

17/10/23

IW-NET Graph Analytics

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IW-NET Graphs

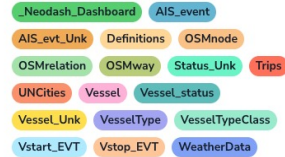


Graph Storage and Analytics approach for full 2018 and 2019 dataset around Weser

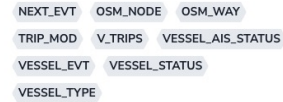
- 120 M Nodes
- 190 M relationships
- Modest hardware setup
- Data Integration
- Data Cleansing,
- Performance optimisation,
- Other enhancements

Database Information

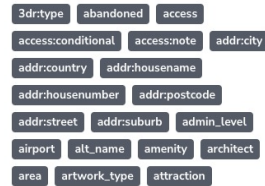
Nodes (117,139,176)



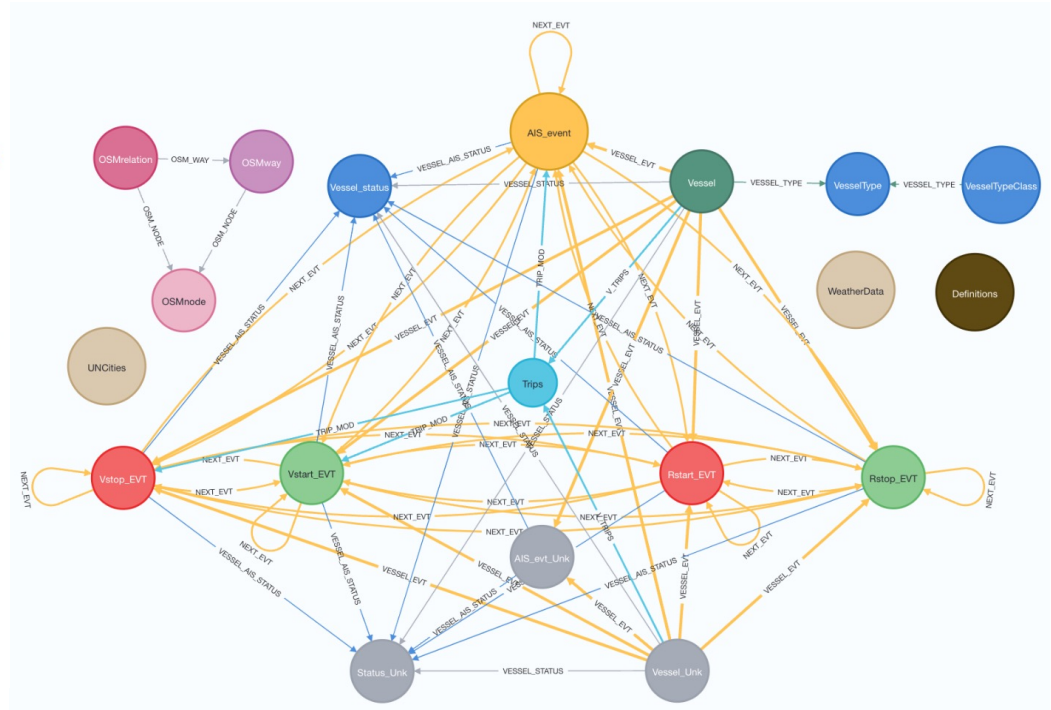
Relationships (189,101,313)



Property keys



Show all (658 more)

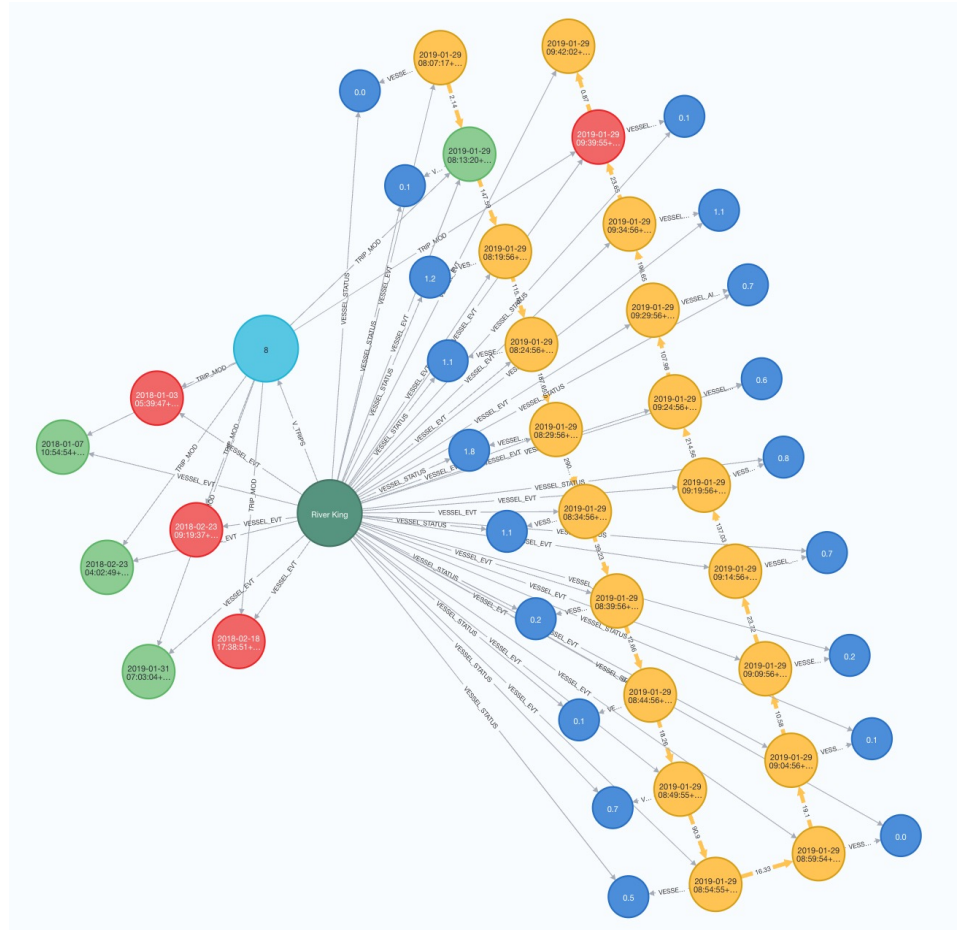




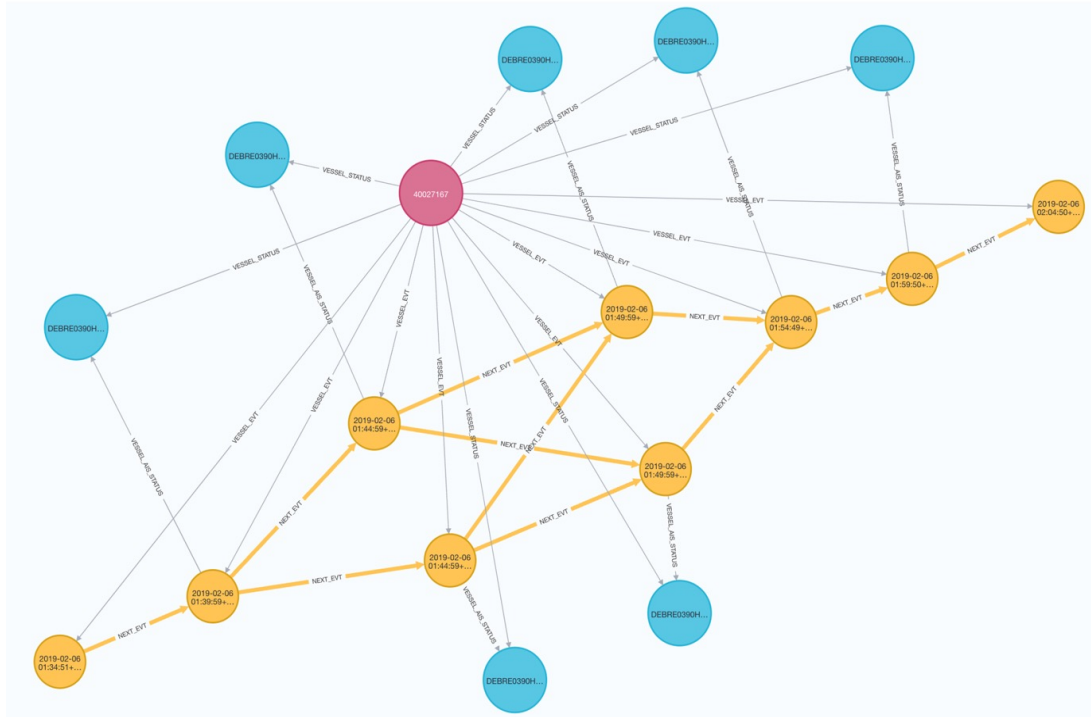
Information Enhancements

Enhance Graphs

- Trips for vessels
- Starts and stops
- "Next" events on events
- Vessels Info enhancements
 - Dimensions
 - CEMT
 - Analytics Artefacts
 - No of events for segmentation
 - Speeds observed
 - Location perimeters for future queries

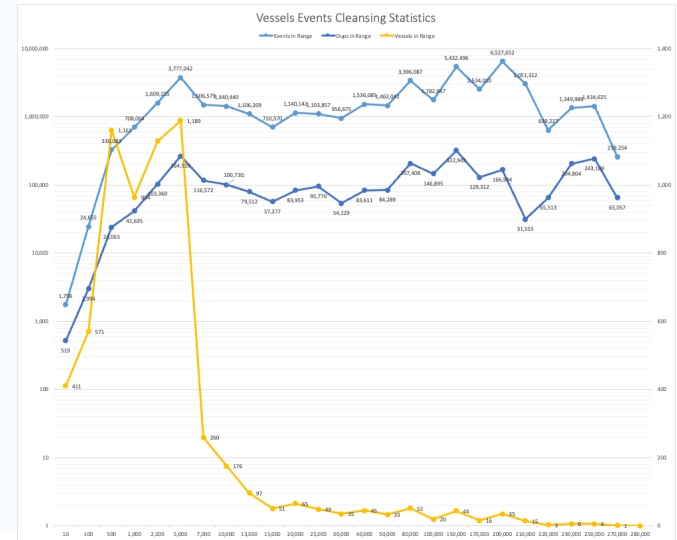


Information Enhancements



Cleansing

- Duplicates etc.





The Dashboards



Map Resources

Provide context for AIS and comprehensive views of surroundings and infrastructure

- View Area Infrastructure
- View Seamarks and Filter
- Show Waterway Resources
- View CEMT Rivers with Distance Marks
- Accessibility of CEMT Rivers

Map Resources (Seamarks)



Map Resources Vessels and Maps Waterway Resources Vessel Stats Weather Locks and Vessels UN LOCODES Nav Status Schema +

IW Dashboard
IW-NET area characteristics

Seamarks

Seamarks	No
beacon_cardinal	10
beacon_lateral	392
beacon_special_purpose	31
bridge	300
building	2
buoy_cardinal	150
buoy_isolated_danger	1
buoy_lateral	256
buoy_special_purpose	50
cable_overhead	114
distance_mark	981
gate	41
harbour	80
landmark	178
light_major	30
light_minor	200
mooring	1,698
notice	582

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set seamark type here!

seamarktype
distance_mark

IW-NET AIS related Area, showing CEMT rivers with Distance Marks

Weser Seamarks

OSMnode
river:waterway:distance

OSMnode
waterway
OSMway
whitewater:section_grade

OSMnode
waterway:sluice_gate
location: Point[*lat*=4326, *x*=8.4918385, *y*=53.2239268]
id: 2396067664

Waterway Resources



Map Resources Vessels and Maps **Waterway Resources** Vessel Stats Weather Locks and Vessels UN LOCODES Nav Status Schema +

Waterway Resources

- Waterway
- boatyard
- canal
- construction
- ditch
- dock
- drain
- fish_pass
- lock_gate
- navigation
- pressurised

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Waterway

waterway

fish_pass

Waterway Resources

Waterway Resources Closeup

fish_pass OSMode (label) -

fish_pass OSMode (label) -

Vessels and River

Provide information about vessels around infrastructure

- Show vessel navigation
- Start and Stop events around gates, docks and facilities
- Vessel anonymization and Graphs
- CEMT river data and navigability

Vessels and Maps



New Vessel Name
Phoenix Queen

New Vessel Name
name
Arktischer Sturm

RIVER CEMT

Vessel Tracker

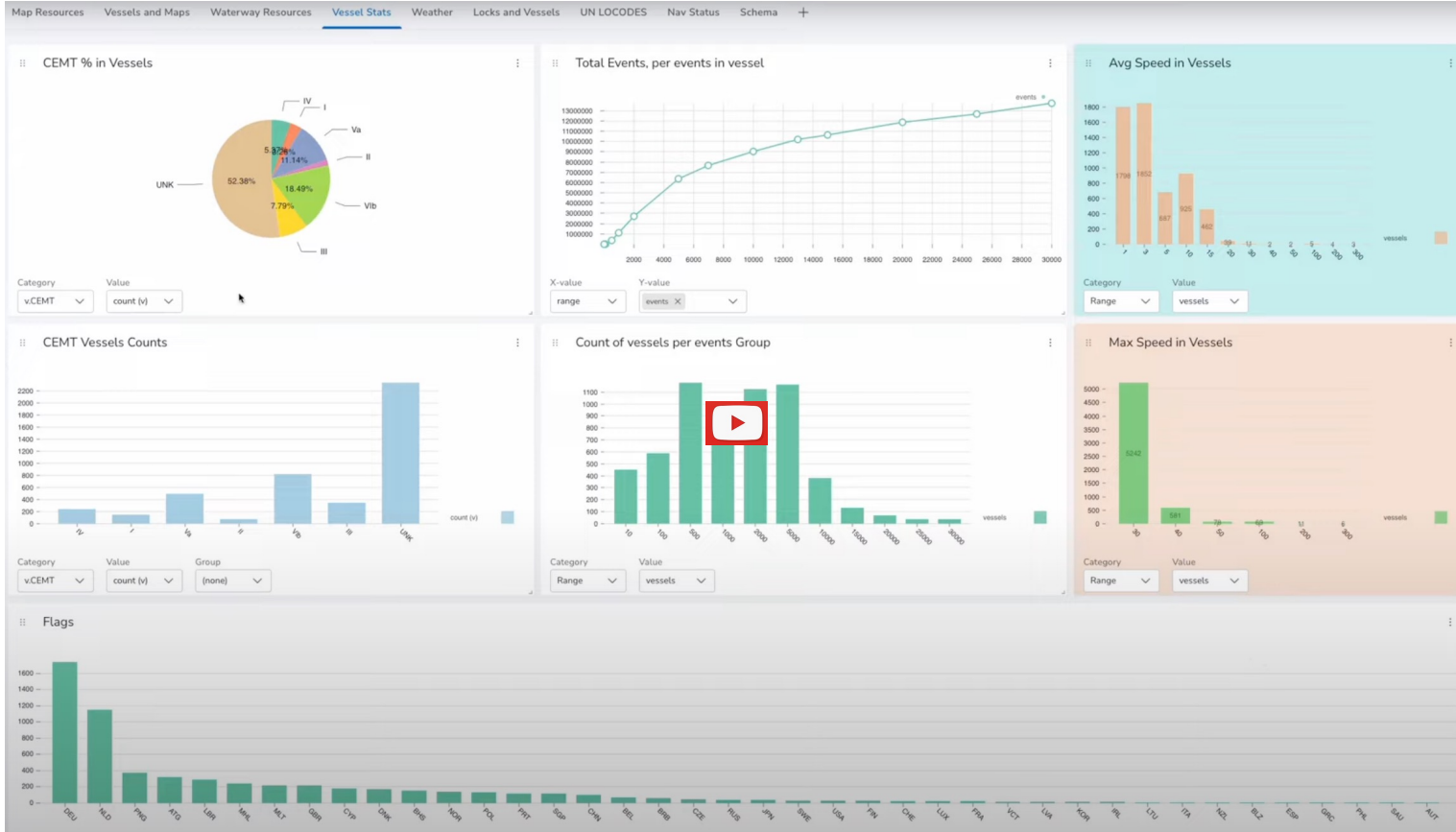
Vessel AIS_event OSMMode
Name tstamp waterway

Vessels Statistics

Contextualise AIS vessels navigation

- Vessel Classification Metrics
- Events Accumulation Analysis
- Speed Metrics, average, maximum
- CEMT count metrics, events-based analysis and segmentation
- Vessel registration statistics.

Vessel Statistics





Weather

Weather information combined

- Weather Stations
- Yearly, Monthly trends and daily data
- Help analytics providing weather context.



Weather Data



AIS Dashboard

Map Resources | Vessels and Maps | Waterway Resources | Vessel Stats | **Weather** | Locks and Vessels | UN LOCODES | Nav Status | Schema

Pick a station: GME00123274

Pick a day: 2019-02-26

Report name...
*** WEATHER SELECTION ***

METEO Stations

w.name	w
BREMERHAVEN, GM	WeatherData
HAMBURG FUHLBUETTEL, C	WeatherData
HAMELN HASTENBECK, GM	WeatherData
BREMEN SEEFAHRTSCHULE, I	WeatherData
BREMERVORDE, GM	WeatherData
HAMBURG NEUWIEDENTHAL	WeatherData

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Yearly Averages

X-value: month | Y-value: avgMinTemp, avgPrecip, avgSnow, avgMaxTemp

Monthly Averages

X-value: Day | Y-value: precip, maxTemp, minTemp, snow

METEO Stations

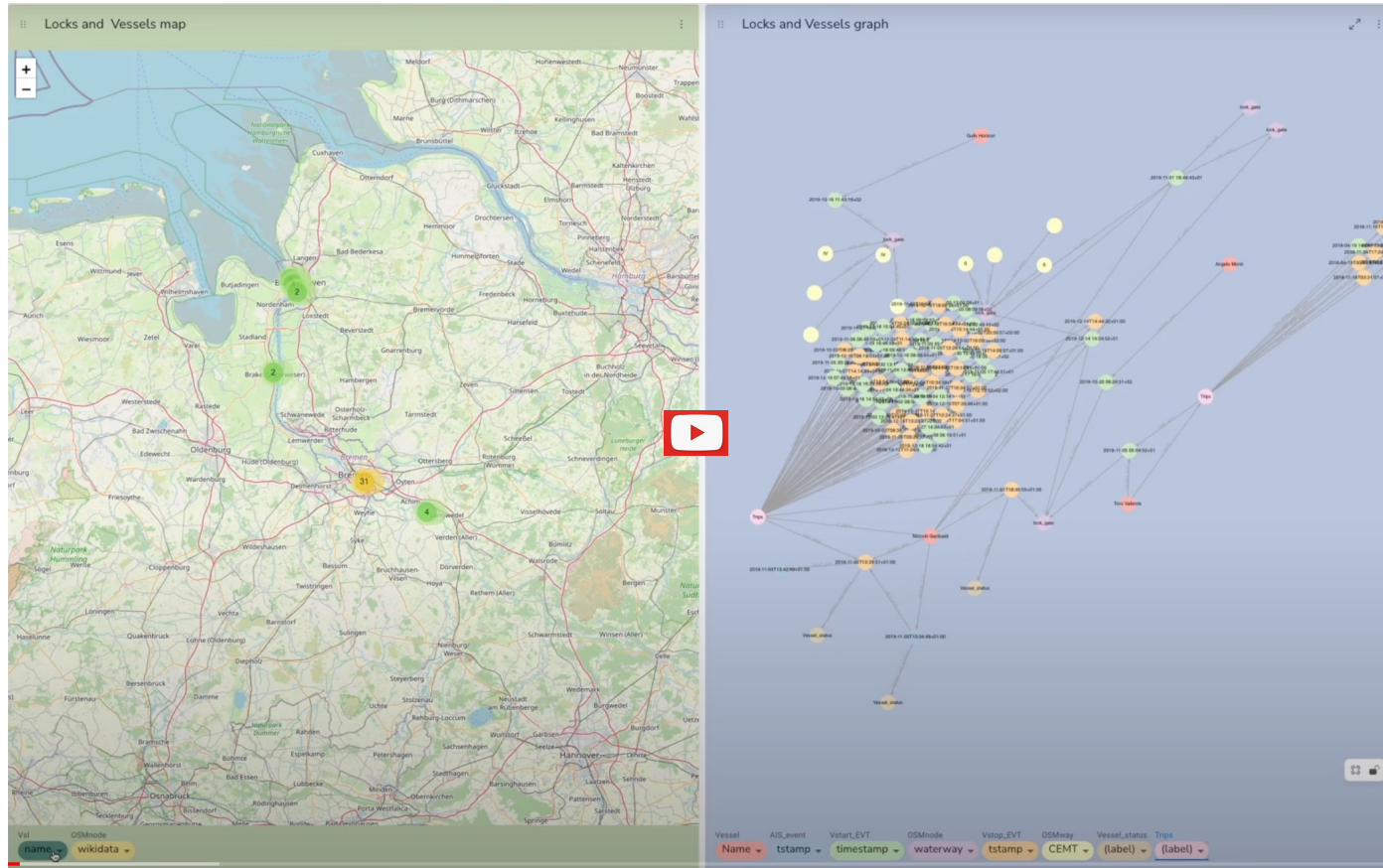
maxTemperature

Locks and Vessels, Graphs

Use Spatio-Graph queries to combine geographical context and graph vessel events information, the power of the graphs.

- proximity to facilities,
- analytics related to infrastructure resources,
- vessel based analytics wrt. infrastructures,
- graph analytics.

Locks and Vessels



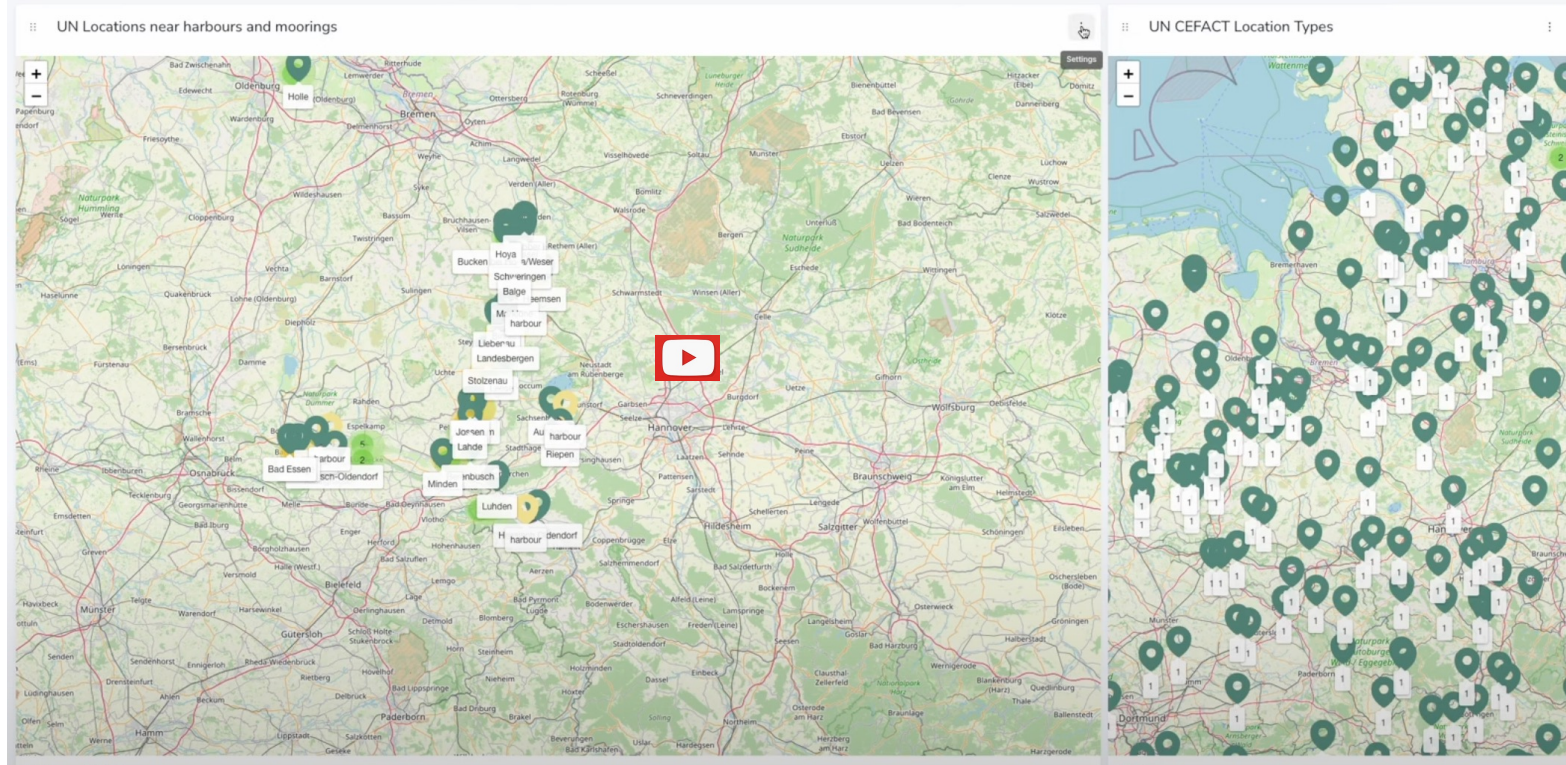
UN/LOCODES

Fuse UN/CEFACT locations information for transportation and logistics analysis, multimodal and other facilities.

- Locations proximity to rivers,
- Combine facilities in intermodal scenarios,
- Transportation routes planning and connections,
- Validity checking.

AIS Dashboard

Map Resources Vessels and Maps Waterway Resources Vessel Stats Weather Locks and Vessels UN LOCODES Nav Status Schema +



Navigation Status

Queries based on navigation status.

Various navigation status conditions in queries and contextualization (weather, location, waterway characteristics).

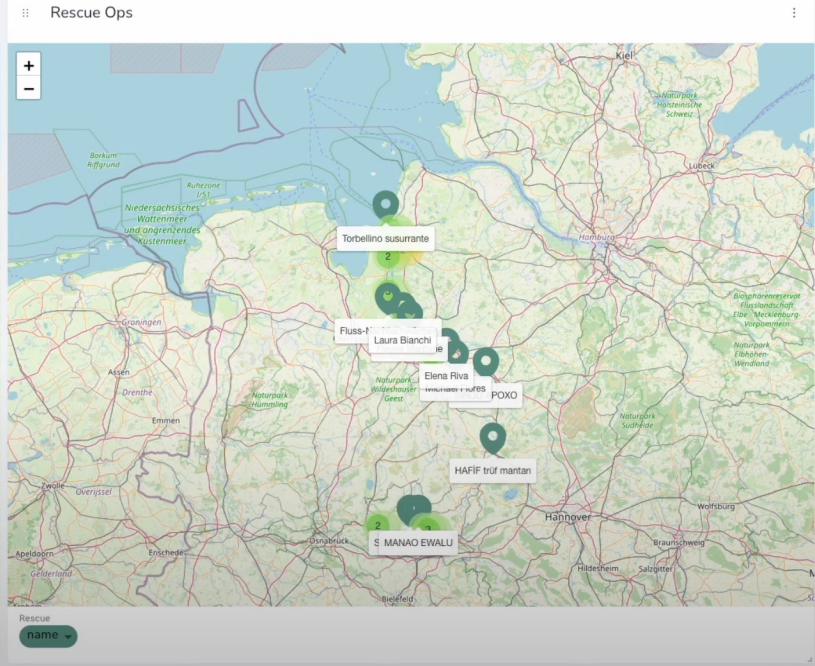
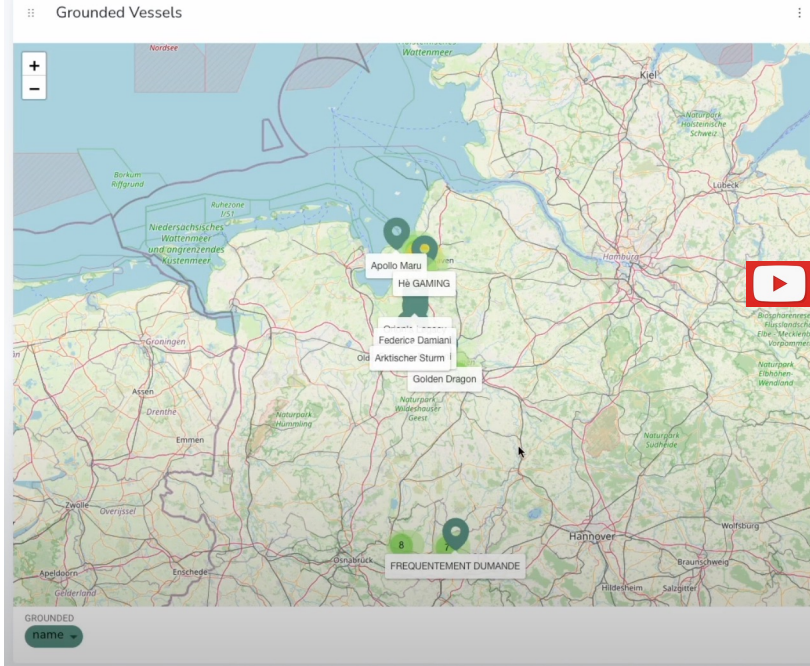
- Grounded vessels,
- Rescue operations

Navigation Status



AIS Dashboard

Map Resources Vessels and Maps Waterway Resources Vessel Stats Weather Locks and Vessels UN LOCODES Nav Status Schema +



Other

Various possibilities and exploitation of Knowledge Graph.

- Data set generation for analytics
- Machine Learning and Simulation models



Next Steps

Various possibilities and exploitation of Knowledge Graph, in applications and other projects.

- Graph Vector Embeddings
- Graph analytics
- LLM accessing (lang-chain)



Thanks for the attention!

Any Questions?