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## Living Lab 3: Urban Logistics Consolidation

### 1 Background and introduction

#### 1.1 Background

Europe is considered as one of the global leaders in the logistics sector. Eight EU Member States are ranked among the top 10 countries in terms of logistics performance for the year 2018<sup>i</sup>, while the market size of the logistics sector in Europe was estimated as being equal to €878bn in 2012<sup>ii</sup>.

However, in various sectors, logistics costs remain a significant part of total supply chain costs. These logistics costs represent 12% of total cost in the manufacturing sector and more than 20% in the retail sector<sup>iii</sup>. Moreover, logistics efficiency could be improved. Statistics have shown that 24% of all vehicle movements per kilometre in the EU are not carrying goods, while the average load factor for vehicles is estimated as being 57%<sup>iv</sup>.

To enhance efficiency in the EU logistics sector, increased collaboration could improve the current situation. More efficient synchronized networks and a decrease in operational costs are the main benefits for the companies involved in cooperation schemes<sup>v</sup>, as it has been estimated that cost savings and efficiency gains of 6-10%, according to Transport Intelligence<sup>vi</sup>, or a reduction of 9-30% in distribution costs, could be expected<sup>vii</sup>.

#### 1.2 SELIS (Shared European Logistics Intelligent Information Space)

However, a key barrier to collaboration is doubts around secure data exchange, and this is the barrier that SELIS aims to remove. The Shared European Logistics Intelligent Information Space



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(SELIS) project is a €17 million European Union Horizon 2020 Research and Innovation Programme, running from September 2016 to August 2019. The project has built a scalable and replicable platform for pan-European logistics applications, at every level allowing a standardized exchange of core data between any number of registered users.

The SELIS project combined strategies for innovative, efficient and green logistics with leading edge open source information technology techniques that support collaborative logistics, through building applications and testing them in real world use cases.

### 1.3 Living labs

Living Labs have been used by SELIS as the testing and proving environment by using current commercial and operational scenarios to test and refine the SELIS developed technical solutions. Some solutions incorporated opensource systems integrated into the overall platform.

The SELIS Living Lab activities have included the stress-testing of the solutions developed for building the basis for a safe, secure, reliable and robust data-sharing platform.

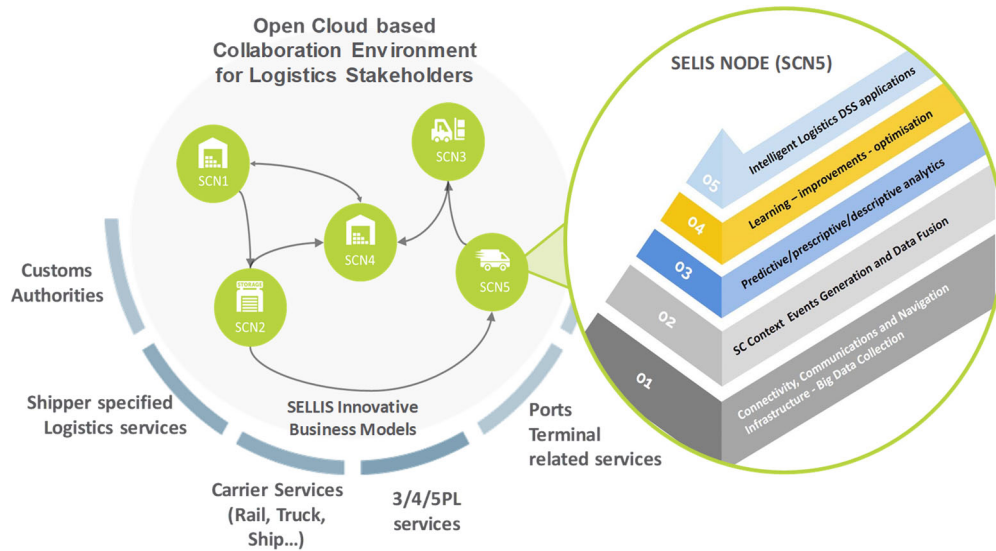
- Each living lab involved business partners willing to support the development and piloting of these applications.
- Each of these living labs tested one or more applications, with each pilot containing one or more trials, or use cases, which allowed the testing of developed solutions in a number of different scenarios, with different groups of collaboration partners, each effectively conducting a stand-alone experiment which generated a set of real-world results which can then be compared with the expected and anticipated benefits.
- Each real-world pilot and use case trial created insight on implementation, and the enablers and barriers to success.

### 1.4 The Concept of SELIS Community Nodes

SELIS has developed the concept of a network of logistic communities, each created as localized shared intelligent logistics information spaces, each adaptive, configurable and providing the privacy that collaboration requires. These communities are termed as SELIS Community Nodes (SCNs). The aim is to stimulate the growth of a network of these SCN, that will create a distributed common communication and navigation platform for transport and logistics, a platform that through multiplication can be extended and expanded to support Pan-European logistics applications, adaption and collaboration.

Each SCN is a secure domain where supply chain partners share data (e.g. raw data, analytics predictions, inventory, routing decisions etc.) in a secure and governed manner that, in turn, enables the implementation of a specific collaborative logistics model.





**Figure 1: SELIS SCN concept**

An SCN includes the necessary architecture to allows users (data publishers and/or subscribers) to:

- 1 - connect to multiple data sources;
- 2 - transform, reformat and normalize data;
- 3 - share data securely by means of user-defined access rights, thereby enabling collaboration;
- 4 - make use of machine learning that allows for self-learning and improving capabilities, such as continuous improvement in forecasting based on the ongoing and real-time use of accumulated data.
- 5 - adapt and deliver the capability as required by a specific industry or sector.

If appropriate, an SCN could communicate with other SCNs through an open and cloud-based architecture to create a network of SCNs; this would allow any operator to connect with another, such as a single port SCN, which could share appropriate data with an inland 3PL (Third party Logistics provider) or rail SCN.

## 2 Living lab 3 – Urban Logistics Hubs

### 2.1 Three cities, three solutions

Living lab 3 focused on urban freight transport. Urban logistics is essential but has a number of social, environmental and economic impacts. Even if it represents only 11% of the total traffic in urban areas, it is responsible of 25% of GHG (GreenHouse Gas) emissions, 30% of nitrate oxides, 50% of fine particulates, 40% of noise pollution and energy consumption, and although the last mile of the distribution only represents 1% of the total transport distance it contributes up to one third of logistics costs. Living labs 3 has allowed the testing of SELIS solutions in urban logistics environments in Brussels, Milan and Athens, allowing fast and secure communication flows amongst the community partners and rapid and low cost of entry, both essential for breaking down barriers to collaboration.

Previous studies have shown the potential of urban logistics consolidation. For example, the NexTrust London chilled food hub pilot consolidated multiple deliveries of chilled and fresh products onto fully electric vehicles. The pilot concluded that 30% of commercial delivery vehicles could be



removed from London’s roads through such consolidation, which when combined with the use of electric vehicles would reduce emissions by over 95%.

All three use case solutions involved addressing gaps in data consolidation, visibility and global optimization.

## 2.2 Urban logistics hubs case studies

### 2.2.1 Brussels Sumy

#### 2.2.1.1 *The problem*

The living lab in Brussels was coordinated by Sumy, a logistics service provider performing last mile deliveries for food and pharmaceutical products, specializing in temperature-controlled products. Belmedis (PhB-B) is a wholesaler of pharmaceutical products in Belgium with a market share of more than 30%, which delivers pharmaceutical products to 4000 customers, many of the pharmacies being SMEs (Small and Medium Sized Enterprises), with up to three deliveries a day from nine distribution centres. Belmedis hoped that the SELIS solution would through real time tracking and load consolidation, improve the visibility of their delivery chain, improve communication and collaboration between stakeholders to deliver a more efficient and environmentally sustainable delivery network. The SME in this trial were the pharmacies served in the Brussels area.

Key barriers to consolidated urban logistics included an absence of information sharing infrastructure between collaborating parties, lack of real-time monitoring of transport events, and limited understanding of the contribution to actual incurred costs. To aid the collaborative delivery process, manual routing was replaced by use of off-the shelf route optimization software (provided by Mapotempo), and in doing so aimed to replace occasionally reviewed fixed routes with dynamic routing.

#### 2.2.1.2 *New Urban logistics solution for SUMY*

The creation of a new shared delivery platform required real-time and secure collection of orders that could be shared in real-time to allow for dynamic, consolidated and tracked delivery by participating logistics service providers. To identify the benefits for individual parties, a collaborative cost model was implemented that took the operational data to generate costs and gains per participant.

To conduct the new optimized routing, the existing manually planned routes were entered into the routing model as a base. One important proviso to the planning completely new routes with consolidation of deliveries to an individual pharmacy were the expectations of pharmacies and contractual agreements which meant that frequency of delivery (up to three times a day had to be maintained for some customers. The new rounds took these needs into account when producing new routes.

#### 2.2.1.3 *The solution and SUMY platform delivered*

The platform was delivered and tested, which included transport demand and capacity matching and delivery tracking functionality. Data was successfully integrated as part of a data sharing infrastructure, and a reporting function created via a KPI (Key Performance Indicators) dashboard that included feedback on environmental measures. The platform tested a number of cost allocation models and put in place a routing optimisation solution that can be used to optimise route and truck loads in response to multiple transport requests and capacities.



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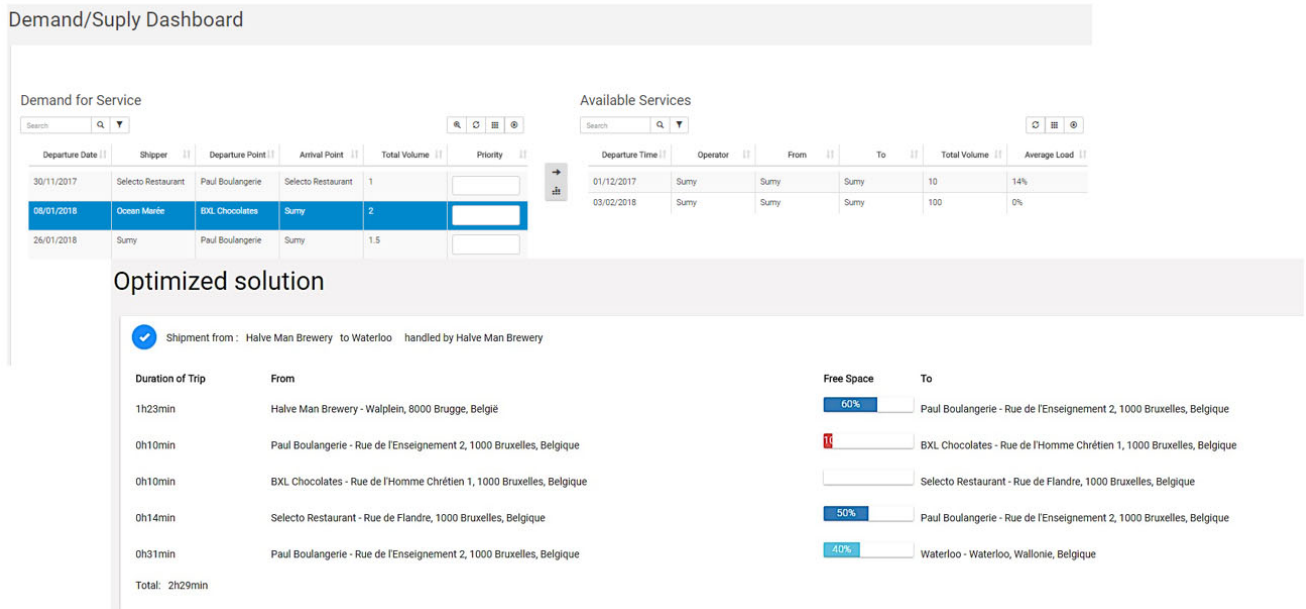


Figure 2: collaborative planning and optimisation

### 2.2.1.4 Business Impact

The platform delivered visibility to facilitate collaborative planning for urban logistics, and in doing so increased the load factor of deliveries made and CO<sub>2</sub> footprint reduced. 49 routes were consolidated to 41, the total distance driven cut by 19%, and the total driving time for all delivery rounds reduced by 8%. CO<sub>2</sub> emissions were estimated to be reduced by 13%, whilst vehicle load was increased by 17% and empty running cut from 18% to 10%.

Delivery reliability was enhanced along with customer service. On time delivery was increased from an average of 87% to 94% for the routes in the trial.

And critically, in delivering a cost and benefit allocation tool, the platform put in place the incentives required to share benefits equitably amongst collaborating parties, as illustrated in the screenshot below.

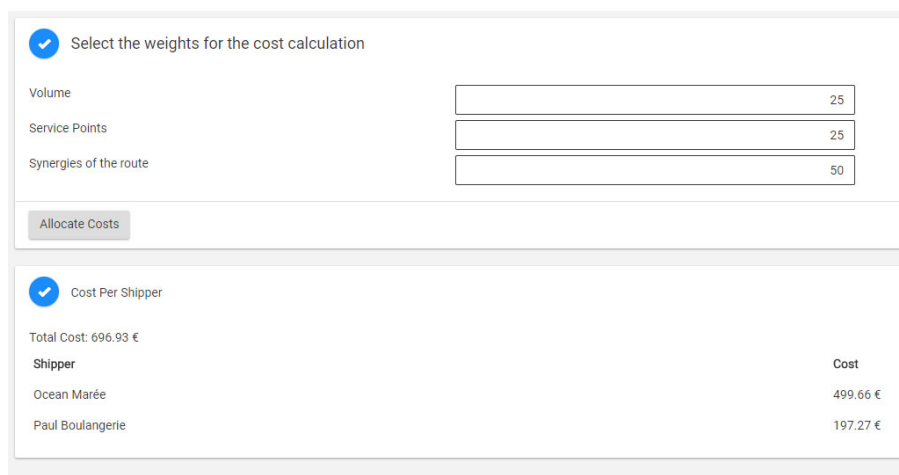


Figure 3: cost allocation tool



## 2.2.2 Sarmed Greece

### 2.2.2.1 The problem

Sarmed is the largest warehousing and distribution operation in Greece, with over 700,000 m<sup>2</sup> of warehousing space and 46% of the vehicle logistics market, delivering to over 97,000 locations each year. Information on the goods shipped through the regions is inconsistent and late, and so clients, logistics service providers and end customers lack up to date information on shipments made or missed. In particular, target delivery dates were not shared with logistics service providers and regional distributors, and there was no automated method of prioritizing or influencing the delivery per consignment.

### 2.2.2.2 SELIS Sarmed platform delivered

The SELIS platform integrated and consolidated information to create a single and faster view of delivery status. The most innovative feature of this platform was the development of a capacity and demand management functionality; a lead time quotation and price negotiation tools were developed and tested to facilitate the sharing of transport capacity and resources in an equitable way amongst regional distributor and logistics service providers.

The solution involved deployment of adapters to bring together the data, harmonized KPI (Key Performance Indicators) reporting via a visibility dashboard. Iterative user feedback helped the developers enhance the usability of the prototype, including the negotiation tool, shown in the screenshot below.

The screenshot displays two side-by-side panels of a negotiation tool interface. The left panel is titled 'Original Version' and the right panel is titled 'Route Under Negotiation'. Both panels have a 'Finalized' status at the top left. Each panel contains the following fields and controls:

- Origin:** A dropdown menu set to 'Θεσσαλονίκη'.
- Destination:** A dropdown menu set to 'Θεσσαλονίκη'.
- Truck Plate Number:** A text input field containing '1'.
- Days Of Week:** A list of days from Monday to Sunday, each with an unchecked checkbox.
- Pricing:** A section with three input fields: 'Fixed Price' (value: 1), 'Τιμή ανά κιλό' (value: 1.00), and 'Price Per Cubic Meter' (value: 1.00). There are also 'Price Per Pallet' and 'Price Per Cubic Meter' labels with corresponding input fields.
- Effective From:** A date input field set to '28/02/2018' and a text label 'Ενεργό έως' followed by an empty input field.
- Capacity:** A section with three rows: 'Total Available Capacity (Laden)', 'Total Available Capacity (KG)', and 'Total Available Capacity (M3)'. Each row has a value of '1' in the first column and 'Requested Reserved Capacity' (Laden, KG, M3) in the second column, with values of '0', '0.00', and '0.00' respectively. The third column is labeled 'Percent of Total' and the fourth column is 'N/A'.

Figure 4: negotiation tool for collaborative logistics



### 2.2.2.3 *The Sarmed solution delivered both operational savings and data management synergies*

Operational costs were reduced by over 8%, via improvements in load factor per vehicle of over 7%, a 5% reduction in distance driven for collections, and a 10% improvement in drop density per truck; these logistics enhancements were estimated to have reduced the CO<sub>2</sub> footprint by 10%.

The key objective of dramatically improving the speed of delivery status information was achieved, with the information passed 30% faster than previously.

### 2.2.3 Zanardo Milan

#### 2.2.3.1 *The problem*

Zanardo are a logistics provider focused on northern Italy and with a strong presence in medical supplies to hospitals. The key challenge identified in their operations, focused on hospitals in urban areas, was lack of real-time shared information about delivery status and available truck capacity, resulting in poor utilization of the fleet, and inefficient loading and unloading processes.

#### 2.2.3.2 *Zanardo solution*

The SELIS information sharing hub consolidated information from multiple systems to streamline management of truck capacity, warehouse working processes, delivery status reporting and transport routing. To achieve this, real time data was integrated on vehicle movements and warehouse processes to allow for dynamic routing and real time reporting.

Adaptors successfully integrated data from existing warehouse management systems, brought together into a real-time data consolidation and flow management tool. This functionality was the basis of both the reporting dashboard and the urban logistics demand and supply matching capability. The flow management tool allowed for improvements to be made in truck unloading and loading, through greater delivery window adherence and improved warehouse processes.

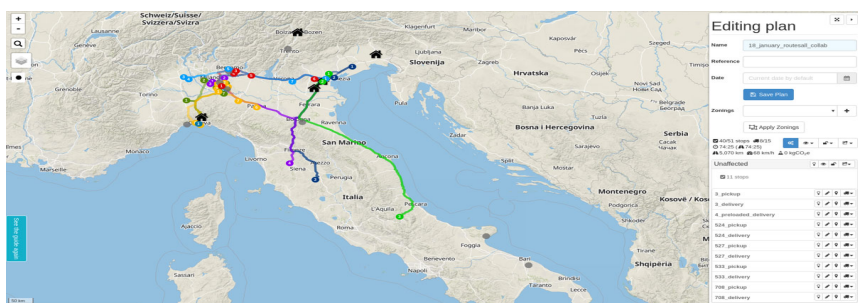


Figure 5: consolidation of urban drop routing

#### 2.2.3.3 *Business impact included significant savings in operational efficiency and carbon footprint*

The SELIS solution delivered the expected visibility of capacity utilization and demand management, and so helped in increasing the efficiency of logistics operations in transport and warehousing. The load factor of vehicles was improved by 15% along with a corresponding 15% reduction in CO<sub>2</sub> emissions. A similar improvement was made in warehouse operations, which through a 15%



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reduction in the time taken to unload and reload vehicles meant that a two-hour window was now the accepted operational standard for the business. The overall impact was an estimated annual saving of 2% of total operating costs.

## 3 Conclusions

### 3.1 Lessons learnt for future development and implementation

The three use case deployments required the delivery of data consolidation, visibility and global optimization solutions for shared transport. Within each case, the applications and solutions addressed slightly different problems. For Sumy, the focus was global optimization and better transport routing. For Sarmed the innovative solution focused on the need to negotiate transport terms and capacity with the Regional Agents in a more informed and standardised way. For Zanardo, the issue addressed was the need to deliver more efficient loading and unloading processes through enhanced visibility.

Better routing and tracking can reduce the undesirable impacts of urban logistics, although the specifics of individual sectors and customers such as those found in pharmaceuticals can act as a barrier to deployment of better solutions. Such trials indicate that users will adapt tools to allow them to take their customer base forwards at the pace at which the customer is comfortable. For urban logistics shared delivery concepts to operate effectively, legacy systems, infrastructure and commercial arrangements must be addressed, and cultural barriers to change therefore should not be underestimated. However, the trials demonstrated that the widespread applications of the functionalities tested could, if much more widely deployed, have a significant impact on efficiency, effectiveness and externalities such as CO<sub>2</sub> emissions.

### 3.2 Urban logistics is bound to increase, and further innovation will follow the building of shared resource platforms

The innovative tools for customer negotiation and demand management developed in this Living Lab, demonstrate the untapped potential for new forms of collaboration that can emerge within platforms such as SCN, once data is shared and standardized and a robust and trusted platform is used to plan and execute shared logistics solutions.

## 4 Further questions

If you wish to ask further questions of the teams involved in this project, please contact Stephen Rinsler ([steverinsler@eluepeg.com](mailto:steverinsler@eluepeg.com)), or Beatriz Royo ([broyo@zlc.edu.es](mailto:broyo@zlc.edu.es)).

The SELIS website is <https://www.selisproject.eu/>



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## 5 References

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- <sup>i</sup> World Bank (2018): Logistics Performance Index: Connecting to Compete 2018 <https://openknowledge.worldbank.org/bitstream/handle/10986/29971/LPI2018.pdf>
- <sup>ii</sup> European Commission (2015). Fact-finding studies in support of the development of an EU strategy for freight transport logistics. Lot 1: Analysis of the EU logistics sector, Brussels.
- <sup>iii</sup> European Commission (2007). An Action Plan for Freight Transport Logistics, MEMO/07/415 18/10/2007, Brussels.
- <sup>iv</sup> World Economic Forum (2009). Supply Chain Decarbonization. The role of logistics and transport in reducing supply chain carbon emission.
- <sup>v</sup> Lehoux, N., S. D'Amours, and A. Langevin (2010). A win-win collaboration approach for a two-echelon supply chain: A case study in the pulp and paper industry. *European Journal of Industrial Engineering*, DOI: 10.1504/EJIE.2010.035656
- <sup>vi</sup> Graham, L. (2011). Transport Collaboration in Europe. *ProLogis Research Insights*.
- <sup>vii</sup> Vanovermeire, C., and K. Sorensen (2014). Measuring and rewarding flexibility in collaborative distribution, including two-partner coalitions. *European Journal of Operational Research*, 239, pp.157–165.

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