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// GET INVOLVED: THE FUTURE OF LOGISTICS IS OPEN SOURCE

Team players instead of lone specialists
Humanoid robots in intralogistics

Paradigm shift
Artificial intelligence as a driver of innovation

With iLEAP on the way to becoming the industry standard

The interface proves its worth in use cases

With insights from

CargoTrack // Dachser
Fraunhofer IML // Gryn // Kinver
LKW WALTER // Smart Freight Centre
Trans.EU // Way Data Technologies

open logistics foundation

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Welcome

In recent years, digital sovereignty has evolved from a niche topic into a key strategic issue for companies in Europe. The term refers to the ability of organisations, industries and economies to consciously design and develop their digital infrastructures, data and processes. It is about choice, transparency, and the ability to act in the long term. In Europe, digital sovereignty is often discussed primarily from a security and regulatory perspective: dependencies on individual providers, critical infrastructure, and data protection. This perspective is important, but it falls short. Digital sovereignty is not only a protective mechanism but also a key driver of innovation and growth. Those who understand, control and can further develop digital foundations create the conditions for new forms of collaboration, as well as scalable and resilient business models.

Open source approaches play a special role in this context. Open software makes it possible to develop technological building blocks collaboratively, share knowledge and, at the same time, create individual value for companies. Proprietary solutions are not fundamentally excluded. Rather, it is a question of balanced interaction. Open where openness increases speed, quality or interoperability – proprietary where highly specialised solutions make sense.

This is precisely the pragmatic approach the Open Logistics Foundation takes. Our starting point is always specific logistics challenges: fragmented systems, a lack of standards or inefficient interfaces. Based on these real-world problems, we identify areas where open, jointly developed solutions can strengthen the industry as a whole. Step by step, this creates digital building blocks that benefit not only individual companies but the entire ecosystem.

Digital sovereignty is thus created through viable solutions in practice. It grows with every interface that becomes interoperable, with every standard that gains acceptance, and with every company that actively participates in shaping it. In this way, digital sovereignty is transformed from a buzzword into a practical basis for sustainable value creation and competitiveness in Europe.

Carina Tüllmann
CCO of the Open Logistics Foundation

With iLEAP on the way to becoming the **industry standard**

The first successful use cases involving implementation of the **iLEAP interface** for exchanging emissions data demonstrate that open standards are an essential prerequisite for sustainable logistics – and the Open Logistics Foundation is actively driving the development of iLEAP into an **industry standard**.

// iStock

Decarbonising supply chains is one of the most effective ways to improve sustainability in logistics, yet the industry is lagging behind. The need for collaboration is clear. “Sustainability in logistics is not a one-off project; it can only be achieved if all stakeholders work together”, says Nathalie Böhning, Innovation and Project Manager at the Open Logistics Foundation. “After all, no company can calculate its carbon footprint in full on its own. It requires data from suppliers, carriers, partners and platforms – and this across many different systems”. If everyone uses their own formats and interfaces, the path to greater sustainability in logistics becomes rocky.

Interest is growing

To establish a common solution for exchanging emissions data, 16 members of the Open Logistics Foundation are now involved in the Working Group Enabling Logistics Decarbonisation

About Smart Freight Centre

Smart Freight Centre (SFC), founded in 2013, is a globally active non-profit organisation (NGO) for climate action in the freight sector based in the Netherlands. SFC works to mobilise the global logistics ecosystem, in particular its members and partners, to track and reduce greenhouse gas emissions. It accelerates the reduction of logistics emissions to achieve a zero-emission global logistics sector by 2050 or earlier. To support this objective, SFC develops and disseminates methods, standards and tools – such as the globally recognised GLEC framework or ISO standard 14083 – for the consistent calculation and reporting of emissions along the supply chain. The organisation promotes collaboration between businesses, policymakers and NGOs to implement practical decarbonisation solutions and strengthen the exchange of knowledge and technology. Together with the SINE Foundation, SFC has developed the iLEAP interface as a shared organisational and technical framework for exchanging emissions data. Smart Freight Centre is a network partner of the Open Logistics Foundation.
www.smartfreightcentre.org

About SINE Foundation

The SINE Foundation is a non-profit organisation based in Berlin turning pioneering research in the fields of cryptography and economics into action. This “think and do tank” combines technology (e.g., cryptographic software) with governance mechanisms to enable companies and organisations to share data securely and with confidence, without losing control over sensitive information. A key area of focus is promoting sustainable collaboration, for example, through protocols such as PACT for CO_2 transparency or the iLEAP data interface. In this way, the organisation aims to pave the way for a more collaborative and sustainable economy.
www.sine.foundation

STANDARDISED SOLUTIONS FOR THE EXCHANGE OF EMISSIONS DATA ARE ESSENTIAL TODAY.

(ELD) and its associated project Emissions Data Exchange. The initiative was launched by the international logistics provider Dachser because an increasing number of the company's customers – ranging from automotive suppliers and consumer goods manufacturers to the chemical industry – were requesting detailed information on the CO_2 emissions of their shipments. "In addition to regulatory requirements obliging companies to systematically document supply chain emissions, many businesses are also increasingly taking a proactive interest in creating transparency regarding emission-intensive transport operations in order to then reduce them in a targeted manner", explains Ingo Müller, Department Head of Prototyping & Testing at Dachser. It thus became clear to the logistics service provider that its previous method of exchanging data via Excel spreadsheets would no longer meet future requirements and that the process needed to be significantly more digitised and automated. Ingo Müller continued, "So it was clear to us right from the start: we need a standardised solution that works for everyone involved and for the entire industry! After all, creating individual interfaces for a large number of customers would entail significant implementation and maintenance costs and, in the long term, lead to a diversity of systems that would be difficult to manage". Dachser's push for 'one solution for all' was met with broad approval among the members of the Open Logistics Foundation.

CUSTOM INTERFACES FOR A LARGE NUMBER OF CUSTOMERS RESULT IN SIGNIFICANT IMPLEMENTATION AND MAINTENANCE COSTS.

Ingo Müller, Dachser

Starting point: iLEAP

At the same time the Working Group formed, Smart Freight Centre and SINE Foundation (see profiles on p. 6) unveiled the iLEAP protocol. It defines the structure, collection and transmission of emissions data, thereby creating a digital standard that ensures reproducibility, consistency and interoperability across software systems. It enables emissions data to be shared in a standardised manner between companies, partners and authorities. It is based on the GLEC Framework and the associated ISO 14083 standard, the globally recognised methodology for calculating greenhouse gas (GHG) emissions consistently across the multimodal logistics supply chain. This methodology is now, in the EU context, the methodological backbone of CountEmissionsEU, part of the Corporate Sustainability Reporting Directive (CSRD). The iLEAP protocol increases transparency and traceability throughout the entire supply chain – even when a shipment passes through multiple companies – whilst supporting compliance with regulatory requirements such as the CSRD. Furthermore, iLEAP boosts operational efficiency: emissions metrics can be closely linked to operational data such as fuel consumption or route planning. In this way, emissions reporting becomes an active management tool, not merely a regulatory obligation.

A key principle of iLEAP is open source development. "Developing the protocol as open source allows companies of all sizes to participate in developing and later adopting the protocol", writes Violetta Matzoros, Senior Tech-

The circular economy as the key to sustainable logistics

Sustainability in logistics is not just zero emissions, says Dr.-Ing. Kerstin Dobers, Senior Scientist and Deputy Head of the "Sustainability and Circular Economy" department at Fraunhofer IML.

When people talk about sustainability in logistics, the discussion often centres on zero-emission logistics and reducing transport emissions. Where else do you see room for improvement?

A key lever is resource efficiency – in other words, alongside the question of whether we need to use resources at all, there is the question of how we can use materials, energy and products for as long as possible and in the most sensible way. After all, sustainability begins long before transport. When companies make greater use of secondary rather than primary raw materials and close material loops, this can reduce not only emissions but also cuts down natural resource consumption. At the same time, it is important to keep products and components in use for as long as possible, for example, by updating or modernising existing products, machines or systems – so-called retrofitting – through software updates, or through services such as predictive maintenance. Those who consider the entire life cycle, from the design stage of products and services, lay the foundations for a genuine circular economy.

Which measures are particularly relevant at the moment?

A key component of the circular economy in the coming years will be the Digital Product Passport, or DPP for short. It is being introduced as part of the EU's circular economy framework and will become mandatory. From 2027, manufacturers and importers of certain products in the European Union will be required to provide such passports, starting with resource-intensive goods such as batteries, textiles, and electronics, as well as intermediate products such as steel. The Digital Product Passport will document information on materials, origin, reparability and recycling options. This means significantly greater transparency regarding products and materials throughout their entire life cycle. At the same time, new opportunities are opening up for data-driven services in logistics, such as return processes, reuse or recycling. However, establishing these data structures is technically and organisationally challenging, as many stakeholders must jointly define processes. Various research projects are currently underway at Fraunhofer IML in this area, in which companies are also involved. However, there are also fundamental points of contact with OLF-eCMR, the Open Logistics Foundation's software solution for the digital consignment note.

What role do open source approaches and standards generally play in the context of sustainability?

We achieve sustainable business practices through the collaboration of various stakeholders. Open standards and interoperable platforms are particularly crucial when it comes to exchanging data across organisational boundaries. Open source approaches can help to establish a common technical foundation that can be used and further developed by a wide range of stakeholders. This not only facilitates data exchange but also lowers barriers to entry for companies that lack significant in-house development resources.

// Fraunhofer IML

EACH USE CASE MAKES AN IMPORTANT CONTRIBUTION TO THE WIDESPREAD ADOPTION OF THE ILEAP INTERFACE.

nical Manager, Data & Digitalization – Methods, Standards & Assurance at Smart Freight Centre, in the Experts' Blog of the Open Logistics Foundation. "This creates a collaborative ecosystem for emissions accounting in logistics". For the Working Group and the Open Logistics Foundation project, iLEAP proved to be an ideal starting point and basis for further development.

Productive use cases

The first use cases have now been carried out, in which members of the Open Logistics Foundation have implemented and tested the interface. Two of these use cases were worked on by logistics service providers in collaboration with a platform for analysing transport emissions data:

- Dachser partnered with Gryn. The Hamburg-based company enables logistics firms to automatically record, standardise, and analyse transport emissions, and to use them for sustainability and regulatory reporting.
- LKW WALTER partnered with the Norwegian company Kinver, a consolidation and analysis platform.

In both use cases, the logistics service providers made emissions-related data on transport operations for a shared customer available to the platforms – in Dachser's case, an international automotive supplier; in LKW WALTER's case, a global market leader in cleaning technology. The main differences lie in the interface hosting: at Dachser, the Gryn platform served as the host, whilst at LKW WALTER, the logistics service provider itself acted as the host. Both projects were successfully completed following the full go-live of iLEAP.

The effort involved in implementing the interface was relatively manageable. At Dachser, the project took around four weeks of working time,

An app store for logistics data

The implementation of the iLEAP interface creates added value for both logistics service providers and shippers. The immediate benefit lies in a seamless flow of data between the two. "The real added value, however, lies in scalability and standardisation", says Karsten Kopland, Head of Product Management/CPO at Kinver. Specifically, the advantage for logistics service providers is the ability to process and provide shipment data in a consistent format for all customers, thereby reducing complexity and the need for duplicate integrations. Kopland adds that, "For shippers, we can now provide a kind of app store for logistics data. Companies can simply select their transport service providers there and retrieve standardised data streams with minimal integration effort. Carriers can be connected with just a few clicks and their data consolidated on a central platform – for analyses, sustainability reports or integration into further internal business processes".

Is the iLEAP interface also suitable for exchanging emissions data from logistics sites? Researchers at Fraunhofer IML are investigating this for the REff Tool®, an application designed to calculate greenhouse gas emissions from warehouses and similar facilities.

spread over a period of three months. The data exchange was set up in stages to enable testing and expansion of the functionality in successive phases. Initially, data exchange was carried out manually. At the same time, semi-automatic data transfer functionality was implemented.

At LKW WALTER, the implementation took a little longer because, unlike Dachser, the company hosted the iLEAP interface itself. The main technical challenge lay in authentication. Unlike traditional methods that use tokens valid for a specific period, iLEAP uses TANs – one-time tokens for a single data query. However, an extension to the API connector quickly resolved this issue. At the same time, two-factor authentication was implemented – an important security mechanism for distinguishing authorised from unauthorised requests. An additional layer of complexity in the use case arose from the fact that, as a specialist in intermodal transport, LKW WALTER had to verify whether and how this could be mapped within iLEAP. It became clear that iLEAP processes the relevant data points regardless of the sequence of transport modes.

In conclusion, the two use cases have demonstrated that the iLEAP interface works with standard ERP and TMS systems – including SAP – and that all of these systems provide the data points required by iLEAP.

Mission accomplished

Dachser and LKW WALTER also draw a positive conclusion from their use cases. Ingo Müller says, “iLeap has proven itself to be practical and will therefore become the interface of choice at Dachser”. Michael Gschwandtner, Chief Digital Officer (CDO) at LKW WALTER, agrees: “We too will rely on iLeap for the exchange of emissions data in future. This provides our customers with

> **WITH ILEAP, OUR CUSTOMERS HAVE ACCESS TO A SIMPLE, SECURE AND COST-EFFECTIVE SOLUTION.**
>
> Michael Gschwandtner, LKW WALTER

// shutterstock

a simple, secure and, moreover, cost-effective solution". The work of the Working Group and the project thus exemplifies what the Open Logistics Foundation stands for. Here, companies develop well-thought-out solutions for practical use that take into account the perspectives of many market participants and which then spread rapidly across the market via the companies involved in the project and the use cases. Ingo Müller and Michael Gschwandtner agree: "As our two companies together reach a very large number of end customers across Europe and worldwide, by using the new iLEAP interface, we are laying an important foundation for it to gradually become the industry standard. Mission accomplished!"

Way conducts trials in Northern Europe

The Finnish start-up Way Data Technologies, also a member of the Working Group and project, has tested the interface in an additional use case. The company operates a platform that collects and analyses telematics and vehicle data from transport fleets. Way piloted the iLEAP interface with several fleets in Scandinavia. The implementation has already been released as open source. The company is also preparing to take part in the pilot project for iLEAP certification. "Our goal is to improve transparency and accuracy in CO_2 accounting by making it easier for all players in the transport and logistics chain to access and exchange carbon footprints based on primary data", says Juho Hyytiäinen, CEO and co-founder of Way.

Logistics sites are following

In another use case, Fraunhofer IML is investigating the extent to which the iLEAP interface is also suitable for exchanging emissions data from logistics sites. This is based on the REff Tool® (short for Resource Efficiency at Logistics Sites), a web-based application developed at the institute to determine greenhouse gas emissions from logistics sites, such as warehouses, transhipment sites or distribution facilities. The tool helps companies collect primary data – such as energy consumption, refrigeration systems, or other on-site consumption – and use it to calculate and report their carbon footprint in accordance with the ISO 14083 standard. Currently,

SUSTAINABILITY IN LOGISTICS WILL NOT HAPPEN OVERNIGHT – IT IS A JOURNEY WITH MANY STAGES.

more than 100 companies use the REff Tool® at over 1.000 sites. Relevant information can be exported as an XML file and imported into other systems for further processing.

"The aim of this use case is to address current challenges in exchanging data from the REff Tool® with another system via iLEAP and to develop practical solutions. To this end, we have examined whether all relevant data for logistics sites is also contained in iLEAP and how the data should be prepared and made available for the interface", explains Dr.-Ing. Kerstin Dobers, Senior Scientist and Deputy Head of the "Sustainability and Circular Economy" department at Fraunhofer IML.

The partner for this use case is the Hannover-based company IVE mbH, which offers EcoTransIT World, a software solution for complex calculations and optimisation of emissions and energy consumption in intermodal transport. EcoTransIT World is used by shippers, logistics providers and transport companies worldwide, which also transmit data from the REff Tool®, amongst other sources. IVE is participating in the use case to actively support standardisation in sustainability.

For sustainability researcher Kerstin Dobers, this use case is yet another step towards greater sustainability in logistics. "We cannot achieve sustainability in logistics overnight," she says. "It is, rather, a journey comprising many steps that will lead us towards sustainable logistics solutions and services". </>

All results from the use cases are, or will be, documented in the Open Logistics Repository. Companies wishing to implement iLEAP can draw on the insights and experience gained there, enabling them to roll out the system more quickly.

Sustainability in focus

MANY COMPANIES ARE STILL RELUCTANT TO SHARE THEIR DATA OPENLY. THERE IS A LACK OF STANDARDS AND, IN SOME CASES, A LACK OF CONFIDENCE IN DATA SECURITY.

Oliver Ritzmann,
CEO and founder, Gryn

STANDARDISED SOLUTIONS BUILD TRUST: IF ALL STAKEHOLDERS USE THE SAME DATA STANDARDS, EVERYONE CAN UNDERSTAND HOW EMISSIONS HAVE BEEN CALCULATED.

Ingo Müller, Department Head Prototyping & Testing, Dachser

Find out more in the podcast "Von A nach Grün" by DVZ – Deutsche Verkehrs-Zeitung.

/* Listen to the podcast (in German) */

// Gryn, Dachser

Connecting new perspectives

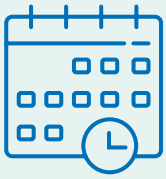
The Open Logistics Foundation is continuously building its international network: the most recent partners include the Japan Physical Internet Center (JPIC), the Terminal Industry Committee 4.0 (TIC4.0), the Open Ireland Network (OIN), and Logistics in Wallonia (LiW).

New impulses and perspectives support the Open Logistics Foundation in further developing innovative approaches in logistics and making them usable for Working Groups and projects. The non-profit organisation JPIC supports research and standardisation around the Physical Internet as a new paradigm for sustainable, open and collaborative logistics systems. The OIN, a community for open innovation in Ireland, is the leading organisation for promoting open source principles. In the cross-industry initiative TIC4.0, terminal operators, manufacturers and solution providers are developing joint standards for digital communication and data exchange in ports and terminals.

Partners such as Logistics in Wallonia make the work of the OLF visible within their networks. The transport, logistics, and mobility cluster Logistics in Wallonia promotes innovation, project development and cooperation among logistics companies.

// Open Logistics Foundation

Thorsten Hülsmann, CFO of the Open Logistics Foundation, and Prof. Takayuki Mori, Chairman of the Japan Physical Internet Center, seal the partnership between the two organisations by signing a Memorandum of Understanding.



Where to meet us

The Open Logistics Foundation regularly attends **international trade fairs, conferences and networking events** to present the activities of the Foundation and its members. Dialogue and demonstration are at the centre of these appearances: the team from the Foundation's Head Office explains the advantages of jointly developed software components for the industry, shares best practices, and promotes exchange between users and developers.

Where to learn more

With the new **Spotlight Sessions**, the Open Logistics Foundation has launched a compact online format in which experts comment on current industry topics. The range of topics extends from new regulations and their practical applications to the functions of OLF software solutions.

++ For members ++

Specifically for members, the Open Logistics Foundation organises the Open Source Innovation Days once a year as an in-person event, as well as regular virtual updates offering insights into the Foundation's current work.

/* Scan for upcoming events */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The Future of Logistics
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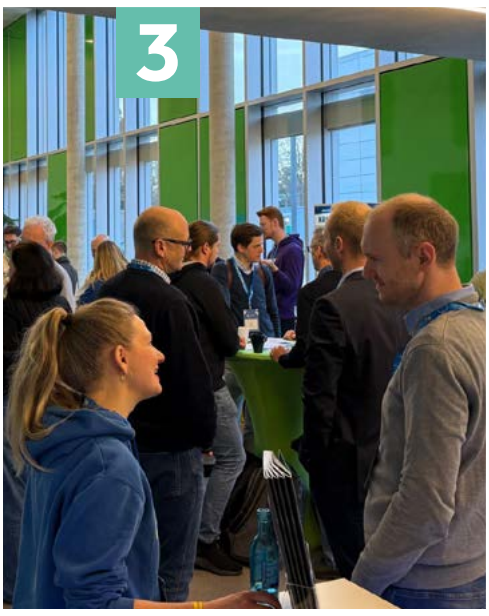

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Space for **ideas**

The **Ideation Workshop** is a core format offered by the Open Logistics Foundation for members and network partners to **develop new ideas** and topics for future open source solutions. Here's how the event works and what participants have experienced.

Every day, logistics and logistics IT experts shape digital transformation in their companies. Through its Ideation Workshop, the Open Logistics Foundation offers them the opportunity to discuss industry-wide challenges across companies, with the aim of developing collaborative open source solutions. The one-day event for Foundation partners takes place annually in the late year in Dortmund **(1)**. Zoltán Aranyi, Product Management Team Lead at CargoTrack, took part in 2025 for the first time. "As a telematics provider focused on digital transport and document workflows, the Ideation Workshop allowed us to step outside daily project routines and exchange perspectives with industry peers facing similar challenges", he says, giving a positive assessment.

At the last Ideation Workshop, members were able to discuss various topics suggested throughout the year in small groups **(2)**, such as the electronic Bill of Lading (eBL) – the key to international logistics – along with time-on-site prediction and yard access management. Paweł Ziaja, Product Development Team Leader at Trans.EU, decided to participate in the eBL session, among others. He shares, "My most exciting insight was that the biggest obstacle is not the technology, but its acceptance – similar to the digital consignment note eCMR in road freight transport. In the B2B sector, there is also a day-zero problem: unlike private deliveries, the recipient needs their own legally valid proof of delivery. Digitalisation must therefore work across the entire network and cannot start with a single sender".

The open, cross-company exchange continues between and after the sessions **(3)**. "What stood out most was the ability to openly debate such challenges with companies that are competitors in daily business. OLF is one of the very few forums that not only allows, but actively facilitates, this kind of honest, cross-industry collaboration", Paweł Ziaja continues.

The results of the sessions are presented to the plenary by the respective group spokespersons **(4)**. "The structured, small-group format encouraged open dialogue and honest input. Hearing different perspectives and constraints across the ecosystem highlighted how much coordination is required to make digital logistics work in practice," emphasises Zoltán Aranyi from CargoTrack. "The workshop reinforced our belief that progress starts with early collaboration, a shared understanding, and jointly developed standards". </>

/* To the Idea Collection Board in GitLab */

// Open Logistics Foundation (7), CargoTrack, Trans.EU

INTEROPERABILITY AS THE KEY FOR HUMANOID ROBOTICS IN INTRALOGISTICS

Humanoid robots: Team players instead of lone specialists

The introduction of humanoid robots will shape intralogistics in the coming years. Their success depends, above all else, on their **seamless integration** into existing processes and systems. **Logistics professor Alice Kirchheim** explains the role open standards and open source components play in this.

// Adobe Stock

Intralogistics has been and remains a driver of industrial automation. Intelligent warehouse technology, robot-assisted systems, and driverless transport vehicles define the image of modern logistics centres. Swift and simple integration of heterogeneous systems, processes, and technologies is crucial. Operators of logistics centres and manufacturers of automation solutions respond to a fast-moving logistics world in which resilience means reacting quickly and adapting one's own processes and structures. With the market entry of humanoid robots, automation embarks on a new era. They are more than just another form of existing automation technology. They follow a new paradigm: traditional automation solutions take over predefined functions in structured process environments and are designed for maximum performance in a specific task. By contrast, humanoid robots embody the ideal of multi-purpose robotics, i.e. the flexible, needs-based execution of various tasks, including those previously reserved for humans. In consequence, they operate in open, dynamic work environments, taking on different tasks in changing contexts. This fundamentally changes the requirements for integration.

INTEGRATION IS NOT A QUESTION OF TECHNICAL DETAIL, BUT A STRATEGIC DECISION.

Not “if”, but “when”

A recent study by Fraunhofer IML reveals that companies worldwide are actively developing humanoid robots that, according to current product claims, are feasible to be deployed in logistics. The researchers identified more than 80 systems in a market survey; the study presents a dozen of them. A complementary industry survey showed that, although humanoid robots are not yet in productive use at any company, most enterprises expect deployment within the next four to ten years. Thus, the question is no longer whether humanoid robotics will be used in intralogistics, but when and under what integration conditions.

The new Fraunhofer IML study is entitled “Automation on Two Legs? Humanoid Robots in Logistics”. It presents the results of a detailed industry survey and an international market study. From these insights, Fraunhofer IML derives recommendations for action for companies, researchers, and policymakers.

/* Scan to download */

Hardware development is currently concentrated in the USA and China. So far, Europe is represented sporadically. However, integration nonetheless concerns European companies. To operators of warehouses and distribution centres, the integrability of the new generation of robots into existing systems directly affects productivity, scalability, and economic efficiency.

In highly automated environments, physical material flow is inseparable from ERP, WMS, and control systems. Any additional technology that cannot be seamlessly integrated into this architecture reduces the transparency necessary for decision-making, increases complexity, and creates new interfaces. European users, logistics service providers, and system integrators who will incorporate humanoid robots into their portfolios face similar challenges. Robots from different manufacturers each come with unique navigation concepts, data models, and communication protocols. Each new system combination, therefore, results in project-specific integration solutions.

This was already observed several years ago with the introduction of driverless transport vehicles in intralogistics. In 2017, the German Association of the Automotive Industry (VDA) and the Specialist Association for Conveyor Technology and Intralogistics of the German Engineering Federation (VDMA) therefore initiated a communication interface for the development of an open standard: VDA 5050, a manufacturer-independent, standardised communication between driverless transport vehicles, autonomous mobile robots (AMRs), and central control systems, enabling operators of logistics and distribution centres to run mixed fleets of different types of robots. The open source software libvda5050++, developed at Fraunhofer IML in 2021 and published in the Open Logistics Repository of the Open Logistics Foundation, provides an open source solution that serves as the technical implementation of the standard and can equip almost any driverless transport vehicle for the VDA 5050 standard.

Opportunity for Europe

The more diverse and universal the fields of application for robotics become, the greater the need for shared, open integration foundations. In the context of humanoid or multi-purpose

// Fraunhofer IML

About the author

Prof. Dr.-Ing. Alice Kirchheim is an expert in intralogistics, with a focus on the planning and design of warehousing and order picking systems, the automation of logistics processes, and the use of AI. Since April 2024, she has been Director of the Fraunhofer Institute for Material Flow and Logistics IML and holds the Chair of Material Handling and Warehousing at TU Dortmund University. Fraunhofer IML is a founding member of the Open Logistics Foundation; Alice Kirchheim is Chair of the Board of Open Logistics e. V., the Foundation's supporting association.

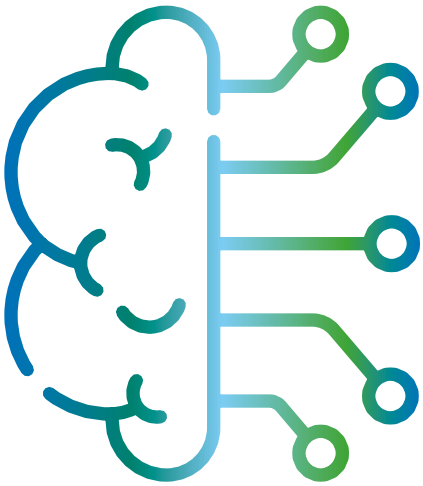
robots, it is not just about communication, but about modelling basic logistics functions, standardised process descriptions, and interoperable data models that allow flexible task allocation between humans and robots. Open standards and open source components for non-competitive areas provide users and integrators with the opportunity to focus development resources on performance features that differentiate them, rather than repeatedly solving interface problems on a project-by-project basis. Operators benefit because they can integrate new robotics faster and with lower risk into existing structures.

Especially against the backdrop of global hardware dynamics outside Europe, this presents an important opportunity. If it is possible to further develop the integration and software architecture of intralogistics on open, shared foundations, Europe can strengthen its competitive position in logistics in a sustainable fashion. </>

A task for everyone

In intralogistics, many fundamental terms such as pick, order picking, retrieval, or packing, have so far been interpreted in different ways – resulting in inconsistent processes. "The advent of humanoid robotics now highlights the need for operators and manufacturers alike to standardise definitions and procedures", explains Christian Prasse, Head of Strategy at Fraunhofer IML. To ensure processes are implemented consistently and productively, uniform standards are now essential, benefiting everyone – for greater efficiency and lower costs. Christian Prasse explains, "Against this backdrop, I can well imagine operators and manufacturers working together on this in a working group on intralogistics within the Open Logistics Foundation and in relevant projects."

The new paradigm of **artificial intelligence**



Artificial intelligence is today technologically capable of supporting and orchestrating **entire value chains. Three approaches** show how this can be achieved.

// flaticon

ARTIFICIAL INTELLIGENCE IS PARTICULARLY VALUABLE FOR LOGISTICS WHEN IT IS EFFECTIVE NOT ONLY IN ISOLATED OPTIMISATION BUT ALONG THE ENTIRE SUPPLY CHAIN.

1 When AI becomes a collaborator rather than a tool

Applications of artificial intelligence (AI) have long arrived in logistics. Yet solutions that address isolated sub-problems still dominate. However, this hardly does justice to logistics' true strength – its ability to network and control highly complex processes. "The core competence of logistics lies in coordinating many individual steps in such a way that highly complex tasks can be reliably accomplished", says Andreas Nettsträter, CEO of the Open Logistics Foundation. "Now the question is how artificial intelligence can provide support at this central point".

The often-expressed hope that artificial intelligence will solve all logistical questions in the form of a universal system – in other words, a "ChatGPT for logistics" – will certainly not be fulfilled. Instead, a different scenario is emerging: an ecosystem of specialised AI agents orchestrated to manage supply chains. AI agents typically operate within a clearly defined area of responsibility, react to events, and trigger subsequent processes in a targeted manner. The particular added value for logistics lies in their interplay: when multiple specialised AI agents act together, an end-to-end process along the entire value chain becomes possible.

For AI agents to be integrated into logistics processes and usable along the entire value chain, the underlying workflows, data models, and interfaces must be comparable and defined in a binding manner. "AI delivers its benefits above all, where structured and comparable data are available", Andreas Nettsträter sums his thoughts it up.

2 How data models become "AI-ready"

Within the Open Logistics Foundation, companies have already developed various components and data models that can be specifically used for the development and deployment of AI agents.

- One example is the electronic consignment note (eCMR). The solution developed by the member companies of the Open Logistics Foundation – the so-called OLF-eCMR – is based on structured, standardised data. This makes documents directly machine-readable and easier for AI to process. It enables automatic extraction and validation of content, handover to downstream processes, and integration with transport, billing or compliance systems. In addition, the three status messages of the eCMR – "Provision by Sender", "Loading by Driver", and "Acceptance by Recipient" – are legally effective through

COMPANIES THAT STANDARDISE THEIR DATA, PROCESSES, AND INTERFACES LAY THE FOUNDATION FOR THE MEANINGFUL INTEGRATION OF AGENTIC AI.

the respective signature and act as triggers for subsequent processes, such as initiating automated invoicing or payment release.

- Another example is the Tracking Event Model of the Open Logistics Foundation. Companies have agreed on a standardised description of status events along the transport chain. The model thus provides an ideal basis for AI agents that can interpret events in real time and automatically derive subsequent actions. For example, an agent can evaluate incoming status messages and automatically trigger notifications, suggest re-routings, or re-coordinate time windows.
- Currently, companies in the Open Logistics Foundation are also developing a basic model for timeslot management. This could allow AI agents to dynamically manage time slots based on real-time data and capacity information. Instead of static bookings, an adaptive system emerges that can respond to delays, utilisation, or changed priorities and replan or optimise time slots accordingly. Through the use of AI, the examples mentioned can be fully automated. Simple agents can accelerate usage while simultaneously simplifying the dissemination of standardised data models and status events.

3 Why open source is an enabler for agentic AI

The current shift towards agentic AI, which acts proactively and "works on" tasks, is not only a technological but also an organisational question. Agentic AI should therefore not be conceived as a centrally provided solution, but rather as the result of the interplay of open components and company-specific integration. "Companies will only deploy AI agents in critical end-to-end processes if they can understand the decisions, retain control over their data, and integrate systems securely", identifies Jens Leveling, Technology Advisor at the Open Logistics Foundation, citing two main reasons for open source: traceability and trust in open implementations. Open architectures and open source approaches enable the connection of different systems – a fundamental prerequisite for seamless value chains. Jointly developed components also reduce implementation effort and accelerate innovation. In addition, companies avoid dependencies on proprietary platforms and retain control over their processes.

In principle, the Open Logistics Foundation develops only basic functionalities, so-called commodities. Agentic AI and the underlying data models are not, in themselves, elements that differentiate competitively. Therefore, it makes sense for companies to develop them together and provide them as open source. Each company thus has the opportunity not only to use them but also to reuse them commercially. Andreas Nettsträter says, "The same principle also applies in the field of artificial intelligence: the actual differentiation in logistics does not arise in the AI agents themselves, but in the orchestration of AI agents within concrete application environments". For companies, this opens the opportunity to develop their own solutions based on these building blocks and deliberately leverage the orchestration of AI agents as a competitive advantage. </>

All current **topics**

WORKING GROUPS

The air cargo industry is under increasing pressure to accelerate processes and provide real-time information. The Working Group **DIGITAL AIR CARGO** aims to make air cargo processes more efficient, transparent, and future-proof.

Shipping documents are often inconsistent, fragmented, and difficult to automate. The Working Group **ELECTRONIC TRANSPORT DOCUMENTS** is developing open solutions for standardised and digitalised handling across company and system boundaries.

The path to climate-neutral logistics requires standardised data and digital tools for measuring and reducing emissions. The Working Group **ENABLING LOGISTICS DECARBONISATION** is creating open foundations for all stakeholders in the supply chain.

Trust in digital customs data is essential for automated border processes. As a basis for next-generation digital customs processes, the Working Group **OPEN CUSTOMS BLOCKCHAIN** relies on blockchain technology.

Lack of transparency hinders planning certainty, sustainability, and compliance. The Working Group **TRACK & TRACE** standardises track and trace processes using open source to improve the exchange of information and coordination throughout the entire supply chain.

PROJECTS

The blockchain-based application **BORDER**, from the project of the same name, enables the digital handling of customs-relevant processes.

The software for the digital consignment note from the **ECMR** project is key to seamless digital logistics processes.

The **EMISSIONS DATA EXCHANGE** project uses the iLEAP data standard as an example to provide an interoperable data model for emissions measurement across the entire supply chain.

The **GOODS PASSPORT ID (GPID)** project is designed for the rapid identification of critical goods and is specifically tailored to the needs of authorities.

In the **NE:ONE** project, an open source solution is being developed to implement the IATA ONE Record standard for continuous, connected, and open air cargo processes.

The **TIMESLOT MANAGEMENT** project aims to create a common understanding of a basic model for slot management.

In the **TRACKING EVENT MODEL** project, the focus is on uniform terms for track and trace processes, which serve as the basis for a fundamental architecture.

To the website
openlogisticsfoundation.org

To the repository
git.openlogisticsfoundation.org/explore/projects/starred

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