AutonomSOWII

mFUND

Funded by:
Federal Ministry for Digital and Transport
on the basis of a decision by the German Bundestag

AutonomSOW II – Development of an information platform to increase the efficiency of transport processes on the Spree-Oder Waterway

Jörg Zimmermann (Alberding GmbH)

BMDV-Workshop No. 9: Data innovations for autonomous systems in the mobility sector

25 May 2022

Alberding GmbH

BEHALA Hauptstadt.Logistik

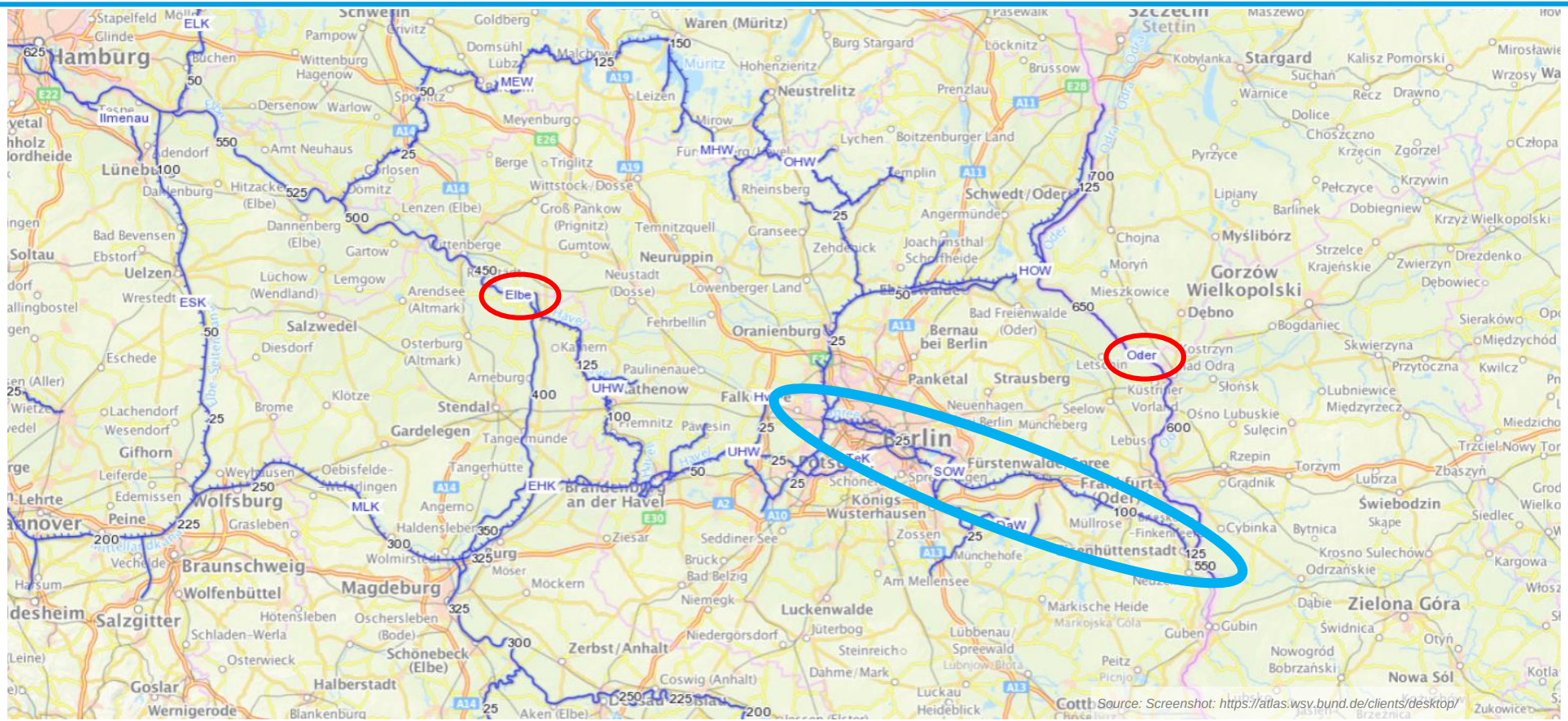
Der Bundesverband Öffentlicher Binnenhäfen e.V.

DLR

EBMS

LUTRA

Spree-Oder-Waterway



Motivation

- Continuous growth in transport of goods by road is increasingly leading to congestion and emissions
- Inland waterway transport is more economical and more environment friendly
- the transport process has to be projectable for integration into multimodal transport chains

Source: rbb / Fred Pilarski

Approaches to waterway transport:

- Provision of available information on the integration of the waterway into the transport process chain
- Potential savings through the automation of processes
- Emission reduction through the use of alternative drives

Source: https://www.hafenkw.de

Project partners

Alberding GmbH, Wildau

Software and System Development – Lead Partner

BÖB – Bundesverband Öffentlicher Binnenhäfen e. V., Berlin

Federal Association of Public Inland Ports

BEHALA – Berliner Hafen- und Lagerhausgesellschaft mbH

Port Operator at Berlin

LUTRA GmbH – Hafen Königs Wusterhausen

Port Operator at Brandenburg

DLR – Institut für Kommunikation und Navigation, Neustrelitz

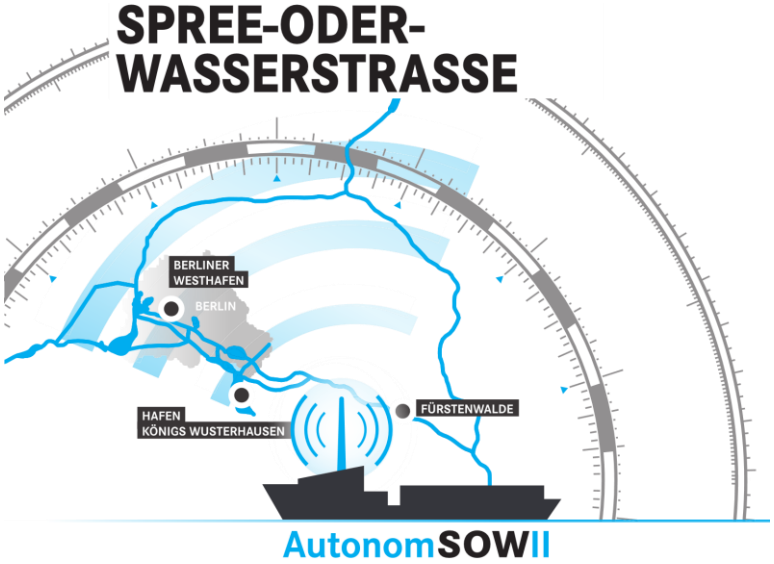
Research Institute for Navigation and Communication, Multi sensor systems

Technische Universität Berlin

Department for Design and Operation of Maritime Systems

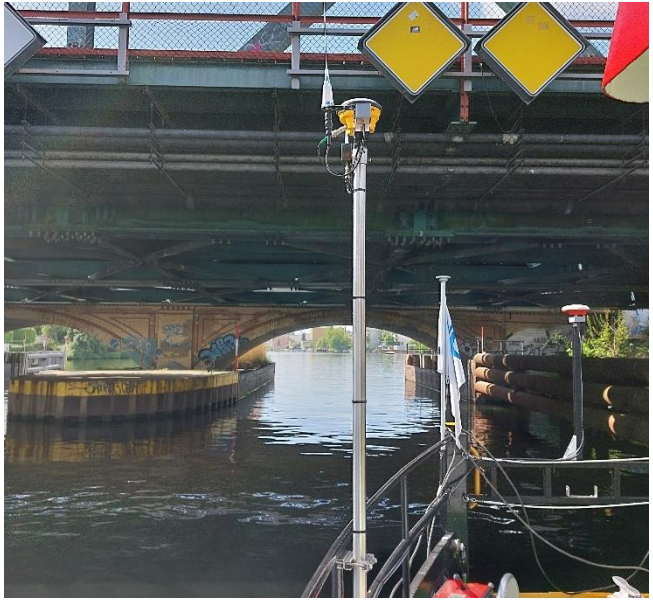
Project details

- AutonomSOW I – preparation for AutonomSOW II
  - Feasibility study (mFUND funding line 1 project)
- Funded by the “Modernitätsfonds directive” (mFUND) of the BMDV
- Project start: 01-11-2020
- Life-span: 36 months (until 31-10-2023)
- Project budget ~ 2 Mio. €
- Project funding ~1.5 Mio. €



Challenges of waterway transport

- Competition with other traffic carriers
- Connection with other modes of transport
  - is necessary for handling the transport on the "last mile"
- The transport capacity is subject to change
  - Fairway or Structures
- Temporary restrictions, General traffic situation and waiting times at locks
  - Alternative routes rarely available

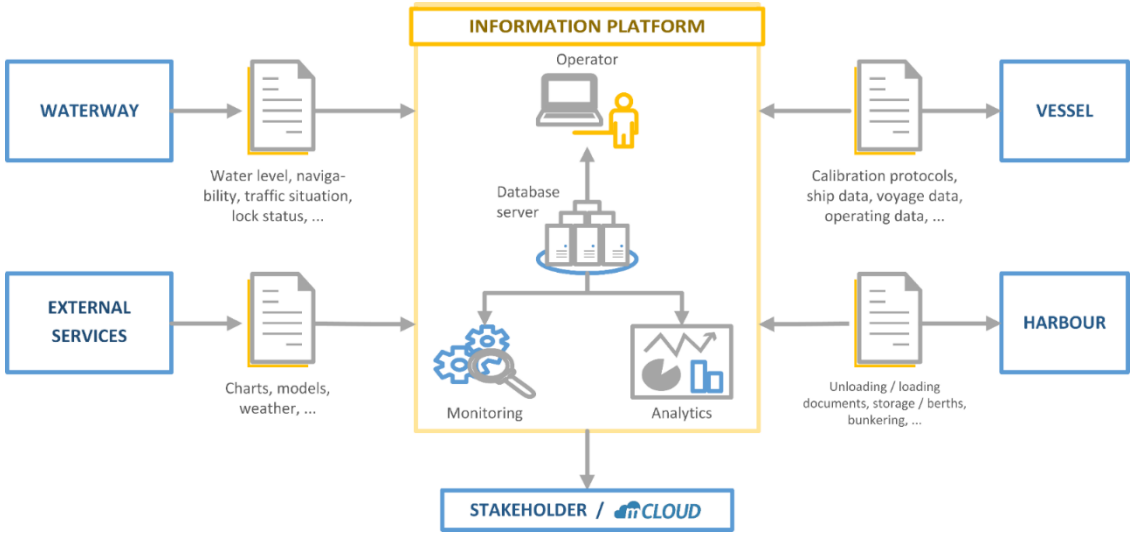


Source: Alberding GmbH / Maik Uhlemann

Project goals

Information platform (One Common Database)

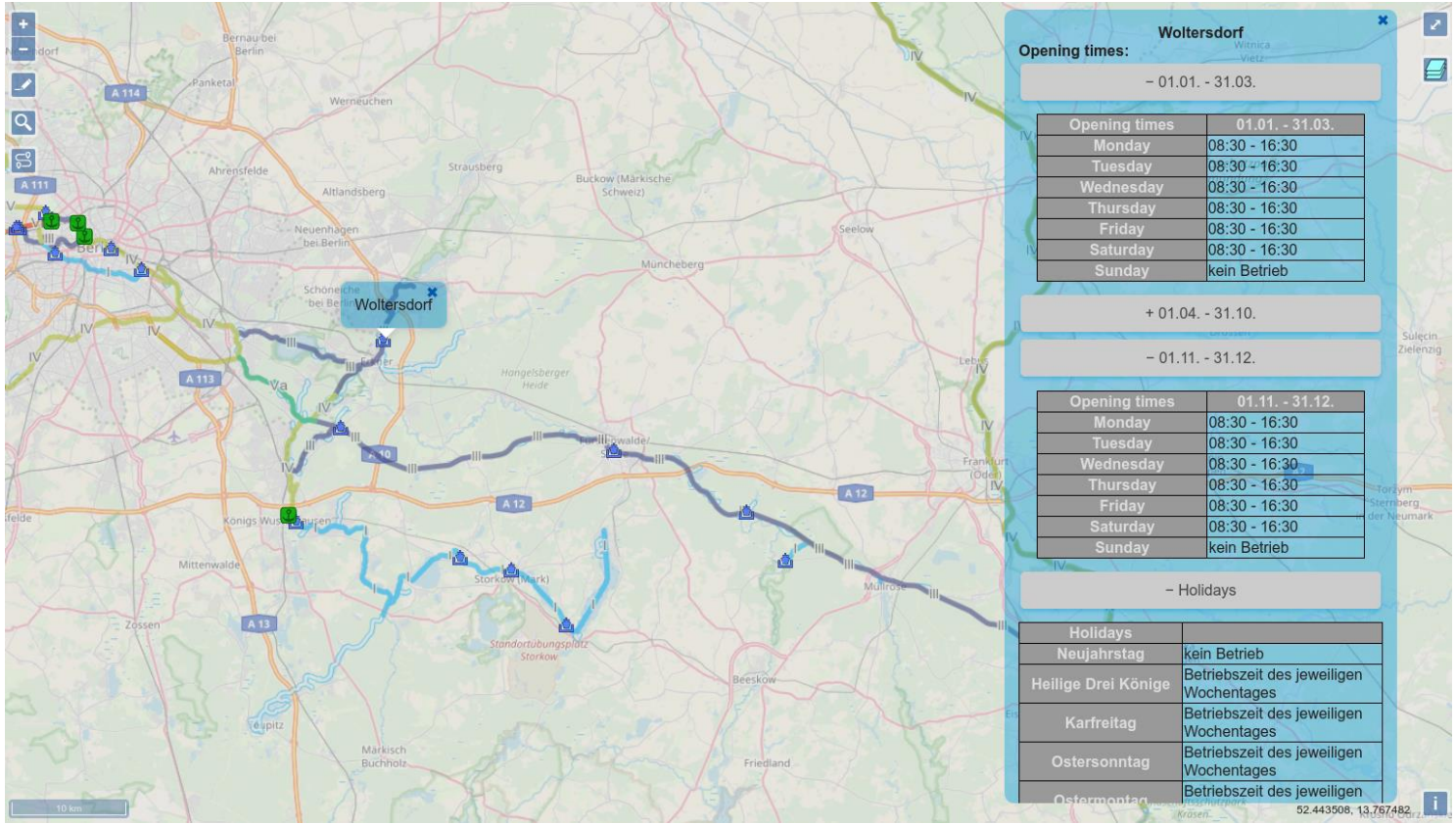
- Waterway data
- Transport process data
- Traffic information
- with Interfaces to:
  - *the stakeholders*
  - *existing information systems*
  - *other data sources*
  - *real-time data*



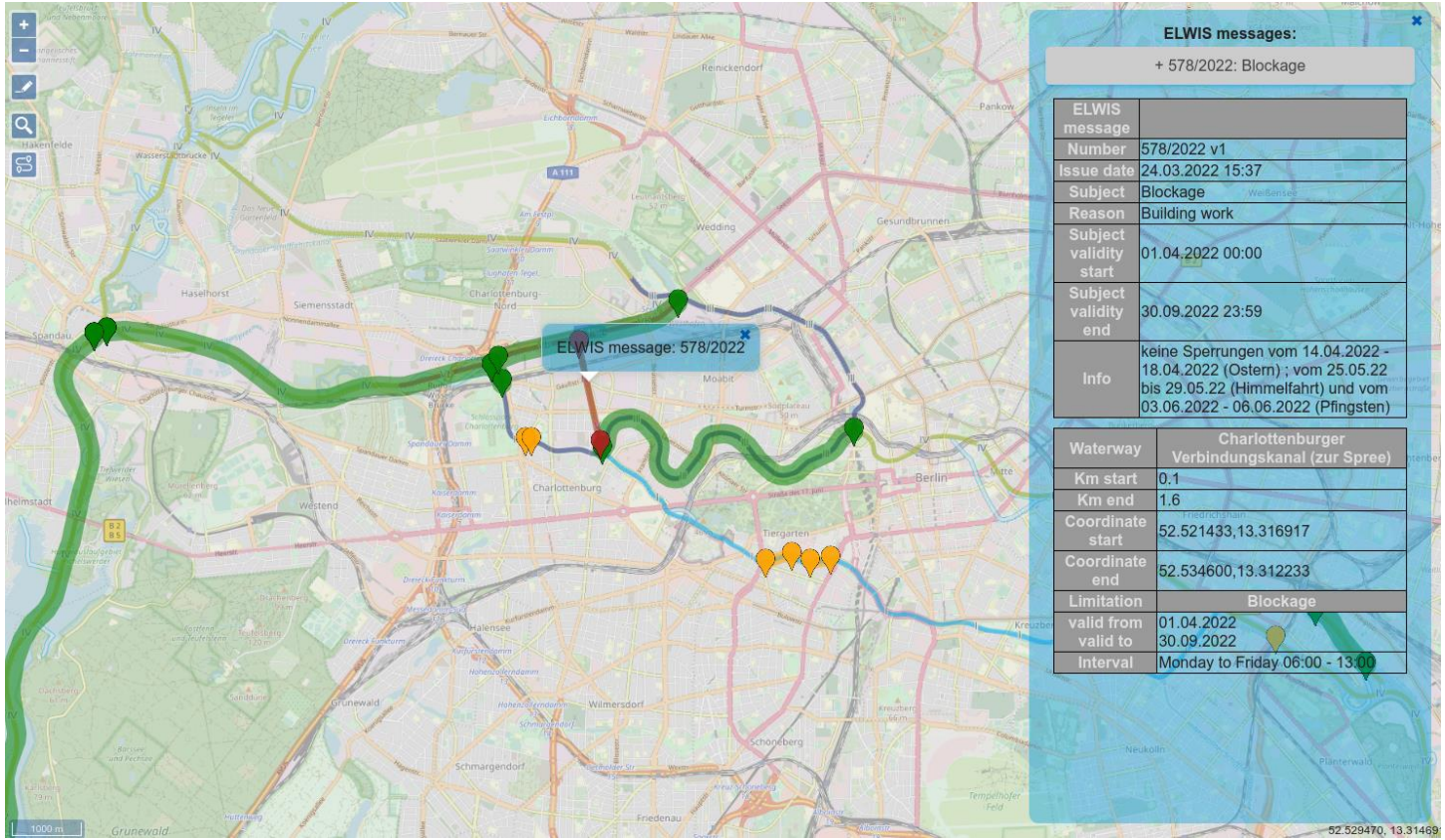
Novel systems for real-time data

- Waterway data (profiles, gauges, fairway)
- Machine data (with regard to alternative drives)

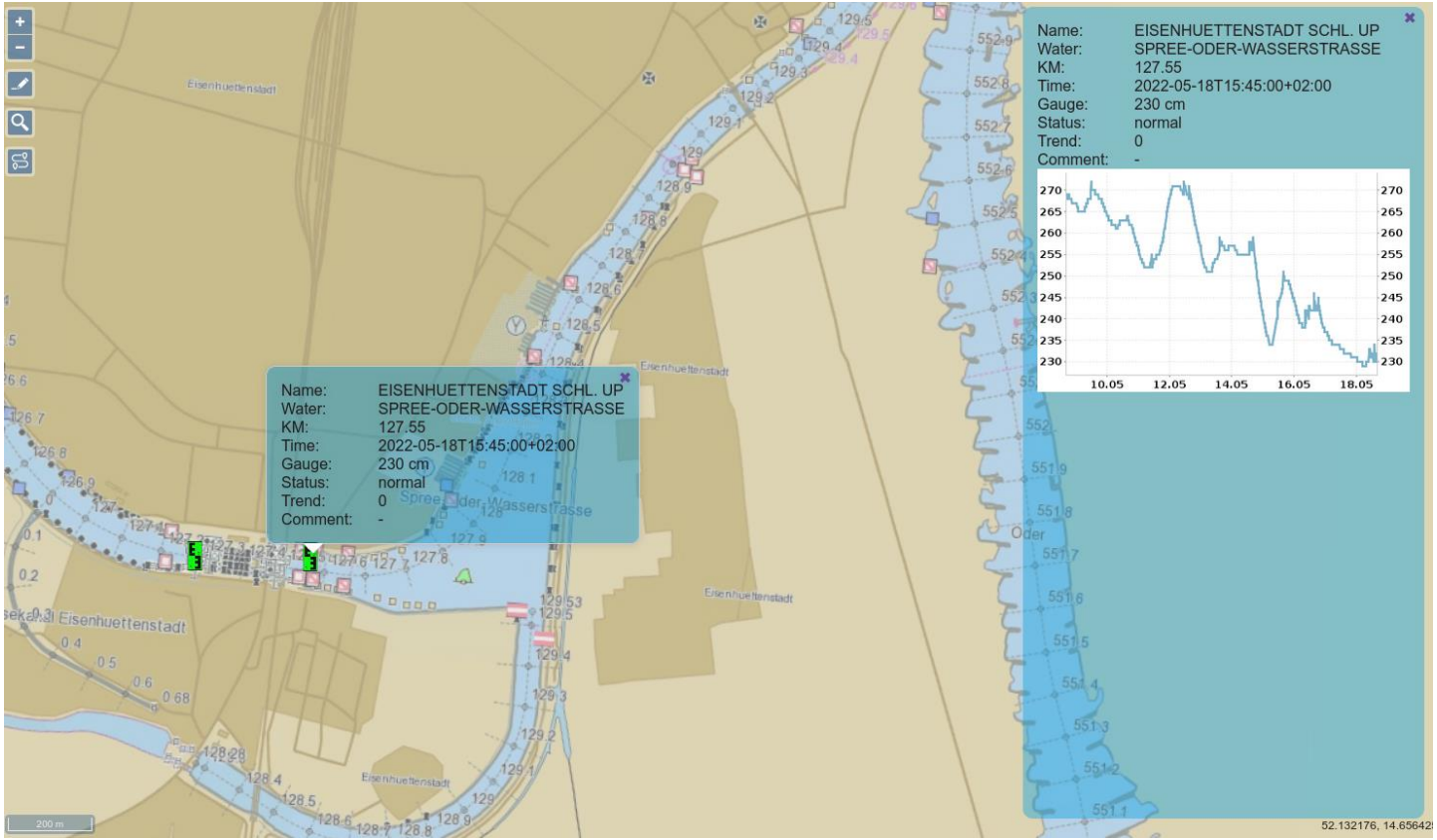
Waterway data



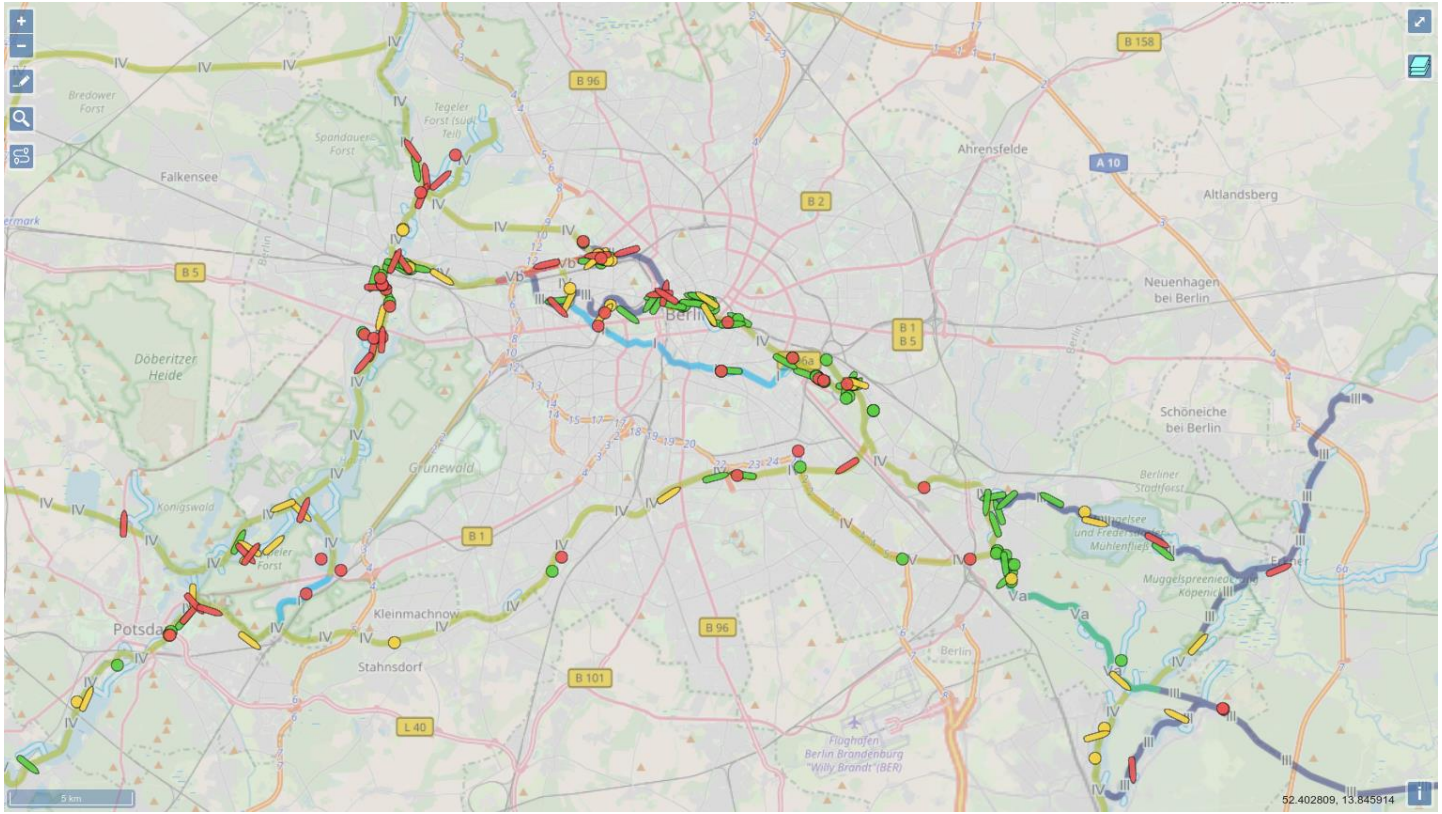
Notice for skippers - ELWIS



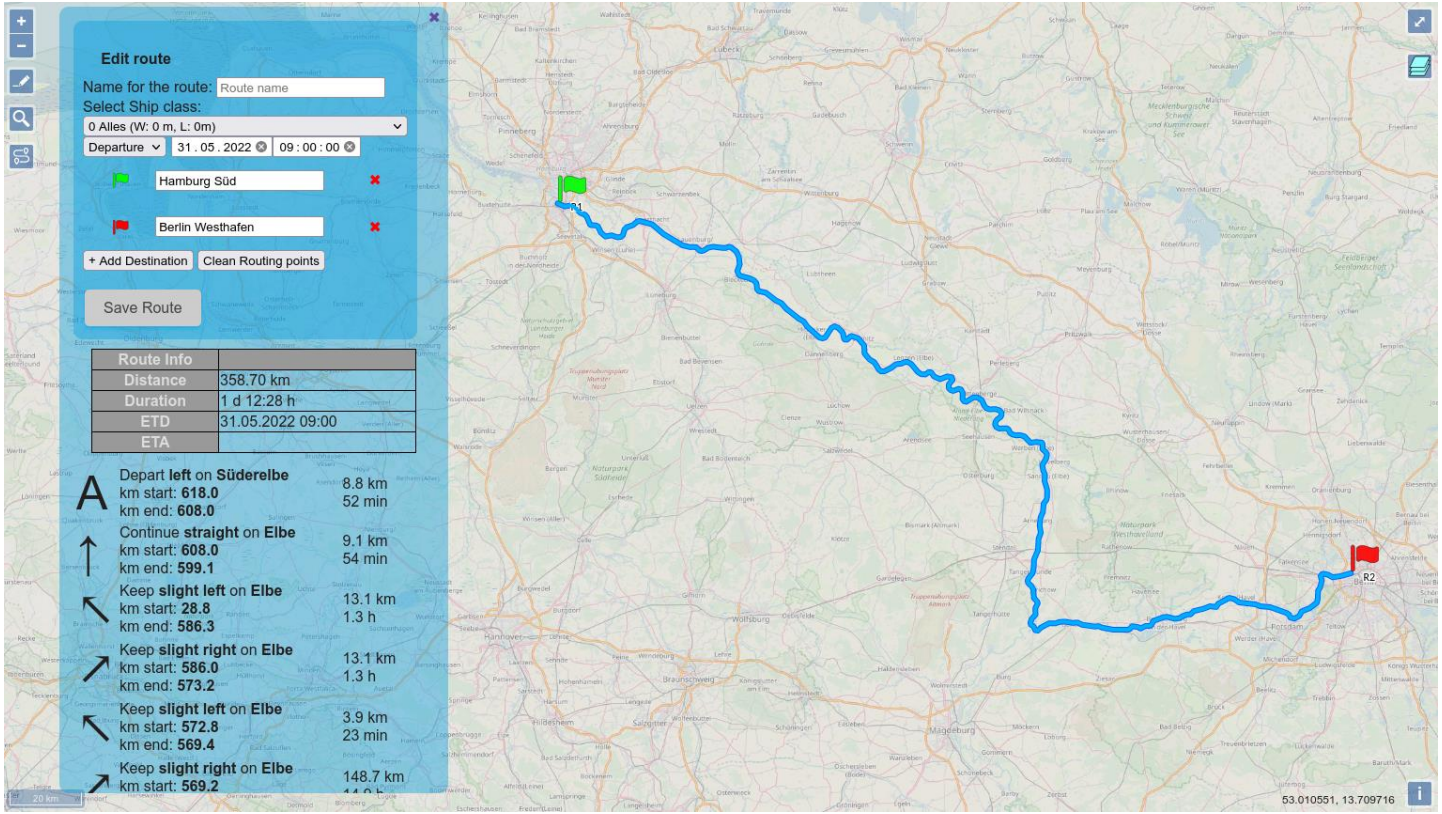
Real time data – gauge



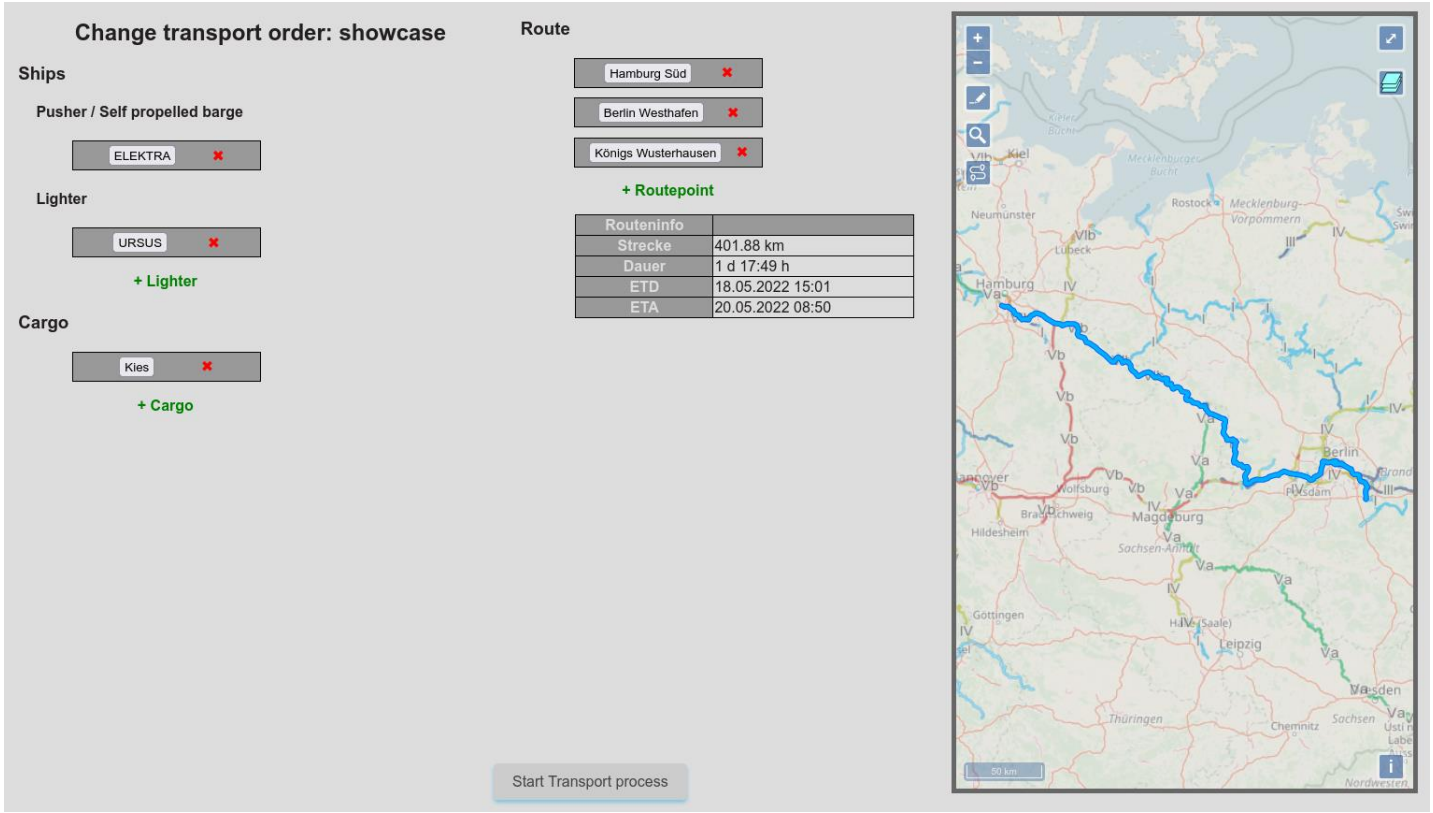
Real time data – AIS



Routing


Edit route
Name for the route:
Route name
Select Ship class:
0 Alles (W: 0 m, L: 0m)
Departure
31 . 05 . 2022
09 : 00 : 00
Hamburg Süd
Berlin Westhafen
+ Add Destination
Clean Routing points
Save Route
Route Info
Distance 358.70 km
Duration 1 d 12:28 h
ETD 31.05.2022 09:00
ETA
Depart left on Süderelbe
km start: 618.0
km end: 608.0
8.8 km
52 min
Continue straight on Elbe
km start: 608.0
km end: 599.1
9.1 km
54 min
Keep slight left on Elbe
km start: 28.8
km end: 586.3
13.1 km
1.3 h
Keep slight right on Elbe
km start: 586.0
km end: 573.2
13.1 km
1.3 h
Keep slight left on Elbe
km start: 572.8
km end: 569.4
3.9 km
23 min
Keep slight right on Elbe
km start: 569.2
148.7 km
R1
R2
53.010551, 13.709716

Transport process data

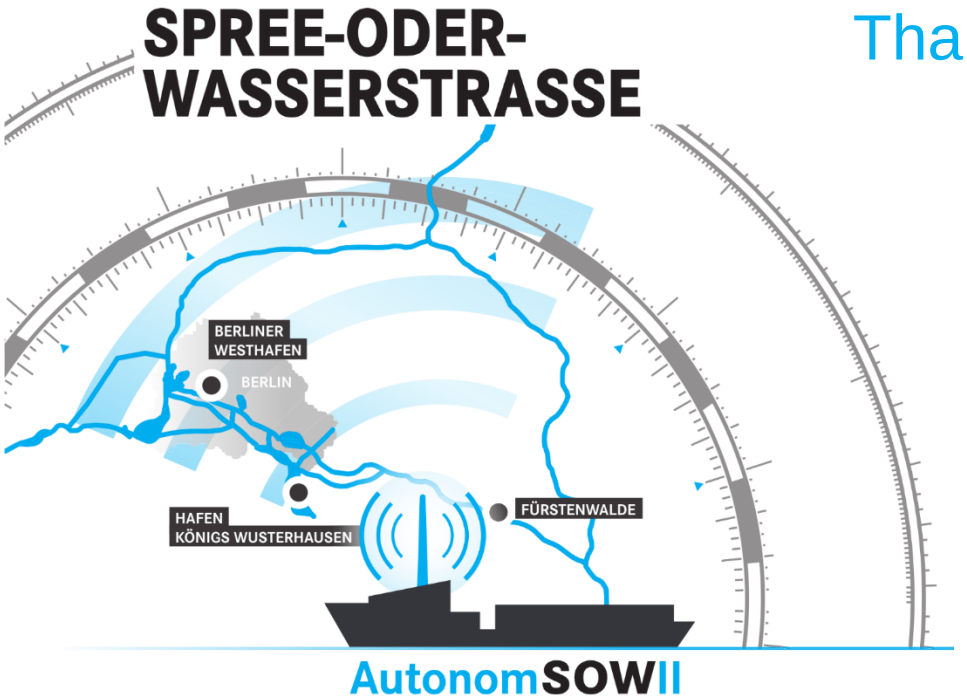


Further works

Development and implementation of

- Possible transport slots
- Reliable arrival times
- Loadable capacities
- Recommended speed to optimize energy consumption
- Current and predicted traffic situation
- Pro-active and automated forwarding of information

Source: GDWS



Thank you for your attention!

Contact:
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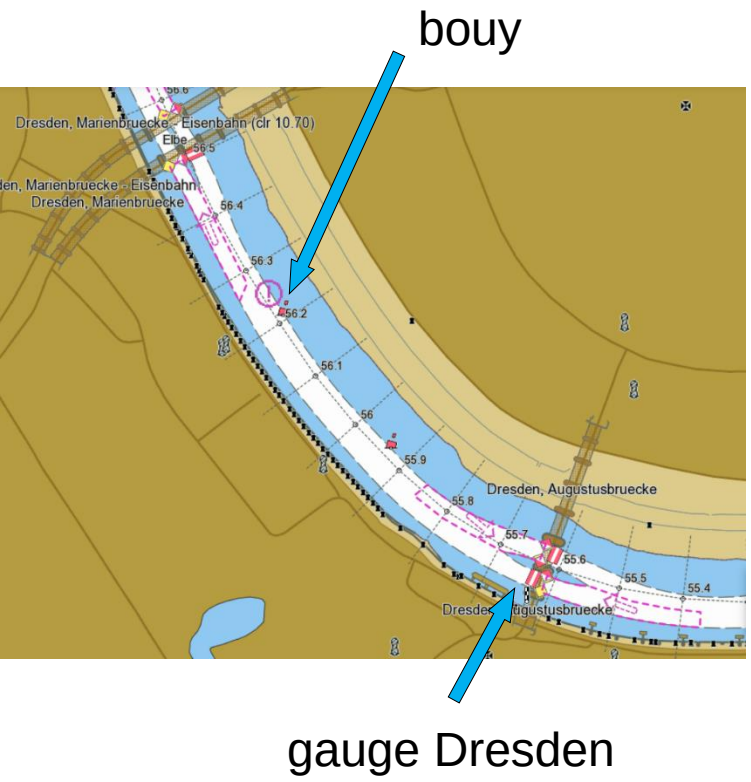
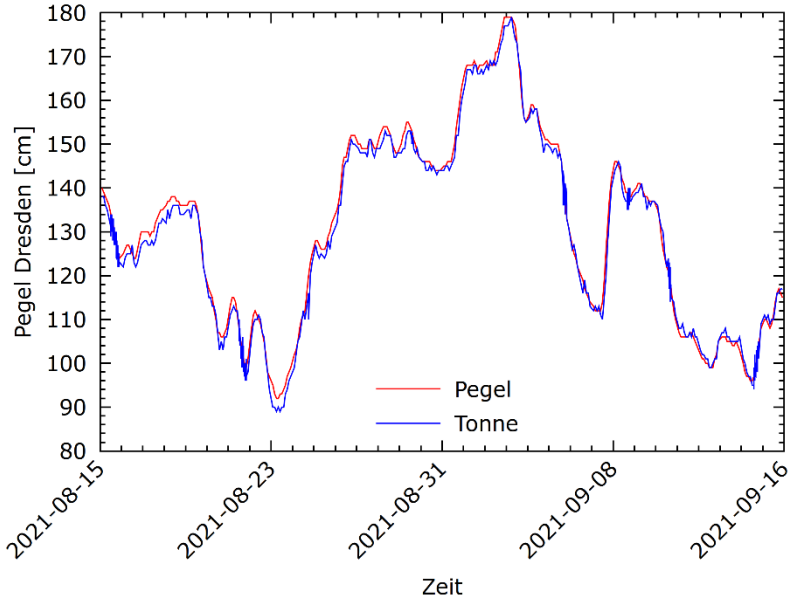
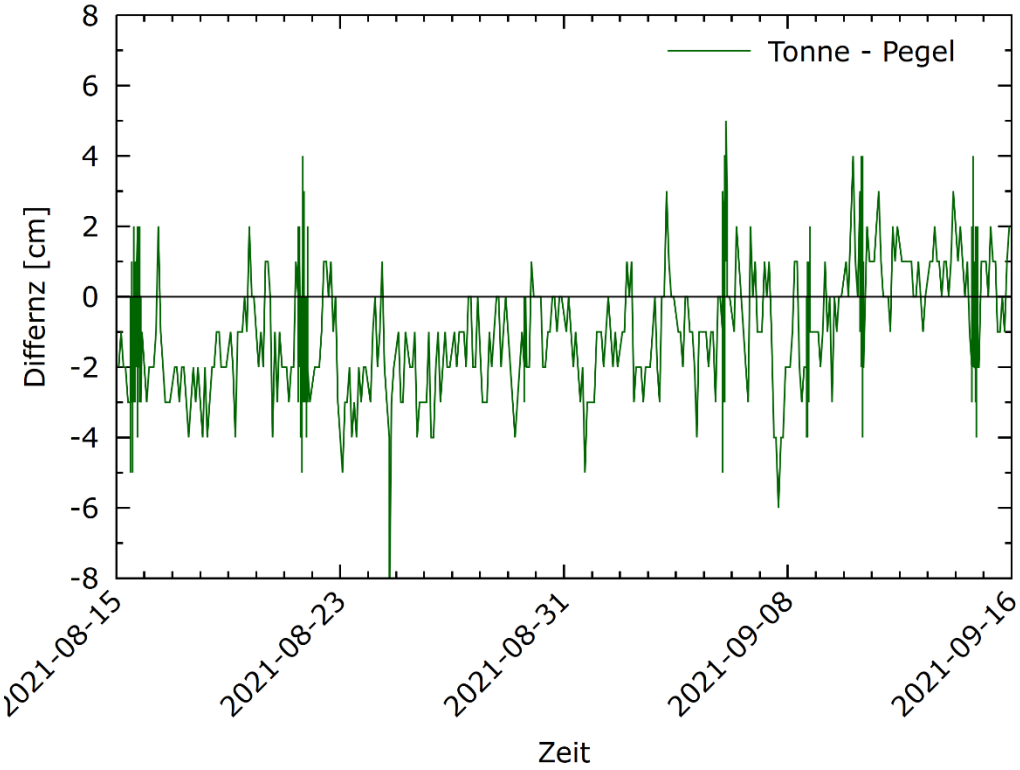
Test bouy at Dresden



Comparison: test bouy – gauge Dresden

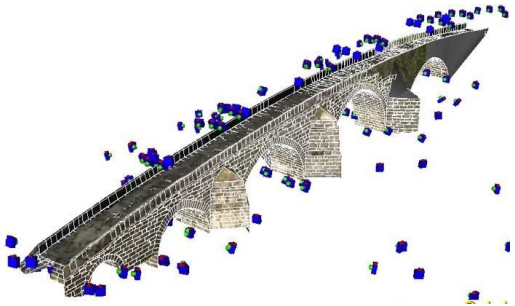




Using Vessels as Mapping Tools (DLR)

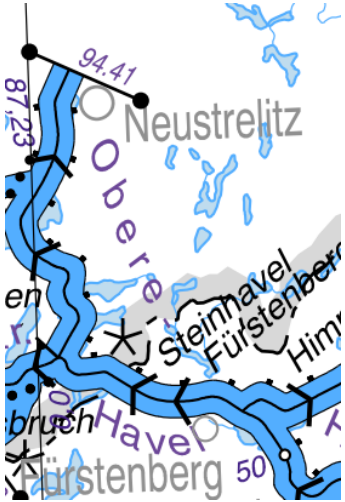
Vessel as a sensor suite

- GNSS for absolute positioning
- LiDAR for high accuracy points
- Camera to “aid” LiDAR



Broadcasting spatial mapping information

- Use LiDAR points to create a map
- How to efficiently create 3D structures



Self-updating inland waterway chart

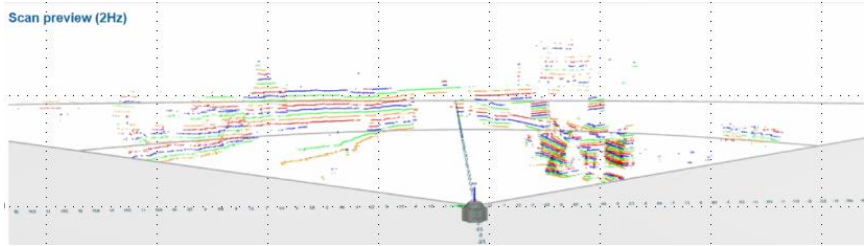
Workflow and Status (DLR)

List of objective:

- Processing LiDAR point clouds:
  - Identify which points are bridges / locks / river banks (semantic segmentation)
  - Use camera to help with semantic segmentation
- Use high precision GNSS for relative-to-global translation (attitude + positioning)
- Create a 3D format from the identified infrastructure

Status overview:

- First data collections and processing



- Results on camera-based segmentation

Machine and Traffic Data Collection (TU Berlin)

- ship specific sensor system was designed and implemented
- sample data collection was carried out
- sensor fusion algorithm was implemented
- traffic data evaluation started
- SLAM-algorithms are being investigated

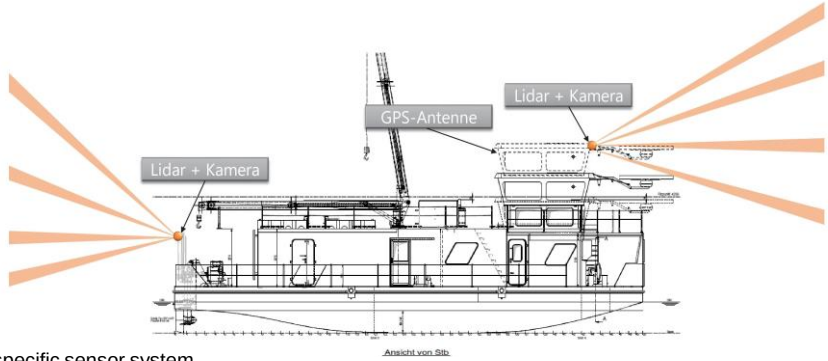


Fig 1.: ship specific sensor system

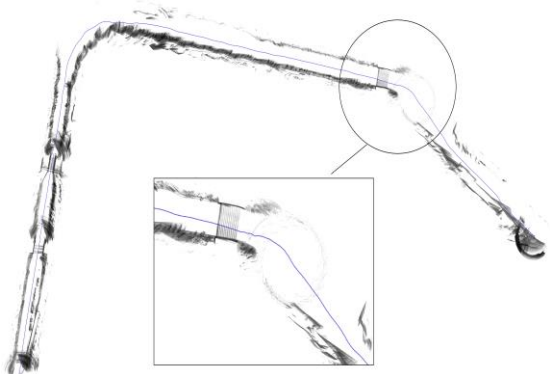


Fig 4.: SLAM generated 2D-map using lidar data and GNSS Track

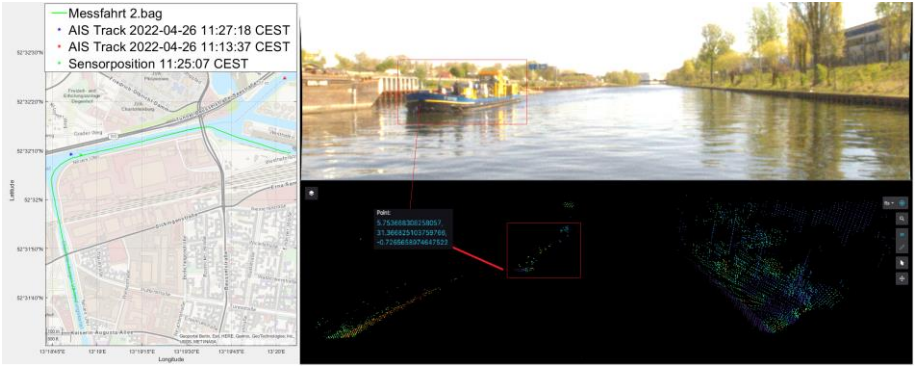


Fig 2.: lidar recognition of traffic (ship)