Introduction to the MobiSpaces project

Danish Geodata Agency

MobiSpaces Vision

MobiSpaces places focus on developing data management platforms for mobile data that can be processed decentrally and to such an extent that it can return usable data, thus improving data processing for all.

- Effective and trustworthy data governance
- Optimise energy consumption, minimise carbon footprint
- Efficient AI-based data operations
- Enforcement of security, privacy and compliance
- Standardized data sharing and interoperability
- Decentralized processing and analytics at the Edge

Factsheet
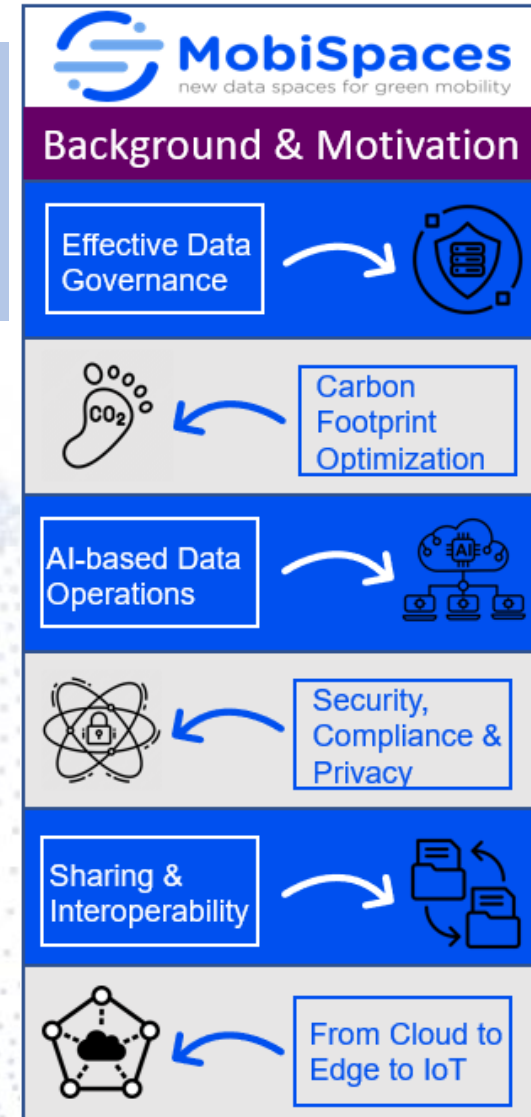
MobiSpaces	New Data Spaces for Green Mobility
Project number	101070279
Starting date	1/9/2022
Project duration	36 months
Call	World Leading Data and Computing Technologies 2021
Topic ID	HORIZON-CL4-2021-DATA-01-01
Topic Description	Technologies and solutions for compliance, privacy preservation, green and responsible data operations
Budget	~ € 8.8 M (Funding: 100%)

The MobiSpaces Consortium
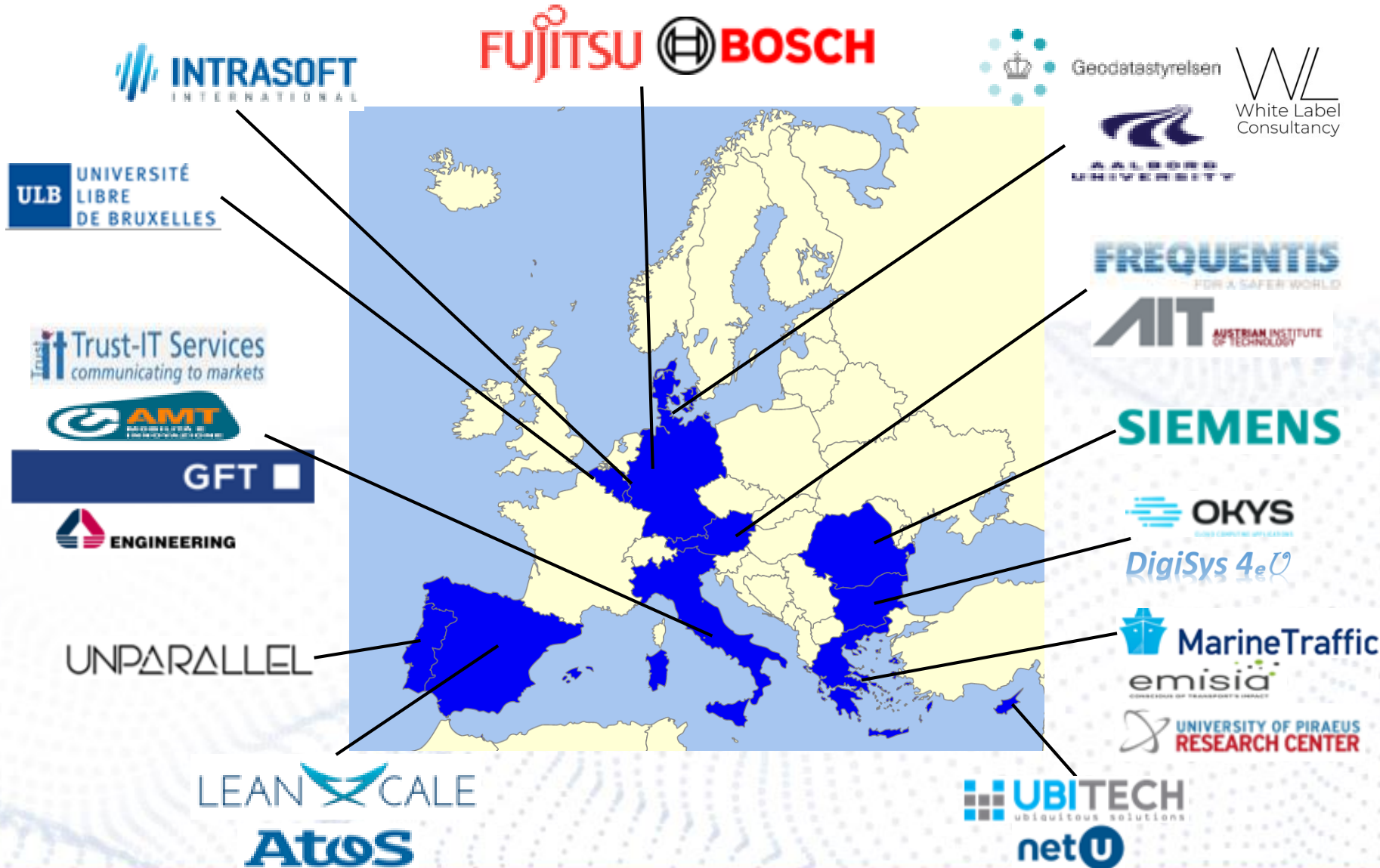
>10 Technical partners with expertise in:
- Big data
- ML / AI
- Data science
- Cloud / Fog / Edge / IoT
- …

5 Use-case partners
- pioneers in maritime intelligence
- urban/maritime authorities

2 Mobility domains:
- Urban
- Maritime

Five Exciting Use-cases

Predictive maintenance and service analysis

Intelligent infrastructure traffic sensing

Edge-powered vessel tracking

Edge-computing on moving vessels

Enhancing nautical map by crowdsensing

Use Case #5: CrowdSea Mapping

- "CrowdSea Mapping - Federated Learning (FL) for Enhancing Nautical Charts"

- This use case will validate how crowdsourced nautical sensor data can be processed directly onboard vessels, and qualified for improving navigational safety at sea

- Federated Learning approach processes and prioritizes data on vessels
  - Machine learning models trained on multiple decentralized edge devices

- The Federated Learning approach will prioritize what information is urgent to share with the centralized server and what can wait until connected to a low-cost communication channel, and in the end updating nautical charts.

- Partners:
  - AAU: Data management experts
  - AIT: Federated Learning researchers
  - EMIS: Environmentally sustainable monitoring experts

UC#5 Objective
# Edge-based in-situ Data Processing

- Validate how
  - Data can be collected and processed decentralized
  - Data quality can be assessed on the edge
  - Data criticality can be assessed in-situ
  - Communication patterns can be optimized
  - Federated Learning can support this on the edge
- To address the challenges
  - Slow and expensive communication
  - Often offline
  - Unmonitored equipment and devices
  - Difficult quality assessment

Centralized model

GPS antenna

Transducer

Swath

Single beams
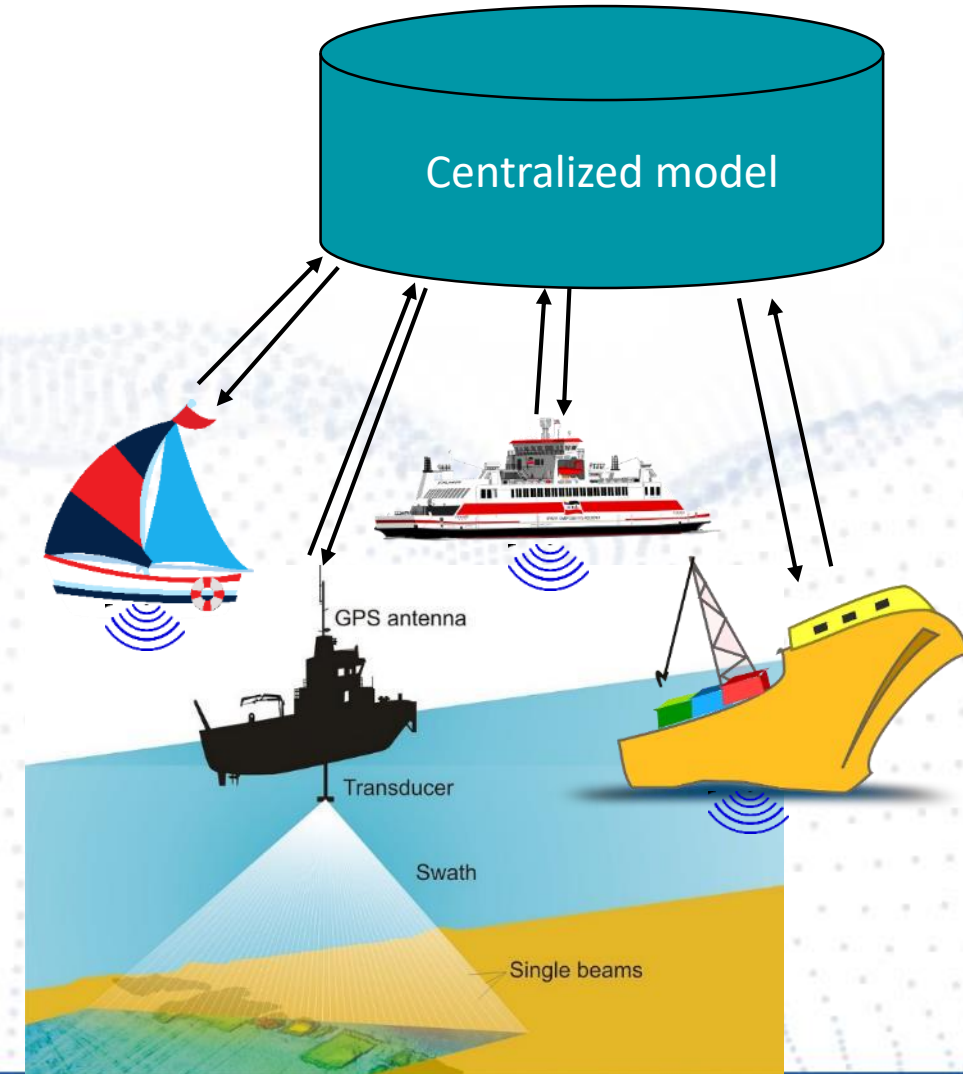
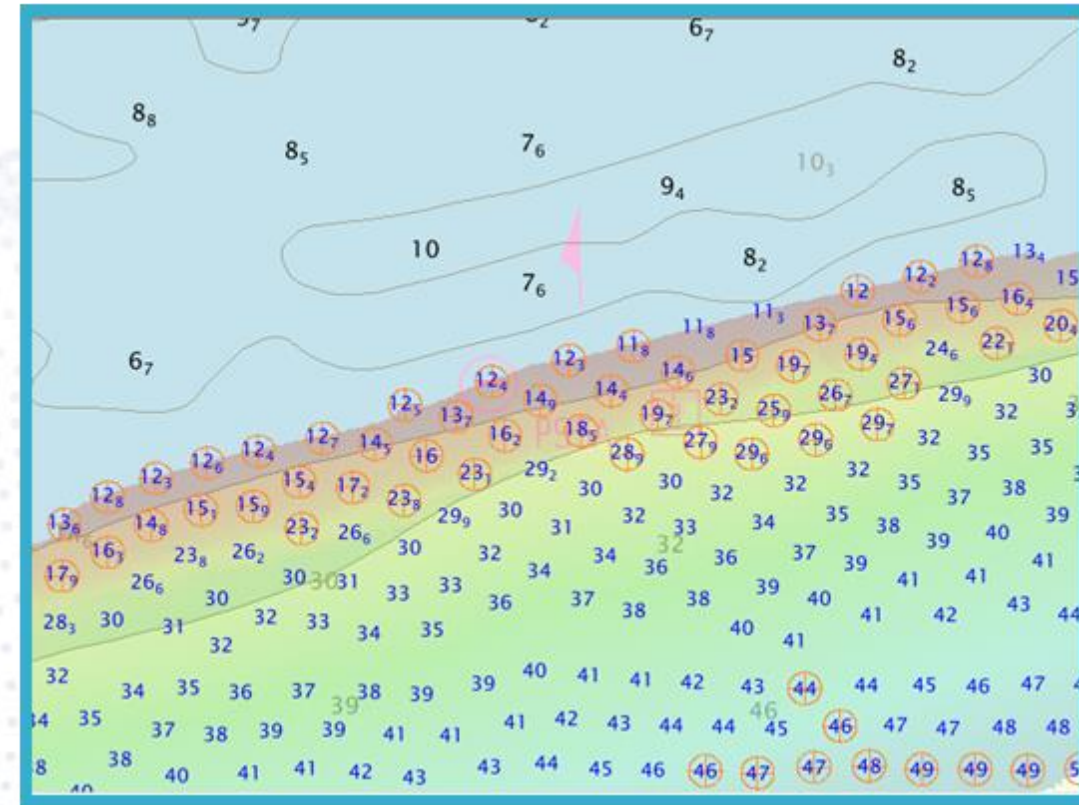# UC#5 Targets
Validate Historic Chart Data

- Are historical depth data still valid?
  - The seafloor changes over time
  - Sand is moved by current
  - Harbors are excavated
  - Precision of surveying has improved

- Where should surveying be prioritized

ddm_50m.aar
Bånd 1: SourceYear
2021
1869
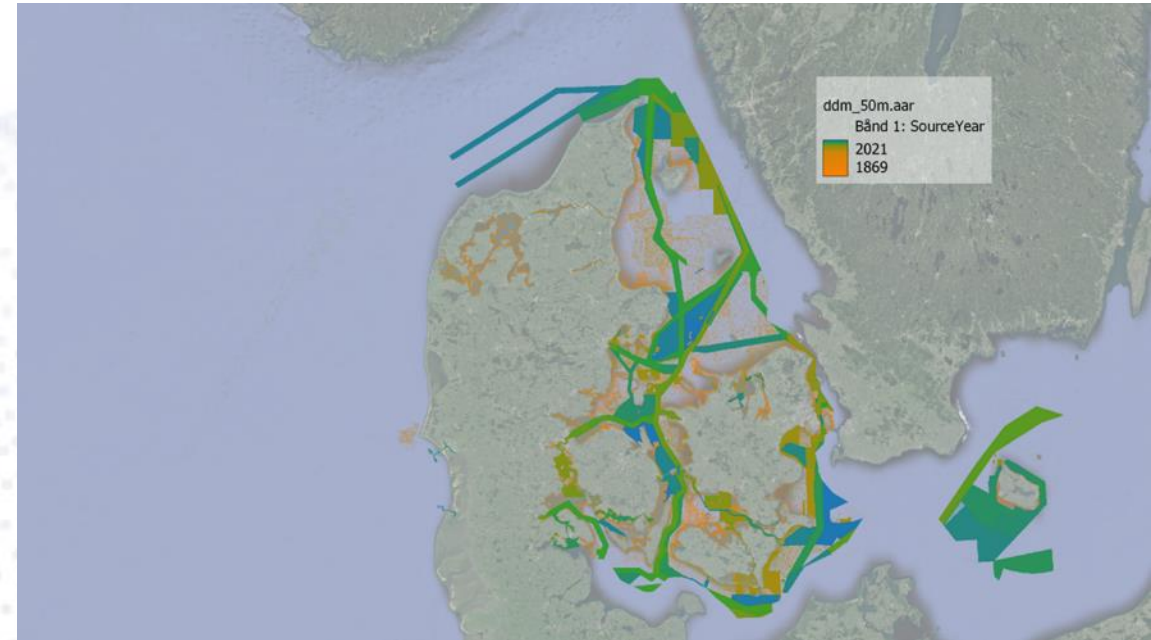
UC#5 Targets
Detect Chart Discrepancies

- Detect chart discrepancies
  - Are there unknown shoals not in the chart

- Notify on critical findings
  - Some information is more urgent than other

UC#5 Targets
Update Nautical Charts

- CSB data directly to charts
  - Can we ensure quality of data?

- Is CSB data better than no data?
  - Poor quality data versus no data

- Responsible for the quality in charts
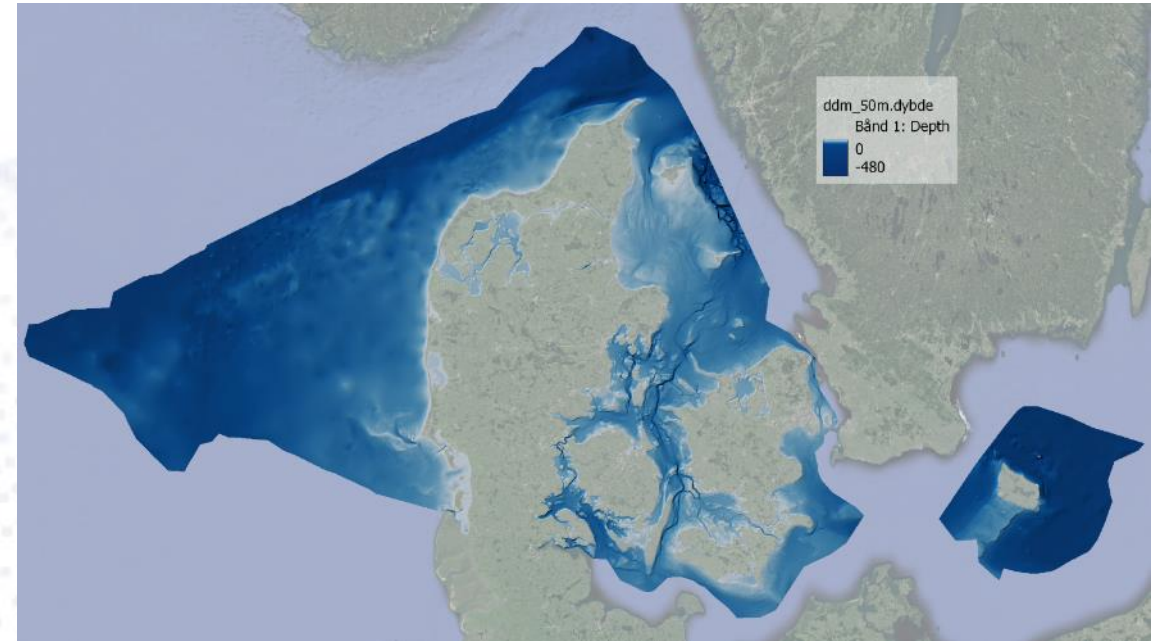
Denmark's Depth Model, 50 m resolution - Depths
https://eng.gst.dk/danish-hydrographic-office/denmark-depth-model

- Raspberry Pi 4
  - Hardware and platform by Sternula A/S
  - Low power consumption
    - Reduced computational powers
  - Optimized communication
    - Transfer data on demand and priority
    - VDES, mobile network, WiFi, etc.

Questions?