

Industry 4.0 Enhanced Digital Product Passports and Circular Economy Dataspaces for Sustainable Bio-Based Industries



bi0space

PROJECT INFORMATION:



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11 Partners from 7
countries



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DEAR READERS,

We are pleased to share with you the **1st biOSpaCE newsletter**.

Our **vision** is to **drive the digital and circular transformation of Europe's bio-based industries**. Through biOSpaCE, we aim to deliver a suite of technologies, services, and standards to enable the rapid deployment of circular economy solutions across bio-based value chains. In this first issue, we highlight the key results we have achieved during the first nine months of the project.

To give a clear overview of the current status of the biOSpaCE project, the **newsletter is divided into three parts**:

- **Part 1** focuses on the technical aspects. After presenting the entire biOSpaCE platform, we introduce each component and discuss the main research and technical challenges it addresses.
- **Part 2** highlights the biOSpaCE use cases, which cover four complementary bio-based sectors: paperboard production, eco-industrial parks, plant-based products and cosmetics, and bio-based plastic packaging. For each use case, we describe a problem to be solved and the expected benefits.
- **Part 3** of the newsletter covers dissemination and project management activities. We summarize our achievements and outline our plans for the next project phase.

After the first nine months of activity, we are now entering a new phase in which results will become tangible, visible, and measurable!

We hope you enjoy the read, and please don't hesitate to contact us if you have any questions or suggestions.

Best regards

The biOSpaCE Project Team

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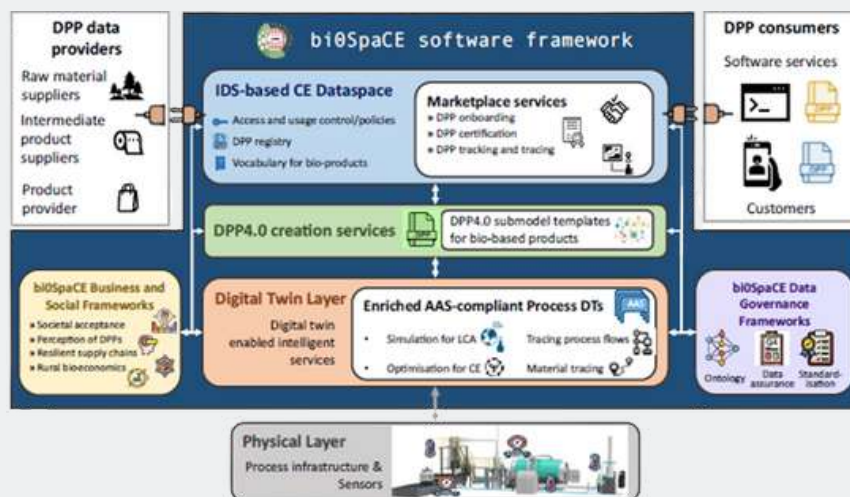
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PART 1: THE BIOSPACE APPROACH

1.1 HIGH-LEVEL OVERVIEW

The biOSpaCE approach aspires to propel the digitalization of Europe's bio-based industries forward by developing innovative solutions for creating bio-based products and services that are circular, as well as environmentally and socially sustainable.

To achieve these ambitions, the biOSpaCE project will deliver a suite of technologies, services, guidance frameworks, and standards, for rapid deployment and scaling of circular economy (CE) solutions and services across bio-based industries and their value chains. Included are components for creation and implementation of Industry 4.0 enhanced Digital Product Passports (DPPs), which provide trusted sustainability performance data (e.g. energy or water consumption) pulled from production process Digital Twins (DTs) or smart services such as life cycle assessment (LCA) simulation and are shared in an International Dataspace (IDS) compliant CE dataspace, thereby enabling transparency of green and CE claims across the value chain.



The biOSpaCE conceptual architecture

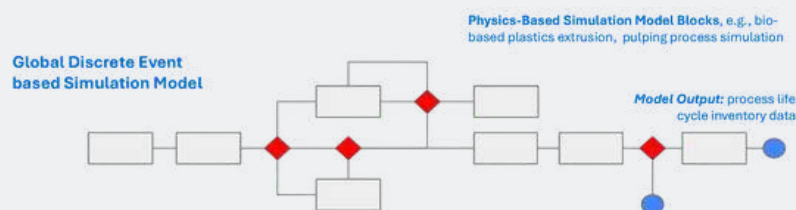
Figure above presents an overview of the biOSpaCE software framework presented in the form of a layer-based conceptual architecture that highlights the major building blocks. At the bottom, the **Physical Layer** encompasses the process infrastructure and sensors interfacing with the **Digital Twin Layer**, which enables process DTs augmented with Circular Economy (CE) services such as process simulation, life-cycle assessment (LCA) optimization, and end-to-end material and process traceability. Above, the **DPP Layer** defines the DPP structure and content for bio-based products used in the DPP creation and enrichment pipeline that includes trusted data from process DTs, and governance. At the top, the **Dataspace Layer** provides semantic search and discovery of DPPs and supports trusted sharing of data with consumers with policy-based access and usage control via user-facing APIs and applications.

1.2 INDIVIDUAL COMPONENTS

Component developed by DTU

DTU, together with AU, will advance the methodological framework enabling the use of physics-based process simulations for life cycle assessments (LCA) and circular economy (CE) assessments of bio-based products.

The key challenge addressed is the need for accurate estimation of sustainability and CE performance of bio-based industries in the process planning phase. Second, to optimize process performance, there is a need for understanding how changes in process control parameters and product design parameters affect the resulting sustainability and CE performance metrics of bio-based production processes. Through developing advanced process simulation-based frameworks for LCA and CE assessment, the delivered technical advancements will enable generating hybridized process inventory and emissions models combining real-world sensor data with simulation-derived data and process optimization via progressive parameter and model refinement.



Advanced process simulation-based frameworks for LCA and CE assessment

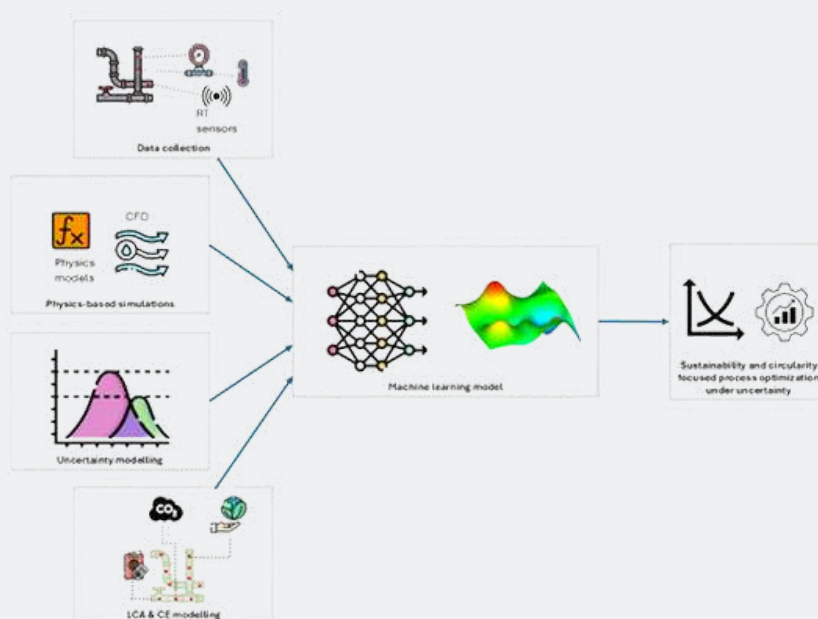
Component developed by AU

In biOSpaCE, AU together with DTU, will develop: i) an optimization framework to identify process parameters that maximize the sustainability and circularity performance under statistical uncertainties and ii) machine-learning (ML) models capable of tracing continuous process flows in bio-based manufacturing, contributing to help the seamless integration of bio-based industries into the circular economy.

The developed optimization and modelling framework will focus on computational efficiency, by integrating data from numerical process simulations as well as collected process data for training and validation of ML models. These ML models, together with developed tools for uncertainty modelling, will enable the maximization of the worst-case prediction of the combined LCA and CE indicators with respect to the process parameters.

Key research & technical challenges of this component are:

- **Computational cost:** High fidelity numerical simulations for tracing material/energy flows using computational fluid dynamics (CFD) as well as for developing Digital Twins of bio-based processes can provide precise solutions, but at the expense of prohibitive computational cost. Therefore, low-order empirical tools are more feasible to simulate bio-based systems on a larger scale, enabling efficient integration into the developed sustainability and circularity focused optimization framework.
- **Generalizability and explainability:** ML models developed to trace fluid and energy transport as well as replace expensive process simulation, generally offer a “black box” approach, substantially affecting the level of trust in their predictions by the end user. Here, we will focus on tackling well-known but under-explored challenges of ML models including their low level of generalizability and explainability.



Optimization and modelling framework

Components developed by IOSB

In biOSpaCE, FhG will provide the tools for the creation and implementation of Industry 4.0 enhanced Digital Product Passports (DPPs) that include data from process Digital Twins (DTs) to be shared in an IDS compliant CE dataspace.

Therefore, FhG will expand three components of their FA³ST Ecosystem:

- The FA³ST CreAitor for smart and efficient generation of DPPs,
- the FA³ST Mapper for linking of heterogeneous data sources with DTs,
- and the FA³ST EDC Extension that ensures the sovereign exchange of DPP data between consumers in a protected data space.

To ensure consistent comprehensibility and integrability of the data and services across system and company boundaries, FhG's technologies are compliant with the Asset Administration Shell (AAS) standard for Industry 4.0 DTs.

FA³ST CreAitor

The creation of AAS is a complex process that requires expert knowledge. This poses significant challenges, particularly for small and medium-sized enterprises (SMEs) that lack the necessary resources and AAS expertise, especially when implementing more complex use cases.

The FA³ST CreAitor employs generative artificial intelligence (GenAI) in the form of large language models (LLMs) to extract relevant information from various textual data sources (URLs, TXT, PDF) and organise it into an AAS appropriate for the specific use case – such as creating a DPP. This significantly reduces the manual effort required for data preparation, information retrieval and structuring.

The key challenge is the creation of a user-friendly, robust process that makes dedicated use of LLMs to guide non-expert users quickly and efficiently to a standard-compliant, high-quality AAS, while considering hallucinations and non-determinism of the LLMs and noisy or incomplete input data.



The FA³ST CreAitor enables (non-expert) users (left) to create of standard-conform AAS (right) supporting the integration of important subject matter expertise in the process

FA³ST Mapper

To create a reactive process DT including dynamic data, an AAS must be connected to physical assets such as machines or sensors. The FA³ST Mapper facilitates the linking of heterogeneous data sources, such as sensors or machines with AAS enabling flexible and standard-compliant data integration. It allows users to create mapping rules for OPC UA, MQTT, and HTTP and export them as so called AssetConnections. These ensure automatic synchronization between DTs and physical assets.

A key challenge is the development of easy-to-understand processes, that allow for AAS configuration without programming knowledge supported by valuable suggestions for AssetConnections created by LLMs.

FA³ST EDC-Extension

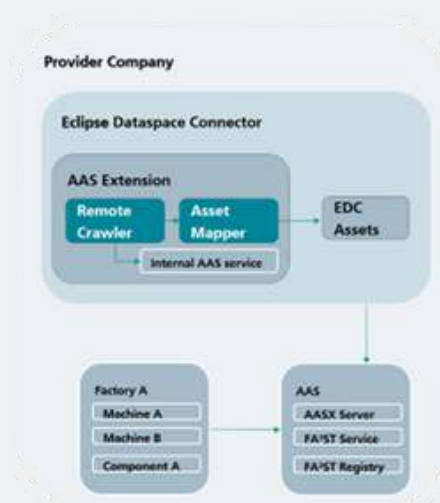
The FA³ST EDC Extension extends the Eclipse Dataspace Connector (EDC) to share AAS easily and automatically in a data space. This makes (DPP) data exchange more efficient, while users benefit from simplified contract processing.

The extension automatically synchronizes all elements of AAS and creates an up-to-date data description in the data space. This significantly reduces manual effort - especially in the case of frequent changes and large data volumes. In addition, predefined contracts are automatically attached so that users only need to accept them to retrieve the data.

To make it even easier to use, the complex contract negotiation process has been automated: Instead of performing several steps manually, users receive the data directly after confirming the predefined conditions. Experienced users can still submit their own contract proposals.

Furthermore, functional enhancements have been integrated to optimally AAS in the data space that allow execute operations directly and display data immediately without additional implementation.

While the FA³ST EDC Extension already offers significant benefits to expert users, the key challenge is developing an easy-to-understand, secure onboarding process with a user-friendly graphical user interface, that significantly reduces the complexity of data space processes and enables non-experts to share their data in a CE-data space based on well-informed decisions.



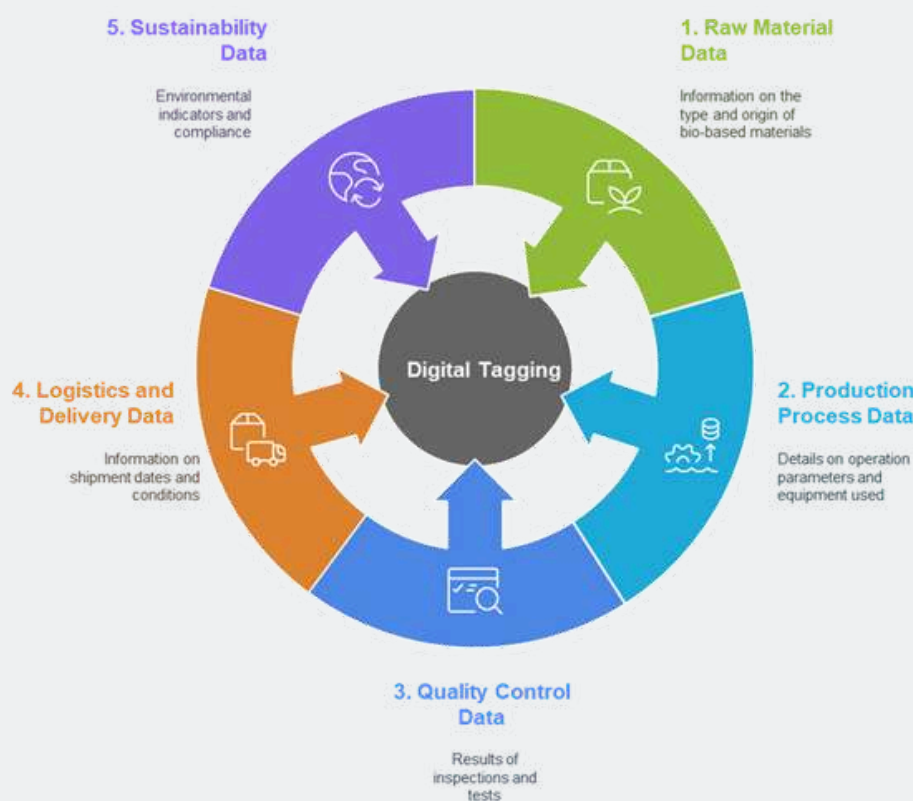
FA³ST EDC Extension – Simply share Asset Administration Shells in the data space

Component developed by CARTIF

The digital tagging component enables the integration of physical products with their digital counterparts across the biOSpaCE ecosystem. Each unit—raw material, intermediate, or final product—can be assigned a unique digital identity through hybrid tagging mechanisms combining physical marks (e.g., QR, RFID, watermarks) and embedded digital data. This approach supports full traceability from source to final product and beyond, ensuring that information such as origin, processing conditions, and sustainability metrics is securely attached to the product.

Key research & technical challenges of this component are:

- **Hybridization:** Designing a robust system that merges physical identifiers with embedded digital tags, ensuring durability under industrial conditions.
- **Scalability and interoperability:** Making the tagging system compatible with existing IT/OT infrastructures (SCADA, MES, ERP) and ensuring seamless interaction with the digital twin and Digital Product Passport (DPP).
- **Real-time updates:** Enabling the system to handle batch-level and event-based updates, providing fresh and accurate information throughout the product lifecycle.



Digital tagging component

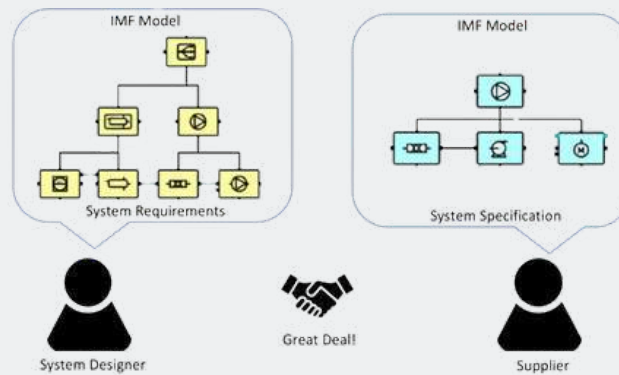
Component developed by SSF

bioSpaCE ontologies

In the context of the bi0SpaCE project SSF is responsible for the development of ontologies and IMF based on semantic foundations to ensure the interoperability of the physical, DT, DPP, and dataspace layers. With the goal of enabling scalable implementation, the IMF will be designed as a standards-compliant collection of libraries, structuring principles, and modelling techniques for creating models and optimizers of engineering assets in bio-based industry domain. This is accomplished by employing ontologies for classification and verification, application-independent formats via semantic technologies, straightforward method implementation, and user-friendly software for end users. Enforcing model consistency, or making sure all models have the same design, is one of the framework's objectives. The IMF, standards, and common ontologies will provide cross-domain technological harmonization. This allows for the enhancement of the digitalization of manufacturing assets, optimization of data management, and data-driven process efficiency optimization, for I4.0 based automation across the entire material/product/process life cycle.

Key research & technical challenges of this component are:

- **Cross-domain ontologies:** Designing ontologies that span physical assets, digital twins (DT), digital product passports (DPP), and dataspaces is complex due to domain-specific semantics.
- **Ontology harmonization:** Aligning existing bio-based industry standards with reference ontologies (e.g., for I4.0, manufacturing, materials, processes) while avoiding redundancy or conflicts.
- **Standards compliance:** Ensuring compatibility with I4.0 frameworks, OPC UA, ISO 23247 (Digital Twin Framework), DPP standards (e.g., CIRPASS, Catena-X), and W3C semantic web standards (RDF, OWL, SHACL).
- **Semantic interoperability:** Bridging gaps between heterogeneous data formats, legacy systems, and emerging dataspace architectures (Gaia-X, IDSA).
- **Scalability:** Developing an IMF that can scale across multiple plants, processes, and products without performance degradation.



IMF component

Tracking and tracing component

Within the project, SSF will contribute by enhancing and deploying a pre-existing track and trace application (Figure 9), designed to provide continuous monitoring and comprehensive documentation for each asset across the entire value chain. The implementation begins with a detailed use-case analysis, where identified process steps are digitized into distinct "nodes." These nodes are then connected via multiple communication protocols like REST and MQTT, enabling the automated retrieval of data directly from enterprise systems such as ERPs. This automation ensures real-time, accurate data collection for enhanced efficiency and traceability. Furthermore, the system is designed with flexibility in mind, supporting not only automated data streams but also manual entry methods to ensure all necessary information can be captured, regardless of source. Ultimately, this creates a unified digital thread, offering end-to-end visibility and robust data integrity throughout the asset lifecycle.



Tracking and Tracing Concept

Key research & technical challenges of the component:

- **Interoperability & Data Standardization:**

Technical Challenge: Integrating with a wide variety of legacy and modern systems (ERP, WMS, IoT) across the value chain, each with different data formats and APIs.

Research Challenge: Developing a universal, flexible data model or semantic ontology that can automatically normalize disparate data into a consistent and meaningful format without requiring major changes from partners.

- **Data Integrity, Security, and Privacy:**

Technical Challenge: Ensuring end-to-end data security through encryption, robust access controls, and secure authentication for both automated and manual data inputs.

Research Challenge: Designing mechanisms for verifiable data provenance and trust, especially for manual entries or external data sources, to prevent fraud and ensure auditability while complying with data sovereignty regulations (e.g., GDPR).

- **System Scalability & Real-Time Performance:**

Technical Challenge: Architecting a system that can handle massive data volumes from millions of assets and nodes without latency, requiring efficient data streaming pipelines (e.g., with Kafka) and high-performance databases.

Research Challenge: Optimizing data ingestion, storage, and querying models for real-time tracking and historical analysis at scale, particularly managing the network overhead of constant MQTT communication.

Component developed by NISSATECH

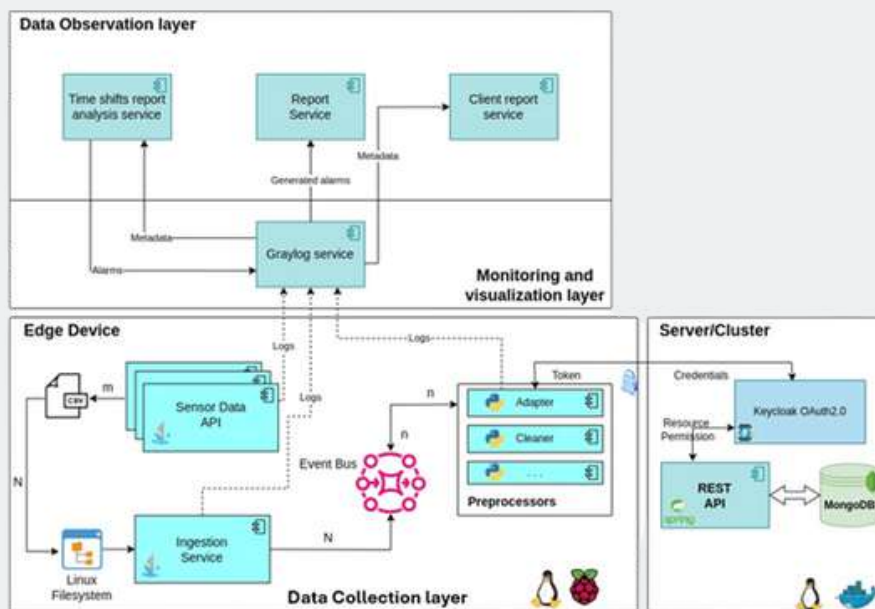
Data Collection & Observation Framework

Data collection is a crucial activity when building a data-driven system, as it primarily ensures both the quality and the quantity of the data to be used for further processing. Existing systems have mostly concentrated on making sure that the data is cleaned, uncorrupted, and free of outliers i.e., through so-called data-cleansing processes. However, in bio-based manufacturing the data varies greatly, especially because of the variability in the quality of the raw (bio-based) material. This situation demands special monitoring of the stability of the data-collection process.

Accordingly, there is a need for a novel, advanced data-collection system that not only controls the quality of the data but also monitors the quality of the data-collection system itself. The plan is to develop an additional layer on top of the traditional data-collection layer, which will monitor the stability of the data collection, as illustrated in the figure below.

The Data Collection & Observation Framework consists of three main parts:

- **The edge-device component** – responsible for collecting and preprocessing data, which is then stored on the server.
- **The server/cloud component** – responsible for data storage and authentication.
- **The data-observability component** – responsible for monitoring the data-collection system and issuing alerts in clearly defined cases.



Data Collection & Observation Framework

Process Behavior Analyzer

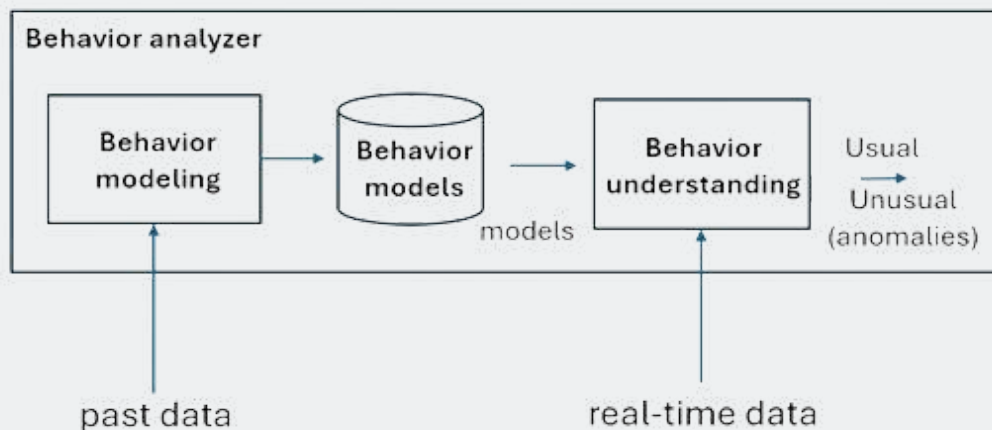
In traditional data-driven industrial systems, collected data is used for various analyses of the underlying industrial processes, such as quality control and anomaly detection. In the circular bio-based industry—characterized by many unknowns, including variability in the quality of bio-based materials, instabilities in the process environment, and uncertainties in circularity processes—there is a strong need to achieve high resilience in industrial operations.

In our previous work, we have developed several methods for process-understanding analyses that detect different types of process inefficiencies, such as variations, instabilities, and anomalies. Building on this work, the plan is to develop a novel system for process-behavior analysis that will proactively detect inefficiencies and propose corresponding corrective actions.

The planned system consists of three elements:

1. **Behavior modelling** – responsible for processing historical data and learning models of process behavior.
2. **Model storage** – responsible for storing models that are learned under different contextual conditions.
3. **Behavior understanding** – responsible for applying the models to real-time data in order to determine when the observed behavior is anomalous. This can be considered an anomaly-detection process.

This processing flow is illustrated in the following figure.



The architecture of the behavior analyzer

PART 2: BIOSPACE PILOTS

2.1 FISKEBY USE CASE

A short partner intro

Fiskeby Board AB is a Swedish manufacturer specialized in the production of 100% recycled paperboard. The company processes approximately 600 tonnes of recovered fibre per day, sourced from mixed household waste, industrial waste, used beverage cartons (UBC) and corrugated board, contributing significantly to circular economy practices in the paper and packaging sector.

The main industrial process at Fiskeby includes raw material preparation through drum and batch pulpers, fibre cleaning and refining, followed by forming, drying and coating on the board machine. The final output is approximately 170,000 tonnes per year of recycled paperboard used for various packaging applications.

In addition to its production operations, Fiskeby performs in-house post-processing steps such as winding, PE-coating, sheeting and packaging. The company holds several certifications (ISO 9001, ISO 14001, ISO 50001, FSC, PEFC), ensuring adherence to international quality, environmental and energy standards, and is committed to reducing water consumption across its operations.

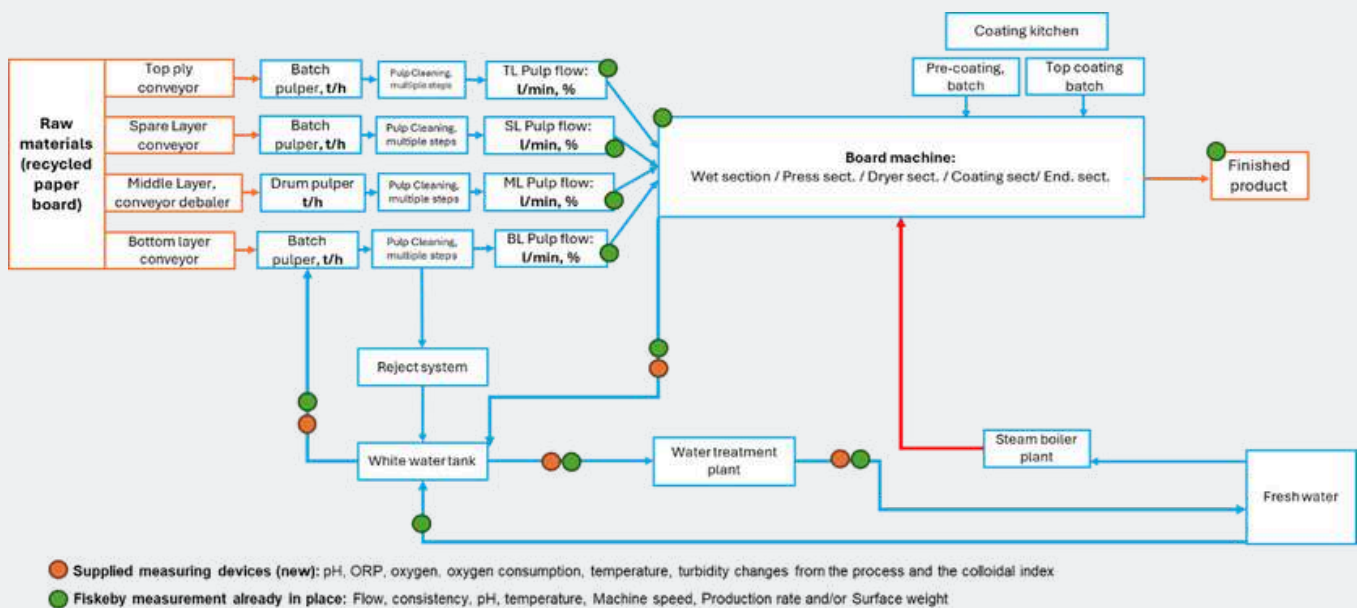
Use case description

In the biOSpaCE project, Fiskeby aims to examine the possibilities and required conditions for reusing process water in their current 100% recycled paperboard production process. Through this investigation, the aim is to generate knowledge on the process variables, measurement methods, and requirements for productive reuse of process water. Furthermore, cost-effective solutions for circular transition are explored through benchmarking the best possible solution(s) for process water reuse. The resulting study also has the aim of generating recommendations on how to deploy digital solutions, including process monitoring and tracking, towards cost-effective process water reuse.

Expectations from biOSpaCE

Through participation in biOSpaCE, Fiskeby expects to:

- Explore the feasibility of returning process water from flotation stages to the production cycle, thereby reducing both water withdrawal and energy usage.
- Enhance traceability of material flows (e.g., fibre composition, water quality) for proactive decision-making.
- Explore deployment of AI-based monitoring tools and digital integration of DCS data to predict machine events and optimize sustainability performance.
- Investigate the development of DPPs for at least three key paperboard products (Multiboard Offset, Multiboard EcoFrost, Multiboard Kraft), improving product transparency and supporting regulatory compliance.



Fiskeby use case

2.2 NATURAE USE CASE

A short partner intro

Naturae is a Spanish company dedicated to producing high-quality organic aloe vera beverages. From its own certified organic farms located in Sevilla to its IASC- and IFS Food-certified facility in Valladolid, the company oversees the entire value chain — cultivation, processing and packaging — ensuring full traceability, food safety compliance, and alignment with sustainability principles. The manufacturing process involves careful selection, washing, pulp extraction (ensuring aloin removal below the regulatory threshold of 1 ppm), juice extraction, blending with other ingredients, pH adjustment, and final stabilization using High Pressure Processing (HPP). Naturae's product portfolio includes pure aloe vera juice with and without pulp, aloe vera with apple, aloe vera with honey, and other blended beverages, all produced under strict organic standards.

Use case description

Within the biOSpaCE project, Naturae's use case aims to strengthen real-time quality control, traceability, and sustainability in the production of organic aloe vera beverages.

The focus is on integrating inline sensors and IoT monitoring (pH, temperature, aloin, energy, water flow) to automate data acquisition and move beyond manual records.

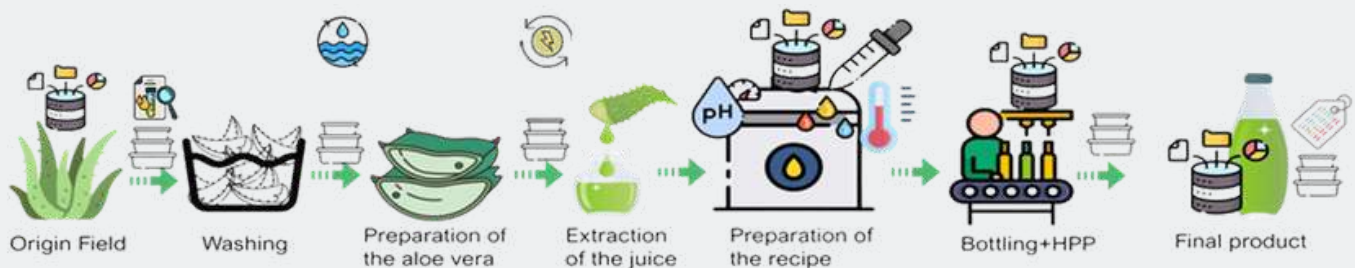
This will enable:

- Continuous tracking of critical quality parameters (pH, temperature).
- More detailed traceability of agricultural data (e.g., field location, leaf harvest date, harvest area).
- Optimised water and energy consumption through process monitoring.
- The development of Digital Product Passports (DPPs) to transparently share information on product origin, certifications, and sustainability attributes from farm to bottle.

Expectations from bi0SpaCE

Through its participation, Naturae expects to:

- Deploy and validate additional inline sensors and IoT solutions for continuous process and quality monitoring.
- Establish an integrated data collection framework, enabling advanced traceability and supporting the potential use of Digital Twins for process optimisation.
- Develop Digital Product Passports aligned with EU sustainability goals, such as the Green Deal and Circular Economy Action Plan.



Naturae use case

2.3 GREENLAB USE CASE

A short partner intro

GreenLab Skive Energy Park is an eco-industrial park located in Denmark that provides infrastructure and services to multiple industrial clients. GreenLab itself does not engage in production activities; instead, it acts as both a provider of green energy and utilities, including electricity and heat, sourced from on-site wind and solar generation, as well as the national energy grid. The park is designed to promote industrial symbiosis and circular resource flows, where different companies can exchange surplus energy, water and other services through GreenLab's proprietary SymbiosisNet™ system. This intelligent grid enables optimization of energy and resource flows distribution among the park's industries, contributing to sustainability and energy efficiency goals.

Use case description

Currently, GreenLab monitors overall electricity production and consumption in the park through its transformer station, with data stored through the digital infrastructure in place. This provides robust background for energy data management, but:

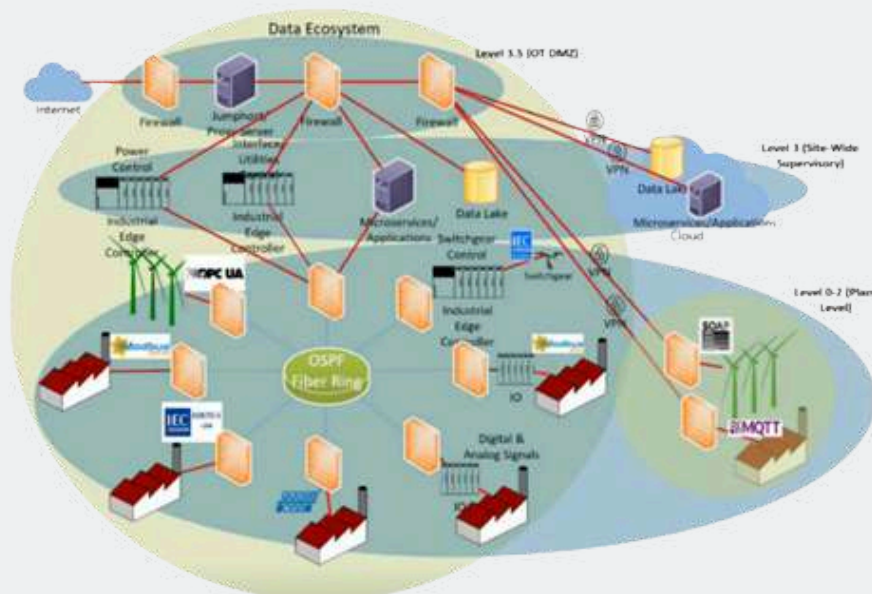
- Real-time, detailed energy flow data (e.g., at hourly resolution with CO₂ eq footprint attribution) is not yet fully implemented.
- Material flow monitoring within the park boundaries is limited, and there are no systems in place to track physical flows (biomass, waste streams, etc.) in an integrated way.
- GreenLab is building its SymbiosisNet™ system as both a physical infrastructure and a digital overlay that can optimize energy flows and track sustainability performance, but this system remains under development.

At present, GreenLab does not collect or own production data from the companies operating within the park, meaning that its capability to link energy supply data directly to product-level sustainability performance is constrained by the lack of data and confidentiality from the side of site-partners

Expectations from biOSpaCE

Through biOSpaCE, GreenLab aims to:

- Develop a dynamic energy carbon footprint tracking system based on its SymbiosisNet™ platform, capable of providing hourly CO₂ eq intensity data for electricity and heat supplied to park customers. In this case, the SymbiosisNet™ acts as a digital shadow, through monitoring energy exchanges between different types of energy sources and end users.
- Advance the knowledge and implementation on how to define and structure dynamic energy mix data monitored using the SymbiosisNet™ platform so that it can be integrated into DPPs for biobased product manufacturers, supporting industrial clients in meeting regulatory requirements under emerging frameworks such as the Ecodesign for Sustainable Products Regulation (ESPR).
- Investigate the ability to tracking material flows at the industrial park level and linking this data to circularity performance indicators. Although GreenLab is not a manufacturer of bio-based products, their role as an energy and utility provider positions them as a key enabler for improving the sustainability performance of bio-based manufacturing industries operating within the park and demonstrating a digital shadow testbed (based on the SymbiosisNet™ platform) for creating accurate DPPs using integrated, real-time digital infrastructure in industrial symbiosis contexts.



GreenLab 's SymbiosisNet Infrastructure for secure sharing of energy and product exchange data. Figure reproduced with permission from GreenLab

2.4 NORIWARE USE CASE

A short partner intro

noriware is a young and innovative Swiss Start-Up dedicated to developing innovative, sustainable packaging solutions that drive the transition away from plastic. noriware creates packaging nature loves – simple, sustainable, and better for our future and our planet. Packaging that works like plastic, but without the harm.

Use case description

As part of biOSpaCE, noriware contributes its expertise in the development of unmodified materials and films based on natural raw materials. The use case examines the implementation of biOSpaCE technologies for our innovative material in industrial manufacturing processes. The objective of this study is to validate the scalability, functionality, and traceability of the solution. This will pave the way for the implementation of the projects technologies in the manufacturing sector of bio-based materials.

Expectations from biOSpaCE

With BiOSpaCE we want to establish transparency, circularity, and scalability for our innovative materials, thereby accelerating the path to market readiness.

Our main objectives are:

- **Transparency & traceability**

Trustworthy data collection for the life cycle assessment (LCA) of our materials and raw materials.

Traceability from sea to shelf and beyond: transparent supply chain, including data collection on production, energy and water consumption.

Communication along the entire value chain – from raw material suppliers to producers to end consumers.

- **Digital integration & data management**

Implementation of a dynamic, flexible and scalable Digital Product Passport (DPP) system. End-to-end monitoring with verified and accessible data throughout the entire product life cycle.

Building trust and transparency between manufacturers, suppliers and end users.

- **Process optimization & regulation**

Data-driven process optimization for scaling and efficiency.
Impulses for further development towards a circular economy.
Adaptation to regulatory requirements at European level.

With the project biOSpace we are laying the foundation for the rapid and sustainable industrialization of our technology and, together with strong partners, driving forward the transformation of the biobased materials industry.



noriware use case

PART 3: BIOSPACE STATUS

3.1 SUMMARY OF ACTIVITIES CONDUCTED

bi0SpaCE project kickoff in Aarhus, Denmark [February 2025]

The kick-off meeting of the bi0spaCE project took place on February 4th and 5th in the beautiful city of Aarhus, Denmark. The kick-off meeting included presentations on the work packages, alignment of expectations and in-depth discussions that fostered a collaborative environment among the partners.



bi0SpaCE team - kickoff meeting

bi0SpaCE project meeting in Karlsruhe, Germany [January 2026]

The 2nd project meeting of the bi0spaCE project took place on January 14th and 15th in the Karlsruhe, Germany. The meeting included deep discussions about performed work with the focus on the contribution to the pilots needs.



bi0SpaCE team - project meeting in Karlsruhe

biOSpaCE Ongoing Project Activities [January 2025 – Sep 2025]

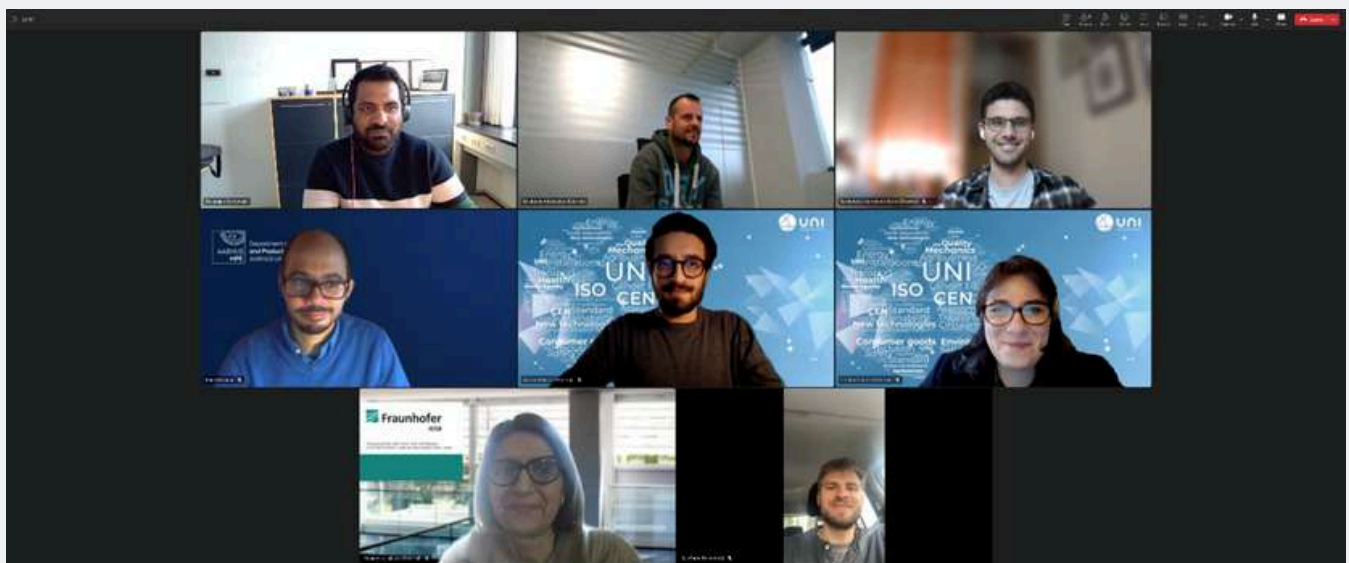
- Project coordination, cooperation, cohesion and management. Project Coordination is led by DTU, Technical Management and Scientific Management are led by FhG.
- Analysis of biOSpaCE pilots, including use case descriptions, requirements gathering regarding biOSpaCE innovations. Definition of user stories, use-case specific pilot specific KPIs, KPI baseline values, and assessment methodologies.
- Technical requirements specifications, for the solutions to be developed in biOSpaCE. Definitions of requirements for design time and run-time capabilities of the biOSpaCE ecosystem as well as the usability, security, and reliability of the biOSpaCE ecosystem.
- Desk research study to understand the social requirements, including considerations, and implications associated with the adoption and implementation of bio-based solutions across various sectors. For this, the biOSpaCE consortium is also conducting a mapping of relevant stakeholders involved in bio-based value chains, including producers, suppliers, consumers/citizens, policymakers, NGOs, and community representatives.
- Development of a semantics-based information modelling layer that will link existing or develop new ontologies for bio-based sectors including description of lifecycle flows. Corresponding Knowledge Graphs will also be developed respecting market standards.
- System-level specification of biOSpaCE technical architecture, including high-level view of the layers and components, as well as tools and applications, and their interaction patterns in biOSpaCE
- Delivering biOSpaCE data collection framework, including identifying and describing relevant data sources and collecting historical data to be used by data-driven biOSpaCE services to train the corresponding models.
- Specifying sensor infrastructure for the measurement of process inventory data, operating conditions, and emissions from the biOSpaCE pilots.
- Development of guidelines for environmental footprint and social value assessments of bio-based products, to steer the environmental, social and circularity evaluation of the relevant bio-based products.
- Developing a methodological framework for physics-based process simulations for predicting life cycle assessment results and circular economy assessment performance metrics for the relevant of bio-based products.
- Communication, industrial and scientific dissemination of biOSpaCE results and outcomes.
- Clustering and liaison activities with other projects financed under the same topic and other relevant Horizon Europe projects.

bi0SpaCE Submitted Deliverables [January 2025 – Sep 2025]

- Version 1 of the bi0SpaCE Data Management Plan (DMP)
- Dissemination and communication strategy for bi0SpaCE
- Draft of the bi0SpaCE exploitation plan

bi0SpaCE Co-operation Activities [January 2025 – Sep 2025]

In March 2025, the first meeting between the bi0SpaCE and ARGONAUT projects—both funded under Horizon Europe—was held to initiate a clustering collaboration. The two projects share the goal of promoting the digitalization of information along bio-based value chains, through the development of Digital Product Passports supporting sustainability and traceability in industrial processes.



Online meeting - bi0SpaCE and ARGONAUT

During the call, the partners presented their respective approaches and explored common ground for collaboration. The discussion highlighted the complementarity of technical, scientific, and project management expertise, laying the groundwork for joint work in areas such as digital twins, smart services, and digital product passports.

And this is just the beginning: the collaboration between bi0space and ARGONAUT will continue at the upcoming Synergy Days, the biennial European event that brings together projects, innovators, digital hubs, and policy makers to foster connections, thematic workshops, and project pitches. On 21–22 October 2025 in Rotterdam, the Netherlands, the two projects will jointly host the workshop “Lowering adoption barriers for Digital Product Passports” within the Synergy Days programme, a unique opportunity to advance the dialogue, showcase results, and build common pathways. Stay tuned!

In September 2025, DTU and AU representatives attended the 2025 Global Conference on Sustainable Manufacturing, held in Bologna, Italy where we discussed the biOSpaCE projects with 20+ international attendees, including representatives from the Land Resources and Supply Chain Assessments Unit within the Sustainable Resource Directorate at the Joint Research Centre.



In September 2025, DTU hosted a delegation visit from the INTERREG2CFIMH – Twin City Future Innovation Manufacturing Hub project, led by EIT Manufacturing East and consisting of 19 partners from various organizations in Austria and Slovakia. The biOSpaCE project mission, vision, and ongoing status was presented to the delegation.

PART 4: PROJECT TEAM HIGHLIGHTS & ACKNOWLEDGEMENTS

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FURTHER INFORMATION