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D7.3

Exploitation Plan (I)

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Table of contents

DOCUMENT HISTORY.....	2
LIST OF AUTHOR(S), CONTRIBUTORS(S) AND REVIEWER(S)	2
TABLE OF CONTENTS	3
LIST OF ACRONYMS	5
EXECUTIVE SUMMARY	6
1. INTRODUCTION	7
1.1. PURPOSE OF THE DOCUMENT AND SCOPE	7
1.2. STRUCTURE OF THE DOCUMENT	7
2. EXPLOITATION TOOLS AND METHODOLOGY	7
2.1. DEFINITIONS.....	7
2.2. PHASES OF EXPLOITATION ACTIVITIES AND CURRENT STATUS.....	8
2.3. MAIN EXPLOITATION TOOLS.....	8
2.3.1. <i>Diagram of technical components</i>	8
2.3.2. <i>Exploitation Pathways Map</i>	9
2.3.3. <i>Individual exploitation plans</i>	9
3. PROJECT EXPLOITABLE RESULTS	9
3.1. CYCLOPS SOLUTION.....	10
3.1.1. <i>User Intent Layer</i>	12
3.1.2. <i>Knowledge layer</i>	13
3.1.3. <i>Runtime layer</i>	16
3.1.4. <i>Interoperability layer</i>	22
4. EXPLOITATION PATHWAYS.....	24
4.1. FURTHER RESEARCH.....	24
4.2. TRAINING AND EDUCATION.....	24
4.3. STANDARDISATION	24
4.4. MONETISATION	26
4.5. POLICY CONTRIBUTIONS.....	26
5. INDIVIDUAL EXPLOITATION PLANS.....	26
5.1. LARGE ENTITIES	26
5.1.1. <i>ATOS</i>	26
5.1.2. <i>AVORIS</i>	27
5.1.3. <i>EXAI</i>	28
5.1.4. <i>GRD</i>	29
5.1.5. <i>NTTDES</i>	30
5.2. SMEs.....	31
5.2.1. <i>APIDAE</i>	31
5.2.2. <i>ASOL</i>	32
5.2.3. <i>CP</i>	34
5.2.4. <i>DC</i>	35
5.2.5. <i>FDI</i>	35
5.2.6. <i>ONTOPIC</i>	36
5.2.7. <i>PRES</i>	37
5.2.8. <i>SUITES</i>	38
5.2.9. <i>TIME.LEX</i>	39
5.3. RTOS	40
5.3.1. <i>BSC</i>	40
5.3.2. <i>CERTH</i>	40

5.3.3.	<i>EODC</i>	42
5.3.4.	<i>EURAC</i>	43
5.3.5.	<i>NUIDUCD-CeADAR</i>	44
5.4.	<i>ACADEMIA</i>	45
5.4.1.	<i>TUBS</i>	45
5.4.2.	<i>UNIBZ</i>	46
5.4.3.	<i>UPC</i>	47
5.5.	<i>ASSOCIATIONS</i>	48
5.5.1.	<i>EONA-X</i>	48
5.5.2.	<i>FIWARE</i>	49
6.	KEY BUSINESS INSIGHTS ABOUT CYCLOPS' SOLUTION	50
7.	NEXT STEPS	52
	ANNEX A – TECHNOLOGY READINESS LEVELS (TRLs)	54

List of acronyms

Abbreviation	Meaning
BD	Big Data
BDVA	Big Data Value Association
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CRISP	Climate Risk Planning & Managing Tool for Development Programs in Agri-food Systems
CSA	Coordination & support action
DEA	Data and Execution Abstraction
DIN	German Institute for Standardization
DS	Data Space
DSSC	Data Spaces Support Centre
EBDVF	European Big Data Value Forum
ECISO	European Cyber Security Organisation
EDC	Eclipse Data Connector
EDIB	European Data Innovation Board
ETP4HPC	European Technology Platform for High Performance Computing
ETSI	European Telecommunications Standards Institute
GDPR	General Data Protection Regulation
HPC	High Performance Computing
IKB	Intelligent Knowledge Base
ICT	Information and Communication Technology
IDaaS	Identity as a Service
IFIP	International Federation for Information Processing
IDSA	International Data Spaces Association
JRC	Joint Research Centre
KG	Knowledge Graphs
M4D	Multimodal Data Fusion and Analytics Group
ML	Machine Learning
NLP	Natural language processing
NLU	Natural language Understanding
PPDS	Public Procurement Data Space
RML	Requirements Modeling Language
SAAS	Software as a Service
SRA	Strategic Research Agenda
TRL	Technology Readiness Level
UNE	Spanish Association for Standardisation
W3C	World Wide Web Consortium

Executive summary

This deliverable presents the first version of the CyclOps exploitation plan, with the final version planned at the end of the project. The main objective of the exploitation endeavours is to improve the utilisation of project results during and after the end of the project through both commercial and non-commercial pathways.

This document presents the CyclOps solution, the key activities identified for each exploitation pathway, the individual exploitation plans from each partner, and the preliminary key business insights related to the CyclOps solution.

The deliverable details the methodology and tools used to gather these results, emphasizing the use of visual diagrams to provide a comprehensive overview and support decision making.

The CyclOps solution is designed to facilitate the preparation and exploitation of data, AI models, and services from both internal sources and external data spaces, while covering the entire data lifecycle. Its goal is to foster the development of data-driven solutions and facilitate the adoption of data spaces for entities with limited data skills. The CyclOps solution is composed of a large number of technological components provided by the partners.

With respect to the exploitation pathways, an initial analysis of the various results gathered during discussions with the partners has been conducted. These results have been grouped by thematic areas and by exploitation pathway. In the upcoming period, efforts will focus on fostering synergies among partners to facilitate the achievement of these additional results.

Regarding individual exploitation plans, entity profile and description, motivation, contributions and main interests regarding exploitation pathways have been collected for each partner.

Specific scenarios and sustainability aspects will be further explored in the next phase. Preliminary key business insights have also been gathered as reference.

1. INTRODUCTION

1.1. Purpose of the document and scope

This document presents a compilation of the **exploitable results**, the **individual exploitation plans** for each partner within the **CyclOps** project, as well as a **compilation of the key business insights identified on the CyclOps solution**. This deliverable, which outlines the planned course of action for task 7.3 - Exploitation and Replicability activities, represents an important milestone in the project, as it lays the groundwork for the business model design that will be conducted in subsequent steps.

A final, comprehensive version of this document will be submitted at the end of the project (M36), gathering the most comprehensive plan possible.

1.2. Structure of the document

This document comprises several sections aimed at detailing the exploitation strategy for the project's results.

The **Exploitation Tools and Methodology** section defines key terms and outlines the methodology followed, including phases, workflow, and sessions conducted. It also introduces various tools utilised in the exploitation process, such as diagrams, results maps, and individual exploitation plans.

Following this, the **Project Exploitable Results** section offers an overview of the results generated by the project, with a specific focus on the *CyclOps solution* and its components.

In the **Exploitation Pathways** section, different pathways for exploiting the project's results are discussed, including research, monetisation, policy contributions, training and education, and standardisation.

The **Individual Exploitation Plans** section outlines individual plans for exploitation for each participating entity, including objectives, motivations, technological contributions, and exploitation interests.

The **Key Business Insights** section offers insights about the definition of the *CyclOps* solution, the value proposition, the key functionalities, and of the target customers.

Finally, the **Next Steps** are presented.

2. EXPLOITATION TOOLS AND METHODOLOGY

2.1. Definitions

The main objective of the exploitation endeavours is to improve the utilisation of project results during and after the end of the project through both commercial and non-commercial pathways. The overarching aim is to translate each Research and Innovation result into tangible value. This section provides essential definitions for understanding the exploitation activities within the project.

- **Key Exploitable Result (KER).** It represents a significant result identified due to its potential to be effectively 'exploited' downstream in the value chain of a product, process, or solution, or to serve as a crucial input for policymaking, further research, or educational purposes. KERs are selected based on criteria including innovation degree, exploitability, and anticipated impact.
- **Exploitable Results (ERs)** encompass the remaining outcomes with lower exploitable capacity. These may include data, knowledge, or information in various forms.
- **Components** are technical elements that may combine with others to form an ER or KER.
- **Exploitation pathways.** This refers to the routes used to exploit KERs or ERs, whether through commercial or non-commercial means.

- **Stakeholders** are the target groups towards whom exploitation pathways are directed, ensuring the effective use of ERs/KERs.
- **Dissemination, Exploitation and Communication goals** represent the measurable objectives set in the Description of Action to be pursued through Dissemination, Exploitation, and/or Communication activities. They can be short and mid-term (during the project) or long-term (post-project).

2.2. Phases of exploitation activities and current status

The timeline below outlines the planned work phases for the exploitation activities within the *CyclOps* project. It guides the progression of T7.3 to ensure the consortium meets its objectives effectively.



Figure 1. Exploitation activity timeline

During this initial period of the project, the activities of the exploration phase have been carried out. Bilateral conversations were held with all partners to gather their individual exploitation plans and potential contributions. The materials presented in this deliverable have been generated based on the collected information and the submitted technical deliverables, such as the technical component diagram of the CyclOps solution and the exploitation pathways map. These materials will evolve as the project progresses.

During this phase, the vision around the value proposition of the main solution was also checked, which helped to gather certain findings that will be very useful for the next activities related to the design of the exploitation scenarios.

Additionally, the General Assembly in Thessaloniki (M13) was used to conduct a joint workshop with the partners to understand how these pipeline implementation processes are traditionally carried out, the problems they face, and how the CyclOps solution contributes to these.

On the other hand, the licensing, the dependencies, and owners of each of the results that make up the CyclOps solution were reviewed during the GA Meeting in Palma in June 2025 (M18). Additionally, a first exploitation scenario of the main solution was outlined.

The work carried out during this first period of the project and all the information collected and processed has allowed us to develop a unified starting point, which is included in this document. This constitutes a solid foundation for the next phases of the project.

2.3. Main exploitation tools

A customized framework has been used to support to guide the project's exploitation activities. This framework consists of a set of tools and materials developed by NTT DATA and validated through extensive experience in leading exploitation activities across multiple projects under both Horizon 2020 and Horizon Europe. These tools are described in the next sections.

2.3.1. Diagram of technical components

The 'Diagram of Technical Components' is a block diagram that outlines the different layers, modules and components that constitute the joint solution. It also shows the owners and the proposed licensing of each of these components. Although this diagram may appear similar to the reference architecture, it has important differences:

- 1) it clusters the modules and components based on partner ownership (rather than technical aspects), and
- 2) it aims to facilitate the functional understanding of the solution.

In later iterations, this diagram may evolve to reflect the packaging of components for the commercialized solution.

2.3.2. Exploitation Pathways Map

The 'Exploitation Pathways Map' is a diagram that includes well-defined and prioritised routes for exploiting the project results (e.g., further research, monetisation, education and training or policy contribution). It provides a visual representation of the planned routes for maximising the impact and value of the project's results. The map serves as a strategic guide for decision-making and resource allocation, ensuring that the exploitation efforts are aligned with the objectives pursued. In the map, the stakeholders targeted, and short-term and mid-term impacts can be also included.

This tool facilitates the identification of potential synergies, encouraging strategic discussions for coordinated efforts among partners with similar activities. This approach ensures that, while considering each partner's interests and objectives, collaborative efforts are not overlooked.

2.3.3. Individual exploitation plans

To gather information from project partners, a structured interview process was implemented. This process includes a set of generic, yet insightful questions designed to capture the partners' overall interests and contributions. The interview covers the following aspects:

- Entity description and relevant expertise in Horizon Europe projects
- Objectives and motivation for participating in the project
- Technological contributions to the project
- Exploitation interests (including research, training, standardisation, monetisation, and policy contributions) aligned with the exploitation pathways
- Other relevant information (such as existing collaborations or related initiatives)

This methodology has proven to be more effective than standard forms, as it enables richer, more detailed interactions with partners and facilitates a deeper understanding of their perspectives and expectations.

3. PROJECT EXPLOITABLE RESULTS

This section mainly summarises in layperson language the description of the overall solution being developed and integrated, composed of a large number of technological components provided by the partners. Although all identified components (KERs) have a high degree of exploitability, the integrated provision of these components as a unified solution offers significantly greater added value than the individual parts. Therefore, this section illustrates the joint solution and the elements that comprise it.

Other potential exploitable results of the project have been also identified, which are mentioned in the Individual exploitation plans section (Section 5) and in the Exploitation pathways section (Section 4). The final list of these potential exploitable results will be iterated during the next phase of the project, providing more detailed information and monitoring their actual progress. This preliminary list is omitted in this section for the current version of the deliverable, although it will be included in the final version.

3.1. CyclOps Solution

The official aim and objective of the project is:

“To provide interoperable automatic management, governance, and maintenance of the entire data life cycle for large-scale volumes of data generated in heterogeneous distributed sources to enable data sharing and exchange in data spaces and enable AI-based data-driven applications for all players, business and research alike.”

However, an alternative definition of the CyclOps solution has been created to facilitate understanding and discussions with less technical users, as the original version is too complex for all potential stakeholders. This alternative definition has been developed based on the input gathered during bilateral conversations with the partners:

“The CyclOps solution is designed to facilitate the preparation and exploitation of data, AI models, and services from both internal sources and external data spaces, while covering the entire data lifecycle. Its goal is to foster the development of data-driven solutions and facilitate the adoption of data spaces for entities with limited data skills.”

Figure 2 illustrates the Diagram of technical components of the CyclOps solution, presenting its layers and their respective components.

The current exercise has focused on clearly identifying all modules and components that could be part of the solution so far, serving as a starting point for further discussions.

For the sake of completeness, a recap of each component's aim and description has been provided, although the full details can be found in associated deliverables (D3.1, D4.1, and D5.1).

Additionally, each component description includes a table detailing the type of exploitation result, the owner(s), the expected Technical Readiness Level (TRL) at the end of the project and the type of license considered (open source or commercial - including both paid software and software that can be licensed under specific conditions). The explanation of the meaning of each TRL is provided in Annex A.

This configuration will be refined in the next phase of the project, taking into account aspects such as the target TRL, licensing conditions, and other relevant factors. Additionally, partners will be consulted to determine whether the components with higher TRLs are already commercial tools and should be included as KERs, or whether the integration with such tools is, in fact, the KER to be considered.

It is important to note that the diagram showed here corresponds to the current design established during iteration 1 (IT-1). Given the evolving nature of the development process, the structure of CyclOps is expected to be extended and improved. Iteration 2 (IT-2) may introduce additional components or refinements.

The CyclOps solution is composed of four main layers:

- **User Intent Layer**
- **Knowledge Layer**
- **Runtime Layer**
- **Interoperability Layer**

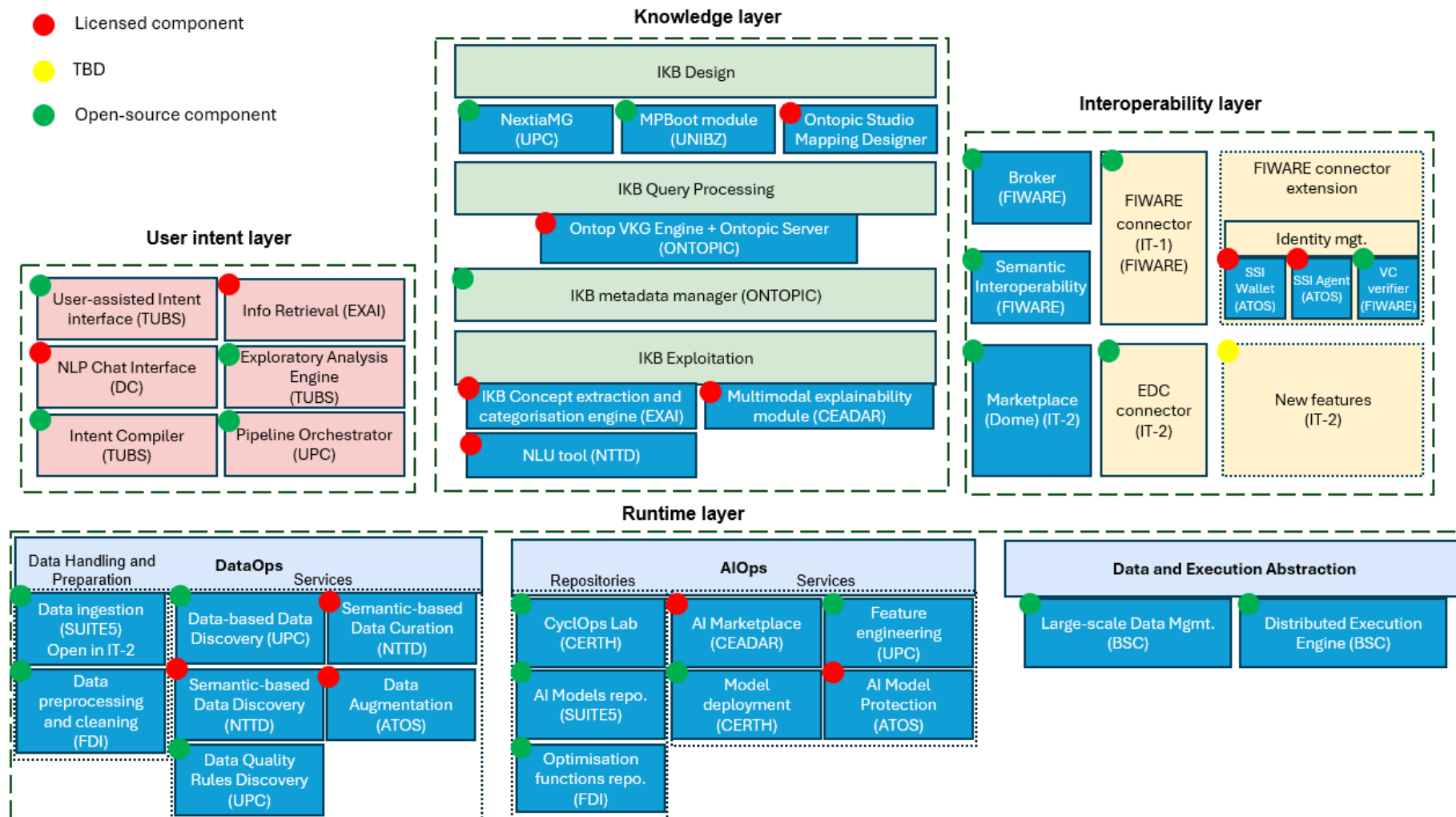


Figure 2 Diagram of technical components of the CyclOps solution

3.1.1. User Intent Layer

The **User Intent Layer** is the entry point for users, designed to receive and interpret user intents and translate them into operations to be performed by CyclOps.

A user intent is a request in natural language specifying the goal or objective a user wishes to achieve, such as extracting specific information from a data space or initiating a data transformation process. These intents are translated and processed to either perform exploratory analysis of the data, or to configure and generate data analytics pipelines.

3.1.1.1. User-assisted Intent Interface

The User-assisted interface supports user login and enable intent creation through either natural language or a structured format, where users can select their desired execution pipeline, made available by the Orchestrator, as well as explore and interact with data retrieved by the Exploratory Analysis Engine. The user-assisted interface includes functionalities to enable user authentication, directing the users to the NLP Chat interface, managing sessions, and assisting with the creation of execution pipelines. In the next iteration, this component is expected to be integrated with the identity manager of the interoperability layer, ensuring seamless and secure access control.

Component details	
Type of result	Open-source result
Owner	TUBS
TRL expected	5
Type of license foreseen	GLP 3.0 License

3.1.1.2. NLP Chat Interface

The Natural Language Processing Chat Interface is responsible for parsing high-level user requests into commands to other CyclOps modules, by means of an NLP chat. Through this interface, users can query the IKB or input their intents for data analytics pipeline creation. For Exploratory Analysis workflow, the user inputs in natural language are translated into queries to the IKB, and the requested data is then returned to the user.

Component details	
Type of result	Commercial SW
Owner	DC
TRL expected	6
Type of license foreseen	TBD

3.1.1.3. Intent Compiler

The Intent compiler is responsible for compiling structured user intents received from the info Retrieval to actionable parameters called policies. These policies can be either exploratory or analytical. Exploratory policies define the parameters needed to retrieve relevant data or information from the data sources, while analytical policies specify the data analytics functions to be performed on selected data.

Component details	
Type of result	Open-source result
Owner	TUBS
TRL expected	5
Type of license foreseen	GLP 3.0 License

3.1.1.4. Info Retrieval

The Info Retrieval is designed to process and interpret natural language conversations between users and the NLP Chat, extracting relevant information and converting it into structured intents for downstream usage, starting from the intent compiler onward. This component bridges the gap

between user-expressed intents and the generation of structured data requests, retrieving all the information and parameters necessary for either exploratory or analytical policies.

Component details	
Type of result	Commercial SW
Owner	EXAI
TRL expected	5
Type of license foreseen	TBD

3.1.1.5. Exploratory Analysis Engine

The Exploratory Analysis Engine allows users to interact with the data and metadata available in the IKB. It has a JSON-to-SPARQL translator that automatically generates SPARQL queries based on policies provided by the Intent Compiler, which supplies them in JSON format. After generating the SPARQL query, the Exploratory Analysis Engine sends the query to an endpoint in the IKB, which returns the related data or no data when no correspondence exists in the dataset.

Component details	
Type of result	Open-source result
Owner	TUBS
TRL expected	5
Type of license foreseen	GLP 3.0 License

3.1.1.6. Pipeline Orchestrator

The Pipeline Orchestrator receives analytical intents in a structured format from the Intent Compiler and generate data analytics pipelines according to the requested operations. The Pipeline Orchestrator sets up data processing or task execution pipelines to fulfil the so-called user intents. For that, ML algorithms are categorized depending on the ML task they achieve. Then, this categorization is used to assign algorithms to policies, depending on the user's high-level data analytics requirements specified within them. Next, metadata are extracted from the selected algorithms and from the data to be analysed. Finally, using this information together with the available preprocessing steps, valid pipelines are generated. Valid pipelines are those that achieve the user's analytical intent and ensure that the data flowing between pipeline components meets each component's preconditions (e.g., a component may require the input data to be numerical and normalized).

Component details	
Type of result	Open-source result
Owner	UPC
TRL expected	5
Type of license foreseen	GLP 3.0 License

3.1.2. Knowledge layer

At the core of CyclOps lies the **Knowledge layer**, which provides a backbone for data operations and decision-making. This layer is centred around the Integrated Knowledge Base (IKB), a repository of semantic assets like ontologies, annotations, and mappings that allow to provide an integrated and homogeneous view of the data sources to be considered, as well as automating processes within CyclOps.

This layer ensures the integration of structured, semi-structured, and unstructured data, enabling a unified approach to data management. Additionally, the Knowledge Layer enables components within CyclOps to write and consume annotations about the processes being executed, which ensure their interoperability and traceability.

The core functionalities within the Knowledge Layer include the design and mapping of ontologies, efficient query processing over virtual knowledge graphs, and the extraction and categorization of

concepts from text. Additionally, it supports explainability, traceability, and compliance with data standards such as GDPR by providing interpretable rules and explanations, thus promoting transparency and trust in AI-driven processes.

3.1.2.1. IKB Design

The IKB Design tool allows the user to build in a semi-automatic way the ontology and the mappings to the data sources for the IKB.

NextiaMG

NextiaMG automatically generates a global schema (ontology) and its corresponding mappings to the data sources, starting from structured and semi-structured data as in a data federation setting.

Component details	
Type of result	Open-source result
Owner	UPC
TRL expected	6
Type of license foreseen	GPL-3.0 license

MPBoot module

The MPBoot module is a tool for bootstrapping R2RML mappings and an ontology, starting from an initial relational instance. This tool is tailored towards relational constraints, and follows the so-called “mapping patterns” approach, where the aim is to reconstruct the entity-relationship (ER) diagram corresponding to the input relational instance by exploiting schema constraints, data, and user input. The ontology produced by the tool is an OWL encoding of the ER-diagram reconstructed from the source, and the mappings produced by the tools link the DB schema to the produced ontology.

Component details	
Type of result	Open-source result
Owner	UNIBZ
TRL expected	TBD
Type of license foreseen	TBD

Ontopic Studio Mapping Designer

While mapping bootstrappers accelerate the IKB design process, manual adjustments are often needed to improve the quality of the mappings and ontologies. These artifacts must also be maintained over time as the data sources and the business needs evolve. Ontopic Studio, a proprietary software developed by ONTOPIC, addresses these needs by providing a Web UI for storing and editing mappings and ontologies.

Component details	
Type of result	Commercial SW
Owner	ONTOPIC
TRL expected	8-9
Type of license foreseen	Proprietary

3.1.2.2. IKB Query Processing

The IKB query processing takes care of processing queries over the data sources, which are exposed as Virtual Knowledge Graphs. Such Virtual Knowledge Graph makes use of the mappings and the ontologies provided to the IKB by the IKB Design component.

The implementation relies on the open-source Ontop VKG engine and its commercial extension Ontopic Server.

Component details	
Type of result	Commercial SW
Owner	ONTOPIC
TRL expected	8-9
Type of license foreseen	Proprietary

3.1.2.3. IKB Metadata manager

The IKB metadata manager stores all the CyclOps metadata except IKB design artifacts (mappings and ontologies). Through its WebAPI, it provides the following features:

- Registration of datasets stored on the long-term storage
- Storage of annotations sent by the CyclOps components
- Retrieval of annotations

Component details	
Type of result	Open-source result
Owner	ONTOPIC
TRL expected	7
Type of license foreseen	Apache 2

3.1.2.4. IKB Exploitation

IKB Exploitation uses the resources in the knowledge base to automate operations, while also providing transversal features like traceability or GDPR compliance.

IKB Concept Extraction and Categorisation Engine

The **IKB Concept Extraction and Categorization Engine (IKB-CECE)** is a REST API that extracts structured data from text documents using user-provided ontologies. It supports PDF and HTML inputs alongside TTL ontology files, returning JSON outputs with extracted entities, their token positions, and matching methods.

The engine ensures **explainability** and **reproducibility** through a symbolic, rules-based approach, enabling users to trace each result back to the source text. It supports multiple domains, such as tourism, manufacturing, procurements, and environment—via dataspace identifiers, aligning outputs with the Integrated Knowledge Base (IKB).

Designed for semantic interoperability, IKB-CECE enriches unstructured content with ontology-aligned information, enabling complex queries that retrieve only the most relevant information.

Component details	
Type of result	Commercial SW
Owner	EXAI
TRL expected	4
Type of license foreseen	Proprietary

NLU tool

The NLU Module allows CyclOps to enrich texts from the IKB with extra information provided by NLP (Natural Language Processing) algorithms. The algorithms considered here are Named Entity Recognition (NER), Text Classification (TC) and Entity Linking (EL). Given a text, NER scans it for named entities, TC returns the topics the text is about, and EL connects the entities returned by NER to the information about them that can be found on [DBPedia](#).

Component details	
Type of result	Commercial SW
Owner	NTTD
TRL expected	3
Type of license foreseen	Proprietary

Multimodal Explainability module

The Multimodal Explainability Module will offer a comprehensive suite of explainability techniques for AI models, including multimodal AI algorithms. It will leverage the metadata stored in IKB that is associated with AI models and the dataset it was trained on to explain how an AI model arrived at a particular decision or prediction. The explainability component will feature both model-specific and model-agnostic approaches, offering diverse methods to generate clear, interpretable insights into model behaviour. It will integrate a variety of tools, presenting them in a structured, user-friendly manner to ensure that users can easily access the explainability resources they need.

Component details	
Type of result	Commercial SW
Owner	CEADAR
TRL expected	6
Type of license foreseen	TBD

3.1.3. Runtime layer

The **Runtime Layer** in CyclOps is responsible for managing the execution of data pipelines, including data ingestion, AI model management (including protection) and distributed execution. It forms the core of the CyclOps solution's ability to process data, manage machine learning models, and deploy them across distributed infrastructures.

It is divided into three main parts: **DataOps**, **AIOps**, and the **DEA (Data and Execution Abstraction)**. DataOps handles data ingestion, preparation, and transformation to make sure that the data is ready for analysis. AIOps focuses on the selection, optimization and deployment of AI models, managing both the algorithms and the models in a decentralized manner, while also providing AI model protection. DEA manages distributed execution, allowing workflows to be run across different computing infrastructures.

3.1.3.1. DataOps

The **DataOps module** provides services to support data management and preprocessing tasks within pipelines. DataOps ensures that data are properly transformed and cleaned before running analysis tasks over them. For that, it offers both data-based services (which directly interact with samples of raw data ingested from the sources) and semantic-based services (which leverage the domain knowledge in the IKB).

The DataOps module consists of a set of repositories and services. On the one hand, the repositories provide a set of functions to be used as operators in data pipelines (e.g., for data preparation, cleaning or integration). On the other hand, the services are tools that consider the user in-the-loop and allow CyclOps' users to get value-added services based on DataOps functionalities (e.g., discover relatedness measures, or quality constraints).

Data ingestion (Data Handling and Preparation)

This component enables the ingestion of data from various sources through different modalities, such as single/batch file(s) upload, upload through APIs, ingestion of streaming data through Kafka, etc., streamlining the overall data collection process.

Component details	
Type of result	Commercial SW
Owner	SUITE5
TRL expected	5
Type of license foreseen	Proprietary (for IT-1) / Open (for IT-2)

Data preprocessing and cleaning (Data Handling and Preparation)

This component plays a critical role in the preprocessing pipeline required for the training of ML models. It is designed to perform essential tasks, including cleaning, removing outliers, transformation/normalization, to ensure consistency and quality in the input data. By standardizing the data, managing missing values, and applying necessary transformations, this module ensures that the data is appropriately pre-processed, thereby optimizing it for subsequent analysis and ML model training.

Component details	
Type of result	Open-source result
Owner	FDI
TRL expected	5
Type of license foreseen	Apache license 2.0

Data-based Data Discovery (services)

This component finds similar or related datasets (either from local sources or dataspace) that can be integrated and propagated to analysis tasks.

The data-based level discovery profiles the data in order to find datasets that can be effectively crossed (e.g. via union or join operations) to enrich the input dataset, finding columns whose values are not only from the same domain but also have a similar distribution and granularity.

Component details	
Type of result	Open-source result
Owner	UPC
TRL expected	6
Type of license foreseen	GPL-3.0 license

Semantic-based Data Discovery (services)

This component finds similar or related datasets (either from local sources or dataspace) that can be integrated and propagated to analysis tasks.

The semantic-based level discovery aims to find similarities amongst semantic datasets (datasets containing semantic data and encoded in semantic formats such as Resource Description Framework (RDF), Terse RDF Triple Language (TTL), or other semantic file formats). The detection of these similarities consists in first using the textual description of the ontology classes to automatically identify mappings with the highest score. The relationships and correspondence between classes of two or more ontologies extends the discovery of similar entities within the semantic datasets.

Component details	
Type of result	Commercial SW
Owner	NTTD
TRL expected	3 (at the end of the project)
Type of license foreseen	Proprietary

Data Quality Rules Discovery (services)

This component automatically extracts the integrity constraints that hold in a raw dataset, preventing the user from manually defining rules to ensure the consistency of the data. Examples of constraints can be identifiers (there cannot be two rows with the same value, e.g. all persons have a different ID), functional dependencies (one column determines another column, e.g. if two rows have the same value in city, then they have the same value in country), order constraints (e.g. a higher salary implies a higher tax rate), or general constraints in the domain (e.g. salary cannot be negative). This component thus minimizes the time required to define quality rules and ensures completeness.

The rules are generated in the form of Denial Constraints, a formalism that is able to represent the different kinds of constraints (or quality rules) using a single formalism.

This component will return a reduced set of meaningful constraints, satisfied by most of the rows in the dataset according to the specified threshold, so that the user can choose which of them should be applied to curate the data.

Component details	
Type of result	Open-source result
Owner	UPC
TRL expected	6
Type of license foreseen	GPL-3.0 license

Semantic-based Data Curation (services)

The Semantic-based Data Curation component aims to ensure the quality of the data in semantic format, by using SHACL shapes, evaluating the semantic resources with FAIR principles. SHACL is a language for validating RDF graphs against a set of conditions, such as the minimum value of a property, the datatype, amongst others. The Semantic-based Data Curation component discovers implicit constraints in order to detect wrong elements or duplicities. Additionally, it considers FAIR principles to curate the data, guaranteeing that it is unique, normalized and not duplicated.

Component details	
Type of result	Commercial SW
Owner	NTTD
TRL expected	7 (at the end of the project)
Type of license foreseen	Proprietary

Data Augmentation (services)

The Data Augmentation module aims to enhance the robustness of AI models by generating synthetic variations of the original training data. This is achieved through the application of various transformations designed to expand and diversify the dataset. While data augmentation can contribute to improved generalisation, its effectiveness depends on careful design and appropriate use. In the context of CyclOps, which is intended to be domain-agnostic, the impact of augmentation strategies may vary and should be evaluated with consideration of the specific use case.

Component details	
Type of result	Commercial SW (TBD)
Owner	ATOS
TRL expected	4
Type of license foreseen	Proprietary

3.1.3.2. AIOps

AIOps module enables advanced AI-driven functionalities for data analysis, model development, and optimization.

As the DataOps module, this component is divided into repositories and services. The repositories provide algorithms, functions, or AI models to be composed in the data analysis pipelines, while the services are additional functionalities provided to the user on top of the repositories to facilitate the management of the algorithms and functions, and the deployment and monitoring of the models.

CyclOps Lab

The CyclOps Lab was initially conceived as a decentralized repository that enables users to track and manage their algorithms. By distributing code and data among multiple nodes, peer networks mitigate the risk of losing critical information due to central server outages or policy changes. This approach allows contributors to customize collaboration rules and avoid bottlenecks from a single “gatekeeping” platform.

This component includes an API that allows other CyclOps components to retrieve and utilize the algorithms while ensuring that the metadata of each public algorithm is managed by the IKB.

As the project progressed, the need for hands-on algorithm development and accessible repositories became evident. Consequently, the Decentralized Algorithms Repository evolved from a simple metadata-serving API to a comprehensive software solution — now referred to as the CyclOps Lab.

The CyclOps Lab extends the original concept by providing a fully integrated environment where users can:

- Edit existing algorithms or write new ones, with the flexibility to choose between decentralized networks (e.g., Radicle) or centralized repositories, depending on their specific needs.
- Manually define algorithm pipelines through a drag-and-drop interface that is interoperable with standard industry formats, such as Kubeflow pipelines and Apache Airflow.
- Integrate additional components easily, either through Docker containers or simple Python scripts, enabling rapid prototyping and testing.

Component details	
Type of result	Open-source result
Owner	CERTH
TRL expected	6
Type of license foreseen	Apache License 2.0

AI Models Repository

The AI Models Repository ensures secure storage, versioning and management of AI models developed in the AIOps module, upon their training and validation in the Decentralized Algorithms Repository.

Component details	
Type of result	Open-source result
Owner	SUITE5
TRL expected	7
Type of license foreseen	TBD

Optimisation Functions Repository

The Optimization Functions Repository is aimed at improving the efficiency, scalability, and overall performance of ML models. This repository provides a comprehensive set of tools and methodologies that streamline the optimization process, making it easier to refine models and ensure they meet desired performance standards.

Key features of the repository include:

- a variety of compression techniques that reduce the size of models without sacrificing accuracy, thereby enabling faster inference and lower computational costs
- hyperparameter tuning, which automates the process of finding the optimal set of parameters that improve a model's performance. This can be achieved through various search strategies such as grid search, random search, or more advanced techniques like Bayesian optimization and evolutionary algorithms.

Component details	
Type of result	Open-source result
Owner	FDI
TRL expected	5
Type of license foreseen	Apache license 2.0

AI Marketplace (services)

This component functions as an AI dashboard, offering users the ability to browse and select from a variety of AI algorithms present in the Decentralized Algorithms Repository. The interface also allows the user to select the Optimization functions for their ML models. The AI Marketplace includes a recommendation platform, functioning as a matchmaking system that suggests the most suitable AI algorithms based on the specific characteristics of the dataset provided and the application.

Component details	
Type of result	Commercial SW
Owner	CEADAR
TRL expected	6
Type of license foreseen	TBD

Model Deployment (services)

The Model Deployment component serves as an add-on to the CyclOps Lab, extending its functionality to handle the serialization, management, and deployment of machine learning models within the CyclOps framework. This component integrates MLflow for model tracking, versioning, and lifecycle management, and includes a custom-built API that automates the containerization of models for deployment.

Key Features:

- **Model Management with MLflow:** Utilizes MLflow to log, version, and monitor machine learning models, ensuring reproducibility and traceability throughout the model lifecycle.
- **Automated Containerization:** Provides a custom API that automatically packages trained models into Docker containers, facilitating seamless deployment across various environments.
- **Flexible Deployment Options:** Supports deployment of models as standalone services or as integrated components within the CyclOps ecosystem, allowing for versatile inference capabilities.
- **Standardized Model Formats:** Ensures models are serialized in standard formats (e.g., ONNX, TensorFlow SavedModel, PyTorch) to maintain compatibility and ease of integration.

Component details	
Type of result	Open-source result
Owner	CERTH
TRL expected	6
Type of license foreseen	Apache License 2.0

Feature engineering (services)

The Feature Engineering component is designed to assist the CyclOps user in selecting the appropriate features for their machine learning tasks based on statistical analysis, correlation analysis, and feature importance metrics. It highlights the best features related to the target of the ML task, enabling users to build more accurate and efficient models.

Features:

- **Feature Transformation:** Detects feature data types (e.g., numerical, categorical, datetime, text) and recommends appropriate transformations (e.g., scaling, encoding, imputation) based on feature characteristics.
- **Feature Selection/Importance:** Performs statistical tests to identify the most relevant features. Analyses feature correlations and allow users to remove redundant features based on this correlation. Also, it computes feature importance and their significance towards the target.
- **Reporting:** Provides analysis reports (e.g., correlation heatmaps, feature summary plots) to help users understand feature impact based on target. Allows users to evaluate the trade-off between the number of features and model accuracy.

Component details	
Type of result	Open-source result
Owner	UPC
TRL expected	5
Type of license foreseen	TBD

AI Model Protection (services)

This module safeguards AI models by actively monitoring for data drift during the inference phase. It continuously analyses incoming data and compares it with the original training dataset. Any discrepancies in schema, feature distribution, or statistical patterns are promptly identified. Detecting such changes is important, as data drift can compromise model accuracy and lead to biased or unreliable predictions.

Component details	
Type of result	Commercial SW
Owner	ATOS
TRL expected	4
Type of license foreseen	Proprietary

3.1.3.3. Data and execution abstraction

The Data and Execution Abstraction (DEA) module simplifies the complexity of underlying infrastructure, making transparent to CyclOps' users the execution of pipelines over a distributed environment.

Large-scale Data Management

The main purpose of the Large-scale Data Management component is to transparently distribute and access data structures during the lifecycle of workloads. The presence of this component enables CyclOps to process larger datasets in an efficient manner.

This component tightly integrates with the Distributed Execution Engine in order to improve data locality and increase throughput.

To achieve this objective, the foundation of the Large-scale Data Management is dataClay. This distributed data management system, dataClay, has the ability to handle distributed objects and execute methods. These capabilities make it a perfect candidate to achieve CyclOps goals by minimizing data movement and facilitating in-place computations. By leveraging dataClay, CyclOps can enhance the automation of data processing pipelines while optimizing performance and scalability.

Component details	
Type	Open-source software
Owner	BSC
TRL	8
Type of license	BSD 3-Clause

Distributed Execution Engine

The main objective of the Distributed Execution Engine is to execute the CyclOps Runtime Layer workflows in a distributed environment (e.g. HPC) exploiting the potential parallelism that the code may have and hiding the parallelization complexities.

This component interacts with the Large-Scale Data Management component to deal with data retrieval and to offload work through in-place data processing.

To provide the necessary execution abstractions, the DEE relies on the PyCOMPSs programming model and two libraries: DDS and dislib. PyCOMPSs is a Python framework designed to simplify the

development of parallel applications for distributed computing environments like HPC clusters and cloud platforms.

Component details	
Type	Open-source software
Owner	BSC
TRL	8
Type of license	Apache 2.0

3.1.4. Interoperability layer

The interoperability layer encompasses the components necessary for integrating the CyclOps solution with external data sources.

Regarding this layer, this deliverable only details the components expected in IT-1, although the diagram of technical component (Figure 2) also illustrates, for informational purposes, the components expected to be included in IT-2.

3.1.4.1. Broker

The broker enables the management of real-time contextual information. It acts as a central point for data exchange between different systems, applications, and devices.

Component details	
Type of result	Open-source result
Owner	FIWARE
TRL expected	TBD
Type of license foreseen	TBD

3.1.4.2. Semantic Interoperability

The Semantic Interoperability component ensures that data consumed and provided are properly aligned with standard schemas defined by the data spaces.

This architecture block accounts for the addition of semantic information to the sources, when available, based on the available semantic assets. It will be based on the pysmartdatamodels components with adaptation for the use cases and data sources of the CyclOps project.

It will help to provide persistence of the new semantic assets identified when they are general enough to be accepted in the Smart Data Models initiative.

Component details	
Type of result	Open-source result
Owner	FIWARE
TRL expected	TBD
Type of license foreseen	TBD

3.1.4.3. FIWARE connector

The FIWARE Data Space Connector is one of the connectors currently available on the market and has been selected to enable CyclOps to connect to compatible data spaces, allowing secure, reliable, and controlled data exchange in accordance with established standards. This component is an integrated suite of modules.

Component details	
Type of result	Open-source result / commercial SW
Owner	FIWARE
TRL expected	TBD
Type of license foreseen	TBD

3.1.4.4. Identity management

These are the CyclOps components responsible for the provision of identity across the different resources to be accessed by the CyclOps solution. These components provide expanded capabilities to the FIWARE Data Space Connector.

SSI Wallet

The SSI Wallet is a mobile app that lets users — such as employees and customers — securely store, manage, and share digital credentials. It's built to follow the guidelines from the European Blockchain Services Infrastructure (EBSI) and is designed to work with the EU Digital Identity Wallet (EUDIW) standards.

Component details	
Type of result	Commercial SW
Owner	ATOS
TRL expected	5
Type of license foreseen	Proprietary

SSI Agent

The SSI Agent has been developed in line with the DSBA Technical Convergence architecture for secure identity (SSI) issuing and authentication for Relying Party organizations including Data Space Consumers. It is designed to work smoothly with EBSI and eIDAS and additionally is aligned with GAIA-X.

In practical terms, the SSI Agent supports the following functions:

- **Issuing Verifiable Credentials** to employees and customers on behalf of both consumer and provider organisations.
- **Checking Verifiable Presentations** as part of the authentication process, helping organisations confirm the identity and role of users.
- **Using credential templates** that allow members of consumer or provider organisations to prove their role or status, based on a shared trust framework set for the Data Space.
- **Providing an adapter module** to connect with the trust framework used by the Data Space — for example, to integrate with trust anchors, approved participant lists and trusted issuer lists.

This approach helps ensure secure and trusted digital interactions between organisations in a consistent and standards-based way.

Component details	
Type of result	Commercial SW
Owner	ATOS
TRL expected	5
Type of license foreseen	Proprietary

VC Verifier

The VC verifier supports the Verification of Verifiable Credentials during authentication/authorization.

Component details	
Type of result	Open-source result
Owner	FIWARE
TRL expected	TBD
Type of license foreseen	Apache 2.0

4. EXPLOITATION PATHWAYS

The exploitation pathways of the project are structured in five main directions: further research, education and training, monetisation, standardisation, and policy recommendations.

This deliverable presents the key activities identified during this first period for each of the exploitation paths, based on bilateral discussions held with the partners. This exercise will continue in the second period of the project, fostering synergies among the different entities around the identified activities, which in turn will enhance the project's impact. This exercise will be regularly iterated with the partners, and the status of these activities and the results achieved will be monitored.

Figure 3 provides an overview of the key activities identified for each exploitation pathway.

4.1. Further Research

The further research pathway includes activities focused on investigation and study to build upon the achievements of the CyclOps project. This involves advancing, refining, and broadening the project's technical outcomes, knowledge, and use cases through new research and innovation efforts.

The Partners' interests in this pathway can be classified into 2 key topics: **(1) gaining capabilities** in topics like Data Spaces, AI model optimization and explainability, Data Knowledge Graphs, Mapping Language or Distributed computing, among others; and **(2) publication of papers**, either from a global or domain-specific perspective.

4.2. Training and education

The training and education pathway involves enriching teaching content by integrating the experiences and results derived from the project. The goal is to enhance the educational materials offered by universities and develop training content for companies, ultimately contributing to the development of technical skills in the workforce.

With this in mind, the primary target audience for these advancements includes academia and professionals within the project's specific domains, although the reach can be extended to the general public.

Another interesting path for exploration is hackathons; leveraging some of the partners' previous experience in hosting such events, a hackathon for the CyclOps project could generate new ideas for the solution's development of further uses beyond the project.

4.3. Standardisation

This pathway emphasises participation in technical committees and their working groups. The aim is to provide insights and recommendations to the standardisation committees, at national and at EU level, contributing to the creation and refinement of standards that will guide the future development of the main topics of the project.

Getting familiar with current and potential standards in development can be also part of this pathway and useful for some partners, especially in the framework of the compliance with different EU Acts that will be operationalised by standards.

In order to advance this pathway, several partners have identified potential areas of influence which are considered relevant, like language standards, semantics, smart data models, OpenEO, and reference continuum architecture, among others.

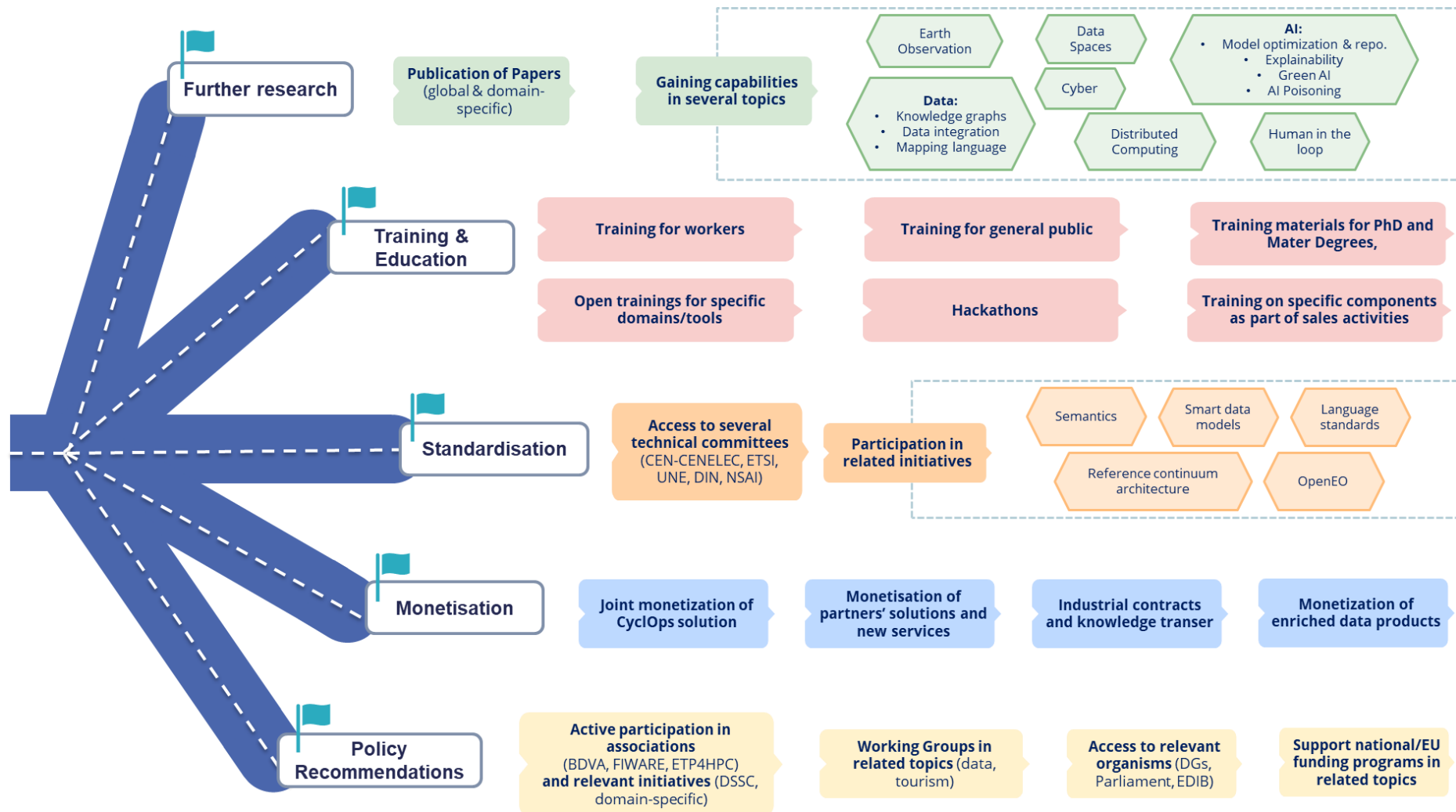


Figure 3 CyclOps exploitation pathways map

4.4. Monetisation

This pathway emphasises the practical application and market deployment of the acquired knowledge and technical advancements with the aim of revenue generation. Some of the CyclOps partners aim to obtain an economic return through either **(1) the joint monetization of the CyclOps solution, (2) the monetization of their own enhanced solutions and new services, (3) acquiring new industrial contracts or knowledge transfers** with external entities; or **(4) selling enriched data products**, either individually or through collaborative efforts within the consortium.

Certain entities within the consortium have established their own spinoffs and are open to commercializing both the joint and individual solutions developed through the project. This approach would leverage the unique strengths and market positions of each partner, facilitating the effective dissemination and monetization of the project's outcomes.

More details on the specific monetisation interests per partner can be found in the 'Individual Exploitation Plans' section.

4.5. Policy contributions

Within the context of CyclOps, the strategy for influencing policy involves engaging directly or indirectly with policymakers and regulatory bodies to shape the policies governing the project's primary domains. This will be achieved through the partners' connections with key organizations such as the Directorate General for Digital Services and the European Data Innovation Board (EDIB). Some partners provide valuable insights to national and EU governments and policymakers, contributing to the development and preparation of funding plans.

Additionally, several partners are actively involved in working groups on related topics such as data, information processing, tourism, sustainability, and printing industry. The consortium has access to key players in the fields of data spaces, such as the Big Data Value Association (BDVA), FIWARE and the Data Spaces Support Centre (DSSC), and in other relevant domains such as the European Technology Platform for High Performance Computing (ETP4HPC).

As the project progresses, more specific areas of influence will be identified, while the required channels for action are already in place (see D7.2 for the report of liaisons and synergies).

5. INDIVIDUAL EXPLOITATION PLANS

The following section presents the individual exploitation plans of each project partner. Partners have been grouped according to the type of entity (Large Entity, SME, RTO, Academia, and Association) to facilitate understanding of their approaches.

5.1. Large Entities

5.1.1. ATOS

ATOS is a multinational IT services and consulting company, which provides solutions in cybersecurity, cloud, employee experiences, and digital transformation. The company focuses on delivering technological solutions to enhance business operations and efficiency.

5.1.1.1. Objective and motivation for participation

ATOS is participating in the project with two teams: Robustness AI and Identity Management. Its primary objective is to augment the capabilities of its solutions and add value to its comprehensive portfolio in these domains. As a technology provider, its primary interest lies in monetising its capabilities and technological solutions.

In the case of Robustness AI, the objective is to continue expanding its services portfolio in Protecting AI. For Identity Management, they aim to evolve capabilities and solutions to fit into the Evidian Orbion (Identity as a Service). This service is closely related to data spaces, which is why they are actively involved in GAIA-X and IDSA (International Data Spaces Association). Additionally, they are working on developing their proprietary data connector.

5.1.1.2. Technological contributions

As mentioned earlier, ATOS will contribute to the project with capabilities in Robustness AI and Identity Management.

5.1.1.3. Exploitation interests

ATOS is interested in the following exploitation key points:

- **Research:**
 - ATOS will explore new ways to improve their solutions.
- **Education and Training:**
 - Not interested.
- **Standardisation:**
 - ATOS participates in several technical committees, but they don't expect to participate in this kind of activities related to the CyclOps project.
- **Monetisation:**
 - ATOS aims to sell their solutions and enhance their portfolio through the project, focusing on expanding their market reach and impact.
- **Policy Contributions:**
 - Not interested.

5.1.1.4. Other information

ATOS has had prior contributions to European cybersecurity initiatives such as the European Cyber Security Organisation (ECSO) and the European Wallet Identity Ecosystem. They have experience in EU projects and can bring lessons learned from previous projects to CyclOps, such as:

- [Digital Credentials for Europe | DC4EU](#) (Digital Europe Programme Large Scale Pilot).
- [EU Digital Identity Wallet - \(europa.eu\)](#).

5.1.2. AVORIS

Avoris Retail Division (AVORIS) is the travel division of the Barceló Group, a Spanish company based in Mallorca. AVORIS specializes in travel arrangement and reservation services.

5.1.2.1. Objective and motivation for participation

The main objective of AVORIS' participation in the CyclOps project is to enhance its understanding of customer behaviour and anticipate customer needs to offer complementary services. AVORIS aims to shift from a push marketing strategy, which involves selling predefined travel packages, to a more personalised approach based on customer behaviour, travel preferences, age, and financial status. This transition is intended to improve digital marketing efficiency and offer more tailored solutions to customers. By learning and adapting gradually, AVORIS seeks to understand how to better organise travel experiences and the customer behaviour to suggest relevant activities during their trips.

5.1.2.2. Technological contributions

AVORIS will use the solutions developed in the project as a player in the tourism use case. They will contribute to the requirement definition, testing and validation of the technical tools leveraging their data.

5.1.2.3. Exploitation interests

Through the project the company main exploitation interests are:

- **Research:**
 - AVORIS is interested in incremental service innovation through research application.
 - They plan to bring knowledge from use cases tested in real environments to refine their offerings.
- **Training and Education:**
 - AVORIS is interested in upskilling their employees, aiming to shift their mindset towards understanding and leveraging data for better customer engagement. This

"evangelisation" process is crucial for the successful adoption of new marketing strategies.

- **Standardisation:**
 - Standardisation is not directly applicable to AVORIS.
- **Monetisation:**
 - The primary focus for AVORIS is monetising the tested solutions. They intend to update its business model. By predicting customer behaviour and understanding competitor offers, AVORIS aims to sell more relevant and appealing travel products. They also plan to negotiate travel offers based on the analysis conducted within the project.
- **Policy contributions:**
 - Currently, AVORIS does not foresee making significant policy contributions. However, they might consider providing recommendations in the future, depending on project outcomes.

5.1.2.4. Other information

No more information.

5.1.3. EXAI

Expert.ai (EXAI) is an Italian company that uses a hybrid approach combining symbolic AI, large language models, generative AI, and agentic AI to offer industry-specific solutions. Their technology enhances business outcomes by automating complex processes and improving decision-making efficiency.

5.1.3.1. Objective and motivation for participation

The main objective of EXAI's participation in the project is to leverage its expertise in natural language processing (NLP) and AI to enhance text analysis, particularly in the context of green deal. EXAI focuses on enhancing AI explainability and ethical standards, addressing the "black box" issue. The company's primary objective is to improve transparency in text analysis through various techniques.

EXAI is also interested in using CyclOps' results for green model optimisation, providing added value through tools that accelerate the development of pipelines and enhance quality standards, reducing the resources needed for this analysis.

EXAI aims to engage with end-users within the project, particularly in the climate change and tourism domains, to gather feedback and refine its solutions. Furthermore, the company has a roadmap to approach similar end-users in different domains and offer them tailored solutions in later project phases.

Additionally, EXAI is interested in participating in Data Anonymisation and Management. They use anonymisation and data extraction techniques to maintain privacy and confidentiality of their clients' information.

5.1.3.2. Technological contributions

By leveraging its proprietary knowledge graph and employing a hybrid approach that integrates statistical and linguistic rules with machine learning algorithms, EXAI aims to improve the management of non-structural data. This approach ensures that the reasoning behind AI decisions is understandable and interpretable, fostering trust and accountability in AI applications.

Additionally, EXAI contributes to sustainable strategies, particularly in the realm of climate change, by enhancing transparency in AI applications.

Specifically, EXAI's concrete contributions are:

- **Green AI Models Optimization:** EXAI is dedicated to optimising AI models to reduce their environmental impact, aligning with the objectives of the green deal and sustainability initiatives.

- **Human in the Loop - Explainability:** EXAI integrates human oversight into their AI systems, ensuring transparency and explainability in their decision-making processes, which is crucial for building trust and accountability.
- **GDPR Recognition Tool:** EXAI has developed a GDPR recognition tool that anonymizes content after identifying potential GDPR compliance issues. This tool ensures that data handling practices adhere to GDPR regulations, mitigating privacy risks.
- **Green Deal Domain:** EXAI focuses on contributing to the Green Deal domain by enhancing the precision of its tool for this domain.

5.1.3.3. Exploitation interests

EXAI's main exploitation interests are the following:

- **Research:**
 - EXAI aims to continue working on explainability, green AI, and transparency in its research efforts. It seeks to innovate by applying its knowledge graph approach to new domains and patterns.
- **Training and Education:**
 - EXAI includes professional training services in its client implementation projects, mainly covering general AI knowledge and specific topics for the client. It will be explored whether there could be any synergy on this topic with another partner.
- **Standardisation:**
 - Not planned.
- **Monetisation:**
 - The expert.ai platform is expected to evolve thanks to the knowledge and capabilities generated in CyclOps, which will lead to a stronger market position and an enhanced service offering.
- **Policy Contributions:**
 - While EXAI does not see itself directly contributing to policy, it acknowledges the importance of transparency and interpretability in AI applications for the public good.

5.1.3.4. Other information

EXAI is participating on the generation of the Italian LLM.

5.1.4. GRD

Garden Hotels is a hotel chain. It has 10 hotels, most of them in the Balearic Islands, another in Huelva, and they are going to start operating another one in the Dominican Republic.

5.1.4.1. Objective and motivation for participation

GRD's primary motivation for participating in the CyclOps project stems from its vision to enhance guest experience and operational efficiency within the tourism sector.

GRD aims to leverage CyclOps technology to gain a better view of guest interactions (mainly in real time) from departure to return and then, improving service delivery and overall customer satisfaction. Currently, they work with forecasts, they do not have real-time information about customers. Having this information through the implementation of data spaces would allow them to provide better services.

Ultimately, GRD participates here to learn and be part of the innovation ecosystem, aiming to identify new trends, use cases, and synergies.

5.1.4.2. Technological contributions

GRD will use the solutions developed in the project as a player in the tourism use case. They will contribute to the requirement definition, testing and validation of the technical tools leveraging their data.

5.1.4.3. Exploitation interests

The exploitation main interests of GRD are the following:

- **Research:**
 - GRD is interested in exploring topics as behaviour profiling and real-time incident identification to enhance guest experiences and operational efficiency.
 - The focus is on investigating client profiles and behaviour patterns to tailor services and improve customer satisfaction.
- **Education and Training:**
 - GRD plans to conduct training sessions to transfer knowledge and innovation to hotel associations. They aim to increase their reputation within the tourism ecosystem and promote participation in European projects. Supporting the replication of the experience could also be a key point.
 - As a recommendation, developing toolkits and learning materials for hotels could facilitate the adoption of innovative practices and mindset changes within the industry.
- **Standardisation:**
 - Ensuring quality standards for future operations is a priority for GRD. They aim to contribute to the standardisation efforts within the project to streamline processes and enhance efficiency.
- **Monetisation:**
 - GRD aims to increase direct sales to clients and reduce reliance on tour operators. By leveraging insights from the project, they seek to optimise sales strategies and improve revenue generation.
- **Policy contributions:**
 - The tourism sector is very relevant to the EU's GDP, where it represents 10% (for example, the automotive sector represents 8%). It is also a very fragmented market.
 - Additionally, many different tools are currently used for daily operations, and everything is not integrated. It would be very beneficial to simplify all of this, have complete integrated platforms, etc. The implementation of data spaces in the sector itself would be very beneficial. Participation at the national and EU levels could foster initiatives in this direction.

5.1.4.4. Other information

The hotel ecosystem in Spain is very mature. Hotels have formed associations at different levels and in clusters. This scenario is not equivalent in other destinations. It has allowed for greater maturity of the entire sector, sharing of best practices and innovations, general improvement, etc. This could represent a new channel to disseminate the experience and solutions developed in the project.

5.1.5. NTTDES

NTTDES is a global IT service provider, responding to business needs through information technology. They have wide expertise in innovation projects, deploying its knowledge and its innovative, industry-leading solutions.

5.1.5.1. Objective and motivation for participation

NTTDES's primary motivation to join the CyclOps project is to increase capabilities of an internal technological asset, which is a toolkit of semantic based solutions, covering the lifecycle of production, maintenance and exploitation of knowledge graphs.

Additionally, the participation in the project will allow for continued growth in knowledge and experience in the domain of data spaces, as well as strengthening the entity's positioning in the market in this aspect.

On the other hand, NTTDES leads the use case for the Public Procurement, whose purpose is to enhance Small and Medium Enterprises' (SME) participation in Public Procurement. This use case will enable the generation of new capabilities and the dissemination of the project in the Public Sector, the policymakers field and SME alike.

5.1.5.2. Technological contributions

NTTDES provides significant technical expertise and components in semantics and data spaces technologies through the active participation of the entity in most of the EU-funded data spaces initiatives within the ecosystem.

5.1.5.3. Exploitation interests

NTTDES has outlined its priorities across the five exploitation pathways:

- **Research:**
 - Increase expertise in data discovery, curation, quality, and vocabulary hub solutions.
 - Gain more knowledge in data spaces.
 - Explore new use cases around the Public Procurement Data Space (PPDS).
 - While scientific publications are not a priority, participation in conferences is of interest to gain visibility and insights.
- **Training and Education:**
 - No actions planned.
- **Standardisation:**
 - No actions planned.
- **Monetisation:**
 - NTTDES expects to monetise through public tenders for the deployment of data spaces and requests for data processing in public administration primarily. Participation in the project allows for strengthening the entity's own solutions and capabilities in this regard to improve its market positioning, as well as incorporating new references.
 - NTTDES will also disseminate the public procurement use case with the aim of attracting new clients to it and monetizing through the sale of professional services.
- **Policy Contributions:**
 - They participate in conferences and events to share insights about CyclOps project and PP use case, such as Data Week, EBDVF, and the FIWARE Global Summit, among others.
 - Support national agencies, leveraging the PP use case.

5.1.5.4. Other information

No more information.

5.2. SMEs

5.2.1. APIDAE

APIDAE is a collaborative public platform in France dedicated to tourism. It enables tourism professionals to efficiently share, manage, and distribute tourist information. Originally created to improve the visibility and quality of the tourism offer, APIDAE fosters collaboration among key stakeholders - tourist offices, accommodation providers, activity organizers, event planners, and more. The platform provides a suite of tools for data management, content creation, and multi-channel information distribution. By streamlining operations and facilitating partnerships, APIDAE helps its members deliver a richer and more consistent experience to visitors. This is the first EU innovation project for them.

5.2.1.1. Objective and motivation for participation

APIDAE joined the CyclOps project with the objective of developing new use cases in collaboration with European partners. The primary motivation is to enhance the quality and completeness of the data and the tools it manages by leveraging cross-border cooperation and shared expertise. Through its participation, APIDAE aims to contribute actively to research and innovation in tourism data management, fostering interoperability, scalability, and improved services for tourism stakeholders.

5.2.1.2. Technological contributions

APIDAE is involved in the tourism-related use case, bringing its domain expertise and providing access to relevant datasets. They will contribute to the requirement definition, testing and validation of the technical tools leveraging their data.

5.2.1.3. Exploitation interests

APIDAE has prioritised the following exploitation interests:

- **Research:**
 - APIDAE places a strong emphasis on research activities aimed at validating business processes within concrete use cases and increasing their relevance and attractiveness.
 - The organization is particularly interested in testing and developing new Tourism use cases, with a focus on exploring Software as a Service (SaaS) models and data-sharing frameworks.
 - A key area of interest is the improvement of tourism data quality using artificial intelligence, data science, semantic data models, and the integration of local services.
- **Education and Training:**
 - Use of CyclOps outcomes to support better understanding and adoption of AI methods in tourism data processing, within APIDAE's network.
 - APIDAE is considering the development of training services to support stakeholders in adopting innovative data practices and tools derived from the project's outcomes.
- **Monetisation:**
 - While direct monetisation is not foreseen in the short term, APIDAE anticipates cost reductions through the adoption of CyclOps technologies and methodologies, especially in data processing and service delivery.
 - It is also possible the use of the CyclOps solution in internal or member-oriented services.
 - APIDAE may also help disseminate relevant solutions across its ecosystem.
- **Policy contributions:**
 - APIDAE intends to be actively involved in policy-related discussions and studies, particularly through its engagement in the EONA-X network. The goal is to contribute to shaping the governance and regulatory frameworks for tourism data at both national and European levels.

5.2.1.4. Other information

No more information.

5.2.2. ASOL

AnySolution (ASOL) is an innovative and dynamic SME based in Spain that focuses on developing methodologies and strategic projects in the fields of R&D, Tourism, Smart Cities, Smart Destinations and Emergencies, among others. ASOL brings its expertise in data management and analytics, jointly with its deep knowledge of the tourism sector. It also coordinates the Common European Data Space of Tourism.

5.2.2.1. Objective and motivation for participation

The main objective of ASOL is to gain knowledge and capabilities in the project's data technologies, so that they can be provided to its clients and potential clients. This will also allow them to improve their positioning and market share. Strengthening knowledge in these technologies, and specifically in data spaces, allows them to improve their value proposition and communicate with stakeholders in the tourism sector to help them better understand it and its benefits. This will help them improve their value proposition and better identify and solve customer problems. Additionally, their participation in the tourism use case will provide them with a reference to show their potential clients and indicate that it has been positively tested.

Additionally, synergies are expected to be generated with the project's partners on common topics.

5.2.2.2. Technological contributions

ASOL is involved in the tourism use case, where it expects to use its own data management platform based on FIWARE. This platform collects data from heterogeneous sources, organizes it, and allows for its visualization. The integration of this platform with data spaces will greatly expand its possibilities. The entity's participation in the project is expected to facilitate the expansion of these platform capabilities. Additionally, since the tourism sector is quite cross-cutting, the connection with data spaces from related sectors (mobility, cost management, green deal) is expected to be particularly relevant.

5.2.2.3. Exploitation interests

ASOL's exploitation interests are the following:

- **Research:**
 - ASOL is interested in exploring new opportunities to gain capabilities in data analytics and data spaces, enabling the evolution of its portfolio of services and solutions.
 - ASOL is also very interested in generating knowledge around data space connectors and exploring possible opportunities in the field.
 - They are interested in publishing a joint paper regarding the overall solution and the use cases.
 - ASOL is open to participating in other initiatives that allow them to continue expanding their capabilities.
- **Training and Education:**
 - They show interest in exploring collaborations around data management in tourist destinations in business and tourism degrees. In the past, they cooperated with the University of Valencia, which could be resumed.
 - They also have some collaboration with the University of the Balearic Islands in hospitality, tourism, and joint degrees.
 - They also have some connections with the University of Castilla-La Mancha around research.
- **Standardisation:**
 - ASOL participates in the review of the national security framework and exploring opportunities to contribute to create norms or standards. However, this is not their main priority.
- **Monetisation:**
 - ASOL expects to monetize through new opportunities that arise based on its data-driven platform and related professional services. They aim to work on data management tools to facilitate efficient data use and offer analytics services to help entities manage data better. ASOL aims to monetise by offering data-driven solutions and tools to support European tourism destinations.
 - On the other hand, ASOL will leverage the project to explore possible opportunities as a data intermediary.
- **Policy Contributions:**
 - ASOL expects to participate in political decisions at the European level to raise awareness of the issues faced by companies from tourism sector.

5.2.2.4. Other information

ASOL is actively involved in discussing about CyclOps with the Spanish Secretary of State for Digitisation and Artificial Intelligence and participating in the National Interministerial Data Working Group. They have also connections with various European organizations (DG Digital, JRC, among others) to promote these topics. It will be explored whether these connections could be useful for the project.

ASOL is coordinating the European Competence Centre for data management in tourist destinations (D3HUB). They will start selecting 40 destinations to provide training and support on: managing their

needs, how they can collect and use this data. In this, CyclOps could offer a solution by providing the tool.

The JRC aims to improve the European tourism dashboard (content is good but the visualization is not pleasant/practical). At a European level, it would be good to have a tool for tourism so that various entities can access this data, and then it can be purchased for studies/analysis.

5.2.3. CP

ColorPrint (CP) is a Greek SME specialised in marketing packaging for drugs and cosmetics. This is the first EU-funded project for them.

5.2.3.1. Objective and motivation for participation

CP aims to leverage the CyclOps project to delve into data-driven solutions. The motivation stems from CP's desire to be involved in data-related processes and enhance its reputation by collaborating with other organisations. Additionally, CP sees an opportunity to bring added value to its partners in the printing industry by promoting greener practices.

CP participates in the project with the ultimate goal of improving its industrial processes thanks to the services developed in the project. By using the operational data from this partner and PRES, a more robust predictive maintenance AI model is expected to be generated that can be used by both companies, reducing downtime and waste.

CP's involvement in the project aligns with their long-term vision of fostering innovation and sustainability within the printing industry, contributing to a greener future while enhancing their own business strategies.

5.2.3.2. Technological contributions

CP plays a crucial role as a data provider in the manufacturing use case (UC4). This data is key to create a better predictive maintenance service for the printing machines. They will contribute to the requirement definition, testing and validation of the technical tools leveraging their data.

They have machinery from Heidelberg Druckmaschinen AG (as PRES) for printing. They have collected operational data in the last two years ago. They have a program to control the waste.

5.2.3.3. Exploitation interests

CP has expressed their interest in the following exploitation pathways:

- **Research:**
 - CP plans to collaborate with external companies to enhance processes, such as waste reduction through automation, thereby gaining new insights and knowledge in the printing industry.
- **Education and Training:**
 - CP aims to prepare training materials to educate workers on adapting their work processes, enabling them to embrace new technologies effectively.
- **Standardisation:**
 - No interest.
- **Monetisation:**
 - Printing industry is very important. There are many opportunities in EU for this industry.
 - The focus here is on improving CP's strategic positioning within the industry, potentially leading to better monetisation strategies and market positioning.
- **Policy Contributions:**
 - CP participates in working groups such as the Greek Printing Association, contributing to policy discussions and initiatives within the printing industry.

5.2.3.4. Other information

No more information.

5.2.4. DC

DataCalculus (DC) is an Estonian start-up with a team of 10 people and additional subcontractors, specializing in advanced data analysis and machine learning. It offers highly automated software designed to enhance productivity for data experts and enable executives to develop AI-driven strategies efficiently. DC covers various data mining techniques, data visualization, anomaly detection, among others.

5.2.4.1. Objective and motivation for participation

The primary objective of DC's participation in the CyclOps project is to expand their technology by leveraging data analytics and visualisation capabilities. DC is keen to test new developments in pilots and gain valuable feedback from end-user partners. This involvement will help DC explore new markets, expand revenue, and share market opportunities with partners.

DC, as expert in data analytics and visualisation, provides a product that covers data visualisation and pattern findings in databases.

Over the past year, DC has transitioned to a cloud-based solution, focusing on product development and seeking partners for further advancements.

5.2.4.2. Technological contributions

DC is going to contribute technologically to the development of several components in the User Intent Layer.

5.2.4.3. Exploitation interests

DC will mainly work on the following exploitation pathways:

- **Research:**
 - DC is open to participating in joint publications, which could be valuable for the Horizon Europe program and project evaluation by showcasing CyclOps's contributions and enhancing the project's impact.
- **Training and Education:**
 - While not a current priority, education and training present future opportunities for DC. They aim to bring their knowledge and new developments to end-users, enhancing product adoption and user experience.
- **Standardisation:**
 - DC is interested in standardisation and certification processes, recognising its potential to ensure product quality and interoperability.
- **Monetisation:**
 - Monetisation is a priority for DC. They are interested in selling their products and developing their capabilities in data analytics and visualisation through a user-centric platform. Additionally, the catalogue of data sets could become a revenue source due to high demand.
- **Policy contributions:**
 - Not applicable.

5.2.4.4. Other information

No more information.

5.2.5. FDI

Four Dot Infinity (FDI) is an SME based in Athens, with a team of around 20 dedicated professionals specialized in Industry 4.0 solutions. It focuses on leveraging artificial intelligence, machine learning, and advanced telemetry to enhance business operations.

5.2.5.1. Objective and motivation for participation

The company aims to expand their capabilities in AI models for optimization and predictive maintenance and gain expertise in data spaces. They have also had preliminary discussions with PRES about a potential collaboration business opportunity.

FDI's primary objective for participating in the project is to get involved in the validation of technology on printing factories. The company aims to collect and analyse data from data spaces and leverage various technologies that will be used for future projects. They intend to provide AI as a service post-project and explore potential monetisation opportunities, such as subscription models, with the goal of minimising consumption in printing, which presents a significant market opportunity.

5.2.5.2. Technological contributions

FDI's technological contributions involve working with federated learning models and providing enriched data analysis services. The partner will also engage in AIOps and contribute to the architecture definition process over the coming months. By exploring CyclOps' solutions for data extraction and potential integration with their portfolio, FDI aims to enhance customer experience and simplify company processes.

5.2.5.3. Exploitation interests

FDI is interested in the following exploitation key points:

- **Research:**
 - The objective is to expand capabilities in AI models for optimisation and predictive maintenance.
 - FDI is interested in getting data spaces knowledge and they are also interested in publishing research papers in the data spaces field in collaboration with project partners, including CERTH.
- **Education and Training:**
 - Not interested.
- **Standardisation:**
 - Not involved.
- **Monetisation:**
 - FDI plans to expand the portfolio in AI models for optimisation and predictive maintenance and sell professional services to potential customers.
 - FDI also intends to enter in new sectors with its expanded portfolio.
 - FDI is open to explore joint exploitation opportunities, intending to accompany customers and clients, ensuring alignment between the project and their long-term company strategy.
- **Policy Contributions:**
 - FDI is not directly involved at the EU or national policy level.

5.2.5.4. Other information

FDI is actively seeking to join EU associations to expand their network and positioning.

5.2.6. ONTOPIC

ONTOPIC is a spin-off of the Libera University of Bolzano focused on developing innovative products and services in the field of data integration and data access through the emerging technology of virtual knowledge graphs.

5.2.6.1. Objective and motivation for participation

The main objective of ONTOPIC's participation in the CyclOps project is to expand its semantic capabilities, enhance its knowledge graph expertise and learn about data spaces.

ONTOPIC also aims to identify common topics among partners to generate synergies.

5.2.6.2. Technological contributions

ONTOPIC owns a closed solution with semantic technologies that could be used and improved during the project. The consortium could have free access to these components, but a fee will be applied beyond the project's duration.

5.2.6.3. Exploitation interests

Within the project, ONTOPIC will mainly be involved in the following exploitation activities:

- **Research:**
 - ONTOPIC aims to increase its expertise in knowledge graphs.
 - On the other hand, ONTOPIC aims to increase its knowledge in the domain of data spaces (they lack prior expertise in this area) and exploring new opportunities, particularly in security (decentralised manner, OpenID). Additionally, they aim to gain knowledge on use cases and verticals within data spaces.
- **Training and Education:**
 - Training services are part of the ONTOPIC's sales process, including presales and awareness activities.
- **Standardisation:**
 - As UNIBZ, ONTOPIC is actively involved in providing feedback from an industrial perspective within the W3C working group.
- **Monetisation:**
 - Through their participation in CyclOps, ONTOPIC expects to significantly improve their knowledge and market positioning, ultimately leading to the development of better data products and services.
 - ONTOPIC plans to expand its suite as a horizontal solution, particularly when semantics are involved. They are interested in vertical applications of their solution for green data spaces (UC2). Additionally, they aim to leverage the EONA-X use case (UC1) to enter new markets.
 - ONTOPIC aims to expand its portfolio by developing comprehensive solutions that meet customer needs. Understanding the roles and agreements with other partners is crucial for enhancing their service offerings.
 - Monetisation strategies include creating better data products and offering end-to-end solutions, enhancing its portfolio and attracting customers interested in comprehensive data solutions.
- **Policy contributions:**
 - Currently, ONTOPIC does not have specific policy contributions planned. However, they are open to explore opportunities with national agencies and working groups at the European Commission level in the future.

5.2.6.4. Other information

They are exploring its role as a data intermediary and developing data products that leverage their technological capabilities.

5.2.7. PRES

PressiousArvanitidis (PRES) is a family-owned company based in Greece with over 50 employees that offers printing solutions. They have experience in 5 H2020 and Horizon Europe projects.

5.2.7.1. Objective and motivation for participation

PRES participates in the project with the ultimate goal of improving its industrial processes thanks to the services developed in the project. By using the operational data from this partner and ColorPrint, a more robust predictive maintenance AI model is expected to be generated that can be used by both companies, reducing downtime and waste.

PRES highly values the identification of new synergies with consortium members, such as FDI, with whom they have a close relationship through various projects.

5.2.7.2. Technological contributions

PRES plays a crucial role as a data provider in the manufacturing use case (UC4). This data is key to create a better predictive maintenance service for the printing machines. They will contribute to the requirement definition, testing and validation of the technical tools leveraging their data.

5.2.7.3. Exploitation interests

PRES is mainly interested in the following activities regarding the defined exploitation pathways:

- **Research:**
 - PRES is focused on research and development of new technologies, with an emphasis on artificial intelligence. They aim to be a key player in innovation, providing data and a use case that drive forward the CyclOps project.
 - PRES also has a track record of publishing scientific papers in AI, demonstrating their commitment to advancing knowledge and technology.
- **Training and Education:**
 - PRES could have interest in training its IT workforce, but as they have a small IT team, it has low interest. As a comment, they suggest that the developed tools should be easy for workers to use.
- **Standardisation:**
 - While PRES does not currently have specific standardisation activities, they remain open to exploring opportunities for developing and implementing new standards in collaboration with industry partners.
- **Monetisation:**
 - PRES aims to increase its market position and competitiveness by leveraging CyclOps solutions. By integrating these innovative solutions, PRES seeks to establish itself as a market leader and expand its portfolio into new sectors, attracting new customers and enhancing its offerings.
- **Policy contributions:**
 - PRES is interested in participating in European printing industrial groups. By engaging in these policy discussions, PRES aims to influence industry standards and contribute to the broader adoption of innovative technologies.

5.2.7.4. Other information

No more information.

5.2.8. SUITE5

SUITE5 is an SME based in Cyprus that focuses on big data, AI enablement, analytics, and data modelling.

5.2.8.1. Objective and motivation for participation

The main objective for SUITE5 is to enhance its platform's capabilities and services. By participating in the project, SUITE5 aims to integrate the developed solutions into their existing data and AI services to create a set of tools that can accelerate the creation of pipelines for data preparation and integration.

5.2.8.2. Technological contributions

SUITE5 is leveraging its expertise in data, AI, and data integration to contribute to the project. Its experience with model repositories and platform development in previous projects provides a strong foundation for its contributions to the project's AI and data modules.

SUITE5 contributes to the development of AIOps, DataOps and Exploitation of the knowledge base, while also supporting the software integration activities

5.2.8.3. Exploitation interests

SUITE5's main exploitation pathways interests are:

- **Research:**
 - SUITE5 aims to enhance its data integration features through the project.
 - They are also interested in exploring capabilities around AI model repositories.
- **Education and Training:**
 - Not interested.
- **Standardisation:**
 - They are not focused on standardisation.
- **Monetisation:**
 - SUITE5 expects to monetize the new developments through the sale of projects around its platform and professional services to new clients.
 - They are open to exploring collaborations for the exploitation of the CyclOps solution.
- **Policy Contributions:**
 - SUITE5 does not see policy contributions as applicable given the nature of its tools and services.

5.2.8.4. Other information

No more information.

5.2.9. TIME.LEX

TIME.LEX is an entity specialized in providing legal and consulting services in the field of information and communication technology (ICT). Its main focus is to offer expert advice in areas such as data protection, privacy, information security, and intellectual property.

5.2.9.1. Objective and motivation for participation

Their primary motivation for joining CyclOps is to gain knowledge in data spaces to expand its legal portfolio.

5.2.9.2. Technological contributions

TIME.LEX aims to contribute by offering its knowledge and expertise in the legal field to ensure the development of compliant solutions.

5.2.9.3. Exploitation interests

TIME.LEX is focusing on the following priorities to maximize the impact of CyclOps:

- **Research:**
 - Improve knowledge of data spaces from a legal and ethical perspective.
- **Education and Training:**
 - TIME.LEX plans to work closely with academia to advance understanding of legal frameworks.
 - Deliver presentations on key legal topics, including the AI Act, GDPR, and data spaces.
- **Standardisation:**
 - Not applicable.
- **Monetisation**
 - They will use the gained knowledge on data spaces to increase market share and revenues.
- **Policy Contributions**
 - TIME.LEX wish to provide support to the European Commission in implementing AI regulation and to continue advising public sector clients on legal and ethical considerations.

5.2.9.4. Other information

No more information.

5.3. RTOs

5.3.1. BSC

Barcelona Supercomputing Center is a leading public research centre in Barcelona that specializes in high-performance computing and hosts the MareNostrum supercomputer. BSC is recognized for its contributions to data management, database technology, and artificial intelligence.

5.3.1.1. Objective and motivation for participation

The main objective of BSC's participation in the CyclOps project is to expand capabilities and identify synergies for new proposals. They aim to position themselves in research and operations for data. As experts in supercomputing, they can contribute to business services.

5.3.1.2. Technological contributions

BSC's technological contributions focus on data and execution abstraction, distributed data management abstractions, programming abstractions, and distributed execution. They will use their expertise to develop and implement these solutions within the project.

5.3.1.3. Exploitation interests

The exploitation main interests of BSC are the following:

- **Research:**
 - BSC aims to expand its tools such as pyCOMPSSs, dislib, DDS, and DataClay.
 - They are also interested in publishing papers on these topics.
 - The goal is to leverage the project's findings to advance its research capabilities and contribute to the academic community.
- **Training and Education:**
 - BSC conducts internal training on its tools such as pyCOMPSSs, dislib, DDS, and DataClay.
 - They also provide tutorials to enhance the skills of its team and collaborators.
 - They aim to extend its training offerings to project partners and external stakeholders to facilitate the adoption and effective use of its tools.
- **Standardisation:**
 - Standardisation efforts are not currently a focus for BSC within the project.
- **Monetisation:**
 - BSC's tools are open source. Sometimes they have industrial contracts with companies related to professional services based on the group's tools and capabilities, although it is not the main focus.
 - BSC is interested in defining a collaborative exploitation strategy with project partners, assessing whether a joint approach to monetisation is feasible given their open-source model.
- **Policy contributions:**
 - BSC's team members are involved in several policy and strategy groups as well as ETP4HPC SRA and the BDVA HPC-BD convergence group, focusing on HPC and Big Data.

5.3.1.4. Other information

BSC emphasises the importance of accelerating the generation of data pipelines for organisations that lack data expertise, ensuring ease of interoperability.

5.3.2. CERTH

Ethniko Kentro Erevnas Kai Technologikis Anaptyxis – Centre for Research & Technology Hellas (CERTH) is a research centre in Greece that specializes in various scientific fields, including energy, environment, sustainable mobility, information and communication technologies, processes and manufacturing, agritech, and biosciences. CERTH participates in the project from two different departments: M4D (Multimodal Data Fusion and Analytics Group) and VARLAB (Virtual and

Augmented Reality Lab). These departments provide capabilities and expertise in AI, social media analytics, data sources, and data spaces connectors.

5.3.2.1. Objective and motivation for participation

M4D's initial objective was to explore applications in social media analytics and Earth observation within the context of the Green Deal and tourism. However, as the project direction became more defined, M4D needed to shift focus to the development of core AIOps and DataOps components within WP3. As WP3 lead and Task 3.1 lead, M4D is now developing the CyclOps Lab, a unified, use case agnostic system for managing algorithm repositories and model deployment, ensuring consistent integration and scalability across the CyclOps runtime layer.

Nonetheless, the goal of utilizing M4D's expertise in social media analytics and Earth observation remains relevant as the use cases become more defined. Potential applications in these domains are still considered viable future directions, contingent upon emerging project needs and partner requirements.

VARLAB's objective is to support Use Case 4, focusing on the manufacturing data space. The data space setup for the offset printing industry and the application of AI are the main interests of Varlab. The established data space will be used to address data sovereignty and interoperability challenges. The development of dedicated AI-driven workflows for data management and analysis in the offset printing manufacturing sector will support maintenance activities of the involved companies.

5.3.2.2. Technological contributions

CERTH will contribute to the technological advancements of the CyclOps project. CERTH's existing tools and experience from other EU projects will support the development and implementation of innovative solutions within CyclOps.

5.3.2.3. Exploitation interests

Participating in this project, CERTH will mainly contribute to:

- **Research:**
 - M4D's research work is concentrated on the CyclOps Lab, aiming to establish a robust system for algorithm management and model deployment.
 - VARLAB group will enhance its expertise in data spaces, machine learning and transfer learning. These research activities will enable CERTH to develop and refine its technological solutions further.
 - CERTH will also disseminate the results of its work through the IDS hub for Greece.
- **Training and Education:**
 - M4D group has experience in organising hackathons and they plan to continue these activities within the CyclOps project.
 - VARLAB ran a competence centre on manufacturing and they plan to continue providing education and training on data management and analytics to various stakeholders, including universities and industry professionals within the CyclOps project.
- **Standardisation:**
 - CERTH is involved in technical standardisation initiatives, such as FIWARE data models. They will contribute to the standardisation efforts within the CyclOps project, ensuring the interoperability and alignment of project deployments with existing standards.
- **Monetisation:**
 - CERTH plans to monetise its enhanced solutions through spin-offs and professional services.
- **Policy Contributions:**
 - CERTH is actively involved in BDVA and DSSC, contributing to the data space domain. They plan to influence policy decisions and ensure the visibility of European companies at both national and European levels.

5.3.2.4. Other information

No more information.

5.3.3. EODC

EODC (Earth Observation Data Centre for water resources monitoring) is a research centre specialised in earth observation and information technology and offers EO-tailored IT infrastructure and tools for the scientific, public and private sector. They provide the basis to create societal benefits in the areas of environmental and climate monitoring, agricultural applications, infrastructure management, and humanitarian aid and civil security.

5.3.3.1. Objective and motivation for participation

Its high-level vision is to be actively involved in use cases, data standardisation, and data collection, focusing on research and technical capabilities improvement. They aim to contribute to the project's objectives by leveraging its experience and expertise in semantics. EODC aims to expand its technical capabilities and generate synergies with other partners. EODC seeks to solidify its position as a leader in semantic data and data standardisation.

Additionally, they are involved in green deal use case.

5.3.3.2. Technological contributions

EODC contributes its expertise in semantics focusing on the collection and standardisation of data and knowledge graph capabilities.

5.3.3.3. Exploitation interests

EODC's main exploitation interest are:

- **Research:**
 - EODC prioritises improving new technical capabilities, particularly in data skills.
 - They aim to verticalise its solutions, focusing on areas such as the green deal.
 - Additionally, they have a keen interest in publishing research on digital twin technology, leveraging the project's findings to contribute to academic and industry knowledge.
- **Education and Training:**
 - EODC plans to collaborate with universities to promote education and training in data management and semantic data, ensuring the next generation of professionals is well-equipped with the necessary skills.
 - EODC aims to enhance community knowledge through collaborations with universities and synergies with other project partners. Although EODOC will not lead training sessions, it will support training initiatives, particularly in collaboration with universities.
- **Standardisation:**
 - EODC acknowledges their resource limitations but emphasizes the importance of following community standards such as openEO. They plan to utilise capabilities and metadata knowledge graphs to contribute to and improve existing standards.
- **Monetisation:**
 - EODC prioritises improving market entrance, positioning, and competitiveness through the project. They aim to leverage capabilities in knowledge graphs to enhance its offerings and exploit the project's results effectively.
- **Policy contributions:**
 - EODC plans to focus on outreach activities to reach a wider range of stakeholders. This includes participation in international conferences and other events to disseminate the project's results and influence policy decisions.
 - They will develop guidelines for data standardisation and semantic data management, targeting policymakers and industry stakeholders.

5.3.3.4. Other information

No more information.

5.3.4. EURAC

Eurac Research (EURAC) is a private research centre headquartered in Bolzano, Italy, focused on applied research in areas such as health, energy, political and social systems, and environmental sustainability.

5.3.4.1. Objective and motivation for participation

EURAC's main objective in participating in the CyclOps project is to enhance its data processing and digital twin modelling capabilities in climate and tourism domains.

5.3.4.2. Technological contributions

EURAC provides capabilities in climate data processing and tourism-related digital twin modelling frameworks. Its technological contributions include:

- Implementing a semantic approach for data visualisation using tools like CRISP¹ (Climate Risk Planning & Managing Tool for Development Programs in Agri-food Systems).
- Integrating various data sources to facilitate predictive analytics and data sharing, making data accessible for end-users.

5.3.4.3. Exploitation interests

EURAC has prioritised the following exploitation interests:

- **Research:**
 - EURAC is open to explore joint research activities with other partners in common topics.
 - EURAC aims to collect data at different levels (National, EU).
 - They are also interested in natural language data processing.
 - Additionally, they are interested in developing digital twin modelling frameworks in data spaces (DS) for tourism. In the second phase, EURAC intends to integrate regional data into pilots, such as how hotels can report data and make statistics accessible.
- **Training and Education:**
 - EURAC has current collaboration with some universities.
 - Currently, they provide online courses mainly on standards for EU agencies.
 - EURAC is committed to presenting data management and digital twin concepts to EU agencies and educational institutions. They aim to enhance knowledge and skills in data processing and climate risk management.
- **Standardisation:**
 - EURAC promotes new standards for geographic data, metadata, and data processing. They advocate for a bottom-up approach to community standards, contributing
- **Monetisation:**
 - EURAC is interested in providing services for companies and regions, particularly within the scope of climate change. However, monetisation is not a priority for them in this project.
- **Policy contributions:**
 - EURAC plans to provide tools for data recommendations in collaboration with key stakeholders. They are involved in discussions with EU agencies to influence policy and regulatory frameworks related to data governance.

5.3.4.4. Other information

No more information.

¹ <https://crisp.eurac.edu/>

5.3.5. NUIDUCD-CeADAR

CeADAR (Centre for Applied Data Analytics and Machine Intelligence) is Ireland's national centre for Artificial Intelligence. The centre sits as the bridge between the worlds of applied research in AI and its commercial deployment. CeADAR is promoted by the Government of Ireland through the main innovation agency (Enterprise Ireland) and based within University College Dublin, with national and international reach. They work with a range of organisations, including startups and scaleups, established businesses, government and public sector, research and academia, to enable them to adopt and leverage the value of AI and machine learning.

5.3.5.1. Objective and motivation for participation

NUIDUCD-CeADAR's primary motivation for participating in the CyclOps project is to facilitate knowledge transfer and enhance its expertise in data spaces, which aligns with their core competency. The organisation aims to gain insights into the project's developments and define its role effectively. CeADAR also seeks to leverage the project to improve their understanding of how to support end-users with practical tools, especially in an environment where there are multitude of open source repositories available.

5.3.5.2. Technological contributions

CeADAR plans to contribute primarily to the AIOps aspect of the project, focusing on the development of the Multimodal Explainability AI Module (MXAI) and the AI Marketplace (AIMP) to guide users in selecting the best algorithm that matches their datasets according to their needs.

5.3.5.3. Exploitation interests

CeADAR is mainly interested in the following activities regarding the defined exploitation pathways:

- **Research:**
 - CeADAR aims to expand its capabilities and knowledge in AI and data spaces.
 - They are also interested in exploring and enhancing methodologies to make easier for companies the implementation of technology.
 - Additionally, they seek to learn how to effectively provide end-users with tools that facilitate implement technologies and develop and access data spaces in real-world scenarios in different sectoral areas.
 - They are also interested in contributing to research papers in areas related to AI and ML.
 - CeADAR contributes to primary and secondary research on market needs for digitalisation and adoption of advanced technologies, like AI, ML, and data science.
- **Education and Training:**
 - CeADAR contributes to upskilling and reskilling programmes in collaboration with Skillnet, the Irish National Agency for training and skills in Ireland in different sectors.
 - CeADAR develops programs to train internal personnel, who work jointly in companies and later transfer knowledge to the company (Work Ready Graduate Program). It is a service to its members.
 - Regarding the collaboration with academia, they also expect to generate new contents based on the project developments for update Masters programs, specifically with UCD. Additionally, they have collaboration with several other universities around Trustworthy AI through the Z-Inspection initiative.
 - They also organise workshops, tech talks, lighthouse training programmes and hackathons to develop results for its members.
- **Standardisation:**
 - CeADAR participates in the Ireland's National Standard Authority (NSAI) to contribute to standardisation efforts in AI and data, as well as in technical committees of international technical committees, notably NSAI/TC02/SC18, CEN/CLC/JTC 21, ISO/IEC JTC 1/SC 42.

- **Monetisation:**
 - CeADAR plans to transfer technology through contracts, offering individual projects or licenses. They aim to provide preferential access to CyclOps solutions for CeADAR partners, facilitating indirect monetisation.
- **Policy contributions:**
 - CeADAR has a close link to the Department of Enterprise, Tourism and Employment and collaborate in the definition of the Strategic Research Agenda of the Government of Ireland and public and ad-hoc consultations as AI experts. CeADAR collaborates with organisations such as the OECD, is member of the Steering Committee of the GlobAlpol (Global AI research policy network) and participates in innovation groups to contribute to policy discussions related to AI and data.

5.3.5.4. Other information

No more information.

5.4. Academia

5.4.1. TUBS

Technische Universität Braunschweig (TUBS) is a German university that participates in the project with a team specialised in data and communication techniques.

5.4.1.1. Objective and motivation for participation

The main objective of TUBS's participation in the CyclOps project is to leverage their expertise in AI and Machine Learning (ML) to enhance user experience and interactions within the system, focusing on human-in-the-loop methodologies. This participation provides a valuable opportunity for creating scientific publications and advancing research in AI, which aligns with their academic goals and expertise.

5.4.1.2. Technological contributions

TUBS will primarily contribute through the development of an intent-based human interface. This component allows users to give instructions to the system, which then shows and executes decisions based on those instructions. TUBS will also collaborate with other partners, like BSC, on open-source tools and contribute to various other technological components within the project.

5.4.1.3. Exploitation interests

TUBS is interested in working on the following exploitation pathways:

- **Research:**
 - AI and ML (Human in the Loop): TUBS will focus on developing AI and ML models that integrate user feedback to improve system performance. This involves creating open-source tools that allow users to see how the system works, make decisions, and execute tasks based on those decisions. There is potential for collaboration with BSC on open-source tools with project partners.
 - TUBS also would like to identify new joint opportunities thanks to the AI components developed, ensuring long-term research continuity.
 - TUBS aims to produce scientific papers based on their research in the CyclOps project together with the project partners.
- **Training and Education:**
 - Workshops and Tutorials: TUBS plans to develop workshops, tutorials, and training programs for students and CyclOps partners, focusing on the new AI intent-based component.
 - They are also interested in working on creating educational materials which will be disseminated online to reach a broader audience, ensuring practical knowledge transfer.

- They will provide Component Interface Training on the AI-based interface operating over data sets, enhancing students' and partners' understanding and skills.
- **Standardisation:**
 - While TUBS does not have a clear plan for standardisation, they will ensure that the open-source tools and interfaces developed are compliant with generic standards to facilitate broader adoption.
- **Monetisation:**
 - While the primary focus is on open-source tools, TUBS will explore potential monetisation strategies of its component through enhanced services and functionalities, making the tools appealing to both SMEs and large companies.
- **Policy Contributions:**
 - TUBS recognises the significance of human-in-the-loop in AI and although they are not directly contributing to policy development, they aim to leverage this concept to influence AI-related policies indirectly.

5.4.1.4. Other information

They also plan to coordinate with other partners, such as EXAI and DC, on human-in-the-loop methodologies to enhance the project's overall impact.

5.4.2. UNIBZ

Libera Università di Bolzano (UNIBZ) is an Italian university, with several scientific and technological laboratories.

5.4.2.1. Objective and motivation for participation

The main objective of UNIBZ in the CyclOps project is to expand their knowledge graph capabilities.

Additionally, UNIBZ aims to work on standardisation of knowledge language and to develop new mapping languages, specifically within the CyclOps RML framework.

UNIBZ is also interested in working on risk management analysis based on knowledge graphs, indirectly contributing through EURAC in the UC2.

5.4.2.2. Technological contributions

UNIBZ brings substantial expertise in knowledge graph technologies and mapping languages to the CyclOps project.

5.4.2.3. Exploitation interests

UNIBZ is interested in working on the following exploitation pathways:

- **Research:**
 - UNIBZ aims to expand their research capabilities on knowledge graphs and open-source tools.
 - They are particularly focused on advancing the research in mapping languages, including the new RML standard.
 - They also plan to explore risk management analysis based on knowledge graphs, leveraging the use case of EURAC-UC2.
- **Training and Education:**
 - UNIBZ provides courses related to knowledge graphs, data integration, and data access at the university level and within the industry. Although education and training are not their primary objectives in the project, they aim to develop training programs as part of the CyclOps project to enhance understanding and application of these technologies.
- **Standardisation:**
 - UNIBZ is actively involved in the standardisation of new mapping languages, particularly the RML standard, which is essential for ensuring the interoperability and scalability of knowledge graph technologies within the CyclOps project.

- **Monetisation:**
 - UNIBZ engages in commercial agreements with companies through research contracts, facilitated by their ONTOPIC spin-off company. These agreements support their research activities rather than generating profit.
- **Policy contributions:**
 - UNIBZ does not directly contribute to policy but collaborates with entities like SIRIS Academic, which uses UNIBZ's technology to provide recommendations to national agencies and working groups at the European Commission level.

5.4.2.4. Other information

No more information.

5.4.3. UPC

Universitat Politècnica de Catalunya (UPC), also known as BarcelonaTech, is a public university in Spain that specializes in engineering, architecture, sciences, and technology. UPC has made significant contributions to data management, data spaces, artificial intelligence, and optimization of the cloud continuum. It leads several projects aimed at developing data spaces in sectors like agri-food and mobility.

5.4.3.1. Objective and motivation for participation

The primary objective of UPC's participation in the project is to advance research in data management technologies and data optimisation. As an academic partner, UPC focuses primarily on scientific and academic research and exploitation. Their main goal is to produce high-quality scientific papers and develop foundational knowledge that can later be applied by other partners for industrial use.

UPC will also leverage their involvement in the CyclOps project to enhance their educational offerings, ensuring that their students are well-equipped with cutting-edge knowledge and skills in data management and optimisation.

5.4.3.2. Technological contributions

UPC will be working on several key technical components within the project. They will contribute to:

- The Intent-based Human Interface by capturing data analysis intents for the generation of pipelines in collaboration with TUBS.
- Within the Runtime Layer, they will be involved in DataOps, automating data discovery and data quality processes for data analytics, and in AIOps, developing a semi-automatic Feature Engineering component.
- Lastly, UPC will collaborate with UNIBZ on the Knowledge Layer, particularly in the development of virtual and materialized Knowledge Graphs (KG).

5.4.3.3. Exploitation interests

Regarding the Exploitation results, UPC is interested in the following exploitation key points:

- **Research:**
 - UPC prioritises research outputs, including the development of papers on database technologies and data integration methods. The focus will be on contributing to the academic body of knowledge.
 - UPC also aims to publish their findings in renowned academic journals and present them at conferences to disseminate their research.
- **Training and Education:**
 - UPC is committed to the transfer of knowledge to their students and research groups. This includes integrating project findings into PhD programs and other academic courses to position their students at the forefront of data management and optimisation.
 - UPC will prepare educational materials and training programs to assist organisations in developing their data skills, targeting entities that lack the resources or expertise to build their own data pipelines.

- **Standardisation:**
 - UPC is exploring the design of a reference continuum architecture in collaboration with the Eclipse Foundation through a CSA. This standardisation effort aims to create a common framework that can be adopted by various stakeholders in the data management ecosystem. It will be explored whether there could be any synergy on this topic between this initiative and CyclOps.
- **Monetisation:**
 - Monetisation is not a primary focus for UPC as they operate on an open-source basis. Their contributions and findings will be openly accessible to foster further research and collaboration.
- **Policy Contributions:**
 - UPC will participate in the IFIP (International Federation for Information Processing) working group, contributing their academic expertise to influence policy discussions related to data management and integration. This involvement will help bridge the gap between academic research and policy formulation.

5.4.3.4. Other information

UPC emphasises the importance of capacity development and knowledge transfer. By operationalizing the generation of data pipelines, UPC aims to support organisations, especially those with limited data expertise, in achieving efficient data management. In particular, CyclOps' target users include both small and large organisations that may not have the interest or capability to build data pipelines independently. The focus is on helping these entities develop their data skills and capabilities, also within data spaces.

5.5. Associations

5.5.1. EONA-X

EONA-X is a European data space focused on mobility, transport, and tourism, designed to facilitate secure and open data sharing within these sectors. It operates under the broader Gaia-X initiative and aims to revolutionize how data is used and exchanged within the mobility and tourism industries. EONA-X is a collaborative effort involving leading companies like Air France-KLM, Amadeus, and Renault, among others.

5.5.1.1. Objective and motivation for participation

The main objective of EONA-X's participation in the CyclOps project is to leverage the project to address business-related issues and advance research and development efforts. EONA-X aims to explore long-term projects over the next 2 to 3 years, improve their marketing strategies, and better understand key actors and partners working on the same topics. By participating in CyclOps, EONA-X seeks to enhance their business-oriented approach, connecting technical challenges with external business realities, and identifying potential customers for the solutions.

5.5.1.2. Technological contributions

EONA-X will not generate new technological components but will utilise existing ones. Amadeus is its technological provider.

They are particularly interested in the data space radar to understand the operational components needed for operational use cases. EONA-X will integrate services into their catalogue, such as data quality scores and ontologies for visitors, passengers, and tourists. They aim to propose services to improve quality for stakeholders.

5.5.1.3. Exploitation interests

EONA-X has highlighted specific interests in the following exploitation topics:

- **Research:**
 - Validate open-source data spaces solutions for EONA-X in an operational environment.

- Test data space components to verify interoperability (ontologies, SIMPL, others).
- Enhance internal business intelligence for EONA-X members
- **Training and Education:**
 - EONA-X is interested in addressing business model questions with academic institutions such as INRIA (external party), focusing on AI and data space integration. It will be explored whether there could be any synergy on this topic between this initiative and CyclOps.
- **Standardisation:**
 - It's not a priority however they review the national standards to be aligned with the national security framework and identify opportunities for proposing norms or standards.
- **Monetisation:**
 - The objective of EONA-X is to attract new members and potential partners.
 - Their approach is to prioritise the technology development over immediate monetisation, with a focus on reducing costs and making the product more accessible.
- **Policy contributions:**
 - They are interested in promoting the benefits of using data spaces in public administrations, as well as involving more public partners and universities.
 - They also have an advisory role providing guidance for national/EU programs about data spaces, though not proactively.

5.5.1.4. Other information

No more information.

5.5.2. FIWARE

FIWARE Foundation, a non-profit association based in Germany, promotes open-source and open-standard interoperability. By defining and implementing open standards, FIWARE enables portable, interoperable smart solutions, accelerating development, reducing costs, and avoiding vendor lock-in. FIWARE supports a community of over 600 companies and their developers, fostering a sustainable and innovative business ecosystem.

5.5.2.1. Objective and motivation for participation

Through the project, FIWARE aims to evolve and maintain the developed solutions while adhering to the open-source approach. They will also facilitate the use of the solution within the industry and community, reducing technology development redundancy and simplifying processes.

FIWARE will establish connections with the Data space community through projects and the Data Space Support Centre (DSSC), ensuring that new technologies align with DSSC guidelines. As a technology provider, FIWARE will ensure the inclusion of their solutions in the project, such as smart data models and data connectors, while promoting and advocating for Data Spaces.

5.5.2.2. Technological contributions

FIWARE contributes to the project by supporting the development of data spaces and aligning them with the other technical components which will be developed within the project. They aim to streamline data exchange and governance processes, ensuring interoperability across different data systems.

5.5.2.3. Exploitation interests

- **Research:**
 - The company is interested in evolving their existing solutions to align with the needs of the project according to the FIWARE roadmap.
 - They mentioned their engagement in tech transfer activities involving 40 iHubs, where they provide support and training to affiliated entities, including SMEs and other stakeholders. These 40 iHubs represent a valuable channel not only for incorporating services and data products generated within CyclOps, but also for identifying potential synergies to develop new research topics. By leveraging the network of iHub members

as prospective users, this initiative could foster co-creation opportunities and expand the impact of CyclOps beyond its current scope.

- FIWARE is interested in exploring further research opportunities that align with their objectives, specifically those that allow for the development of technologies in data spaces. FIWARE has specialised working groups in smart cities, agrifood, energy, and water sectors.
- They are also interested in using the project to conduct a comparison between the EDC (Eclipse Data Connector) and theirs, determining where each excels and is best applied.
- **Training and Education:**
 - FIWARE has a training program for the iHubs, including university academy courses and webinars, that they are willing to share with the project. Their focus on technology transfer through standardisation and training helps companies and individuals gain knowledge and skills in data spaces and related technologies. FIWARE's involvement extends to provide training materials and support technology transfer mainly to SMEs, technology centres, and universities.
- **Standardisation:**
 - Standardisation is a key focus for FIWARE, as they create de facto standards and support the community long after the project ends.
 - They work closely with existing standardisation bodies such as CEN-CENELEC, ETSI, UNE (Spain), and DIN (Germany) and these forums can be leveraged to ensure the widespread adoption of project results.
- **Monetisation:**
 - It will be explored whether CyclOps can leverage the iHubs as a channel for disseminating the joint solution and supporting its monetization.
- **Policy Contributions:**
 - FIWARE plays an advisory role, and it is a member of the European Data Innovation Board. Additionally, they provide valuable insights to governments and policymakers, contributing to the definition and preparation of funding plans. It will be explored whether any synergies can be generated through these channels.

5.5.2.4. Other information

No more information.

6. KEY BUSINESS INSIGHTS ABOUT CYCLOPS' SOLUTION

This section summarizes the main value proposition elements identified so far for the CyclOps joint solution. It serves as the foundation for further refinement and commercialization planning in collaboration with project partners during the next project phase.

Although this is a Research and Innovation Action, addressing these issues is considered beneficial to guide the solution and related activities in the most appropriate direction from the beginning and in a manner agreed upon by all partners.

As mentioned in the section 3, the CyclOps solution is envisioned as a set of tools designed **to foster the development of data-driven solutions and facilitate the adoption of data spaces.**

Core Value Proposition Highlights

- **User-friendly Interface with Natural Language Processing:** Enables less experienced users to efficiently select relevant data, prototype pipelines, and receive algorithm recommendations, saving time and reducing complexity.
- **Integrated set of tools.** Having an integrated solution provides a series of key functionalities:
 - A single point with all metadata, which combines information from multiple sources and formats, and can also be semantically enriched,
 - Unified query interface
 - Unified access to data from multiple sources and formats

- **Comprehensive Data Lifecycle Management:** Covers all stages of data handling, minimizing the need for multiple separate tools and reducing learning curves and costs.
- **Integration with data spaces.** The solution facilitates the adoption of data spaces and leverages this integration by allowing access to and publication of valuable resources (data, AI models, services) ready to use.
- **Compatibility with distributed computing.** The solution has also been designed from the beginning to be compatible with distributed infrastructure, reducing model training times and process execution times thanks to distributed computing.

Preliminary monetisation scenario for the CyclOps solution

This is a Research and Innovation Action, and therefore, the joint solution developed will have an intermediate level of maturity and will not be ready to reach the market directly. For this reason, the strategy should focus on building a solid foundation of tools that can be used and evolved in a controlled manner around early adopters, and that can continue to be developed by the community in future projects.

Based on these premises, a preliminary monetisation scenario has been formulated, centred on an open joint solution composed of multiple components and the sale of professional services to support its deployment among potential clients. It is expected that the core components of the solution will be open, although paid components with greater maturity and capabilities may also be offered.

This preliminary scenario will be iterated with the partners, and other options and combinations will be explored too during the second part of the project.

Furthermore, it will be possible to confirm which partners are interested in exploiting the joint CyclOps solution.

Identified Customer Profiles

Two primary customer profiles have been outlined:

- **Integrators:** Entities with certain data skills who can embed CyclOps into their service portfolio and sell professional services based on the solution to end customers.
- **End Customers:** Organizations seeking to enhance existing services or tools based on data by leveraging internal and external data resources through the CyclOps solution.

User Profiles

The different user profiles targeted by the solution (for both customer profiles) are mentioned below:

- **Developers and data scientists.** These are the key users, responsible for implementing and managing the data pipelines that take data from diverse sources and process it to generate specialized AI models or other insights. These users traditionally deal with the technical aspects of pipeline orchestration and data integration, tasks that often require significant time and expertise. CyclOps alleviates this burden by operationalizing and automating large portions of the workflow, allowing developers to focus on more critical, higher-level tasks. They can use the platform to define pipelines, ensure that privacy and regulatory constraints are met, and execute the models, ultimately delivering actionable insights with less manual effort.
- **Knowledge scientists and domain experts.** These are responsible for ensuring that the data is compliant with governance policies and regulations. These experts typically manage the creation and handling of semantic assets, such as ontologies, which are crucial for data integration and interoperability. CyclOps minimizes the need for their manual input by automating much of the metadata generation and governance-related processes. As a result, the platform makes it easier for organizations to enforce privacy, traceability, and legal compliance without requiring extensive domain expertise. While knowledge scientists traditionally handle complex integration processes, CyclOps aims to streamline their work by automating much of the data connection and governance tasks, making the platform accessible even to organizations with limited technical resources.

- **Secondary stakeholders: business experts and data spaces experts.** On the one hand, business experts focus on aligning data-driven services with the organization's business objectives. Their role involves defining requirements for data services to be developed by the company and identifying how these services can best meet market demands. They also must ensure compliance with legal and regulatory frameworks. On the other hand, data space experts facilitate the interaction between the organization and external data spaces, ensuring that the company's data complies with the frameworks governing data exchange and integration across different sectors.

The users of the use cases are considered potential early adopters of the solution. The details will be reviewed with them in the next phase of the project.

Potential channels

As potential channels to commercialize the solution, it will be explored to include incorporating the solution into the portfolio of the FIWARE AI Hubs, the CeADAR service catalog, or the EONA-X catalog, AlonDemand or EuroStack, to name a few.

The information gathered in this section will be used as a basis for iterations with partners and for designing different commercialisation scenarios in the next phase of the project.

'Navigating Challenges' session in Data Week 2025

Additionally, the 'Navigating Challenges' session was organized during the recent Data Week 2025 event, where various inputs were collected from the ecosystem to discuss and validate key challenges, needs, and expectations around data sharing, integration, and usage. CyclOps' project led the session in collaboration with other sister projects from the Data Space cluster (projects from the same call).

The most critical processes, ranked by overall importance, were identified as follows:

- **Data Sharing** emerged as the top concern, reflecting ongoing challenges related to trust, access, governance, and legal frameworks.
- **Data Integration**, highlighting the importance of interoperability and the complexity of consolidating diverse data sources into usable formats.
- Other key areas included **Data Processing and Discovery & Ingestion**.
- Finally, **Data Usage and AI applications** were noted, suggesting that earlier-stage bottlenecks—particularly in sharing, integration, and processing—are hindering progress toward more advanced data-driven and AI-enabled solutions.

Another important insight emphasized the need to steer the strategy through the development of modular, user-centric solutions, the early integration of governance frameworks, and the active involvement of diverse stakeholder groups in co-creation processes.

This information is key to shaping the narrative around the added value that CyclOps provides to its users.

7. NEXT STEPS

This document provides a solid foundation to guide the upcoming activities and efforts focused on exploiting the project results across the identified pathways. It includes the composition of the joint CyclOps solution and the exploitable results, the main elements identified for each exploitation pathway, individual exploitation plans from each partner, and initial insights related to the value proposition of the main solution.

The next period of the project will focus on the following objectives:

- **Market study:** Conduct a comprehensive analysis to identify alternative tools to the joint CyclOps solution and perform benchmarking. This will clarify differences in positioning, scope, and unique functionalities of competing tools, as well as uncover relevant innovations that could enhance the CyclOps solution.

- **Opportunities exploration.** Deeply investigate use cases and opportunities, focusing primarily on early adopters within the project consortium. This will enable refinement of the value proposition and other critical aspects based on real user feedback.
- **Business Model Design:** Develop and select optimal business models for the joint solution, considering factors such as target user segments, licensing schemes, component dependencies and packaging options, relevant commercialization channels, partners' interests, and sustainability.
- **Exploitation Pathways Monitoring:** Track progress across the various exploitation pathways to foster synergies among partners, maximize the use of all project results, and enhance overall project impact.

ANNEX A – TECHNOLOGY READINESS LEVELS (TRLs)

The table below shows what TRL (Technology readiness level) is equivalent to.

TRL	Description
TRL 1	Basic principles observed
TRL 2	Technology concept formulated
TRL 3	Experimental proof of concept
TRL 4	Technology validated in lab
TRL 5	Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 6	Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 7	System prototype demonstration in operational environment
TRL 8	System complete and qualified
TRL 9	Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)