SMALL MASS ASSISTING MANNED MERCHANT VESSELS: THE ANTI-GROUNDING USE CASE

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Why anti-grounding?

Between 2011 and 2015, more than 1,426 grounding accidents in European waters [1]

Image source @Maritime New Zealand

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Why anti-grounding?

51 groundings in the river Elbe [1],

Image source @ Shippin Herald

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Why anti-grounding?

51 groundings in the river Elbe [1],

40% thereof in port of Hamburg [2]

Image source @Hafen Hamburg

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Agenda

1. Why anti-grounding and how to prevent it
2. The anti-grounding use case
3. Virtual Full Scale Simulation

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How to prevent it?

Problems

- Shallow riverbeds and tidal bore restrict passage
- Sea Charts only display normed water depth
- Recurring sedimentation requires frequent bottom mapping

Current approach

- Weekly, for important areas daily depth measurements
- Requires fleet of ships

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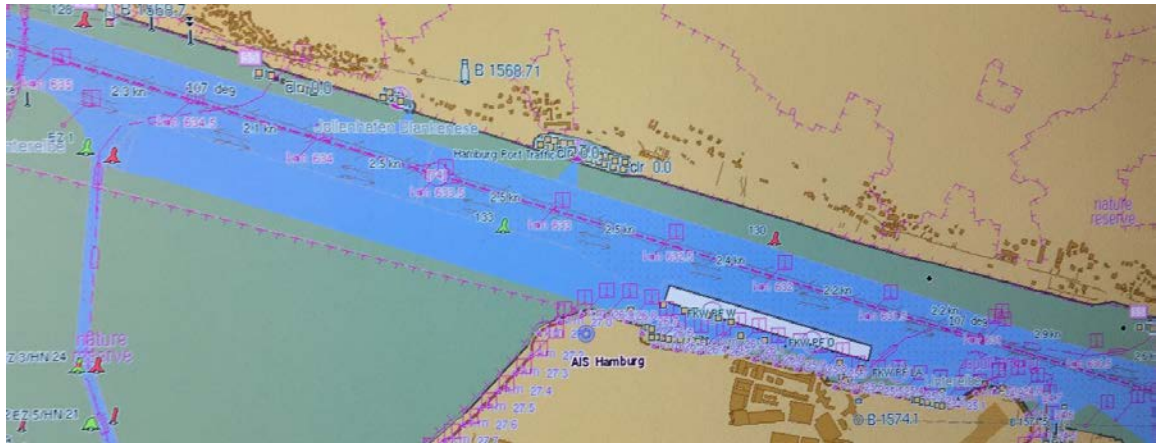
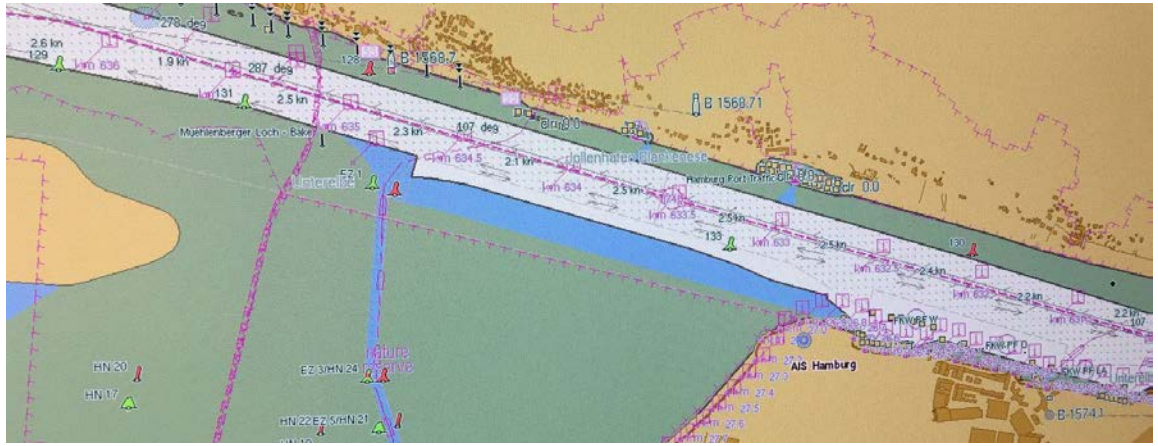
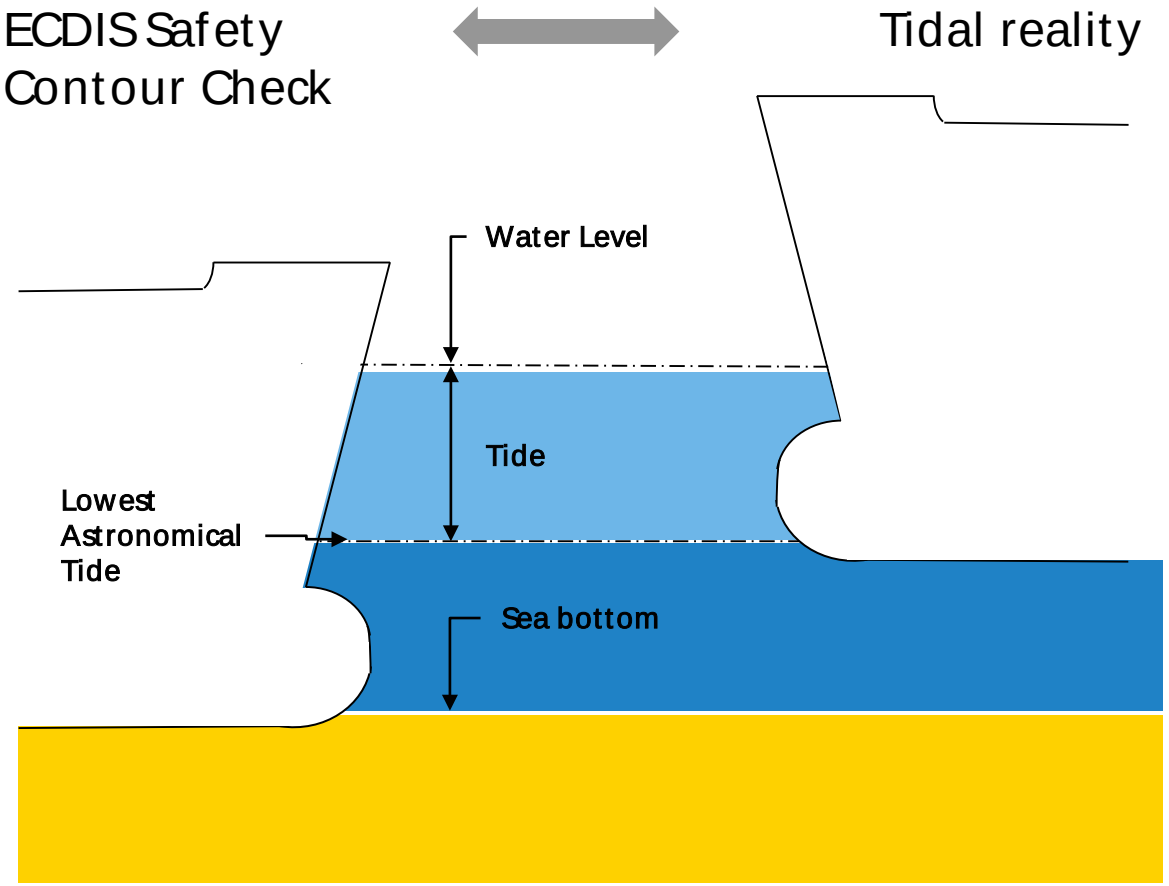
Sea chart

The drawback of LAT-based safety features in tidal waters







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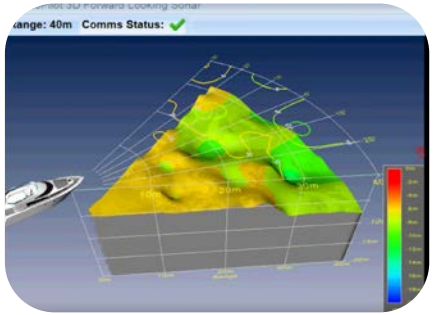
Current technologies

Hydrography maps



Forward looking sonar

ASV

Low time resolution

Shallow water depth

Better time resolution

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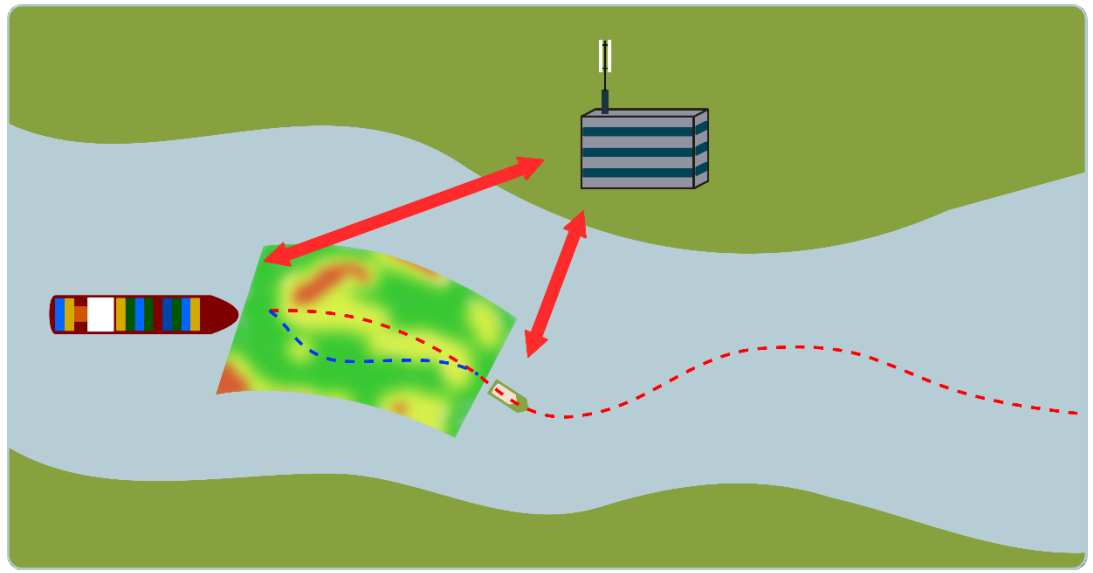
The anti-grounding use case

how a real-time solution could look like



1. Ship on port appraoch
2. ASV creating map
3. Ship avoids shallow water

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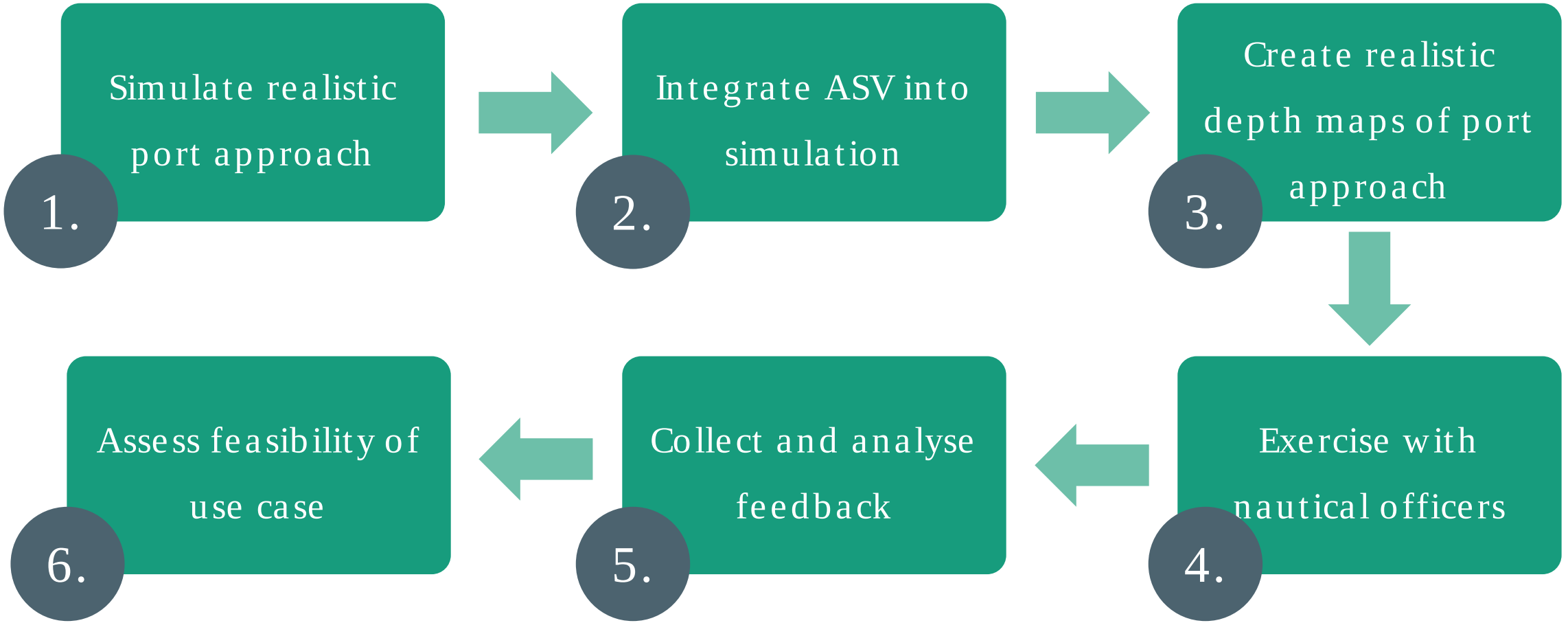
Virtual Full Scale Simulations

early stage testing of system integration



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Virtual Full Scale Simulation

1. Simulate realistic port approach

Stealth View

function:
free perspective

Simulation Centre

function:
ENC- und 3D-modeling

OsMan-Standalone

function:
modeling of own ship models

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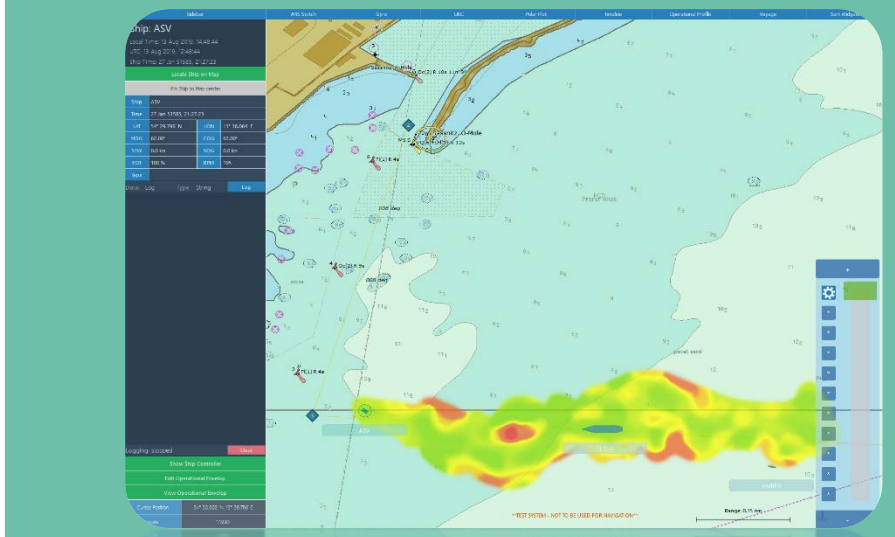
Virtual Full Scale Simulation

2. Integrate ASV into simulation

Ship Handling Simulator



Autonomous Navigation System

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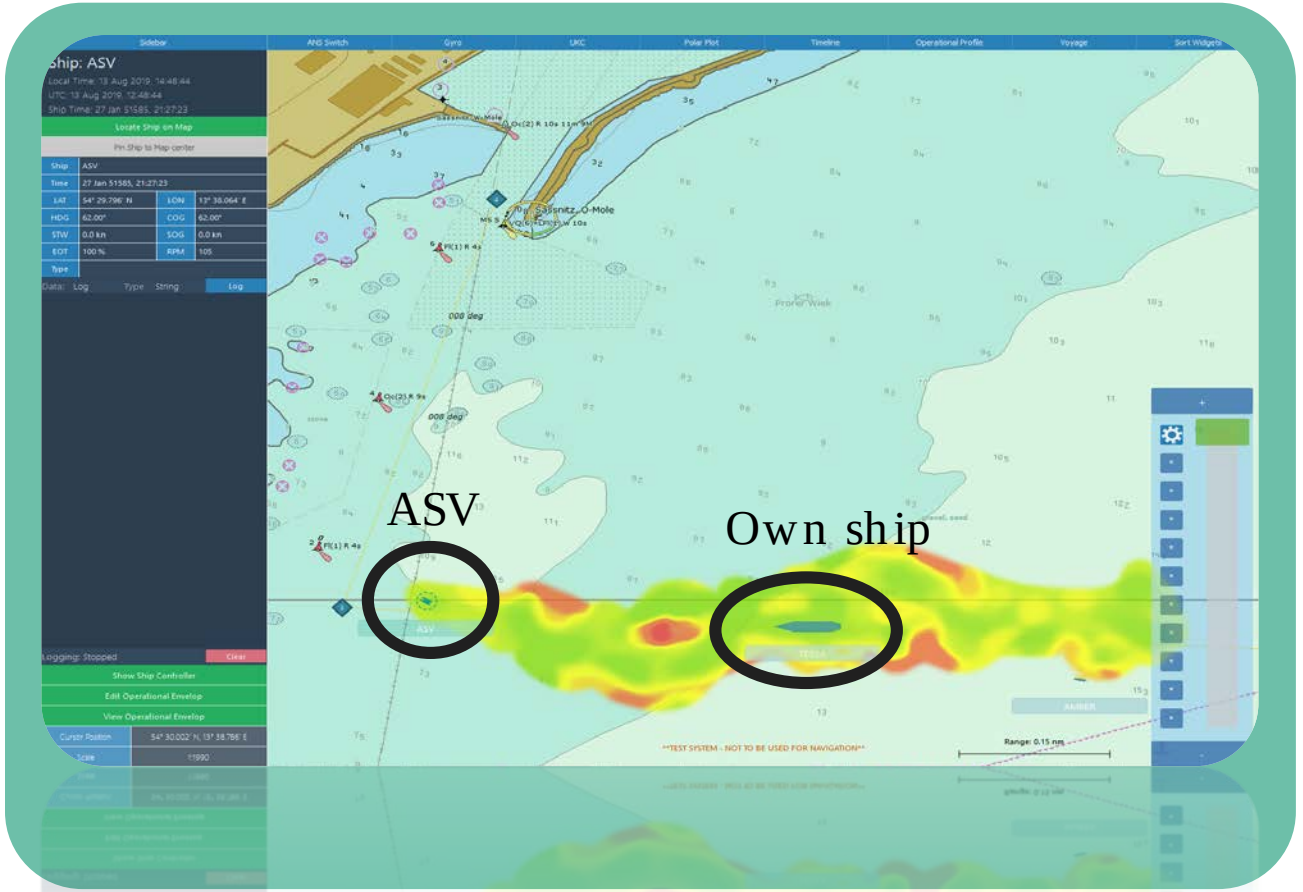
Virtual Full Scale Simulation

2. Integrate ASV into simulation

ANS

- AIS messages from SHS
- Harsh weather controller
- Collision avoidance
- Autopilot
- Can control multiple ships



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Virtual Full Scale Simulation

3. Create realistic depth maps of port approach

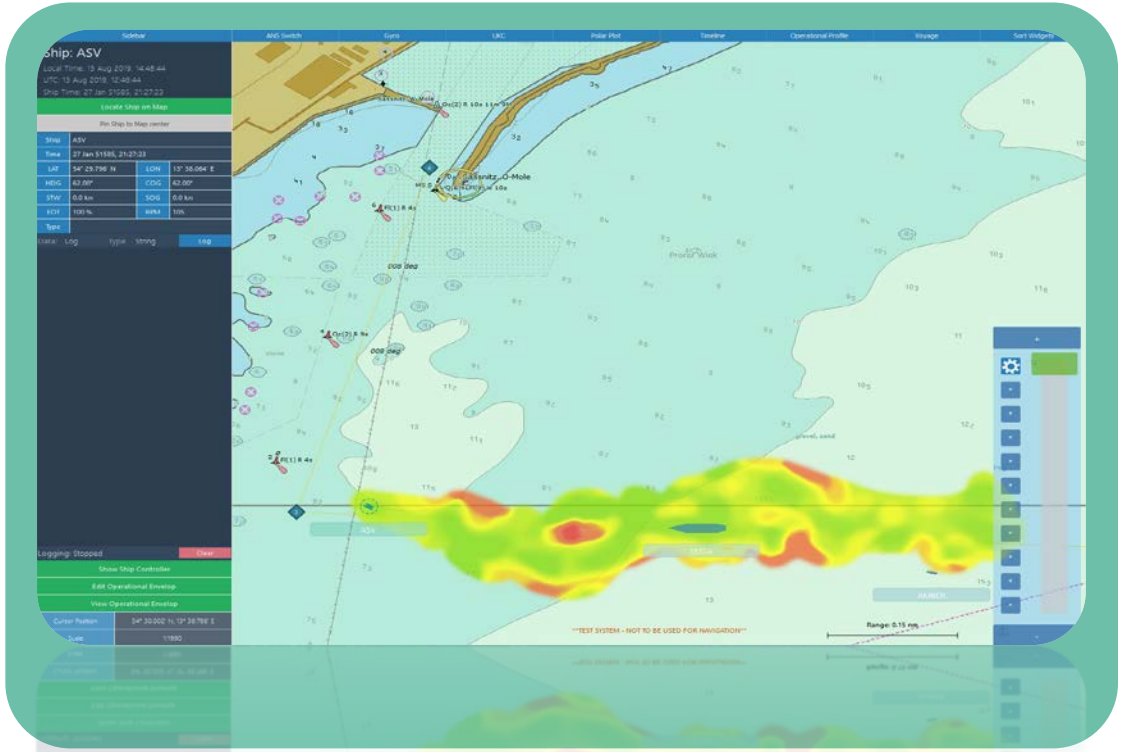

Image @wikipedia

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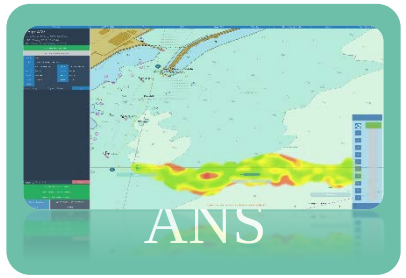
Virtual Full Scale Simulations

4. Exercise with nautical officers



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Virtual Full Scale Simulations

5. Feedback and 6. Evaluation

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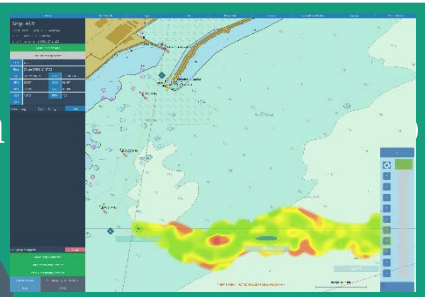
2. In



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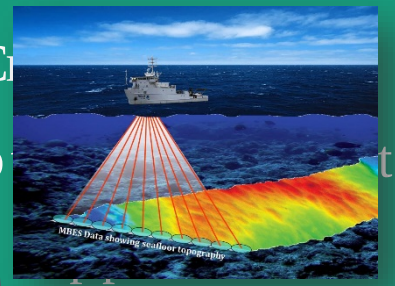

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5. Collect and analyse feedback

6. Assess feasibility of use case

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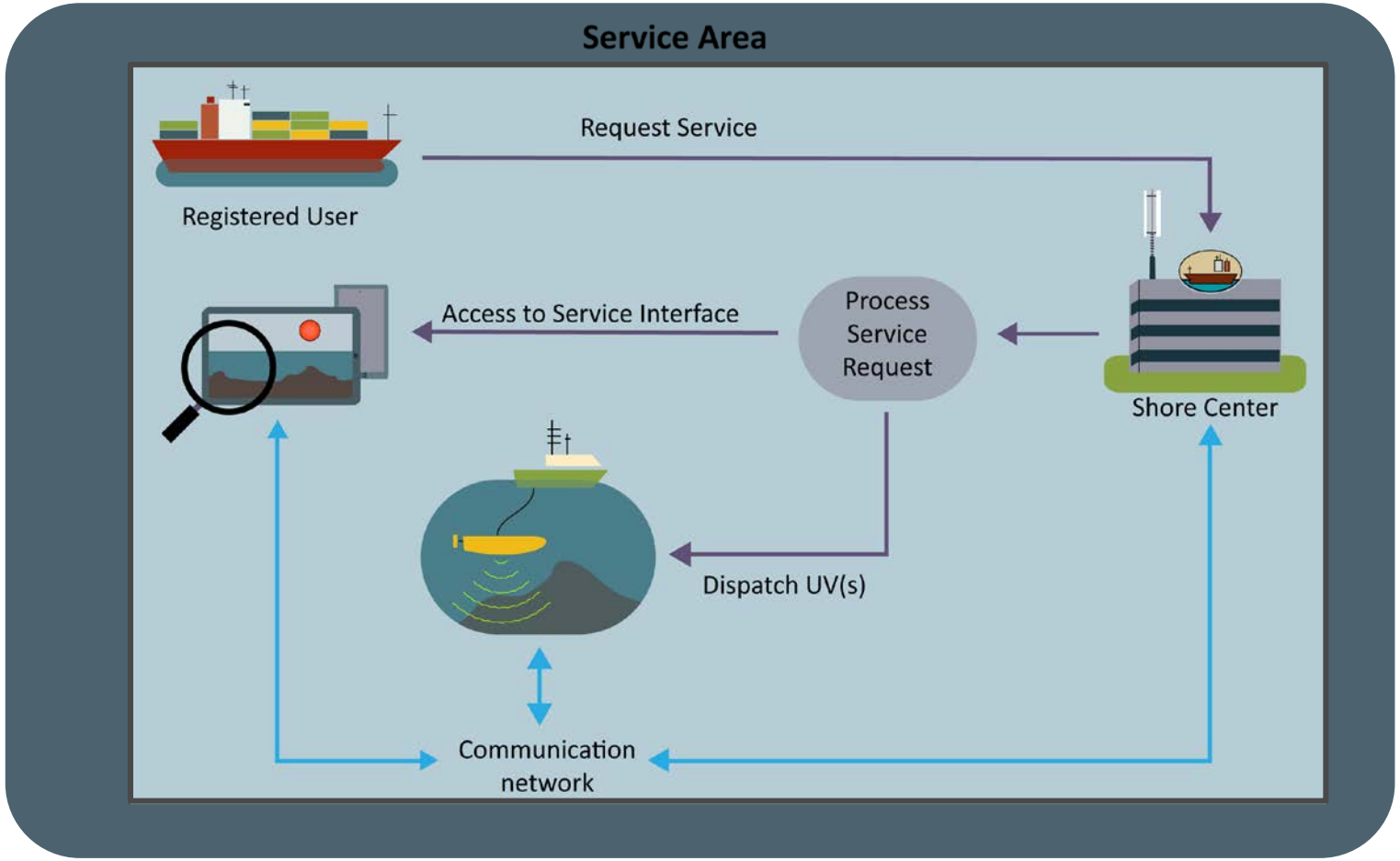
RoboVaaS – anti grounding use case

the service design



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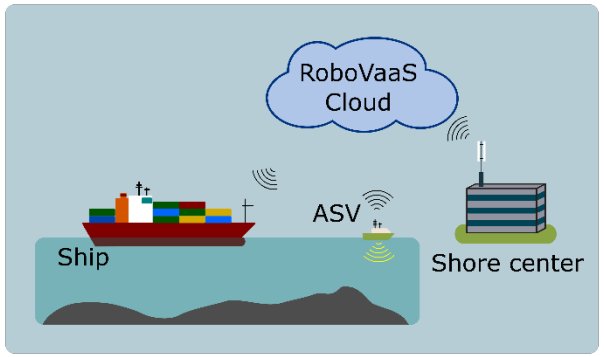
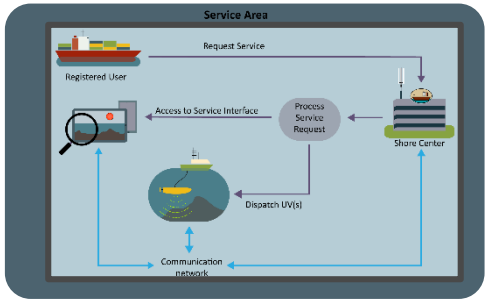
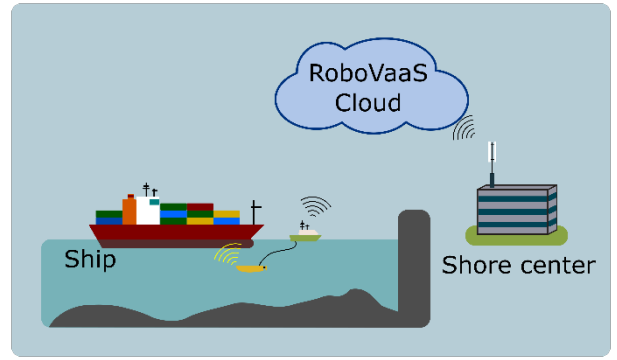
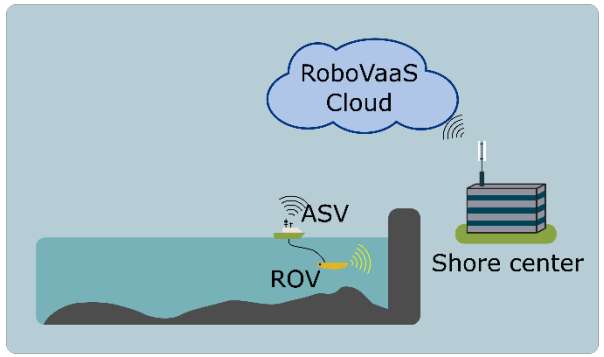
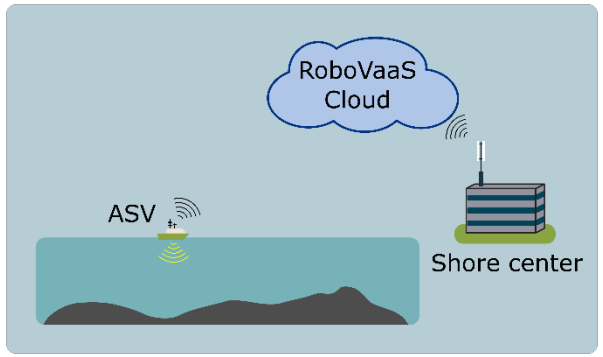
the five use cases

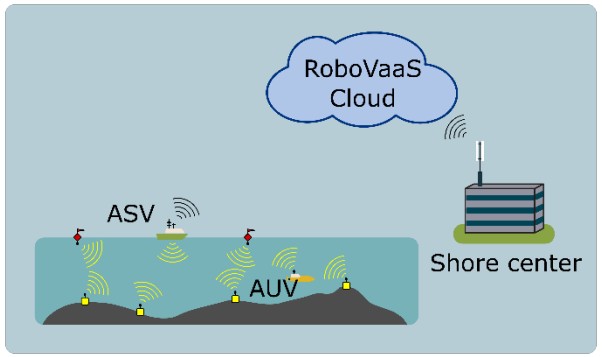












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[2] 5. BürgerschaftHH, *Schriftliche Kleine Anfrage des Abgeordneten Michael Kruse (FDP) vom 19.03.15 und Antwort des Senats*, B.d.F.u.H. Hamburg, Editor. 2015

[3] Köster F, T. Thies, The evolution of the Port of Hamburg from a hydrographic perspective, Hydrographische Nachrichten, 100, pp. 48-52, 2015

[4] https://www.hafen-hamburg.de/en/news/container-vessel-runs-aground-on-the-river-elbe---34489