



SMART
MARITIME

ECOROUTER

Agathe Rialland, SINTEF Ocean
June 20, 2023 - Trondheim

sf = Centre for
Research-based
Innovation

The Research Council of Norway



KRISTIAN GERHARD JEBSEN
SKIPSREDERI
PART OF THE KRISTIAN GERHARD JEBSEN GROUP



ODFJELL



SINTEF



Forskningsrådet



ROUTE OPTIMIZATION INTEGRATING LOW-CARBON TECHNOLOGIES

EcoRouter

- **Ship-model based route optimization** software tool.
- Combines zero-emission **ship technology**, state-of-the-art **ship models** and **optimization method**.
- **Ship routing maximizing performance** / minimizing power consumption (given ship and weather conditions)

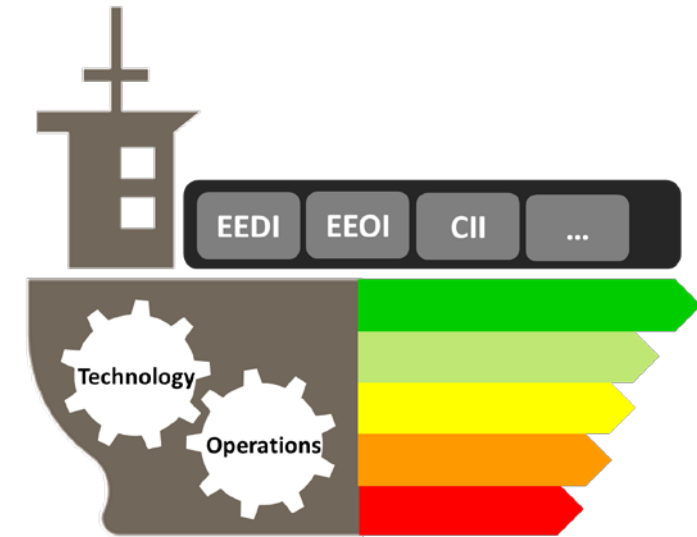
Motivation

Complexity & Urgency

- IMO short-term measures: Cii & EEXI
- New and more expensive zero-emission energy carriers.
- Novel propulsion systems increasing sensitivity to weather.
- Larger variations in ship performance within a fleet.
- Multiple technology = multiple claimed potential.

Sustainability & Competitiveness

- Fuel saving
- Emissions reductions
- From technical improvement to operational competitiveness



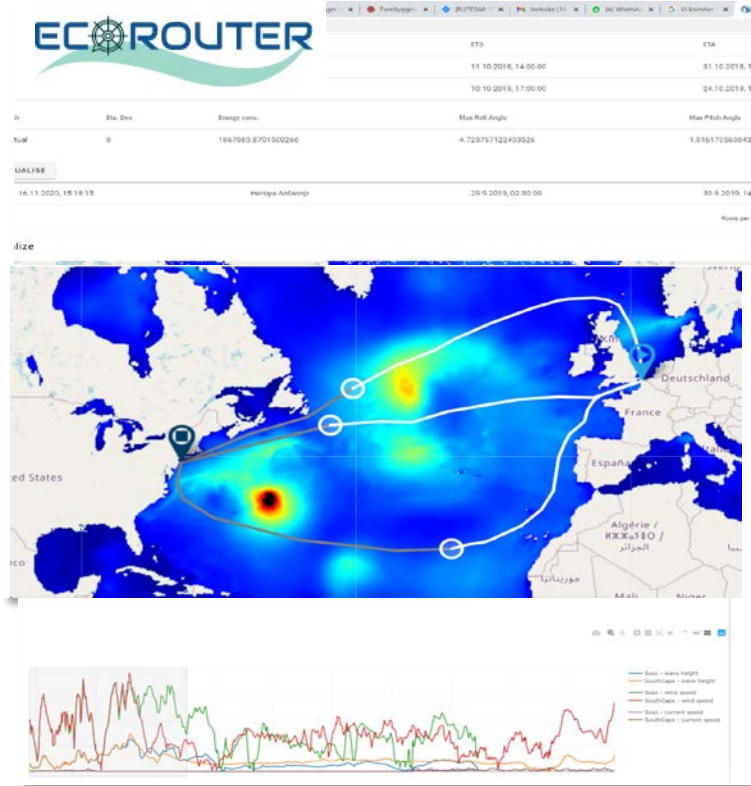
Expectations



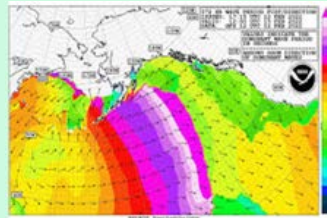
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- Gain more knowledge about the wasp technology for **taking better future decision**
- Use it for **feasibility studies** for various wasp technology
 - Select the best technology for each route and ship type
 - Select the vessels/fleet most suitable for fitting the technology
- Verification of **wasp system manufacturers' claims** which may be suspected to be optimistic
- Use it for estimation for **new trading routes**
- Use it in **targeted marketing** of our fleet
 - Including support to our potential charterers
 - Profiling of KGJS as a “environmental oriented” marine transport provider
- **Later use** it for **route planning** and **operational calculations** like fuel oil consumption guarantees
- Select the **best possible voyages** where we may get the **best benefits from the technology**

Matching Technology with Operation

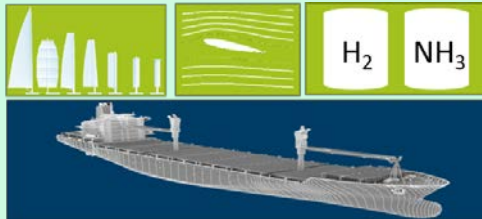


WEATHER DATA



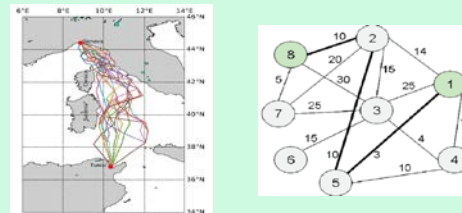
REAL SEA CONDITIONS

TECHNOLOGY SELECTION



VESSEL MODEL

OPTIMIZATION ALGORITHM



SHIP ROUTING

Application in decision-support

STRATEGIC TEST NOVEL TECHNOLOGY

- Impact of new technology on routing decisions
- Virtual retrofit and performance estimation

OPERATIONAL PRE-/UNDER- VOYAGE STUDY

- Support tool for voyage planning/replanning
- Benchmark weather-routing- & alternative routes

TACTICAL POST-VOYAGE STUDY

- Post voyage evaluation
- Routing strategies

- Add voyage
- RorTrdVoy
- VoyTwo
- FirstVoyage
- NewOrleans-Rotterdam
- Config**
Configure voyage
- Routes
Configure routes
- Simulation
Show simulations
- MandalBergen
- TestVoy

Configuration

ETD*

Estimated time of departure
03/01/2023 00:00

ETA*

Estimated time of arrival
27/01/2023 00:00

Vessel*

Select vessel
SINTEF Ocean Bulk Carrier (Bulk Carrier)

Weather source*

Select weather source
Copernicus (Global coverage, -2y to +10d)

Min speed*

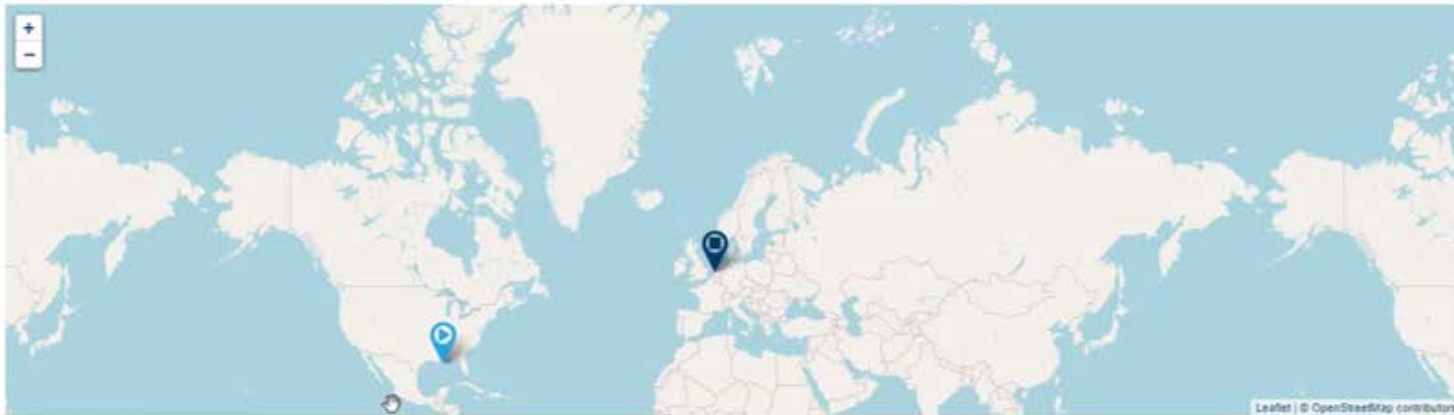
Minimum allowed speed
11 knots

Max speed*

Maximum allowed speed
12 knots

SAVE CONFIGURATION

Start/stop config

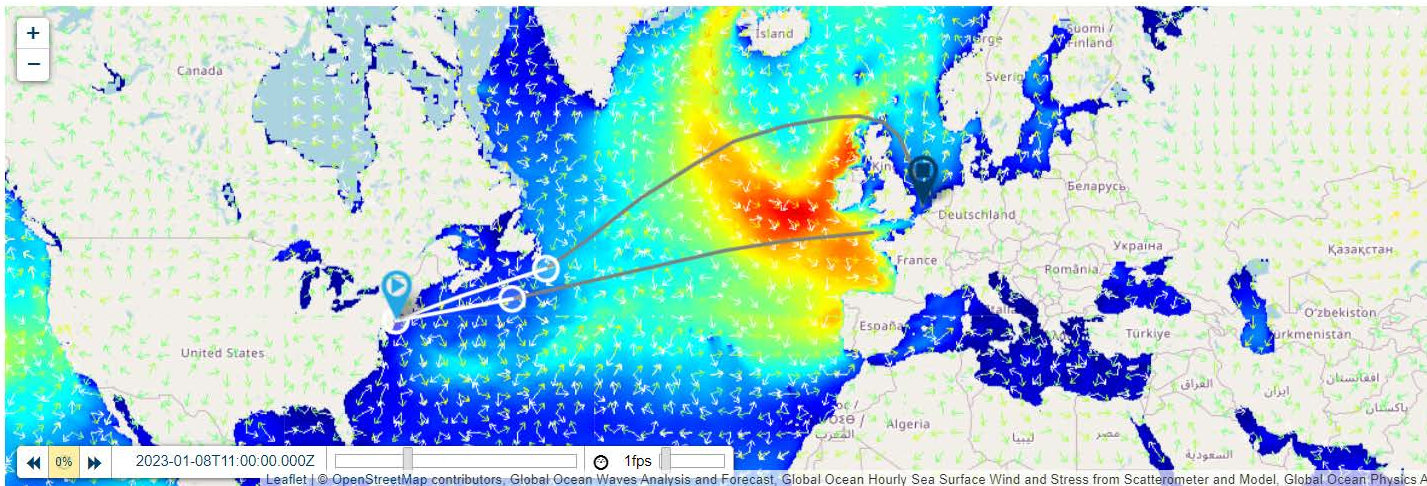


SAVE START/STOP POSITION

- Add voyage
- RorTrdVoy
- VoyTwo
- FirstVoyage
- Atlantic route1
- Config
- Configure voyage
- Routes**
- Configure routes
- Simulation
- Show simulations
- MandalBergen
- TestVoy

Routes configuration

Editor



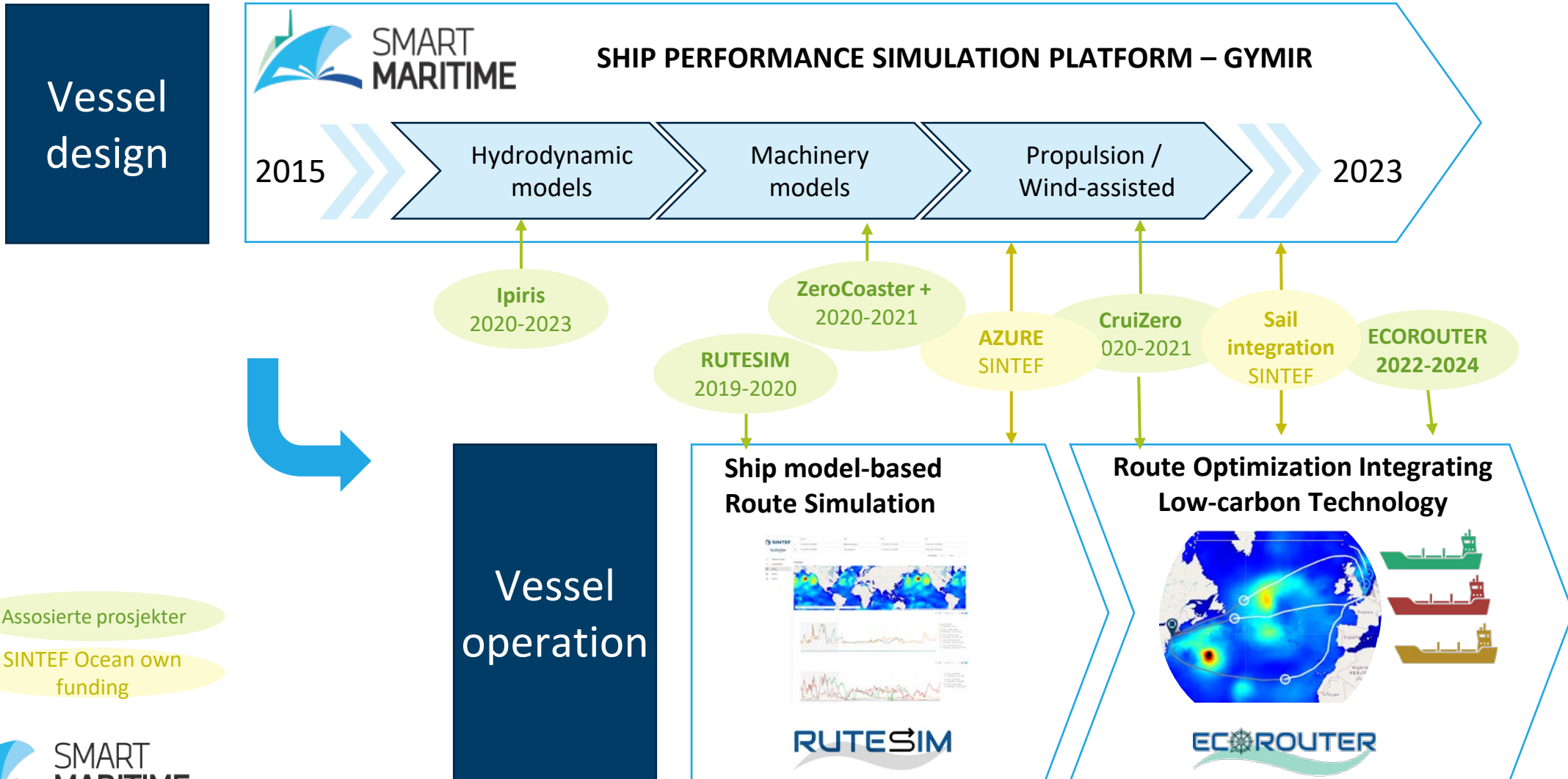
| Name | Edit | Delete | Save | Optimize | Optimize status | Progress [%] | Optimize message |
|--------------------------|------|--------|------|----------|-----------------|--------------|------------------|
| 91: RTZRoute | ⚙️ | 🗑️ | 💾 | 💡 | | | |
| 93: CSVRoute | ⚙️ | 🗑️ | 💾 | 💡 | | | |
| 94: ManualRoute | ⚙️ | 🗑️ | 💾 | 💡 | | | |
| 137: CSVRouteOptimal | ⚙️ | 🗑️ | 💾 | 💡 | COMPLETED | 100 | |
| 135: ManualRouteOptimal | ⚙️ | 🗑️ | 💾 | 💡 | COMPLETED | 100 | |
| 138: ManualRouteOptimal2 | ⚙️ | 🗑️ | 💾 | 💡 | COMPLETED | 100 | |

Simulation

SIMULATE

Optimization finished

A product of SFI Smart Maritime



Project team



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Vegard Marken



**Route Optimization
Algorithms**



Elin Halvorsen-Weare



Yauheni Kisialiou (H4)

**Ship (retrofit) model
WASP model**



Endre Sandvik



Anders Östman

**Ship Performance Simulator
& EcoRouter GUI**



Jon S. Dæhlen



Ulrik Jørgensen

Project management



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