Working with RISE-platform Deplide in Kvarken ports
A talk with Sandra Haraldson, Mikael Lind, and Mathias Karlsson on Living Labs #13, #14 and #15[1]

Sandra Haraldson is a researcher and concept developer at RISE. Sometimes she visualizes her concepts in illustrations, which the participants of FEDeRATED know all too well from their publications

Mathias Karlsson is a researcher at RISE and he does his 'industrial PhD' in Maritime Informatics on the case of Kvarken ports at Umea University. He has been working on the subject of ports –also airports– for the last 15 years, and he coordinates Kvarken Living Labs #13, #14 and #15. For those who wonder: his beard has been growing for the last 12 years.

Mikael Lind is senior strategic research advisor at RISE and professor in Maritime Informatics at Chalmers University of Technology in Gothenburg. Within RISE he is responsible for all the FEDeRATED-efforts, and he is a rapporteur of DLTF, sub group 2. The three deal mainly with organizational aspects of the Living Labs that use research platform Deplide as an enabler of situational awareness. They work on the concept development and front-end solutions, while Eddie Olsson and Kenneth Lind deal with back-end FEDeRATED-technology within Deplide.

Mikael Lind

A maritime base

In Sweden, maritime transport forms a big part of the transport cake, and it may come as no surprise that RISE's platform Deplide "is based on solid experience from similar platforms in several large-scale projects within the maritime sector, adapted to more generic multimodal transport needs."[*] Within the FEDeRATED Living Labs that adaption to other transport modes is primarily carried out by coordinating the collaboration between multimodal stakeholders in transport nodes, i.e. ports and terminals.

Mikael: "Deplide is the fourth generation of a data sharing platform we are working on. In one of the earlier versions we adopted the capabilities of the Maritime Connectivity Platform, which dealt with functionalities like findability, identity management and access management. This is similar to what is being pushed within the Data

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[1] Interview by Minne Buwalda

Space orientation of the EU. We do not use these functionalities in the same way now, but we build upon it in a FEDeRATED way." And: "There are enough similarities between the maritime sector and the rest of the transport sectors, to use the same kind of reasoning."

In our interview we mainly talk about LL's #13, #14, #15, which are all centered around Kvarken ports. Kvarken is the name of the Gulf of Bothnia where the distance between Sweden and Finland is only 80 km, with Umea port (SE) on one side and Vaasa port (FI) on the other. It is a historical maritime crossing, and in modern-day logistical terms one would call it a main transport corridor.

So, on top of all the experience with data exchange in the maritime sector, experience with multimodal data exchange is sought and realized within these FEDeRATED Living Labs. Asking about the digital maturity of these other modalities, Sandra says: "Most modalities are digitally immature. Exchanging data between rail transport actors is mostly dealt with manually and then reported digitally, in the best case." And: "We are working on different projects to increase digital maturity in the transport ecosystem, including the transition of data, so information can be shared more easily." Mikael adds: "Concerning rail, we have a strong actor in the Swedish Transport Administration (STA), which collects as much information as possible, in order to maintain the railway infrastructure. But they do not coordinate the operations on that infrastructure. When we ask a train operator for data, they in turn say: you should ask the STA, because we already sent them the data." He concludes: "When Deplide is trying to operationalize these situations, and build this API connectivity, all these legacies start to show." It is a tough process, but by showing stakeholders the benefits they can get from data exchange, change is initiated.

Mathias Karlsson

And then of course there is RFID-technology, which helps a lot.

Mathias: "Take *LL#13 BetTerFlow*, which is about optimizing the railway terminal in Kvarken ports. Initially we did not know when the trains in Umea were coming, or if they were delayed. But now we know, because we collaborate with *LL#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. And when a wagon is missing, because something has gone wrong in the physical transport, we can track that wagon and give the freight forwarder or cargo owner a new ETA."

Collaborative Decision Making

Opposed to Eddie Olson and Kenneth Lind, who deal with the zero's and one's of Deplide, Mikael,

Sandra and Mathias focus more on the organizational aspects of data sharing, and that is reflected in their vocabulary. In their publications they describe the FEDeRATED Living Labs as 'collaborative arena's', and coin Deplide 'a democratic platform'. This shows that, for them, the three Living Labs are about the organization of data sharing in the first place.

These Living Labs aim at creating a level playing field for the stakeholders involved. This is not only done to practice fairness and create equality –FEDeRATED-values that are deemed important, especially in Sweden– but also to create 'the situational awareness' that is needed: a situational awareness amongst equals. Mikael: "RISE is pushing a 'collaborative model'. Basically, we place every stakeholder –authorities and businesses alike– on the same level. This is because we realize the system is never going to be better than the weakest link in the chain." He continues: "We started from the transport nodes, coordinating the actors in those nodes. The opportunities that now present themselves, within and between our Living Labs, are about multimodal data sharing amongst multiple partners spreading over many different transport nodes."

It must be said: sometimes conversations in the FEDeRATED setting resemble Babylonian confusions of speech. But when zooming in on the different terms used by separate Living Labs, one can get a pretty clear picture of their different approaches. And often it seems that, even though different terms are used, more or less the same is meant. To give an example: within FEDeRATED there is much talk about 'supply chain visibility', whereas Mikael and his colleagues work with the notion of 'situational awareness'. Yet, supply chain visibility and situational awareness facilitate each other. They both create a more 'holistic', and therefore a more efficient planning by the parties involved.

So, there is a clear 'democratic' approach** in the fashioning of these Swedish Living Labs, which means that companies and organizations, big and small, can equally benefit from the results. And since a level playing field assures that more stakeholders get involved, this results in a bigger overall supply chain visibility for all the stakeholders, and an increased predictability of the transport. Mikael: "Take Living Labs #13 and #14, where we work with Ahola/Attracts. Ahola might have a transport for a cargo owner by truck to the Finnish port of Vaasa, then via Wasaline to Umea port in Sweden, and onwards by truck or rail. For the sake of their cargo-owners they want to secure that a many steps as possible in the supply chain can be pursued with as high a predictability as possible. And predictability you fix by knowing what is happening in the next steps of the supply chain."

Coordinating self-organization

In the three Living Labs the self-organization of data exchange between parties operating within the respective transport nodes and chains is facilitated and coordinated. To get that 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: "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 Living Labs very much from a use case perspective." Mikael concludes: "So, 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."

© Sandra Haraldsson

One might describe the three Living Labs as incubator and accelerator environments for multimodal data sharing in and between transport nodes. Yet another term, and not a term that Mikael, Sandra or Mathias used in the interview, but one which pretty well describes the self-organizing and co-creative approach within these Living Labs, coordinated by RISE and supported by Deplide's data sharing environment.

Diagrams and interfaces

Within the Living Labs conducted by research institute RISE, part of the efforts is directed towards creating the technology that supports a FEDeRATED data exchange. This is done in specific use cases, but on the generic level of multimodal ports, terminals and supply chains. Another part of their efforts is directed towards creating overview and insight as a means to organize the collaboration needed.

Overview is created by way of diagrams or charts, which visualize the needed data exchange in specific transport nodes and chains. Sequence charts are used to agree on how which data need to be exchanged in order to realize use cases. Sandra's illustrations also bring overview, but mainly overview intended to bring clarity to FEDeRATED colleagues.

Besides working on diagrams and illustrations, several interfaces for end users are developed, in order to show stakeholders the advantage of situational awareness and digital collaboration. Mikael: "Deplide is just about supplying zero's and one's. On top of the Deplide environment we develop user interfaces within our Living Labs. And those user interfaces become a main tool within our discussions with the stakeholders. They become a valuable source for the actors in the Living Lab to pursue their operations in a better way."

Asking for examples of such charts or diagrams used, Mikael says: "We describe the use case for each Living Lab in a so-called objective diagram, in order to see where digital data sharing is needed. Then we draw a sequence diagram in order to understand what actors need what information when.
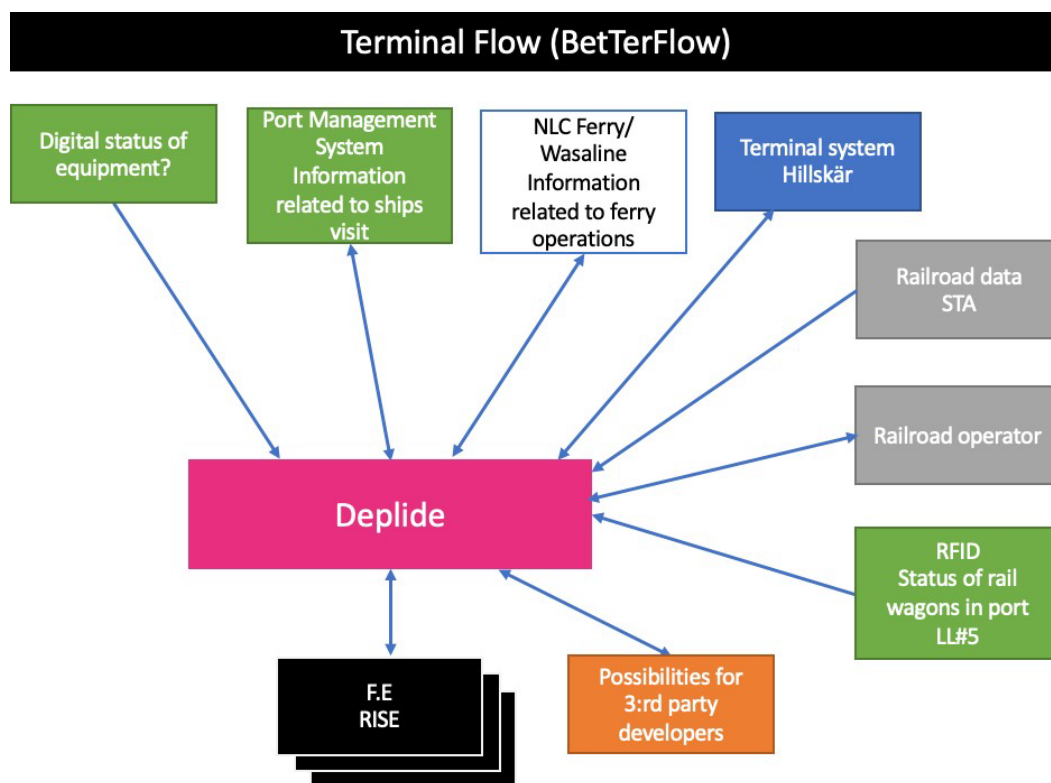
Then we have the information pieces, which we visualize in object-relationship diagrams. These reflect what the data objects are, and how these are defined semantically between the different environments."

Asking if these semantics follow EU-standards, Mikael says: "Yes, we use MSW (MaritimeSingleWindow)-data, which is based on the IMO Compendium standard messaging structure. And the GS1 has a lot of influence with their EPCIS-standard. Take the RFID-transponders we installed in Kvarken ports. They carry EPCIS-messages." Yet, Mikael finishes with a reservation: "That said, for some parts of the use cases there might not be enough standards out there. And there it is our role to explore new dimensions of standards which are not yet existing."

LL#13 BetTerFlow

In order to show what kind of data, data providers and data users are involved in the Kvarken Living Labs, Mathias shows the sequence chart of *LL#13 BetTerFlow*, which is "a work in progress" and "a way to give a holistic view of the needed data exchange".

The involved parties in this Living Lab are cargo owners, freight forwarders, transport operators (ship, truck, train), terminal and port operators, and authorities. Mathias: "You start with the transport assignment about what goods need to be transported from A to B, say from Lulea in Sweden to Vaasa in Finland. From there you can start sharing data on when the goods are going to be loaded on a train in Lulea, and with the rail-data from the STA and the data from the RFID-readers you can then tell the ETA's and ATA's of the goods' arrival at the terminal. After inspection and approval of

the wagons, the terminal operations can begin." Here Mathias changes the screen from the 'main flow' to a 'lower-level flow', which focusses on the terminal operations and the subsequent transport by ferry to the Finnish port of Vaasa. "When the goods are inspected and approved, the ferry operator is informed, and they in return inform the terminal operator which containers are assigned to be loaded onboard the vessel in what order. The timestamps on the subsequent movements of goods in the harbor are then shared, also with the transport buyer or the freight forwarder. Then the ETD and ETA of the ship is shared, etc."

When asked about the realization of the flow of information described in the chart, Mikael steps in, formulating in a thoughtful and precise manner: "What is described here is the emergence of an operational alignment in the framework of FEDeRATED. It is a mimic of the opportunities that arise within the construction of a FEDeRATED network of platforms. This is now being explored. This sequence diagram is generated within the Living Lab, meaning that the actors are committed to establish the foundations for this data exchange." He continues: "The Living Lab-approach is basically an action-and-design-research-approach." And: "The outcome is not an academic RISE-invention but an invention within and by the Living Lab. These outcomes are co-created by the Living Lab-actors. They collaboratively define and agree on how to work."

LL#14 Sustainable Intermodal Chain

Although the process of 'implementing the design' faces hurdles like legacies, there are also successes to be reported in Living Lab #14: an important stakeholder updated its IT-system, and is now able to share data using the Deplide environment.

The Spring 2022 *Factsheet LL#14 Sustainable Intermodal Chain* stated that 'Kvarken ports is in the process of acquiring a Port Management System (PMS)'. But in the meantime, May '22, that process has been completed. Because of that, an important link in the data exchange for this Living Lab is in place. Mathias: "The Kvarken ports PMS will be an important data provider to Deplide."

Mikael adds to that: "If involved actors do not invest in upgrading their systems based on Deplide, there is still the possibility to enter data manually into the system. This is to secure we have the data feed. But now they started working with a new PMS, the data do not need to be entered manually anymore." He continues: "So, now the PMS of Kvarken ports Umea is the operational environment." He goes on explaining: "Besides the PMS, we have the service tower of Ahola, the platform of Wasaline, etcetera. We then place Deplide in the middle and have every stakeholder channel their data in that direction. Then, either we have a user interface that they can access, or we feed back the information to the original systems by way of API's."

The adjective 'sustainable' in the title of Living Lab #14 reflects the objective to stimulate transporters to use more often the ferry when having a transport from Sweden to Finland or vice versa, instead of the road. Mathias: "Streamlining the process of trucks crossing by ferry is what needs to be done, in order to convince businesses to use the maritime modality more often. Wasaline has the world's

most environmental-friendly ferry, fueled by batteries and LNG." He adds to that: "Another actor in this Living Lab, trucking company Ahola, wants to be able to reduce CO_2-emissions on their transports and calculate the emissions on the level of the goods more precisely. By bringing in data from Wasaline, Ahola can fill existing 'information gaps' in order to calculate emissions end-to-end."

The concept developed in *LL#14 Sustainable Intermodal Chain* is aimed at supporting the collaboration between service towers, fleet operating centers and transshipment hubs. Mikael: "The fleet operating center of Ahola is their drivers' best friend, because they collect and distribute all the needed data from the transport chain, data that help the drivers work more efficiently. And because of that, they are also the transport buyer's best friend. The essence of these platforms is that they offer an overview of something that moves along a self-organizing system of transport. Besides that, they can also act, for example by telling a driver that he will be too late for the ferry and needs to drive all the way to Helsinki instead."

Eddie Olsson

Kenneth Lind

Validation

Asking about the realization of the 'demonstrators' mentioned in the factsheets on the Living Labs coordinated by RISE, Mikael says: "The way we implement the Living Labs is by way of Deplide-technology and its associated user interfaces. The implementation within Deplide generates experiences for involved actors on what to do in the next phase. And whether we call it a demonstrator or a senior operational environment or whatever, is more or less irrelevant." He goes on: "I understand the EU-concerns about reaching the highest TRL-level, but we are seriously implementing the steps and it will be real time data that will be shared in this environment."

"Yet, it is doubtful if this environment will be very long lasting, because Deplide is not intended to be used as some kind of final operational environment. It is about generating requirements for a future operational environment. And it is meant to shorten the lead times and lower the thresholds to implementation."

Mikael concludes: "As to requirements for a final solution… you will never get a company like Ericsson or IBM make these kind of incremental developments or additional refinements, because that would cost a fortune. That is why we came to the conclusion that we had to take this intermediate step, but with real-time data in real-world use cases."

* From: *The Role of Democratic Platforms in Transport System Innovation*, RISE and STA, May 2022.

** Mikael: "The 'democratic approach', as elaborated in *The Role of Democratic Platforms in Transport System Innovation,* is both about actors meeting in a neutral arena to explore use cases and make the appropriate designs, and abo ut technical environments for data sharing (where Deplide is used as an information broker) and front-end interfaces."