Nantes | Hamburg | Helsinki

Ref. Ares(2019)7391546 - 01/12/2019

mySMARTLife

Deliverable due date: M36 – November 2019

D4.18 Lighthouse features integrated into public transport on-line system

WP4, Task 4.7 (Subtask 4.7.5)

Transition of EU cities towards a new concept of Smart Life and Economy

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731297.

Project Acronym	mySMARTLife		
Project Title	**Transition of EU cities towards a new concept of Smart Life and Economy**		
Project Duration	1st December 2016 – 30th November 2021 (60 Months)		
Deliverable	D4.18 Lighthouse features integrated into public transport on-line system		
Diss. Level	PU		
Status	Working		
	Verified by other WPs		
	Final version		
Due date	30.11.2019		
Work Package	WP4		
Lead beneficiary	FVH		
Contributing beneficiary(ies)			
Task description	**Task 4.7: Sustainable Mobility and Electrical Mobility - SMART MOBILITY [VTT] (FVH, HEL, HEN, HMU, SAL, CAR)** With the large up-take of electric buses, the road-based mobility system in Helsinki becomes electric. Both the uptake and the monitoring of the charging infrastructures for this fleet, as well as demonstrations with all-electric fleet, are taken. **Subtask 4.7.5: Intermodality strategies (transport cards …).** Definition and deployment of intermodality strategies in Helsinki by integrating mobility data in Lighthouse-features for the public transport online system as a link to the Urban Platform.		

Date	Version	Author	Comment
2/11/2019	0.1	Timo Ruohomäki (FVH)	First draft
16/11/2019	1.0	Timo Ruohomäki (FVH)	Ready for peer review
27/11/2019	1.1	Timo Ruohomäki (FVH)	Updates after peer review.

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Table of Content

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731297.

Table of Figures

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731297.

Table of Tables

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731297.

Abbreviations and Acronyms

Acronym	Description
mySMARTLife	Transition of EU cities towards a new concept of Smart Life and Economy
API	Application Programming Interface
AQ	Air Quality
ENFUSER	Environmental Information Fusion Service
HAQT	Helsinki metropolitan Air Quality Testbed
WFS	Web Feature Service: in upcoming version 3.0 to be renamed as OGC API for Features
WMS	Web Map Service

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1. Executive Summary

This deliverable covers the work related to the definition and deployment of intermodality strategies in Helsinki by integrating mobility data in Lighthouse-features for the public transport on-line system as a link to the Urban Platform. The main difference between this deliverable and the D4.10 is the focus on data sources instead of the services. The scope of work naturally contains various relationships and dependencies to other projects and city initiatives. This is partially because in the past, the real time situational awareness in Helsinki has not been at an advanced level. Only in a few cases information about transport have been provided in real time and the mySMARTLife project has provided the city an opportunity to better understand the need and use of new data sources in order to proceed with the smart mobility initiatives.

2. Introduction

2.1 Purpose and target group

The purpose of this document is to provide an overview of the actions related to building capacities on the Urban Platform to better support the transport on-line system. While this is an official deliverable intended for review, the document is created also for the public view, since the deliverables will eventually be published on the project website.

2.2 Contributions of partners

The following Table 1 depicts the main contributions from participant partners in the development of this deliverable. The contributions have been provided as part of the review process and comments and suggestions have been taken into account in the content of this deliverable.

Table 1: Contribution of partners

Participant short name	Contributions
FVH	Main author
HEL	Peer review
CAR	Final review

2.3 Relation to other activities in the project

The following Table 2 depicts the main relationship of this deliverable to other activities (or deliverables) developed within the mySMARTLife project and that should be considered along with this document for further understanding of its contents.

Table 2: Relation to other activities in the project

Deliverable Number	Contributions
D4.15	This deliverable is linked to the operations of autonomous bus in Kivikko (2018) and Kalasatama (2019)
D4.10	This deliverable and the efforts within have been created in parallel with D4.10 that defines the Lighthouse Features and their inclusion into the transport navigator
D4.11	The Urban Platform data originates to IoT service backend that is described in D4.11

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3. Background

3.1 Overview

The action 30, Integration of “all electric” and “fresh air router” in multi-modal public transport and pedestrian navigator was delivered parallel to mySMARTLife by the Synchronicity -project (Grant 732240). The development was followed closely and joint meetings were organized to be able to provide the input and requirements to the project.

In general, the mySMARTLife Urban Platform development work has focused on the backend development, making any data available through several APIs in their harmonized formats. The current journey planner service used by HSL, the Helsinki Regional Transport Authority dates back to 2001. While the HSL is not a member of mySMARTLife consortium, they have heavily invested on open source development, thus welcoming new service ideas for the platforms they maintain. The journey planner service is currently based on OpenTripPlanner -project that is active and the codebase has had 110 contributors so far.

The journey planner[1] is based on OpenStreetMap and OpenTripPlanner technologies. The platform is called Digitransit and it has been developed as a joint project between HSL and the Finnish Transport Agency. As part of the Interreg -project FinEst Smart Mobility, the platform has been taken to Estonia to be used in Tallinn public transport system.[2]

3.2 Geospatial Traffic Data

In 2018 the mySMARTLife project was invited to participate on the steering group of the new national Finnish Geospatial Platform Service[3] , operated by the National Land Survey of Finland. The project aimed to harmonise the built environment data models at the national level, using the same international and ISO/TC211 compliant standards as the 3D city model of Helsinki. Mobility -related side projects for the Geospatial Platform are Digiroad and Digitraffic, the national traffic system data services.

3.3 Helsinki metropolitan Air Quality Testbed

In mySMARTLife -project, the new sensor infrastructure built in Helsinki will mostly focus on environmental noise and air quality. The number of sensors will anyway be relatively small compared to the size of the city. In the case of air quality monitoring the area of observation is also very small and sensors with a distance of one meter can provide different results. The project focused on a limited demonstration of air quality and environment noise measuring, but the limited number of sensors became a limitation for wider

[1] https://www.reittiopas.fi
[2] http://www.finestlink.fi/en/2019/06/03/helsinki-solves-cross-border-traffic-challenges-with-smart-digital-services/

[3] http://www.paikkatietoalusta.fi/en

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area usage. In the case of clean air journey planning, reliable air quality information was required covering the whole city.

The air quality monitoring is also made in co-operation with other projects such as HAQT – Helsinki Air Quality Testbed. In mySMARTLife, air quality sensors are also being co-created with the city residents under the Citizen Science -framework at Vekotinverstas living labs. It is expected that such sensors can provide additional information to the official air quality sensors when their data is managed appropriately.

It is expected that simulations could provide more useful data with larger coverage. The ENFUSER -model developed as part of the HAQT -project[4] can provide that. It combines the sensor readings with weather data and other sources. The model covers the whole city area with a 20x20 meter grid, providing level of details that is not feasible to reach with a traditional sensor network.

As part of the mySMARTLife -project, an additional task is to see how the simulated air quality data could be managed parallel to sensor data for services like journey planning. The main issue is the volume of data in simulations: while there will be 40-50 high-quality AQ sensors in the city, the total number of "virtual sensor datapoints" in ENFUSER -model can be in millions. There may be need for an aggregation service but that is to be seen in later stages of the project.

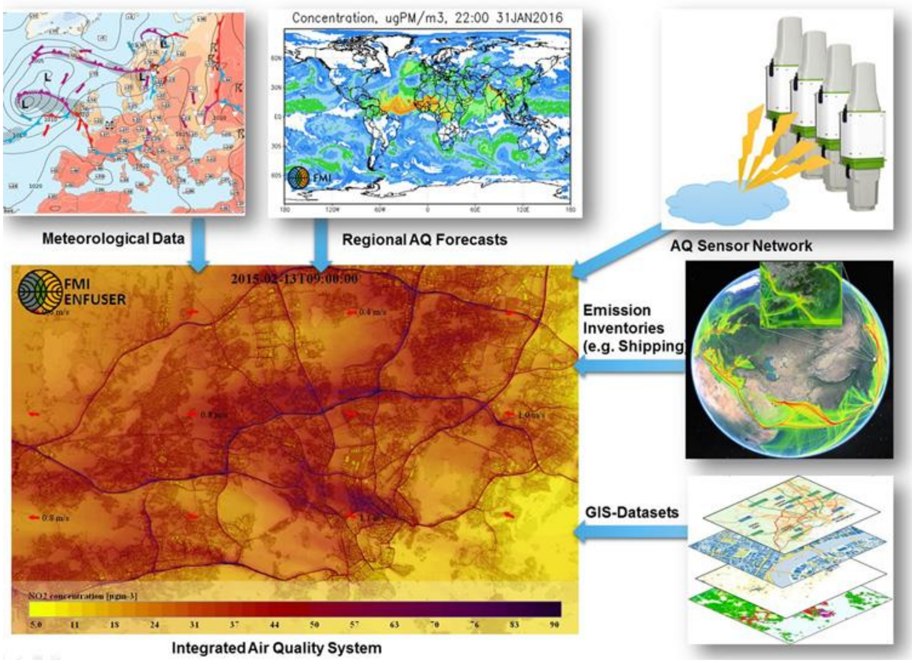

Figure 1: Core components of ENFUSER model

4 http://fmispace.fmi.fi/index.php?id=haqt

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3.4 Environmental Noise

As part of the mySMARTLife -project, ten permanent environmental noise sensors are to be deployed around the city. While the number is low, they are placed in locations that represent well a replicable target: a certain type of street, corner of roads or park. The noise sensors can also be used in later analysis, as an example to define traffic volume patterns to the analysis of traffic emissions. Later in other future projects there will be more comprehensive noise simulations and artificial intelligence models that can provide input on route planning algorithms in the same way as the ENFUSER -model does for air quality.

4. Current Status

4.1 Overview

The Synchronicity -project completed the proof-of-concept work together with a Finnish company Metatavu Oy. The service with additional routing options like clean air and electric only routes is currently available at https://sdt.metatavu.io/, but will likely be closed when the service can finally be embedded with the public journey planner service. This will naturally depend on the roadmap and development resources of HSL. From the mySMARTLife perspective, the task is seen as completed.

4.2 Services for Autonomous Buses

The autonomous last mile pilot reported in Deliverable D4.15 also has a link to the journey planning. The autonomous bus pilot operated in 2018-2019 was running a scheduled route and the route information was included in the HSL journey planner. The new bus stops used by the autonomous service were also included in the national traffic information system, Digiroad[5]. It is the primary source of traffic related information made available as open data in various spatial formats, including the WMS and WFS API interfaces. The bus stops are defined as Point of Interest in the model. Because of this, the stops are also visible on other services using the same data, including the Oskari service with its traffic layer enabled (see Figure 4).

This information was then used on bus stop displays (see Figure 2), that were able to guide people to use the autonomous, electric bus instead of normal routes. Naturally the very limited number of options for autonomous lines made the pilot very small, but as a proof of concept it was enough to show that this kind of trial operations can be included into region-wide public transport system with low effort, simply by entering the bus stop locations and routes into the system.

[5] Digiroad: https://vayla.fi/web/en/open-data/digiroad

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Figure 2: Autonomous Bus 94R in Bus Stop Display

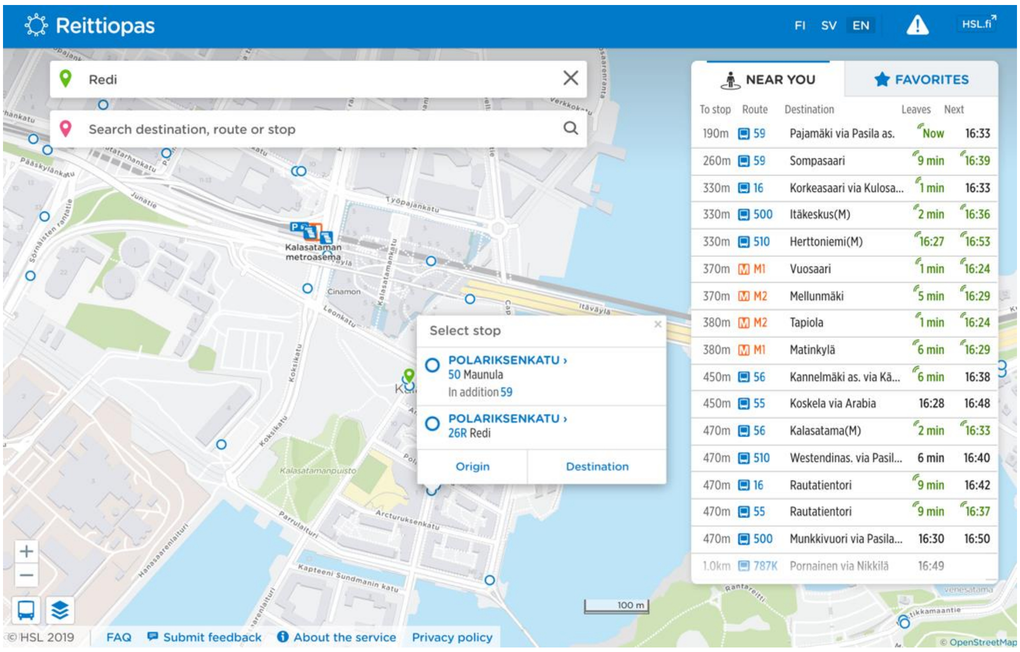

Figure 3: Bus Stops for Autonomous Bus 26R

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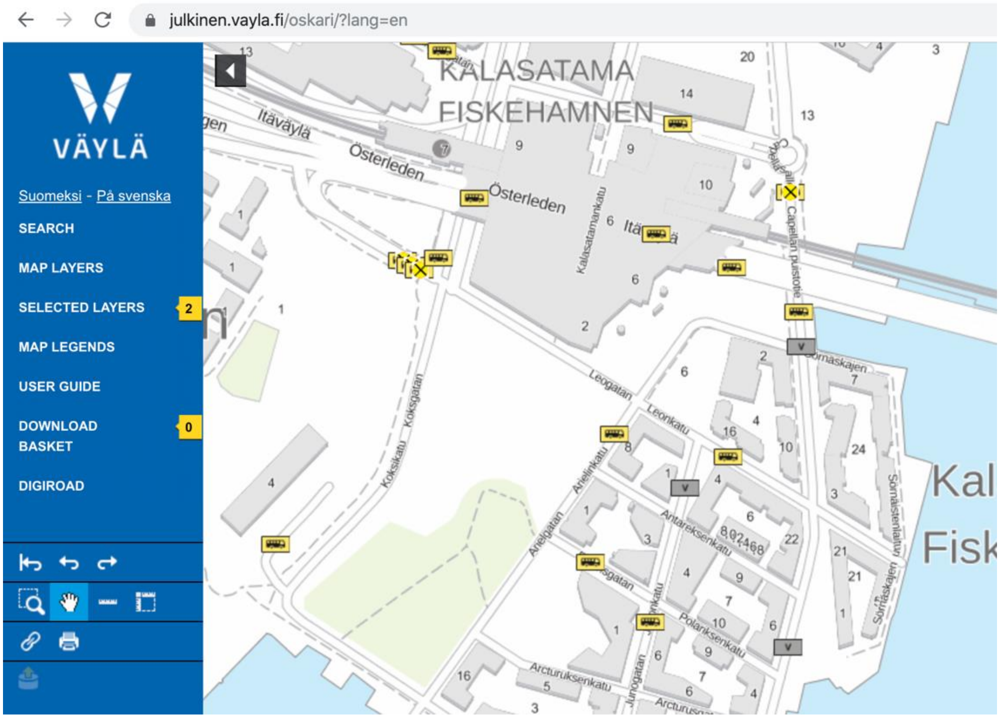

Figure 4: Bus Stops for Autonomous Bus in Alternative Service

5. Future Directions

5.1 Open Routing API

As part of their innovation program, Open Geospatial Consortium OGC organised in April 2019 a testbed where one of the hackathon challenges was a routing pilot. The approach there was to use the third geospatial API called Web Processing Service (WPS) to host the necessary logic and then using the existing geospatial information infrastructure as a basis for the service.

The approach introduced in the testbed is very promising when planning the next steps on urban platform development. With this approach different types of information such as sensor observations and traffic routes can be combined by the location without the need of actually integrating various information systems together. The following diagram illustrates the structure of geospatial services, fully in sync with the requirements set by the INSPIRE -directive:

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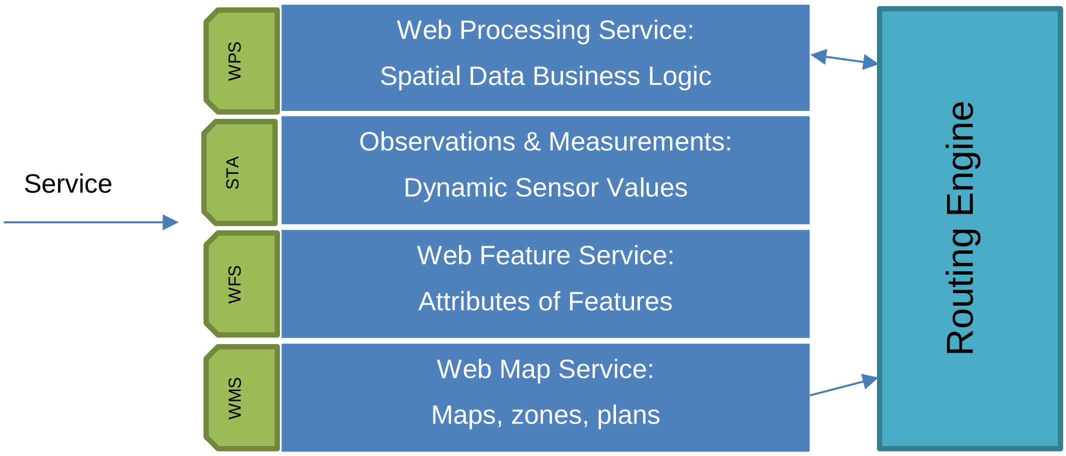

Figure 5: Geospatial Data Services for Routing

The benefit of this approach is also that it is more API driven than the current approach with OpenTripPlanner. It is expected that in the Smart City use cases, routing optimisation can benefit various thematic domains as an example when optimising parcel and resource logistics.

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6. Conclusions

While the role of mySMARTLife has been mostly supportive regarding journey planner actions thanks to the Synchronicity -project, it has been very useful to include the requirements as use cases when working on the Urban Platform concept. The existing journey planner service has been a success story and it is widely used, but it is also based on aging core technology that limits its usage on additional use cases. It has also become clear that the journey planner function has wider usage than just on the public transportation system. A generic journey planner could be used in last mile parcel logistics, on planning the routes of snowplough trucks or the most effective order of visits of the home care assistants on their daily work planning. While these use cases haven't been on the scope of mySMARTLife, it became evident that more flexibility and agility is needed on platforms like journey planner. The recent OGC Testbed pilot was very interesting from this point of view, providing a dynamic API -driven service that would utilize the very latest maps and points of interests thanks to compatibility with WMS maps made available as part of the INSPIRE -service.

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