# EuProGigant

Magazine for sovereign data usage

**Capturing the collaborative spirit: Participants at the EuProGigant Open House Day 2023**

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# Together towards a common ecosystem

*The EuProGigant Open House Day held in Berlin on 10 and 11 October 2023 showcased the projects' remarkable progress and fostered a sense of inspiration in the five project consortia. It brought together project partners, funding authorities and representatives from industry and politics as well as experts from various SMEs, making ample space for conversations. Over the course of the event, participants not only conducted a comprehensive review of the project's achievements over the past years, including key milestones, but also engaged in discussions about the future developments of the research and innovation initiatives.*

## Editorial

The European Commission set the goal for Europe to position itself as leader in a data-driven society when they released the Data Strategy in 2020, proclaiming a "Single Market for European Data".

This market was envisioned to be composed of various data spaces in different domains, enabling cross-sector data exchange for the benefit of all, while adhering to European regulations on data protection and privacy.

The Gaia-X initiative embraces this objective and is in the process of developing a framework for creating and using federated services to ensure secure, sovereign data exchange in compliance with European law.

For the manufacturing industry, the potential is huge – as are the challenges. The Manufacturing sector can develop individual solutions for the value-added processing and utilisation of large data volumes – but how exactly?

There isn't a single answer to this question. When the project EuProGigant, originally called "the European Production Giganet" launched in 2021, the project partners from Austria and Germany blazed a trail.

Initial achievements were recognised when the project became one of the Gaia-X lighthouse projects. Presenting the first tangible demonstrator at the Hannover fair in 2022 marked another milestone for the project.

The magazine you are reading right now bears testimony to the urgency of the creation of a data and service ecosystem. In the meantime, five projects with the same vision have joined forces: AMIDS, DIONE-X, ESCOM, EuProGigant and Flex4Res. We encourage you to get to know the projects in more detail and glean insights from different perspectives of Gaia-X.

And don't miss the articles on the Pontus-X ecosystem, which EuProGigant is part of, some background on data-driven business models as well as the impact of the Asset Administration Shell on Industry 4.0!

We hope you enjoy reading the magazine.

**Your Project Management**

**6-17**

## Project ecosystem: Joining forces

What started in 2021 as a single Gaia-X project for the manufacturing industry progressed rapidly in 2022, becoming a prominent lighthouse project. As of 2023, it has matured into a pioneering ecosystem encompassing five innovative research projects.

**24-25**

## Asset Administration Shell: The DNA of Industry 4.0

Explore the transformative role of the Asset Administration Shell (AAS) in Industry 4.0. This article delves into its synergies with Gaia-X and its implications for secure and efficient production in the modern industrial landscape. A comprehensive look into the future of the industry.

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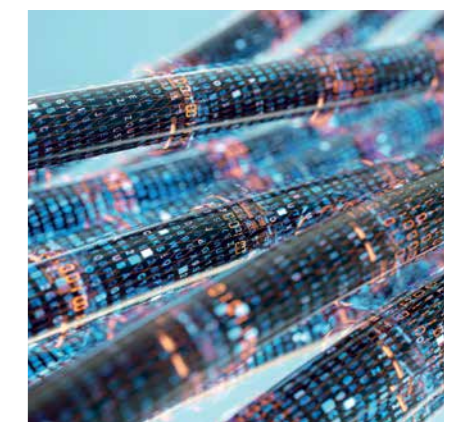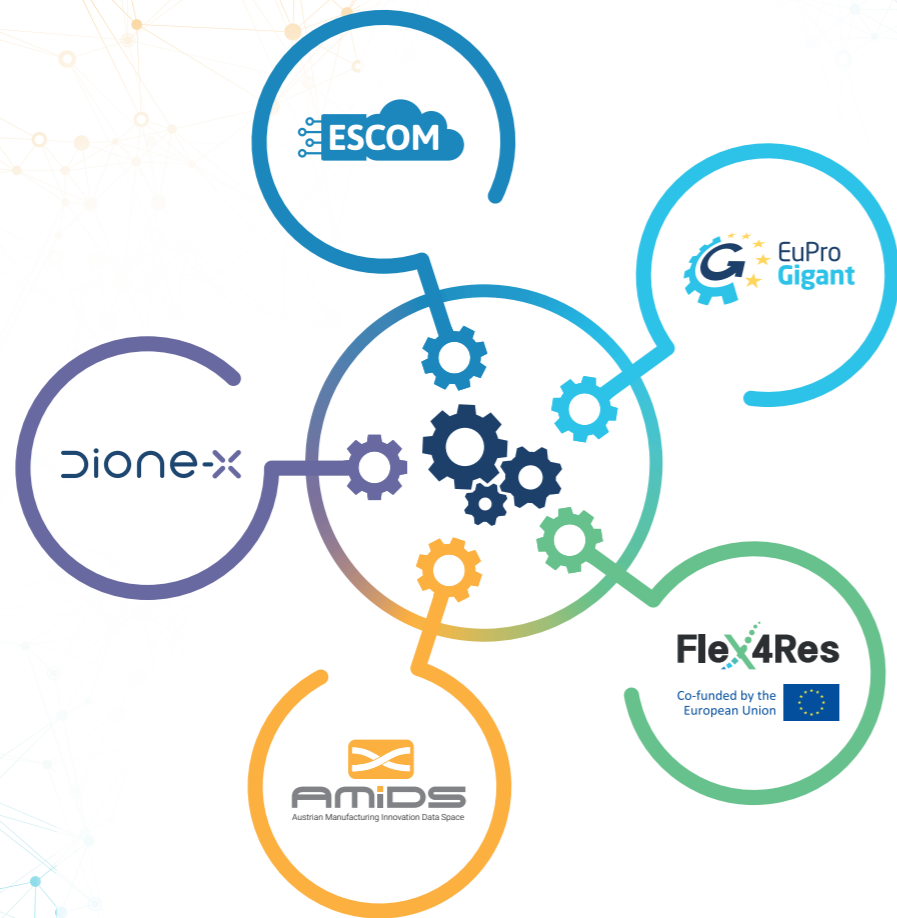
# Joining forces

*There are certainly more than five research and innovation projects around data spaces. What sets five of them apart is that they have joined forces to build on their findings – and thus have created a dynamic ecosystem.*

Imagine if you could exchange and use data from production securely and sovereignly. That's exactly the vision of the pioneering European manufacturing data and service ecosystem, which has evolved around a single Austrian-German project for the manufacturing sector: EuProGigant.

Advocating for a European production giganet to compete with global players from 2021, it became a Gaia-X lighthouse project in 2022. Four further projects have followed suit and tackle related challenges.

## *Leveraging Europe*
The result is a pioneering data and service ecosystem that comprises AMIDS,

DIONE-X, ESCOM, EuProGigant and Flex4Res. Meanwhile, this ecosystem has taken on truly European dimensions with more than 100 project partners from six European countries.

All projects are united by the same vision: working towards a resilient, data-driven and sustainable data and service ecosystem that makes the European manufacturing industry resilient and has the potential to even bring back manufacturers to Europe.

## *Smart and secure*
The goal of the ecosystem is to demonstrate how data can support value creation in manufacturing while describing the benefits of data-driven business

models. Close collaboration with industry partners is key to making the project results relevant.

15 use cases address pressing challenges universal to the industry, such as reducing the CO2 footprint to achieve net zero or reconfiguring supply chains for increased resilience.

## *Gaia-X principles*
All use cases require data to be shared along the supply and value chains. By implementing Gaia-X principles, the ecosystem enables production companies to make the best use of their data and share them with others via their data and service ecosystem – securely and sovereignly.

**6**
participating
European nations

**5**
innovative
research projects

**100**
project partners

**> €30**
million total grant

AMIDS project partner meeting
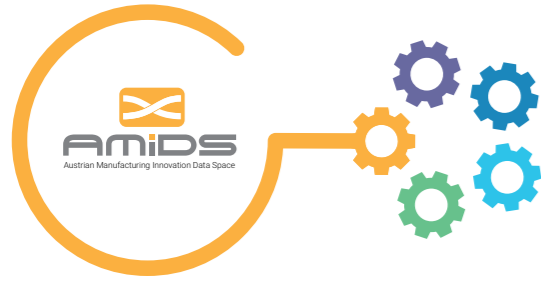
# Building on pilot factory know-how

## KEY FACTS

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| FUNDING VOLUME | €2.5 million over five years |
| PROJECT VOLUME | €4 million |

*The requirements for, and the complexity of, innovations are increasing – especially in the manufacturing industry. The Austrian pilot factories, the Pilot Factory Industry 4.0 of TU Wien, the LIT Factory of JKU Linz and the Smart Factory of TU Graz, have been successfully established for many years as innovation laboratories for the Austrian industry.*

Combining the existing pilot factories' know-how with that of other research institutions and the industry, the creation of a common ecosystem is now intended to enable distributed innovation processes across multiple locations and companies. The association AMIDS – Austrian Manufacturing Innovation Data Space – was founded by the three pilot factories in March 2023.

### High innovation capacity
Austrian industrial companies are outstanding players in the European innovation landscape due to their high innovation capacity. This capacity is built on internal research and development efforts as well as successful cooperation with academic institutions and research partners. Regardless of company size, there are many hidden champions that have achieved great success through in-house innovation.

While in-house innovation is a costly and challenging undertaking, it has always been imperative for the long-term success of any company. To remain competitive in the future, the importance of extremely complex cross-company innovation increases and poses new challenges to companies.

Many universities and universities of applied sciences are already innovation partners of numerous companies. However, general structures that allow easier access to joint innovation activities are still missing.

Additionally, due to advances in in-house digitalisation, namely Industry 4.0, and the increasing demand in cross-company data exchange, companies need to develop competences in the areas of data spaces and data ecosystems, especially in settings in which multiple partners collaborate. Besides a data space for innovation processes, AMIDS also offers companies the opportunity to gain experience with Gaia-X.

### Creating space – exchanging data
Due to the lack of necessary structures for innovation processes within data spaces, AMIDS has set the goal of creating them. It is crucial that industry and research collaborate to develop practical solutions.

Through the sub-projects Research-Lin-X and PilotLin-X, a data space will be established, allowing innovation-friendly companies in Austria to cultivate a common understanding. This will enable them to drive innovations even more effectively in the future.

The AMIDS association and the sub-projects are led by TU Wien, Graz University of Technology and Johannes Kepler University Linz. Their pilot factories and institutes have many years of experience in collaborating with companies.

The project consortium consists of 29 project partners and, in addition to the universities, includes universities of applied sciences and a broad spectrum of companies, from start-ups to well-established large corporations, from various sectors.

Interested companies and research institutions can become members of AMIDS. On top of access to the AMIDS data space and a Gaia-X test environment, companies are given the opportunity to build up know-how by participating in webinars, training programmes and events organised by the association. The membership fee depends on the size of the company, i.e. number of employees, or the type of institution. In the ramp-up phase of the association, the prices for a membership range from €300 per year for individuals to €2,200 per year for large companies.

### Two use cases
For the development of the requirements for the data space and, subsequently, for its demonstration, two innovation processes are carried out within the project.

### Co-design and co-production
One of the use cases is dedicated to the topics of "co-design" and "co-production". Co-design and co-production have so far been limited mainly to processes within a single organisation, including the associated supplier network.

Collaboration via innovative data and networking structures across company boundaries enables an increase in sustainability and efficiency. However, this also opens a multitude of valid questions, such as: How can compliance with intellectual property rights be ensured? How is the handling of proprietary know-how regulated?

The development of a mobile manipulator was chosen as a concrete use case. This example seems ideal due to the large number of necessary components and various technical disciplines required for the development and production of the robot.

### Product lifecycle analysis
The second use case deals with the analysis of the product lifecycle of an injection-moulded plastic component along the entire value chain. This is achieved through a digital product passport, enabling transparency, efficiency and sustainability in manufacturing.

The digital product passport documents relevant data of the individual process steps from the product idea to the end of the product's life: From the first drafts and designs, via the development and manufacture of the mould to the manufacturing of the product and, finally, its recycling or upcycling.

Verifiable monitoring along the manufacturing processes is intended to create incentives to ensure that the product is manufactured in a way that saves resources. The data collected with the digital product passport will also be used to enable reliable calculation of the products' carbon footprint, i.e. carbon dioxide emissions caused by the product.

## Collaborative Condition Monitoring & Smart Service Planning

The value creation network in this case is represented by Berger as a component manufacturer, DMG MORI as a machine manufacturer and Munsch as a manufacturing end user: Munsch manufactures its products with machines from DMG MORI, in which Berger ball screws are installed.

The ball screws are wearing parts. Their service life is influenced by various dynamic factors and hard to estimate. If ball screws fail, major production losses can ensue.

The core of the presented use case is therefore a condition monitoring system for the ball screws that relies on machine data released by Munsch and estimates the remaining service life. Providing DMG MORI with access to these data makes it possible to plan replacement or maintenance services and trigger corresponding spare parts orders.

The Gaia-X-compliant interfaces developed within the framework of DIONE-X ensure the trustworthy transmission of the data via an IoT platform.
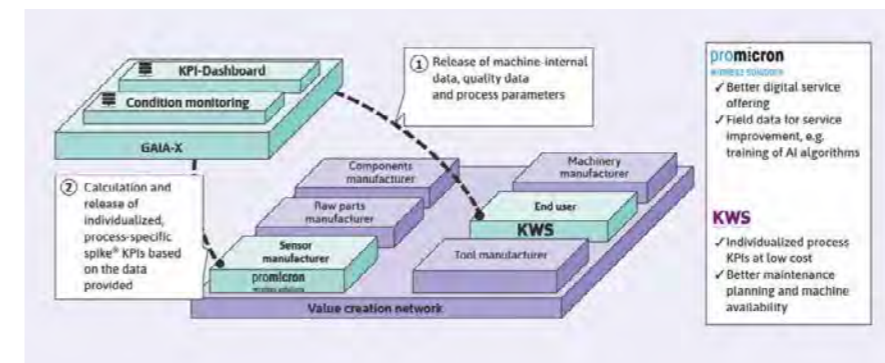
## Individualised KPI Dashboard

The value creation network of this use case is represented by pro-micron as the sensor manufacturer and KWS Kölle as the manufacturing end user. KWS Kölle uses the sensory tool holders – developed and distributed by pro-micron – in their manufacturing processes.

The recorded sensor values are used to calculate key performance indicators (KPIs) for the quality and stability of the machining process. Since both the stability and quality limits are process-dependent and thus individual, a blanket calculation is not useful. Thus, in this use case, pro-micron uses the sensor data released by KWS Kölle to compute process-specific KPIs.
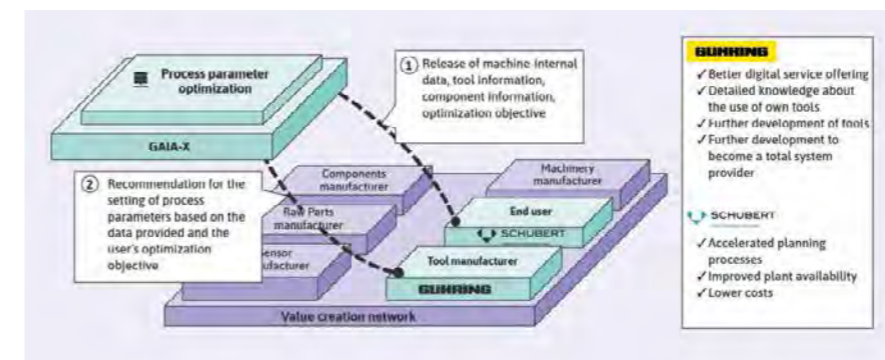
## Optimised Tool Usage

The value creation network of this use case is represented by tool manufacturer Gühring and manufacturing end user Schubert. Schubert relies on tools from Gühring to complete their incoming manufacturing orders.

In many situations the ideal cutting parameters for a given tool and material are not known beforehand and require extensive domain expertise. Based on a given objective of Schubert, e.g. increasing tool life or achieving better surface quality, and by sharing information about, e.g. the used tool and material, Gühring suggests the right cutting parameters to meet the objective defined by Schubert.

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# Enabling trust

## KEY FACTS

| | |
|---|---|
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| PROJECT PARTNERS | pro-micron GmbH, Deckel Maho Pfronten GmbH, Software AG, Berger Holding GmbH & Co. KG, Gühring KG, A1 Digital Deutschland GmbH, Munsch Chemie Pumpen GmbH, Schubert Fertigungstechnik GmbH, KWS Kölle GmbH, Institut für Produktionsmanagement Technologie und Werkzeugmaschinen – TU Darmstadt, Institut für Datenoptimierte Fertigung – Hochschule Kempten |
| ASSOCIATED PARTNERS | EIT Manufacturing Central gGmbH, Verband Deutscher Maschinen- und Anlagenbauer e.V., Hessenmetall e.V., Verein Deutscher Werkzeugmaschinenfabriken e.V. |
| FUNDING VOLUME | €3 million over two years |
| PROJECT VOLUME | €5.3 million |

*Manufacturing companies need to adapt to rapidly changing economic and political conditions. Their response to short-term disruptions must be timely and effective. Only then can German companies remain competitive in a global market.*

Exploiting the potential of increasing digitalisation within the machining industry and the availability of more data is essential to increasing the resilience and sustainability of future value creation systems.

While German manufacturers own "data treasures", the willingness to share is low, in particular due to a lack of trust. A fully interoperable and sovereign data-oriented ecosystem along the lines of Gaia-X can foster trust and create incentives to take the next step.
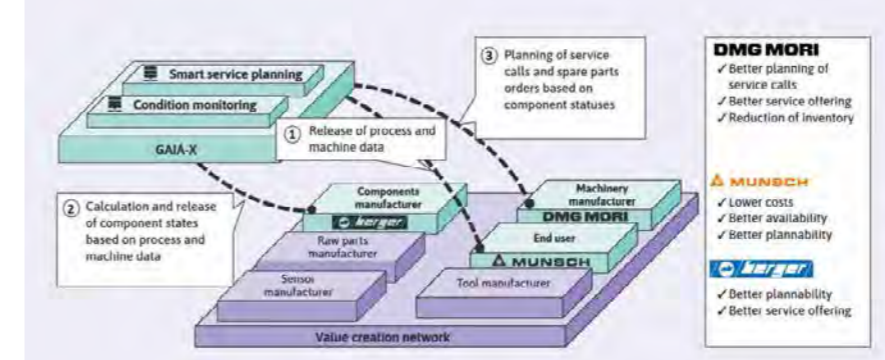
### Focus on machining

The DIONE-X research project highlights the potential of open data exchange in accordance with Gaia-X standards and guidelines for the machining industry and works on translating this potential into transferable IT solutions.

DIONE-X builds an efficient and secure data and service ecosystem based on Gaia-X principles for the value creation network in the machining industry. This network consists of machine manufacturers, tool manufacturers, component manufacturers, sensor manufacturers as well as manufacturing end users and service providers.

The data and service ecosystem enables network participants not only to exchange data across companies but also to create new fields of application, including data-driven business models.

The project partners work on three use cases, which are introduced on the next page.

# Right on the edge

## KEY FACTS

| | |
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| ASSOCIATED PARTNERS | Danobat-Overbeck, DMG MORI, Posedio, VDMA, TU Wien, Linz Center of Mechtronics, A1 Digital International GmbH |
| FUNDING VOLUME | €4 million over three years |
| PROJECT VOLUME | €6.4 million |

*Manufacturing holds enormous potential for edge-cloud environments to create new business models. Vast amounts of data are generated on the shop floor, often by various machine components at the network's edge. Yet, data often remain on the shop floor, falling short of their value. Moving forward, components will be incorporated into open, service-oriented systems, leveraging data sovereignty mechanisms.*

Utilising microelectronics and sensors, machine components provide valuable insights into both the condition of the component itself and the overall process. For example, this enables more stable operations and reduced emissions through efficient use of resources.

Component manufacturers often lack access to this generated data, primarily due to the challenges of integration. Current platforms or digital marketplaces involve high costs for the participation in platform-based business models and require specific hardware to be purchased.

Additionally, this hardware is limited and can only be used according to the legal stipulations of the platform operators. Reducing today's integration efforts for interfaces by employing open standards and new technologies is a prerequisite for enabling data sharing.

### Straightforward integration

ESCOM is therefore working on provider-independent access for machine end users to the know-how of component manufacturers, developing digital services deployed in edge-cloud environments. This development comes from the integration of available and largely standardised digital technologies. As a result, corporate partners will benefit from product-specific innovations.

### Market potential

These perspectives represent greater market potential for component manufacturers and are characterised by collaborative, interdisciplinary coinnovations in alignment with the machine manufacturer as an Original Equipment Manufacturer (OEM). Currently, the market perspectives are predominantly supply-oriented, as there has been a lack of exchange with end users. Implementing component-service systems in open, sovereign edge-cloud environments shifts the market perspective, developing innovations driven by demand.

### Use cases

The focus of the first use case is a motor spindle, a central component of a machine tool, which serves as a data source for new digital service offerings through integrated sensors. In collaboration with machine manufacturers and end users, this creates new opportunities to optimise machining processes.

### Digital nameplate

The digital nameplate of the component is a key technology. A service is offered based on this technology for verifying the correct commissioning of the spindle, allowing for more flexible warranty terms.

In operation, this service can be used for condition monitoring and predictive maintenance. Additionally, real-time data from vibration, displacement and temperature sensors will be utilised for model-based real-time artificial intelligence (AI) services to detect critical machining processes, which help users avoid critical machine conditions.

The second use case also follows the shared solution approach but is implemented for another component of a machine tool, the ball screw.

### Asset Administration Shell

Through the digital nameplate in the form of an asset administration shell (AAS), the necessary information is stored in a standardised data model, enabling users to commission an AI service to monitor the condition of the component.

Based on integrated sensors, the service analyses the condition of the component and forecasts the remaining useful lifetime to avoid unplanned machine downtime. A planned extension of the service will offer suggestions for process optimisation based on historical data, or even provide a stress-based leasing model, in which the fees depend on the load.

# Trailblazer

## KEY FACTS

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| FUNDING VOLUME | €8 million over 4 years |
| PROJECT VOLUME | €10 million |

*From the start, the binational Austrian and German project EuProGi-gant stood for smart and sovereign use of data in the European manufacturing industry. The goal of what is elaborately called "Euro-pean Production Giganet for calamity-avoiding self-orchestration of value chain and learning ecosystems" is nothing less than getting industries back to Europe.*

EuProGigant started working in March 2021 and has risen to some fame early on. It became one of the Gaia-X light-house projects in 2022 and was the first to show a demonstrator that complied with the Gaia-X Trust Framework at the Hannover trade fair in June 2022 – dra-wing considerable interest from research and industry alike.

In the meantime, EuProGigant has grown into a project ecosystem for data and services in manufacturing, which has manifested itself for the first time in EMO Hannover in September 2023 and is again presented in the EuProGi-gant Open House Day in October 2023 in Berlin.

Five projects, AMIDS, DIONE-X, ESCOM, Flex4Res and EuProGigant, have safe and sovereign data exchange at their heart. They show how data can support the industrial value creation process while describing the benefits of data-driven business models.

### Hot topic data exchange
The topic of data exchange is a universal challenge in the manufacturing industry. The need for transparency on emissions as defined in the Paris Climate Agreement and the European Green Deal make it a must have, but it also offers room for data-driven busi-ness models that companies will benefit from.

EuProGigant focuses on both aspects with its four different use cases on component matching, the validation platform, mobile processing machines and the prediction of the product car-bon footprint during product develop-ment.

### Enabling CO2 prediction
To reduce a product's carbon footprint, the product design phase is the crucial time. Considerate choice of raw mate-rials, production processes and ade-quate machines can lower the carbon footprint of a product considerably.

To make the right decisions, a valid prediction of a carbon footprint is necessary – and this requires trustwor-thy, uniform and verified information from the stakeholders involved as well as a comprehensible, harmonised cal-culation methodology for mutual data utilisation.

Based on the results that had been generated until July 2022, the project partners applied for additional funding, as the feedback from the industry side was very positive. It became evident that additional partners and higher investment into the use case would help to better fulfil industrial needs, espe-cially with regard to the supply chain. The funding authorities shared the pro-ject partner's view and granted additi-onal funds.

### Successful application
In the next two years, the project is expected to prove that ecosystems according to Gaia-X can be implemen-ted with the software components of different vendors and that the Gaia-X-based concept is truly interoperable with other federated services designed according to Gaia-X specifications.

The aim is to combine the following aspects: in the EuProGigant project, business models for the four use cases are currently being worked on. The upgrade will involve developing the business model of the federator that enables the ecosystem. In addition, a validated, interoperable ecosystem architecture will be technically imple-mented.

Interoperability is crucial because without data spaces being interopera-ble, data exchange hits a barrier very fast. This would constitute a blow, espe-cially for small and medium-sized com-panies which often serve as suppliers. If they cannot participate in various data spaces without putting in high effort, they might get bound to data spaces governed against their interests.

This is why the demonstration and knowledge transfer from EuProGigant will continue to address the heteroge-neous business landscape of small and medium-sized enterprises, which is typical for the manufacturing industry in Europe.

### Active part of Gaia-X
Several project partners have been hea-vily involved in the Gaia-X Association from the beginning. Others joined the Association during the project, bringing perspectives from industry as well as research to the table.

The Market-X event in Vienna in March 2023 brought together the Gaia-X community, including project partners and representatives of EuProGigant. The project was introdu-ced to a large audience with a demons-trator for the use case in component matching, which made Gaia-X tangible.

### Outlook
The validation platform use case has moved from a focus on federated ana-lysis in the first part of the project to federated learning over the course of two years. The future focus will be on federated learning, as algorithms use third-party data to improve proprietary processes and translate them into machine learning.

The business model development and the concept of the federator including all discussions around roles and practi-calities have drawn great interest. The idea of a federator has been around for some time, but no clarity has yet been achieved on how data usage and the federation will be paid by clients. Fin-ding a structured approach will hold enormous value for the manufacturing industry and ongoing conversations will certainly enhance this approach further.

At the same time, the discussion of interoperability will take centre stage, as it is vital to any data sharing along the value chain.
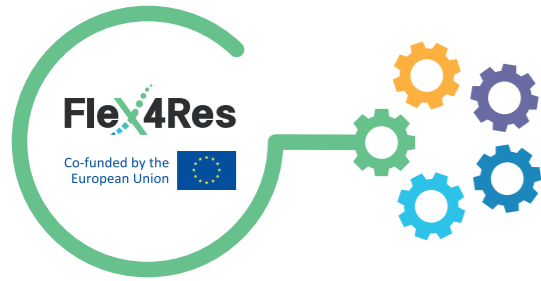
# Boosting flexibility

## KEY FACTS

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| **FUNDING AUTHORITY** | European Health and Digital Executive Agency (HADEA) This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101091903 |
| **FUNDING VOLUME** | €8 million over three years |
| **PROJECT VOLUME** | €10 million |

*Manufacturing supply chains are often global, complex, multi-layered and interconnected. They are vulnerable to disruptions from sudden influences e.g. cyberattacks, financial crises, global pandemics. Yet, manufacturers need to deliver high-quality products at a high production rate while minimising non-value-adding activities. Increasing production flexibility and supply chain resilience helps them stay competitive.*

Main reasons for flexibility deficiencies are the lack of efficient means for trustworthy data exchange as well as interoperability barriers across the value chain. There is a need for determination when such changes lead to deterministic chaotic behaviour with far-reaching consequences.

In the Flex4Res project, 17 partners from 6 EU countries work on creating data spaces for flexible production lines that significantly enhance the reconfigurability of production services, thus strengthening the flexibility and the resilience of the European manufacturing industry.

### Open platform
The project will provide an open platform for secure and sovereign data exchange along the supply chain to support the reconfiguration of production networks for resilient manufacturing value chains.

Additional toolboxes for resilience assessment and reconfiguration planning will enable stakeholders across the supply chain to manage different types of disruptions by reconfiguring supply chains and production lines quickly and efficiently.
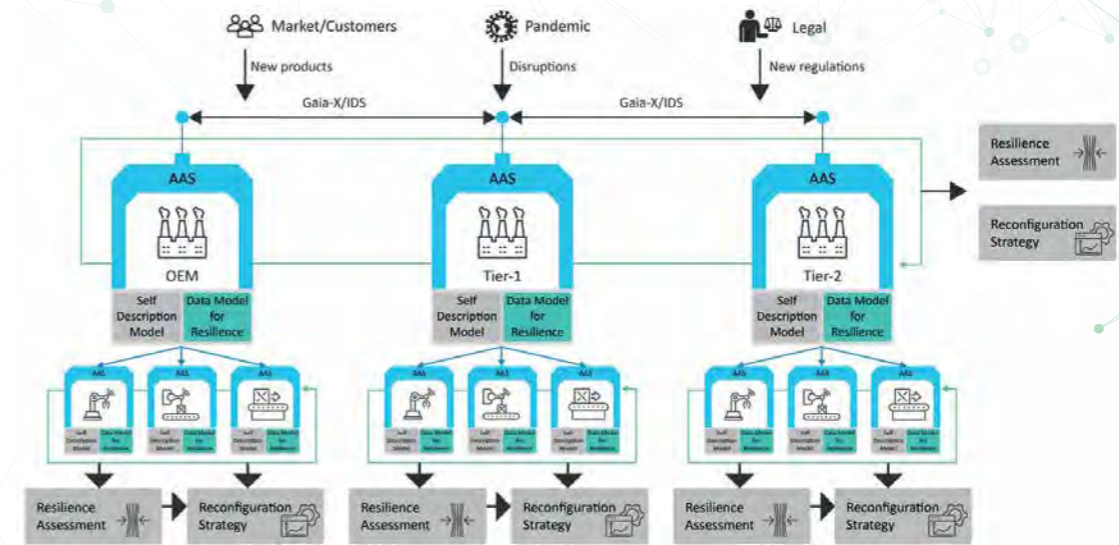


Flex4Res concept (© Flex4Res consortium)

### Based on standards
Based on the latest Gaia-X framework with self-descriptions, International Data Space (IDS) Reference Architecture Model (IDS-RAM) and Asset Administration Shell (AAS) technology, a data space for sharing data among stakeholders without interoperability barriers will be implemented. It will also contain a Gaia-X/IDS connector for secure data sharing.

Knowledge-based and easy-to-integrate smart tools from the toolboxes will complete the concept and support users with recommendations for corrective actions so that they can make smarter decisions regarding their systems from a resilience perspective.

### Better planning
Moreover, Flex4Res will develop a production planner using real-time data to suggest reconfiguration strategies and a predictive maintenance module to identify anomalies that could potentially lead to failures.

### Collaboration across disciplines
Four use cases address different types of manufacturing systems and focus on various hierarchical layers.

### Reconfiguration measures after a tool change
Challenge: at Hans Berg's, adjustment measures are necessary when a tool or material has changed. The required time and quality of the outcome depend on the experience of each employee.

Goal: reducing the time required to reconfigure the tools, the amount of produced defective components and the need for the experience required to perform the adjustment tasks.

### Production planning optimisation
Challenge: in the GOIMEK production, the process steps within the production of one part are performed in several working centres. They need to be fixed according to the daily production needs.

Goal: increasing the efficiency and competitiveness as well as the predictability of production by developing a cross-site production planner, which can be constantly reconfigured.

### Reconfiguration of manufacturing processes during production
Challenge: the products in voestalpine Group's High Performance Metals Division vary in size and shape.

They can only be machined on machinery providing the necessary capabilities, which also vary, e.g. for tools.

Goal: highly flexible production planning and scheduling, also depending on the current machine state and manufacturing utilities, with the opportunity to reconfigure the manufacturing processes during production.

### Supply planning optimisation
Challenge: disruptions in processes from Sidenor require production reallocation, which is done manually. Decisions at network level are not connected to the reconfiguration needed at the factory level.

Goal: reducing reconfiguration time of the production plans for the production network by supporting users throughout reconfiguration planning.

# Pontus-X: Owned by no one, open to everyone

*A new neutral infrastructure and ecosystem allows companies from different sectors and countries to securely create, collect, market and utilise data: the Pontus-X network. Sharing best practices and executing governance rules complies with the Gaia-X framework while ensuring transparency, portability, sovereignty and interoperability from edge to cloud.*

Launched in 2022 by deltaDAO, EuPro-Gigant and other Gaia-X members, Pontus-X takes a decentralised and federated approach to digital service management and orchestration. The principle of this decentralised ecosystem is "owned by no one, open to eve-

ryone". The same applies to the network supporting these services and exchanges. It is neutral in the sense that all participants can meet on equal ground, collaborate and compete on an open market.
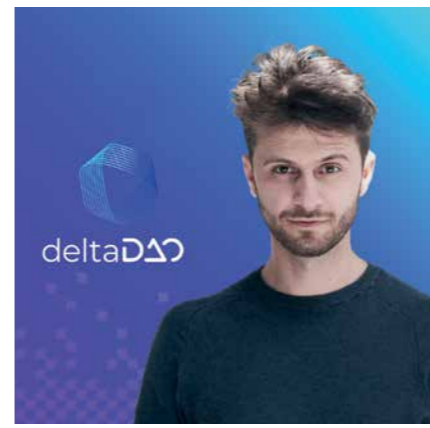


*Albert Peci*
Co-Founder and Web3 Lead at delta DAO

*"The Pontus-X ecosystem enables secure storage, sharing and processing of industrial data from edge to cloud in a seamless, decentralised and resilient manner. In doing so, we address the individual points of failure that could otherwise cause the entire system to fail."*

Within the framework of Gaia-X, EuPro-Gigant demonstrates how a highly connected manufacturing set-up can be equipped with self-orchestrating and stabilising characteristics. Sovereign data and information exchange enable sustainable and resilient manufacturing.

deltaDAO joined EuProGigant early-on as an associated partner to work on the neutral infrastructure EuProGigant needs to facilitate business, product development, common exploitation of digital resources. This also involves efficient orchestration of digital services across companies, domains and countries.

## Joint development

The EuProGigant project partners identified potential uses and benefits of Distributed Ledger Technologies (DLT). Thus, the EuProGigant ecosystem portal and various service implementations were developed with deltaDAO.

Therefore, EuProGigant was one of the initial supporters of the Pontus-X network, recognising the need for a neutral infrastructure, decentralisation, interoperability, resilience and the added value of blockchain and DLT.

## Compute-to-Data for sovereignty

Concerns about the intellectual property often makes companies reluctant to share data. Compute-to-Data (CtD) makes it possible to securely process data on edge devices, on-premise or in trusted cloud environments by giving access to data, but not transferring it.

EuProGigant and deltaDAO integrated Ocean Protocol's CtD data access mechanism into the shared ecosystem. It is one of the cornerstones for data sovereignty, privacy and compliance, as CtD empowers data owners to grant compute-only access to their data without creating copies in other environments they cannot control. The automation and protection capabilities associated with CtD create added data value through scalability.



*Kai Meinke*
Co-Founder & Business Lead at deltaDAO AG

*"Returning control to companies, especially small and medium-sized companies, is key to fair competition, excellent services and a sustainable data economy. Self-sovereign identities, including for machines, open-source software, technical data sovereignty and efficient settlement of automated business transactions to enable cost savings across companies and borders determine daily operations in manufacturing and are key to competitive offerings."*

## Compute-to-Edge evolution

To improve response times and save bandwidth, production data is often no longer processed in the cloud but directly on the machine, i.e. the edge. Combining the cloud-to-edge paradigm with CtD takes full advantage of edge computing in the form of Compute-to-Edge (CtE). Using CtE, collected data can stay on the machine and under control of the data owner.

Just like with CtD, approved software applications are brought to the data with CtE, so that privacy-preserving compute jobs can take place in the data owners' edge environment. Replication, transport and additional data storage is unnecessary, thus keeping the data footprint small – an important contribution to a more sustainable and resource-efficient ecosystem.

CtE opens new opportunities for using and monetising data across companies and industries, ensuring compliance while enabling cost savings and data control. The software solution can be deployed on any cloud platform, on-premises or edge infrastructure that complies with Gaia-X standards and the Trust Framework. The EuProGigant ecosystem and Pontus-X network give companies technical control of their data while enabling them to monetise it in a decentralised manner.

deltaDAO's mission is to create a federated system that brings together service providers and users in a transparent and secure environment in line with the Gaia-X framework.

## About deltaDAO

deltaDAO AG is a software development, integration and consulting company based in Hamburg, Germany, founded in 2021. As a Gaia-X member and specialist for distributed ledger technologies and smart contracts, deltaDAO is engaged in the Gaia-X community and several lighthouse projects and provided the first functional Gaia-X Ecosystem "Pontus-X" in 2021.

| What is Gaia-X? | What is Gaia-X not? |
|---|---|
| Gaia-X defines the architecture and rules for data exchange and infrastructure compliance and makes this set of rules openly available. In addition, Gaia-X certifies compliance with these regulations via Digital Clearing Houses. | Gaia-X is not a certification organisation, software, hardware or European cloud platform and does not provide an environment to run Gaia-X services. |

# The Gaia-X Hubs network

*The Gaia-X Association has an international network of hubs – currently 21. The are the think tanks which are firmly rooted in their countries and bring their perspectives, the countries' needs and requirement to the table. Thus, all hubs have a slightly different focus. Here are voices from three hubs in Central Europe.*

*Mentor and motivator*
*"The Gaia-X Hub Slovakia is a leader in digital transformation and data economy in Slovakia. Our main aim is to accelerate digital transformation in Slovakia by involving companies, universities and public bodies in the creation of data space projects. We also explain what Gaia-X is (a framework, not a European cloud service), what open source means and how the European support for data space projects works."*

Martina Maláková
Gaia-X Hub Slovakia

*Close collaboration*
*"The Gaia-X Hub Germany supports the Gaia-X development and application in Germany and beyond. We generate, collect and disseminate theoretical and practical knowledge and help to translate it into practical solutions. In the area of manufacturing, we seek close cooperation with Plattform Industrie 4.0 as well as the Kopa 35-C funding projects, Catena-X and, soon, Manufacturing-X."*

Jan Fischer
Gaia-X Hub Germany

*"Domain Manufacturing" for Austria*
*"Since 2022, the Gaia-X Hub Austria has provided information and created trust, facilitated data sharing within organisations and supported companies in building up data spaces, joined forces nationally and internationally and raised the visibility of Austrian activities. Since May 2023, the Austrian "Domain Manufacturing" has brought together all relevant actors, initiatives and lighthouse projects that deal with data spaces in manufacturing in Austria."*

Roland Sommer
Gaia-X Hub Austria

# Interview:
# Roland Fadrany on Gaia-X



*Roland Fadrany*
Gaia-X, COO

*Roland Fadrany has been Chief Operating Officer of Gaia-X since May 2022, but had ample touchpoints with the association in his previous role as a partner at Detecon. Over 20 years, he has held different roles in the IT sector, in companies such as EDS, HP, A1 Telekom Austria and Microsoft.*

**Why Gaia-X?**
Gaia-X exists because the industry has become enormously fragmented. The digital world must reflect this division of labour and industrial specialisation by exchanging data. To do this, you need two things: a trust framework and interoperability. Gaia-X delivers both.

**What makes Gaia-X special?**
Nobody but us does what we do. We are a neutral, member-funded non-profit organisation with a who's who of industry involved, both on the user and provider side. We don't represent our own interests and we don't believe in protectionism, geographical or other, because that has never worked as a strategy.

**What is a Digital Clearing House?**
A Digital Clearing House is a verification node of the Gaia-X rules that can be used to obtain compliance and become part of the Gaia-X ecosystem. The open-source code for it comes from the OSS community, from lighthouse projects and from our own developers.

**Why are Digital Clearing Houses important?**
Firstly, because they are operationally secure and tamper-proof. Digital Clearing Houses need to work with each other. One must recognise the certification of the other, so the system is self-regulating. Secondly, the Digital Clearing Houses are the only way to control compliance. They are independent of the Gaia-X ASBL but allow us to maintain control and governance over the software.

**What benefits do you see for the manufacturing industry?**
Especially the manufacturing industry is facing the dilemma of high division of labour – at EuProGigant, ideal component matching is a good example. Two parts are manufactured in different places and should match as precisely as possible. The benefit does not have to be about marketing data. Take product recalls, for example: instead of recalling an entire series of vehicles, you can recall specifically those in which a particular part was installed.

**How well is Gaia-X recognised and implemented?**
For our Market-X event in Vienna in March 2023, we conducted a survey on how many projects were working with Gaia-X – there were 120. I estimate the number is twice as high.

**There are a number of data space initiatives like Gaia-X and IDSA. Do you expect them to converge?**
There's the DSBA, which is BVDA, Fiware, Gaia-X and IDSA. BVDA refers to the business layer, Fiware to the implementation and Gaia-X and IDSA to definition. And then there is the business layer that the projects must do themselves.

In the past, we didn't talk to each other, but we talked about the same things. Today, we work as closely as we can and try not to overlap in what we define – we are completely aligned. When we present ourselves, we even use the same narratives.

**What are Dataspace Support Centres, or DSCCs?**
DSSC is another EU initiative, in which Gaia-X participates. DSSC is kind of a formal description of how to build dataspaces. Unfortunately, they started this initiative very early. Now there is another instance, again with members from Gaia-X, IDSA, BDVA and Fiware.

**How does that affect projects like EuProGigant?**
It always affects them as far as they participate. Our lighthouse projects are showcases from the industry how to apply and benefit from Gaia-X. That message was well presented and perceived. However, we need more contribution of the lighthouse projects to the community because they are close to the industry and to the market. This is an opportunity and my request: Join us proactively, we co-create the rules that apply afterwards. EuProGigant is exemplary because it has been an open project from the very beginning.

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# Digital business models:
# Driving monetisation

*Data has become the proverbial new gold. Yet, way too often, it is not used to best advantage due to a number of considerations and barriers. Developing business models in Gaia-X compliant data spaces is supposed to drive monetisation of an industrial data base.*

A lack of consideration of the business-relevant aspects is a critical factor for the failure of data-based solutions on the market. Therefore, the development of data-based business models has been firmly anchored in the project and pervaded all areas since the launch of EuProGigant in early 2021.

Business models form the basis for creating benefits from a technical solution for customers, operators and the other players in the value network. In production, business models are mostly product-driven. The development of business models in the context of data ecosystems requires attention to some specific aspects.

## Service-orientation is key
The service-oriented focus results in changed cross-lifecycle expenses and revenue opportunities compared to the product business. This also includes a recurring or continuous exchange of services between the players, which significantly strengthens customer relationships.

While value creation in traditional business models often follows a linear process, we look at a cooperative generation of benefits between a wide variety of partners in data ecosystems. This includes providers of domain-specific services as well as providers of data and infrastructure services.

## Federator as facilitator
A special role in the Gaia-X compliant data ecosystem belongs to the federator. Federators perform technical tasks, such as services for secure data transmission, and organisational tasks, such as the integration of relevant players or the onboarding of members. They thus form the backbone of any ecosystem.

Finally, the establishment of transparency about the benefits generated by the activities in the data ecosystem is an important task in the creation of sustainable business models.

## Incentives for all
This applies above all to communication geared toward customers in order to create incentives for consumption of the data and algorithms offered. The monetisation of the service offerings needs to create sufficient incentives for all players in the value network in order to promote the sustainable economic viability of the data ecosystem.

The insights gained during the project have already been incorporated into the development of business models for the use cases of the project. They have also been made available to a broad scientific audience in several publications.

## Focus on CO2 use case
Future activities in the area of business model development in the EuProGigant project focus in particular on the business model in the use case "CO2 footprint in product creation" as well as the business model of the federator.

# AAS: The DNA of Industry 4.0

*The fourth industrial revolution, often referred to as Industry 4.0, has the potential to drastically change the way products are manufactured and delivered. By merging the physical with the digital world, companies can increase production efficiency, produce better products and develop innovative business models. The Asset Administration Shell (AAS) is a core technology of the Industry 4.0 concept.*

The Asset Administration Shell (AAS) represents a digital depiction of a physical object or entity, i.e. a machine, product or process. This digital representation allows data and information about the lifecycle of the physical counterpart to be collected, analysed and exchanged.

## Type vs instance

There are different types of Asset Administration Shell. The instance shell represents a specific physical unit or instance. For example, for a particular machine in a factory, the instance shell contains all detailed information about this machine. By contrast, the type shell represents a class or type of object. This type might be, e.g. a category of machines.

While the instance shell contains individual and specific information, the type shell provides general information relevant to all instances of this type.

Furthermore, type and instance shells can be composite shells when several asset administration shells are connected or linked. In such cases, the composite shell represents multiple machines, facilities or products.

## Data Exchange

Within the digital landscape of Industry 4.0, the AAS offers various mechanisms for efficient and reliable data exchange, allowing the involved systems and devices to communicate optimally. A central element here is the AASX-File, also known as Type 1. The AASX can bundle all relevant data in defined submodels. This format is particularly useful when a copy of the AAS is required, e.g. for data backup or between different systems.

In parallel, Type 2, or Rest API, offers a modern approach to interacting with the AAS. By using RESTful API methods, specific data or functions of the AAS can be retrieved or controlled via standardised HTTP requests. This concept allows fine-grained interaction with the AAS without transferring the entire unit.

Lastly, the Industry 4.0 language, or Type 3, comes into play. This semantic data transmission mechanism allows various systems and devices to communicate using a common "language". This unified communication base will enable data to be consistently and understandably interpreted across different platforms. A notable feature of this type is the ability for systems to interact proactively with each other without the need for central control or external intervention.

In summary, these three data exchange mechanisms provide the versatility and robustness required for the AAS to function in an Industry 4.0 dynamic environment.

## AAS and Gaia-X

With the ongoing digitalisation and networking, it is crucial to securely and efficiently exchange data across company boundaries. Enter Gaia-X, a European cloud and data infrastructure initiative promoting secure and sovereign data exchange in data spaces.

In conjunction with the AAS, Gaia-X offers a concept to store and share digital twins and other Industry 4.0-relevant data in a protected space. By combining AAS and Gaia-X, companies can position their digital representations of physical objects – their Asset Administration Shells – in a Gaia-X-based data space.

This combination not only enables secure data exchange but also a standardised interaction between different companies. In this way, machines, products and systems from various manufacturers and providers can communicate more efficiently and seamlessly with each other while ensuring a high level of data protection and data security.

## AAS as digital revolution

The introduction of the Asset Administration Shell in industry is a revolutionary step. The combination of Asset Administration Shells with Gaia-X can radically transform our production environments. Imagine a world where machines and products communicate seamlessly with each other through their standardised digital representation!

In such a connected environment, companies can access operational data in real time. That means that they cannot only monitor their machines more efficiently, but they can also proactively respond to changing conditions. A breakdown or disruption? No problem. With the real-time insights the AAS provides, maintenance needs can be detected early and planned effectively.

Component manufacturers also benefit from this digital revolution. Not only can they offer preventive maintenance services but also tailor their services to the specific needs of their customers or the associated new customers such as machine end users. The keyword here is "flexibility". And flexibility entails resilience. Companies leveraging the AAS can dynamically react to market changes and optimise their processes in our ever-changing world.

### Enhancing data consistency

Furthermore, the AAS enhances data consistency across various enterprise data systems, allowing for seamless integration of Product Lifecycle Management, Enterprise Resource Planning and Manufacturing Execution Systems. This integration is particularly important when discussing the Digital Product Pass. This pass enables tracking products throughout their entire lifecycle, promoting transparency in the supply chain and more sustainable decision-making.

Integrating Gaia-X not only boosts security in data exchange but also offers the chance to learn from the data and experiences of others. This integration accelerates the continuous improvement process and the optimisation of production processes.

### Transformative technology

In a nutshell, the Administration Shell is a pivotal element for transforming the industry within the context of Industry 4.0, sustainability and resilience. Its capability to digitally represent physical objects and processes fosters a connected, efficient, future-ready and resilient production environment.

## Application of AAS in research projects

| ESCOM | Flex4Res |
|---|---|
| Development of vendor-independent access for machine end users to the digital services of component manufacturers in an edge cloud environment. The prototypical implementation in an industrial context uses the concept of the AAS and CONTACT Elements for IoT in a Gaia-X-compliant data ecosystem. | Development of an approach to support flexible reconfiguration in resilient production value chains. Combined with CONTACT Elements for IoT, Gaia-X and IDS technologies should ensure the required interoperability in the horizontal supply chain. In parallel, the AAS is used for factory-internal reconfiguration. |

# Powerful network

*It is amazing to know that the project partners of the five projects include more than 100 companies and institutes. Several of the partners are active in more than one project, making sure knowledge is transferred. Thanks to everybody who is advocating for the ecosystem!*