



TRUSTWORTHY, COGNITIVE AND AI-DRIVEN COLLABORATIVE ASSOCIATIONS OF IOT DEVICES AND EDGE RESOURCES FOR DATA PROCESSING

Grant Agreement no. 101136024

Deliverable D7.1 **Factsheet, Project Presentation and Website Development**

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05.03.24	Aristotelis Kretsis	Draft	0.1	Website description
18.03.24	Panagiotis Kokkinos	Draft	0.2	Social media accounts, project factsheet and presentation
22.03.24	Panagiotis Kokkinos	Draft	0.3	Editing and minor fixes
28.03.24	Aristotelis Kretsis	Draft	0.4	Integrate internal review changes
29.03.24	Panagiotis Kokkinos	Final	1.0	

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Abstract: The deliverable contains the description for the initial project dissemination material activities. The EMPYREAN project website (<https://empyrean-horizon.eu>) was launched in March 2024 and populated with relevant information about the EMPYREAN project. In addition to the website, we have created social media accounts and dissemination materials, e.g., project factsheet and presentation to help the dissemination of the EMPYREAN project.

Keywords: Project Presentation, Dissemination, Website, Social Media

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Abbreviations

AI	Artificial Intelligence
D	Deliverable
DoW	Description of Work
EC	European Commission
EU	European Union
FPGA	Field Programmable Gate Arrays
IoT	Internet of Things
IIoT	Industrial Internet of Things
ML	Machine Learning
PM	Project Manager
PO	Project Officer
RDMA	Remote Direct Memory Access
UC	Use Case

1 Executive Summary

The deliverable describes the EMPYREAN project dissemination materials created for advertising the project outcomes and advances. The website (<https://empyrean-horizon.eu>) constitutes the main online tool for the dissemination of all relevant outcomes of the project. Moreover, the website will present additional general information, news and events regarding the EMPYREAN project.

The website went online on March 2024 (M2) according to the proposed timeline schedule. There are twelve main pages, namely: “Home”, “Consortium”, “Vision”, “Objectives”, “Work Packages”, “Use Cases”, “Public Deliverables”, “Publications”, “Communication Material”, “News”, “Clustering”, and “Contact”. The website has been designed in such way that it is easy for every user to find all the necessary information in an effective and accurate way.

In addition to the website, the project established other dissemination channels like social media pages to enhance the project’s visibility and advertise the project activities’ outcomes. Complementary, we have created dedicated communication material including (i) a factsheet to summarize the main takeaway of the project concept, (ii) a project presentation to be used by all the partners for presenting the EMPYREAN project in a unified manner, and (iii) the newsletter to keep the potential EMPYREAN subscribers up to date with the project advances.

2 Introduction

2.1 Purpose of this document

This deliverable presents the initial set of EMPYREAN dissemination material produced to advertise the EMPYREAN project. The package includes the website and the social media accounts used by EMPYREAN partners for project dissemination and communication activities. Moreover, the document contains the factsheet of the EMPYREAN project along with a high-level presentation of the project.

2.2 Document structure

The present deliverable is split into five major chapters:

- EMPYREAN Website
- Social Media Accounts
- Factsheet
- Project Presentation

2.3 Audience

This document is public.

3 EMPYREAN Website

The EMPYREAN website has been created and already hosts all the basic information regarding the project and its partners; it can be reached at this address:

- <https://empyrean-horizon.eu>

The site will be updated regularly by the site administrator (ICCS) who will be able to upload public documents, news and publications, in order to maximize dissemination of the achieved results and increase project awareness.

The EMPYREAN website follows a neat design that provides a modern feel and ease of access for its various pages. The key features include:

- attractive, user-friendly and professional design;
- easy access to the key project information (objectives, work packages and use cases);
- comprehensive presentation of the project consortium, by using links to each partner's webpage;
- links to the project's social media pages;
- news and events pages to keep users up to date with the latest project developments;
- "Communication Material" to present useful information regarding the project;
- contact information;
- ability to update the website's content.

The structure of the EMPYREAN website is the following:

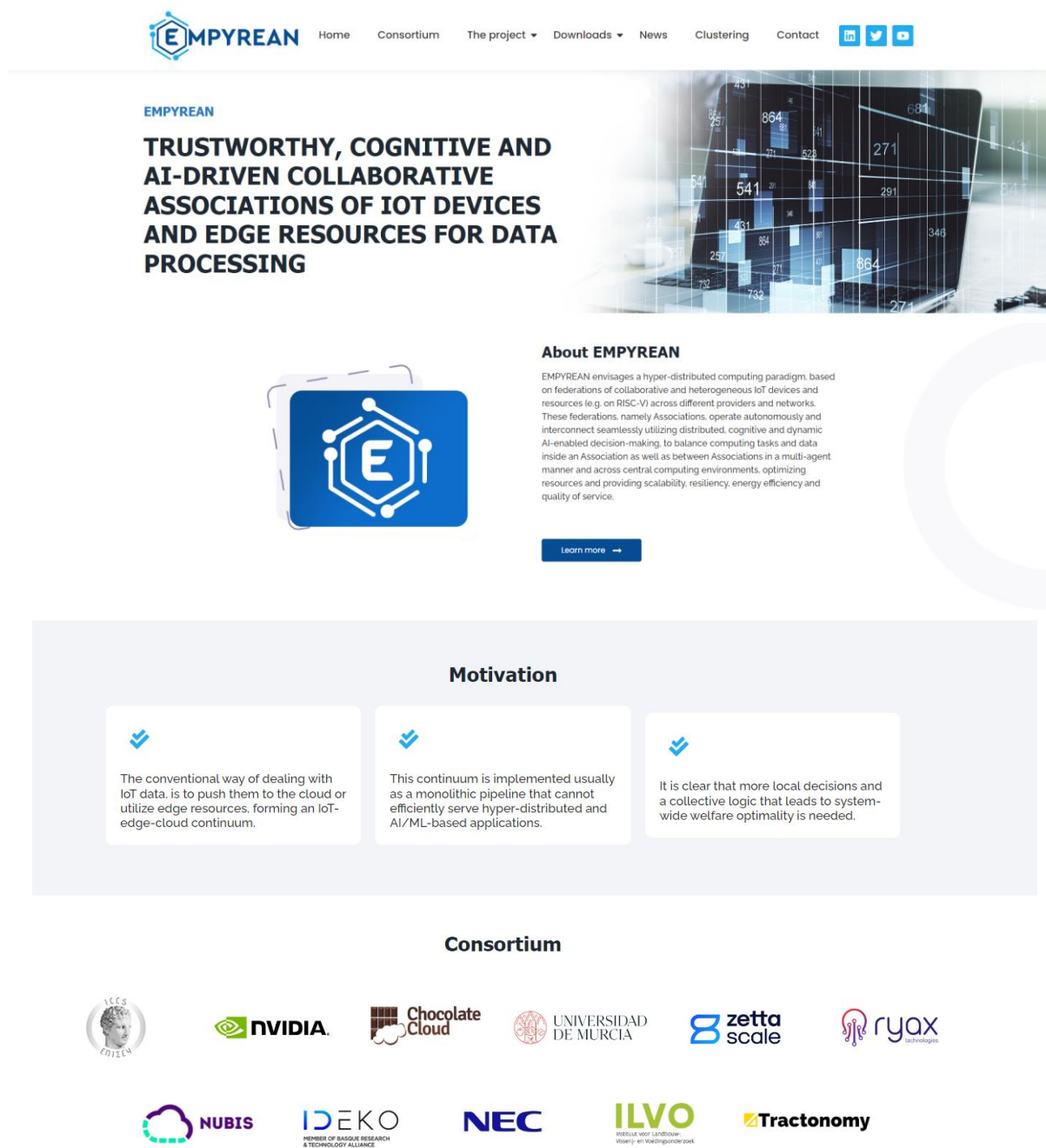
- Home
- Consortium
- The Project
 - Vision
 - Objectives
 - Work Packages
 - Use Cases
- Downloads
 - Public Deliverables
 - Publications
 - Communication Material
- News
- Clustering
- Contact

As the project progresses, ICCS will continuously update the website content and possibly its current structure to reflect project's current state and ensure user-friendliness.

In what follows, we provide screenshots and a brief description of each page of the website.

Home Page

The EMPYREAN's portal home page (<https://empyrean-horizon.eu>) in Figure 1, provides a brief introduction to the project, the consortium members and the latest news. The header and footer sections are the same for all the pages of the website and are always visible.



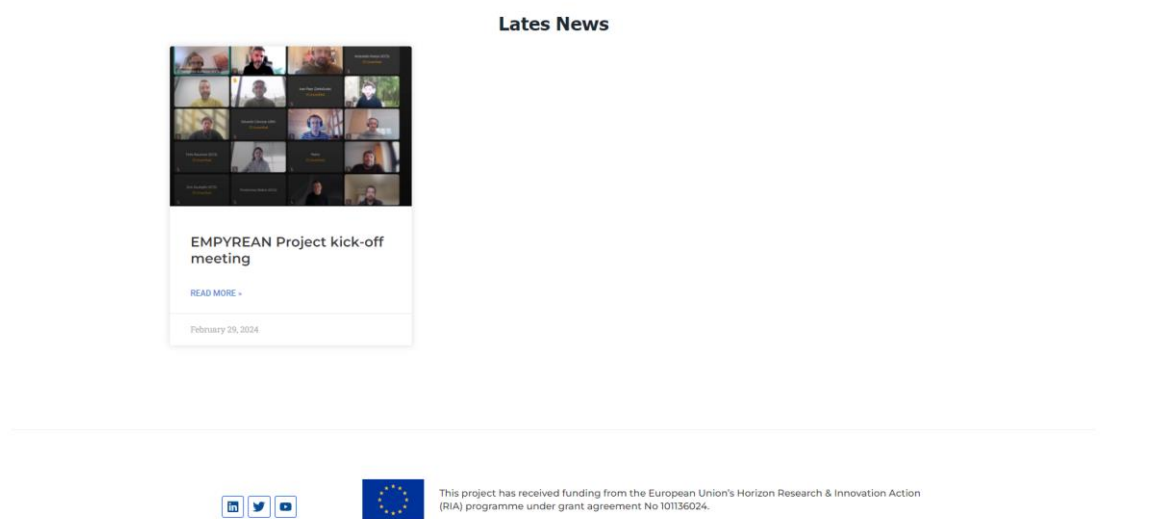


Figure 1: EMPYREAN Home Page

The header (Figure 2) includes the EMPYREAN logo and the website menu, through which the users are able to navigate to the individual pages. The "Project" menu option includes the following four sub-sections: "Vision", "Objectives", "Work Packages" and "Use Cases". The "Downloads" menu option includes the following three sub-sections: "Public Deliverables", "Publications" and "Communication Material". The footer (Figure 3) includes an acknowledgment to the European Union's Horizon Europe framework, the grant agreement number and links to project's social media accounts (i.e., Twitter, LinkedIn, YouTube).

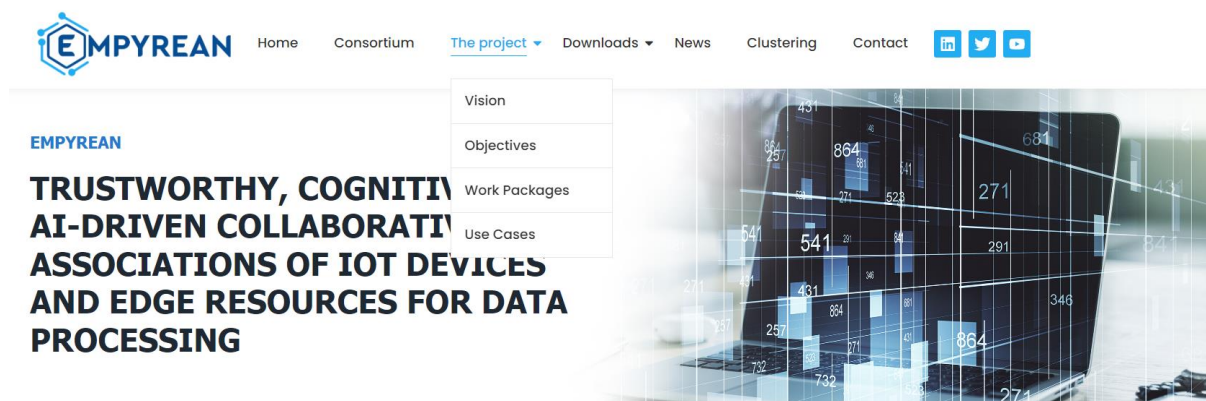


Figure 2: EMPYREAN website header section



Figure 3: EMPYREAN website footer section

Consortium

The “Consortium” page (Figure 4) provides basic information regarding the project partners and links to their websites.

Consortium

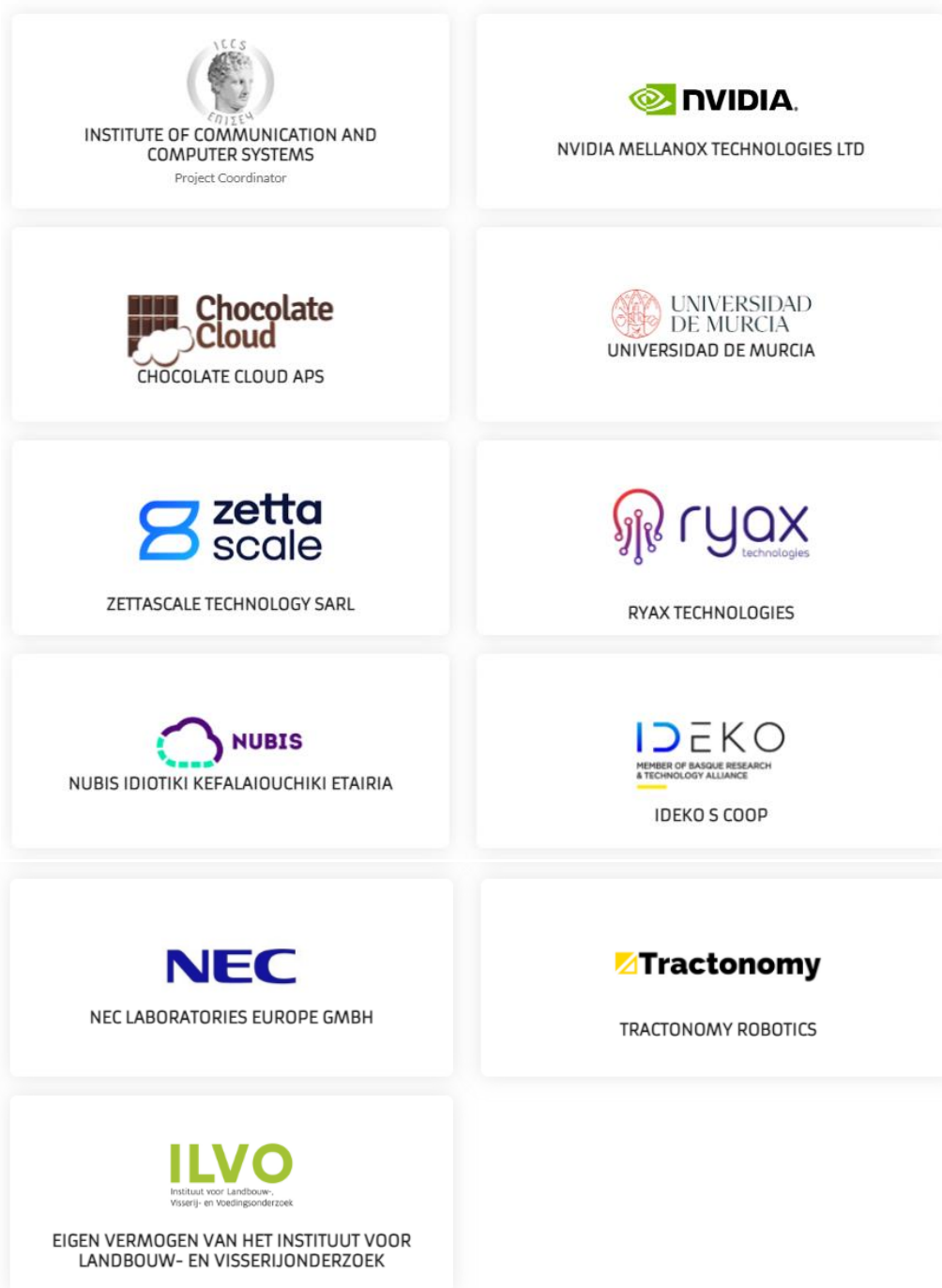


Figure 4: Website section “Consortium”

Vision

The “Vision” page (Figure 5) presents briefly the EMPYREAN concept and the overall vision of the project.

Vision

- ✓ EMPYREAN aims at creating a collaborative autonomous computing ecosystem over heterogeneous resources, different providers and connectivity types
- ✓ In this way, federations of collaborative resources will be created, referred to as IoT-Edge Associations or simply Associations
- ✓ This Association-based continuum will balance computing tasks and data locally inside an Association as well as between federated Associations
- ✓ An Association will constitute a secure execution environment where the trust between data generating and data processing entities will be continuously validated, while identity and data access management will assure controlled access and confidentiality of data among different organizations
- ✓ The EMPYREAN platform will be empowered by automated tools and mechanisms for seamless interconnection, efficient data processing of ML-workloads and secure distributed edge storage
- ✓ Technologies will be developed for Associations-native application development and deployment, for AI-driven value extraction of high volume and dynamic IoT data

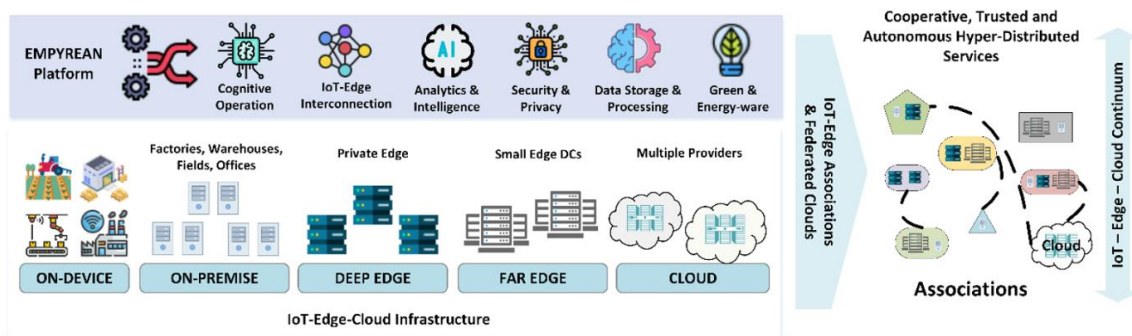


Figure 5: Website section “Vision”

Use Cases

The “Use Cases” section (Figure 6) presents an overview of the EMPYREAN use cases along with the expected important limitations that EMPYREAN is expected to address.

Use Cases



Advanced manufacturing UC:

Aims at developing a system able to perform process monitoring in robotic machining cells

Smart agriculture UC:

Aims at developing a Soil Organic Carbon (SOC) process to assess the soil state in agriculture fields



Warehouse automation UC

Aims at developing technologies to operate fleet of robots for order picking functions in warehouses

A South Korea based UC

In smart factories will further showcase the use of the EMPYREAN platform in international scenarios



Figure 6: Website section “Use Cases”

Objectives and Work Packages

The first section (Figure 7) enumerates the project objectives, while the second one (Figure 8) presents a short description for the project Work Packages.

Objectives



Figure 7: Website section “Objectives”

Work Packages

#	WP Title	Lead No	Lead Short Name	Person-Months	Start Month	End Month
1	Project Technical and Administrative Management	1	ICCS	28.1	1	36
2	Use Cases Analysis, System Requirements and Overall Architecture	6	RYAX	57.5	1	12
3	Security, Trust and Seamless Data and Computing Management	4	UMU	98	4	26
4	Decentralized Intelligence, Application Development and Deployment	1	ICCS	94	4	26
5	Platform Integration and Use Case Development	5	ZSCALE	87.5	13	36
6	Use Cases Demonstrators and EMPYREAN Evaluation	8	IDEKO	54.5	25	36
7	Business Modelling, Dissemination, Standardization and Exploitation	2	NVIDIA	53	1	36
8		Total PMs	473			

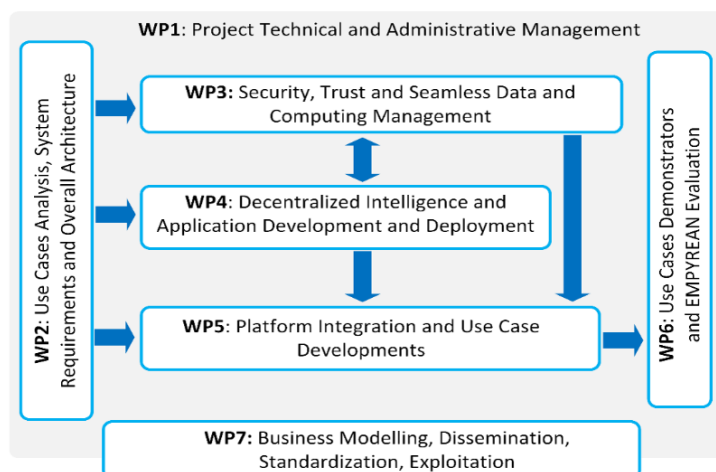


Figure 8: Website section “Work Packages”

Public Deliverables and Publications

The “Public Deliverables” and “Publications” sections contain information regarding the publications performed by the partners in the context of the EMPYREAN project. Moreover, the public deliverables will be available through the respective section. Both sections will be updated regularly throughout the duration of the project.

Communication Material

The “Communication Material” section (Figure 9) provides easy access to dissemination and communication content. It will include all public dissemination documents. Currently, there are available for download the project factsheet, the EMPYREAN presentation, and the initial newsletter. New material, including a project video, will be added as the project progresses.

Communication Material

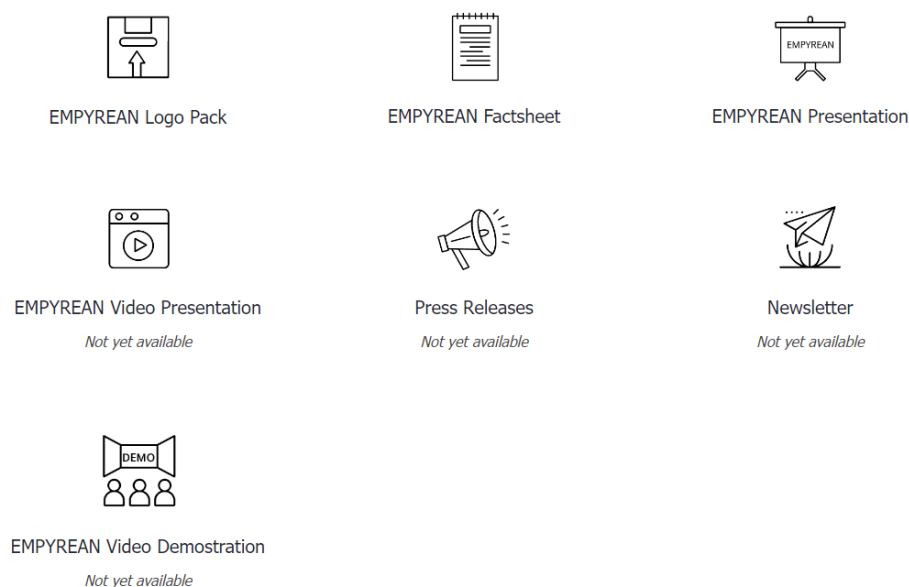


Figure 9: Website section “Communication Material”

News

The “News” section (Figure 10) includes news relevant to the project in the form of short, concise headings with additional links where necessary.

News

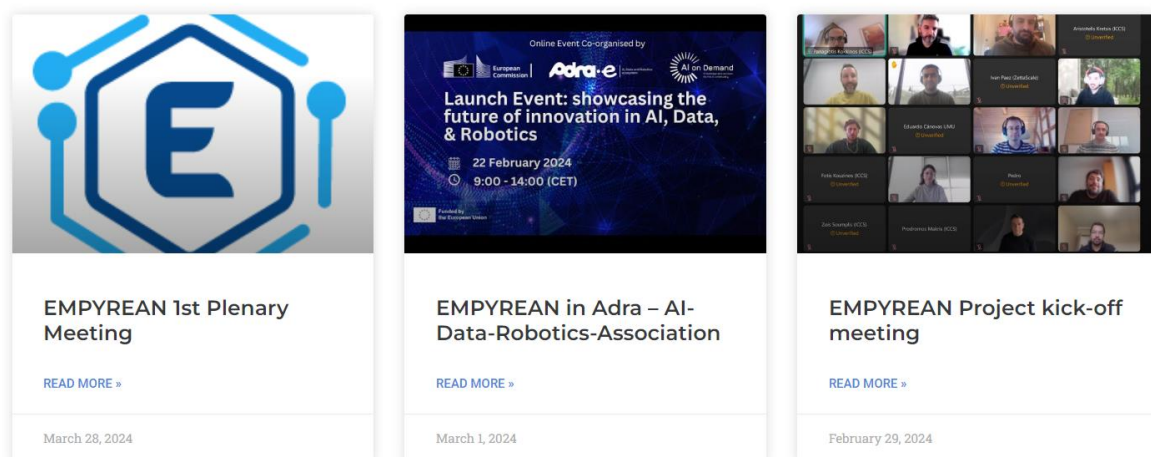


Figure 10: Website section “News”

Contact

The “Contact” section (Figure 11) provides information (email, phone and address) for contacting the EMPYREAN project coordinator. An e-mail message application is also available through which it is possible to communicate directly with the coordinator.

Contact

 Prof. Emmanouel (Manos) Varvarigos

 15780, Zographou Campus School of Electrical
Computer and Computer Engineering New premises,
3rd floor, Room: B.3.6

 vmanos@mail.ntua.gr

Follow us on social media



Figure 11: Website section “Contact”

4 Social Media Accounts

EMPYREAN has established accounts at various social networking platforms, such as Twitter/X, LinkedIn, and YouTube, as additional dissemination tools. ICCS created and will manage the following social media accounts and groups.

Twitter/X

EMPYREAN Twitter/X account (Figure 12) is available at the following address:

- https://twitter.com/empyrean_he



Figure 12: EMPYREAN Twitter/X account home page

The project follows 47 other accounts (Figure 13), while it has 19 followers (Figure 14), including other EU projects and relevant initiatives.

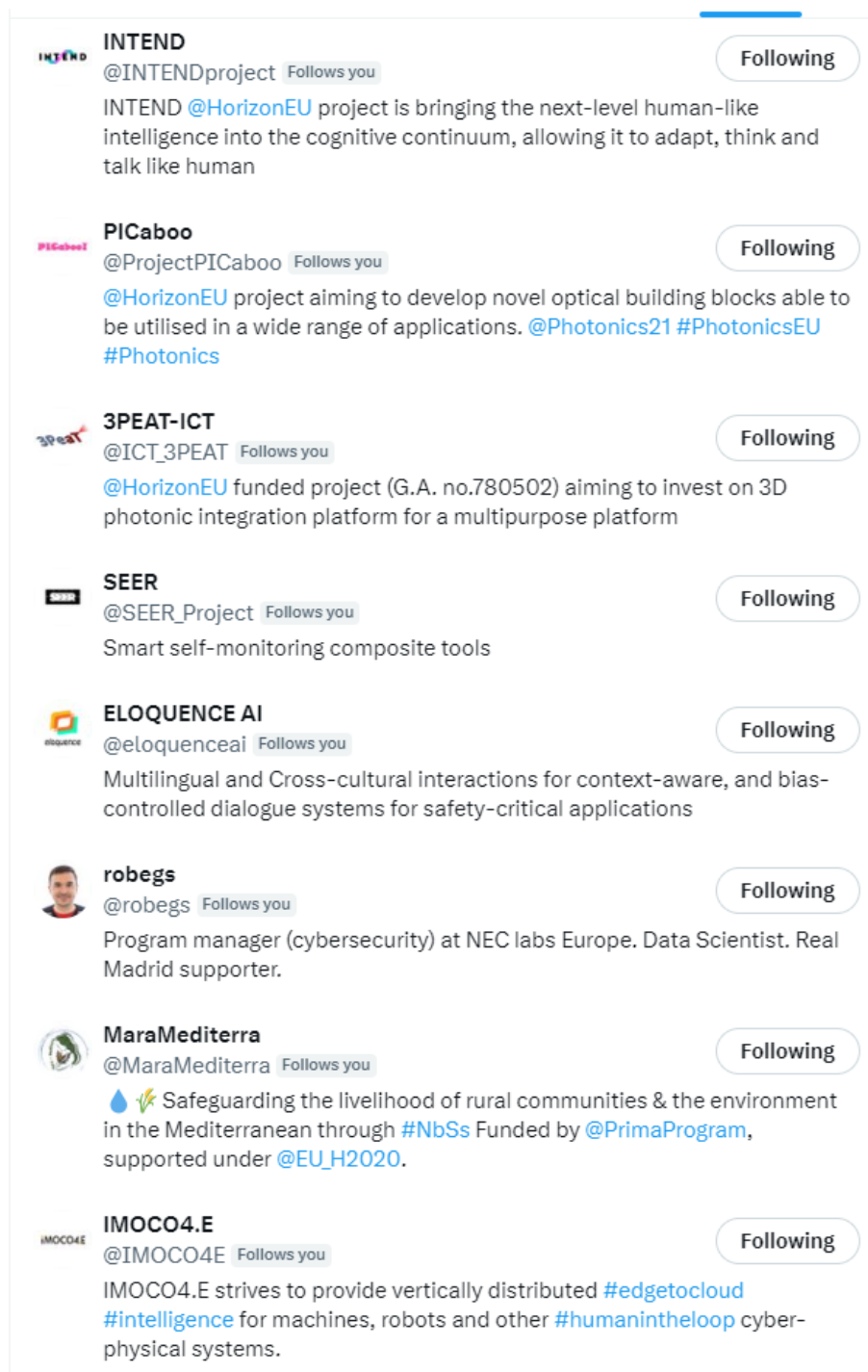


Figure 13: EMPYREAN follows many Horizon Europe projects, respective initiatives and open-source projects

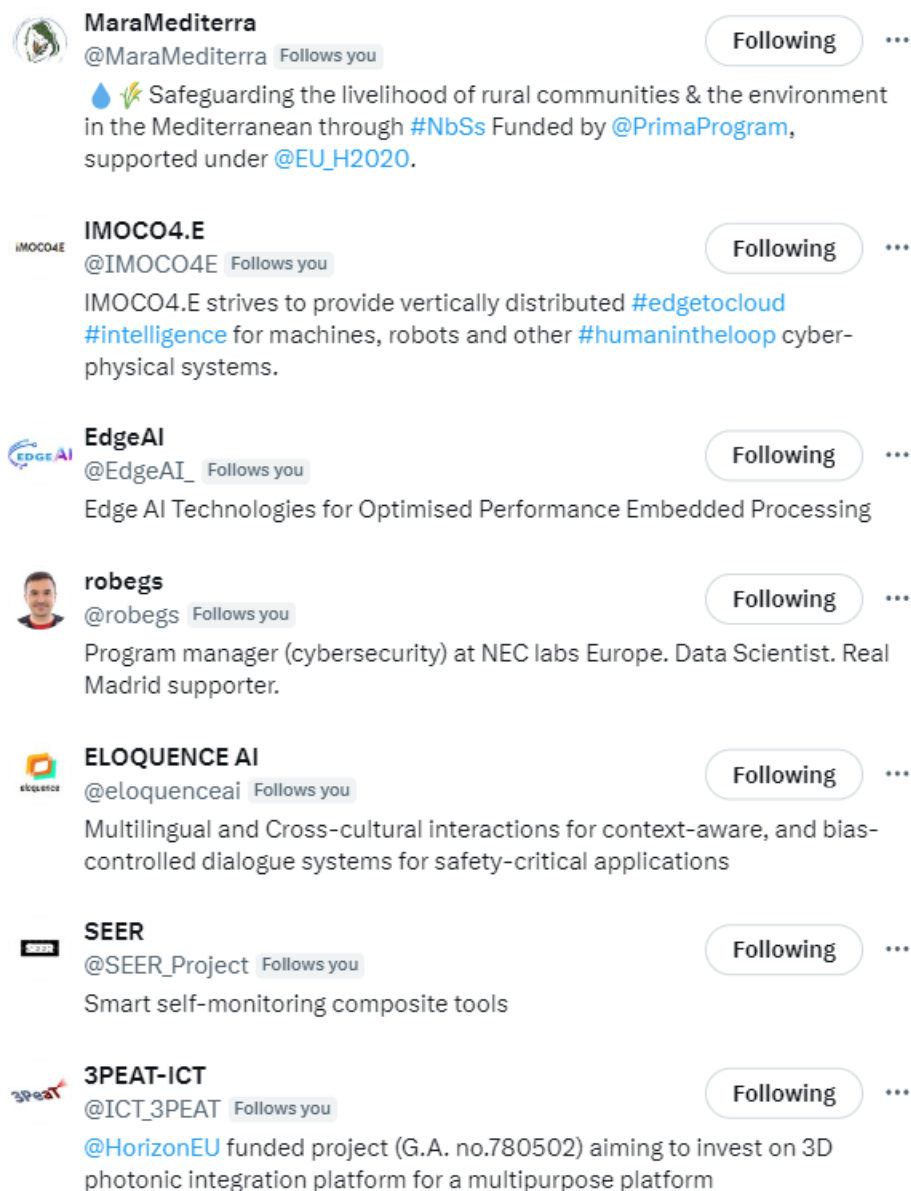
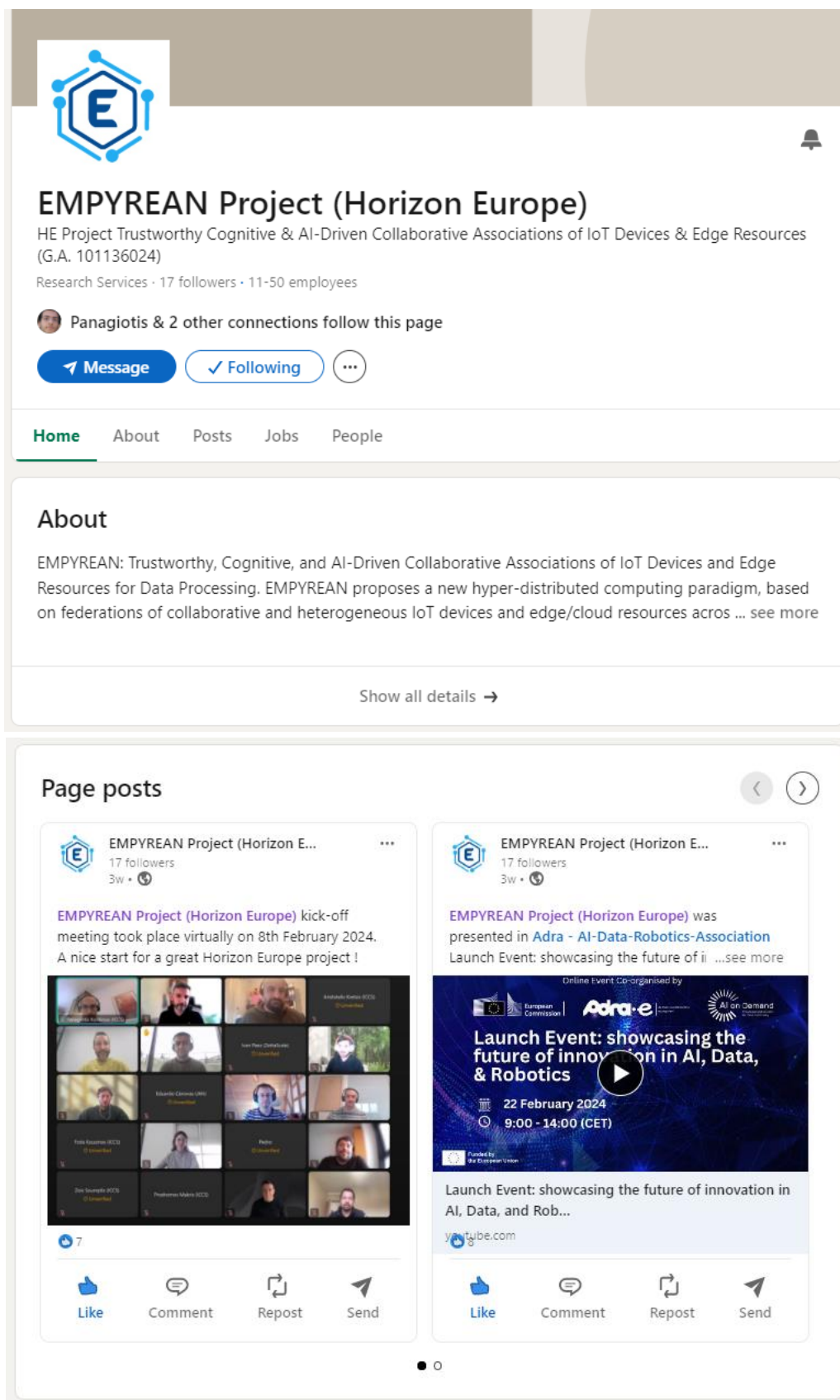


Figure 14: EMPYREAN followers

LinkedIn

The LinkedIn account of EMPYREAN (Figure 15) is available at the following link:

- <https://www.linkedin.com/company/empyrean-project/>



EMPYREAN Project (Horizon Europe)
HE Project Trustworthy Cognitive & AI-Driven Collaborative Associations of IoT Devices & Edge Resources (G.A. 101136024)
Research Services · 17 followers · 11-50 employees

Panagiotis & 2 other connections follow this page

[Message](#) [Following](#) [...](#)

[Home](#) [About](#) [Posts](#) [Jobs](#) [People](#)

About

EMPYREAN: Trustworthy, Cognitive, and AI-Driven Collaborative Associations of IoT Devices and Edge Resources for Data Processing. EMPYREAN proposes a new hyper-distributed computing paradigm, based on federations of collaborative and heterogeneous IoT devices and edge/cloud resources across ... see more

[Show all details →](#)

Page posts

EMPYREAN Project (Horizon Europe) · 17 followers · 3w · [View profile](#)

EMPYREAN Project (Horizon Europe) kick-off meeting took place virtually on 8th February 2024. A nice start for a great Horizon Europe project!

[View photo](#)

EMPYREAN Project (Horizon Europe) · 17 followers · 3w · [View profile](#)

EMPYREAN Project (Horizon Europe) was presented in [Adra - AI-Data-Robotics-Association](#) Launch Event: showcasing the future of innovation in AI, Data, and Robotics. ...see more

[View photo](#)

Launch Event: showcasing the future of innovation in AI, Data, and Robotics

22 February 2024
9:00 - 14:00 (CET)

[View video](#)

Launch Event: showcasing the future of innovation in AI, Data, and Robotics

[View video](#)

Figure 15: EMPYREAN LinkedIn profile

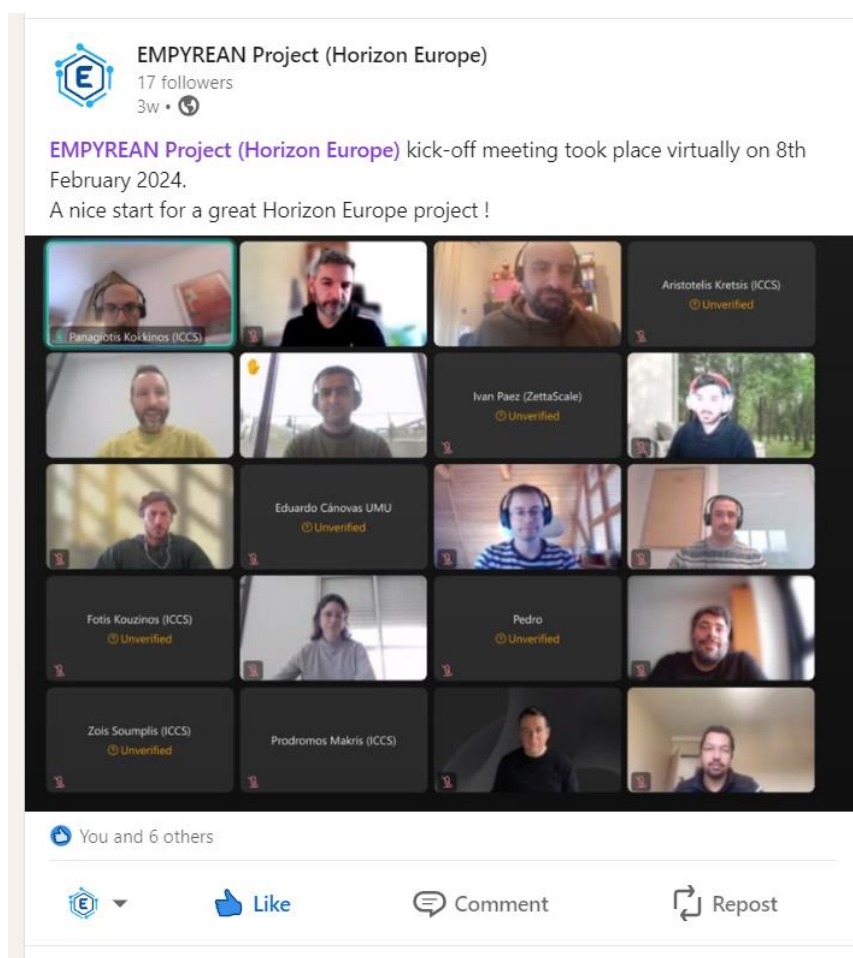


Figure 16: Kickoff dissemination through EMPYREAN LinkedIn page

YouTube

The Official Video Channel on YouTube of EMPYREAN (Figure 17) is available at the following address:

- <https://www.youtube.com/@empyreanheproject>

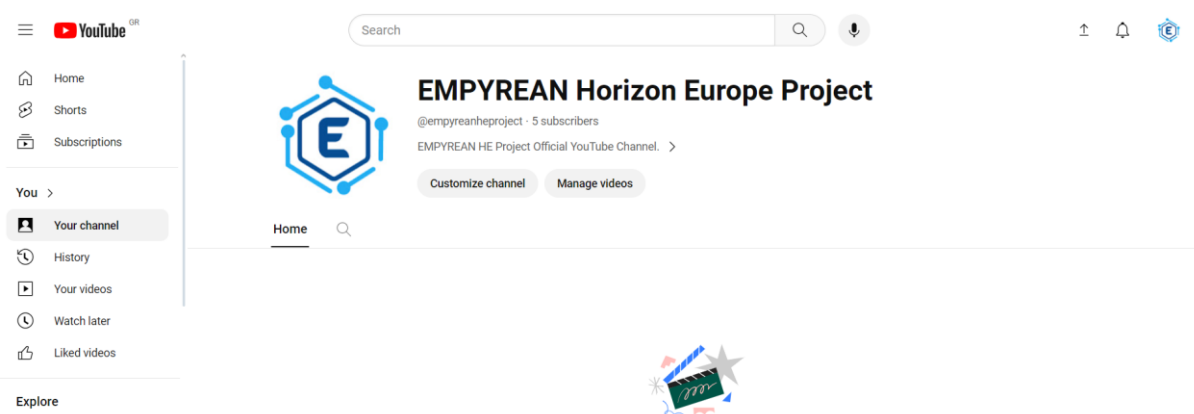


Figure 17: EMPYREAN YouTube channel home page

5 Factsheet

Trustworthy, Cognitive and AI-Driven Collaborative Associations of IoT Devices and Edge Resources for Data Processing



EMPYREAN envisages the creation of federations of collaborative resources, Associations, that will provide a secure execution environment by utilizing distributed, cognitive and dynamic AI-enabled decision-making to provide scalability, resiliency, energy efficiency and quality of service.



Project Title: Trustworthy, Cognitive and AI-Driven Collaborative Associations of IoT Devices and Edge Resources for Data Processing

Grant Agreement no: 101136024

Topic: HORIZON-CL4-2023-DATA-01-04: Cognitive Computing Continuum: Intelligence & automation for efficient data processing

Duration: 01/02/2024 – 31/01/2027 (36 months)

EC Contribution: 4,673,541.7€

Project Coordinator: Prof. Emmanouel (Manos) Varvarigos
ICCS/NTUA
vmanos@central.ntua.gr

Project Website: empyrean-horizon.eu

Social Media

- https://twitter.com/empyrean_he
- <https://www.linkedin.com/company/empyrean-project>

Consortium:



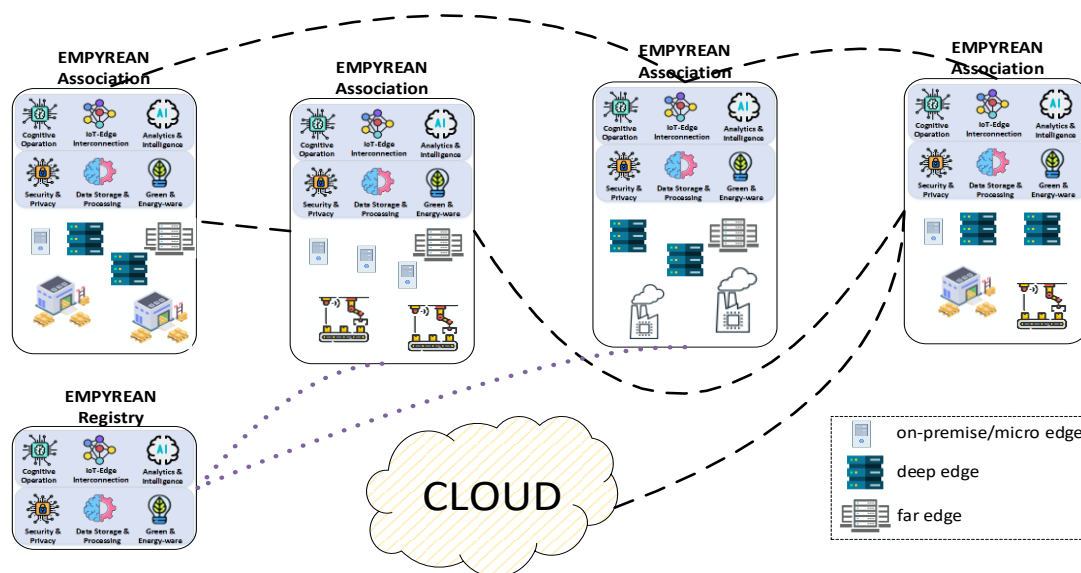
The Challenge

Internet of Things (IoT) devices equipped with various sensors and mobile or stationary units mounted with computing and storage capacity, like robots, are recognized today as key for the realization of cyber physical systems, smart cities and spaces, providing critical services and business intelligence in a variety of user contexts and sectors. The conventional way of dealing with data generated and exchanged by IoT devices is to utilize jointly edge along with federated cloud resources, thus forming an IoT-edge-cloud continuum. Yet, when this continuum is implemented as a monolithic pipeline, it cannot efficiently serve the emerging hyper-distributed applications.

Vision

EMPYREAN aims to create a collaborative autonomous computing ecosystem over heterogeneous resources, different providers and connectivity types. It will be supported by a seamless, distributed and AI-enabled control and management plane across the IoT-edge-cloud continuum, which will enable IoT/IIoT devices and edge

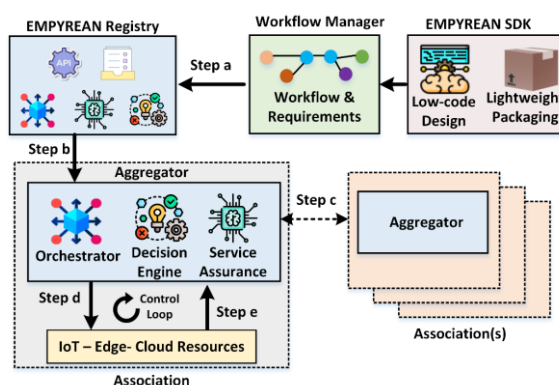
resources to operate in a location (e.g., factory, warehouse, agricultural field) and dynamically and autonomously cooperate through EMPYREAN's Associations. These distributed Associations will underpin the ubiquitous compute, storage and communication needs of current and future hyper-distributed, dynamic, and time-critical applications through the provision of a distributed fabric controlled by decentralised intelligence and innovative management techniques.



EMPYREAN general concept and vision

Project Objectives

An Association is a collection of IoT devices, multilayer edge resources and federated cloud platforms that dynamically and autonomously cooperate via a sophisticated coordination framework. Their operation will be empowered by a cognitive platform and will also be coupled with identity and access management mechanisms to assure controlled access and confidentiality of data. EMPYREAN will develop an S3-compatible distributed secure storage and will provide a decentralized and distributed interconnection and data distribution service. Communication mechanisms will be developed for direct message and data transfer, using an FPGA-based RDMA device driver that drastically improves small-message transfer performance. EMPYREAN also contributes to workflow-based, AI-augmented application development and seamless control and deployment on the edge-cloud continuum. EMPYREAN will demonstrate its advanced innovative capabilities through three well-defined use cases that involve device- and data-rich applications in advanced manufacturing, smart agriculture and warehouse automation. Also, a South Korea based use



Applications' lifecycle workflow in EMPYREAN

case in smart factories will further showcase the use of the EMPYREAN platform in international scenarios to ensure a guaranteed level of interoperability and portability.

Expected Impact

EMPYREAN's modular-by-design approach supports the creation of a plethora of services that can be placed in the center of an innovative market ecosystem, which drives business innovation and enterprise transformation. **IMPACT 1:** EMPYREAN will play a crucial role in EU's strategic autonomy, in its effort for the edge/cloud dominance. **IMPACT 2:** EMPYREAN unique technological advancements, their application in diverse key sectors (manufacturing, agriculture and warehousing) through the UCs will substantially contribute toward the realization of Europe's Digital Decade targets by 2030, while benefiting EU industry roadmap. **IMPACT 3:** EMPYREAN is committed to promote interoperability and portability at every stage of the innovation process, towards an EMPYREAN-based open ecosystem. **IMPACT 4:** EMPYREAN partners will promote the strategic industrial cooperation in AI/ML-based data storage and processing that can benefit the EU industry roadmap.

6 Project Presentation

The EMPYREAN high-level project presentation is presented in the following pages.



**TRUSTWORTHY, COGNITIVE AND AI-DRIVEN
COLLABORATIVE ASSOCIATIONS OF IOT DEVICES
AND EDGE RESOURCES FOR DATA PROCESSING**

Project Presentation

Call : HORIZON-CL4-2023-DATA-01

Topic : HORIZON-CL4-2023-DATA-01-04 -
Cloud Computing: towards a smart cloud
computing continuum

Type of Action: RIA

Grant Agreement no: 101136024

Project start: 01/02/2024

Duration: 36 months

Budget: 4,673,541.7

Site: empyrean-horizon.eu

Project Administrative Information



- ❑ **Project Name:** Trustworthy, cognitive and AI-driven collaborative associations of IoT devices and edge resources for data processing
- ❑ **Call identifier:** HORIZON-CL4-2023-DATA-01-04: Cognitive Computing Continuum: Intelligence and automation for more efficient data processing
- ❑ **Project Type:** Research & Innovation Action (RIA)
- ❑ **Grant Agreement Number:** 101136024
- ❑ **Project Coordinator:** Institute of Communication and Computer Systems – ICCS
- ❑ **Duration:** 36 months (01/02/2024 – 31/01/2027)
- ❑ **Funding from the EC:** 4,673,541.7 €
- ❑ **Total Budget of the project:** 4,673,541.7 €

Consortium (11 partners)



- INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS – ICCS (Greece)



- NVIDIA MELLANOX TECHNOLOGIES LTD – NVIDIA (Israel)



- CHOCOLATE CLOUD APS – CC (Denmark)



- UNIVERSIDAD DE MURCIA – UMU (Spain)



- ZETTASCALE TECHNOLOGY SARL – ZSCALE (France)



- RYAX TECHNOLOGIES – RYAX (France)



- NUBIS IDIOTIKI KEFALAIOUCHIKI ETAIRIA – NUBIS (Greece)



- IDEKO S COOP – IDEKO (Spain)



- NEC LABORATORIES EUROPE GMBH – NEC (Germany)



- INSTITUTE FOR AGRICULTURAL, FISHERIES AND FOOD RESEARCH – EV ILVO (Belgium)



- TRACTONOMY ROBOTICS BVBA – TRAC (Belgium)



3

Motivation

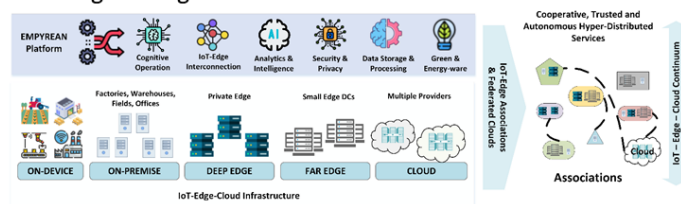


- The conventional way of dealing with IoT data, is to push them to the cloud or utilize edge resources, forming an IoT-edge-cloud continuum.
- This continuum is implemented usually as a monolithic pipeline that cannot efficiently serve hyper-distributed and AI/ML-based applications.
- It is clear that more local decisions and a collective logic that leads to system-wide welfare optimality is needed.
- EMPYREAN proposes a new hyper-distributed computing paradigm, encompassing heterogeneous IoT devices and computing, storage and connectivity resources that may belong to different providers at different segments of the continuum.

EMPYREAN Vision



- ❑ EMPYREAN envisions a collaborative autonomous computing ecosystem over heterogeneous resources, different providers and connectivity types.
- ❑ EMPYREAN will build federations of collaborative resources, the IoT-Edge Associations.
- ❑ Association will provide a secure execution environment.
- ❑ Association-based continuum will balance computing tasks and data locally inside an Association as well as between federated Associations.
- ❑ EMPYREAN platform will provide interconnection, efficient data processing of ML-workloads and secure distributed edge storage.



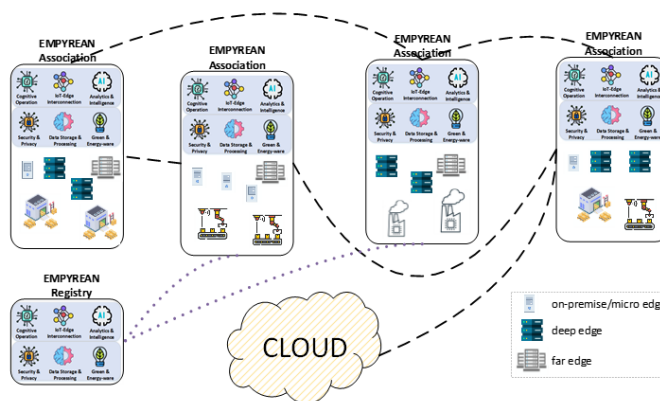
EMPYREAN Project Presentation

5

EMPYREAN Concept



- ❑ Transforming IoT-Edge-Cloud continuum into a collaborative autonomous computing ecosystem.
- ❑ Perception of a unified, adaptable, low latency, efficient, reliable and trustworthy virtual execution environment.
- ❑ Development activities:
 - Security, Trust and Seamless Data and Computing Management
 - Decentralized Intelligence, Application Development and Deployment
 - EMPYREAN Aggregator



EMPYREAN Project Presentation

6

EMPYREAN Objectives



- ❑ **Objective 1:** Enable collaborative autonomy in the IoT-edge-cloud continuum.
- ❑ **Objective 2:** Cognitive Associations, speculative resource orchestration and AI-driven adaptability.
- ❑ **Objective 3:** Ensure security, privacy and multi-party-trust in the IoT-edge-cloud continuum.
- ❑ **Objective 4:** Build mechanisms for efficient IoT data processing of ML-workloads and hyper-distributed applications.
- ❑ **Objective 5:** Workflow-based, AI-augmented application development and seamless control and deployment on the edge-cloud continuum.
- ❑ **Objective 6:** Demonstrate the capabilities of the EMPYREAN platform in supporting hyper-distributed, highly-demanding and dynamic applications.

EMPYREAN Project Presentation

7

EMPYREAN (3+1) Use Cases



- ❑ High-demanding, safety-critical, dynamic, greatly impactful applications that pose heterogeneous demands.
- ❑ **Advanced manufacturing UC**
 - Developing a system able to perform process monitoring in robotic machining cells.
 - Demonstrate EMPYREAN platform as a key enabler for the ongoing industrial revolution.
- ❑ **Smart agriculture UC**
 - Developing a Soil Organic Carbon (SOC) process to assess the soil state in agriculture fields.
 - Demonstrate a revolutionary way to monitor and manage soil health, leading to more sustainable and efficient agricultural practices.
- ❑ **Warehouse automation UC**
 - Developing technologies to operate fleet of robots for order picking functions in warehouses.
 - Demonstrate secure and trusted interconnection of warehouses served by distributed Associations.
- ❑ A **South Korea based** UC in smart factories will further showcase the use of the EMPYREAN platform in international scenarios.



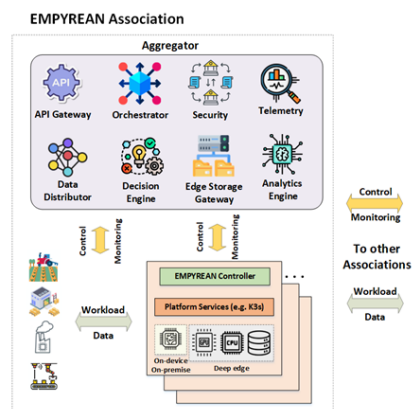
EMPYREAN Project Presentation

8

EMPYREAN Ecosystem



- EMPYREAN Association is managed by an Aggregator.
- Multiple self-managed and interacting Aggregators form the management plane for the envisioned distributed and AI-enabled Associations-based continuum.
- EMPYREAN platform key building blocks:
 - API Gateway
 - EMPYREAN Orchestrator
 - Decision Engine
 - Edge Storage Gateway
 - Data Distributor
 - Security & Privacy
 - Telemetry Engine
 - CTI Engine
 - Analytics Engine
 - EMPYREAN Controller
 - Service Development Kit



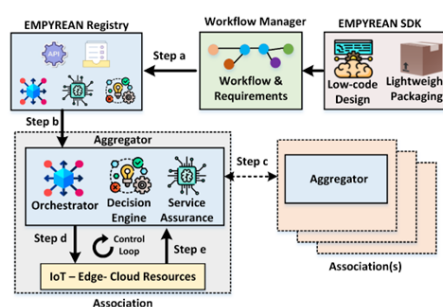
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EMPYREAN Lifecycle



- EMPYREAN Associations and Hyper-Distributed Applications.
- Seamless deployment, cognitive orchestration and autonomous adaptability.
- Distributed closed-loop control system and self-driven continuous adaptations.
- Lifecycle:
 - **Step a:** User provide application workflow-based description and high-level deployment requirements.
 - **Step b:** EMPYREAN Aggregator decomposes high-level requirements into specific service goals.
 - **Step c:** Assign application workload to resource in one or multiple Associations, involves cooperation among Aggregators in different Associations.
 - **Step d:** Aggregator forwards low-level infrastructure-specific deployment objectives to Local Orchestrators.
 - **Step e:** Distributed service assurance mechanisms, based on real-time telemetry, trigger re-optimizations.



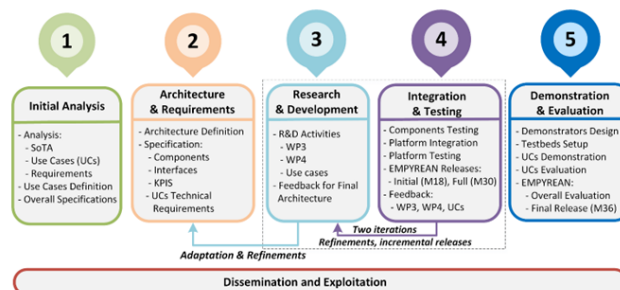
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EMPYREAN Methodology



- **Phase 1** - Initiates technical work:
 - UCs detailed definition and analysis
- Incremental implementation and evaluation.
- **Phase 2:**
 - Detailed SERRANO architecture
 - Ensure integration and interoperability
- **Phase 3** - Implements innovations
- **Phase 4** - Integrates and verifies technological developments
- **Phase 5:**
 - Full functionality demonstration
 - High impact components identification



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EMPYREAN Impact



- EMPYREAN's modular-by-design approach supports the creation of a plethora of services.
- **Impact 1:** EMPYREAN will play a crucial role in EU's strategic autonomy and in its effort for the edge/cloud dominance.
- **Impact 2:** EMPYREAN unique technological advancements, their application in diverse key sectors (manufacturing, agriculture and warehousing) will substantially contribute toward the realization of Europe's Digital Decade targets by 2030, while benefiting EU industry roadmap.
- **Impact 3:** EMPYREAN is committed to promote interoperability and portability at every stage of the innovation process, towards an EMPYREAN-based open ecosystem.
- **Impact 4:** EMPYREAN partners will promote the strategic industrial cooperation in AI/ML-based data storage and processing that can benefit the EU industry roadmap.

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EMPYREAN Partner Roles



Edge, acceleration and interconnection



Security and Privacy

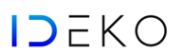


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Application packaging, resource orchestration



Use cases



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**TRUSTWORTHY, COGNITIVE AND AI-
DRIVEN COLLABORATIVE ASSOCIATIONS
OF IOT DEVICES AND EDGE RESOURCES
FOR DATA PROCESSING**

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