

D2.4 - Software prototype for routing and scheduling of delivery orders



What is it about?

This document describes a software prototype created in the SuCoLo project.

The software prototype helps with planning the delivery routes. And it helps with scheduling delivery orders. The goal is to make cargo bike deliveries more efficient, reliable, and environmentally friendly.

The software prototype uses **Open-Source** tools and **Open Map Data**.

Open-Source means:

Information that anyone can use.

Information that is free.

You can look at it, share it and use it.

For example:

Maps.

Traffic data.

Numbers about people or places.

The information is:

Online

Easy to find.

Not secret.

You do not need to pay for it.

Using these **Open-Source** tools the software prototype can calculate and optimize delivery routes.



Main objectives

The development of the software prototype aims to improve planning the delivery routes and scheduling delivery orders.

For example, the software prototype helps to:

- Support bicycle couriers with routes that match their real needs (bike lanes, safe paths, avoiding sharp turns).
- Optimize delivery scheduling by grouping deliveries and pickups in a smart way.
- Reduce travel time, distance and emissions.



How does the system work?

The software prototype works with various technical systems:

OSRM (Open-Source Routing Machine):

This integrated system calculates fast routes using free OpenStreetMap data. It understands bike paths, road rules and surfaces.

VROOM (Vehicle Routing Optimization):

This integrated system solves more complex problems with many stops and vehicles. It considers windows of time, courier capacity and delivery priorities.

Frontend Web App:

This integrated app shows the routes on a map. Users can see how deliveries are distributed between couriers and what the optimized routes look like.

Technical Infrastructure:

The software prototype runs in a modular container system (Rancher). Security and access are managed with Keycloak and Let's Encrypt. Source code is stored on GitHub for collaboration.



Pilot use

The software is currently being tested in Leipzig (district Lützschena-Stahmeln) on a trial basis:

- Local courier data and GPS tracks are used to compare results with their existing software.
- Feedback helps to improve the system, especially to make routing more realistic for cargo bikes.

The software prototype was tested with different delivery scenarios, such as:

- One cargo bike delivering from a depot.
- Deliveries from a micro-hub in Leipzig.
- Pick-up and delivery combinations in the same district.
- Multiple cargo bikes with limited carrying capacity.



Why is it important?

The software is designed to improve logistical planning in the future. Specifically, the software can help with the following things:

- Encouraging sustainable logistics by making cargo bikes more competitive.

- Saving time, planning smarter and reducing stress.
- Supporting cities in cutting CO₂ emissions and traffic congestion.
- Provides a scalable solution that other European cities can adopt.



Conclusion

Our routing prototype shows that Open-Source software and Open Data can successfully be used for sustainable delivery planning.

It helps bicycle couriers by creating smarter, safer and more realistic routes.

The system reduces time, costs, and emissions, while making urban logistics more inclusive and efficient.

The software can be adapted to other cities with similar logistics challenges. And it shows that Open-Source software can replace expensive commercial routing systems.

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