for paperwork, which traditionally exists in the shipping industry, because all records are kept in the ledger, and the business events that trigger transactions can often be incorporated into chaincode (smart contracts) running on the blockchain

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871493

Figure 42 – Data Governance leaflet (back page)

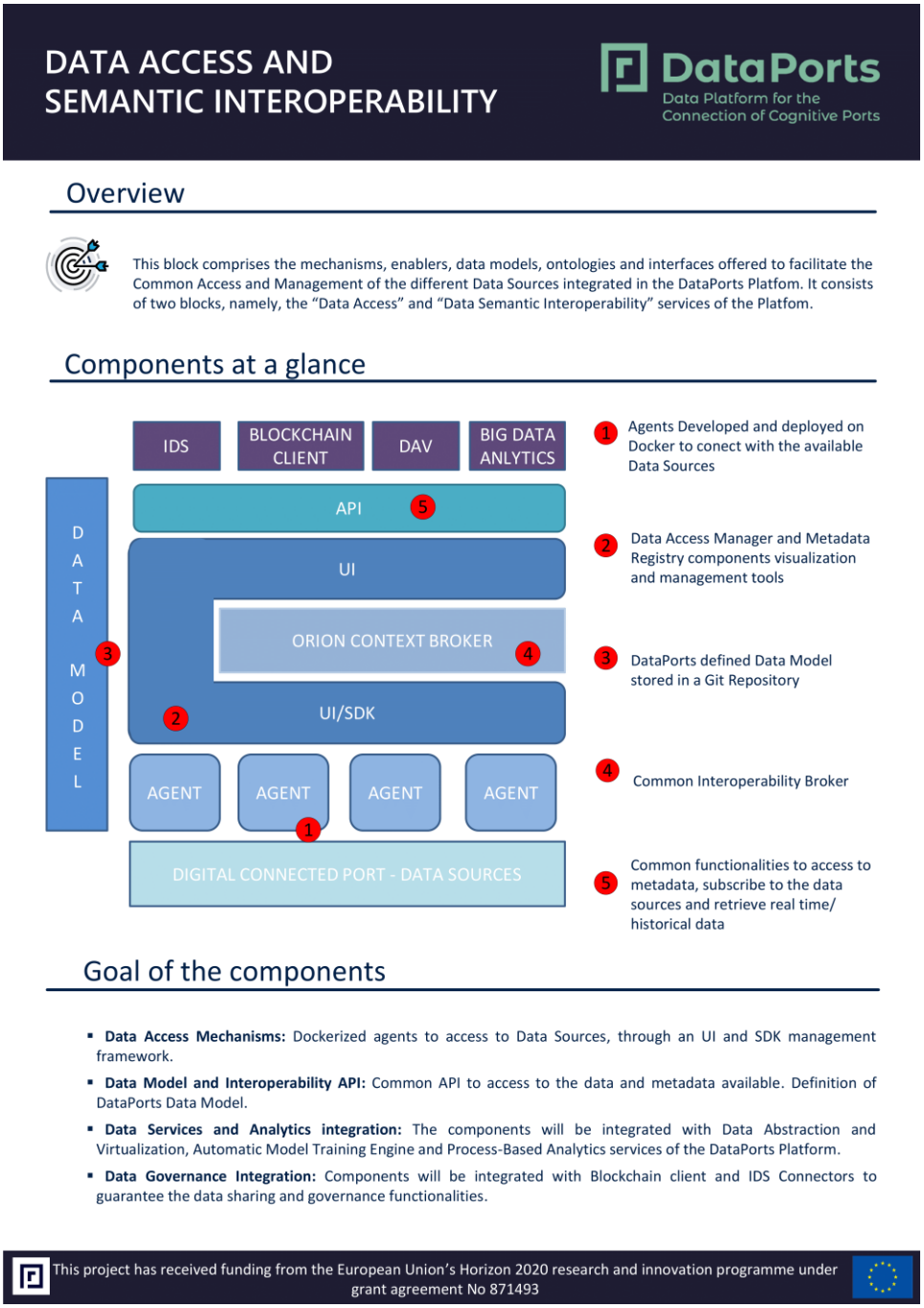


Figure 43 – Data Access and Semantic Interoperability leaflet (front page)

DATA ACCESS AND SEMANTIC INTEROPERABILITY

DataPorts
Data Platform for the Connection of Cognitive Ports

About the components

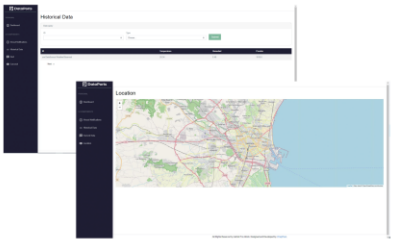
- Data Access: Enablers and mechanisms to guarantee the access to the digital infrastructures of the port.
- Data Semantic Interoperability: Framework and API to describe and provide ports data together with mappings to standard vocabularies in order to simplify the reuse of data by other applications and components.

Target Users

- Data providers and Data Owners
- System Integrators: Agent developers
- Admin Users
- Internal Platform Components
- Data Users

Use case scenarios

- Agent development
- Agents management
- User Interface
- Metadata information and Data Models
- Retrieve real time & historic data
- Suscribe to a data source
- Internal components integration
- Use of the data by external apps
- Reuse of data by existing tools



Benefits

- **Interoperability:** Allowing the connection of heterogeneous Data Sources. Offering a System of systems and Common Data Models.
- **Ease of use and deploy:** Making the access to the available data and metadata simpler. The components can be deployed faster in a PC, Server, Cloud Infrastructure or in a Raspberry.
- **Modular, Scalable and Extensible solution:** Adapted to the User needs. It could be extended with added value tools and it is possible to scale the components on demand.
- **Less development effort:** Reduce the effort in creating applications.
- **Fully compatible with Fiware Ecosystem and common Open-Source Software:** Joint adoption and contribution to standards. Use of common components and shared Open-Source code

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871493

Figure 44 – Data Access and Semantic Interoperability leaflet (back page)

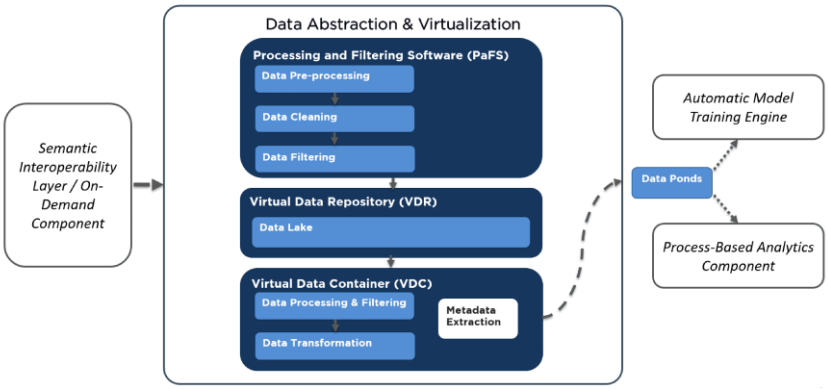
Data Abstraction and Virtualization

DataPorts
Data Platform for the Connection of Cognitive Ports

Overview

Data Abstraction and Virtualization component is responsible for correctly preparing data input from different sources inside the generic DataPorts architecture, maintaining metadata from all feeds, and finally making available the cleaned and processed datasets to any eventual client.

Component at a glance



Goals of the component

- **Data Processing Mechanisms:** Process, clean and filter the incoming data in order to enable developers building cognitive data-driven applications on top of the DataPorts Platform
- **Data Management:** Store and deliver historical Data as a Service, putting emphasis on QoD and QoS
- **Metadata Extraction:** Calculate and provide useful metadata for all the available datasets
- **Data Transformation:** Transforms the data into the requested format, such as JSON, Parquet or CSV
- **Data Services and Analytics Integration:** The component will be integrated with the Semantic Interoperability layer, the Automatic Model Training Engine and the Process-Based Analytics component of the DataPorts Platform

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871493

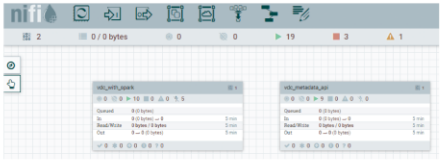
Figure 45 – Data Abstraction and Virtualization leaflet (front page)

Data Abstraction and Virtualization

DataPorts
Data Platform for the Connection of Cognitive Ports

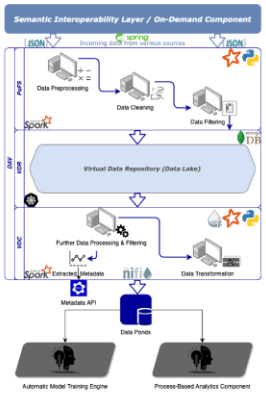
About the component

- **Pre-Processing and Filtering Software:** PaFS is responsible for the initial pre-processing, cleaning and filtering of the datasets
- **Virtual Data Repository:** VDR is the distributed infrastructure where all the pre-processed, cleaned, and filtered datasets, coming from PaFS, are saved
- **Virtual Data Container:** VDC is the interface through which communication with data recipients is achieved, for data stored in VDR to be made available



Target users

- Data Providers and Data Owners
- Data Consumers
- Application Developers
- Internal Platform Components



Use case scenarios

- Retrieve historical data
- Process, store and deliver cleaned data
- Export metadata
- Apply filtering rules to the data
- Internal components integration
- Use of the data by external apps
- Reuse of data by existing tools

Benefits

- **Interoperability:** Provide an abstraction layer between data providers and consumers
- **Less development effort:** Let the application developers just define the content and the format of the needed data and rely on the component to deliver them properly and timely
- **Scalability:** Ability to scale in a fully automated way based on the workload, aiming at optimizing resource utilization and decreasing response times
- **Ease of use and deploy:** Provide a common access layer, where the data consumers simply define queries as filtering rules in a unified format, regardless of the underlying storage technology

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871493

Figure 46 – Data Abstraction and Virtualization leaflet (back page)

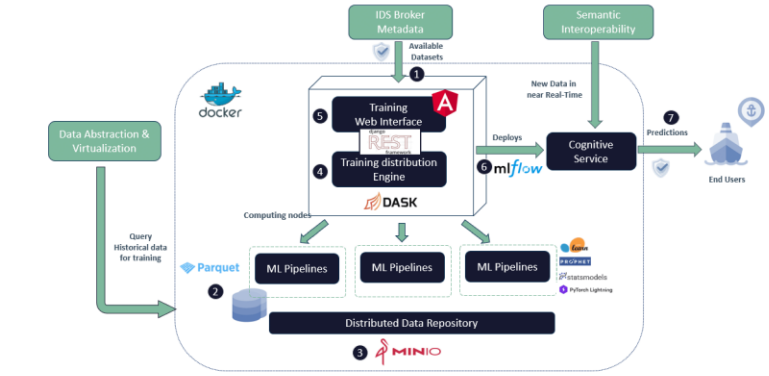
Automatic Models Training Engine

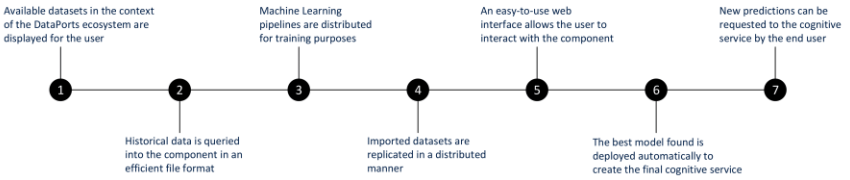
DataPorts
Data Platform for the Connection of Cognitive Ports

Overview

The Automatic Model Training Engine is a technical solution to create cognitive services for Port business KPIs. The component implements a set of predefined training data pipelines made up of a rich collection of state-of-the-art machine learning algorithms from various predictive domains. With a distributed approach, multiple instances of such pipelines are executed simultaneously to automatically find the most suitable model for the goal selected by the end user.

Component at a glance





Goals of the component

- **AI Cognitive Services:** Provide a mechanism to automatically create optimized AI cognitive services to solve port business needs with the available data at the platform
- **Data Training Pipelines:** Offer a set of pre-defined data pipelines based on data analytics services and AI algorithms to develop cognitive applications in the context of the involved pilots
- **Machine Learning Models:** Analysis, evaluation, and selection of a wide collection of state-of-the-art ML algorithms to support the most favorable development of cognitive services
- **Interoperability API:** Provide a common API to access to the data, metadata and cognitive services available at the platform
- **Integration with Data Components:** Integration with Semantic Interoperability API, Data Abstraction and Virtualization and Data Governance components

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871493

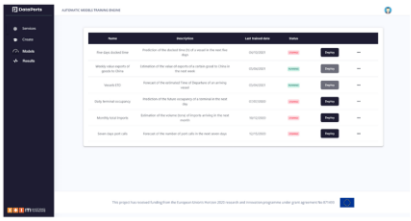
Figure 47 – Automatic Models Training Engine leaflet (front page)

Automatic Models Training Engine

DataPorts
Data Platform for the Connection of Cognitive Ports

About the component

- **Training Web Interface:** Mechanism that enables direct interaction with the component by the end user and allows the creation and administration of port-oriented cognitive services
- **Training Distribution Engine:** Device that computes all the necessary data processing steps to find the best predictive model that is capable of solving a certain business KPI to form the final cognitive service

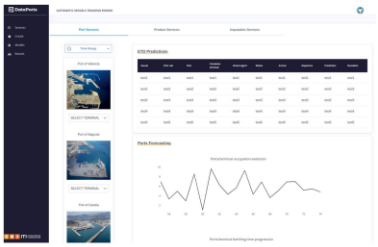


Target users

- Ports business experts
- Internal Platform Components
- Ports Data Users

Use case scenarios

- Creation of Ports Cognitive Services
- Management of existing Cognitive Services
- Analysis of model predictions
- Decision making based on models results



Benefits

- **Ease of use and deploy:** Facilitating the creation of cognitive services in an automatic manner. The component can be easily deployed in any infrastructure.
- **Faster trainings:** The cognitive services trainings are faster due to the advantages of distributed computing
- **Interoperability:** Allowing the connection of heterogeneous Data Sources available at the platform
- **AI knowledge abstraction:** Ease the the effort in creating cognitive services by non AI experts
- **Fully compatible with common Open-Source Software:** Use of common components and shared Open-Source code

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871493

Figure 48 – Automatic Models Training Engine leaflet (back page)

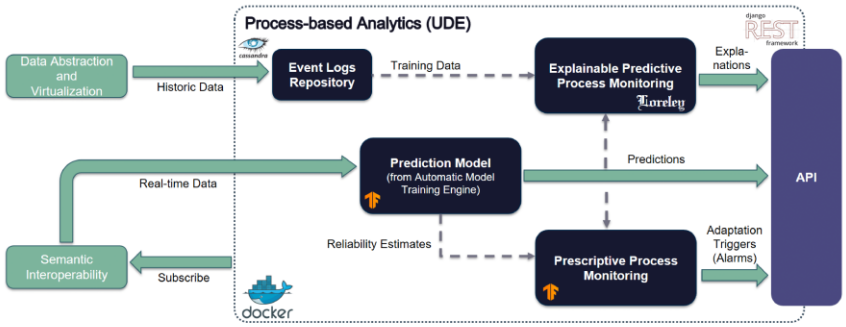
Process-based Analytics

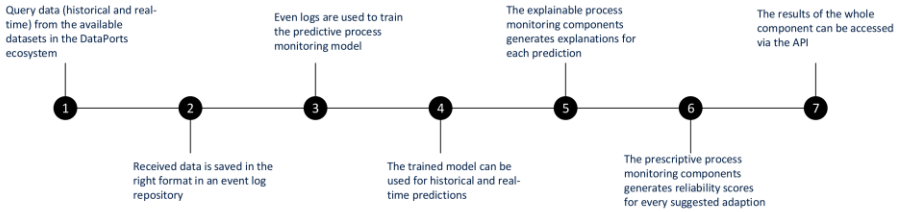
DataPorts
Data Platform for the Connection of Cognitive Ports

Overview

The Process-based Analytics component (PBAC) provides advanced capabilities to monitor and adapt running business processes in the port domain. To this end, PBAC combines different state-of-the-art ML techniques, in particular reinforcement learning, and explainable AI. It analyses business processes by using both historic and real-time data available inside the DataPorts platform to provide its predictive results to cognitive applications, which inform the end-users about the predictions.

Component at a glance





Goals of the component

The PBAC leverages the prediction models trained as part of the Automatic Model Training Engine and connects the outcomes of this prediction model with two novel two sub-components, each of which utilises a different, complementary set of ML techniques:

- **Explainable Predictive Process Monitoring**: Predictive business process monitoring is usually performed via deep learning models, such as the LSTMs. Although such models achieve consistently higher prediction accuracy than simple models, one major drawback is their lack of interpretability, which limits their adoption in practice. This sub-component uses state-of-the-art XAI methods to explain the predictions made by the prediction model trained in the AMTE component.
- **Prescriptive Process Monitoring**: For this sub-component, we developed an approach that uses Online Reinforcement Learning to resolve a fundamental trade-off between prediction accuracy and prediction earliness. This sub-component provides indicators that estimate the reliability of individual predictions made by the predictive models of the AMTE component. Such reliability estimates quantify the likelihood that the prediction is correct, which provides additional information for decision making.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871493

Figure 49 – Process-based Analytics leaflet (front page)

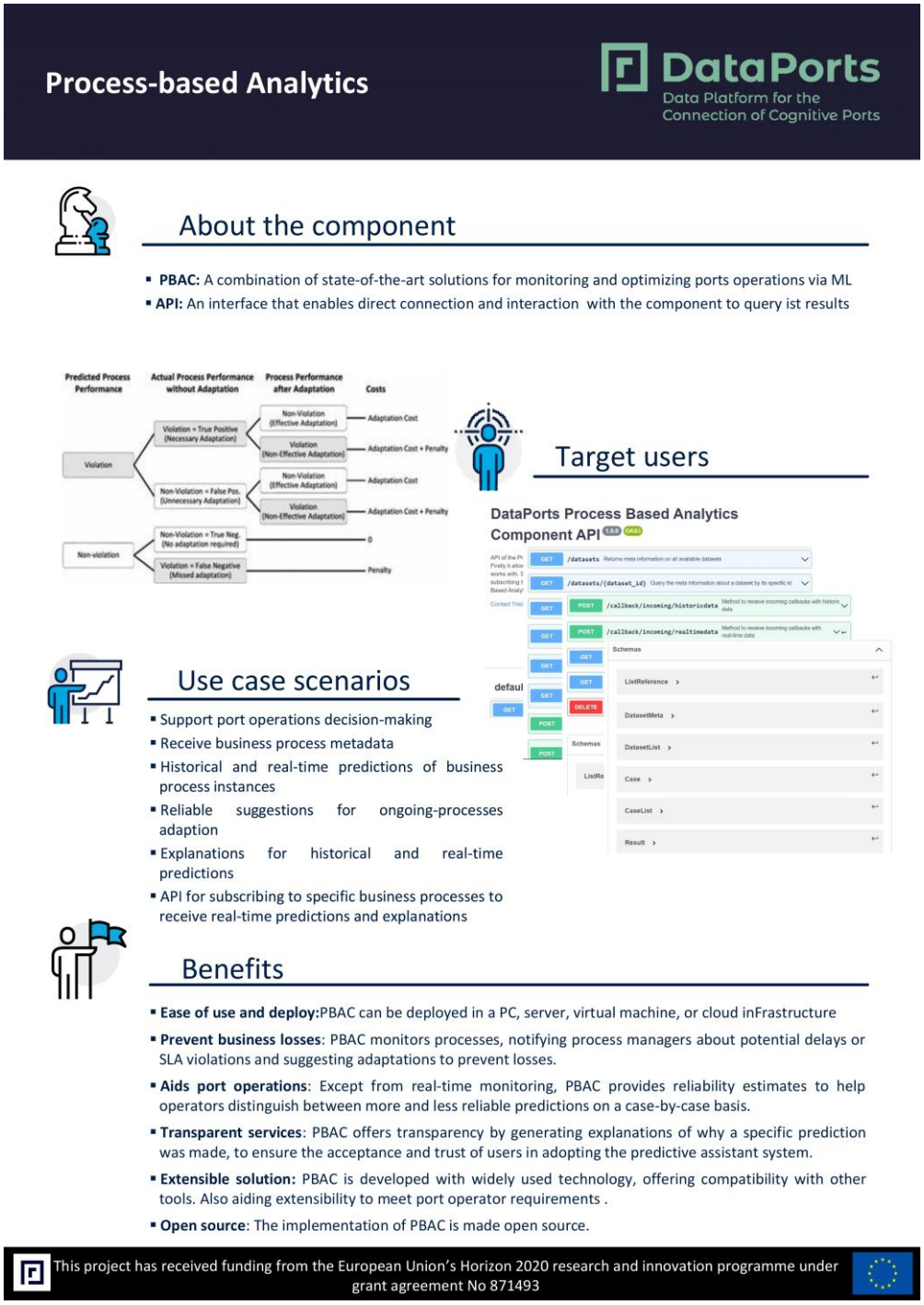


Figure 50 – Process-based Analytics leaflet (back page)

4.4 PRESENCE IN BLOGS AND PRESS

After the project's kick-off meeting, a press release template was circulated to the consortium. These press release guidelines apply in multiple languages including English and Spanish and offer the liberty to each partner to modify the press release template in order to add more information. According to this press release template, several appearances of the project have occurred in the press.

Figure 49 – DataPorts presence in the press with the involvement of VPF (January 2020)

Figure 50 – DataPorts presence in the press with the involvement of VPF (February 2020)

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Traxens Joins European DataPorts Project

H2020 program will boost transition of European seaports from connected and digital to smart and cognitive

March 03, 2020 03:00 AM Eastern Standard Time

MARSEILLE, France--(BUSINESS WIRE)--Traxens, a company that provides high-value data and services for the supply chain industry, announces today that it is now part of the new European DataPorts project, aimed at creating a data platform for cognitive ports of the future. With a total budget of €6.7M ($7.3M), the three-year project will receive €5.7M ($6.2M) from the European Union. It is coordinated by the Technological Institute of Informatics (ITI) in Spain.

"Even today, when seaports have achieved a mature state in terms of digitalisation, there is a clear gap in taking full advantage of digital data assets"

Tweet this

Today, only three per cent of container terminals are automated. However, the future of the industry points towards smart ports as the best way to overcome the challenges and demands that arise in the sector. Challenges include optimizing port operations, enhancing the supply chain for operators and carriers, and reducing emissions and waste.

DataPorts will take advantage of the huge amount of data generated around modern connected sea ports and the high level of digitalization these ports have so far achieved. Existing digital platforms and tools will be leveraged to establish an industrial data platform where data coming from different stakeholders and external sources can be combined and processed to achieve real value.

Today's shippers and related stakeholders are optimizing their supply chains through digital transformation, where real-time data is key. The aim is to expose the smart assets value-added services via the DataPorts' platforms market place. The availability of door-to-door visibility of the transport execution, with applied AI, and the use of blockchain technology will result in easier

TRAXENS

TRAXENS

- **Headquarters:** MARSEILLE, France
- **Website:** www.traxens.com
- **CEO:** Jacques Delort
- **Employees:** 110
- **Organization:** PRI

More News

Contacts

Géraldine Saunière
Director of Communications
Mail: g.sauniere@traxens.com
Tel: +33 695 915 899

Figure 51 – DataPorts presence in the press with the involvement of TRX (March 2020)

In addition, DataPorts project has made appearances in local media with the involvement of different partners.

8 VALENCIA Jueves, 16 de enero de 2020

Data Ports facilitará la interconexión de datos en los puertos digitales

Gracias a esta iniciativa se avanzará hacia una interconexión de datos real de los puertos digitales involucrados en las rutas comerciales y cadenas de suministro, para poder obtener un valor global de los datos generados localmente

VM / VALENCIA

Esta semana ha tenido lugar la reunión de arranque del proyecto DataPorts (A Data Platform for the Cognitive Ports of the Future), cofinanciado por la Comisión europea a través del programa H2020, coordinado por el Instituto Tecnológico de Informática (ITI) y en el que participa la Fundación Valenciaport.

El objetivo principal de este proyecto es aprovechar la gran cantidad de datos generados en los puertos marítimos modernos gracias al alto nivel de digitalización. Para ello, se pretende crear un mercado integrando fuentes de datos de forma significativamente más fácil, rápida y confiable, gracias a la utilización de blockchain.

Participantes en el proyecto *(Foto Fundación Valenciaport)*

La solución de DataPorts permitirá conectar y compartir datos, lo que posibilitará el seguimiento nicas basadas en inteligencia artificial y en datos a nivel global, para proporcionar servicios cognitivos, obtener una mayor eficiencia de los procesos y reducir el impacto medioambiental.

En el caso concreto del de transitarios, un sistema de seguimiento de contenedores, y un PMS (Port Management System). Con estos datos, se crearán diversas aplicaciones para el seguimiento de mercancías y de contenedores y para el control del de los puertos digitales involucrados en las rutas comerciales y cadenas de suministro, para poder obtener un valor global de los datos generados localmente.

El consorcio del proyecto está formado por el ITI (coordinador), la Fundación Valenciaport; Traxens; Prodevelop; IBM Israel; Hellenic Telecommunications Organization (OTE); Everis Spain; Universitat Politècnica de València (UPV); Institute of Communication and Computer Systems (ICCS); University of Duisburg-Essen; Centre for Research and Technology Hellas

Figure 52 – DataPorts presence in local media with the involvement of VPF (January 2020)

Figure 53 – DataPorts presence in local media with the involvement of EVR (July 2020)

Moreover, OTE posted information about DataPorts and the involvement of the company at the Deutsche Telekom Group Intranet site (YaM – Europe News Section), that is accessed only by the Group's employees worldwide. OTE also circulated information about the project at OTE Group's intranet site (Mynet-News Section) that is accessed by approximately 16,000 employees, as well as at OTE Group's corporate website[3].

[3] https://www.cosmote.gr/cs/otegroup/en/dataports.html

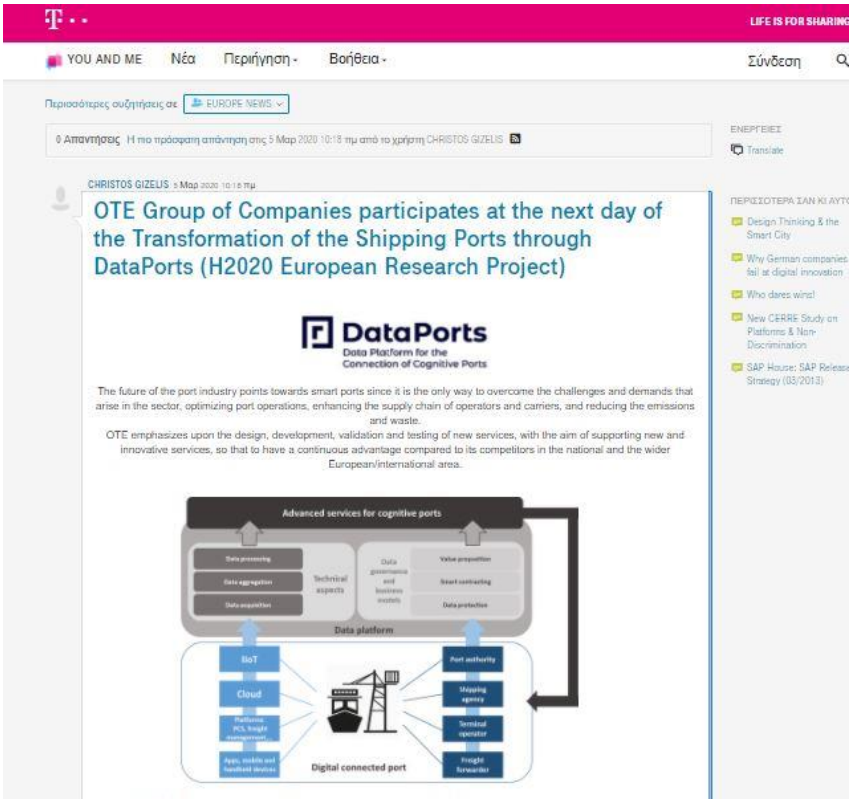


Figure 54 – DataPorts post at Deutsche Telekom Group Intranet site (YaM)

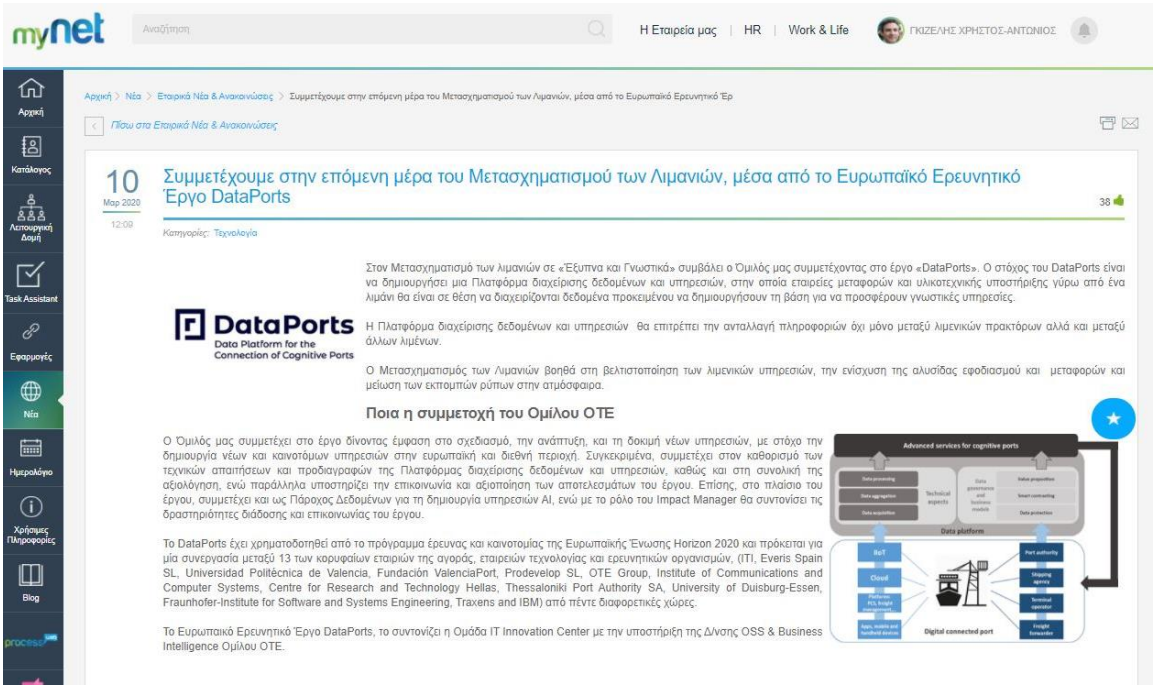


Figure 55 – DataPorts post at OTE Group Intranet site (Mynet)

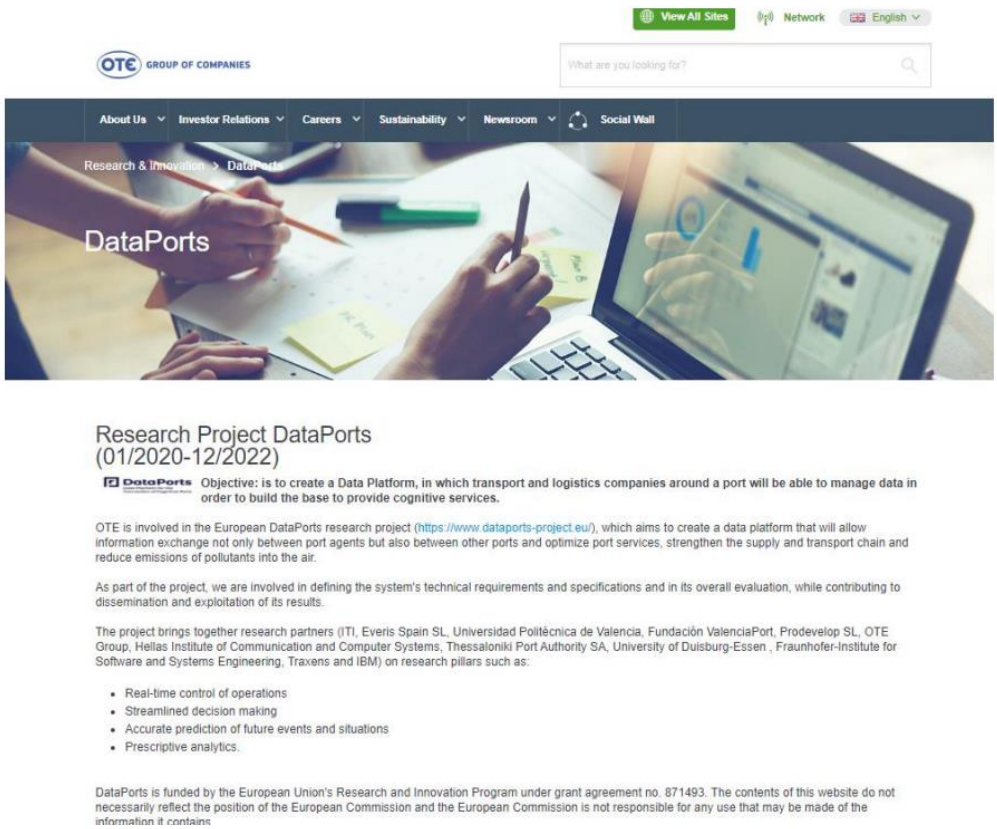


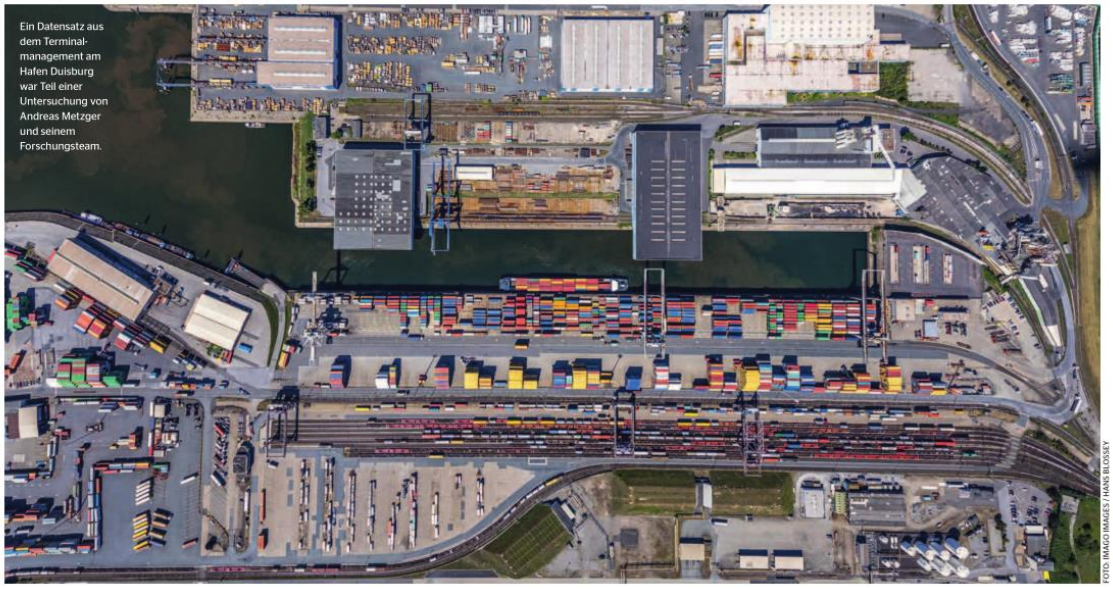
Figure 56 – DataPorts on OTE Group Corporate website

In addition, the process-based analytics component developed by UDE was featured in the special issue of a German transport trade journal (IVZ), as well as in a German electronics magazine.

12 Ausblick
TRANSPORT MANAGEMENT SYSTEME
DVZ Nº 38 · MITTWOCH, 16. SEPTEMBER 2020

Wenn das System zum Autodidakt wird

Mit dem sogenannten Reinforcement Learning sollen Transportmanagementsysteme in einigen Jahren nicht nur automatisiert laufen, sondern stetig aus Prozessen lernen. So sollen diese immer weiter optimiert werden.



Ein Datensatz aus dem Terminal-management am Hafen Duisburg war Teil einer Untersuchung von Andreas Metzger und seinem Forschungsteam.

FOTO: IMAGO IMAGES / HANS BLOSSEY

Figure 57 – IVZ article about UDE's process-based analytics component

elektroniknet.de vom 13.07.2020

world of solutions Elektronik

Universität Duisburg-Essen: Entwicklung selbstadaptiver Systeme mit KI automatisieren

Beim Online Reinforcement Learning lernt KI-Software selbstständig, welche Anpassung des Code zu besseren Ergebnissen führt. Die Universität Duisburg-Essen hat dieses Verfahren zum »Policy-based Reinforcement Learning« verfeinert und kommt so ohne Feinjustierung der Explorationsrate aus.

Für selbstadaptive Software gibt es heute unzählige Anwendungsmöglichkeiten. Doch die Entwicklung der Systeme stellt Software-Ingenieure vor neue Herausforderungen. Wissenschaftler vom Softwaretechnik-Institut »paluno« an der Universität Duisburg-Essen (UDE) haben jetzt vielversprechende Ergebnisse mit neuartigen Verfahren der Künstlichen Intelligenz (KI) erzielt, die den Entwicklungsprozess selbstadaptiver Systeme automatisieren.

Die zunehmend schnelllebige, vernetzte Welt erfordert neue Ansätze in der Entwicklung von Software. Der Bedarf an selbstadaptiver Software wächst, also Software, die in der Lage ist, sich selbstständig an wechselnde Umgebungssituationen anzupassen. Beispiele sind schwankende Übertragungsbandbreiten in der Kommunikation, eine wechselnde Anzahl von Nutzern oder sich ändernde Benutzerpräferenzen.

Eine wesentliche Aufgabe bei der Entwicklung selbstadaptiver Software ist es vorzugeben, wann und wie eine Anpassung erfolgen soll. Das ist jedoch schwierig, weil die Ingenieure zum Zeitpunkt der Entwicklung meist nicht alle möglichen Umgebungssituationen der Software vorhersehen können. Dieser Herausforderung begegnet das paluno-Team mit Online Reinforcement Learning, einem Verfahren der Künstlichen Intelligenz.Lernverhalten für selbstadaptive Web-Anwendung (rot = Verlauf der Höhe des Feedbacks; blau und schwarz = Änderung der Umgebungssituationen; grün = Adaptionen).© Universität Duisburg-Essen

Lernverhalten für selbstadaptive Web-Anwendung (rot = Verlauf der Höhe des Feedbacks; blau und schwarz = Änderung der Umgebungssituationen; grün = Adaptionen).Neuartiger Lernalgorithmus: »Policy-based Reinforcement Learning«

Die Idee dahinter: Die Software lernt selbst, welche Anpassung in welcher Situation die beste ist, indem sie Feedback zur Laufzeit sammelt und auswertet. Gute Anpassungen führen zu positivem Feedback, schlechte

Figure 58 – Virtual article about the UDE's process-based analytics component

Furthermore, on September 28th, 2022, IBM published a blog article in the IBM Blockchain & SupplyChain section, regarding the Valencia Port's Verified Gross Mass (VGM) certificate use case for DataPorts. The article analysed the goal and proposed solution of the DataPorts platform's assets (such as the Hyperledger

Fabric), which could prove to be vital parts of the future ports' infrastructure.

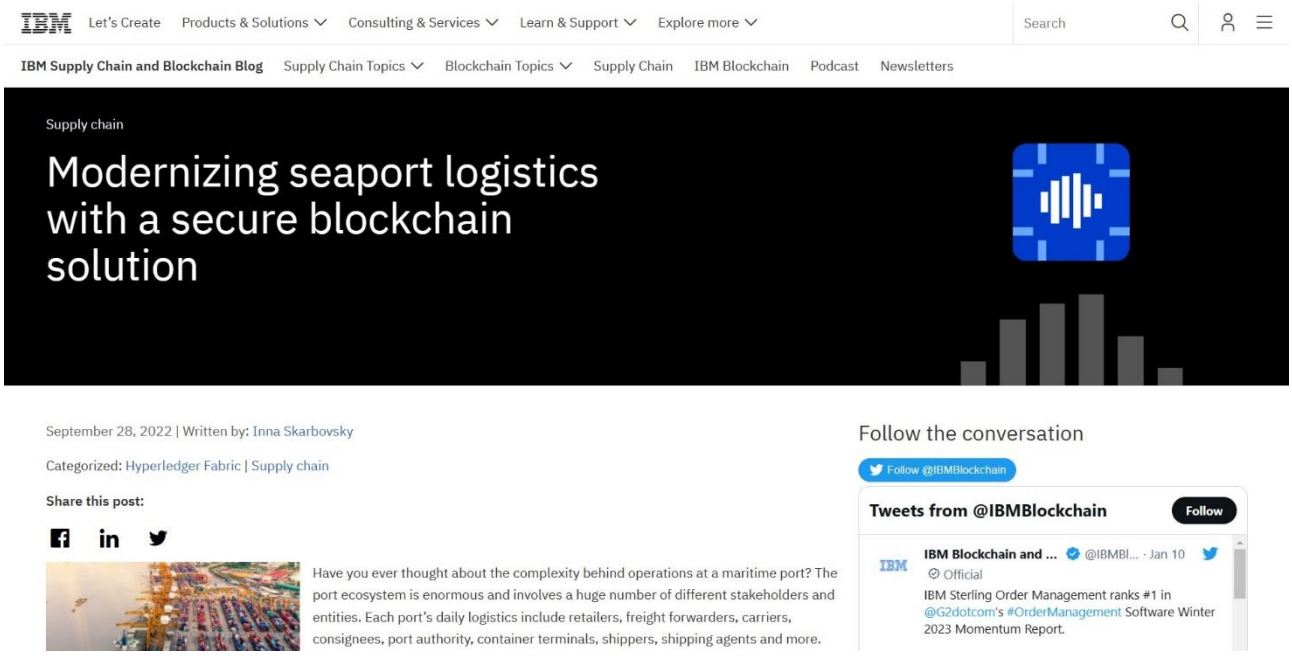


Figure 59 – Blog article in IBM's Blockchain & SupplyChain section (Part 1)

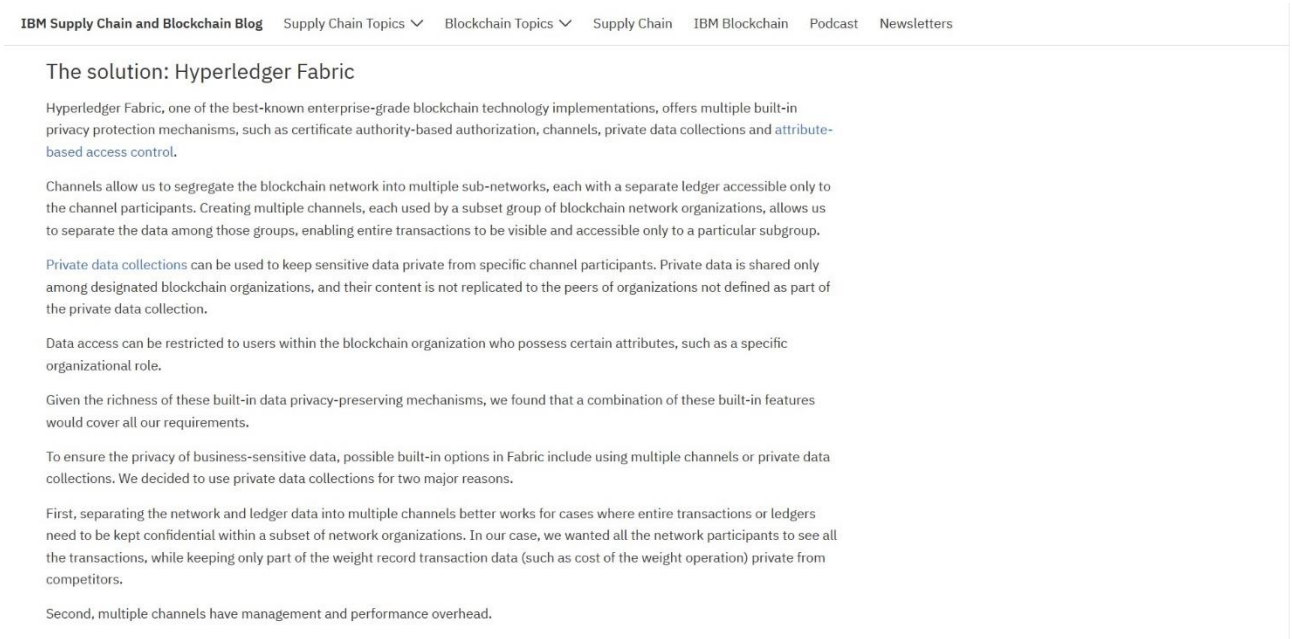


Figure 60 – Blog article in IBM's Blockchain & SupplyChain section (Part 2)

At March 2023 the final event took place at the ValenciaPort Foundation, where all members came to discuss the Platform, the progress that had been made since the beginning of the project, as well as what are the next steps now that DataPorts is at its end. Multiple news articles were written about the event and the project overall, particularly from Spanish and Valencian websites such as El Estrecho Digital, El Periodic, VeintePies and Diario El Canal.

viernes, 10 marzo, 2023 Buscar...

ElEstrechoDigital.

MERCANCÍAS | PASAJEROS | SERVICIOS | INSTITUCIONES | PESCA | OCIO | NATURALEZA | EMPRESAS

El proyecto DataPorts presenta su plataforma para facilitar la interconexión de datos entre puertos

El objetivo de este es proyecto aprovechar la gran cantidad de datos generados en los puertos marítimos modernos gracias al alto nivel de digitalización

por **El Estrecho Digital** — 9 marzo, 2023

La Fundación **Valenciaport** ha acogido la conferencia final del proyecto DataPorts (A Data Platform for the Cognitive Ports of the Future) en un evento que se ha celebrado tanto en formato presencial como online y que ha contado con alrededor de 50 participantes.

El objetivo principal de este proyecto, cofinanciado por la Comisión europea a través del programa H2020, era aprovechar la gran cantidad de datos generados en los puertos marítimos modernos gracias al alto nivel de digitalización. Para ello, se ha

LO MÁS LEÍDO DE LA SEMANA

El proyecto DataPorts presenta su plataforma para facilitar la interconexión de datos entre puertos
9 MARZO, 2023
La Fundación Valenciaport ha acogido la conferencia final del proyecto DataPorts (A Data Platform for the Cognitive Ports of the...

Sindicatos muestran su apoyo a la protesta del Puesto de Control Fronterizo de Algeciras
7 MARZO, 2023
Los sindicatos CCOO y Coordinadora se han sumado a la protesta convocada por las asociaciones empresariales, Cámara de Comercio del...

El PCF del puerto de Algeciras será escenario de una protesta
3 MARZO, 2023
Los colectivos afectados por los retrasos en el despacho de mercancías en el Punto de Control Fronterizo (PCF) del Puerto...

Figure 50 – Article from El Estrecho Digital

Veintepies : Nacional : Puerto de Valencia

Twittear Share

DataPorts presenta su plataforma digital para la sincronización y acceso de datos en los puertos

El proyecto dio a conocer su nueva solución logística en su conferencia final, organizada por la Fundación Valenciaport y que contó con unos 50 participantes

VM. 09/03/2023

La Fundación Valenciaport acogió este miércoles la conferencia final del proyecto DataPorts (A Data Platform for the Cognitive Ports of the Future). que sirvió para la presentación definitiva de la plataforma digital que ofrece una nueva solución logística al sector. La 'plataforma DataPorts' combina datos de diversas fuentes relacionadas con puertos y centros logísticos para mejorar los procesos a través de apliaciones cognitivas, basadas en inteligencia artificial, y para generar nuevos modelos de negocio.

Imprimir

El objetivo de la plataforma es interconectar datos para mejorar los procesos. DataPorts, cofinanciado por la Comisión Europea en el marco del programa H2020, pretende aprovechar los registros generados en los puertos modernos gracias al alto nivel de digitalización. Es por eso que se ha creado un mercado de datos en el que han participado algunas empresas de la cadena de transporte y se han desarrollado soluciones big data integrando datos con una velocidad exponencialmente mayor y confiable "gracias al uso de tecnología blockchain".

Así lo explicaron los socios del proyecto en su conferencia final, un evento celebrado tanto en formato presencial como online, y que contó con alrededor de 50 participantes. Los responsables trasladaron los resultados más relevantes, entre ellos un componente para adquirir datos, surtidos de todo tipo de fuentes, de manera ágil ya sea mediante consultas o por subscripción.

Conferencia final del proyecto DataPorts (Foto Valenciaport)

Se presentaron más soluciones: un framework para la gobernanza de los datos que permite determinar cuáles se comparten y quién tiene permiso para acceder a ellos; un enfoque semántico para compartir registros basado en un modelo global, lo que facilita el acceso a la información, ya que los datos que llegan a la plataforma lo hacen siguiendo distintos formatos y ontologías; o el uso de aplicaciones basadas en blockchain para garantizar la veracidad e inmutabilidad de los datos de manera que la información no pueda ser alterada.

Además, en el caso concreto del puerto de València se han interconectado datos de diferentes fuentes como son los históricos de plataformas portuarias, la plataforma 4.0 de la autoridad portuaria, el sistema de transitarios vForwarding, un sistema de seguimiento de contenedores de Traxens, y Posidonia, y un PMS (Port Management System). Con estos datos, se han creado diversas aplicaciones para el seguimiento de contenedores y mercancías y para el control del estado del transporte de las mismas.

Servicios Regulares
Movimiento de buques
Puerto de Valencia
Puerto de Sagunto
Puerto de Gandía
Planos de Puertos
Valencia
Sagunto
Gandía
Alicante
Bolsa de Trabajo
Enlaces
Puertos de España
Puertos del Mundo
Navieras y Agentes
Organizaciones

Figure 51 – Article from VeintePies

el canal
MARÍTIMO Y LOGÍSTICO

Marítimo Terrestre Aéreo Ferroviario Logística Puertos Empresas Internacional Eventos

DataPorts presenta su plataforma para la interconexión y el acceso a los datos

8 marzo, 2023

La Fundación Valenciaport ha acogido este miércoles la conferencia final del **proyecto DataPorts** (A Data Platform for the Cognitive Ports of the Future) en un evento que se ha celebrado tanto en formato presencial como online y que ha contado con alrededor de 50 participantes.

El objetivo principal de este proyecto, cofinanciado por la Comisión Europea a través del programa H2020, era aprovechar la gran cantidad de datos generados en los puertos marítimos modernos gracias al alto nivel de digitalización. Para ello, se ha creado un mercado de datos en el que han participado las empresas de la cadena de transporte y se han desarrollado soluciones de big data integrando las fuentes de datos de forma significativamente más rápida y confiable gracias a la utilización de la tecnología blockchain.

Durante la conferencia, los socios del proyecto han presentado la plataforma DataPorts, una solución que combina los datos provenientes de diferentes fuentes relacionadas con la logística y los puertos marítimos, altamente digitalizados y conectados, para mejorar los procesos existentes. Esta plataforma permitirá establecer nuevas aplicaciones cognitivas, basadas en inteligencia artificial, y generar nuevos modelos de negocio.

Figure 52 – Article from Diario El Canal

elperiòdic.com

El proyecto DataPorts presenta su plataforma para facilitar la interconexión y el acceso a los datos en los puertos

ELPERIODIC.COM - 08/03/2023

- Los socios del proyecto han presentado hoy esta solución durante la conferencia final del mismo, organizada por la Fundación Valenciaport

MÁS FOTOS

La Fundación Valenciaport ha acogido hoy la conferencia final del proyecto **DataPorts (A Data Platform for the Cognitive Ports of the Future)** en un evento que se ha celebrado tanto en formato presencial como online y que ha contado con alrededor de 50 participantes.

El objetivo principal de este proyecto, cofinanciado por la Comisión europea a través del programa H2020, era aprovechar la gran cantidad de datos generados en los puertos marítimos modernos gracias al alto nivel de digitalización. Para ello, se ha creado un mercado de datos en el que han participado las empresas de la

Figure 53 – Article from El Periodic

4.5 DIGITAL NEWSLETTER

DataPorts newsletter aims at content mailing campaigns that contain information about the project's news and achievements. The contact information captured from the contact section of the website is utilized in order to summarize the project's progress, publications and blog posts.

The first newsletter was published in December 2020 (M12). It provided (i) an introduction containing the basic information of the project, (ii) a summary of the main activities and achievements during 2020, and (iii) the link to the main DataPorts social networks.

The basic information is composed by the project presentation, the consortium description, a link to the DataPorts informative file in CORDIS (Community Research and Development Information Service), a blog article about the collaboration with the BDVA, a link to the blog section of the website and a link to the project contact form. These contents allowed the reader to get a general overview of the main aspects of the project.

The summary of the main activities and achievements of 2020 included the main technical achievements, scientific publications, and events, as well as a summary of what was expected to achieve or present in the following phases of the project. The purpose was to offer to the potential audience what has happened during the first year of the project.

The second and third newsletters, published in December 2021 (M24) and July 2022 (M31) respectively, follow the same style and appearance, in order to maintain the corporate image and style. The purpose is to make this layout familiar to the readers. The basic information has few changes, other than highlights of the progress made across the years; the link to the promotional video has been added as a tool for presenting the project, instead of the project presentation available in SlideShare, and the link to the contact web form has been removed and has been replaced by a contact email address. Finally, regarding the activities and achievements, the text that appears as a summary of each section has been updated according to the 2021 results, and the corresponding pages with that information (accessible clicking on the corresponding links) have been created.

The last newsletter was the one published after the final event in March 2023 (M39), again following the same format seen in the other newsletters, only this time the "Upcoming" section was changed to "Final Event" and Next Steps" due to the fact this is the last major event in the Project. In this section the final points of the project and the event that took place in VPF are highlighted. Other sections were modified to reflect the nine events in which DataPorts was featured since July 2022, as well as the three scientific publications.

Figure 61 – DataPorts 2nd newsletter (December 2021)

Figure 62 – DataPorts 1st newsletter (December 2020)

Figure 50 – DataPorts 3rd newsletter (July 2022)

Figure 51 – DataPorts 4th newsletter (March 2023)

Apart from the main newsletters of the project, OTE included in the OTE Group's monthly newsletter in March 2020 a description of DataPorts and the involvement of the company. The mailing list consisted of 16.000 employees.

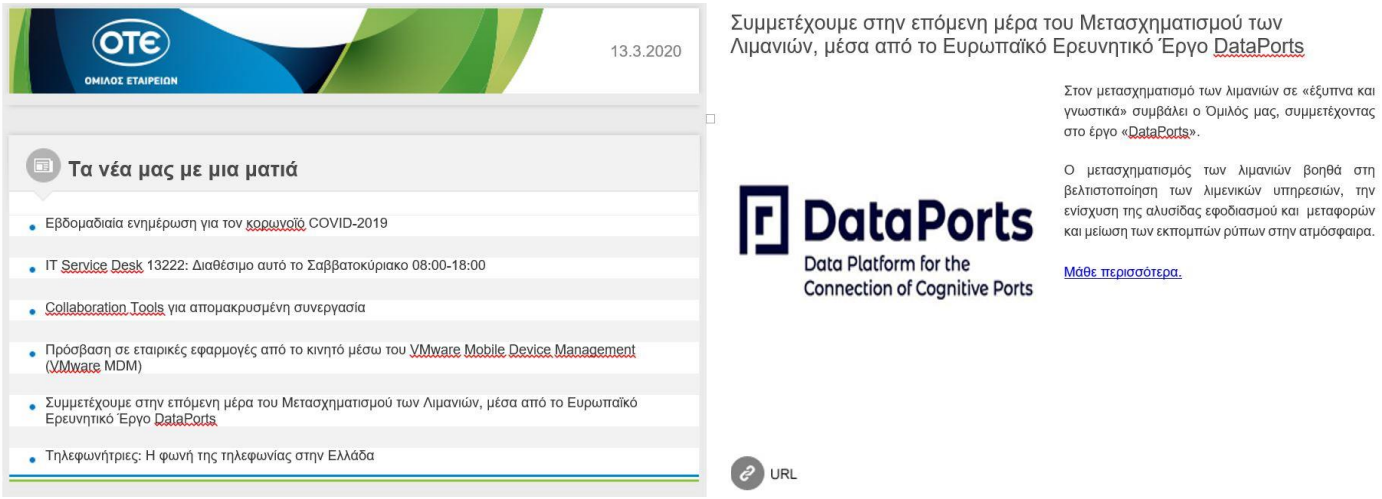


Figure 63 – Screenshots from OTE's newsletter

5 ON-SITE/VIRTUAL DISSEMINATION

On-site dissemination is considered an effective way to diffuse the content and achievements of DataPorts. The main objectives of such kind of activities are to gain awareness and visibility of the project and its goals and make direct contacts with potentially interested stakeholders, thus promoting the outcomes and the benefits of the project mainly to the industrial community. This section includes organising or attending workshops, conferences, industry events and meetings, webinars, exhibitions, etc.

5.1 KPI FULFILMENT

Diffusion Activity	Description	Target value in Grant Agreement	From Whom	Achieved Milestones and Category Ranking	
				Current Value	Evaluation
Workshops, showcases	Final dissemination workshop with presentation of DataPorts results, open call for papers and industry session	Total of 2 over the project's lifetime	Scientific/industry community	3	Category 2: Good progress
Industry events	"Marketing-oriented" presentations at industry events	At least 2 per year	Industry community	11 conferences 10 workshops 4 webinars 7 industry meetings 10 industry events 2 exhibitions	Category 3: Overachievement
On-site visits to field trial	Selected User and stakeholder groups, e.g., stakeholders, public authorities or solution developers	At least 2 during project lifetime	Industry community	2	Category 2: Good progress
International industrial events (exhibitions, conferences)	Number of attended events where DataPorts is represented	-	-	6 workshops 1 webinars 2 industry meetings 8 industry events 9 conferences	-
	Number of events organised/moderated by DataPorts partners	-	-	3 conference sessions 4 industry meetings 4 workshops 1 exhibition 1 industry event session	-
	Number of DataPorts partners participating to events	-	-	22 partners	-

Diffusion Activity	Description	Target value in Grant Agreement	From Whom	Achieved Milestones and Category Ranking	
				Current Value	Evaluation
	Average number of different partners attending each event	-	-	1.8 partners	-
	Number of leaflets distributed	-	-	495	Not applicable for 2020 and 2021 due to the Covid-19 outbreak
Showcases at the test sites	Number of showcases organized	-	-	1 showcase – DataPorts Final Event	Not applicable for the first two years of the project
	Number of participants to each organized showcase	-	-	34	Not applicable for the first two years of the project

Table 10 – On-site dissemination KPI fulfilment

During the project, there have been a lot of events (workshops, industry events, conferences etc.) that have promoted DataPorts to many audiences by presenting different aspects and milestones of the project that are tailored to each one of them. Nevertheless, many of the planned dissemination events for the first two years of the project were cancelled, or have been prohibited (i.e., leaflet and promotional material distribution) due to the Covid-19 pandemic.

5.2 COVID-19 ADAPTATIONS

The outbreak of the Covid-19 pandemic altered the planned on-site dissemination activities in the first two years of the project, as many of them were cancelled or took place virtually. Contrary to the traditional approach, this dissemination approach does not enable the same actions, nor does it raise awareness about DataPorts to the same length. Therefore, as can be noticed below, most communication activities during that period have been virtual. Nevertheless, during 2022 the Covid-19 restrictions were progressively lifted, making possible again the participation in physical events.

5.3 TARGET AUDIENCES IDENTIFIED AND KEY MESSAGES

Workshops are utilized as a dissemination medium for DataPorts' results presentation, to initiate discussions between the project's consortium and the wide European research community. They are primarily addressed to that community, to the industry, and to End Users, aiming at the initiation of discussions for potential collaborations, the diffusion of the project's milestones, and the communication of the DataPorts data sharing platform and its functionalities. Moreover, workshops are also addressed to Technology Providers, such as innovative SMEs, IoT Providers, universities, and non-profit entities that may act as End Users of the DataPorts Platform's data and tools and subsequently as enablers for on-top innovative services. Industry events are primarily marketing oriented and aim at the diffusion and bilateral discussions between the project's consortium and potential stakeholders. They act as an introduction of the project to the industry and data market, and a first presentation of the project's data platform alongside its functionalities. The content of industry events are different aspects of the project's achievements, breakthroughs, and innovative actions that are communicated to data market actors, such as Data Owners, Providers, Consumers, Port Community Stakeholders, shipping and maritime companies, as well as transport and logistics value chains.

5.4 EVENTS DETAILS

The events that were organized by the consortium of DataPorts or included participation of the project's partners are presented hereunder in chronological order:

- **Meetings with key industry officers, January 2020:** In January 2020, UKL organized two meetings with industry officers in order to introduce and disseminate the project of DataPorts. One of the meetings took place in Boppard, Germany and was addressed to the Chief Information Officer (CIO) of logistics software producer EPC. The second meeting with the CIO of the ship propulsion producer Schottel took place in Spay, Germany
- **Software practitioner conference OOP, February 2020:** The OOP is an annual conference for software architecture and is consisted of tracks of presentations and topics that are selected by an independent program committee after detailed examination. The topics of the conference vary from Artificial Intelligence to Web Apps including all the in-between areas of interest, such as Agility, Digital Transformation, Domain-Driven Design, Programming Languages and Software Development. OOP claims to offer the opportunity to deepen core competencies through the participation of renowned speakers that ensure deep content and a wide thematic spectrum.
  The participants of the "Web Application Security: Current Developments"[4] session, that was organized by UKL and took place on the 3rd of February 2020, acquired State-of-the-Art practical knowledge on IT security, in terms of web applications as far as protective measures and best practices for the prevention of typical vulnerabilities are concerned. These guidelines were based on the current "OWASP Top 10 Security Vulnerabilities" of the "Open Web Application Security Project". The session also included practical exercises using open-source tools for security testing, and it was addressed to Architects, Developers, QA Managers, Project Managers, and Product Owners
- **Big Data Congress Valencia, February 2020**: This is an annual conference in Valencia, Spain where Big Data is discussed, from how to analyze big data elements to get clearer ideas, leading to better decisions and strategies; to helping organizations to identify new opportunities, business movements and more efficient operations. VPF presented DataPorts, focusing on the potential benefits of Big Data and Blockchain in the ports and logistics sector.
- **Meeting with Internal Managers, April 2020:** In April 2020, Everis Industry Department organized a virtual meeting with the internal managers in order to present DataPorts to the different business areas and to explain EVR participation in the project. The scope of this meeting was to disseminate DataPorts project through the company
- **PortForward, SmartShip and DataPorts meeting, May 2020:** This workshop took place online in May 2020 in order to liaise the PortForward, SmartShip, and DataPorts projects. At the meeting, that lasted one hour, presentations were shown, and discussions of future collaborations and opportunities were discussed. The agenda of this workshop contained brief presentations including results, and objectives of these projects, an open discussion on ways to collaborate, as well as next steps. From the DataPorts partners, ITI was the one who presented the project
- **Meeting with the Operations Department, May 2020:** Everis Operations Meeting is a quarterly presentation to discuss and communicate new projects to the entire sector and the current status of the department. Carlos Torres, Senior Consultant at Everis, presented DataPorts project during the meeting, which had the participation of all the members of the operations department from Spain and Italy. Over 50 people had the opportunity to understand the purpose of the project and the importance of data platforms for the ports of the future

[4]https://www.oop-konferenz.de/oop2020/english/program/sessiondetails/action/detail/session/mo-9/title/sicherheit-von-webanwendungen-aktuelle-entwicklungen-ausgebucht.html%3Ftx_dmconferences_session%255BshowRooms%255D=0&cHash=7eed5c1be9115cabbf5da6b4b5b58e6d.html

- **Big Data Value workshops: Industrial Data Platforms, May 2020:** This webinar was organized on 6th – 8th May 2020 under the auspices of Big Data Value PPP. It served as the motive to start identifying synergies, as well as presenting the ways in which data platform projects address key data collection, sharing integration, and exploitation challenges. DataPorts was one of the projects presented. ITI and UDE performed an online presentation titled "A data platform for the cognitive ports of the future"

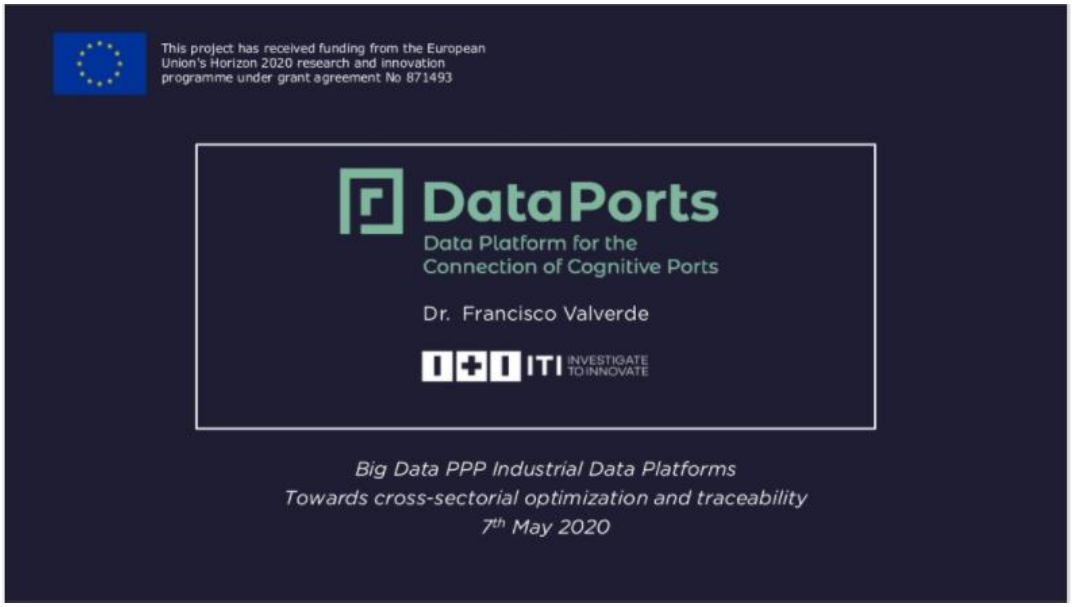


Figure 64 – DataPorts presentation in Big Data Value webinar

- **EUHubs4Data Kick Off meeting – IDSA session, September 2020:** The European federation of Data Driven Innovation Hubs serves as a connecting organization between data driven initiatives in Europe, federating solutions in a global common catalogue of data services and sharing data. In this way, this federation assists with the consolidation of a European reference for data driven innovation and experimentation.
  In scope of these Common European Data Spaces, DataPorts was presented in a session organize by IDSA as part of the EUHubs4Data Kick Off meeting by its Technical Manager, Francisco Valverde (ITI). The presentation addressed DataPorts data governance and sovereignty approach and was titled "A data platform for the cognitive ports of the future". The audience that this presentation was addressed to, consisted of around 60 people belonging to the EUHubs4Data consortium

- **FoMSESS Workshop: Engineering Trustworthy Data-Intensive Systems with Software Models, October 2020:** The aim of the FoMSESS special group is to offer a discussion forum in the German-speaking area in the field of computer and information security that deals with basic research and the application of formal or mathematically precise techniques in software engineering. The special group is interested in security in the sense of both safety and security.

  The FoMSESS workshop took place in 12th and 13th October 2020 virtually, and UKL presented two topics in scope of the DataPorts project. The first topic named "Eliciting Privacy/fairness solution requirements and generating action plans" overviewed the bridging of the gap between legal data protection principles prescribed in the legal obligations and action plans that aim to concretely mitigate the privacy risks in an impact assessment process is a major challenge. The goal of this seminar thesis was to study privacy/fairness solution requirements and action plans for the purpose of privacy risk mitigation. In addition, to provide an overview of the tools, methods to elicit and generate such requirements and action plans. The second topic named "Designing privacy-aware reference architecture" provided an overview and comparison between existing methods and models to design IoT reference architectures. To this end, one should study various reference architectures (such as HLA, AIOTI-WG3, OneM2M, IIRA, RAMI 4.0, IDSA). Furthermore, a

comprehensive overview of methods and tools to support privacy goals in an architecture design was required

- **Meeting with member of the German State Parliament, October 2020:** On the 13th October 2020, UKL organized a meeting with a member of the German Parliament. The discussion took place in Koblenz, Germany, and the agenda included an introduction of the Faculty of the University of Koblenz Landau, the introduction of the projects in the field of E-Democracy, and the introduction of the projects in the field of Digitalization, Artificial Intelligence and e-Health

- **BDVA Task Force 6.SG1 Data Technology Architectures, October 2020:** DataPorts coordinator, Santiago Cáceres (ITI), presented the project and its architecture online to the BDVA data technology architecture task force on 20th October 2020. The presentation addressed solely the architecture of DataPorts project and was titled "A data platform for the cognitive ports of the future". The audience that this presentation was addressed to include around 16 persons that belong to BDVA task force

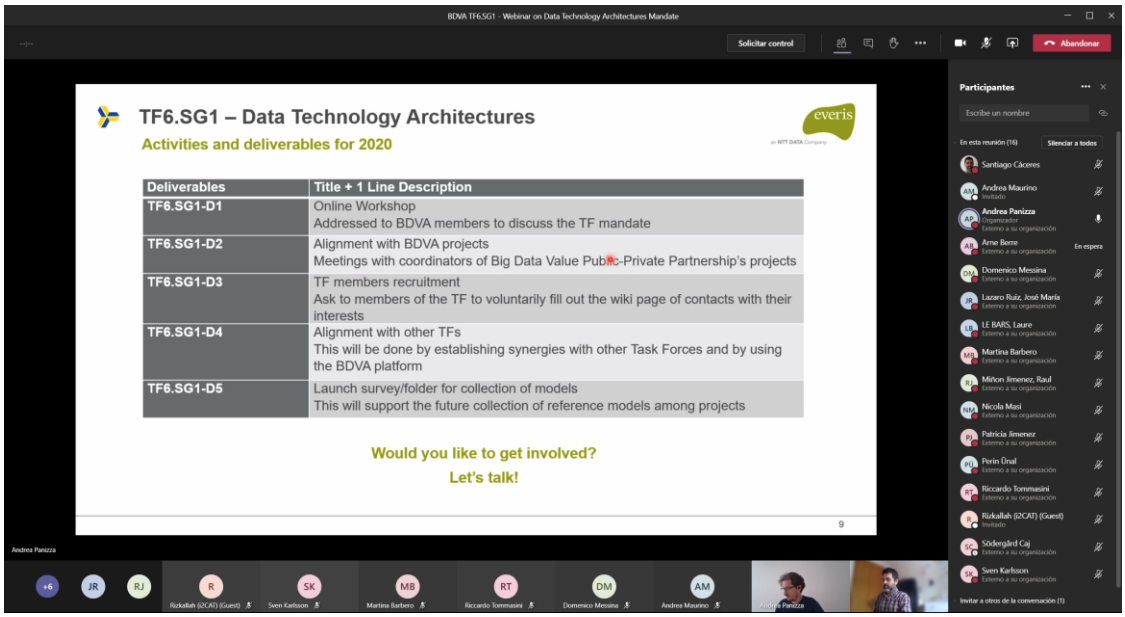


Figure 65 – DataPorts presentation at BDVA Task Force 6.SG1 Data Technology Architectures

- **European Big Data Value Forum – EBDVF 2020, November 2020:** The European Big Data Value Forum (EBDVF) is the major event of the European Big Data and Data-Driven AI Research and Innovation community organized by the Big Data Value Association (BDVA) and the European Commission (DG CNECT). The central theme of the 2020 edition of the EBDVF was "Building a strong European Data and AI Ecosystem" and aimed at the connection between the German and European communities on AI and Data. Moreover, the event that was held in Berlin and online on 3rd – 5th November 2020, addressed key topics for Europe such as the development of European Data Spaces, the importance of Technology Platforms and Trust, the opportunities for market uptake and the new challenges ahead for Data and AI within the society.

  DataPorts was sponsoring the EBDVF 2020, and Santiago Cáceres, project coordinator, presented the project online in a talk. DataPorts architecture, use cases and challenges were discussed, and feedback was positive from the audience that included more than 60 attendants. The partners that participated in this presentation was ITI, UPV and UDE, while the presentation included an introduction of the DataPorts project and was titled "A data platform for the cognitive ports of the future". DataPorts also held a virtual booth in scope of the project's dissemination

- **Infocom World Conference, November 2020:** Infocom World Conference is annually organized by Smart Press in Athens and has been established as a renowned conference in the

telecommunications and IT sector in southeast Europe.

Figure 66 – DataPorts presentation cover at Infocom 2020

This industry event addresses multiple markets and technology fields since ICT is interconnected with all technology markets. As a conference it is addressed primarily to professionals and executives from Telecommunications, IT and Media professional divisions. However, it also appeals to Data Analysts, Sales Executives, Security Officers, Service Providers, Consultants, Data Analysts, HR and PR professionals amongst others.

In November 2020 Infocom World Conference was scheduled to take place in Athens, Greece. However, due to the pandemic circumstances the event was held virtually with a three-day duration. DataPorts participated with a web presentation titled "Towards a smart port: A Digital Ecosystem Creation" and was represented by OTE and ICCS partners. This world conference aims at the presentation of the 5G and fibre enablers, the infrastructure, the digital transformation, and the creation of a digital ecosystem that stem from this newly introduced in the telecommunication industry

- **BodyPass – The Future of 3D Human Body Data for Health and Industry, December 2020:** The BodyPass project[5], funded under the European Union's Horizon 2020 research and innovation programme and member of the BDV-PPP, presented its main results in its final event on the 3rd of December 2020. This event was conducted in an online format and was addressed to companies, professionals, and institutions interested in the application of 3D human body data for health and product design. Moreover, the event gathered experts from different European countries and disciplines in order to tackle the most relevant topics related to 3D human body data and upcoming trends, including secure exchange of data, the use of Blockchain and the protection of personal data following the General Data Protection Regulation (GDPR). DataPorts was present in this event as an exhibitor and the project's virtual exhibition was visited by 51 attendees

[5] https://www.bodypass.eu/

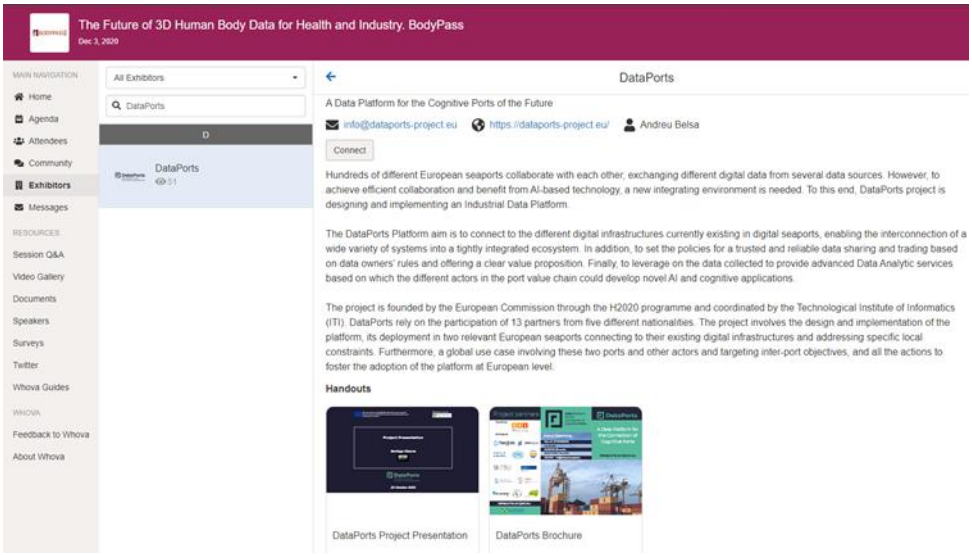


Figure 67 – DataPorts virtual exhibition

Figure 68 – DataPorts presence at the BodyPass project final event

- **BDV PPP Technical Committee Meeting #6, December 2020:** ITI presented the initial lessons learned of DataPorts as part of a joint BDVA Activity Group and Technical Committee Meeting, taking place December 11, 2020. Over 100 participants joint this inline event, which also feature interventions from the European Commission as well as BDVA members
- **Slide2open Shipping Finance 2021, March 2021**: OTE participated in the Slide2Open Shipping Finance 2021 Digital Conference (Tuesday to Thursday 16-18 March 2021). The purpose of the conference was to offer tangible results to participants, through valuable information on activities, offers, proven practices and trends in the field of shipping finance. Among the key topics of the conference were the international trading, sustainability and energy issues, and digital transformation and information and communication technology. During the participation, OTE presented DataPorts to the global shipping community with a presentation titled "DataPorts: Designing the Future of Seaports". It was a presentation regarding the vision and the objectives of DataPorts toward the seaports transformation. The live presentation was attended by approximately

950 simultaneous users/IPs. The replay is still being watched and is expected further increase of attendance

Figure 69 – DataPorts presentation in Slide2open Shipping Finance 2021

- **BDVA/DAIRO Activity Group Meeting 43 - BDV PPP Technical Committee #7, March 2021**: As in previous occasions, BDVA members and the BDV PPP projects joined forces around common topics of interests on 18th and 19th March 2021. Main topics discussed were Data Platforms, Data/AI Governance and Standards and Trustworthiness of Industrial AI. DataPorts participated with two presentations from Francisco Valverde (ITI) about data spaces building blocks, and Sofia Terzi (CERTH) on data governance issues
- **EUH4D Data Forum, March 2021**: EUH4D Data Forum is as an annual event to be held within the framework of the EUH4D project. It is created with the aim of raising awareness, sharing results and recommendations, and receiving contributions on strategies and policies from the European Commission around data. The event took place on Tuesday, March 30, 2021 in online format with the participation of different experts in the field of European Big Data. DataPorts project coordinator, Santiago Cáceres from ITI, presented[6] project perspective on technical challenges around data exploitation. Around 70 people from institutions of any kind (academic, industry, SME, etc.) as well as the EC participated in the event
- **BDVA/DAIRO Activity Group Meeting 44 - BDV PPP Technical Committee #8, April 2021**: As in the previous group meeting reported, BDVA members and the BDV PPP projects joined forces around common topics of interests on 22nd and 23rd April 2021. Main topics discussed were Data/AI Standards and interoperability, Data Spaces and Trustworthiness of Industrial AI. DataPorts participated with a presentation from Andreu Belsa (UPV) about Metadata Interoperability
- **Workshop on Transforming in Shipping & Maritime with Blockchain technologies, May 2021**: OTE and CERTH co-organised the workshop in collaboration with AMMITEC[7], the Association of Maritime Managers in Information Technology and Communications. This workshop, which took place on Thursday 13th May 2021, aspires to be the first step in a series of collaborative actions between DataPorts and Ammitec that will emphasize on the technology transfer in the shipping and maritime ICT community predicting and planning the transformation of seaports. Challenges in maritime and

[6] https://www.youtube.com/watch?v=KXXckgcoJpw&t=796s

[7] https://www.ammitec.org/

shipping addressed by Blockchain-based solutions were presented along with real-life Blockchain supported use cases

Figure 70 – Workshop on Transforming in Shipping & Maritime with Blockchain technologies

- **RI.Logistica conference, May 2021**: The RI.Logistica conference is an event designed for research infrastructures (RIs), their users and collaborators, companies in the supply chain management, and governmental authorities to discuss all aspects of logistics critical for research facilities and laboratories. The event was held virtually on 19-20 May 2021. Fabiana Fournier from IBM moderated a session called "Traveling on the Data Highway: The Digital Transition". The session addresses the challenges and opportunities that come with an ever-increasing digital landscape. Andreas Metzger from UDE made a presentation[8] in this session titled "How Data and AI can Transform Transport and Logistics and Enable New Insights". Around 50 people from academia and industry in logistics attended the event
- **Data Spaces Synergy Group - Kick-off meeting, May 2021:** The meeting took place on 21st May 2021. The Data Spaces Synergy Group kick-off meeting was aimed at initiating the collaboration between organizations and projects sharing the above described vision on how to materialize an open standard-based, open source available, and CEF-compatible soft infrastructure for creation of data spaces in Europe. A number of projects part of the BDV PPP (EUH4Data, i4Trust, BD4NRG, PLATOON, Synergy, DataPorts) participated in this kick-off meeting. After a first intro presentation and presentations from initial projects joining the Data Spaces Synergy Group, a number of breakout sessions were run in parallel. Santiago Caceres (ITI) presented the DataPorts project and participated in Task Force 1: Data Spaces Technology Building Blocks. Cristina Muñoz (EVR) participated in Task

[8] https://prod5.assets-cdn.io/event/6219/assets/8377539812-ba6bf7c321.pdf

Force 2: Business and Legal Frameworks and Policy recommendations. Finally, Andreu Belsa (UPV) participated in Task Force 3: Ecosystem building and Communications

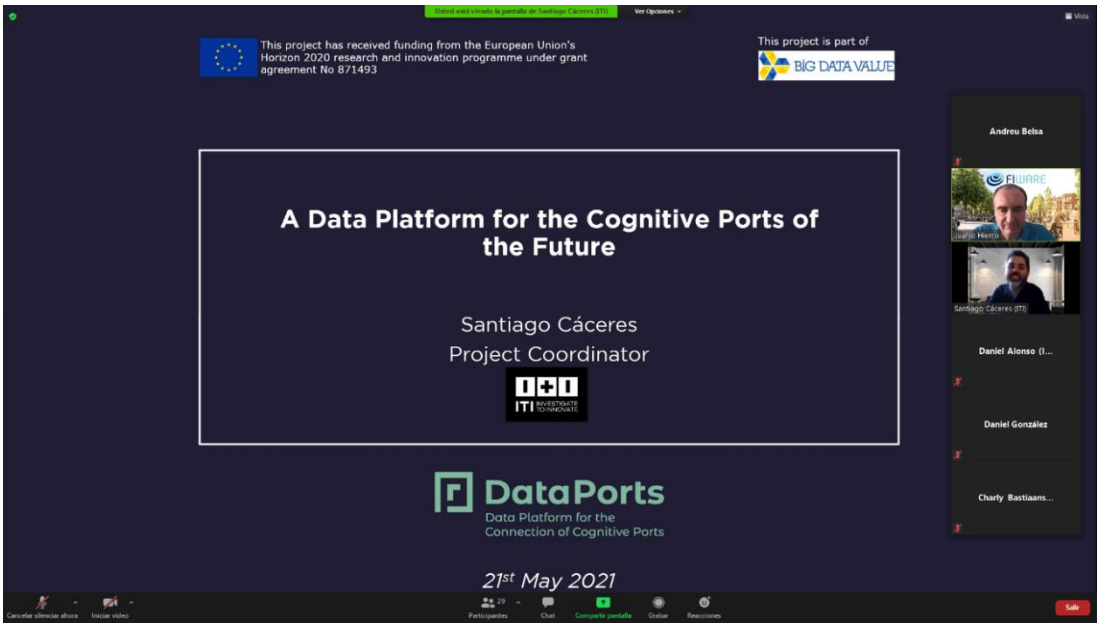


Figure 71 – Data Spaces Synergy Group - Kick-off meeting

- **BDVA/DAIRO Data Week 2021, May 2021**: Data Week is the spring gathering of the European Big Data Value and Industrial AI research and innovation community. This year, it was held online from 25th to 27th of May 2021. On Thursday May 27, DataPorts partners from UDE, ITI, UPV and PRO organized a session[9] called "Unleashing the potential of ports and maritime logistics via data-driven solutions: Opportunities and Challenges" and/or made presentations there. The workshop elaborated how data-driven services and applications (including AI-based cognitive solutions) can help stakeholders in the logistics, ports, and maritime sectors to improve their operations. It also helped identify and understand the challenges that must be addressed to facilitate adoption of these solutions. Thereby, it focused on industrial data spaces and platforms, with a focus on transport and logistics, as one key vertical sector of European importance. The workshop featured interventions from key ICT projects dedicated to data-driven solutions for transport, including the BDV PPP projects DataPorts and TransformingTransport, as well as the H2020 projects SmartShip, PIXEL, and ASSIST-IoT. It also leveraged insights and experiences from linked activities, such as the BDVA Task Forces and Subgroup. Around 30 people participated in the event

[9] https://whova.com/embedded/session/dsdw_202105/1609542/?view=

Figure 72 – BDVA/DAIRO Data Week 2021 speakers

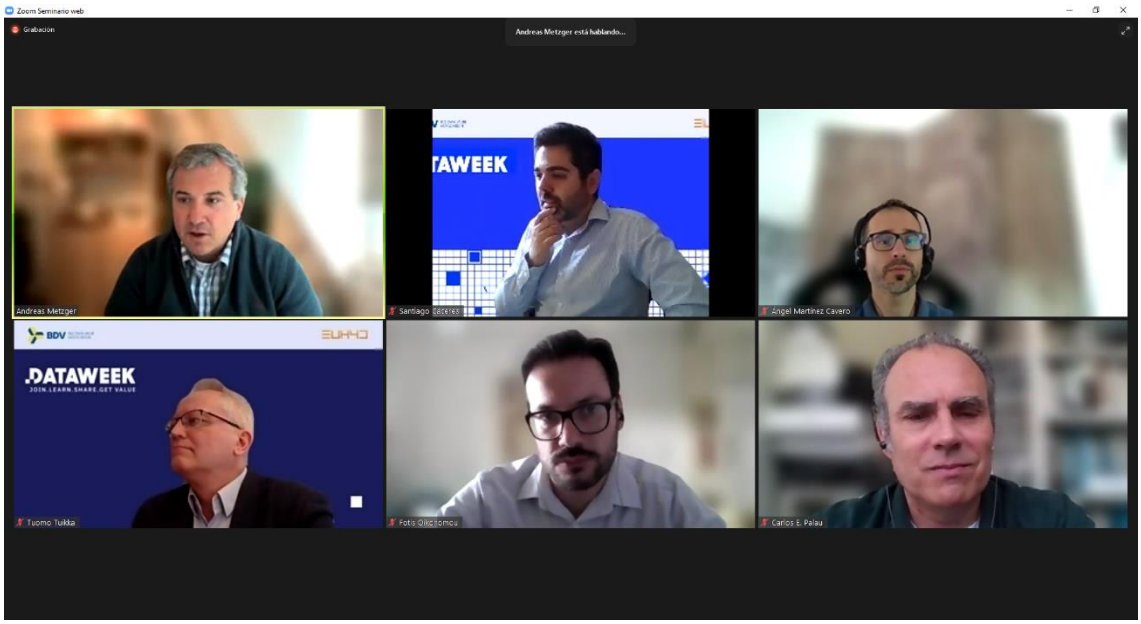


Figure 73 – BDVA/DAIRO Data Week 2021 workshop

- **3rd PIXEL Webinar – The PIXEL Platform, June 2021:** The webinar took place on 17th June 2021. DataPorts Project participated in a webinar organized by PIXEL Project mainly focused on describing Pixel Platform in detail. Andreu Belsa (UPV) presented DataPorts and its synergies with Pixel in a slot of this webinar called: "Cross-fertilisation between research projects: synergies with DataPorts and the use of FIWARE in maritime ports' innovation initiatives"

Figure 74 – DataPorts participation in 3rd PIXEL webinar

- **14th International Symposium on Intelligent Distributed Computing (IDC), September 2021:** The Symposium took place virtually on 16 – 18 of September 2021. DataPorts participated with an online presentation titled ”A novel approach for calculating real-time Composite Indicators relying on Internet of Things and Industrial Data Spaces”. The IDC symposium gathers researchers and practitioners in the area of Intelligent Distributed Computing to discuss the latest findings, research achievements and ideas in that field. Rafael Vañó (UPV) presented a work done in collaboration with H2020 Project PIXEL, which proposed a solution based on the development done in PIXEL and DataPorts, to calculate collaboratively and share quantitative composite indicators among industrial actors while ensuring data sovereignty

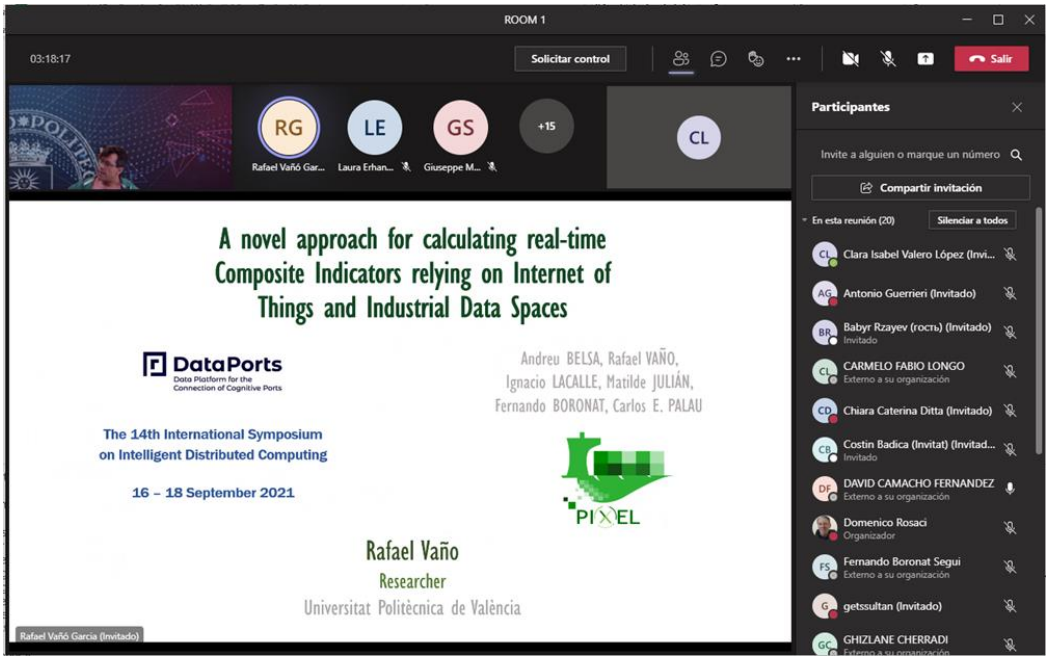


Figure 75 – DataPorts presentation at IDC 2021

- **Smart Ports 4.0 Summit, September 2021**: The Smart Ports 4.0 Summit aims to bring the traditional ports and maritime sector towards the digital future by embracing, adopting and deploying already matured as well as new, developing technologies with human capital and corporate identity. By an in-depth analysis of the maritime regulations and upcoming cybersecurity directives as well as the technologies already matured and those still in progress, the conference will bring the industry learnings into the 21st century. Case studies, panel discussions, and sessions purely based on the industry research, aim to combine and comprehend the already existing knowledge with the industry`s vision towards the future. VPF presented the objectives, architecture and benefits of DataPorts, focusing on the Port of Valencia pilot scenarios.
- **TRA2022 – Get Engaged through ALICE, November 2021**: Open session to ALICE members and ALICE Liaison Projects. The first information session, held on 19 of November 2021, shared and explored possibilities for projects, companies and organizations to join TRA and discover opportunities to influence the agenda and outreach to a wide range of stakeholders. Particularly, it was shared and discussed how the projects can get the best out of TRA by joining forces and get support or do it through ALICE. The UPV assisted to that meeting representing DataPorts as dissemination member of an ALICE liaison project.

Figure 76 – DataPorts in ALICE open session

- **BDVA Data Platforms Workshop 1, November 2021:** Santiago Cáceres, DataPorts coordinator, participated in the first Data Platforms workshops, organized by BDVA/DAIRO and took place online on 23 of November 2021. Santiago showed the project status and lessons learned so far, together with a description of the architecture. The DataPorts presentation was followed by panel discussions. Around 70 people, representing all BDV PPP projects dealing with data platforms, attended this first data workshop

- **Infocom World Conference, November 2021:** Infocom World 2021 Conference was held online on 24 - 26 of November. DataPorts participated with a web presentation titled “DataPorts: Data and Services for the Future of Seaports” and was represented by OTE and ICCS partners. The day 3 event was organized in seven distinct sessions, so that to present both the scope and results of related 5G EU-funded projects as well as to identify further opportunities for growth. DataPorts was involved in session 2, the scope of which was to emphasize on the verticals by presenting not only the context and/or the architectural framework but also advanced validation trials (including results and assessment of respective KPIs) from multiple vertical industries. The audience of the conference included scholars, practitioners and research students

Figure 77 – DataPorts presentation at Infocom 2021

- **MobiDataLab 1st Webinar, November 2021:** DataPorts project was presented by Santiago Cáceres, DataPorts coordinator, in the first MobiDataLab webinar[10], followed by a panel discussion about the importance of a data sharing culture in Europe and the corresponding challenges and opportunities. Other initiatives related to data sharing between actors in the transport and mobility, like Moliere and SoBigData++ project, joined the discussion. The webinar was held online on November 25, 2021 and around 40 participants were involved

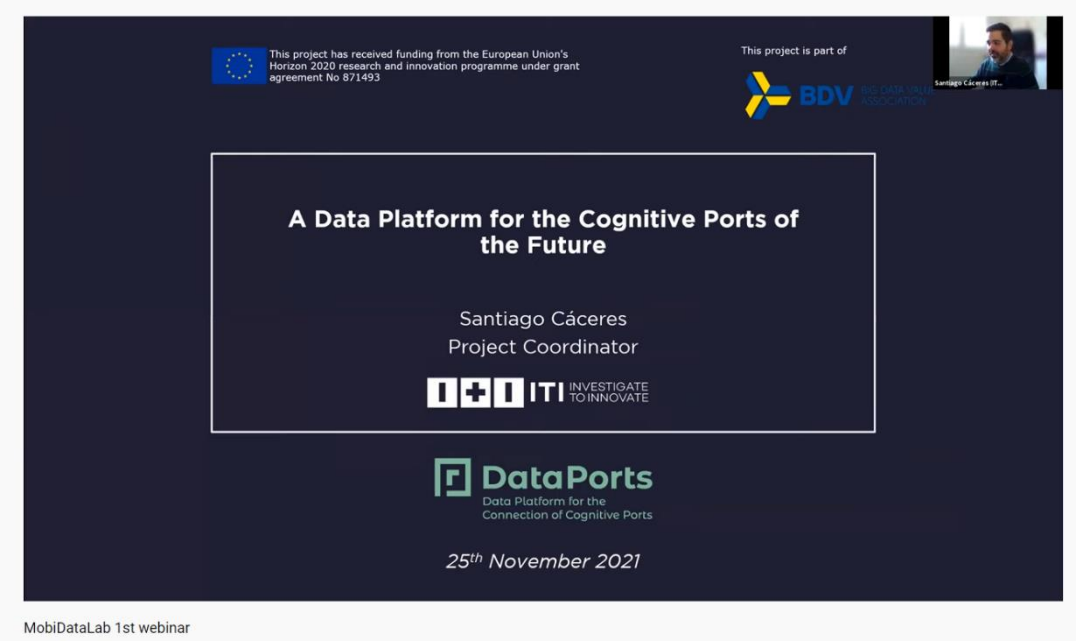


Figure 78 – DataPorts participation in 1st MobiDataLab webinar

- **European Big Data Value Forum – EBDVF 2021, November 2021:** Sponsor talk DataPorts: A Data Platform for the Cognitive Ports of the Future: The European Big Data Value Forum (EBDVF) is the flagship event of the European Big Data Value and Data-Driven AI Research and Innovation community organized by the BDVA and the European Commission (DG CNECT). The EBDVF 2021

[10] https://www.youtube.com/watch?v=BI9JBkFWteA

theme was “Digital Transformation powered by Data and AI”. The event brings together industry professionals, business developers, researchers and policymakers from all over Europe and other regions of the world to advance policy actions, and industrial and research activities in the areas of Data and AI. DataPorts organized a session titled “DataPorts: A Data Platform for the Cognitive Ports of the Future” on November 29, 2021 and was represented by ITI, CERTH, UPV and ICCS partners. This session provided an overview of the project platform and main technical outcomes, as well as specific details and demonstrations about the main components of this industrial data platform. In addition, some final remarks about the platform and the project were presented

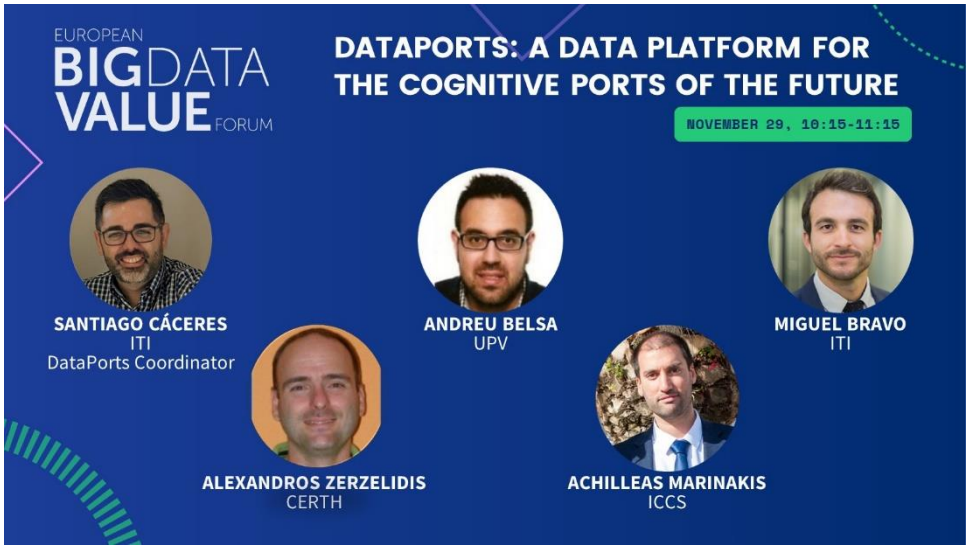


Figure 79 – DataPorts speakers at EBDVF 2021

- **FOCUS PYME, November 2021:** DataPorts project was presented by Santiago Cáceres, DataPorts coordinator, in the FOCUS PYME[11] workshop, followed by a panel discussion about the importance of using data effectively in SMEs**.** The workshop took place physically in Valencia, Spain on 30 November 2021 and around 30 attendants, plus 20 additional online participated

[11] https://focuspyme.emprenemjunts.es/?op=14&n=19527&codMenu=4712

Figure 80 – DataPorts participation in FOCUS PYME

- **Meeting with Local Stakeholders, January 2022:** In the framework of the project a series of meetings were held, with local representatives of shipping lines, agents/forwarders, logistics operators and trucking companies that operate in the Port of Thessaloniki. In those meetings, DataPorts solution was presented, in order for them to evaluate the impact of its use on port operations. Following these meetings, stakeholders' feedback was recorded through dedicated questionnaires.
- **Madeira's digital Slide2open Shipping Finance 2022 – Euphoria in the Shipping World, March 2022:** The DataPorts project was presented by Christos Gizelis, member of OTE's team in the project, in the Slide2open Shipping Finance 2022 – Euphoria in the Shipping World conference[12], held physically in Athens, Greece between 2nd and 3rd of March, 2022. Christos Gizelis prepared a presentation named "DataPorts – Cognitive Ports of the Future"[13] on the 2nd of March, presenting the achievements of the project and the vision to the transformation of the seaports. Moreover, it was an invitation to the parallel session (March 3rd). The attendance was high, with over 100 people having physical presence in the conference, mostly representatives of the Shipping industry.

[12] www.Slide2Open.net/ShippingFinance2022

[13] https://www.youtube.com/watch?v=bjBEqY7HcwM

Figure 81 - OTE's presentation at Slide2open Shipping Finance 2022

Figure 82 - DataPorts participation at Slide2open Shipping Finance 2022, through OTE's Christos Gizelis

- **Slide2open Shipping Finance 2022 – Euphoria in the Shipping World (Parallel Session), March 2022:** The Slide2open Shipping Finance 2022 conference continued on March 3rd, 2022, with DataPorts having a strong presence again, after OTE's presentation on March 2nd. The attendance was both physical and online, with multiple Presentations and Discussion Panels. Apart from OTE (which was the organizer), other DataPorts partners that attended were ITI, UPV, ICCS, NTT DATA and VPF. Similar to the day before, there were over 100 participants with physical presence, from policy makers and researchers, to government, shipping industry, energy and banking representatives. The presentation by OTE was titled "The Seaports of the Future - Research and Innovations". This presentation aimed to bring together all stakeholders on the seaports of the future, to present the research vision, the available solutions and hear the concerns & the needs of the related industries. It highlighted that DataPorts' main ambition was to create a trusted and secure environment where

all actors operating in the diverse supply chains involved in European seaports could share and trade their data. This will boost the transition from digital / connected to smart / cognitive ports, involving the setting-up of new services, an increase of the efficiency of the ports, and a reduction of the environmental impact.

Figure 83 - DataPorts participation at Day No2 of Slide2open Shipping Finance 2022 (Part 1)

Figure 84 - DataPorts participation at Day No2 of Slide2open Shipping Finance 2022 (Part 2)

Figure 85 - DataPorts participation at Day No2 of Slide2open Shipping Finance 2022 (Part 3)

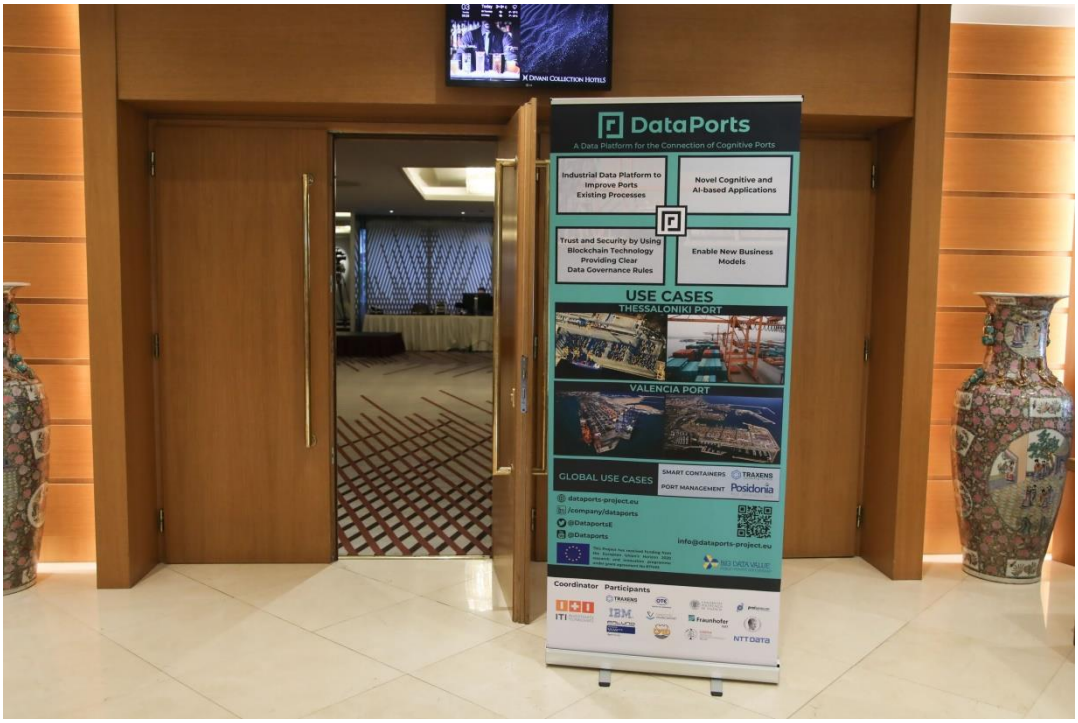


Figure 86 - DataPorts participation at Day No2 of Slide2open Shipping Finance 2022 (Part 4)

- **Digitalization, Automation and Block Chain in Shipping and Supply Chains, MBA in Shipping, Aegean University, March 2022:** DataPorts project was presented during the the MBA programme in Shipping, of Aegean University, on March 19th 2022. DataPorts was represented by CERTH's Alexandros Zerzelidis & Konstantinos Vottis, and ThPA's Eirini Tserga. Many MBA candidates of the Aegean University attended the presentation and enrolled in the Blockchain module. More specifically, CERTH and ThPA presented the Blockchain Technology implemented in the DataPorts

project, as part of the guest speakers invited in the Blockchain module of the MBA in Shipping programme. The presentation had two parts, titled “An Overview of the DataPorts Project” and “An Overview in Blockchain Techonology at DataPorts”, respectively.

Figure 87 - DataPorts project presented at the Digitalization, Automation and Block Chain in Shipping and Supply Chains, MBA in Shipping, Aegean University (Part 1)

Figure 88 - DataPorts project presented at the Digitalization, Automation and Block Chain in Shipping and Supply Chains, MBA in Shipping, Aegean University (Part 2)

- **Smart Digital Ports of the Future 2022, May 2022:** Port Technology International’s mission is to be the leading multi-channel media company providing timely, insightful content to the ports and terminals industry. In-house expertise and leading-edge products and services help to inform,

educate and connect industry professionals enabling them to address challenges, discuss solutions and explore the adoption of new, innovative technologies that are shaping the way the industry operates. PTI covered the latest technologies and innovations being adopted across the industry including terminals, digitalization, automation, shipping, global trade, sustainability and the energy transition, among others. VPF presented DataPorts in the context of the Big Data Panel session, focusing on the Valencia Port pilot scenarios.

Figure 89 - DataPorts participation in Smart Digital Ports of the Future

- **FIWARE Global Summit 2022, June 2022**: Together with its members and partners, FIWARE Foundation drives the definition – and the Open Source implementation – of key open standards that enable the development of portable and interoperable smart solutions in a faster, easier and affordable way, avoiding vendor lock-in scenarios, whilst also nurturing FIWARE as a sustainable and innovation-driven business ecosystem. UPV attended the event in Gran Canaria, presenting the platform to dozens of experts in the field and aligning it with the strategy compass that FIWARE offers**.**

- **Data Week 2022, June 2022:** DataPorts project participated in Data Week 2022[14], which was held online on the 3rd of June, 2022. It was represented by OTE's Christos Gizelis, ITI's Santiago Caceres and UPV's Carlos Palau. Over 50 participants attended the online workshop (from the academic, industrial and developer community), with web presentations & discussion panels being held. OTE's presentation, titled "Joining research forces and create the future of ports and maritime based on data-driven services: Defining the Strategy"[15], the progress and achievement performed since 2021 in DataPorts project was presented. The workshop elaborated on how data-driven services and applications (including AI-based cognitive solutions) can help stakeholders in the logistics, ports, and maritime sectors to improve their operations. It also helped identify and understand the challenges that must be addressed to facilitate adoption of these solutions. Thereby, the workshop focused on industrial data spaces and platforms, with a focus on transport and logistics, as one key vertical sector of European importance.

[14] https://www.big-data-value.eu/data-week-2022
[15] https://youtu.be/0jvYduWcQQs https://youtu.be/0jvYduWcQQs

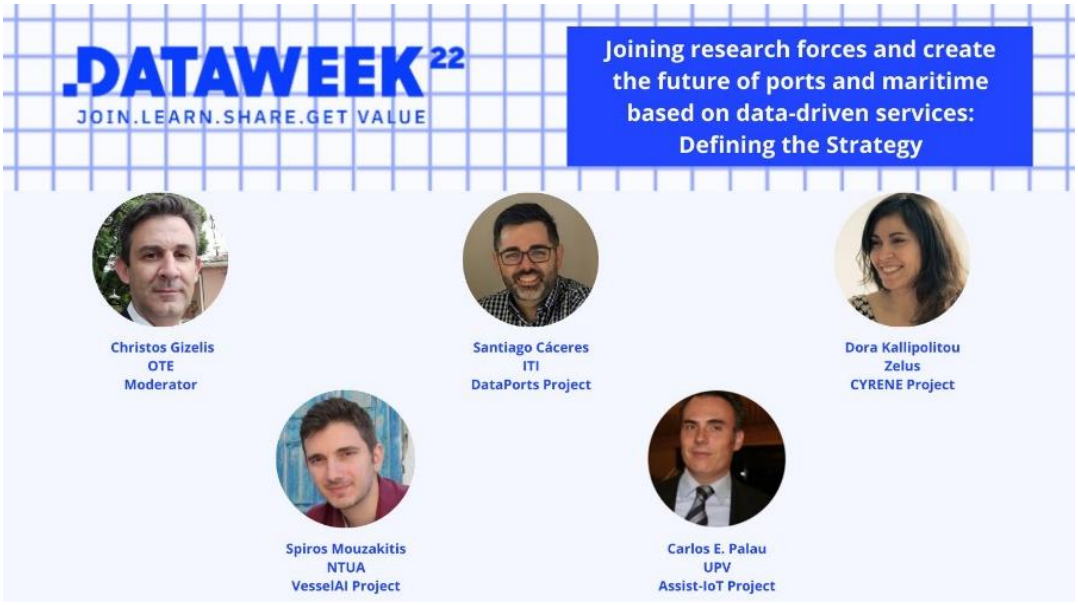


Figure 90 - DataPorts' presence in Data Week 2022

- **Posidonia - The International Shipping Exhibition, June 2022:** DataPorts had a strong presence in Posidonia[16], one of the biggest events in the field of Maritime and Shipping industry. It was organised and hosted in Athens, Greece, between the 6th and 10th of June, 2022. Over 1,964 exhibiting companies from 88 countries attended the event, with more than 28k visitors from all over the world being present (more than 700 visited the DataPorts booth). It is worth mentioning that all DataPorts partners were present at Posidonia. During the workshop, CERTH's Alexandros Zerzelidis held a presentation with title "Data Governance", which analyzed the Data Governance component of the DataPorts platform. Data Governance is the mechanism that enables the enforcement of access rules to business data assets in a transparent, verifiable and non-repudiable way. ThPA's Eirini Tserga presented the ThPA SA Correor Use Case, that was organized in the context of Posidonia Exhibition. OTE's Christos Gizelis also held a presentation, named "Challenges and Opportunities in Seaports", which presented for the first time the proposed solutions for Data Governance, Processing Services, Analytics and AI. Also, a discussion panel was organized in which the opportunities opened through the digital transformation of the Ports were discussed, as well as the development possibilities both at national and European level. Distinguished panel members Ms. Christina Gialama, Director of ICT Consulting, Solutions & Service Management of OTE Group, Messrs. Michalis Dritsas, Director of the Office of the Deputy Minister of Development and Investment Dr. Chr. Dimas, responsible for the Research - Technology portfolio, Antonios Venieris, President of the International Maritime Union of Greece and Ioannis Fetanis, Commercial Director of the Thessaloniki Port Authority discussed about the opportunities and challenges towards the seaports transformation.

[16] Posidonia 2022 | posidonia (posidonia-events.com) Posidonia 2022 | posidonia (posidonia-events.com)

Figure 91 - DataPorts project had a strong presence in Posidonia 2022 (Part 1)

Figure 92 - DataPorts project had a strong presence in Posidonia 2022 (Part 2)

Figure 93 - DataPorts project had a strong presence in Posidonia 2022 (Part 3)

Figure 94 – DataPorts' partners and representatives in Posidonia 2022

- **18th AIAI 2022 - The 7th Workshop on "5G – Putting Intelligence to the Network Edge" (5G-PINE), June 2022:** DataPorts project was present on AIAI 2022[17], an online Workshop held between the 17th and 20th of June, 2022. Representatives from OTE, ICCS and UPV attended the virtual meeting. OTE prepared a presentation, titled "Efficient Data Management and Interoperability Middleware in Business-Oriented Smart Port Use Cases", which proposed DataPorts' data model, a framework that follows the newest technology standards, that tries to consolidate APIs and services of highly

[17] https://ifipaiai.org/2022/ https://ifipaiai.org/2022/

complex infrastructures. Port environments are a characteristic example of such infrastructures, since massive amount of data and services from different sources are processed and used. The framework's approach adopted is a bottom-up one, considering every service interconnection as an independent entity, which must be aligned with the proposed common vocabulary and data model. The strict guidelines that are injected into the lifecycle of a service/component development, lead to explicitly enforce interoperability between each one service that lives inside the ecosystem of the port. That is -and should be- a step towards "the cognitive port of the future", where developers, SMEs and huge vendors can exchange and reuse data from a shared repository. The presentation concluded, stating that ports will play key role in the new information system model, as in-house marketplaces will be developed, for companies to disseminate and exploit their data and services.

Figure 95 - OTE's presentation, as a partner of DataPorts, in AIAI 2022

- **IoT Week, June 2022:** DataPorts project had presence in last year's IoT Week[18], held in Dublin, Ireland from the 20th to the 23rd of June. The speakers were over 380 in number, representing research faculties, industry, business, technology and science companies from all over the world. There were 700 registered participants from 49 countries. Prodevelop's Héctor Iturria Sánchez presented the Data Access Component of the DataPorts platform, which is the mechanism that enables the data acquisition of external data sources, the transformation to the platform ontology and the forwarding to the target components or users. CERTH's Alexandros Zerzelidis held a presentation with title "Data Governance", which detailed the Data Governance component of the DataPorts platform, explaining its role as the mechanism that enables the enforcement of access rules to business data assets, in a transparent, verifiable and non-repudiable way. Last but not least, UPV's Andreu Belsa held a session with title "DataPorts - A Data Platform for the Connection of Cognitive Ports". This session provided an overview of the project, platform, and main technical outcomes, in addition to specific details and demonstrations about the main components of this industrial data platform. Finally, some final remarks about the platform were presented. The session consisted of several slots focused on: i) DataPorts Project Overview, ii) DataPorts platform in a nutshell, iii) Framework to manage the access to heterogeneous IoT data sources, iv) Data Processing Challenges: Interoperability and Data Abstraction and Virtualization and v) Data Analytics Services and Cognitive Applications: AI-based Weather Predictions/ Forecasts using Telecom Data.

[18] https://iotweek.org/iot-week-2022-dublin/

Figure 96 – DataPorts' representation by UPV (among others) during IoT Week 2022

Figure 97 - DataPorts' representation by UPV (among others) during IoT Week 2022 (Part 2)

- **3rd IEEE International Conference on Autonomic Computing and Self-Organizing Systems - ACSOS 2022, September 2022:** DataPorts was represented by UDE during 2022's ACSOS International Conference[19], conducted virtually between 10th and 23rd of September. More specifically, UDE

[19]https://2022.acsos.org

presented a paper with title “Explaining Online Reinforcement Learning Decisions of Self-Adaptive Systems”. The paper dealt with Online reinforcement learning, i.e., employing reinforcement learning (RL) at runtime. This framework is an emerging approach to furnish cognitive services with self-adaptation in the presence of design time uncertainty. By using Online RL, the self-adaptive system can learn from actual operational data and leverage feedback only available at runtime. Deep RL represents learned knowledge as a neural network whereby it can generalize over unseen inputs, as well as handle continuous environment states and adaptation actions. A fundamental problem of Deep RL is that learned knowledge is not explicitly represented. For a human, it is practically impossible to relate the parametrization of the neural network to concrete RL decisions and thus Deep RL essentially appears as a black box. Yet, understanding the decisions made by Deep RL is key to (1) increasing trust, and (2) facilitating debugging. This solution enhances and combines two existing explainable RL techniques from the machine learning literature.

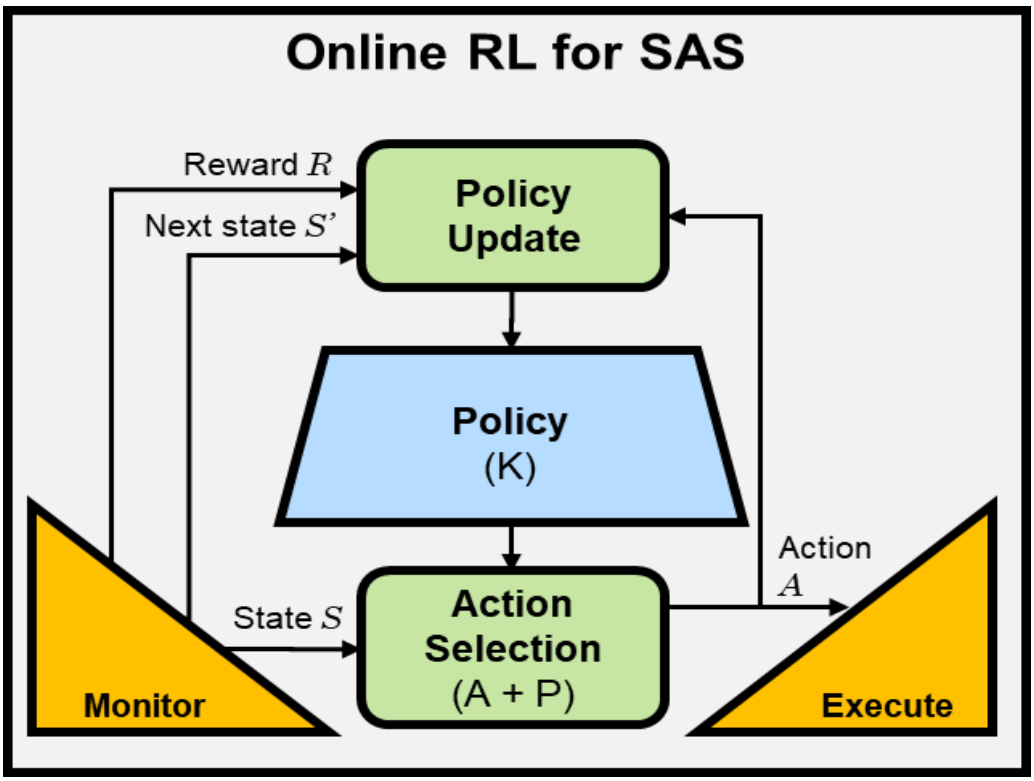


Figure 98 - UDE's presentation of the proposed RL framework during ACSOS 2022

- **Digital Transformation Summit 2022, October 2022:** DataPorts project had a presence in the Digital Transformation Summit[20], held in Madeira, Portugal from the 24th to the 27th of October 2022. The Madeira's Digital Transformation Summit is a forum where the EU's Digital strategy and ongoing results are debated to achieve the visionary objectives at European and regional levels. Bringing together recognized individualities from the European Commission, Government, Academia and Industry. Needs, expectations, developments and innovative solutions are discussed, aiming at digitally empowering citizens and businesses to improve, grow, innovate and compete on fair terms, while achieving climate neutrality. The Summit sets the scene for a human-centric vision in a digital society. Last year’s summit had the following tracks: i) Health and Horizontal Challenges (e.g. cybersecurity, AI, etc…), ii) Manufacturing and Sustainability and iii) Maritime & Digital

[20] https://summit.digit-madeira.pt/

Innovation Hubs. UPV's Andreu Belsa presented the session titled "Enabling Maritime Digitalization" in which the DataPorts Project was presented to dozens of people in the sector[21].

Figure 99 - UPV represented DataPorts in 2022's Digital Transformation Summit

- **International Conference on Applied Technologies (ICAT), November 2022**: Benjamin Molina from UPV, was invited as a keynote speaker, at the speech, titled "Semantic interoperability, ontologies, and trends" provided key insights into the usage of semantics and ontologies in modern environments. The DataPorts Project was highlighted. ICAT aims to bring together top researchers and practitioners working in different domains in the field of ICT (Information and Communications Technology) to exchange their expertise and to discuss the perspectives of development and collaboration, inviting high-quality submissions in different areas in the field of ICT (Information and Communications Technology).

[21] https://summit.digit-madeira.pt/sessions3.html#session14

- **Workshop with Startups, November 2022:** The DataPorts project was part of a virtual meeting with startup companies on November 10th, 2022. DataPort's presence was strong, since UPV, ITI and OTE participated in the meeting, along with Prodevelop (PRO). Representatives of various Greek startups participated in the workshop, while Prodevelop's Héctor Iturria Sánchez held a presentation of the different pilots of the project. He also made an introduction of the ports and the scenarios that are being demonstrated, highlighting the role of the platform and how it is being used to improve some of the port processes.
- **Transport Research Arena (TRA) 2022, November 2022**: DataPorts participated in last year's Transport Research Arena[22], from the 14th to the 17th of November. Over 2200 people attended the conference, which took place in Lisbon, Portugal. The Transport Research Arena (TRA) is the largest European research and technology conference on transport and mobility. TRA is the foremost European transport event that covers all transport modes and all aspects of mobility. Themed "Moving together – reimagining mobility worldwide", TRA 2022 brought together experts from around the world to discuss the newest innovations and future of mobility and transport, building also on the Portuguese historical legacy and links to overseas transport professionals. During the whole event, DataPorts had a stand positioned in the exhibition area. UPV and ITI were the DataPorts partners that attended the conference. ITI's Paolo Calciati presented the paper titled "Innovative cognitive data platform to improve processes in European seaports" in the scientific session. The paper described the use and potential benefits of the DataPorts platform in several scenarios from the pilots.

Figure 100 - DataPorts had presence in TRA 2022 (Part 1)

[22] https://traconference.eu/programme-overview/

Figure 101 - DataPorts had presence in TRA 2022 (Part 2)

- **2nd International Workshop on Software Engineering and AI for Data Quality in Cyber-Physical Systems (SEA4DQ), November 2022:** DataPorts project was part of last year's 2nd International Workshop on Software Engineering and AI for Data Quality in Cyber-Physical Systems (SEA4DQ 2022)[23], collocated with the ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC / FSE). It was held on November 17th 2022 in Singapore and attracted hundreds of people from all over the world. UDE was the partner that participated and represented DataPorts in the workshop. UDE also prepared a presentation titled "Data Quality Issues in Online Reinforcement Learning for Self-adaptive Systems". It dealt with Online reinforcement learning, which is an emerging machine learning approach that addresses the challenge of design-time uncertainty faced when building self-adaptive systems, thereby facilitating building cognitive services. Part of the presentation was the discussion around three relevant issues and recent solutions – developed in the DataPorts project -- related to data quality in online reinforcement learning for self-adaptive systems.

[23] https://sea4dq.github.io/

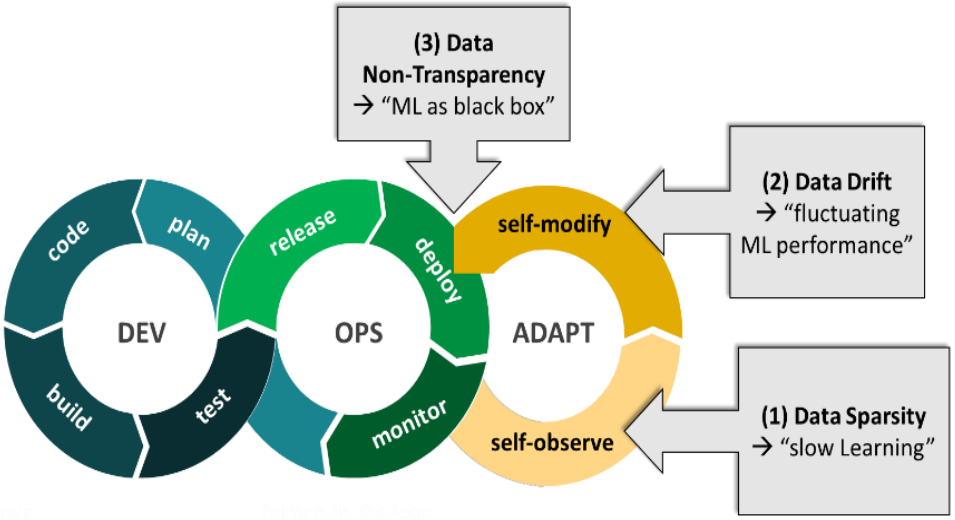


Figure 102 - Part of UDE's presentation during SEA4DQ 2022

- **European Big Data Value Forum (EBDVF) 2022, November 2022**: DataPorts had a strong presence in the recent European Big Data Value Forum (EBDVF)[24], which took place in Prague, Czech Republic from the 21st to the 23rd of November, 2022. EBDVF is the flagship event of the European Big Data Value and Data-Driven AI Research and Innovation community organised by the BDVA and the European Commission (DG CNECT). It brought together industry professionals, business developers, researchers and policymakers from all over Europe and other regions of the world to advance policy actions, and industrial and research activities in the areas of Data and AI. UPV, along with ITI, ThPA and OTE were the DataPorts partners that represented the project, which also sponsored the Forum. The partners prepared a presentation with title "Joining forces and sharing the future of ports and maritime sector with data-driven services". This session took one new step forward towards the digital transformation of the seaports, a step that shapes the future to become smart and cognitive by offering new AI-based services to their stakeholders and the community.

Figure 103 - DataPorts was a sponsor and had a strong preence in EBDVF 2022 (Part 1)

[24] https://european-big-data-value-forum.eu/2022-edition/programme/

Figure 104 - DataPorts was a sponsor and had a strong preence in EBDVF 2022 (Part 2)

Figure 105 - DataPorts was a sponsor and had a strong preence in EBDVF 2022 (Part 3)

- **Infocom World 2022, November 2022**: DataPorts project was represented in Infocorm World 2022[25], a hybrid and public workshop held in Athens, Greece on November 29th, 2022. It was mainly oriented to the Greek audience. CERTH, OTE and ICCS were the partners that participated in the event, also presenting a session with title "DataPorts - Coreor Pickup Use Case: Making Ports Nodes in the Global Network". The session's main topic was the presentation of one of the core cases that are implemented in the framework of DataPorts, for the Port of Thessaloniki.

Figure 106 - DataPorts' partners ICCS, CERTH and OTE participating in Infocom World 2022

- **DataPorts Final Event, March 2023:** On the 8th of March the final event of the DataPorts Project happened in Valencia's portuary foundation, with all the partners and members of the Project attending the event. The event was hybrid, with both physical and virtual attendance, and had nearly 100 participants in total. The event started with a warm welcome by both Santiago Cáceres from ITI and Riku Leppanen from the European Commission followed by a keynote from Juanma Díez, VPF and an overview by Santiago Cáceres again. After a break, the platform itself was introduced by Andreu Belsa, UPV and then the Data Processing, Data Governance and Data Analytics were described and explained by Matilde Julián from UPV, Alexandros Zerzelidis from CERTH and Miguel Bravo from ITI. This was followed by a presentation of the DataPorts Cognitive Services and Applications by Hector Iturria, Prodevelop, who then allowed Pablo Giménez, Erini Tserga and Alexandros Zerzelidis from VPF, ThPA and CERTH to present the pilots. The session concluded with Hector Iturria presenting a Posidonia port solution and DataPorts platform scenario. The event concluded with a panel discussion moderated by Christos Gizelis from the Hellenic Telecomunications Organisation in with Jaime Luezas from Puertos del Estado, Head of Unit Service

[25] https://infocomworld.gr/24o-synedrio-infocom-world-2022-fiber-and-5g-highways-digitall-greece/epistimoniki-enotita/https://infocomworld.gr/24o-synedrio-infocom-world-2022-fiber-and-5g-highways-digitall-greece/epistimoniki-enotita/

to Port Community, Christophe Joubert from Prodevelop, Chief Operating Officer International, Sue Probert from UN/CEFACT and Daniel Saez, ITI, Strategic Intelligence & Technology Transfer Director took part and talked about their expectations, experiences in the project and hopes for the future.

Figure 95 – Welcome by Santiago Cáceres

Figure 96 – Group photo of all involved

Figure 97 – Group photo of the panel discussion

6 SCIENTIFIC DISSEMINATION

One of the main goals of the DataPorts dissemination and communication strategy is to transfer knowledge to the research, academic and scientific communities. Therefore, the consortium aims at producing high quality publications in the fields that are related to the research being carried out in the context of the project. Apart from drafting scientific papers, this category of dissemination activities also includes open-source contributions to already established software tools and platforms, as well as educational initiatives, such as online courses, webinars and training sessions.

6.1 KPI FULFILMENT

Diffusion Activity	Description	Target value in Grant Agreement	From Whom	Achieved Milestones and Category Ranking	
				Current Value	Evaluation
Publications	Key scientific publications at top tier conferences, associated workshops and magazine/journals	At least 2 per year; Total of 5 over project's lifetime	Scientific community	18 publications in conferences and journals	Category 3: Overachievement
Open-source contributions	Contributions to open-source projects (e.g., FIWARE, ECLIPSE, Bridge.IoT)	At least 1 per year	Scientific and Industry community	3 contributions	Category 2: Good progress
Education	E-learning platform and training sessions will be developed to allow the stakeholders of all country partners to let to know the conclusions, results and products, as an open access platform. World-wide dissemination tours and industry-organized seminars at universities	Two online seminars per year. At least 1 MOOC. At least 1 seminar per year	Scientific and Industry community	6 activities	Category 1: Needs further attention
Scientific papers publication	Number of submitted papers	-	-	4 book chapters	-
	Number of papers published in international referenced journal	-	-	3 journal articles	-
	Number of papers in international conferences	-	-	11 conference papers	-
	Number of DataPorts authors contributing to scientific papers	-	-	8 partners	-
	Average number of different partners authoring each paper	-	-	1.7 partners	-
	Total number of reads of scientific publications in ResearchGate	-	-	1003 reads	-
	Number of participated scientific events	-	-	10 conferences	-

Diffusion Activity	Description	Target value in Grant Agreement	From Whom	Achieved Milestones and Category Ranking	
				Current Value	Evaluation
Scientific Dissemination events	Number of posters at scientific events	-	-	2 posters	Not applicable during 2020 and 2021 due to the Covid-19 outbreak
Organization of scientific actions	Organization of webinars	-	-	-	-
	Organization of technical workshops at University	-	-	2 seminars 4 courses 2 training sessions	-
Open-source contribution	Number of project's outcomes available as open source	-	-	1 Contribution – Major DataPorts' software components available through GitHub	-
	Number of contributions to open-source initiatives	-	-	2 contributions	-

Table 11 – Scientific dissemination KPI fulfilment

Regarding the target values of the KPIs that are presented in the Grant Agreement, the publications exceeded the expectations, while open-source contributions of the project are in good progress. Besides those target values, additional quantitative indicators are also reported concerning the scientific dissemination, in order to display more accurate results. However, the educational dissemination of the project seems to need further actions, mainly from the academic partners. Nevertheless, virtual presentations of DataPorts include a lot of information about the scientific milestones of the project, and can be accessed and leveraged by the academic community.

6.2 PUBLICATIONS

The scientific results of DataPorts need to be published within the scientific community to generate knowledge from the innovation actions that take place within the lifespan of the project. The primary targets are Q1 scientific journals (the top 25% journals in the field), with occasional publications in Q2 journals (the top 50%), where members of the DataPorts consortium can publish the results of their findings. In addition, distinguished scientific and technical conferences in all the addressed fields are identified as media for channelling the knowledge generated from the project's advances.

6.2.1 Target Audiences Identified and Key Messages

The DataPorts project addresses many topics form different technological areas, converging within the port ecosystem. Therefore, scientific and research communities may be highly interested in the results of the project, whose dissemination strategy in research and in scientific communities is quite similar in the different research domains. The identified research communities that are of interest for DataPorts are approached through the publication of research papers that stem from the project's results and State of the Art analysis in specialized journals and conferences. Moreover, the publication of the results of the research activity of DataPorts enables the academic community to utilize and further develop the research in the

respective area. The key messages that are communicated to these communities and audiences depend on the technical outcomes, achievements, and milestones of the project.

6.2.2 Scientific Papers

Scientific papers refer to publications in established and well-known journals and presented at conferences where a plethora of academics and researchers participate.

- **Towards a smart port: the role of the telecom industry:** The paper titled "**Towards a smart port: the role of the telecom industry "**[26] is co-authored by members of the OTE and ICCS partners. In specific, Christos-Antonios Gizelis, Theodoros Mavroeidakos, Achilleas Marinakis, Antonis Litke, and Vrettos Moulos submitted this scientific paper to 16th International Conference on Artificial Intelligence Applications and Innovations – AIAI, Greece, June 2020. The paper was published on 29th May 2020 in IFIP Advances in Information and Communication Technology book series (IFIPAICT, volume 585) by Springer.

  The scope of this paper is to analyse and scrutinize the opportunities and challenges that are risen for Telecommunications/Information and Communication Technology (ICT) Providers at ports. These opportunities are the stepping stone towards the transformation of ports for the future. Furthermore, the initial DataPorts architecture is being presented, along with a high-level description of the project's functional components

- **Online Reinforcement Learning for Self-adaptive Information Systems:** "**Online Reinforcement Learning for Self-adaptive Information Systems"**[27] is co-authored by Alexander Palm, Andreas Metzger, and Klaus Pohl and was published on 3rd June 2020. The paper was submitted to the 32nd International Conference, CAiSE 2020, Grenoble, France, in June 2020 and is published as a conference proceeding in the "Advanced Information Systems Engineering", which is an A-level ranked computer science conference.

  This paper presents the technology underlying the "Prescriptive Process Monitoring" component of the DataPorts Process-based Analytics module. See the following paper

- **Triggering Proactive Business Process Adaptations via Online Reinforcement Learning:** Andreas Metzger, Tristan Kley, and Alexander Palm published the book chapter "**Triggering Proactive Business Process Adaptations via Online Reinforcement Learning"**[28] as a conference paper of the Business Process Management book that was published by Springer. This book constitutes the proceedings of the 18th International Conference on Business Process Management, BPM 2020, held online, in September, which is an A-level ranked computer science conference.

  The key contribution of this paper is to introduce a system that can (within limits) react to process unstationarity and still makes somewhat good decision, even when the processes' structure suddenly starts to deviate from what it was trained on. This is a (huge) improvement compared to previous systems, which relied solely on the knowledge gathered during their training phase, meaning they would need to be retrained whenever even a small change within the process occurs. This is doubly bad, as the process logs generated during the use of said systems cannot be used to then train it again. To some extent, the proposed system still suffers from this, but it is able to mitigate it measurably

[26] https://link.springer.com/chapter/10.1007/978-3-030-49190-1_12

[27] https://link.springer.com/chapter/10.1007/978-3-030-49435-3_11

[28] https://link.springer.com/chapter/10.1007/978-3-030-58666-9_16

- **"Ensemble Deep Learning for Proactive Terminal Process Management at duisport"[29]**: This is a book chapter co-authored by A. Metzger, J. Franke, T. Jansen during 2020 and was included in the Business Process Management Cases – Volume 2, J. vom Brocke, J. Mendling, and M. Rosemann, Eds. Springer, published in August 2021., representing the selected best papers of the BPM 2019 conference industry track.

  This book chapter presents the "Ensemble Predictive Process Monitoring "component of the DataPorts Process-based Analytics module (previously prototyped in the TransformingTransport project). Advanced data analytics were employed to provide decision support for terminal operators and facilitate proactive management of the terminal's processes. Using ensembles of deep learning models, the component predicts delays in the execution of a running process and provides operators with decision support regarding whether to intervene by adapting the process. Lessons learned clearly indicate the need for a data sharing platform, such as DataPorts

- **A Scalable and Semantic Data as a Service Marketplace for Enhancing Cloud-Based Applications:** DataPorts submitted in March 2020 the journal article with title **"A Scalable and Semantic Data as a Service Marketplace for Enhancing Cloud-Based Applications"[30]** to the Future Internet journal of the Multidisciplinary Digital Publishing Institute (MDPI). The authors of the article belong to ICCS and are Evangelos Psomakelis, Anastasios Nikolakopoulos, Achilleas Marinakis, Alexandros Psychas, Vrettos Moulos, Theodora Varvarigou and Andreas Christou. The article was revised and accepted in April 2020 and published in the Special Issue Network Cost Reduction in Cloud/Fog Computing Environments. More significantly, amongst 17 published papers in this issue, this article was selected to be placed in the cover of that issue (ISSN 1999-5903). *Future Internet* was ranked Q2 (133/307) during 2020 in the category "Computer Networks and Communications", according to Elsevier's Scopus citation database[31].

  This journal article analyses and implements the Virtual Data Container (VDC) concept that aims to simplify the data management in heterogeneous, complex, and distributed infrastructure. Following the Data as a Service paradigm (DaaS), VDC –a core component of DataPorts architecture- provides an abstraction layer that takes care of retrieving, processing, and delivering data with the proper quality level, while in parallel putting special emphasis on performance, security, privacy, and data protection aspects. Similarly, to the main goal of the DataPorts project in terms of improving data management, the article presents a DaaS platform that attempts to deal with critical issues such as scalability and semantic interoperability

[29] https://link.springer.com/chapter/10.1007%2F978-3-662-63047-1_12

[30] https://www.mdpi.com/1999-5903/12/5/77

[31] https://www.scopus.com/sourceid/21100409311

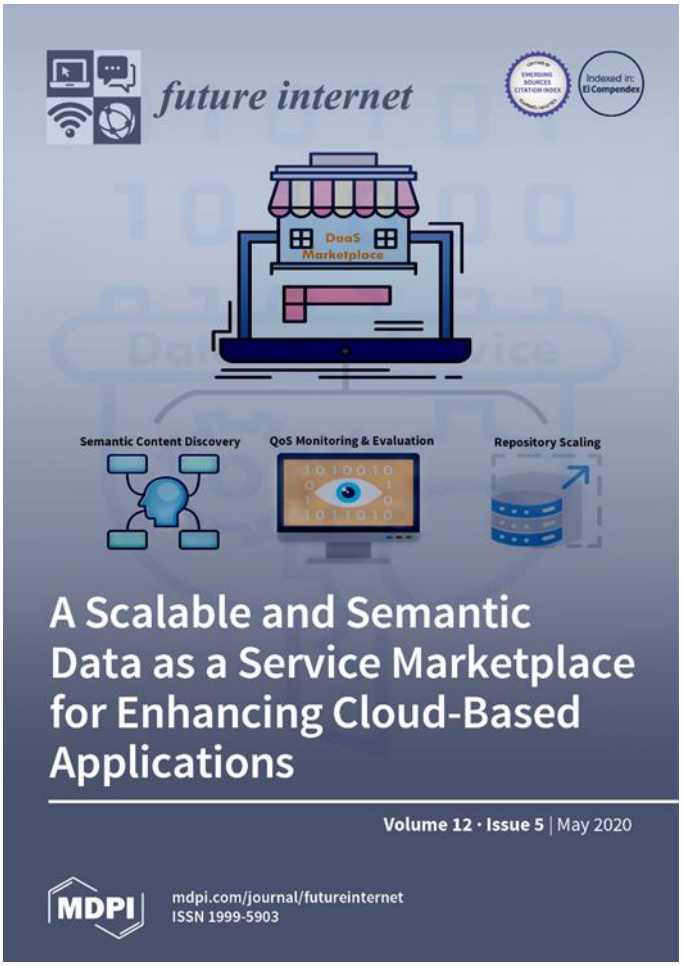


Figure 107 – MDPI Future Internet Volume 12 / Issue 5 cover

- **Framework and Methodology for Establishing Port-City Policies Based on Real-Time Composite Indicators and IoT, A Practical Use-Case:** DataPorts in collaboration with PIXEL-ports project[32] submitted in July 2020 the journal article with title "**Framework and Methodology for Establishing Port-City Policies Based on Real-Time Composite Indicators and IoT: A Practical Use-Case**"[33]. The authors of the article belong to UPV and are Ignacio Lacalle, Andreu Belsa, Rafael Vaño and Carlos E. Palau. The article was revised and accepted in July 2020 and published in the Special Issue IoT-Enabled Smart Cities[34]. This is a special issue of Sensors (ISSN 1424-8220)[35] journal. This special issue belongs to the section "Sensor Networks". *Sensors* was ranked Q1 (15/64) in the category “Instruments & Instrumentation”, Q2 (22/86) in the category “Chemistry, Analytical” and Q2 (77/266) in the category “Engineering, Electrical & Electronic” during 2020, according to the JCR[36] category rank.

  This paper proposes an IoT-based software framework, accompanied with a methodology for defining, calculating, and predicting composite indicators that represent real-world phenomena in the context of a Smart Port-City. The experiment consists of deploying a composite index for

[32] https://pixel-ports.eu/

[33] https://www.mdpi.com/1424-8220/20/15/4131

[34] https://www.mdpi.com/journal/sensors/special_issues/IoT_Enabled_Smart_Cities

[35] https://www.mdpi.com/journal/sensors

[36] https://jcr.clarivate.com/

monitoring traffic congestion at the port-city interface in Thessaloniki (Greece). This research involves Thessaloniki port, responsible of one of the DataPorts use cases. The paper is focused on the interoperability of Thessaloniki city and port in freight traffic. The aim is to optimize the traffic between the city and the port area. In addition to reduce pollution, queues, energy consumption etc. Finally act as a single point of reference for data exploitation for the benefit of the Port Authority, the passengers and the local community. The proposed solution will help the authorities to have a better planning and resource optimization, while the passengers will have a more comfortable and smooth transfer from their home until their embarkation. From a technical point of view, semantic interoperability is implemented through the use of Fiware Data models, NGSI agents, Orion Context Broker and Fiware components. These technologies are a key element of the Data Access and Semantic Interoperability components of DataPorts

- **Cost Fairness for Blockchain-Based Two-Party Exchange Protocols**: Matthias Lohr, Benjamin Schlosser, Jan Jürjens, and Steffen Staab submitted to the 2020 IEEE International Conference on Blockchain (Blockchain) the paper titled **"Cost Fairness for Blockchain-Based Two-Party Exchange Protocol"**[37]. This conference proceeding was published to IEEE Xplore on 11 December 2020.

  The DataPorts architecture supports the exchange of data and involves the use of Blockchain. The paper presents an approach for performing a Blockchain based data exchange supporting fairness requirements

- **"Towards cognitive ports of the future"**: This is a book chapter co-authored by Santiago Cáceres, Francisco Valverde, Carlos E. Palau, Andreu Belsa Pellicer, Christos A. Gizelis, Dimosthenes Krassas, Hanane Becha, Réda Khouani, Andreas Metzger, Nikos Tzagkarakis, Anthousa Karkoglou, Anastasios Nikolakopoulos, Achilleas Marinakis, Vrettos Moulos, Antonios Litke, Amir Shayan Ahmadian, and Jan Jürjens that is going to be included in the Book "Technologies and Applications for Big Data Value"[38].

  This book chapter deals with scalability, interoperability and standardization features of data platforms from a business point of view in a smart port case study. It describes how DataPorts tries to address these challenges and provide an ecosystem where port authorities and external stakeholders such as transportation and logistics companies, can cooperate and create the basis to offer cognitive services to the end-users

- **Ontology-driven evolution of software security**: DataPorts submitted in November 2020 the journal article with title **"Ontology-driven evolution of software security"**[39] to the Data & Knowledge Engineering[40] journal of Elsevier. The authors of the article belong mainly to UKL and are Sven Peldszus, Jens Bürger, Timo Kehrer, and Jan Jürjens. The article was revised, accepted and published online in May 2021. *Data & Knowledge Engineering* (ISSN 0169-023X) is ranked Q2 (32/125) in the category "Information Systems and Management, according" to Elsevier's Scopus citation database[41].

[37] https://ieeexplore.ieee.org/document/9284801

[38] https://www.bdva.eu/node/1616

[39] https://www.sciencedirect.com/science/article/pii/S0169023X21000343

[40] https://www.sciencedirect.com/journal/data-and-knowledge-engineering

[41] https://www.scopus.com/sourceid/24437

In the course of DataPorts project, an ontology within the Tasks of WP2 and WP3 has to be developed to formally specify the knowledge of ports domain. As discussed in this journal article, such knowledge domains are subject to continuous change, especially concerning the security requirements. The article provides a solution to consistently support the evolution of ontologies

- **"AI: Opportunities and Challenges - The optimal exploitation of (Telecom) corporate data"[42]:** A paper co-authored by Polyxeni Palaiogeorgou, Christos A. Gizelis, Michalis Kefalogiannis, Antonios Misargopoulos, Filippos Nikolopoulos-Gkamatsis and Antonis M. Christonasis, has been accepted for presentation and publication in the 20th IFIP Conference e-Business, e-Services, and e-Society I3E2021, Responsible AI and Analytics for an Ethical and Inclusive Digitized Society, 1st – 3rd September 2021 National University of Ireland Galway, Galway, Ireland conference proceedings.

  This paper introduces the Telecommunication's Industry approach to adopt Artificial Intelligence mechanisms into daily tasks and operations, in order to accelerate digital transformation. The scope of this paper is to analyze and explore the opportunities and the challenges that are raised for telecommunications organizations by exploiting vast amounts of data they own or handle. The opportunities and challenges that are created by AI technologies are presented through several Use Cases, which IT Innovation Center of OTE Group is investigating, and create the baseline towards digital transformation and the engagement in future markets. However, as depicted in this paper, although the numerous opportunities, telecoms in this AI journey face many challenges that they need to overcome

- **"A Reference Model for Big Data Technologies"[43]:** This is a book chapter co-authored by Edward Curry, Andreas Metzger, Arne J. Berre, Andrés Monzón and Alessandra Boggio-Marzet, included in the Book "The Elements of Big Data Value", published in July 2021.

  The Big Data Value Reference Model has been developed with input from technical experts and stakeholders along the whole big data value chain. This chapter elaborated the various elements (both horizontal and vertical) of the framework and illustrated how it might be used to map technical elements stemming from research and innovation projects. Horizontal concerns cover specific aspects along the data processing chain, starting with data collection and ingestion, and extending to data visualisation. Vertical concerns address cross-cutting issues, which may affect all the horizontal concerns and may also involve non-technical aspects. Concerning the data management horizontal concern, access to the data sources has turned out to be much more complicated than expected due to the following reasons: firstly, the number of different sources and data production and storage systems; secondly, the access characteristics of data sources – from a technical point of view, some of these sources and systems did not have the optimal flexibility. Using domain-specific data platforms such as DataPorts, together with domain-specific machine learning components could significantly increase productivity in developing and deploying data analytics solutions

- **"Hoplite Antivirus for Adversarial Attacks: A Theoretical Approach"[44]**: A paper co-authored by Anastasios Nikolakopoulos, Achilleas Marinakis, Vrettos Moulos and Theodora Varvarigou has been accepted for presentation and publication in the 17th International Conference on Web Information Systems and Technologies (WEBIST), that took place on 26-28 October 2021.

[42] https://link.springer.com/chapter/10.1007%2F978-3-030-85447-8_5

[43] https://link.springer.com/chapter/10.1007%2F978-3-030-68176-0_6

[44] https://www.scitepress.org/Link.aspx?doi=10.5220/0010721600003058

The paper summarizes the existing (and most well-known) adversarial attacks & defenses. Then, it proposes a potential solution to the issue, with a theoretical approach of an antivirus software scenario, the Hoplite Antivirus. This approach could be a vital step towards addressing the constantly evolving adversarial attacks, taking a note from the way software scientists defended (and keep defending) against computer viruses. Countering adversarial attacks could contribute to a drastically better & safer function of deep neural networks and machine learning algorithms. DataPorts' ML implementations could benefit by Hoplite, which could prove to forge them against any attackers. Therefore, data quality, security and integrity are assured, even in the stage of machine learning processing tasks.

- **"Counterfactual Explanations for Predictive Business Process Monitoring"[45]:** A paper co-authored by Tsung-Hao Huang, Andreas Metzger and Klaus Pohl was accepted for presentation in the European, Mediterranean and Middle Eastern Conference on Information Systems, held online between the 8th and 9th of December, 2021.

  The paper focused on the predictive business process monitoring, which increasingly leverages sophisticated prediction models. Although sophisticated models achieve consistently higher prediction accuracy than simple models, one major drawback is their lack of interpretability, which limits their adoption in practice. Thus, a growing interest in explainable predictive business process monitoring is been seen, which aims to increase the interpretability of prediction models. Existing solutions focus on giving factual explanations. While factual explanations can be helpful, humans typically do not ask why a particular prediction was made, but rather why it was made instead of another prediction. While research in explainable AI produced several promising techniques to generate counterfactual explanations, directly applying them to predictive process monitoring may deliver unrealistic explanations, because they ignore the underlying process constraints. That is why the authors proposed LORELEY, a counterfactual explanation technique for predictive process monitoring, which extends LORE, a recent explainable AI technique. They imposed control flow constraints to the explanation generation process to ensure realistic counterfactual explanations. Moreover, they extended LORE to enable explaining multi-class classification models. Experimental results using a real, public dataset indicate that LORELEY can approximate the prediction models with an average fidelity of 97.69% and generate realistic counterfactual explanations.
- **"A Novel Approach for Calculating Real-Time Composite Indicators Relying on Internet of Things and Industrial Data Spaces"**[46]: A paper co-authored by Andreu Belsa, Rafael Vaño, Ignacio Lacalle, Matilde Julian, Fernando Boronat, & Carlos Palau "A Novel Approach for Calculating Real-Time Composite Indicators Relying on Internet of Things and Industrial Data Spaces" was accepted for presentation in the International Symposium on Intelligent and Distributed Computing held virtually between the 16th and 18th of September, 2021.
  The paper aimed at devising an IoT-based system to collaboratively calculate quantitative composite indicators among Industrial actors. Requirements have been considered to build a reliable, trusted, anonymised environment within which involved stakeholders can safely share information on the indicators while keeping sovereignty over their data. Technologies such as enhanced Context Brokers, the usage of Industrial Data Spaces agents and the introduction of distributed publish-subscribe data exchange schemes layed the foundations of the proposed solution. This work entailed the design of the system altogether with a proposal of technologies for its deployment. Drawing from

[45] https://link.springer.com/chapter/10.1007/978-3-030-95947-0_28

[46] https://doi.orglink.springer.com/chapter/10.1007/978-3-030-96627-0_5

previous public-funded projects' results and highly relying on open-source technologies, the authors have come up with a solution that aimed to be proven in Computational real environments in the near future.

- **"Efficient Data Management and Interoperability Middleware in Business-Oriented Smart Port Use Cases"[47]:** This paper was co-authored by Achilleas Marinakis, Matilde Julian (Segui), Andreu Belsa (Pellicer), Carlos E. Palau, Christos-Antonios Gizelis, Anastasios Nikolakopoulos, Antonios Misargopoulos, Filippos Nikolopoulos-Gkamatsis, Michalis Kefalogiannis, Theodora Varvarigou, Konstantinos Nestorakis & Vrettos Moulos, It was presented in the IFIP International Conference on Artificial Intelligence**,** vol 1026. Springer, Cham Applications and Innovations (AIAI), which took place in Crete, Greece from the 17th to the 20th of June, 2022.

  This paper was written in collaboration with H2020 project Pixel and describes the design of an IoT-based system to calculate composite indicators making use of input data from different industrial actors. In this system, the information on the indicators from different stakeholders is shared following the Industrial Data Spaces principles, thus ensuring that the data owners keep sovereignty over their data. Moreover, the paper proposes a set of open-source technologies for the implementation of the proposed solution.

  The paper's topic was about the interoperability of critical infrastructures (such as ports), which has become a primary concern of EU in recent years. Information systems that have the control of these infrastructures are continuously evolving and handle heterogeneous collections of data, processes, and people. Moreover, cross-infrastructure dependencies may give rise to cascading and escalating data model discrepancies across interconnected systems. Inside the article, the authors presented a data model - following the newest technology standards - that tries to consolidate APIs and services of highly complex infrastructures. Port environments are a characteristic example of them, since massive amount of data and services from different sources are processed and used. The authoring team adopted a bottom-up approach, considering every service interconnection as an independent entity, which must be aligned with the proposed common vocabulary and data model. The strict guidelines that are injected into the lifecycle of a service/component development, lead to explicitly enforce interoperability between each one service that lives inside the ecosystem of the port. That is - and should be - a step towards "the cognitive port of the future", where developers, SMEs and huge vendors can exchange and reuse data from a shared repository. Consequently, ports will play key role in the new information system model, as in-house marketplaces will be developed, for companies to disseminate and exploit their data and services.

- **"SCAL-E: An Auto Scaling Agent for Optimum Big Data Load Balancing in Kubernetes Environments"[48]:** This is a paper co-authored by Efstratios Karypiadis, Anastasios Nikolakopoulos, Achilleas Marinakis, Vrettos Moulos & Theodora Varvarigou. It was presented in the 2022 International Conference on Computer, Information and Telecommunication Systems (CITS), held online from the 13th to the 15th of July, 2022.
  The paper's main topic was about effective big data load balancing. During the past years, the issue of effectively balancing incoming big data streams has been under serious research. It still allows for new solutions, even if load balancing is already being addressed by multiple frameworks. The paper proposed a smart agent, named "SCAL-E" that achieves balancing of big data loads and lives within the Kubernetes Environment. SCAL-E takes advantage of MongoDB's scaling, replicating & sharding capabilities and decides when to increase or decrease its repository's sub-components, based on the

[47] https://link.springer.com/chapter/10.1007/978-3-031-08341-9_10

[48] https://ieeexplore.ieee.org/document/9832990

incoming load. This way, SCAL-E assures of proper resource allocation and gives efficiency to the jobs of big data storing & forwarding.

- **"Explaining Online Reinforcement Learning Decisions of Self-Adaptive Systems"[49]:** A paper co-authored by Felix Feit, Andreas Metzger & Klaus Pohl, it was Published at the 3rd International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS 2022), which took place virtually between the 19th and the 23rd of September, 2022.
  The paper's content is about online reinforcement learning (i.e., employing reinforcement learning (RL)) at runtime, which is an emerging approach to realizing self-adaptive systems in the presence of design time uncertainty. By using Online RL, the self-adaptive system can learn from actual operational data and leverage feedback only available at runtime. Recently, Deep RL is gaining interest. Deep RL represents learned knowledge as a neural network whereby it can generalize over unseen inputs, as well as handle continuous environment states and adaptation actions. A fundamental problem of Deep RL is that learned knowledge is not explicitly represented. For a human, it is practically impossible to relate the parametrization of the neural network to concrete RL decisions and thus Deep RL essentially appears as a black box. Yet, understanding the decisions made by Deep RL is key to (1) increasing trust, and (2) facilitating debugging. Such debugging is especially relevant for self-adaptive systems, because the reward function, which quantifies the feedback to the RL algorithm, must be defined by developers. The reward function must be explicitly defined by developers, thus introducing a potential for human error. To explain Deep RL for self-adaptive systems, the authoring team enhanced and combined two existing explainable RL techniques from the machine learning literature. The combined technique, XRL-DINE, overcomes the respective limitations of the individual techniques. Then, they presented a proof-of-concept implementation of XRL-DINE, as well as qualitative and quantitative results of applying XRL-DINE to a self-adaptive system exemplar.
- **"Design of a Next-Generation Interoperable Cognitive Port Solution"**[50]: Belsa Pellicer, A. et al. (2022). "Design of a Next-Generation Interoperable Cognitive Port Solution". In: González-Vidal, A., Mohamed Abdelgawad, A., Sabir, E., Ziegler, S., Ladid, L. (eds) Internet of Things. GIoTS 2022.This is a conference paper co-authored by a team of DataPorts partners, which are Andrew Belsa (Pellicer), Matilde Julian (Segui), Achilleas Marinakis, Anastasios Nikolakopoulos, Vrettos Moulos, Hector Iturria, Jose Antonio (Clemente), Xhulja Shahini, Tristan Kley, Andreas Metzger, Miguel Bravo, Paolo Calciati, Christos-Antonios Gizelis, Filippos Nikolopoulos-Gkamatsis, Konstantinos Nestorakis, Ignacio Lacalle, Carlos E. Palau & Santiago Caceres. The paper is a part of the *Lecture Notes in Computer Science*, vol[51] book series (LNCS, volume 13533. Springer, Cham.).
  This paper was presented at the Global IoT Summit (GIoTS) 2022 and the conference paper's content was about ports, viewing them as the essential nodes in global maritime trade they truly are. As such, their efficency is key to ensure sustainable supply chains across the world. Current studies point interoperability and data integration as the next milestones to achieve efficient, smart ports. DataPorts aims at covering those gaps, delivering an industrial data platform bearing in mind seaports' involved actors' needs. With DataPorts, transportation and logistics companies will leverage the current data deluge to offer cognitive services. The paper describes the technical design of the Data Access, Data Processing and Data Analytics services of the DataPorts such a platform and how the enableit enables the acquisition, homogenization, and processing of the heterogeneous data, enabling the creation of cognitivejudiciously handled to generate advanced data-exhaustive services. Finally, it presents a practical usage example use case aimed at improving the business processes in the port of Valencia.

[49] https://arxiv.org/abs/2210.05931

[50] https://doi.orglink.springer.com/chapter/10.1007/978-3-031-20936-9_12

[51] https://www.springer.com/series/558

- **“Innovative cognitive data platform to improve processes in European seaports”:** Andreu Belsa, Matilde Julian, Paolo Calciati, Santiago Cáceres, Christos Gizelis, Filippos Nikolopoulos-Gkamatsis, Konstantinos Nestorakis, Pablo Giménez, José Antonio Clemente, Héctor Iturria, Carlos E. Palau. (Conference paper, accepted for publication). This paper was presented at the Transport Research Arena (TRA) 2022 and describes the use and benefits of the DataPorts platform in several scenarios from the pilots.

6.3 OPEN-SOURCE CONTRIBUTIONS

DataPorts aims at being a reference on the data-sharing and data-market fields, as well as being an enabler platform for Application Developers to build upon. To achieve the above, DataPorts participates in different trending open-source initiatives.

The expected envision about how to contribute to open-source projects, such in the case of FIWARE, has been published since 2020. For example, the motivation behind the collaboration with the Fiware Ecosystem was described in a DataPorts Blog entry titled "Open-Source contributions: Fiware Ecosystem"[52]. In addition, the first technical steps of the contribution with Fiware were described and are available in the article previously presented titled “Framework and Methodology for Establishing Port-City Policies Based on Real-Time Composite Indicators and IoT: A Practical Use-Case".

During the second semester of 2021, another publication was provided following the aim to define clear lines in the collaboration between DataPorts and Fiware Ecosystem. The work is titled “A novel approach for calculating real-time Composite Indicators relying on Internet of Things and Industrial Data Spaces”. It was carried out by UPV and accepted for publication, but it has not been published yet. The publication is focused on the requirements that have been considered to build a reliable, trusted, and anonymized environment within which the involved stakeholders can safely share information based on performance indicators while keeping sovereignty over their data. Technologies such as Orion Context Broker, the usage of Industrial Data Spaces and the introduction of distributed publish-subscribe data exchange schemes lay the foundations of the proposed solution. This work entails the design of the system together with a proposal of technologies for its deployment. Drawing from DataPorts results and highly relying on open-source technologies, the authors have come up with a solution that aims to be proven in real environments in the near future.

Regarding Fiware Initiatives, DataPorts has participated in some open sessions of the Smart Data Models, which are held periodically on Mondays and are focused into present updates, coming data models and services to the users and contributors. In addition, the project actively participated in the Data Spaces Synergy Group, which is an initiative promoted in the scope of the BDVA activities. In that synergy group, organizations and projects were sharing their vision on how to materialize an open standard-based, open-source available and CEF-compatible software infrastructure for the creation of data spaces in Europe. Finally, other ways of collaboration with the Fiware environment or related projects are being initiated, mainly based on the contacts provided by these meetings.

Since the beginning of 2022 the results of the DataPorts project have been presented in events and initiatives related to the Fiware ecosystem. In September 2022, UPV attended the Fiware Summit to create awareness of the platform. DataPorts is also contributing actively to the Smart Data Models initiative, mainly in the maritime transport domain, with the classes defined in the common data model.

Regarding technical open-source contributions, DataPorts has contributed with the OpenJS Foundation via the creation of Node-RED nodes and flows. This allows putting the DataPorts Data Analytics services available in an open and browser-based programming tool for wiring together hardware devices, APIs and online

[52] https://dataports-project.eu/open-source-contributions-fiware-ecosystem/

services. This opens a wider world to This exponentially exploits the capabilities of interoperating the results of DataPorts with an incredible number of solutions in a simple and user-oriented manner.

DataPorts has intensified each year the common strategies with European initiatives to promote the platform among end users, as well as consolidate the open-source contribution and gain visibility in associations or communities like the BDVA, IDSA or Fiware. Firstly, regarding BDVA, it is interesting to highlight the periodical participation in workshops, events, books and publication. Secondly, DataPorts is located in the IDSA Data Space radar as a committed cross-domain use case. In addition, DataPorts has defined an architecture aligned with the IDS-based principles. DataPorts has been focused on the use of Data Spaces Business Alliance common components and shared Open-Source code. DataPorts is aligned with the main initiatives that compose the DSBA (IDSA, BDVA, GAIA-X and FIWARE) and the technical solutions they offer or recommend. The project has collaborated with the Data Spaces Support Centre ensuring the handover of knowledge and lessons learnt as a project related to supporting the emergence of data markets and the data economy. Thirdly, DataPorts Is part of the running projects liaised with ALICE. Fourthly, the project members have been participating in several AIOTI Working Groups related with IoT. DataPorts has contributed to the report of IoT and Edge Computing EU funded projects landscape. Finally, DataPorts has collaborated with Data Innovation Hubs (EUHubs4Data) to have greater impact and enable the platform to participate in a broader data federation.

6.4 EDUCATION

From an educational point of view, DataPorts has provided seminars, an online course platform, and training sessions.

6.4.1 Seminars

As a part of the exploitation and dissemination plan of the academic and research partners, DataPorts funnel the innovative outcomes of the project to transfer the knowledge into academic realities. This provides opportunities for the training of new graduate and PhD students. To this end, Prof Carlos E. Palau (UPV) has given on December 7 2020 a seminar about DataPorts in the “Master's Degree in Cybersecurity and Cyberintelligence” within the topic Security of Things at the Universitat Politècnica de València.

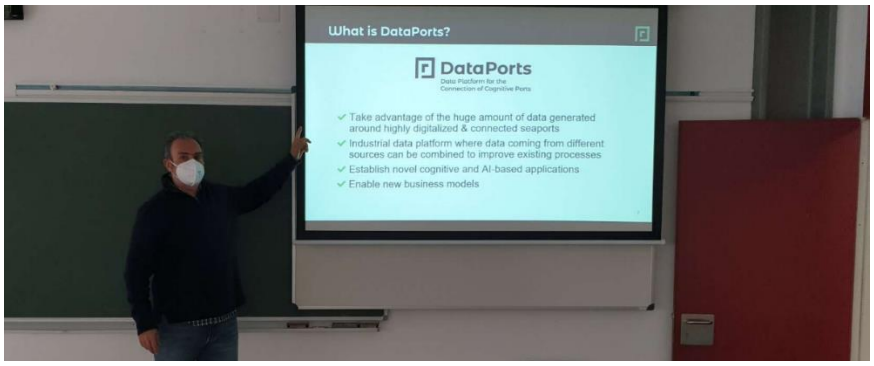


Figure 108 – Prof. Carlos E. Palau explaining DataPorts in an educational seminar

During this presentation, an overview of DataPorts, a description of the platform and its components, as well as some details about how the challenges of secure information exchange will be faced in the project were offered.

Furthermore, Prof Carlos E. Palau has given on June 10 2021 a course of three hours related with DataPorts in the “Master's Degree in Port Management and Intermodal Transport” within the topic "Elements of maritime transport" and covering the module “Introduction to IoT. Application to maritime transport”. The Master’s Degree is organized by Autoridad Portuaria de Valencia, VPF and UPV. The objective of this module is to explain to the professionals, who develop or want to develop their activity in the logistics-port field, the fundamental concepts related to the Internet of Things, the main technologies, and their relationship with

maritime transport, including definitions, main actors, and relationships with other types of services, such as Data Analytics and Artificial Intelligence.

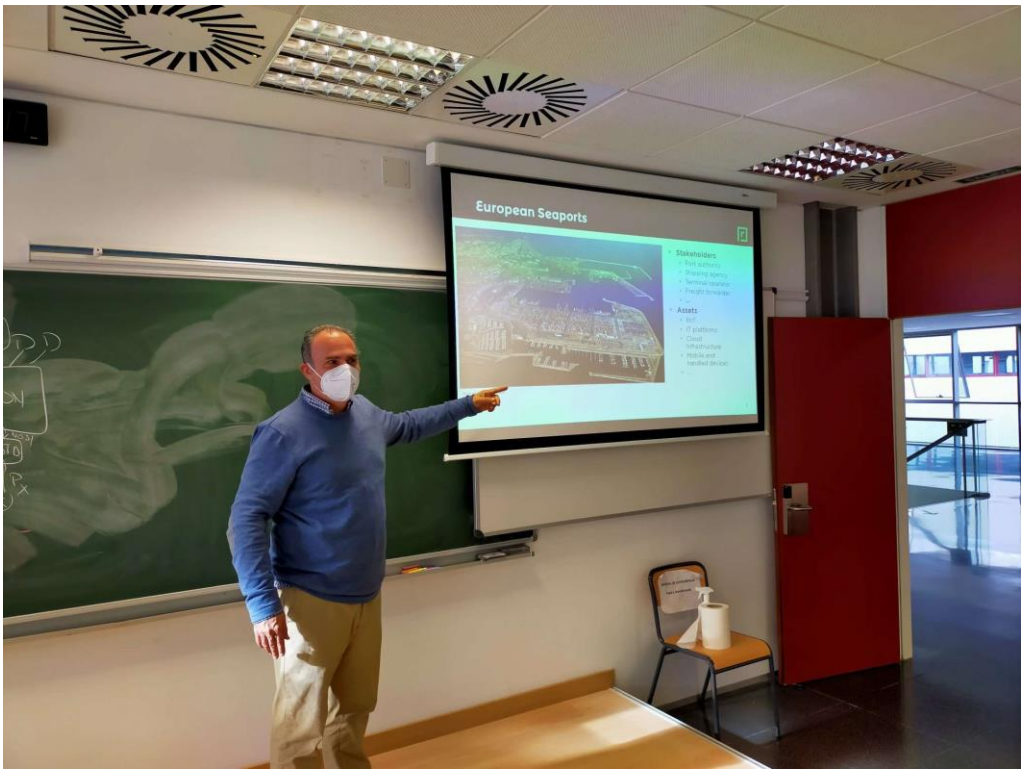


Figure 109 – Prof. Carlos E. Palau explaining DataPorts in an educational course

In addition, the new content of the Data Ports Platform developed during 2021 was presented more broadly, both theoretically and practically, in two subjects corresponding to different teaching programs of the Universitat Politècnica de València on the academic period 2021-2022:

- Interoperability on the Internet of Things: This subject corresponding to the “University Master's Degree in Communications Technologies, Systems and Networks” and the “PhD Program in Telecommunications”. During several classes, theoretical knowledge related to the Data Access and Semantic Interoperability components of the DataPorts Platform are taught. The different use cases and some hints of issues related to security and privacy were also presented in a more general way. Finally, practices were mainly focused on the implementation of agents to access to heterogeneous data sources, the use and role of the semantic interoperability broker and the definition of data models
- Security of Things: This subject corresponding to the “University Master's Degree in Cybersecurity and Cyberintelligence”: In 2021 a seminar was given on the subject, this year the content related to DataPorts became part of the cases. From a theoretical point of view, privacy and security, Data Governance and IDS reference architecture were emphasized. The components related to the Platform's Data Processing services were also presented. In the internships, emphasis was placed on the security of agents and the interoperability broker, although mainly using the security offered by the Fiware stack

Finally, on the academic period 2022-2023 DataPorts has been presented as a use case in two different subjects from different teaching programs at UPV:

- Interoperability on the Internet of Things: This subject corresponds to the “University Master's Degree in Communications Technologies, Systems and Networks”. An overview of the DataPorts

platform was presented and the Data Processing services of the platform were presented in detail, focusing on how they enable interoperability.

- IoT Platforms: This belongs to the University's Bachelor's Degree in Digital and Multimedia Technologies. The DataPorts platform was presented as a use case and an overview of its different components and the use cases of the DataPorts pilots was provided.

As well as the content presented at the UPV, the project was presented by VPF in a course titled "Blockchain in maritime logistics. 1st Edition", organized by the Spanish Maritime Institute in December 2021. The objectives of the course were as follows: To offer a general vision of digital transformation in transportation mediums, to get to know Blockchain's technological base, to learn about Blockchain's application in the maritime sector and to get to know the DataPorts project and how Blockchain technology was implemented in it.

Figure 71 – The presentation of DataPorts in the "Blockchain in maritime logistics" course

In March 2022 CERTH and ThPA presented DataPorts to the MBA in Shipping candidates of the University of the Aegean. Their presentation provided an overview of the project and focused on the use of Blockchain in the project, the Data Governance component of the platform, and the Thessaloniki Port pilot scenarios.

Figure 110 – Presentation of the seminar organised by CERTH and ThPA

In addition, in the "Advanced digitization solutions with IoT for seaports", session given by Ignacio Lacalle and Carlos E. Palau at UPV to members of Port Authorities of Mexico (May 17th) and Brazil (May 24th) as part of complementary training actions of the Master “Innovation and digitalization of the logistic-port sector”.

Figure 71 – Presentation of seminar organized by SATRD members

One of the members if the UPV team, Andreu Belsa Pellicer, published his thesis “Specification and development of interoperability mechanisms at a Middleware and Application/Services among Internet of Things Heterogeneous Platforms”. The work carried out in this PhD thesis aims to address this problem associated with the heterogeneity of IoT platforms and the lack of a predominant interoperability standard in the market. Therefore, the objective is to offer a solution focused on taking advantage of the different benefits offered by the available IoT platforms, applications and services, in order to offer a series of interoperability mechanisms and a common framework that allows accessing, interacting and exchanging information and functionalities between the different IoT platforms. In section 8 of the thesis DataPorts’s objectives are aligned with the thesis objective itself53.

6.4.2 Online Courses

As a part of the exploitation and dissemination plan of the academic and research partners, as well as to facilitate the use of the platform by the user, several courses were created using the Moodle Platform. These courses were written by all the groups participating in the development, the link to the main site can be found here here54.55. Among other material, these courses took advantage of the content available on the DataPorts project documentation platform and the published deliverables.

The courses index is as follows:

- DataPort platform overview

53 https://riunet.upv.es/handle/10251/185508 https://riunet.upv.es/handle/10251/185508

55 https://moodle.satrd.dcom.upv.es/course/view.php?id=6

    - Building blocks
- Data Access Management
    - Introduction
    - Installation guide
    - Creating an agent from an existing image
    - Agent development with pyngsi
    - Download a new agent template using the wizard
    - Development of agent templates
    - Documentation
    - Component demonstration
- Semantic Interoperability Component
    - Introduction
    - Access to near real-time data
    - Access to data on demand
    - Documentation
    - Component demonstration
- Data Abstraction and Virtualization
    - DAV Introduction
    - DAV Deployment
    - Example of a rule
    - Documentation
    - Component demonstration
- Automatic Model Training Engine
    - AMTE Course
    - Documentation
    - Component demonstration
- Process-based Analytics
    - Documentation
- Data Governance
    - Documentation
    - Component demonstration
- Security
    - Creating your own endpoint directly
    - Testing APIs through KrakenD
    - Creating your own endpoints using Flexible Configurations
    - Krakend Config File

6.5 TRAINING SESSIONS

To increase the impact of DataPorts project on the academic and developers' community, ICCS and OTE organized a series of application development challenges (App-athon), with the vision of improving citizens' quality of life. The App-athon took place during the spring semester 2019-2020 "Internet & Applications" course, which is part of the education program of the School of Electrical and Computer Engineering of the National Technical University of Athens (NTUA). In the context of the App-athon, students and developers were requested to create innovative applications, on top of open data sources, but also exploiting data coming for various H2020 EU projects, such as DataPorts. More details about the App-athon can be found in the deliverable D6.3 Report of impact and outreach results M12 [3].

7 CONCLUSIONS AND NEXT STEPS

The main indication for the effectiveness of the dissemination and communication plan of DataPorts are the KPIs that are described in the Grant Agreement, in combination with the additional quantitative indicators that were introduced in the D6.1 deliverable [2] and were updated in D6.5 [1]. These documents describe the dissemination plan of the project with extensive detail. In the present deliverable took place the reporting and evaluation of the dissemination activities that were planned and realized during the whole lifespan years of DataPorts.

The main conclusion drawn from the deliverable is that, in general, the planned KPIs have met the initial expectations and, in some cases, with better results than the expected (overachievement). This indicates that, despite the difficulties due to the constraints of the pandemic, the consortium has been able to adapt to the changing situation of these three years and has managed to follow the path established during the project.

Taking into consideration the specific aspects of the communication and dissemination plan, during the first two years of the project's lifecycle, its identity, goals, and vision were created and established. Furthermore, all the identified dissemination channels were evaluated and prioritized in terms of "what", to "whom", and "why" to communicate the different outcomes of the project. To this end, by approaching each dissemination aspect, the website of the project, which serves as the main dissemination channel, as well as several social media platforms, exhibited great progress by overachieving the target values of the KPIs. As far as the dissemination package is concerned, great content has been created (logo, brochure, poster, video, newsletters) to establish and diffuse the identity of the project and its core values. This third year has been focused on the presentation and capitalisation of the project results. Some activities, like fairs, conferences, exhibitions and mainly the final event, turn up more technical or business-oriented activities facilitating to show to the identified target audiences the final results of the project. At the first stages of the project, on-site dissemination activities encountered the most hurdles due to the Covid-19 pandemic. Once the restrictions to travel were reduced, on-site dissemination has been a key and successful piece for the execution of the plan. The target values that were accomplished and the last year were overachieved.

Concerning the scientific dissemination of the project, many publications have been drafted during these three years. The educational courses have been enriched in 2022, compared to the previous years. During the last year, the correction measures towards the enhancement of the dissemination metrics have been mainly focused on providing additional education and open-source contributions. For that reason, in order to further disseminate DataPorts results in the academic and research community, more seminars along with a MOOC a were performed during the last year of the project. In addition to some open-source contributions, collaboration with several initiatives and project and technical demonstrations of the platform. On a different level, the project's presence in all social media platforms has been adapted according to the nature of each platform's content and the corresponding target audience. That is, some of the selected social media platforms (Twitter, LinkedIn, YouTube) have been established as prime fora for the diffusion activities that are important for the dissemination of DataPorts, while some others (ResearchGate, SlideShare, Flickr) have been gaining a more prominent role during the evolution of the project.

Furthermore, all dissemination media are constantly evolving in terms of content. For instance, DataPorts website has been regularly updated with new material, revisions of the already present resources, blogposts, and information about the project. This will continue after the completion of the project. To this respect, the consortium keeps searching for new publication opportunities, and identified events on scientific and industrial level that the project could participate in. An example is the existing collaboration with BDVA and other initiatives that supports an exchange of information, achievements, and expertise.

As a conclusion, dissemination and communication activities should not stop after the end of the project. The aim is still showing to the society the impact and benefits of the DataPorts EU funded activity, transfer knowledge and ensure that the results will be available to be used by others. In addition, the dissemination

and communication activities are going to continue according to the individual dissemination plans of each project partner.

8 REFERENCES AND ACRONYMS

8.1 REFERENCES

[1] DataPorts Consortium, “D6.5 - Dissemination and communication plan M18,” June 2021.

[2] DataPorts Consortium, “D6.1 - Dissemination and communication plan M06,” June 2020.

[3] DataPorts Consortium, “D6.3 - Report of impact and outreach results M12,” December 2020.

8.2 ACRONYMS

Acronyms List	
AI	Artificial Intelligence
AIOTI	Alliance for Internet of Things Innovation
ALICE	Alliance for Logistics Innovation through Collaboration in Europe
BDVA	Big Data Value Association
BDV PPP	Big Data Value Public-Private Partnership
CIO	Chief Information Officer
DaaS	Data as a Service
DAIRO	Data, AI and Robotics
DG CNECT	Directorate-General for Communications Networks, Content and Technology
DOI	Digital Object Identifier
EBDVF	European Big Data Value Forum
EC	European Commission
EU	European Union
HLA	High Level Architecture
HR	Human Resources
ICT	Information and Communication Technology
IDSA	International Data Spaces Association
IEEE	Institute of Electrical and Electronics Engineers
IFIP	International Federation of Information Processing
IIRA	Industrial Internet Reference Architecture
IoT	Internet of Things
ISSN	International Standard Serial Number
IT	Information Technology
JCR	Journal Citations Reports
KPI	Key Performance Indicator
ML	Machine Learning
MOOC	Massive Open Online Course
N/A	Not Available
PhD	Doctor of Philosophy
PR	Public Relations
QA	Quality Assurance
RAMI	Reference Architecture Model Industrie
RT	Reply Tweets
SME	Small Medium Enterprise
TRA	Transport Research Arena
VDC	Virtual Data Container

Table 12 – Acronyms

9 ANNEX 1: GLOBAL DISSEMINATION MATRIX

Figure 111 depicts the status of the Dissemination Matrix, at the month of submission of D6.5 deliverable (ANNEX M) [1], whereas the Dissemination Matrix in Figure 112 lists all the dissemination activities between M18 and M39:

	Data sharing / Data Markets			Data Analytics/AI			Ports business			Data security / Smart Contracts		
	id	Description	Partners	id	Description	Partners	id	Description	Partners	id	Description	Partners
SCIENTIFIC DISSEMINATION EVENTS	#S.D.1	Article "A Scalable and Semantic Data as a Service Marketplace for Enhancing Cloud-Based Applications" in Future Internet journal	ICCS	#S.DA.1	Conference proceeding "Online Reinforcement Learning for Self-adaptive Information Systems" presented at the 32nd International Conference, CAISE 2020	UDE	#S.P.1	Article "Framework and Methodology for Establishing Port-City Policies Based on Real-Time Composite Indicators and IoT, A Practical Use-Case" in Sensors journal	UPV	#S.DS.1	Seminar for the Master's program in Cybersecurity and Cyberintelligence at the Polytechnic University of Valencia	UPV
	#S.D.2	D3.1 - Data access interfaces	PRO, UPV	#S.DA.2	Conference proceeding "Triggering Proactive Business Process Adaptations via Online Reinforcement Learning" presented at the 18th International Conference on Business Process Management, BPM 2020	UDE	#S.P.2	Conference proceeding "Towards a smart port: the role of the telecom industry" presented at the16th International Conference on Artificial Intelligence Applications and Innovations – AIAI 2020	OTE, ICCS	#S.DS.2	D2.3 - Blockchain design specification deliverable	EVR, IBM, CERTH, VPF, ThPA, ITI
	#S.D.3	D3.2 - Data processing services	UPV, ICCS	#S.DA.3	Book chapter "Ensemble Deep Learning for Proactive Terminal Process Management at duisport" to be published in Business Process Management Cases – Volume 2	UDE	#S.P.3	Book chapter "Towards cognitive ports of the future" to be published in the Book "Technologies and Applications for Big Data Value"	ICCS, ITI, UPV, OTE, TRX, UDE, UKL	#S.DS.3	Conference proceeding "Cost Fairness for Blockchain-Based Two-Party Exchange Protocols" presented at the 2020 IEEE International Conference on Blockchain	UKL
	#S.D.4	App-athon with the vision of improving citizens' quality of life	ICCS, OTE	#S.DA.4	D3.3 - Data analytics services and cognitive applications	ITI, UDE	#S.P.4	D2.1 - Industrial Data Platforms and seaport community requirements and challenges	ICCS, TRX, ThPA, UKL, CERTH, PRO, VPF, ITI, EVR, UPV, IBM, UDE	#S.DS.4	Article "Ontology-driven evolution of software security" in Data & Knowledge Engineering journal	UKL
							#S.P.5	D5.1 - Integration, software quality assurance and deployment plan	PRO, CERTH, ThPA, OTE, VPF, TRX, ITI	#S.DS.5	D3.4 - Permissioned Blockchain network	IBM, EVR, CERTH, VPF
							#S.P.6	DataPorts project liaised with ALICE. DataPorts included in The Physical Internet knowledge platform.	OTE, ITI, UDE, UPV			
							#S.P.7	Course Introduction to IoT. Application to maritime transport in Master's Degree in Port Management and Intermodal Transport	UPV			
ONSITE DISSEMINATION EVENTS	#OS.D.1	PortForward, SmartShip and DataPorts meeting workshop for future collaboration	ITI	#OS.DA.1	"A data platform for the cognitive ports of the future" presentation at the Big Data Value workshops: Industrial Data Platforms	ITI, UDE	#OS.P.1	Meeting with the Chief Information Officer (CIO) of logistics software producer EPC.	UKL	#OS.DS.1	Web Application Security: Current Developments session at the Software Practicioner Conference OOP	UKL
	#OS.D.2	"Towards a smart port: A Digital Ecosystem Creation" presentation at the 22nd Infocom world conference	OTE, ICCS	#OS.DA.2	"A data platform for the cognitive ports of the future" presentation at the EUHubs4Data Kick Off meeting – IDSA session	ITI	#OS.P.2	Meeting with the CIO of the ship propulsion producer Schottel	UKL	#OS.DS.2	"Eliciting Privacy/fairness solution requirements and generating action plans" session at the FoMSESS Workshop: Engineering Trustworthy Data-Intensive Systems with Software Models	UKL
	#OS.D.3	Presentation about project perspective on technical challenges around data exploitation at the EUH4D Data Forum	ITI	#OS.DA.3	"A data platform for the cognitive ports of the future" presentation at the European Big Data Value Forum – EBDVF 2020	ITI, UDE, UPV	#OS.P.3	Dissemination meeting with internal managers	EVR	#OS.DS.3	"Designing privacy-aware reference architecture" session at the FoMSESS Workshop: Engineering Trustworthy Data-Intensive Systems with Software Models	UKL
	#OS.D.4	Presentations about Metadata Interoperability at the BDVA/DAIRO Activity Group Meeting 44 - BDV PPP Technical Committee #8	UPV	#OS.DA.4	Dissemination meeting with member of the German State Parliament concerning AI and digitalization projects	UKL	#OS.P.4	Dissemination meeting with Operations department	EVR	#OS.DS.4	DataPorts exhibition at the BodyPass - The Future of 3D Human Body Data for Health and Industry	UPV
	#OS.D.5	Participation in Data Spaces Synergy Group - Kick-off Meeting	ITI, EVR, UPV	#OS.DA.5	Presentation of initial lessons learnt from DataPorts at the BDV PPP Technical Committee Meeting #6	ITI	#OS.P.5	"DataPorts: Designing the Future of Seaports" presentation at the Slide2Open Shipping Finance 2021 conference	OTE			
	#OS.D.6	Partipation in 3rd PIXEL Webinar. Presentation about synergies with DataPorts and the use of FIWARE in maritime ports' innovation initiatives	UPV	#OS.DA.6	"A data platform for the cognitive ports of the future" presentation at the BDVA Task Force 6.SG1 Data Technology Architectures	ITI	#OS.P.6	Workshop on Transforming in Shipping & Maritime with Blockchain technologies in collaboration with AMMITEC	OTE, CERTH			
				#OS.DA.7	Presentations about data spaces building blocks and data governance issues at the BDVA/DAIRO Activity Group Meeting 43 - BDV PPP Technical Committee #7	ITI, CERTH						
				#OS.DA.8	"How Data and AI can Transform Transport and Logistics and Enable New Insights" presentation at the RI.Logistica conference	IBM, UDE						
				#OS.DA.9	"Unleashing the potential of ports and maritime logistics via data-driven solutions: Opportunities and Challenges" workshop at the BDVA/DAIRO Data Week 2021	UDE, ITI, UPV, PRO						

	id	Description	Partners
VIRTUAL DIFFUSION CHANNELS	#VD.N.1	First release of the website of DataPorts https://dataports-project.eu/	UPV
	#VD.N.2	Logo, corporate identity, supporting material (i.e., flyers, brochure, presentation templates etc.) creation	UPV
	#VD.N.3	Social media accounts' creation	UPV
	#VD.N.4	Publications on local media and press	UPV, UDE, EVR, VPF, OTE
	#VD.N.5	Blogposts in DataPorts website	UPV, ICCS, PRO, ITI, EVR, UDE, OTE
	#VD.N.6	OTE's Newsletter	OTE
	#VD.N.7	Digital Newsletter	UPV
	#VD.N.8	DataPorts poster creation	UPV
	#VD.N.9	DataPorts video	UPV

Figure 111 – Dissemination Matrix until M18

	Data sharing / Data Markets			Data Analytics/AI			Ports business			Data security / Smart Contracts		
	id	Description	Partners	id	Description	Partners	id	Description	Partners	id	Description	Partners
SCIENTIFIC DISSEMINATION EVENTS	#S.D.5	D2.4 - Platform Architecture and Specifications	UKL, ITI, UPV, ICCS, PRO, IBM, CERTH, UDE, EVR	#S.DA.5	Conference proceeding "AI: Opportunities and Challenges - The Optimal Exploitation of (Telecom) Corporate Data" presented at the 20th IFIP WG 6.11 Conference on e-Business, e-Services and e-Society, I3E 2021	OTE	#S.P.8	D5.3 - Use case oriented pilots initial version	PRO, TRX, VPF, ThPA, OTE, UPV, ITI, UDE, CERTH, IBM, EVR, ICCS	#S.DS.6	Conference proceeding "Hoplite Antivirus for Adversarial Attacks: A Theoretical Approach" presented at the 17th International Conference on Web Information Systems and Technologies - DMMLACS	ICCS
	#S.D.6	D2.2 - Scalability, Interoperability and Definition Standards	TRX, ICCS, UPV, UKL, EVR, ITI, OTE, UDE	#S.DA.6	Book chapter "A Reference Model for Big Data Technologies" included in the Book "The Elements of Big Data Value", published in July 2021	UDE				#S.DS.7	D2.5 - Blockchain design specification	EVR, IBM, CERTH, VPF, ThPA, ITI
	#S.D.7	Interoperability on the Internet of Things, teaching subject corresponding to the University Master's Degree in Communications Technologies, Systems and Networks and the PhD Program in Telecommunications	UPV	#S.DA.7	D2.4 - Platform Architecture and Specifications	UKL, ITI, UPV, ICCS, PRO, IBM, CERTH, UDE, EVR				#S.DS.8	D2.4 - Platform Architecture and Specifications	UKL, ITI, UPV, ICCS, PRO, IBM, CERTH, UDE, EVR
										#S.DS.9	D4.2 - Blockchain based data governance rules M20	IBM, CERTH, EVR, VPF
										#S.DS.10	Security of Things, teaching subject corresponding to the University Master's Degree in Cybersecurity and Cyberintelligence	UPV
ONSITE DISSEMINATION EVENTS	#OS.D.7	"A novel approach for calculating real-time Composite Indicators relying on Internet of Things and Industrial Data Spaces" presentation at the 14th International Symposium on Intelligent Distributed Computing	UPV	#OS.DA.10	Presentation of DataPorts architecture in BDVA Data Platforms Workshop 1	ITI	#OS.P.7	TRA2022 - Get Engaged through ALICE, representing DataPorts as dissemination member in the first infromation session	UPV	#OS.DS.5	Presentation of DataPorts architecture in BDVA Data Platforms Workshop 1	ITI
	#OS.D.8	Panel discussion about the importance of a data sharing culture in Europe and the corresponding challenges and opportunities, at MobiDataLab 1st Webinar	ITI	#OS.DA.11	Session titled "DataPorts: A Data Platform for the Cognitive Ports of the Future" in the European Big Data Value Forum - EBDVF 2021	ITI, CERTH, UPV, ICCS	#OS.P.8	"DataPorts: Data and Services for the Future of Seaports" presentation at Infocom World 2021 Conference	OTE, ICCS	#OS.DS.6	Session titled "DataPorts: A Data Platform for the Cognitive Ports of the Future" in the European Big Data Value Forum - EBDVF 2021	ITI, CERTH, UPV, ICCS
	#OS.D.9	Presentation of DataPorts architecture in BDVA Data Platforms Workshop 1	ITI									
	#OS.D.10	Session titled "DataPorts: A Data Platform for the Cognitive Ports of the Future" in the European Big Data Value Forum - EBDVF 2021	ITI, CERTH, UPV, ICCS									

	id	Description	Partners
VIRTUAL DIFFUSION CHANNELS	#VD.N.1	First release of the website of DataPorts https://dataports-project.eu/	UPV
	#VD.N.2	Logo, corporate identity, supporting material (i.e., flyers, brochure, presentation templates etc.) creation	UPV
	#VD.N.3	Social media accounts' creation	UPV
	#VD.N.4	Publications on local media and press	UPV, UDE, EVR, VPF, OTE
	#VD.N.5	Blogposts in DataPorts website	UPV, ICCS, PRO, ITI, EVR, UDE, OTE, FHG
	#VD.N.6	OTE's Newsletter	OTE
	#VD.N.7	Digital Newsletter	UPV
	#VD.N.8	DataPorts poster creation	UPV
	#VD.N.9	DataPorts video	UPV

Figure 112 – Dissemination Matrix M18 – M24

	Data sharing / Data Markets			Data Analytics/AI			Ports business			Data security / Smart Contracts		
	id	Description	Partners	id	Description	Partners	id	Description	Partners	id	Description	Partners
SCIENTIFIC DISSEMINATION EVENTS	#S.D.8	D3.5 - Data Processing Services	ITI, UPV, ICCS, PRO, IBM, CERTH, UDE, EVR	#S.DA.8	D3.6 - Data Analytics Services and Cognitive Applications	ITI, UPV, ICCS, PRO, IBM, CERTH, UDE, EVR	#S.P.8	D5.3 - Use case oriented pilots initial version	PRO, TRX, VPF, THPA, OTE, UPV, ITI, UDE, CERTH, IBM, EVR, ICCS	#S.DS.11	D3.7 - Permissioned Blockchain Network	ITI, UPV, ICCS, PRO, IBM, CERTH, UDE, EVR
	#S.D.9	Data Week 2022	OTE, ITI, UPV	#S.DA.9	Data Week 2022	OTE, ITI, UPV				#S.DS.12	Digital Transformation Summit 2022	UPV
	#S.D.10	Digital Transformation Summit 2022	UPV	#S.DA.10	18th AIAI 2022 - The 7th Workshop on "5G – Putting Intelligence to the Network Edge" (5G-PINE),	OTE, UPV, ICCS						
				#S.DA.11	3rd IEEE International Conference on Autonomic Computing and Self-Organizing Systems - ACSOS 2022	UDE						
ONSITE DISSEMINATION EVENTS	#OS.D.11	FIWARE Global Summit 2022	UPV	#OS.DA.12	Posidonia - The International Shipping Exhibition 2022	CERTH, OTE, UPV, ITI, VPF, PRO	#OS.P.9	Meeting with Local Stakeholders	THPA	#OS.DS.7	Digitalization, Automation and Block Chain in Shipping and Supply Chains, MBA in Shipping, Aegean University	CERTH, THPA
	#OS.D.12	Posidonia - The International Shipping Exhibition 2022	CERTH, OTE, UPV, ITI, VPF, PRO	#OS.DA.13	IoT Week 2022	PRO, CERTH, UPV	#OS.P.10	Madeira's digital Slide2open Shipping Finance 2022 – Euphoria in the Shipping World (with Parallel session)	OTE	#OS.DS.8	Smart Digital Ports of the Future 2022	VPF
	#OS.D.13	IoT Week 2022	PRO, CERTH, UPV	#OS.DA.14	International Conference on Applied Technologies (ICAT) 2022	UPV	#OS.P.11	Digitalization, Automation and Block Chain in Shipping and Supply Chains, MBA in Shipping, Aegean University	CERTH, THPA	#OS.DS.9	Transport Research Arena (TRA) 2022	UPV, ITI
	#OS.D.14	Workshop with Startups, November 2022	ITI, OTE, PRO, UPV	#OS.DA.15	Transport Research Arena (TRA) 2022	UPV, ITI	#OS.P.12	Smart Digital Ports of the Future 2022	VPF	#OS.DS.10	Infocom World 2022	CERTH, ICCS, OTE
	#OS.D.15	European Big Data Value Forum (EBDVF) 2022	UPV, ITI, THPA, OTE	#OS.DA.16	2nd International Workshop on Software Engineering and AI for Data Quality in Cyber-Physical Systems (SEA4DQ), 2022	UDE	#OS.P.13	Posidonia - The International Shipping Exhibition 2022	CERTH, OTE, UPV, ITI, VPF, PRO			

VIRTUAL DIFUSION CHANNELS	id	Description	Partners
	#VD.N.1	First release of the website of DataPorts https://dataports-project.eu/	UPV
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	#VD.N.6	OTE's Newsletter	OTE
	#VD.N.7	Digital Newsletter	UPV
	#VD.N.8	DataPorts poster creation	UPV
	#VD.N.9	DataPorts video	UPV

Figure 113 - Dissemination Matrix M25 – M39