## MOBILITY & PRODUCTION

Fields of Expertise TU Graz

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**Helmut Eichlseder**
**Mobility & Production**
Source: Lunghammer – TU Graz

The two key themes of FoE Mobility and Production were strongly represented at two major events in September 2023. First, the international conference Sustainable Mobility, Transport and Power Generation, jointly organised by the Institute of Thermodynamics and Sustainable Propulsion Systems and the Large Engine Center LEC, with 300 participants from all over the world, largely dealt with the current state of research and development in the field of passenger and freight mobility.

Secondly, under the general topic "New worlds in production", the Science Day of Graz University of Technology was also held in September. Numerous famous speakers cast light on their research fields and young scientists in particular explained their scientific work via posters and elevator pitches.

A keynote address by Merit Bodner introduced new technologies closely related to electromobility and showcased forward-looking manufacturing technologies for fuel cells and electrolyzers.

The subject-oriented exchange of future topics aside, it was wonderful to meet old associates, partners and colleagues who are spread over various companies and do not come to the university on a daily basis. The format again turned out to be successful and will be prolonged into the next years.

Interlinked work with data is definitely the future of industrial collaboration and new forms of managing this are emerging. One example of doing data economy is the establishment of specially dedicated "data spaces". What these are and how they work is explained by Rudolf Pichler in his article.

I can also report good news on the topic of hydrogen research infrastructure. The planning work for the investments at TU Graz announced in an earlier issue is well advanced, and procurement and implementation have begun. The first devices are already in operational use. From the FoE's point of view, too, we can already look forward to a thematically broad hydrogen research infrastructure. ●

Rudolf Pichler

# Data Spaces as European Format of a Data Economy for Manufacturing

Data spaces are not physical places for storing or computing data and they are much more than a seemingly new marketing ploy by data business. Data spaces can offer a highly trustful way of sharing data in a more and more networked world. Data spaces are domain specific and that is why the manufacturing industry is going to participate in this new form of data economy.

## NETWORKING IS THE FUTURE

Powerful and effective value chains are much more important for success in business than singularly strong companies. To form these chains and line-ups, all types of networking technologies, and preferably IT-based ones, are used. Companies that share their expertise and data are the winners in the economy of the future. Studies have shown that these companies create noticeably higher revenues than companies that stick to hiding their data [1].

## THE EUOROPEAN INITIATIVE FOR DATA SPACES

Companies are ready to share their data and expertise, but as soon as data sovereignty and data security is not assured, companies become hesitant or simply stop participating, expecially if they are involved in R&D or crucial innovation projects.

The data economies established so far are dominated by the hyperscalers (Google, Amazon, Meta, Apple, Microsoft) and are not offering a better situation. They are all suspected of skimming data when providing their services. That is why in 2020 the European Commission (EC) advanced a much more trustful and European way of working with foreign data. In a move to enable companies to keep control over their data, the EC proposed the Data Act. The creation of so-called "data spaces" in 10 strategic fields was also announced, viz. health, agriculture, manufacturing, energy, mobility, finance, public administration, skills, the European Open Science Cloud and the cross-cutting key priority of meeting the Green Deal objectives [2].

Source: R – AdobeStock

## CHARACTERISTICS OF DATA SPACE

To understand data spaces one has to move from today's hardware orientation (servers and networks) towards a system of digital infrastructure that relies on a governed form of data usage and data sharing [3]. Data spaces can be understood as a universe built up by participants who share data bilaterally or multilaterally by – and this is the point – following certain rules, mainly the rules of data security and data sovereignty (see Fig. 1). In this way, the handling of data is open, decentralized and – also highly important – traceable. [4]

## DATA SPACES AND THEIR DOMAINS

Data spaces are domain specific. This makes sense because they embody the intention to unite participants of a certain sector of business. They are all confronted with similar business cases and procedures, have to follow similar laws and regulations and they all use more or less the same types of data. The most famous data space so far is "Catena-X", which belongs to the domain of the automotive industry. In the meantime Catena-X is no longer in the pioneer phase and has more than 160 members. It is operated by Cofinity, an association of famous big German companies such as BASF, BMW, Henkel, Mercedes-Benz, SAP, Schaeffler, Siemens, T-Systems, Volkswagen and ZF.

In February 2023 the "Manufacturing-X" lighthouse project was founded in Germany. Its objective is to strengthen the value chains of industrial companies. Again data and digital technologies are used to achieve substantial results in decarbonisation, increase of resilience, finding  **>**
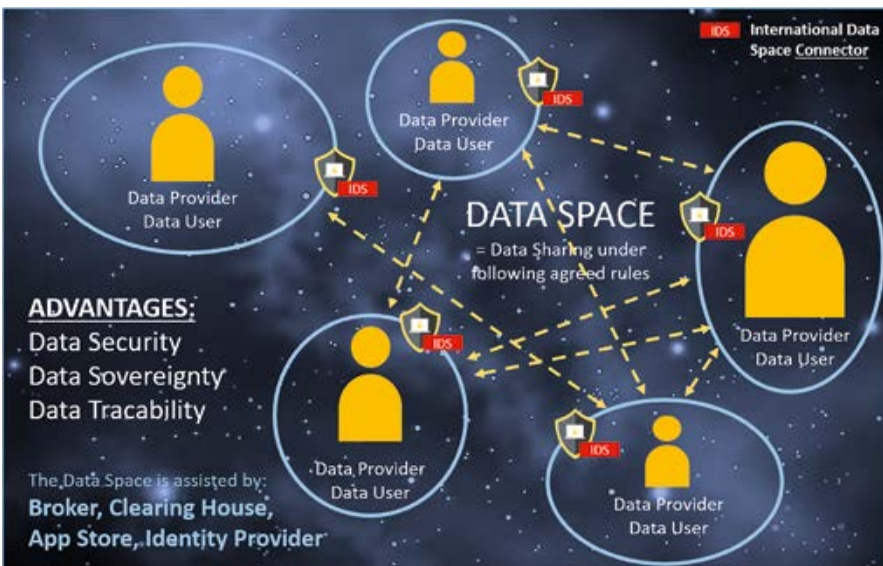


**Figure 1: Data space as a universe for sharing data with sovereign partners and decentralized data transfer facilities.**
Source: own illustration

economical energy solutions and last but not least effectiveness in all industrial categories. Manufacturing-X has also set the target to integrate SMEs in particular as important parts of industrial value chains. The frontrunners within the Manufacturing-X initiative come from the automation and aviation Industry and its realisation is definitely also based on working with data spaces.

Actually Graz University of Technology is also participating in a funded research project on data spaces. Together with Vienna University of Technology, the University of Linz, a big list of producing companies as well as renowned software houses, Austrian Manufacturing Innovation Data Space (AMIDS) will be built in order to empower innovation and a trustful management of data in manufacturing environments. The initiative particularly addresses SMEs and their specific requirements.

### TECHNICAL INFRASTRUCTURE FOR DATA SPACES, GAIA-X AND IDSA

Data spaces need technical infrastructure, rules and guidelines for data exchange [5]. In 2019 Germany and France launched the "Gaia-X" initiative as one possible tech-stack for European data spaces. Gaia-X supports all computing resources with a reference architecture,



**Figure 2: Various initiatives are involved in European manufacturing-driven data spaces.**

Source: amids

networks the single participants, does the accrediting and offers the so-called "federated services". Finally, to use a data space any applicant needs a "connector" (= SW which acts as a kind of gateway). For all these preparations the pioneer and front-end researcher Fraunhofer Gesellschaft offers, e.g., a data space starter kit [6]. Gaia-X works with cloud- and edge technologies and has currently committed to covering six data spaces (finance and insurance, energy, automotive (Catena X), health, aeronautics, travel).

The International Data Space Association (IDSA) works on a higher level – on so-called data eco-systems; in other words, on connecting individual data spaces. Since 2016 the IDSA has been developing standards for a secure and trustful data exchange in this broader field. Their contribution is a reference architecture model (IDS-RAM) and a source-open IDS-connector. GAIA-X and IDS should be understood as complementary tech stacks which benefit from each other in order to achieve digital sovereignty whilst sharing confidential data [7].

### SUMMARY AND OUTLOOK

Data sharing is no longer just a friendly act but the future of doing progressive and innovative business. European initiatives launched the basis for creating secure and trustful ways of sharing knowledge and data by the empowerment of data spaces. Within the domain of manufacturing the Catena-X data space is a frontrunner and many more are currently being developed. TU Graz is part of a research project where an innovation-dedicated data space is going to be built. ●



**Rudolf Pichler**

**is a senior researcher at the Institute of Production Engineering and leads the research and learning factory smartfactory@tugraz. His major research field is digitalisation of manufacturing environments. He is participating in a funded project regarding the development of an innovation data space for manufacturing.**

Source: Lunghammer – TU Graz

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