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Alberding GmbH

DigitalSOW - Digital Test Bed for Automated and Autonomous Inland Navigation on the Spree-Oder-Waterway (SOW)

Jürgen Alberding

Slot: 12.10.2031 11:30 a.m.

Initial situation in Berlin as a metropolitan region

Tense traffic situation on the roads:

- Residents, commuters, tourists, ...
- Growing delivery traffic due to booming online retail with predicted growth

Restrictions on road trafficability due to:

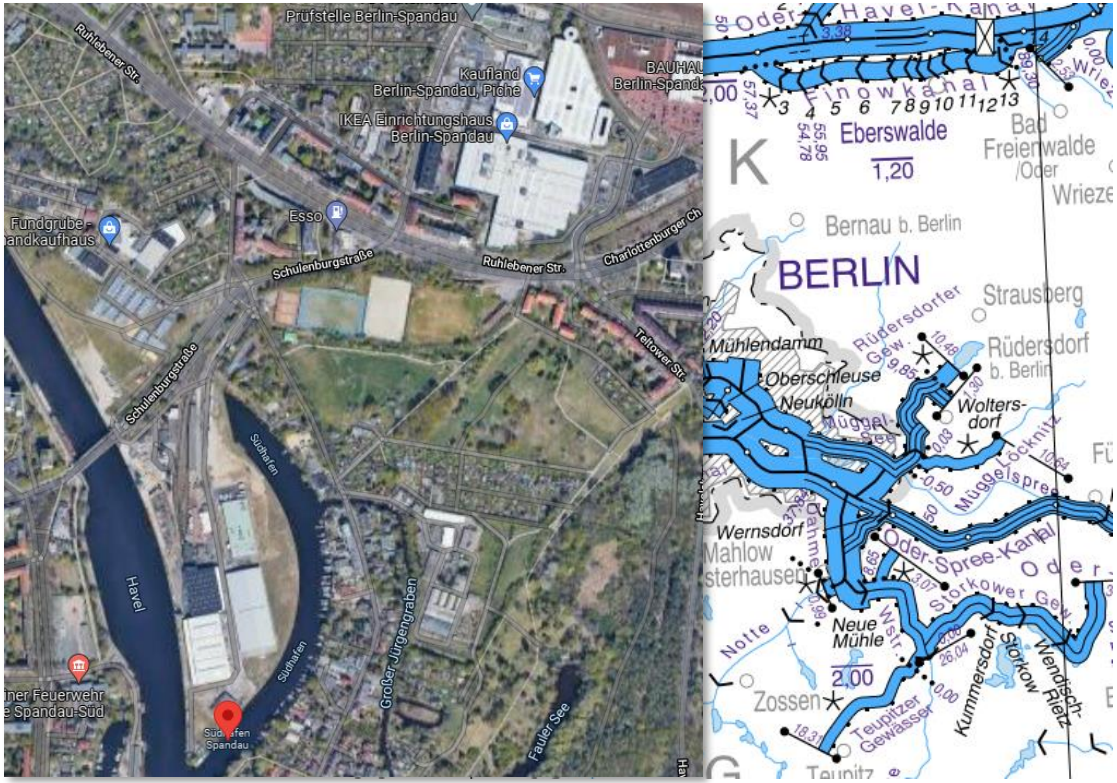
- Construction sites and other closures (demos, etc.)
- New cycle lanes

=> Increasing congestion and emission loads

EU Green Deal:

- The transport sector should reduce its CO2 emissions by 90 percent until 2050.
- The shift of traffic to alternative, environmentally friendly modes of transport will contribute significantly to this.
- The shares of alternative modes of transport in the modal split are to increase to 35 percent by 2030 and to 50 percent by 2050 compared to the reference year 2005.

Potentials of the Berlin-Brandenburg Metropolitan Region



Existing infrastructure:

- Dense waterway network with low capacity utilisation
- Water-related transhipment facilities in direct proximity to industry and commerce, example: southern port
- Excellent connections to around 20 logistics locations

Challenges:

- Integration of the waterway into multimodal transport processes
- Increasing economic efficiency through automation solutions
- Development of a transhipment and loading infrastructure for alternative drives

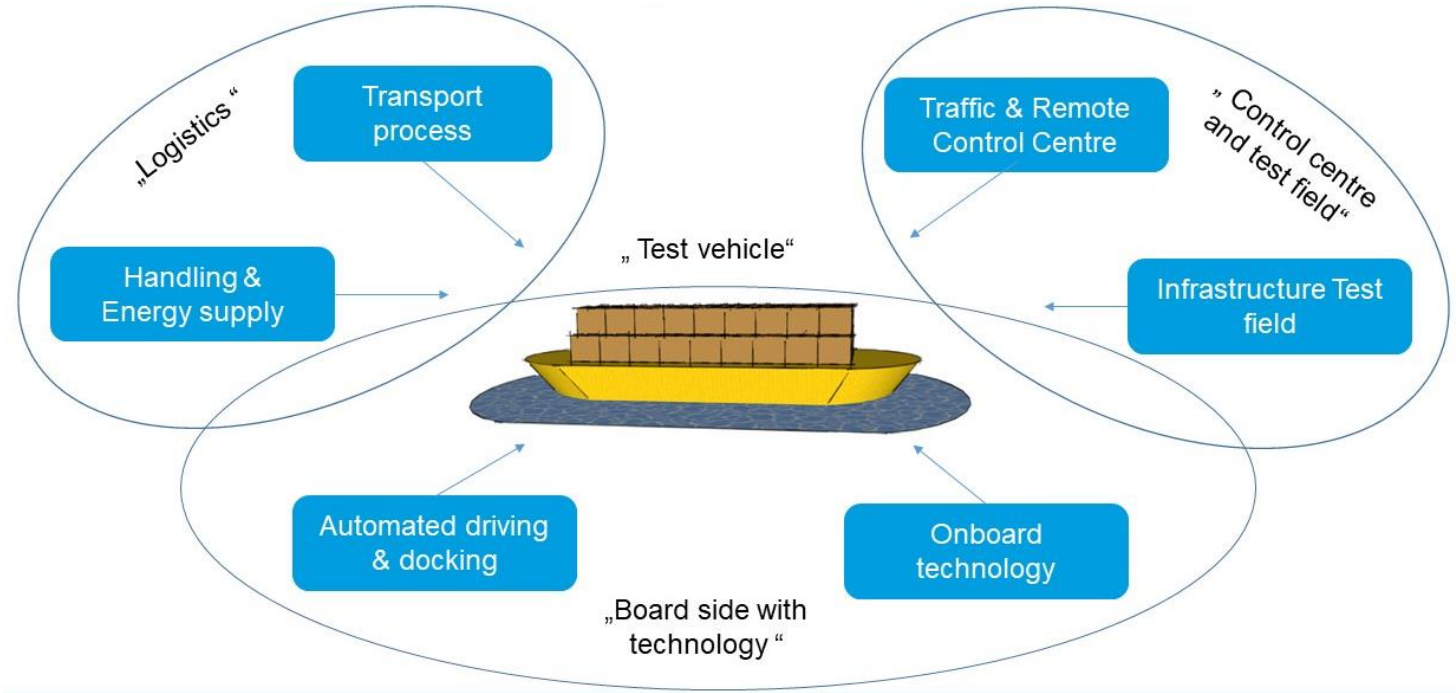
DigitalSOW – Overview

- Six partners from business and research with many years of experience and different competences in the field of waterways:

  - ➔ Alberding GmbH: Shore-based services, data transmission, monitoring, precise GNSS-based telemetry & positioning systems (cm-dm) - consortium leader
  - ➔ German Aerospace Center, Institute of Communication and Navigation: precise ship attitude determination, communication, backup positioning
  - ➔ Schiffsbau-Versuchsanstalt Potsdam: Design of hulls, test and experimental facility for waterway transport carriers
  - ➔ Department of Design and Operation of Maritime Systems at the TU Berlin: Alternative propulsion systems, power supply, driving dynamics, on-board sensor technology
  - ➔ University of Rostock, Institute for Automation Technology: Control and regulation of mobile systems, automated driving and mooring
  - ➔ Association for European Inland Navigation: framework conditions for waterway transport, transhipment and transport concepts

- Project period: 2021 – 2023
- Funding amount: 4.227 m €

DigitalSOW – Structured into three thematic complexes



City logistics transport process

- Development of a valid transport process model
  - Based on application-oriented best practices from city logistics
  - With reference to state of the art technologies in the field of inland navigation
- Analysis of user requirements
- Process redesign in connection with the Spree-Oder waterway and the CCNR automation grade
  - Identification of specific sections of the waterway for the establishment of the test field
  - Iterative validation, evaluation and further development of the developed model in order to ensure practicability

Control centre and testfield infrastructure

Landside infrastructure	• Continuous and large-scale: AIS/VDES • Punctual: cameras, LIDAR, RADAR, ... • Reliable communication and data security
Traffic Centre	• Monitoring and regulation of traffic flow • Decision-making basis for the evaluation of traffic volume • Addressed transmission methods (5G, VDES)
Remote control centre	• Remote control of test vehicle • Adequate user interface • Authenticated and encrypted communication
Technology and services for connected driving	• Access to testfield infrastructure and services • Provision of verified GNSS correction data (SSR via SAPOS BB) • Mobile telemetry and positioning systems
Technical support	• Operator concept • Official permits • Digital waterway maps with depth and structure information

Test vehicle with electric drive

Test vehicle:

- Adapted to the waterway infrastructure and the task at hand (approx. 6m wide, 18m long)
- Adaptable to existing carrier platforms (e.g. pusher vessel Elektra)
- Interface for (remote) control (University of Rostock)

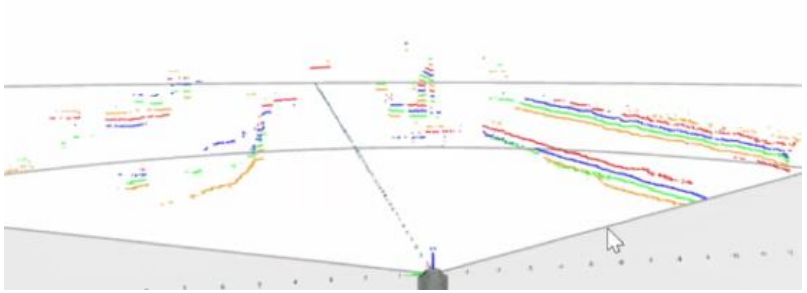
Electric drive:

- Low resistance fuselage
- Efficient propulsion
- Lithium-ion energy storage
- Interface charging infrastructure

Onboard sensors and AIS/VDES communication

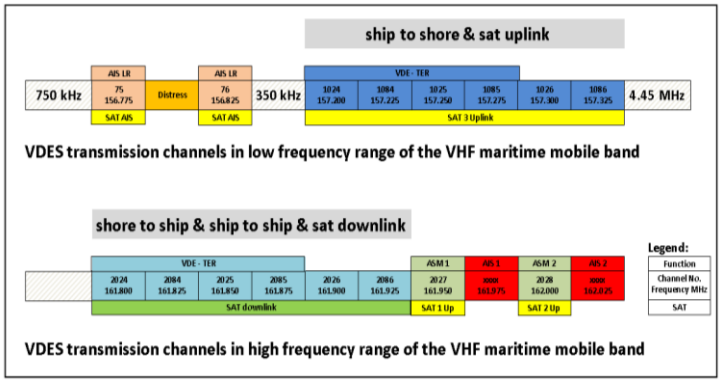
Onboard sensors :

- Environment detection and relative positioning: RaDAR, LiDAR, cameras
- Positioning and heading: GNSS heading sensor, INS coupling
- Communication: AIS, VDES, 4G/5G, WiFi



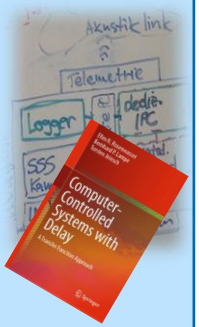
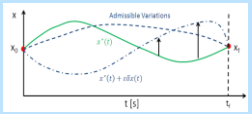
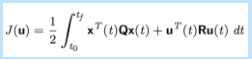
AIS/VDES communication:

- Further development of AIS standards
- Addressable message transmission
- Higher data rate (e.g. for SAPOS GNSS correction data)
- Backup positioning via R-mode



Automated driving / docking

Control modelling and parameterisation of the movement behaviour of variable shearer configurations and their highly automated operation

Methods	Simulation	Method test	Experimental investigation	Functional model in the test field
	  	 	 	

MS1 2022

MS2 2023

2021

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