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Industrial data economy for Finland

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Foreword

Foreword by Jussi Mäkinen, Head of Digital Regulation, Technology Industries of Finland

The era we are living, is the one of data. Data lies at the heart of reform of industries and societies; social media is changing the way we interact with our friends and colleagues and how societal discourse is developing. Data has also become a contested topic of politics, both global and national – discussion is circling around confidentiality localisation and privacy.

Data transformation has only begun: most companies, cities and other organisations are still on a learning curve. Data and its sources and potential uses are being mapped and different dimensions of data are being discussed. Data has some new characteristics. It can be endlessly combined with other data, it can tell us everything and nothing at all. Foremost, data is not a new oil or any other finite commodity. Data does not easily fall under commonly used legal tools but somewhere on a no-mans-land between familiar IPR and NDA clauses of contracts.

You, reading this paper, are likely involved in shaping data practices of tomorrow. We should aim for balanced, reciprocal and allowing soft infrastructure supporting data sharing and governance, of which building blocks are clear usage rights, functional and scalable access to data, good quality metadata and new kinds of skills to make data usable. One important factor is sustenance of trust in networks. Building these capabilities is not necessarily easy, but it is enormously important. Ability to have right data at the right at the right time will play a major role in making industries and societies carbon neutral and more efficient. We should look for streamlined, robust and easily scalable practices to make sure we have the data where we need it. To achieve this, we need new dynamic thinking and agile, balanced structures and some new legal clauses. These practical solutions, as described in this paper, have been developed in Finland by many players of which Technology Industries of Finland is one. In order to have functional data economy, we need functional structures and tools from bilateral data sharing arrangements (such as our Model Terms for Data Sharing) to complex multi-party networks.

Introduction

In the digital era, competitive edge rises to a large extent from various forms of co-operation, like value systems and partnerships. Factories of the future and manufacturing processes will become more and more dependent on data, producing and consuming huge amounts of information and leveraging data in decision-making. According to a survey from the analyst firm IDC¹, 80% of manufacturers need to extensively restructure their processes and place data at the center of their business to increase speed and quality. The more effective use of data in the manufacturing industry will create approximately 2-3 percent increase in company turnover. Currently, globally in the manufacturing industry up to 99 percent of the value of data is left unused, meaning that the potential for improvement is huge.

Many businesses vastly underestimate and underutilise their data as a source of future competitiveness – but this is not just a company level challenge. It is hampering how we use and connect data also in individual supply chains and at local, regional, national and EU levels. Many EU countries have launched national Industry 4.0 data initiatives. At EU level, DG CNECT is bringing together the European Manufacturing Industry to create data sharing practices, templates, regulatory proposals and business platforms. Also, GAIA-X is gaining traction by building a common high-performance, secure and trustworthy data infrastructure for Europe. In addition, many large industrial players have set up their own, proprietary data sharing platforms and we have seen dedicated data clubs emerging on national levels.

The first insights into the logic of operation of Industrial B2B platforms indicate that we are facing a radical transformation of the current industrial landscape. This is likely to be enabled and further promoted by an increasing flow and importance of data exchange between various types of industrial stakeholders, but also by new ways of creating innovations and economies of scale and scope.

Future market value lies in opportunities which are derived from merging, filtering, and cultivating multiple datasets between different members in an ecosystem, between different stages of a value/supply chain, and on factory floor between different machines. This will drive new insights and therefore create opportunities for new innovation.

Data sharing is no longer just a technical challenge. However, there are critical challenges related to data sharing that need to be taken care of related to, e.g. data ownership, data sharing and cultivation skills, trust, data monitoring, reputation, as well as legal, liability and licensing issues, thus a truly holistic approach is needed. The holistic approach to data sharing is strongly connected to the needs of EU's industries and could be driven through a (future) EU industrial strategy which would better incentivise and facilitate a focused approach through a wide range of means and measures (e.g. standardisation, regulation, investments in open data platforms / infrastructures, skills development, risk management, etc.).

Finland has decided to take a very active role in the European industrial data sharing context and several initiatives are underway or planned. This all means that Finland is at the forefront to take a leading position in the European data economy context – an opportunity we should not miss!

In the above context, **this position paper focuses on highlighting the current situation in Europe and beyond and focuses on the role Finland should take in order to foster the next generation of industrial data economy.** For this paper, we interviewed all the Intelligent Industry ecosystem member companies (n=10) and few other subject matter experts. In addition, an in-depth literature review was conducted.

Big picture in Europe and beyond

An 'ecosystem' approach to data will be essential for future industrial competitiveness. The Finnish cases and practices have now a great opportunity to serve as models that can be used more widely for EU's industrial data sharing purposes.

Currently, a socio-technical shift is gaining momentum, converging both regulatory, research and innovation policies as well as technology and data ecosystems towards implementable strategies, frameworks and technical solutions that can sustain an ethical, open and democratic European data economy. In Europe, there is an increasing focus on '**data sovereignty**', which will enable organizations to retain full control over the access and usage of their own data. This will result in **several initiatives to develop decentralized platform architectures**. These types of models typically emphasise data ownership and edge computing, and try to avoid any software vendor lock-ins.

EU launched its data strategyⁱⁱ in early 2020. This strategy has a strong focus on fostering data sharing, adopting legislative measures to data governance and data sovereignty. The European strategy for data intends to:

- **Adopt legislative measures on data governance**, access and reuse, for example for business-to-government **data sharing** for the public interest;
- **Make data more widely available** by opening up high-value publicly held datasets across the EU and allowing their reuse for free;
- Invest €2 billion in a European High Impact Project to **develop data processing infrastructures, data sharing tools, architectures and governance mechanisms for thriving data sharing** and to federate energy-efficient and trustworthy cloud infrastructures and related services;
- Enable **access to secure, fair and competitive cloud services** by facilitating the set-up of a procurement marketplace for data processing services and creating clarity about the applicable regulatory framework on cloud framework;
- **Empower users to stay in control of their data** and investing in capacity building for small and medium-sized enterprises and digital skills; and finally
- **Foster the roll out of common European data spaces** in crucial sectors such as industrial manufacturing, green deal, mobility or health.

Several other initiatives are also shaping the industrial data economy across the world.

Organisations such as the **International Data Spaces (IDS) Association**, **Industrial Internet Consortium (IIC)**, **Data Market Austria**, **Ocean Protocol**, **the IOTA Foundation**, **iShare** and the **Industrial Value Chain Initiative (IVI)** are currently working on industrial data economy initiatives from different angles. Larger initiatives that offer a competitive challenge to European ones include e.g. the **DataTransferProject**, backed by strong US players and the **MadeInChina2025 strategy** for the digitalisation of production centres across the manufacturing industry.

In addition, "**Self-sovereign identity networks**" models are gaining traction. Self-sovereign identity (SSI) means lifetime portable identity for any person, organization or a thing that does not depend on any centralized authority and can never be taken away. It is a term used to describe the digital movement that recognizes an individual should own and control his/her identity without interventions from administrative authorities. SSI allows people to interact in the digital world with the same freedom and capacity for trust as they do in the offline world.

Figure 1 below summarises the path towards data economy. Currently, in most cases B2B data sharing takes place as *Point-to-Point communication*, through proprietary, custom made solutions with selected partners. In addition, data sharing is done mainly manually by exchanging emails, human-readable documents etc. and data is shared only for predefined cases or purposes.

In the next evolutionary phase (*Common Data Space*) machine-readable data will be shared via a common data space or platform. This means that certain tested and verified basic rules and governance models for data sharing are agreed and taken into use by the participants. Some level of autonomy also exists, and companies can start sharing their data using common interfaces and plug'n' play tools.

Industrial data community means that a network of actors has decided to start operating according to a set of common rules. At this stage several data sources will be merged and information about availability and nature of data is openly shared among participants. New data intensive services based on combining data from different sources and from different participants can also be launched.

The *data market* phase is the final step allowing systematic monetisation of B2B data. This requires a dedicated data exchange company for orchestrating and organising data sharing. Companies can assume various roles in this business system: e.g. data producer, data aggregator, insight provider, or data presenter. The data market will provide also application enablement and integration for business applications. Compared to the previous steps, this model will be more open, allowing third parties to join as well.

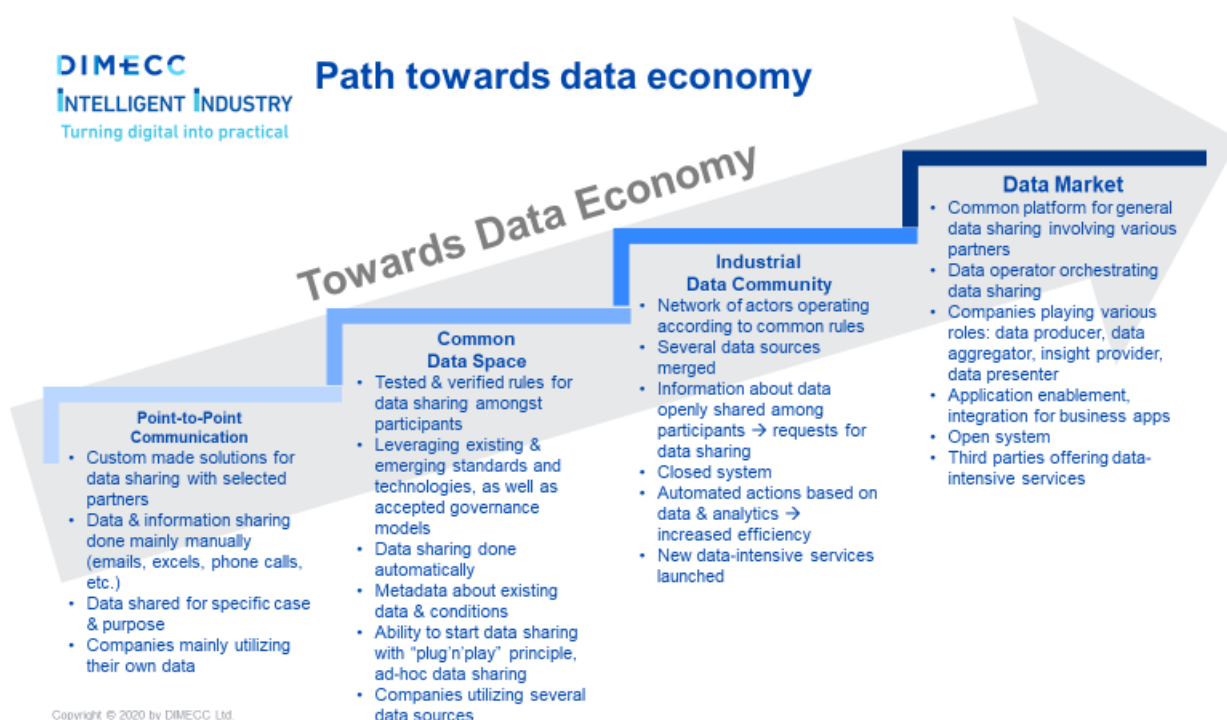


Figure 1. The path towards data economy

Industrial data economy activities in Finland

Finland is in a well-positioned starting point and should take a leading role driving common European industrial data space. Finland is a top player in the European Commission Digital Economy and Society Index (DESI)ⁱⁱⁱ, and it has in place government structures supporting agile and experimentation-based development approaches.

Industrial data economy holds enormous potential and opens opportunities, which the Finnish industries cannot afford to miss. According to European Commission^{iv}, the value of the European data economy may increase to €739 billion by 2020, representing 4% of the overall EU GDP. The value of data-based business in Finland is 2,5 % of GDP and the value will be growing at an annual rate of 20 % based on the Commission's estimate. For mechanical engineering and manufacturing sector this means €2,8 billion worth of new data-based business during the next eight years.

The leading Finnish industrial companies have already made plans for data monetisation and implementation of these plans is progressing rapidly. Companies have started to conduct data feasibility studies and to build their own data platforms and connectivity solutions. Key challenge currently is how to consolidate existing and new actors to co-operate for common good and for larger scale.

Data monetisation takes already place, however at small scale. Some client companies have needs to integrate and link for example machine performance and status data to their own ERP (Enterprise Resource Planning) systems. Many companies are currently investigating what kind of data they could sell, on which terms, and what sort of data views could be opened for their clients. The interviewed companies also highlighted the importance of trust, meaning secure data flows and connections and data sharing frameworks, but also **trust** between people and organisations. Closed IT systems and poor knowledge of available digital platform collaboration mechanisms can be a challenge especially in the manufacturing industry.

In order to be able to fully leverage the benefits of industrial data sharing companies need to understand the earnings logic, i.e. how data sharing will increase their efficiency and effectivity, how it helps them to get more business, and how it improves their financial results. Companies are facing difficulties in defining how the value of their data should be modelled and evaluated and what KPIs (Key Performance Indicators) they should use. For export-oriented companies, one of the challenges is the current fragmented global business landscape. Different regions and countries have different rules and regulations for data sharing, meaning that one size (or business model) does not fit for all.

Companies want naturally to keep control and ownership of the data they are sharing. Today, in many cases large clients are dominating the supply chain relationships and request data to be stored in their cloud platforms. This means that e.g. machine manufacturers might lose control to their machine data. Clearly, a more neutral platform is needed and preferred. In addition, security of national emergency supplies is an important driver. In crisis situations, it is very important that data is in local (read: trustworthy) hands.

Based on the interviews and discussions with the Intelligent Industry ecosystem companies, there is a clear need for a national industrial data exchange company. Close co-operation and collaboration is needed, as companies should invest together on a common data space, and agree on common frameworks, rules and operating models. Working and investing alone is the most expensive and hardest way to proceed.

In Finland, several initiatives are already underway. The Intelligent Industry ecosystem^v has been fostering industrial data economy since 2017, the Technology Industries of Finland has published model terms and conditions for data sharing^{vi} in 2019, and SITRA has worked on its IHAN initiative and created the first version of a data sharing rulebook^{vii}. In the PREGAIA initiative, **Ministry of Economic Affairs and Employment, Business Finland** and **VTT** are working together with the aim to raise awareness in the Finnish industry regarding the GAIA-X initiative^{viii}. Key questions to be addressed include e.g. understanding how this development impacts the Finnish businesses, is there a need to be involved in the GAIA-X and at what level, and how the businesses need to adapt their operations to the future solutions. **DIMECC** has operated the Intelligent Industry ecosystem since 2017. This ecosystem connects leading Finnish manufacturing and ICT companies with the aim to foster industrial digital transformation and data economy. In 2019, the ecosystem launched the Industrial Data Excellence (InDEx) program, with the aim to unlock the value of data as an enabler for the next industrial revolution centered around Artificial Intelligence in the Finnish manufacturing industry. The mission of the InDEx program is **to develop and pilot a common data space in manufacturing** value ecosystems by **defining tested and verified rules and practicalities for scalable data sharing**, taking into account technical, legal, ethical and business aspects.

Couple of actual data exchange companies are already operating in Finland:

CombiEnt - a Swedish-Finnish industry network founded in 2015 with 30 leading enterprises as members - has been driving an initiative for industrial data sharing since 2019. It is based on use cases and needs identified and defined by the CombiEnt network companies and it has focused its activity in creating cross-sectoral and cross-vertical cases, where the trust and business objectives within the network play central roles. The initiative is called DaaS (Data-as-a-Service) and its operations are managed by a Helsinki-based team of CombiEnt MIX Oy. After the solution has been developed and tested with the CombiEnt member companies, DaaS will be gradually opened to non-CombiEnt Nordic companies during the second half of 2020 so that they can take part in the development work. DaaS is focusing on selected industrial areas and it is building shared best practices in close co-operation with other national and Nordic players.

Platform of Trust^{ix} harmonizes incompatible data coming from various data sources, enabling it to be merged and utilized. This platform does not collect data, but allows its customers to decide where the data is stored, who can use it, and for what purpose.

DBE Core^x, on the other hand, focuses on B2B system integration. Its Core Platform is the first generic Network as a Service (NaaS) ever made; providing neutrality, trust, and continuous seek for efficiency. Its final goal is to enable fully digitised B2B integration between multiple ERP's in the business ecosystem. Core Platform combines APIs and Blockchain in a unique trusted way to build ecosystem digitalization.

Flindy^{xi} (Finnish Indy network) is a Finland-based and locally operated, decentralised identity ledger. Its target is to enable use cases and services with use of self-sovereign identifiers in Finland related to data.

In many cases, companies are currently working with third party service providers and are using their platforms to share data for specific purposes. These types of models however lack the economies of scale and are often used only for collaboration between a limited number of parties in a strictly defined environment and use case.

The strategic and systemic plan for industrial data sharing growth

We think that in order to address the industrial data economy topic it is important to build an RD&I focused collaboration model. The strategic and systemic plan for industrial data sharing growth, business, exploration and competence & capability building in Finland is presented in *Figure 2*. This approach takes into account all three aspects of the field work that need to be executed on one hand simultaneously and together, and on the other hand independently and with high importance as such.

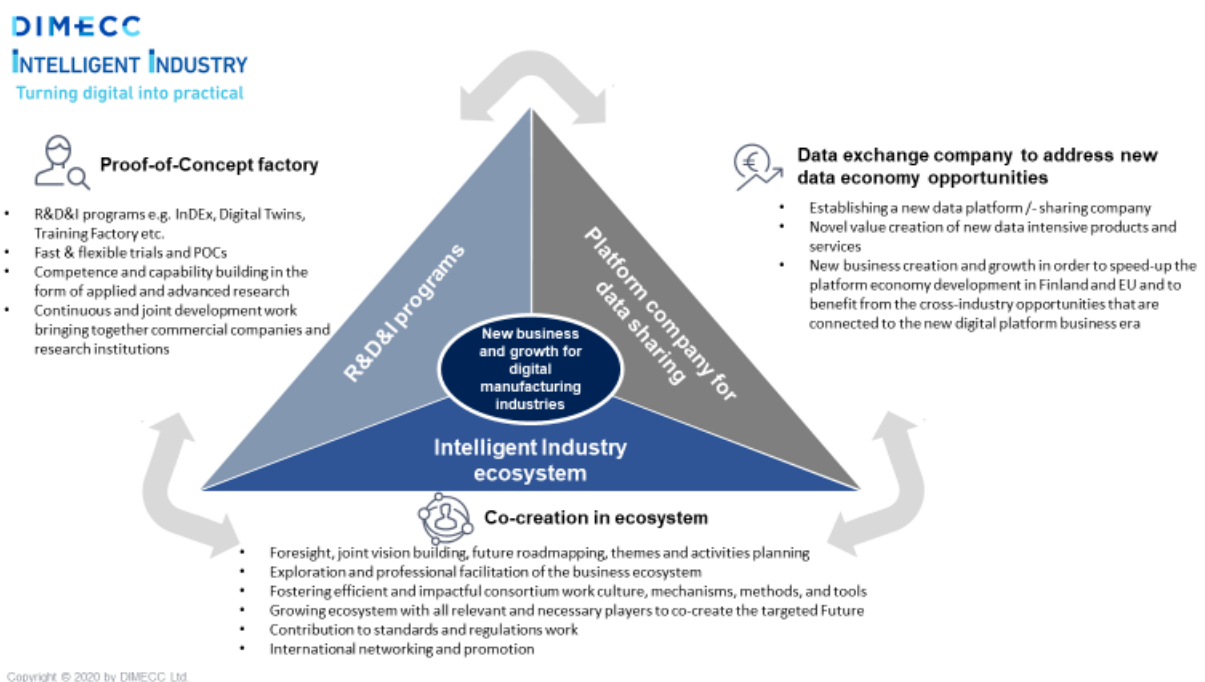


Figure 2. Holistic renewal triangle of Finnish manufacturing industry

Intelligent Industry Co-creation Ecosystem is responsible for exploration and professional facilitation of the business ecosystem in the selected type of industry (in this case, Manufacturing). This work includes the foresight, joint vision building, road-mapping, the search and inclusion of all relevant and necessary players to co-create the targeted Future, as well as the support for this co-creation work with the most efficient and impactful consortium working culture, mechanisms, methods, and tools. The strength of this aspect in Finland is based on the long-term commitment of companies of different size and type, joint discussions, culture of trust and closeness, and non-hierarchical, lean leadership style. Intelligent Industry is the common name for all these ecosystem activities, and it has been facilitated by DIMECC for the past two years.

Proof-of-Concept Factory offers framework for competence and capability building in the form of applied and advanced research, fast & flexible trials and piloting, and continuous and joint development work both in commercial companies and research institutions. This work guarantees that world-class competence and knowledge creation takes place among the ecosystem participants and their stakeholders, and that Finland achieves a leading position in industrial data sharing and the digital utilization of multifaceted and versatile data. The huge advantage for Finland-based businesses in reaching the leading position in data sharing competence, knowledge and practices is based on the heterogenous and specific nature of Finnish industrial

manufacturing, which is not focused on a single product group (like, e.g., the extremely strong automotive industry in Germany) but rather on a variety of focused, leading-edge product families. On one hand, highly focused products limit the overall market size and hence also companies' revenue and growth opportunities, but they also open opportunities to share experiences and technical and process information more deeply and widely, without exposure to direct competitors. The first program in this aspect is DIMECC InDEx (Industrial Data Excellence, public funding received from Business Finland), and the next ones will be launched with an estimated pace of one program per year.

Data exchange Company addresses opportunities related to new data economy, like new business creation and growth for speeding-up the platform economy development in EU and for benefitting from the opportunities that are connected to the new digital platform business era. Manufacturing industry companies and some of their stakeholders will establish a new data exchange company or partner with an existing one, whose business is to analyze and co-create new business opportunities, new products, and new services for itself – or to be sold to 3rd parties. In addition, the owners of the company may buy in some new ideas and opportunities that are identified through eye-opening cross-utilization of the data received from all established businesses.

The new data exchange company gets its data raw material initially from its shareholders, customers, and content providers. Intelligent Industry ecosystem's activities and its program outcomes have also a key role in defining and executing the business model.

As a summary for the triangle, it not only executes the holistic manufacturing industry renewal in Finland, but it also turns companies towards better utilization of ML/AI and data, and towards mastering and leading the European industrial data sharing culture-creation and standardization. The roles for DIMECC, data exchange company, and their stakeholders have been designed to maximize the impact for both private and public investments. Intelligent Industry ecosystem will facilitate growth not only via the new data exchange company, but also through increased sales, improved market shares, and high profitability of all of its members' current and improving businesses.

Our Recommendations

In order to successfully implement the industrial data economy in Finland, we have come up with the following recommendations for the industry, regulators and funding bodies:

1. Lower the barrier for entry - ensure that **industry-driven data exchange companies can and will be established** to Finland, e.g. by **using public innovation funding and/or PPP models**. National level funding commitment needs to be in place and **consolidation of existing actors in Finland for the common goal**. This helps to maintain control, ensure national security of supply, and keep the earnings in Finland. A key challenge currently is: How to get companies work together on a scale for a common goal. If we want to keep Finland as front runner in data sharing, time to act is now.
2. Follow the **data sovereignty principle**, meaning that the data owner has control of usage of its data in a de-centralised platform set-up.
3. Once the data exchange company has been set up, **ensure subsidies or other type of financial support especially for SME companies** to get onboard. SME companies might face technical and/or economical challenges to create interoperability with their own resources.
4. Finland should **take an active role in EU level initiatives** such as the Gaia-X, EC's manufacturing data spaces initiative, IDSA standardisation etc. and make sure our voice is

heard. This means however, that a national data exchange company needs to be in place first.

5. Continue to **raise awareness, educate and commit manufacturing companies to understand the importance of data economy**. Communications of identified actual real-life use-cases in data sharing raises industries general awareness about data sharing topic and via awareness new use-cases will be identified.
6. **Foster collaboration and co-innovation**, the data exchange should have built-in links to strong RD&I networks and business ecosystems in order to develop new business capabilities for the future.

About Intelligent Industry ecosystem

Intelligent Industry is an innovative ecosystem connecting leading Finnish equipment manufacturers and providers of digital solutions to drive and to realize the immense opportunities of the emerging new era of Intelligent Industry. Partner companies include Fastems, HT Laser, Elekmerk, Innofactor, Melkki, Konecranes, Nokia, PrimaPower, Raute and TietoEVERY. The ecosystem is operated by DIMECC and partly funded by Business Finland.

Interviews

Kari Aaltonen, Nokia Bell Labs

Juha Pankakoski, Konecranes

Esko Petäjä, Prima Power

Mika Hyysti, Raute

Mikko Myllys, Innofactor

Jukka Teiskonen, HT Laser

Nea Kontoniemi, HT Laser

Markus Hautala, TietoEVERY

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Seppo Tikkanen, DIMECC

Risto Lehtinen, DIMECC

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