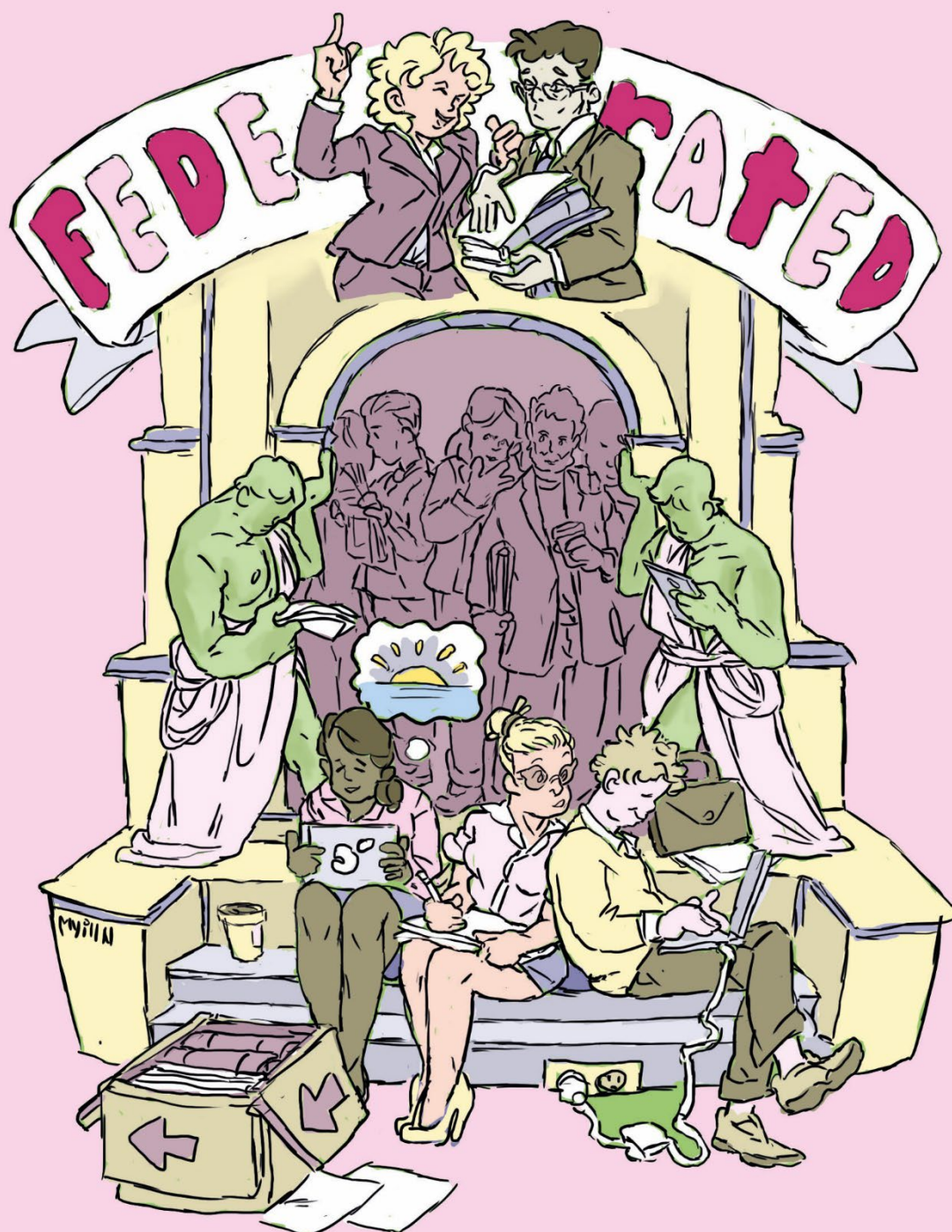




THE SOUL OF THE MACHINE



**Author Minne Buwalda
November 2023**



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Preface

In 2019, under the umbrella of the EU Digital Transport and Logistics Forum, the EU CEF FEDeRATED project started its journey to develop the foundations for a secure, open and neutral data sharing infrastructure provision through practical Living Labs. Until the end of 2023, the 15 FEDeRATED partners located in 6 EU Member States – Finland, Italy, Netherlands, Luxemburg, Netherlands, Spain, and Sweden, were to experience that ‘digitalization of freight transport and logistics in an EU-context’ touches on many subjects and is pretty complicated. One easily gets lost in such a topic, especially when only zooming in on specific aspects of the project, for example technological, procedural or methodological aspects. That is why it is important to zoom out every now and then. This document is meant to do just that.

The document is based on 20 interviews with FEDeRATED Living Lab coordinators in the period March 2022 – September 2023. The interviews were conducted by Minne Buwalda, a writer-storyteller who is familiar with the subject. An important reason for the interviews was to allow the various Living Labs an opportunity to share their experiences with another. Many Living Labs were experiencing a need to enhance their operational brainpower on how to structurally meet the challenges that digital technology poses to our ways of interacting, our ways of thinking and giving meaning: - collaborative innovation After all, the evolving integration of digital technology within our societies and lives means that we are consciously or unconsciously exposing ourselves to a transformation process. This requires us to step back every now and then to see where we come from and where we are going to.

The individual LivingLabs ‘in context’ prove that the whole of all FEDeRATED partners been put to achieve the project goals is greater than the sum of its parts. This document is not structured around a manageable framework. It fans out in all directions relevant in the context of FEDeRATED, for example geopolitics, change management, and governmental matters. And not to forget, the ‘human, all too human’ aspect of the project, for in the end FEDeRATED boils down to humans getting together to create a common future.

The document contains short descriptions of FEDeRATED LivingLabs and quotes the peoples behind them. In doing so, it tries to show glimpses of the Soul of the Machine called FEDeRATED. It was a challenge to find the right words and understanding to describe the experiences gained by the FEDeRATED partners, a bunch of dedicated people intrinsically motivated to assist real world logistics operations, and public sector bodies acquainting themselves with an exciting new world.

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THE SOUL OF THE MACHINE

*The Machine we build is based on our Reference Architecture.
The Soul is our commitment to make IT work together.*

The journey

In 2019, the 15 FEDeRATED partners set sail for an adventurous journey towards the development of an operational framework for federative data sharing in European freight transport and logistics. This happened against the backdrop of the four 'building blocks' formulated by the EU Digital Transport and Logistics Forum (DTLF), an expert group of the European Commission. The FEDeRATED partnership was determined to follow a shared course, while also settling issues of their own interest. Call it unity in diversity. As if a group of ships from different European nations had gathered in a flotilla, in order to set sail together for a common destination.

The first year of the journey went smooth. There were many meetings, for example the Digital Transport Days, October 2019, in Helsinki, Finland. A FEDeRATED *Vision Document* was developed, and agreement was reached on a baseline architecture and the importance of semantics in that architecture. To validate the operational feasibility of the architecture many project ideas were launched and eventually 23 LivingLabs were identified.

The next step for the 23 gathered ships was to set sail in untried waters, the cruel sea, 'to be experienced with both feet on the ground'. Or, to stay with the metaphor used here, with both feet on deck, focusing on the practical pursuits necessary to keep the ship afloat and on course.

February 25, 2020, struck hard on the FEDeRATED journey. Due to the COVID-19 pandemic, the Italian government closed down its airports. The four Italian partners were not able to board their planes to attend the first FEDeRATED workshop in Gothenburg. Two days later, other FEDeRATED partners started to doubt whether they would be able to return home. The world locked down.

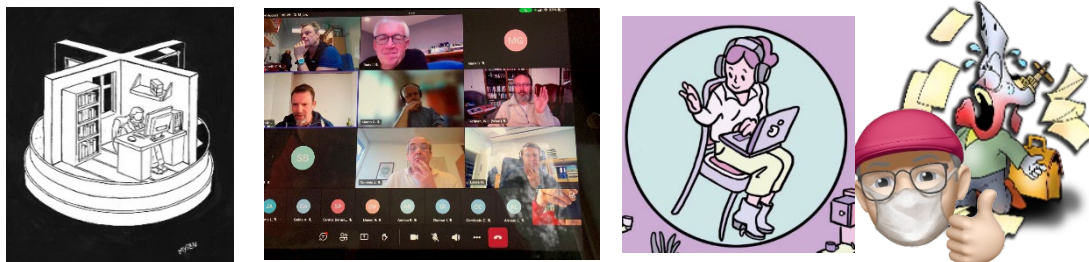


The first FEDeRATED LivingLab-workshop session in February 2020, Gothenburg (RISE/Lindholmen)

The pandemic prevented the FEDeRATED partners from physically meeting for two full years. It was as if a thick mist had rolled in and prevented the ships of the flotilla to put their plans into action and set sail together. Not being able to physically meet, in an era of general isolation, they somehow seemed to lose sight of each other, notwithstanding virtual meetings taking place.

The first full-scale post-COVID meeting of the FEDeRATED partners took place two years later, in March 2022 in Delft, the Netherlands. The title of that workshop meeting was *The Soul of the Machine*. The goal was to validate whether the two years of virtual meetings between the FEDeRATED IT-architects to design a reference data sharing infrastructure - *the Machine* – would meet the practical requirements, stakeholder interests and practices identified by the 23 LivingLabs- *the Soul*.

During the lockdown years, individual LivingLabs had continued to develop their use cases, but without much exchange with other LivingLabs, apart from virtual meetings every three weeks organized by the Swedish partners. After the lockdown, many LivingLabs caught up in terms of alignment with the reference architecture, and there was an intensification of collaboration and data exchange in and between LivingLabs. As if boats that had drifted a bit during the lockdown years, rejoined the flotilla. That said, it seems as if the different squadrons within the flotilla, squadrons based on nationality, retain their separate navigation.



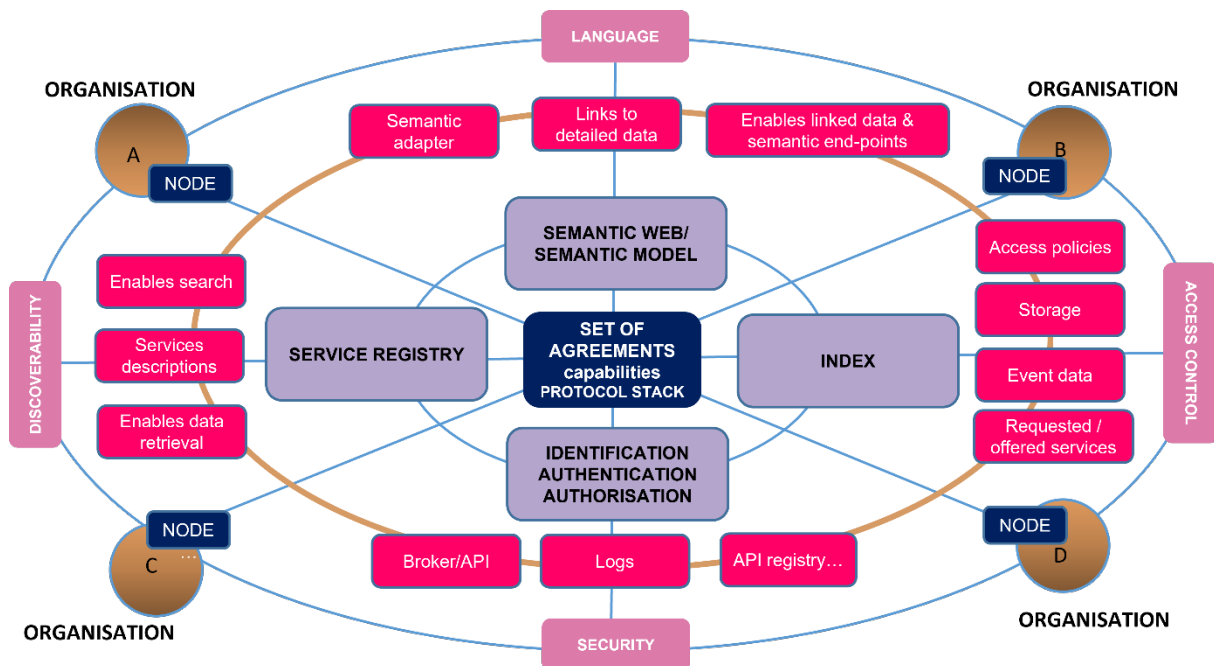
Trying to survive the COVID-19 pandemic 2020-2022

WHAT WE DO

What do we do as a flotilla? What's the destination of our journey together? The Italian road transport and logistics company Codognotto, FEDeRATED project-activity-leader for communication and consultation, identified the need to develop 23 LivingLab *Factsheets*. These Factsheets clearly show LivingLabs seek to enhance supply chain visibility and optimized infrastructure utilization. Why? Because too often private as well as public parties do not know exactly where the goods are located and whether transport will arrive in time, resulting in all kinds of inefficiencies. What we need is an EU-wide and real-time, multimodal data exchange mechanism that creates the supply chain visibility we need to become 'futureproof' as European nations.

In more technical terms, the destination of our FEDeRATED flotilla is an open and neutral data sharing grid of interconnected nodes for freight transport and logistics.

Basically, what those who help build this network have to do, is start functioning as a FEDeRATED node, using interoperable semantics when they exchange data with other organizations. The make-up of their internal IT-system is their own business.



The FEDeRATED LivingLabs are meant to further develop and validate the capabilities needed to participate in such a future digital EU provision for freight transport and logistics. All European stakeholders should benefit from this equally in the end.

Why do we need a FEDeRATED network of platforms? Why do we set sail together? To protect both our values and our interests. The values we stand for as Europeans –think about data sovereignty or a level playing field– are not self-evident from a worldwide perspective. Our interests as private actors –staying competitive in tomorrow's world and meeting corporate responsibility goals–; our interests as public actors –performing governmental tasks efficiently–; and our interests as Europeans – e.g. civil society: safety, security and sustainability– will not be served when we do not act in unison, creating our European version of digitally optimized freight transport & logistics.

Sailing together

To act in unison means to cooperate. It means joining forces by forming this flotilla. Cooperation is the Soul of the Machine we are building. It boils down to agreeing on how to share data, both business-to-business and business-to-administration, and develop the capabilities needed for that data exchange. Public-private partnership is at the core of this collaboration.



Illustration Sandra Haraldson

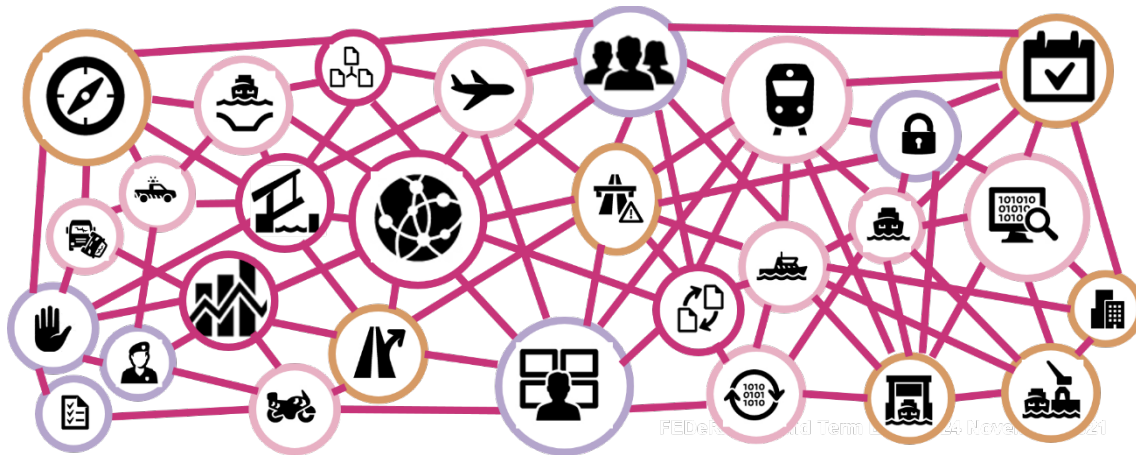
Beyond that, the Soul of the Machine is about collaboration between EU Member States. It is explicitly a European soul, joining national squadrons of ships into a European flotilla. And that collaboration starts with hearing each other when we speak and understanding each other when we share data, so the alignment of our languages, beyond specific standards. Semantic interoperability is at the core of the FEDeRATED Machine.

Why is it important to listen to the Soul of the Machine? Mikael Lind from Research Institutes of Sweden (RISE) gives an answer to that: “Technology can never be detached from the human agency.”

Changing the way in which we share data

FEDeRATED is pursuing data driven logistics based on 21st century technology insights, and preferably based on opensource availability. In general, there are three ways of sharing data. First, there is *bilateral data sharing*, where organisations exchange data with one another through a direct link, based on a one-to-one agreement. Another way is *sharing data through a platform*. In that case, a central entity provides the platform to which individual parties connect, enabling them to share data with one another. But data do not stay ‘at source’ that way, and a contractual relationship is still needed before data exchange can take place. A third way of data sharing is *federative data sharing*, which enables any party to function as a node, being capable to non-prescribed machine-to-machine querying of any other node, and to share readable data through an access point with them as soon as identification, authentication and authorization have successfully been completed, while keeping the data at source and applying security mechanisms.

The FEDeRATED project aims at paving the road towards replacing the present practice of sharing data –bilateral or via a platform– by federative data sharing. The project is about developing, validating and fostering the capabilities that enable stakeholders to act as a node in the federative grid.



The interconnected grid

Developing and validating the capabilities of the future

Between 2019 and 2023 the FEDeRATED Machine has been tried and tested by 23 LivingLabs. This should eventually result in plug-and-play functionalities, enjoyed by all EU stakeholders – but we are not there yet. The process of change towards using a distributed network of platforms approach is not done overnight and can only be reached step by step. This means step-by-step laying the foundations towards the new network-of-platforms approach, while still being able to function the old way. Most LivingLabs still share data based on bilateral agreements or platform agreements, while validating FEDeRATED network-of-platform capabilities. And that will not really change until the capabilities that enable companies to act as a node in the overall grid are fully developed.

All 23 LivingLabs agree that an overarching EU legislation providing a structure for sharing data in an open and secure way is urgently needed to motivate stakeholders to share data this ‘federative way’.



FEDeRATED in brief – stakeholders, topics, objectives, (anticipated) impacts

The many aspects of FEDeRATED

When talking about a ‘federative network of platforms’, most people think about technology. And although technology –the Machine– forms an important part of the project, it is just one of the many aspects that tie into the development of such a future European provision for data-driven freight transport and logistics. Some of the other aspects –the geopolitical, economic, organizational, governmental, and legal aspects– will be touched upon in the following, with a focus on the organizational aspect, because organizing the collaboration that effectuates the necessary change is the Soul of the Machine.



Illustration Sandra Haraldson

Talking about the Machine implies talking about technological and semantic interoperability. Technology implies power. In the FEDeRATED context this means power in the hands of all stakeholders, enabling them to share data at source based on mutual consent in a safe and secure business setting. The starting point of the FEDeRATED journey is explicitly semantic. Based on semantics, specific technologies can be applied.

Semantic web-technology

The FEDeRATED reference architecture aims at making existing digital systems compatible through harmonized data interoperability. Intensive discussions within the FEDeRATED Semantic Modelling Team between 2020-2022 led to the development of a FEDeRATED semantic model. At its core is the set-up of a distributed network of platforms resembling a world-wide-web.

Using different languages, different standards, limits everyone's connection to everyone else. Semantic web-technology provides the bridge between the standards of different transport modes towards a seamless multimodal transport. Internet leads the way to knock on the door of the various IP-addresses and be heard.



Illustration Sandra Haraldson



Henk Mulder

That is why IATA's LivingLab #11 is called an 'Internet of Logistics'. Henk Mulder, from the International Air Transport Association (IATA): "Concerning a digital solution one should start with the idea of the world-wide-web. It is all about developing standards around web-technology." Henk talks about air cargo here, but this goes for the multimodal set-up of FEDeRATED too. All in all, the FEDeRATED Machine has to do with web semantics in the first place.

Internet-of-Things technology (IoT)

Another technology that plays an important role in bringing supply chain visibility and optimized infrastructure utilization is IoT-technology. In the FEDeRATED context there are several LivingLabs with a strong IoT-component.

-IoT in road transport

For Toni Penttinen of the Finnish road transport and logistics company Ahola (*LivingLab #23 Real Time Multimodal Transportation Visibility Platforms*), every company-truck is "an IoT-node", and all the information gathered by way of such technology can be analysed and combined to inform shippers and other supply chain partners with real-time information about the whereabouts of the goods. In addition, this technology is used to achieve sustainability goals by optimizing Ahola's fleet's performance in various ways e.g., through route optimization, filling degree optimization, empty driving optimization, or driver performance monitoring.



- IoT in maritime transport

The same goes for the Italian shipping company Grimaldi, which executes FEDeRATED *Living Lab #10, Hermes Fleet Performance Monitoring System*. Its ships have been equipped with all kinds of sensors. The most important goal of the installed IoT is to create a more sustainable and less costly way of operating the Grimaldi fleet; an additional goal is creating better services to clients and partners.

Cosimo Cervicato

Cosimo Cervicato explains: “With our newest ships, we also interfaced the complete automation of the ship. These ships do not hold any secrets for our Hermes-system anymore. They are constantly monitored in real time. Those working onboard our ships therefore call the Hermes system their Big Brother.” In the future Grimaldi also wants to apply machine learning technology in its ships.

-IoT in rail transport

In Sweden and beyond, RFID-tags attached to train wagons helps with bringing supply chain visibility. Mathias Karlsson from research institute RISE: “*LivingLab #13 BetTerFlow* is about optimizing the railway terminal in Kvarken ports. Initially we did not know when the trains in Umeå were coming, or if they were delayed. But now we know, because we collaborate with *LivingLab #5 RFID in Rail*, which is about putting RFID-tags on train wagons. So now we can follow the wagons when they are on their journey and we know in what order they are put behind the locomotive, which is crucial information when reloading the cargo onto the ship.”

Besides, *LivingLab #5 RFID in Rail* also arranges data exchange on rail transports from Sweden to the Spanish border town Irún. Mats Åkerfeldt (LL#5): “The data is sent via the Spanish platform Simple (LL#21) to the Swedish platform Deplide in a FEDeRATED way. If agreed, RFID-readings can also be shared with third parties, typically forwarders and shippers. A similar process is established in France, and discussions with other partners in the European rail sector on how to proceed are ongoing.”



Gunnar Ivansson



Mats Åkerfeldt



Mathias Karlsson

The geopolitical aspect of FEDeRATED

The development of an EU federative network of platforms approach is closely connected to geopolitics. On the global stage, digital platforms aim at getting as many customers as possible to do business through their platform, constantly updating their service and performance levels. This has geopolitical consequences. It may be about plain business ecosystems, but the public dimension of such systems means that much more is at stake here. It is also about setting the rules of the game –the rules of doing business– in such digital arenas. It is about aligning the EU-approach to dominant market forces originating from the USA and China. How to thrive in the current shadow of giant data platforms?

Here we touch on values that we as Europeans want to uphold, also when it comes to trade and freight transport & logistics. Formulated in a rather caricatural manner, the worldwide divide within the world of present-day logistics looks something like this: USA-style platforms aim for unbridled market dominance and wealth accumulation in a market where ‘the winner takes all’, while China-style platforms aim for global expansion and national security. The American model prioritizes free enterprise –the market– where the Chinese model prioritizes national objectives –the state.

The intermediate European solution –a third way– would be doing business through a ‘federative network of platforms’ approach. This can be based on public-private partnership, fostering the freedom of choice and digital resilience of the EU peoples and companies. The constituting force of the Treaty of Rome is the promotion of ‘the four freedoms’, including the freedom of movement of goods, while the freedom of data is often advocated as a fifth freedom. In addition, the principles of equality and justice constitute the foundations of the EU policy approach stitched in appropriate legal frameworks, with data sovereignty at its heart. Geopolitically, the federative network of platforms approach aims to assist the EU in pursuing its EU Data Strategy and DTLF-policy approach towards developing a Digital Single Market for freight transport and logistics, subsequently facilitating trade the EU way.



A FEDeRATED network of platforms will ultimately enable the European Union to improve the data position of both its governments and its industries, while counterbalancing the global data-monopolies that now seem to emerge.

Countering data monopolization

LivingLab #4 Data sharing case for SME, last mile delivery actors, deals with market place characteristics and ways of countering the phenomenon of data monopolization in first- and last-mile delivery. Urban logistics is often characterized by an uneven playing field, mainly due to a phenomenon called ‘third party logistics’, the business model of big multinational logistics platforms. For reasons of power such platforms often do not share crucial data with courier companies to which they outsource the final delivery.

According to the initiator of LivingLab #4, Kenneth Carling, “last mile delivery amounts to about 50% of the total shipping costs in logistics, and the inefficiencies created by not sharing crucial data with subcontracting parties result in unnecessary losses. The working conditions for subcontracting couriers are bad. The inefficiencies created by not sharing data with the smaller subcontractors result in unnecessary traffic, CO₂-emissions.”



Kenneth Carling and Annica Roos

When a new logistics platform company entered the local market which Kenneth researches – a platform that marketed itself as an ‘open platform’– he tried to convince them to subscribe to the FEDeRATED-principles. But after a while they withdrew, because the company had been taken over by a larger player. LivingLab #4 therefore did not succeed in achieving its initial goal of changing the current power game and needed to refocus. Its new objective is to develop a solid method towards achieving stakeholder commitment before discussing solutions with any platform provider to act according to a federative approach.

Somehow, LivingLab #4 puts its finger on a sore spot: platform thinking aimed at monopolization is still prevalent in the logistics market, and the turnaround to network-of-platform thinking is particularly difficult, because it seems to go against basic market mechanisms. Our geopolitical ‘problem’ in Europe is that we want to create a European grid that serves to counter practices like data monopolization. And we need more companies willing to own that ‘problem’ –in the sense of applying the federative solution. But how to convince them? That’s the geopolitically charged question asked in LivingLab #4.

The economic aspect of FEDeRATED

The Soul of the Machine is collaboration, in the sense of creating interoperability together, by getting connected semantically as European public and private stakeholders. Yet, besides a soul, we also have a business mind.

The activities undertaken in freight transport and logistics are economic activities in the first place, be it in the USA, China, Europe, or anywhere else in the world. Economy is about value creation, and logistic chains are value chains. In recent decades the way in which such value is created has changed dramatically, as the role of data has become increasingly important. This is because having the right data at the right time ensures more efficient operations and helps with the management of all kinds of business processes and governmental tasks.

Connectivity

One of the most important assets in the digital economy is connectivity. That said, many companies still arrange their connections bilateral, because a one-on-one connection is the natural way in which people and companies interact.

Beside Peer2Peer data sharing practices, an increasing number of Logistic Service Providers (LSPs) and platforms –community platforms as well as commercial platforms– offer all kinds of logistical data services. In general, these platforms aim for as many connections as possible. Through the network effect, a platform can eventually dominate a market, simply because it arranges efficient communication between the largest number of connected parties, thus offering the greatest connectivity to its customers.

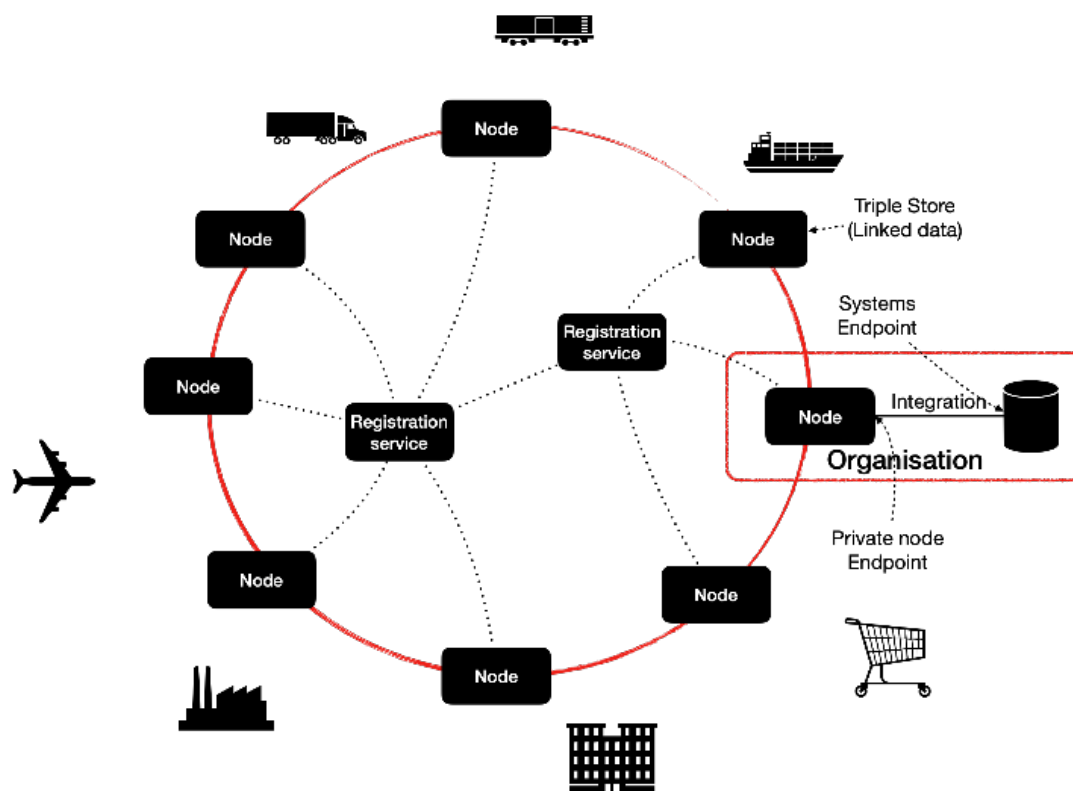


Illustration Sandra Haraldson

Companies know that such a powerful platform offers them great connectivity and enhanced supply chain visibility, but they are rightly afraid that they might become dependent and will eventually be forced to dance to the platform's tune. That is why Brussels aims for a neutral 'network of platforms', which offers interoperability to all existing parties from the world of transport and logistics. Such availability of data in turn ensures that parties can create additional value through those data, adding to the value of European nations and the European Market.

From a government perspective, connectivity can be interpreted as a basic collective provision, comparable to electricity supply or a physical road network. Ideally, a distributed European network of platforms provides such an open, neutral and affordable form of digital connectivity, in order to let all stakeholders in freight transport and logistics benefit from the newly created opportunities for 'value creation'. This way connectivity is seen as a form of public interest.

We touch upon the concept of 'net-neutrality' here, which means that on a digital infrastructure everyone is treated the same way in terms of connectivity. In the EU we want equal opportunities for everyone; we want a level playing field in the market, so small and medium sized companies can also benefit from digitalization and connectivity, just like bigger companies do.



The data sharing grid connecting to supply chain operation through its nodes

Shippers

As said, supply chains are value chains, and those chains are driven by the demand of shippers and consumers. 'Customer is king' is a golden rule in the market, and one wonders: shouldn't there be more shippers actively involved in FEDeRATED?

In the beginning of the project there were several shippers participating in LivingLabs, for example IKEA, H&M and Electrolux, but most of them dropped out.

A significant shipper still engaged is Alleima (formerly Sandvik Material Technology) from Sweden, in *LivingLab #8 Multimodal information sharing III*. Initially, Alleima worked together with technology company Ericsson in this LivingLab, but the IT-giant withdrew from the project during the COVID-years. RISE-platform Deplide then took over the role of Ericsson. RISE's lead IT-architect, Eddie Olsson, takes great care in adjusting the Deplide architecture to serve the various Swedish LivingLab use cases, while integrating the FEDeRATED Design.

LivingLab #8 is about Alleima's export supply chain of advanced steel products from their production site in Sweden to the end customer in Pennsylvania (US), by way of Gävle port and the transshipment port of Bremerhaven in Germany. Daniel Moback (Closer): "The data exchange is first of all business-to-business, and the direct aim of Alleima is clear: they want alerts when there are problems. They want to have efficient information on where goods are in transit, so they can inform their customers in advance in case of a delay."



Daniel Moback



Eddie Olsson

Why do most shippers seem reluctant to cooperate? Such shippers are probably waiting until a workable solution is available. They do not want to invest in public-private experiments in freight transport and logistics until they are convinced there is something in it for them. Besides, most shippers fear too much 'transparency' within their supply chains, e.g. because that way governments know what they are doing. Maybe, the possibility of 'self-controlled transparency' would make them more forthcoming. Such trust can be created by using the 'pull-mechanism', which is part of the FEDeRATED public-private data-exchange.

[The realities of the market](#)

Multimodal supply chains are complex business environments, with stakeholders in various shapes and sizes. From a government perspective, creating supply chain visibility within this market comes with the need to eventually involve all stakeholders, big and small, because the chain is as strong as its weakest link.

In the EU, the goal of creating supply chain visibility is coupled with the design of an open and neutral network-of-platforms structure for the European Market: the FEDeRATED reference architecture. Getting that design implemented in the market, means that we have to take into account the economic realities of that market. And these realities differ, e.g. according to the transport mode, the size of the enterprise, its role in the supply chain and its digital competence. Some stakeholders know how to take advantage of digitalization in the present market, while others struggle to survive, often holding on to more traditional business models.

The companies that collaborate in FEDeRATED are big and/or digitally advanced. In their LivingLabs they are experimenting with the federative network-of-platforms design in their own business cases and multimodal supply chains, to help co-develop

and validate the technological and collaborative capabilities we need for the future. And in the process, they involve other stakeholders from their supply chains.

One of those companies is Vediafi, an IT Service Provider from Finland. One of their services is called Corridor as a Service (CaaS), and in the FEDeRATED project they run three LivingLabs on such CaaS's (LLs #1, #2, #3). Talking to Vediafi's Lasse Nykänen about working out a general European design and basic EU-principles like data sovereignty, he says: "For us, the EU guidelines are tightly linked to specific business cases. Besides complying with EU-principles, we also need to show specific business operators the benefits of our services.

So, we focus on a specific corridor and try to fix the problem there. The EU wants it a certain way; forwarding agencies, hub operators, logistics companies and infrastructure providers want it a certain way, and we are linking those demands through our Corridor as a Service. Corridors are a good approach in this sense."

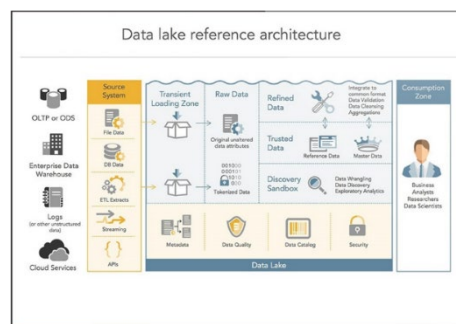


The CaaS ecosystem

The Italian road transport and logistics company Codognotto runs *LivingLab #16 D4You*. Asking Stefan Popa what the benefits of their FEDeRATED efforts are for the wider transport and logistics sector in Europe, he points at the creation of business opportunities in the first place: "We want to improve our company and our business, and the only way to do that is to create this network of companies that work together and exchange data. And by helping to co-create this standard FEDeRATED network as one of the bigger road transport and logistics companies, in time the smaller companies can create their own business networks."



Stefan Popa

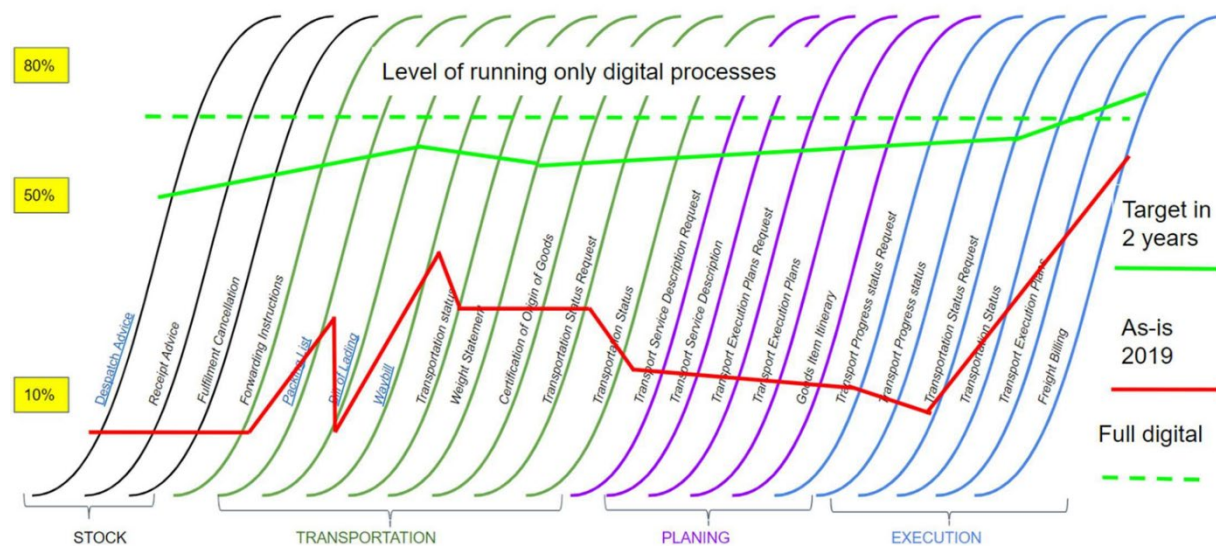


The Codognotto Data Lake

[A shared learning-process](#)

The main premise of FEDeRATED is the public interest. But the private companies that participate with LivingLabs do so primarily because of private interests. They want to benefit from the project themselves, for example because they want to

expand their business, further streamline their operations, and be better prepared for the upcoming regulation in the European market. The good thing is that, based on the FEDeRATED experience gained, they can now put what they learned into practice in other business cases. In many respects FEDeRATED is a shared public-private learning-process. This implies a top-down design, but since this is a distributed solution, such a design needs to be co-organized and implemented bottom-up, taking market realities into account, realities like conflicting interests, different legacy systems and digital poverty.



A Finnish overview illustrating business' digital competences (2019)

Digital poverty

The business partners that cooperate in FEDeRATED are digitally advanced, and their bottom-up experimenting does not solve the problem of 'digital poverty' with the majority of stakeholders in European freight transport and logistics.

Henk Mulder (IATA, LivingLab #11): "Many supply chain participants, especially smaller entities, lack digital capabilities. These businesses operate to survive, focusing on meeting payroll and bills. Acquiring digital skills and making necessary investments in digitalization isn't feasible for them unless it streamlines their operations and reduces costs. In the transport sector, around 80% of supply chain participants are in this disadvantaged position."

Toni Penttinen from the Finnish road transport and logistics company Ahola (LL#23) wonders how the many SMEs in road transport can be involved: "Many problems we encounter must be solved in a broader context, not only in the context of our company, business case and Living Lab. How do we get this mass of small companies involved in digitalization, that's the question. The big companies in Europe are not the problem, but the small ones do not have the power to do it by themselves."

A solution for the future

FEDeRATED is built on a mid- to long-term vision and policy of the EU, so it will be rightly perceived as a solution for the future by SMEs. They may be positive about such a solution, but it does not help them with their short-term issues, which of course is their main focus. Full interest of SMEs will eventually be the case when plug-and-play applications have been developed and technology-independent services can be provided.

And it has to be said: it is not only businesses that are digitally immature. There are



Lasse Nykänen

also many governmental organizations in the EU not yet ready for the transition we want to realize in Europe, be it technological or operational. Lasse Nykänen: “In B2B communication the digital format is quite often established, but a lot of authorities still work with paper. Those authorities need to do something, and we are following their development.”

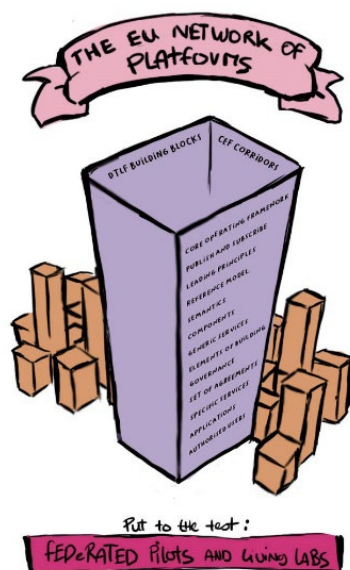


Sjoerd Boot

Despite his critical remark, Lasse is very public-private minded and positive about the concrete steps currently being taken on an EU-level: “For us, the implementation of the eFTI Regulation [applicable from August 2025 onwards] offers all kinds of opportunities. It is like a backbone to the development we want to achieve in FEDeRATED.”

Sjoerd Boot (LL#20): “It all starts with replacing paper with data, and eFTI is about such M2M data exchange. Initially, in LivingLab #20 we aimed at developing pull-based accessibility of eCMR-and eFTI-data for government bodies, eg. inspectorates and the police. We started a use case covering the three BENELUX countries. Unfortunately, in practice, public authorities and economic operators need time to adapt to new paperless data sharing processes, not in the least to cope with possible new technologies like Corda. Making FEDeRATED change happen takes time.”

Fortunately, Rudy Hemeleers of 51Biz (LL#17), fellow FEDeRATED-partner in this BENELUX-project, was able to offer a practical EU OneAPP for reading eCMR/eFTI-data provided by transporters through e-CMR IT-Service Providers, including Pionira, Transfollow, Collect &Go and DashDoc, while closely involving the DTLF subgroup 1 activities on eFTI.



Lasse may be right that eFTI is a backbone to FEDeRATED. However, in itself eFTI deals with 'data models' –data must meet certain requirements– and it does not take into account FEDeRATED semantics. Thinking in terms of 'queries' is neither included in eFTI. But the cross-LivingLab on the implementation of eFTI between trucking and logistics company Codognotto (LL#16), the Dutch ministry of Infrastructure and Water Management (LL#20), 51Biz Luxembourg (LL#17), Ahola (LL#23) and Vediafi (LL#1/#2) does include full FEDeRATED semantics. Lasse: “It is a good rehearsal for all of us, combining our solutions.” This public-private cross-LivingLab only started in 2023, and it enables various FEDeRATED partners to exchange eFTI-data with one another based on the FEDeRATED architecture.

The organisational aspect of FEDeRATED

How do we organise the change we aim for? The change from a bilateral or platform-oriented set-up to a network-of-platforms-based set-up for data exchange? By public-privately developing the technical capabilities that are needed for such a transition, and –in time– have them turned into plug-and-play applications for the EU Market; by convincing other stakeholders of the economic opportunities supply chain visibility has to offer them; and by organizing the technology-backed trust that is needed in order for companies to join in.

Change Management

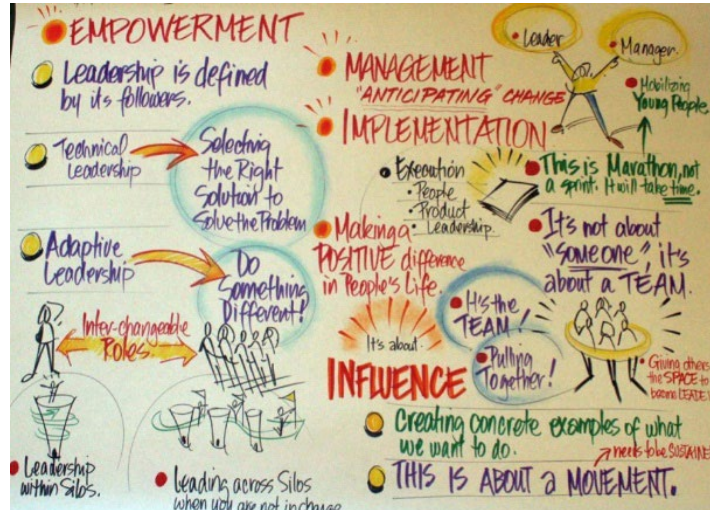
The transformational dynamics of digitalization are huge. They are global waves to surf for companies and governments alike. In the field of Change Management, generally three forms of change are acknowledged: first order, developmental change; second order, transitional change; and n-order, transformational change.

First-order change is about further developing an existing solution. It implies making adjustments within an existing structure. Staying within the boundaries of bilateral agreements or the platform model are examples of such developmental change. Second-order change is about doing something fundamentally different from what was done before. Turning to a network-of-platforms approach is an example of such transitional change. Transformational change, finally, is change that is more or less ungovernable for organizations because it engulfs them like a wave, often a wave of global proportions.

Within the EU we have to move from first-order change (elaborating on bilateral agreements or the platform model) to second-order change (transitioning to a network-of-platforms model), while adapting to third-order change (global digital transformation).

Second-order change implies new ways of seeing things, learning new things, and working on a new story to be told. It requires stakeholders to adhere to a new working concept of federation, instead of clinging to propriety data and system development. And that is a difficult turnaround, because most stakeholders want to stick to what they already invested in.

Managing change in the context of FEDeRATED is about enabling all stakeholder to be capable of dealing with digital technology, thereby putting the power back in the hands of the supply chain partners and enhancing their operational brainpower. FEDeRATED data sharing is about empowering all participants in the supply chain.



An evolutionary versus revolutionary approach

In order to create interoperability and supply chain visibility in the multimodal FEDeRATED context, generally "an evolutionary approach is chosen, meaning adaptation through incremental changes". In view of the FEDeRATED goal, such incremental steps should be taken towards transitional change, leading to an evolution towards the distributed network of platforms we envisage. Yet, many LivingLabs seem to stick to developmental change in the first place, by elaborating on bilateral agreements for sharing data within their specific use cases and supply chains, while focusing on propriety data and system elaboration.

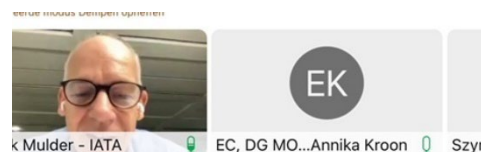
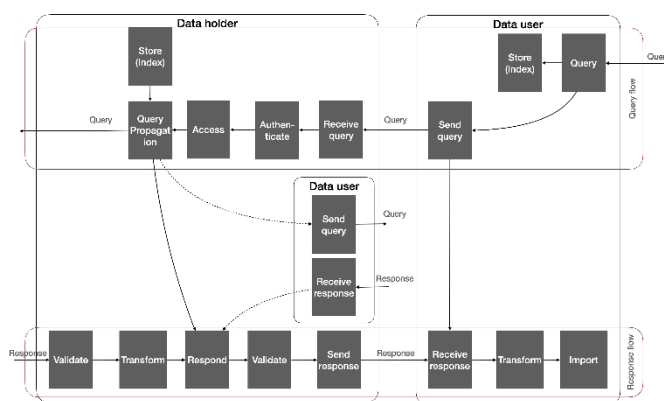
How do we move, incrementally and consistently, from what each and every organization has developed over the years – all the legacy systems that are so dear to us– to federative interoperability? How do we move from the present 'silo-thinking' to a more holistic way of thinking? That is the baseline of the envisioned transition we want to realize. The problem is not so much technology –the technological capabilities are developed right now.

The FEDeRATED architecture design is based on semantic web-technology. Applying this approach in freight transport and logistics can be considered to be a revolutionary approach. As LivingLabs, we elaborate a revolutionary top-down design, but we do it bottom-up and step-by-step, so in an evolutionary way. It is a bit the shock of the new. To make a difference, one must be convinced this is the right way to go. We better not start too big, but keep is small and as simple as possible. With both feet firmly planted on the deck of our ship.

Developing a data sharing grid based on 'linked open data' and 'events' isn't everybody's favourite soundbite. We also have to prevent 'taking the long way home',

by staying abstract and academic. Based on an agreed architecture design the appropriate technology will follow.

From a government perspective, the organisation of change also requires tangible and positive outcomes. Stakeholders must feel secure, especially if they are challenged to go beyond their own 'silo'. It is rather what Wout Hofman (TNO) says: "We have to start with removing bottlenecks like the creation of specific data spaces in the context of e.g. port communities and supply chains. Currently, many go too fast to generate technical solutions without taking a holistic approach, because they focus on the silo of their own specific business."



Data retrieval patterns



Tim Berners-Lee

Linked Data Platforms

Access any data anywhere in the world that is represented in the RDF-format.

Applying semantic web technology (start taking a cup Linked Open Data)

The LivingLab use cases are about data exchange between specific supply chain partners (B2B) and public authorities (B2A/A2B) to create 'value'. However, that value is not only related to the fact that among stakeholders one can make specific business processes more efficient—creating *private value* among partners; it is also related to the fact that one can eventually scale up to other parties—creating the *common value* of general interconnectivity and its consequent possibility for everyone to create value and make money. Legal compliance is an important aspect that comes into play here.



Wout Hofman trying to explain.

The change FEDeRATED aims for, is transitioning to using interoperable semantics and becoming a node in a semantic EU-grid. At the end of its five-year project period (2019-2023) the data exchange most use cases executed in the LivingLabs are still very much bilateral, or through establishing a platform. But most LivingLabs are trying to move toward federation by implementing more uniformity in language, so they can scale up to the targeted EU semantic interoperability.

This approach is particularly evident in the case of LL#10 (Grimaldi) and LL#18 (Terminal San Giorgio). They started as two standalone Living Labs, each implementing its own use case(s); then they identified some common use cases and implemented a first level of bilateral interoperability based on REST APIs; then they evolved to a full-featured semantic interoperability, complying with all the operating principles of FEDeRATED; finally, they made their services available to all other FEDeRATED partners, thus becoming candidate nodes for the project-wide semantic grid.

Organising public-private collaboration

The organizations that run LivingLabs are quite different. They include private companies, governmental organizations and an aviation industry association, while research institutes function as facilitators.

The private companies that contribute to FEDeRATED vary, ranging from big transport companies to forwarders, logistic service providers and management & consultancy companies. The same goes for contributing governmental organizations, which range from ministries to local governments, port authorities, inspectorates or implementing bodies, and network organizations.

Who pulls the cart?

Evidently, the public sector will have to pull the cart in steering the proposed transition. Why? Because the private sector serves business interests in the first place. That way they enable GDP-growth, so the welfare of our nations. But since private companies are each other's competitors too, they have a hard time coming to a general agreement amongst each other, especially when it comes to data exchange in multimodal supply chains. Separate transport modalities did work out several semantic solutions and standards over these past years.

Another point here is that it is a core task of the public sector to facilitate trade and business, thereby stimulating the adding of economic value. In the world of transport and logistics this governmental task includes the provision of proper infrastructure, both physical and digital.

And not to forget, that proper digital infrastructure –the FEDeRATED grid of nodes– has to be developed step by step, so incrementally. Mikael Lind (RISE) rightly says: “As to requirements for a final solution, you will never get private companies like large IT-infrastructure providers make these kind of incremental developments or additional refinements, because that would cost a fortune.” Another reason why the public sector has to pull the cart.

From development towards production

In order to make the foreseen transition happen, the Swedish and Dutch governments rely on the input of innovation and development institutes RISE and TNO respectively. But these institutes are not production companies like large IT-infrastructure providers. They primarily focus on development, not on putting a FEDeRATED approach in production.

In Sweden, RISE works out a collaborative model –both for the purpose of empowering collaboration when co-creating new solutions, and for the purpose of adopting collaborative models in operations– and it coordinates bottom-up experiments with standardized multimodal data exchange. But it seems to avoid top-down steering and does not fully commit to putting the FEDeRATED reference architecture regarding semantics in place. In the Netherlands, TNO does work from a top-down perspective and is making a Dutch prototype for the FEDeRATED reference architecture. But the transition from developing a prototype to realizing the production phase is yet another thing. It will include many more software production houses.

Sjoerd Boot: “In the Netherlands we aim at developing a Base Data-sharing Infrastructure (BDI). This perspective is shared by Dutch Customs, our mainports, and their port community systems (PCSs). To get all these parties on the same footing, and make it real and tangible for multiple stakeholders, is a real challenge. On a policy level, we all embrace the federative concept. On a practical level, we need applications and results. But one gets many ‘no’s’ before one gets a ‘yes’; yet, we are getting ever closer to those ‘yes’s’.”


Jan Bergstrand, Mees van der Wiel en 2 andere connecties vinden dit interessant

Mikael Lind · 1ste
Senior strategic research advisor at RISE and (Adjunct) professor in Maritime Informatics at Chalmers
1 w · 6

The efforts of turning Bill of Lading into a digitised document is a first important step towards data-centric systems. In a new article on “The dynamics around the digitisation of documents – The eBL as vehicle towards a more data-driven approach” Mikael Lind, Wolfgang Lehmacher, Andre Simha, Luteria Porto, Henk Mulder, Dr. Ralf Huesmann, and Luiz Almança put some reflections into this.

To read more about maritime informatics, visit <https://lnkd.in/etdsibj> and join the emerging community at <https://lnkd.in/ertJj-e>

Vertaling weergeven



The dynamics around the digitisation of documents – The eBL as vehicle towards a more data-driven approach

Mikael Lind op LinkedIn · · Leestijd: 11 min.

by Mikael Lind, Research Institutes of Sweden (RISE), Wolfgang Lehmacher, Anchor Group, André Simha, Mediterranean Shipping Company (MSC), Luter...

3 commentaren

Mikael Lind pursuing the need for digitized documents in one of his many LinkedIn messages. Illustration by Sandra Haraldson

The role of Customs

A government agency that forms a vital link in import and export chains is Customs. Timely and correct data exchange with Customs is not only important for governments; efficient, speedy Customs-clearing is also important for businesses. Because of that, there is not only attention for the role of Customs in Dutch *LivingLab #20 eGovernment Logistics* and Spanish *LivingLab #21 SIMPLE*, but also in LivingLabs run by private companies like Vediafi (LL#1, #2), Codognotto (LL#16), Biz51 (LL#17), and Ahola (LL#23).

In the Netherlands, Customs plays an important role in developing a national BDI-node prototype, which is meant to be turned into a FEDeRATED-node prototype serving as final FEDeRATED project delivery for LivingLab #20. This way Dutch Customs is preparing to cope with 'a tsunami of data' that is expected to come its way. Sjoerd Boot: "Many developers are committed to make the BDI-node fit for purpose. We are grateful we can do this in close collaboration with FEDeRATED partners."



The future of data systems

The BDI/FEDeRATED data exchange node was first tested in 2022 by Dutch Customs in collaboration with Tradelens, a Maersk-supported maritime platform using blockchain technology. Unfortunately, Tradelens closed business. A new use case with Singapore Customs was then kickstarted, aiming at exchanging Export Declaration data based on the FEDeRATED pull-mechanism. This use case only started in 2022, and it is facilitated by maritime PCS Portbase. In November 2023, LivingLab #20 expects the first data to be shared between Dutch and Singaporean Customs, applying the FEDeRATED architecture design.

The pull mechanism

In the EU we want data to stay at source, and not be transferred to another platform. From an EU- government perspective, that data sovereignty principle is elaborated in the so-called 'pull mechanism'.

The pull mechanism, also called 'publish-and-subscribe', is used in distributed systems and provides a framework for the automated exchange of messages between 'publishers', those that create data and put them into categories; and

'subscribers', those that pull data from the categories they are entitled to use in the publishers' system. This creates trust in the market, because parties like government agencies are not allowed to use data until they are 'published', so made available, by private stakeholders.

The public sector represented in FEDeRATED

The national governments directly contributing to FEDeRATED with LivingLabs are Sweden, Spain and the Netherlands. Their approach varies from a more top-down design approach (Spain, Netherlands) to a more bottom-up use-case approach (Sweden). These two approaches should eventually meet in the middle, because the top-down design of a distributed solution needs to be co-organized, validated and implemented bottom-up. The two governmental perspectives clearly complement each other.

SWEDEN

The Swedish government partakes with no less than ten LivingLabs. This abundance can be explained by the use-case perspective the Swedes chose. A lot of these LivingLab are co-executed by research institute RISE, and sometimes they are managed by network organization Closer. But they are all coordinated by Trafikverket, the Swedish Transport Administration, and, to a lesser extent, by the Swedish Maritime Administration (SMA).

In most of the Swedish LivingLabs there are a number of recurrent themes, and sustainability and stakeholder engagement are two of them. Trafikverket's Annica Roos and Jan Bergstrand explain it in chorus: "The Swedes have internalized sustainability and use-case-based policy development; it is in our blood, so to speak."

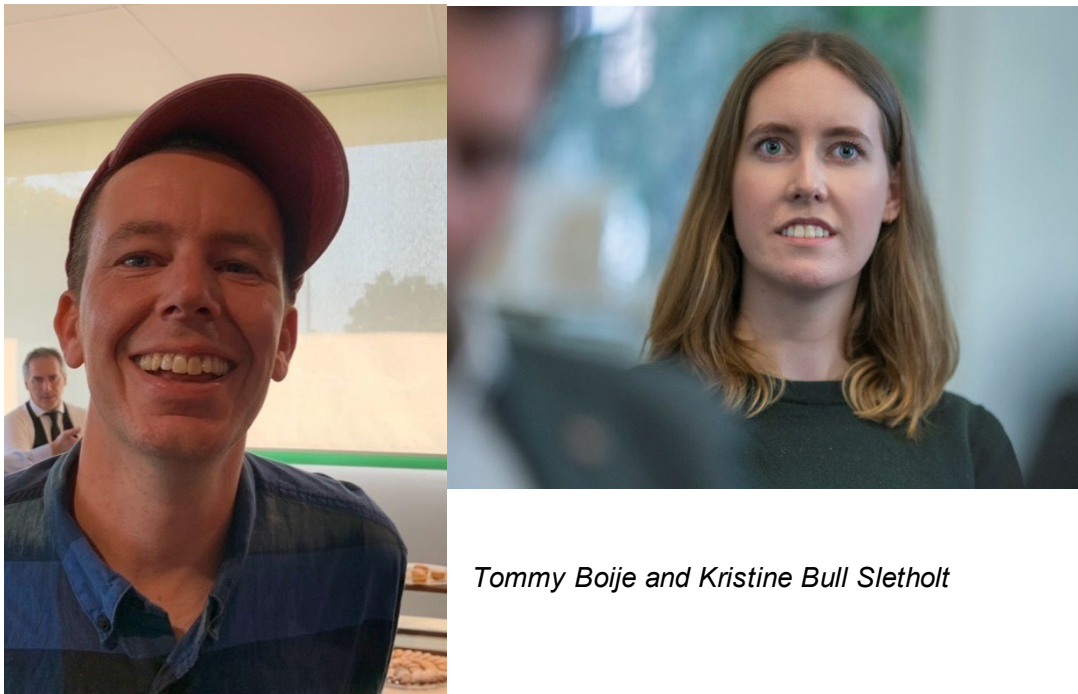


Annica Roos and Jan Bergstrand (illustrations Sandra Haraldson)

The reason why the Swedes start from a use case perspective, is given by Mikael Lind from RISE, the main executor of the Swedish LivingLabs: "We have the firm belief that there won't be any data sharing happening if there are no incentives. Stakeholders first need to understand what's in it for them. That's why we have developed our LivingLabs very much from a use case perspective."

At RISE they organize the needed innovation by way of what is called Collaborative Decision Making. Mikael Lind: “RISE is pushing a collaborative model.” To give an example: the concept developed in *LL#14 Sustainable Intermodal Chain* is aimed at “supporting the collaboration between a service tower, a fleet operating centre and transshipment hubs”, in this case: trucking company Ahola (LL#23), shipping company Wasaline, and Kvarken Ports (LL#14).

LivingLab #9 Transparent Transport – City of Helsingborg is about municipal last mile delivery, and the city of Helsingborg is the ‘problem owner’. The case: a local school which, like any other ‘municipal unit’ in the city, is supplied with food, groceries and supplies on a regular basis. This LivingLab coordinates the distribution of different suppliers, thereby making the city distribution more efficient and sustainable. Tommy Boije: “The form of Urban Logistics the city of Helsingborg envisions could eventually involve a mandate to enforce sustainable transport when driving into the city, using a facility for data sharing.” The Helsingborg use case is limited but exemplary, and the local results should eventually be scaled up. Tommy’s LivingLab-predecessor, Kristine Bull Sletholt: “Trafikverket assists the city of Helsingborg to achieve their goal of more efficient last mile delivery to municipal units. Besides, we also spread the gathered knowledge and solutions to other municipalities.”



Tommy Boije and Kristine Bull Sletholt

To give two more examples of the elaboration of sustainability in Swedish LivingLabs: *LivingLab #14 Sustainable Intermodal Chain* has the objective to stimulate shippers and transporters to more often use the greener Kvarken-ports ferry when having a transport from Sweden to Finland or vice versa, instead of road transport. And *LivingLab #22 BEA-standard ELSA*, revolves around the goal of sustainability and circularity in the Swedish construction sector, and the public-private data exchange that is needed to work towards that important European goal.

But FEDeRATED semantics still seems a bridge too far for *LivingLab #22 BEA-standard ELSA*. Martin Strid: “I suspect we are in the process of raising the basic building blocks that our construction industry needs in order to start talking FEDeRATED.” LivingLab #22 is one of those ships from the FEDeRATED flotilla that has been sailing its own course these past years. A Swedish course that is basically European.



Martin Strid



Kenneth Lind

The LivingLabs executed by RISE work with the concept of ‘situational awareness’, which is closely tied to their use-case perspective. Such situational awareness is created by way of diagrams and sequence charts, which show stakeholders the advantages of data exchange in specific transport nodes and chains, and thereby help with stakeholder engagement. Besides, RISE develops user interfaces within their LivingLabs. Kenneth Lind (RISE): “Such user interfaces become a main tool to drive the discussions with stakeholders.” RISE focusses on stakeholder involvement, but one wonders: involvement in what ‘system’? A Swedish system that is basically European?

Maybe the answer is that RISE does not develop a solution that is meant to be *the* future system. Instead, it executes experiments towards a future solution. The Swedes do not start top-down, from the FEDeRATED architecture point of view, but from the bottom-up perspective of stakeholder involvement. Deplide, the platform RISE uses, is a maritime-based research and development platform, with a focus on organizing situational awareness with stakeholders in multimodal nodes and chains, the Swedish-European way.

SPAIN

LivingLab #21 SIMPLE, the one and only LivingLab from Spain, starts from a more top-down, centralized perspective. SIMPLE is *the* Spanish reference platform for multimodal data exchange in freight transport and logistics, aligned with European FEDeRATED semantics. Javier Garcia Fortea: “We are ambitious and think big. SIMPLE is not just a digital platform; it is a platform that serves the whole transportation sector in Spain.”

The lead of the SIMPLE-project lies with the Spanish ministry of Public Transport, while the management lies with two government agencies: Puertos del Estado, that implements the government's port policy and executes the Maritime Single Window; and ADIF, that operates the Spanish railway system and its freight terminals.



Simplificar | Digitalizar | Colaborar

Puertos del Estado (PdE) successfully integrated Customs and the rest of Spanish authorities with their sea-port systems. PdE's Jaime Luezas Alvarado: "By way of SIMPLE and FEDeRATED we want to extend this success to the land part now". This



means turning a maritime platform (Dueport) into a multimodal platform (SIMPLE) the European way (FEDeRATED). SIMPLE can be described as an extended EMSWe, accommodating 'pull-data-sharing' and FEDeRATED semantics in order to enhance multimodal supply chain visibility in Spain and beyond.

Jaime Luezas Alvarado
Javier Garcia Fortea

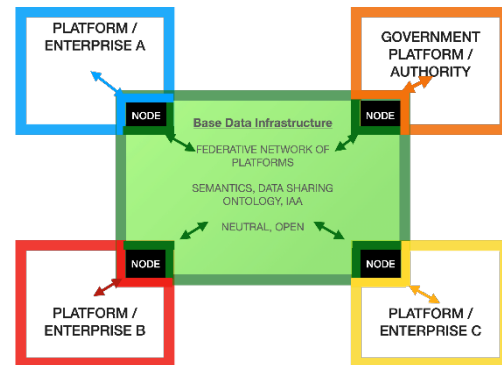


The present focus within SIMPLE is on including the transport modality rail, by developing the data exchange between the maritime silo and the rail silo. Talking from his ADIF rail-perspective, Javier Garcia Fortea says: "Our system can show where a train with specific cargo is located, but until recently these data from the railway system could not be transferred to the customers' systems, because they are in a specific format and standard. SIMPLE now knows the different environments of systems and sends the info, without breaking existing standards, to the customer via API- or web-interface, and in a FEDeRATED way."

NETHERLANDS

The Dutch LivingLabs #19 *DEFlog* and LL#20 *eGovernment Logistics* focus on business-to-administration data exchange. Just like Spanish LivingLab #21 and Swedish LivingLab #7, LL#20 builds on the implementation of the European Maritime Single Window environment (EMSWe), with a focus on trade facilitation by Customs.

Another important foundation of LivingLab #20 is formed by a 'coalition of the willing' between the Dutch government and Dutch ports –both maritime and airports–, together with their Port Community Systems (PCSs). These PCSs seem to embody most of the stakeholder involvement by the private sector in the Base Data-sharing Infrastructure (BDI), the Dutch precursor of a FEDeRATED network of platforms.



The BDI architecture for interconnectivity

Prior to the BDI-strategy, the Dutch launched many other initiatives such as DEFlog (*LivingLab #19 Data Exchange Facility Logistics*). DEFlog is a road-transport API-registry for data sharing in Dutch corridors. Its main aim is to enhance data sharing between government (e.g. municipalities, road managers) and logistics service providers (e.g. carriers, terminals), with a focus on traffic management. The Dutch OpenTripModel is applied in order to structure the data exchange regarding language. iSHARE serves as decentralised authorisation register applying the OAUTH2 standard and its set of legal agreements.

The deployment of influential PCSs may be an advantage to the Dutch, but in general stakeholder involvement by private parties is as sluggish in the Netherlands as it is in other European countries. Sjoerd Boot: “From the government side, we are currently actively raising awareness among SMEs. We need to bridge the gap between what can be done and what is actually done.”

The private sector represented in FEDeRATED

As mentioned, the private companies that contribute to FEDeRATED vary, ranging from transport & logistics companies to freight forwarders, logistic services companies and management & consultancy companies. These companies originate from Luxembourg, Finland and Italy.

All private companies directly involved as FEDeRATED-partners see the possibilities created by digitalization. They adapt to the worldwide changes and capitalize on the opportunities created by these changes.

In general, big European freight transport companies reacted aptly to the worldwide digital dynamics taking place. They have been surfing the global IT-waves for years, so to speak. Both IT and IoT help them manage their business processes and operations. Besides, it creates the possibility to develop e-logistic services next to their traditional transporting business. In the FEDeRATED context these are road transport companies Ahola from Finland (LL#23) and Codognotto from Italy (LL#16), and shipping company Grimaldi from Italy (LL#10). These digitally savvy companies joined FEDeRATED in order to become even better at their game, for example by adapting to the evolving rules of the game in the European Market.

There are also digital management & consultancy companies involved in FEDeRATED, for example Circle (LL#18) and Zailog Srl (LL#12) from Italy. Vediafi from Finland (LL#1/#2/#3) is more a logistics service provider and Biz51 from Luxembourg (LL#17) a freight forwarder.

Vediafi adds public aspects of the supply chain to their services. For them, bringing together the needs and interests of private and public stakeholders is part of their business. In *LivingLab #1 CaaS Asia Gateway for Perishables* they integrate Customs at Helsinki Airport in the data exchange. In *LivingLab #2 CaaS Technology North Sea – Baltic Corridor* they deal with a more general form of collaboration with authorities. Lasse Nykänen: “We build collaboration with Estonian and Lithuanian ministries and municipalities, amongst others. In order to make LL#2 work, it is crucial for us to build these public-private partnerships in the Baltic corridor.” The geopolitical nerve in the EU starts to itch here.

LivingLab #12 Terminal Track and Trace System by Zailog comes from the local perspective of Verona Freight Village in Northern Italy, where rail-road terminal operations are managed. Paolo Lunardi from Zailog stresses the importance of seamless interoperability and extended collaboration with other operators. Zailog arranges data exchange with Italian truck company Codognotto (LL#16), to enhance the terminal yard management at Verona Freight Village. This is done by placing a track-and-trace-platform between the local Terminal Operating System and Codognotto’s Transport Management System.



Rudy Hemeleers (right) and Paolo Lunardi (left)

51Biz Luxembourg runs *LivingLab #17 EU-Gate eCMR/eFTI OneAPP Access Point*, which is about building a one-app-gateway for the EU, with a focus on eCMR and eFTI. Several use cases have been worked out, for example, a road transport from Helsinki in Finland to Luxembourg, and then onwards to Valencia in Spain. Rudy Hemeleers: “The data exchanged are transport and customs datasets like e-CMR, e-AWB and shipment datasets.” Besides, as a timely geopolitical manifestation, 51Biz co-develops data exchange with participants from Ukraine, the EU-way. Together with Abona-ERP, the IT-division of the German Hegelmann Group, and Pionira, a Belgian e-CMR service provider, 51Biz implemented an ‘Internet of Logistics’, including nodes (access points) sharing e-CMR (B2B) and eFTI (B2A) datasets and logistics events. This data sharing infrastructure is currently extended to include other Benelux e-CMR/eFTI platform providers.

Organizing multimodal semantics

The different transport modalities in freight transport and logistics each worked out their own standards concerning data exchange, but the FEDeRATED project is explicitly about multimodal data exchange. It aims at joining separate modal standards, all with their own languages, to become interoperable, by introducing an interoperable language.

In general, FEDeRATED LivingLabs work out data exchange between two or more transport modalities. This often boils down to streamlining operations in ports and terminals, where transport modalities meet. Take the Italian *LivingLab #18 Smart TSGate*, which arranges interoperability between the system of Terminal San Giorgio in Genoa, and the platforms of shipping company Grimaldi and truck company Luigi Cozza. This LivingLab involves the IoT-tagging of trailers and a ‘dedicated lane’ for trucks, streamlining the operations of the terminal. Marco Gorini from Circle, who coordinates this LivingLab by Terminal San Giorgio: “The truck company will be able to access information on a trailer being ready for pick-up, and then book the pick-up of the trailer at Terminal San Giorgio by means of a web service offered by its Terminal Operating System, thus implementing a full-digital workflow, while implementing the FEDeRATED semantic model.”



Marco Gorini

Maritime

The Swedish research platform Deplide builds on top of maritime data exchange models and standards. Cecilia Strokirk (LL#8): “A lot of my colleagues at RISE are acquainted with Maritime Informatics. They worked extensively with Port CDM (Collaborative Decision Making), vessel information, and so forth. That’s the easiest part for us. The difficult part is integrating other standards, for example those used in road transport. We want to integrate global standards.”

In the EU, Member States have set up Maritime Single Windows (EMSWs) where ship operators and agents can fulfil reporting obligations to authorities in electronic format. The EMSW plays a role in Swedish LivingLab #7, Dutch LivingLab #20, and Spanish LivingLab #21.

Swedish *LivingLab #7 Real Time Port Information Services* is initiated by the Swedish Maritime Administration. The SMA ultimately wants to build an EU-legislation-based platform for API's, in order to make the data from its systems available to Swedish stakeholders, be it public or private parties. The developed app called AAA deals with supplying updated, real-time maritime Estimated-Times-of-Arrivals (ETA's) to public rail and road traffic-planning platforms. Maria Gripenblad: "Making data available has to be realized before you can 'federate' or even 'share' data." LivingLab #7 works with the maritime semantic standard IMO, which is adapted to multimodal FEDeRATED semantics.



Cecilia Strokirk



Maria Gripenblad

Air

The transportation modality 'air' is well represented in FEDeRATED. The reason for IATA, its global representative, to join FEDeRATED, was motivated by their need to expose the airline industry to multimodal data exchange. This means linking the IATA air-standard One Record with the semantic model of FEDeRATED.

IATA's *LivingLab #11 Internet of Logistics* is an application of a global modal standard in the multimodal, government involved European context of FEDeRATED. Henk Mulder: "Our Lab differs from others Labs, in the sense that it is not based on the implementation of a system, but on the ongoing development and application of a standard. Our contribution to FEDeRATED is a data exchange standard for air transport that is integrated with and can link to FEDeRATED. Therefore, any company that uses One Record is automatically compatible with FEDeRATED."

Henk Mulder: "What the FEDeRATED model plans to do, is to provide a semantic description for multimodal freight, so the whole story of the cargo being transported

across transport modes. When is my next pick-up? How long is my next leg going to be? Will I be accepted by Customs? But the Air and the Maritime ‘cargo-stories’ are different. The Air cargo story is about what happens with a shipment in an airport warehouse or in the hold of an airplane. In the Maritime industry it is about containers, about the handling by stevedores, etcetera. Separate modalities create different stories on their cargo, using their own modality-specific words. But we need a cross transport mode language to get the whole story of the goods. That is what FEDeRATED semantics are about. It is an overarching semantic model on top of all the data models of the separate transport modes, with all their transport mode specific vocabulary. All transport modes need intermediary semantics, understood by all.”



Henk Mulder explaining the FEDeRATED and IATA connection at an IPSCA Event in 2019

Organizing trust and stakeholder engagement

Within the FEDeRATED context, so among ourselves and within our LivingLabs, we first of all need to trust each other and manage the convergence of our different bottom-up use-case perspectives with the top-down reference architecture of a federative network of platforms. Beyond that, we need to organize trust and stakeholder involvement amongst the organizations in our supply chains. These include all kinds of organizations, big and small. We should be able to convince the big companies, but the SMEs is a different story.

Creating stakeholder engagement amongst SMEs is not easy, because from their perspective digitalization often disrupts their more traditional business. Moreover, because digital technology creates this virtual world they cannot oversee, they tend

to distrust it anyway. So, how to organize trust and involvement with those that are not yet digitally (or otherwise) ready?

A theoretical answer could be: by convincing SMEs the FEDeRATED solution is effective, secure and cheap in the end, so when this 'grid of nodes' we are building has evolved and matured, and they can easily become a node in the grid. By convincing them the grid streamlines their business processes, which brings the possibility of saving and/or making money, while it ensures data sovereignty, a level digital playing field and security, so they do not need to worry about that.

Jaime Luezas Alvarado from the Spanish Puertos del Estado (LivingLab #21): "As public entities we can contribute in creating trust by private parties. We develop the architecture and technical functionalities that should result in trust. In our case, part of the SIMPLE-architecture is based on blockchain technology. This is because we do not want to store all the data shared through the API in the central database. Yet, we do want to store the cache that is generated, in order to be able to recover data if any operator needs it. And this cache is going to be in blockchain, creating trust within the sector. With blockchain we can be sure the data remains at source, with the owner of the data, so it ensures data sovereignty."

Toni Penttinen from Ahola (LivingLab #23) is well aware of the problem that many logistics and transport companies do not trust data sharing, which makes it important to achieve solutions like blockchain immutable data sharing: "We are working on a hyper-ledger which gives the immutable, irreversible history of the information. This creates trust in the information. Take a waybill. Through this hyper-ledger, the waybill can be tracked down to its origin, building trust, for example, by authorities." Toni comes with an example: "If the authorities can trust the information on the electronic waybill, which is coupled with the license plate number of a truck, they do not need to stop and check the transport in a lot of cases." Blockchain technology creates the trust that results in efficiency for businesses and authorities alike.



Toni Penttinen

The Swedish LivingLabs executed through RISE platform Deplide pay a lot of attention to the creation of trust and interest in multimodal data sharing, so to stakeholder engagement. In these LivingLabs the self-organization of data exchange is facilitated.

To get that job done, first the incentives for the different stakeholders have to become clear, in order for them to take action; to innovate their systems and actually start sharing data with each other. Mikael Lind: "We first need to understand the use case, and then get the incentives to the table for the stakeholders to start the process of adapting their systems and actually share data." One might therefore describe the RISE-executed Living Labs as incubator and accelerator environments for multimodal data sharing in and between transport nodes.

The importance of stakeholder engagement in order to scale up the FEDeRATED solution is also stressed by IATA's Henk Mulder: "We need to formulate the opportunities created by FEDeRATED data exchange". Besides stakeholder engagement in a more general sense, Henk also promotes engagement among the FEDeRATED LivingLabs by way of organizing IATA Hacktons. In the present composition of FEDeRATED, a last Hackton took place in October 2023, aimed at creating a FEDeRATED-node within IATA's One Record environment, which somehow seems like Henk organizing the creation of a cherry that is going to be put on top of a FEDeRATED-cake.

The governmental aspect of FEDeRATED

The FEDeRATED network of platforms can be described as a combination of technological solutions and their governance.

The decentralized network of platforms we build together expresses public-private cooperation, and in line with this, it is jointly owned by public and private parties: it is common property. The question that then arises is: What form of governance do we choose for such shared property?

Governing the commons

Jointly managing shared resources is called 'governing the commons', and assumes the strength and interests of a community. A market-based governance model assumes the strength and interests of individual parties; and the state model assumes the superior vision and subsequent dominance of a government or political party. Behold the geopolitical division into roughly three power blocs, three different visions, three models of governance –Europe between the USA and China.

As Europeans, we did not choose the easiest governance model, because governing the commons is based on cooperation and agreement, and that can be a difficult and often time-consuming process. As a result, American-style tech companies may rush far ahead of us, and the Party in Beijing may send over a billion Chinese in a certain direction in no time. But in the end, it may well be that our cooperative European model has the longest life, because after all, we agree with each other; or at least we have somehow brought our opinions together in such a way that we agree to disagree, and set sail together anyway. That's the European Soul of our Machine.

If we assume the governance model of governing the commons when setting up a federated network of platforms, then 'the community' ultimately determines the rules of the game in data exchange via this infrastructure. 'Community' here can be understood in a limited sense, as the community of players from the European freight transport and logistics sector. Beyond that, however, it is also the community in a broad sense, referring to the entire population of the EU. The government represents the community in a broad sense, its citizens. Ultimately, our federated network of platforms must serve both the collective of our transport and logistics sector and the collective of our citizens.

But the private sector will have a major influence on the rules of the game in our network of platforms. After all, this is a grid for business data exchange, and the private parties who will operate in it will largely determine for themselves what rules will apply. In doing so, however, they are bound by the legal frameworks set by EU

government. For example, government must ensure that the interests of logistics players are equally served (level playing field) and that the entire EU-population ultimately benefits -think about consumer interests or the sustainability of transport and logistics.

All in all, it is therefore obvious to make our federated network of platforms, so the playing field, public, while the game that is played therein, including many of the applied rules of the game, belong to the collective of private parties.

The legal aspect of FEDeRATED

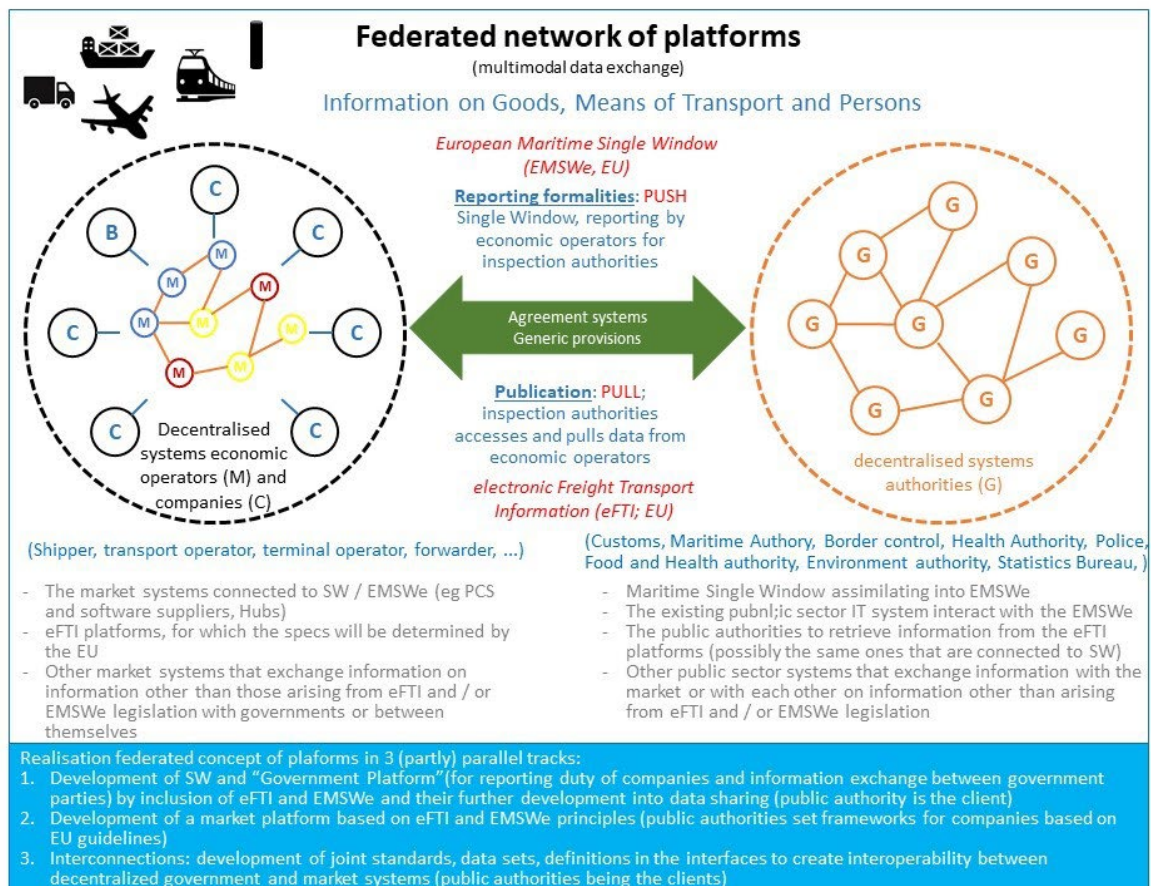
The governance model of governing the commons will have to be underpinned by laws and regulations. Technological developments create new relationships and new situations in the world of transport and logistics, which in turn require legal adjustments. Laws and regulations usually lag behind initial technological developments, making such legal aspects all too often hurdles on the way to the future world of transportation and logistics.

In order for the private sector to have confidence in a FEDeRATED network of platforms, it will be necessary to ensure a sound legal and regulatory framework that establishes, for example, clear conditions and rules for data reuse and the potential liability that might arise from it.

Preferably, it should be avoided that random IT-specialists will decide on how to code the applicable rules. We need more holistic thinkers pulling their weight here.

The public sector in the EU needs to give its long-term policy commitment and legal guarantees, and say: This is what we are going to do. This is where we work towards as a European Community. When the destination of the FEDeRATED flotilla has been made clear and is substantiated by laws, stakeholders know their investments are warranted and the requirements in the various European member states are as uniform and predictable as possible. Only when legal guarantees exist will companies be willing to start using the FEDeRATED grid and consider it their own.

By the end of 2023, European data-based legislation is in place for various transport modes and for Customs. Legislation on eFTI and EMSWe has also passed the legislative process and is in its implementation phase. There is no European legislation yet covering the supply chain outside the areas referred to here. However, we do need more general, multimodal legislation on data exchange in European freight transport and logistics. Legislation underpinning our federative solution, our way of governing the commons.



A policy assessment of the overlapping and different issues covered by the EU eFTI and EMSWe legislation in relation to data sharing

The federative grid serving the EU's Green Agenda

When realizing the federative network of platforms, we do not only have to convince companies this change can be trusted; we also have to stress the change is inevitable. Companies will be spurred when they know future EU-legislation will require the sharing of certain data, for example data on a transport's fuel consumption and CO₂- or NO_x-emissions. Rolling out the logistics network of platforms for the EU will most likely go hand in hand with enforcing the EU's Green Agenda.

The journey revisited

As European nations we all add something to the flotilla called FEDerATED. We add public and private zeal and knowhow to our public-private gathering; we add a Soul to the Machine. In doing so, we all realize this is just the beginning of our journey together. These past five years only offered a first discovery. We left our harbours, met up in gulfs and bays and channels, and sailed towards the open sea, the big wide ocean of global digital freight transport and logistics. That's where we need to hold our course these coming years. Meaning that designed plans need to be further implemented, in order to advance as a flotilla.

We should not be put off by the complexity of the matter, and realise that we are in a development phase, with finished products being realized only every now and then. In this first part of our journey, we just started paving the road towards replacing the present practice of sharing data by federative data sharing. We all know the envisioned transition, which is quite revolutionary as a concept, can only be realized step by step, so evolutionary.

The destination of our flotilla is set, but we don't know exactly how to get there. Yet, that is not really a problem. We are experienced in making our ships resistant to all kinds of weather conditions, and the actual course will automatically reveal itself these coming years. We have clear technological beacons in sight and can learn with each other, as we sail into the open sea.

There are still many aspects of our federative network of platforms that need to be further developed. Besides technological harmonisation, a lot of effort has to be put in engaging stakeholders, so gathering more ships in our flotilla. We have to spread the word –ideally turning federative data sharing into *the* European brand. We have to gather people around our European solution. Besides new captains, or helmsmen and -woman, we also need craftspeople of all sorts to get involved with the finishing of our ships. And we need to get our destination sealed in EU-legislation, for as an EU-flotilla we cannot do without such official backing.

Whatever happens, as long as we keep our common destination in sight and steadily move on –sailing on favourable winds and streams whenever we can, while bracing ourselves for 21st century storms–, we create the common EU-future we aim for. The journey continues.

