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Navigate Tomorrow Today

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Maritime Intelligence

Rob Marshy
CTO

The world needs solutions

- Maritime trade is the foundation of Globalization
- Shipping is responsible for around 80% of all global trade and 3% of global emissions
- Global maritime trade is “complicated”

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The Solution

OCIANA™

Big Data

Artificial Intelligence

Actionable Maritime Intelligence

Communities of Maritime Expertise

Cloud Computing

An opportunity for global impact

In 100 years:
From carrier pigeons to global digital corridors

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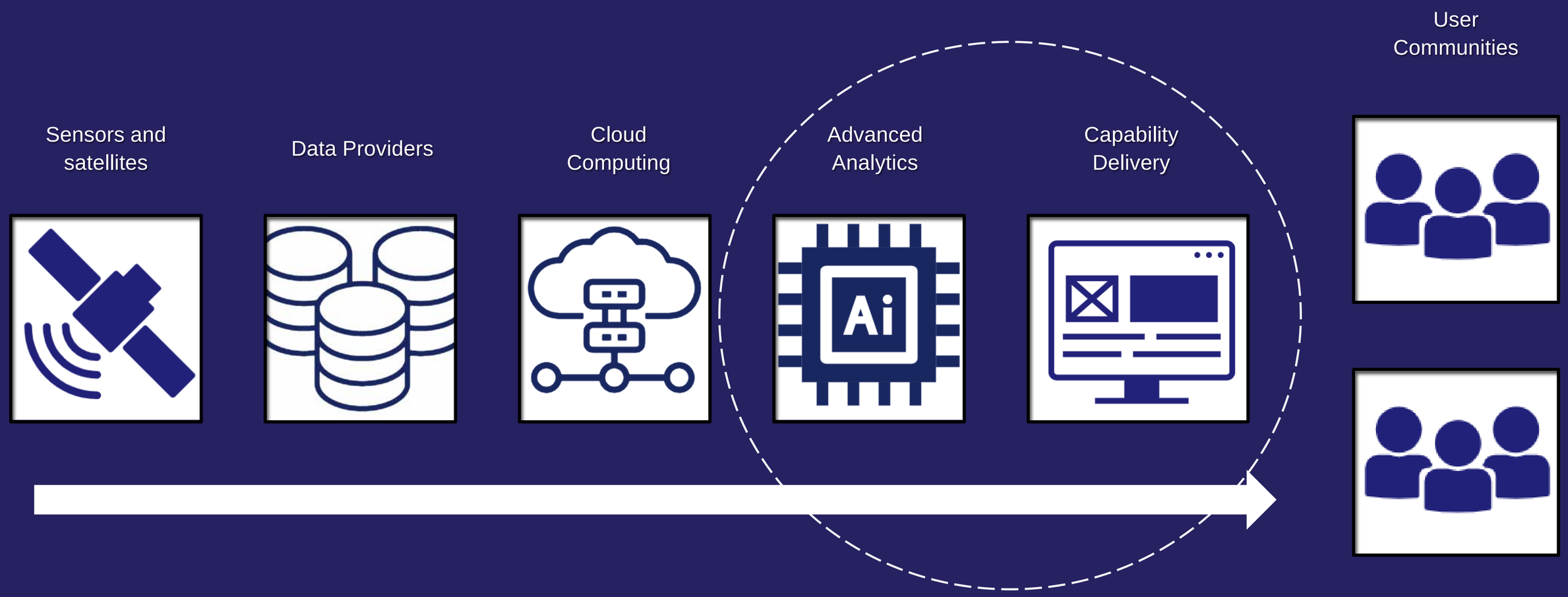
DATA VALUE CHAIN

OUR FOCUS



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IF DATA IS THE NEW OIL

OUR FOCUS

Sensors and satellites

Data Providers

Cloud Computing

Analytics Engines

Capability Delivery

User Communities

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Who we are

Canadian Technology Company focused on delivering Maritime AI Solutions

- Canadian Maritime AI Company - federally incorporated
- Data-driven solutions to support decision making
- AI-based solutions based on vast historical and real-time data (AIS, Optical, SAR, RF, Protected Species, Oceanographic and Environmental)
- Solutions for Commercial, Defence and Civil user groups
- Currently 40+ Staff, increasing to 70

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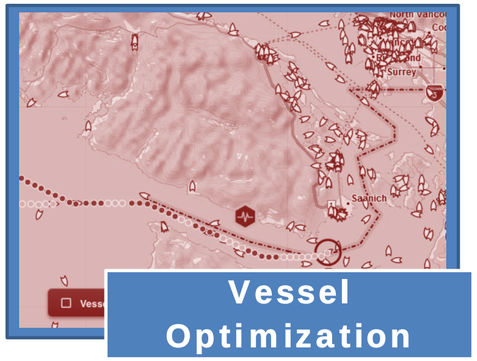
The Challenge

Increasingly Complex and Dynamic Maritime Sector



New Success Indicators

- Emissions
- Efficiency
- Economics

User-Centric Development

The Approach: Partnership-based Solutions

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OCIANA:
Development Project

Significant Research and Development Investments over a 10-year Period

- Canadian Space Agency, Innovative Solutions Canada AI
  "Application of Novel AI Techniques to Satellite Big Data Analysis in support of Maritime Risk Management"
- Canadian Space Agency, SmartEarth Program
- Innovation, Science and Economic Development Canada (ISED), Innovative Solutions Canada Program
- Transport Canada, Clean Transportation Systems R&D
- Sustainable Development Technology Canada (SDTC)

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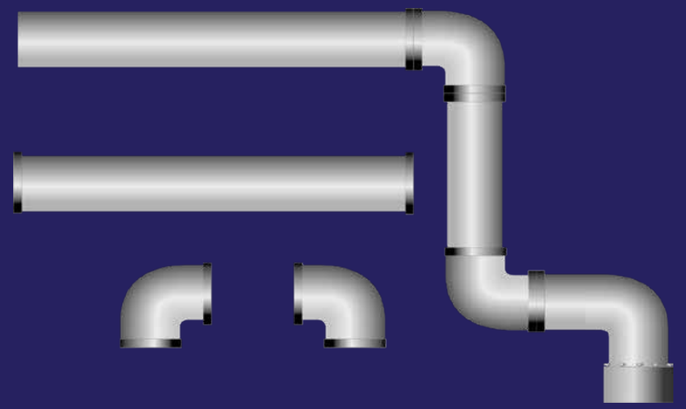
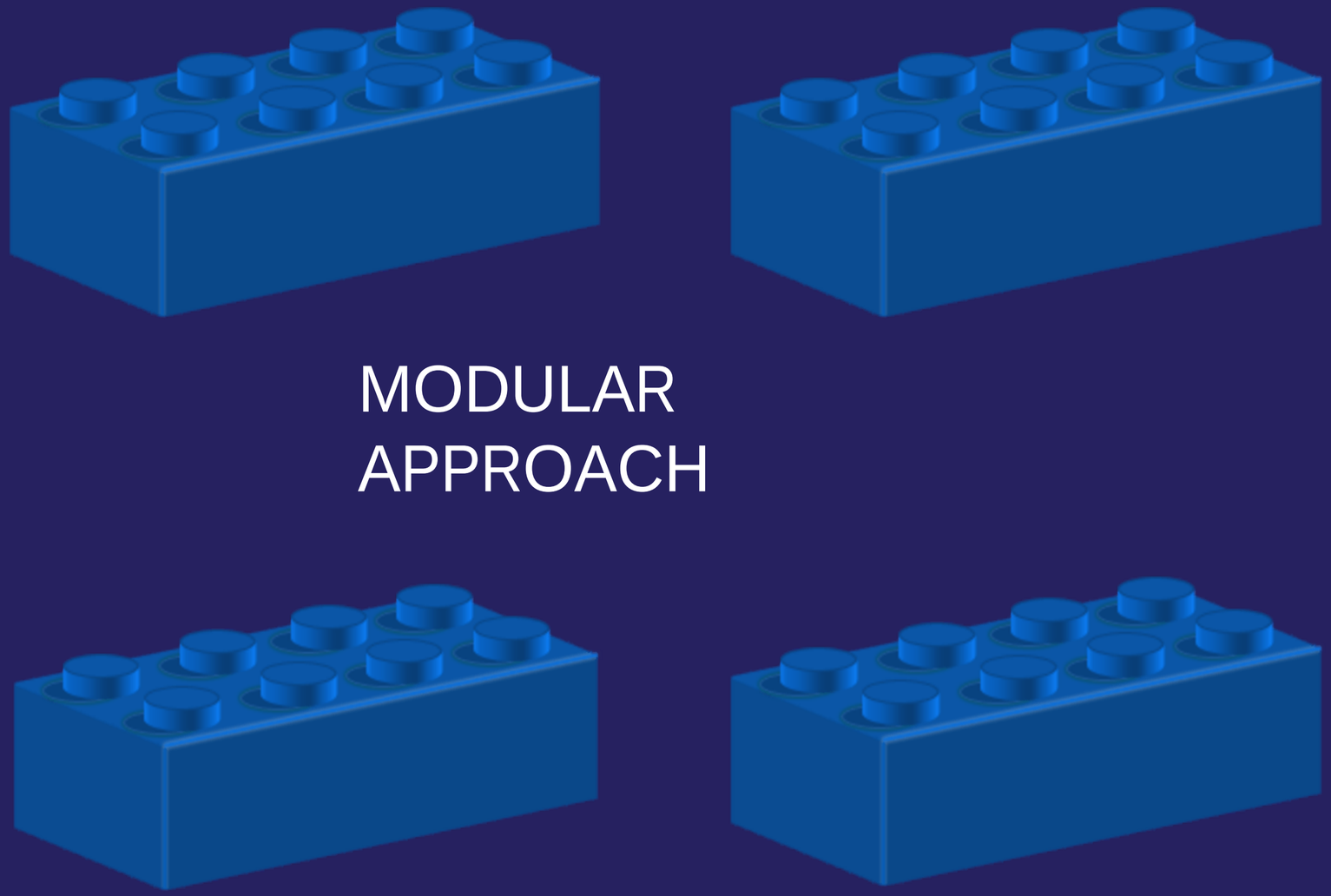


How can we optimize port and terminal resources to help meet their goals?



MODULAR APPROACH

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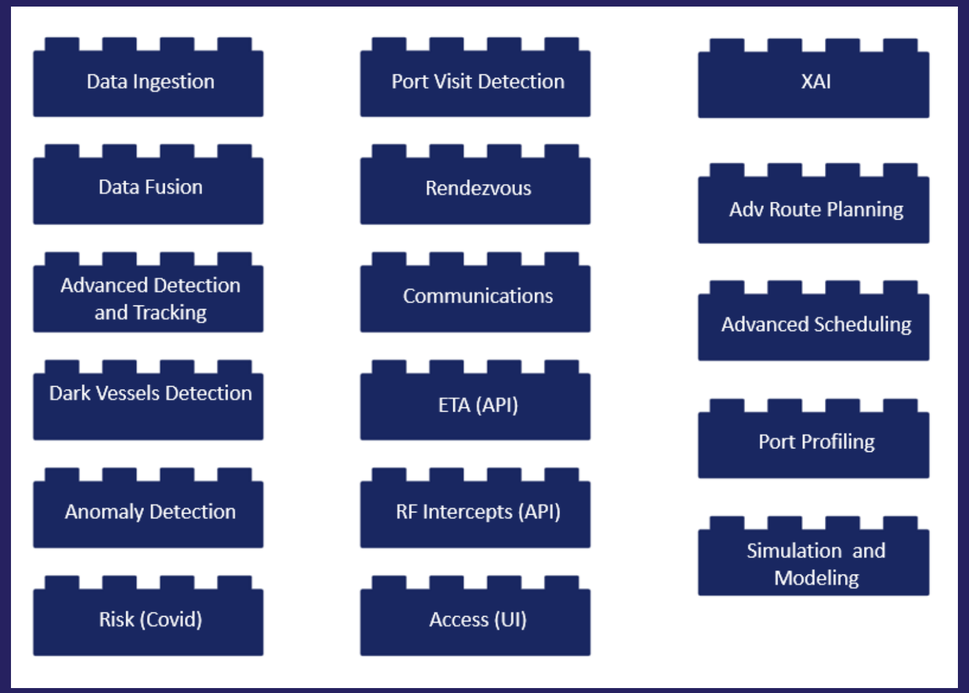
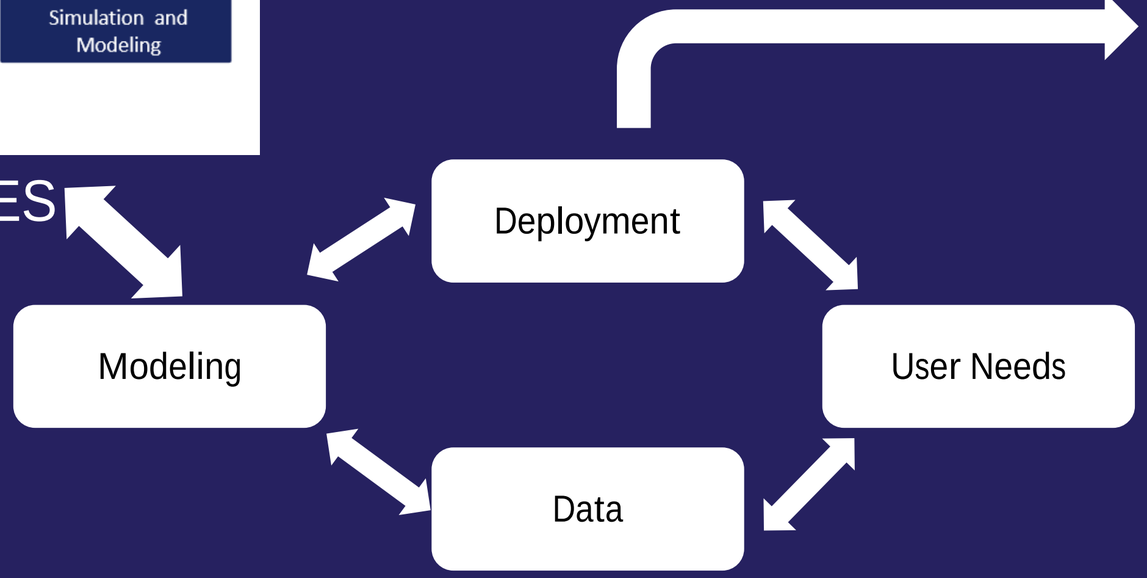


CONFIGURABLE MODULES

UI/UX DESIGN



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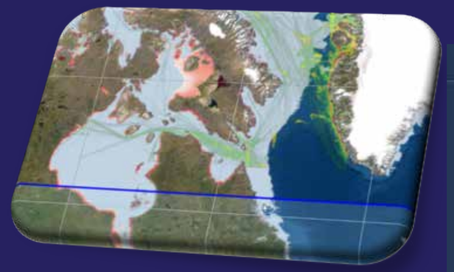
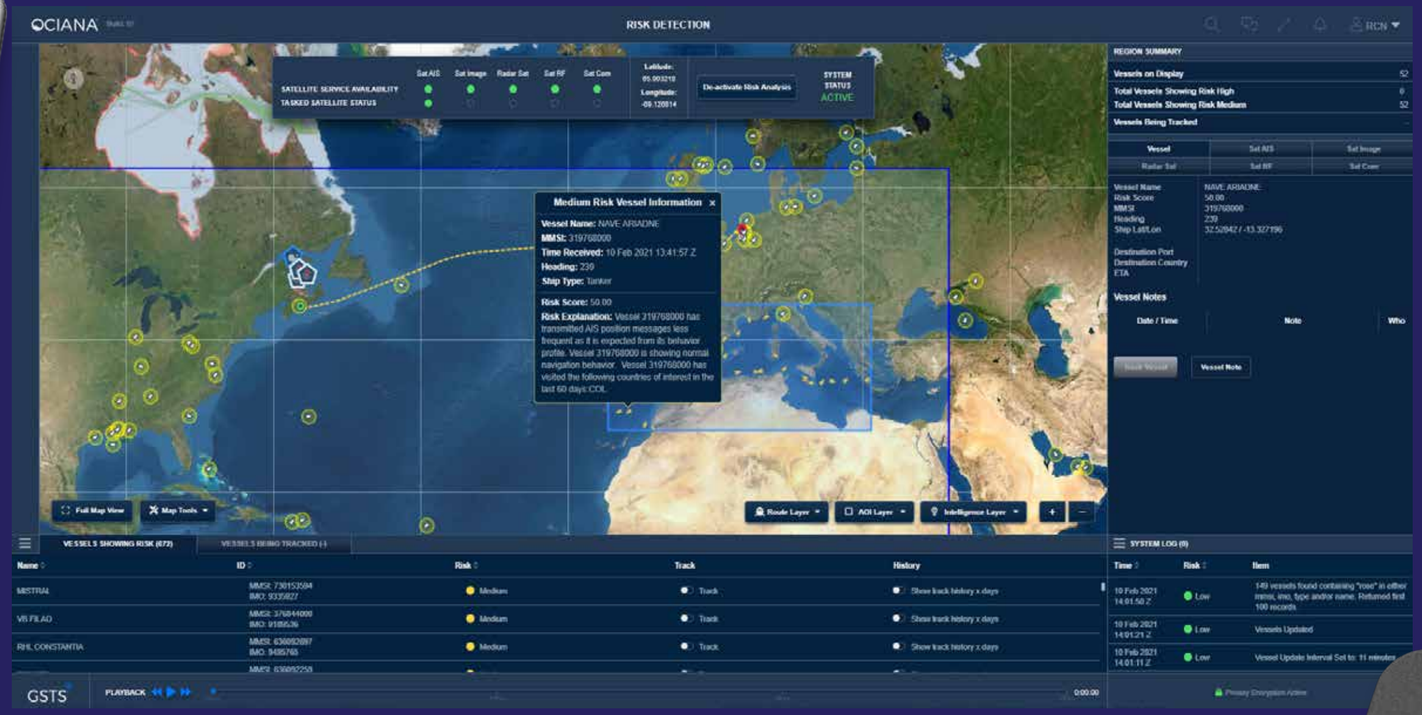
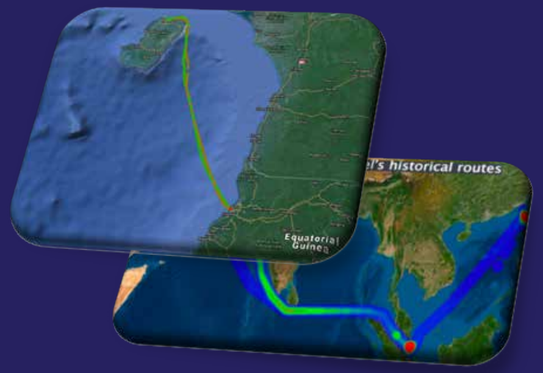
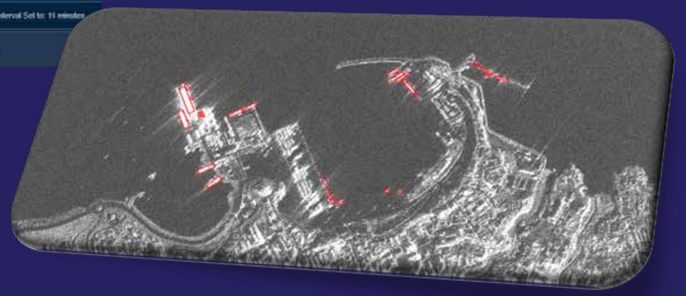
KEY OUTCOMES

USER WORKFLOW IS CRITICAL









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The Solution

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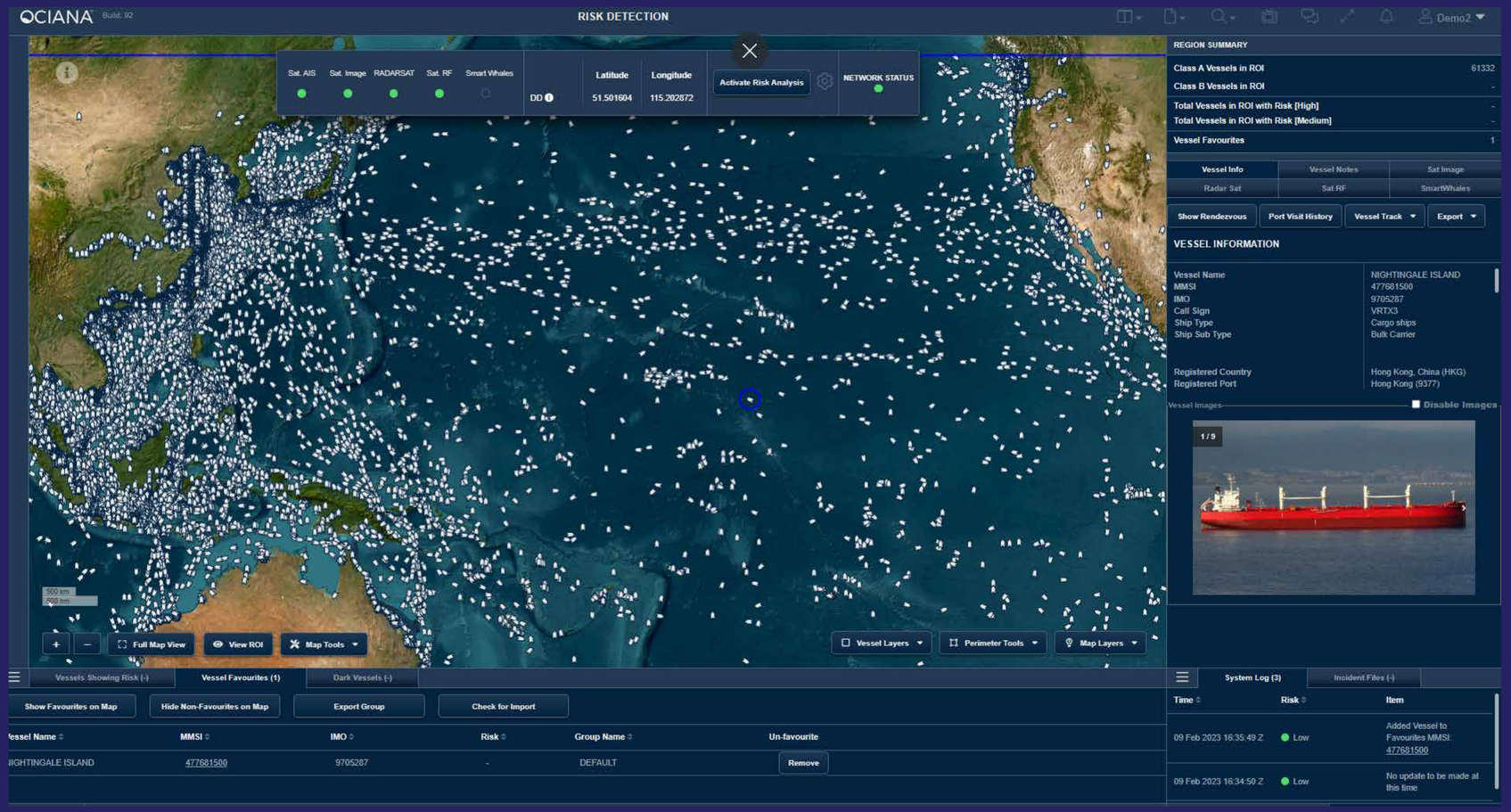
Maritime Management Platform



- Cloud-native platform
- Modular design
- Leverage global data
- Multiple access methods:
  - Applications,
  - Reports,
  - APIs (Data)

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Solution

Some Early Modules

- **Advanced Planning & Scheduling**
  - AI-powered Long-Horizon ETA Predictions
  - AI-powered predictive ETDs
  - What-If Analysis &
  - Sequence Planning

- **JIT Optimization**
- **Advanced Geofencing & Off-Route/ETA Alerts**
- **Anchorage Management and Reporting**
- **Carbon Calculator (Port, Terminal or Trip based)**
  - GHG Emissions Forecasts & Planning for Regions and Routes
  - CII metrics
- **Port and Traffic Analytics**

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Vessel Management

The Supply Chain: Example Requirements

- Vessel wait/delay times reduced
- Vessels arrive when resources available
- Vessels arrive/depart from the berth on time
- Optimized intermodal transfer
- Optimized transshipments
- Reduced dwell times
- Cargo tracking and management
- Reduced emissions and environmental impacts

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Time zone is America/Halifax

ETA v0.6.13

Choose Port

Halifax

Search Vessel

HYUNDAI FAITH
ETA: 2022-09-15 17:07:46

ETA prediction is 12 hours and 7 minutes later than the self-reported ETA.

This is within one day of the self-reported ETA

ETA | Analysis

Table of Recent Arrivals

Vessels that have arrived in the last 30 days.

Search:

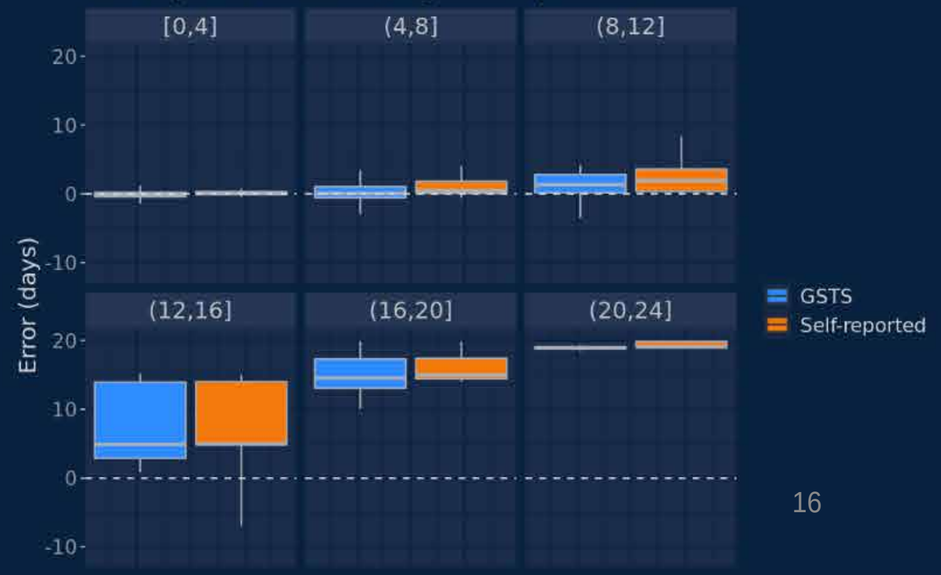
	Name	Actual Time of Arrival	Average GSTS Prediction	Average Self Report
1	VIVIENNE SHERI D	9/8/2022, 4:09:01 PM	9/6/2022, 9:23:59 PM	9/5/2022, 6:52:30 PM
2	CARNIVAL LEGEND	9/8/2022, 10:28:52 AM	9/9/2022, 7:52:27 AM	9/8/2022, 9:45:00 AM
3	ANNASTAR	9/8/2022, 7:40:27 AM	9/8/2022, 1:50:53 PM	9/8/2022, 9:00:00 AM
4	ZAANDAM	9/8/2022, 7:17:38 AM	8/31/2022, 2:48:35 PM	8/31/2022, 5:52:01 AM
5	ADVENTURE OF THE SEA	9/8/2022, 6:57:06 AM	9/8/2022, 5:49:00 PM	9/8/2022, 6:30:00 AM
6	NYK RIGEL	9/7/2022, 3:16:16 PM	9/6/2022, 12:16:22 PM	9/5/2022, 3:54:05 PM
7	MOL MAESTRO	9/6/2022, 6:25:25 AM	9/6/2022, 8:12:29 AM	9/6/2022, 3:00:00 AM
8	CMA CGM MARCO POLO	9/6/2022, 4:54:33 AM	9/4/2022, 1:17:26 AM	9/3/2022, 9:28:41 PM
9	FEDERAL RIDEAU	9/6/2022, 12:20:50 AM	9/6/2022, 5:07:19 AM	9/6/2022, 5:54:43 AM
10	CARIBBEAN PRINCESS	9/5/2022, 8:15:39 AM	8/23/2022, 8:25:25 AM	8/23/2022, 4:10:38 AM
11	SEABOURN QUEST	9/5/2022, 7:40:06 AM	9/5/2022, 7:55:32 AM	9/5/2022, 7:15:00 AM
12	TROPIC LISSETTE	9/5/2022, 7:33:20 AM	8/30/2022, 2:18:41 AM	8/28/2022, 10:18:36 PM
13	MEIN SCHIFF 1	9/5/2022, 7:20:05 AM	9/5/2022, 12:06:21 PM	9/5/2022, 7:00:00 AM
14	MSC SANDRA	9/4/2022,	9/5/2022, 3:10:55	9/4/2022,

Historical Model Prediction Error

Model performance over time. Values closer to 0 are better.

Error Boxplots Separated by Trip Length

Error is how far off the prediction is (in days).
Each boxplot is calculated for a segment of trip duration.



Real-time vessel ETA prediction and analysis

Time zone is America/Halifax

ETA v0.6.13

Choose Port

Halifax

Search Vessel

HYUNDAI FAITH
ETA: 2022-09-15 17:07:46

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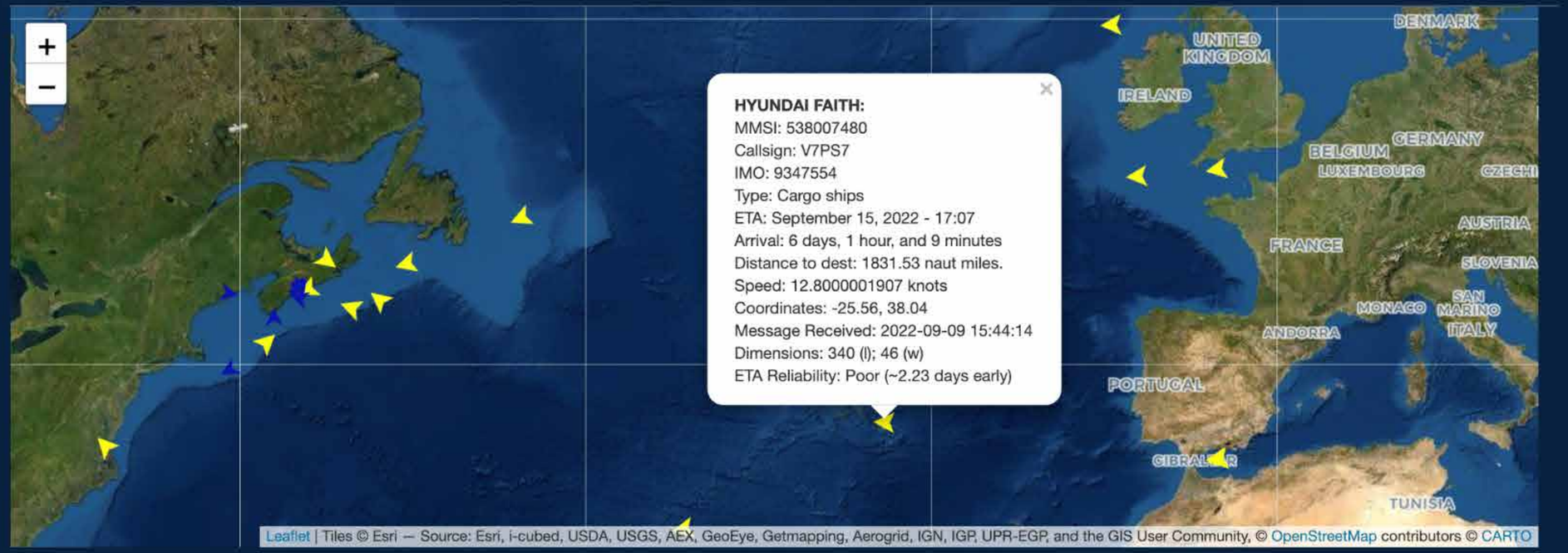
This is within one day of the self-reported ETA

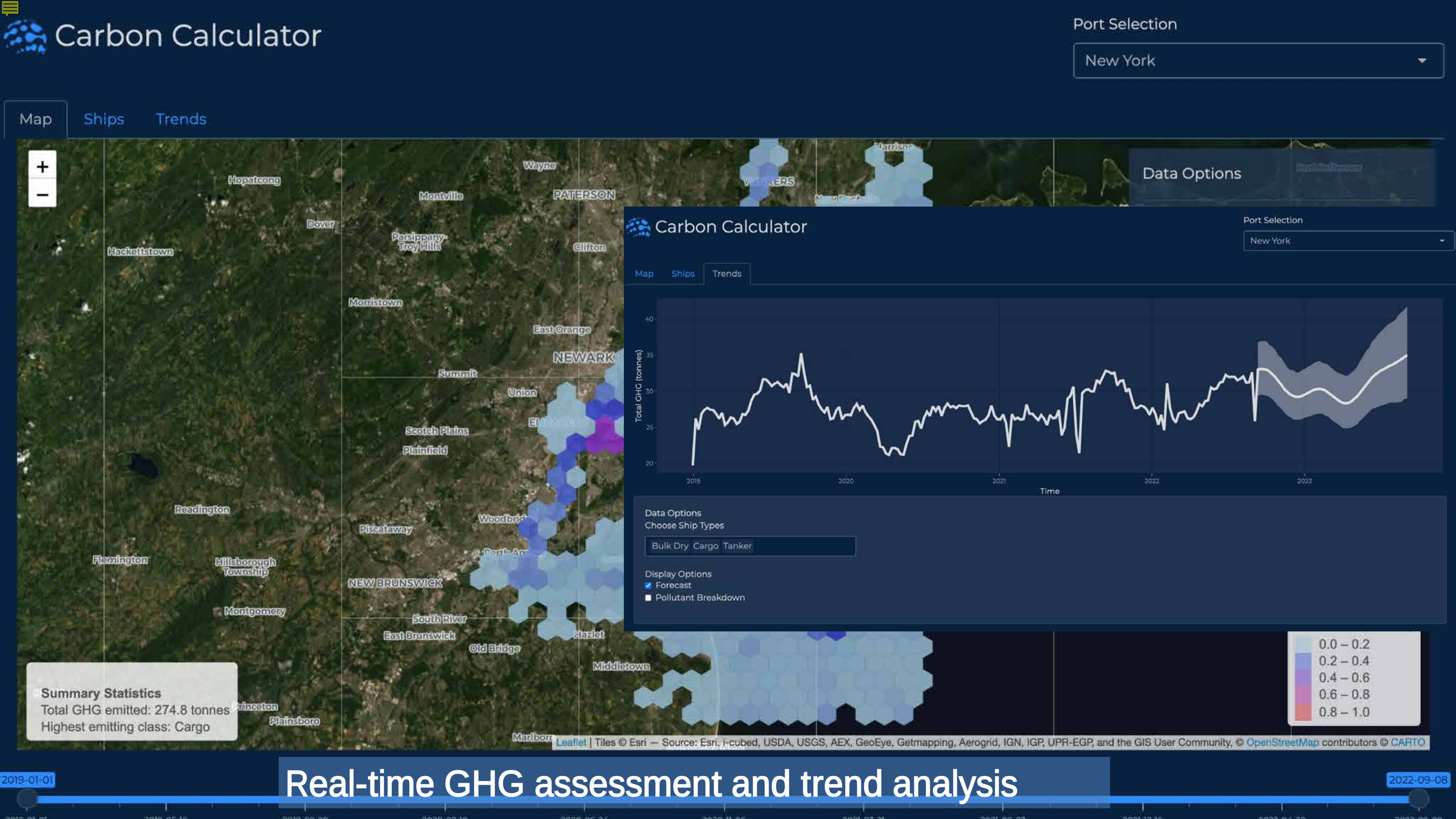
ETA | Analysis



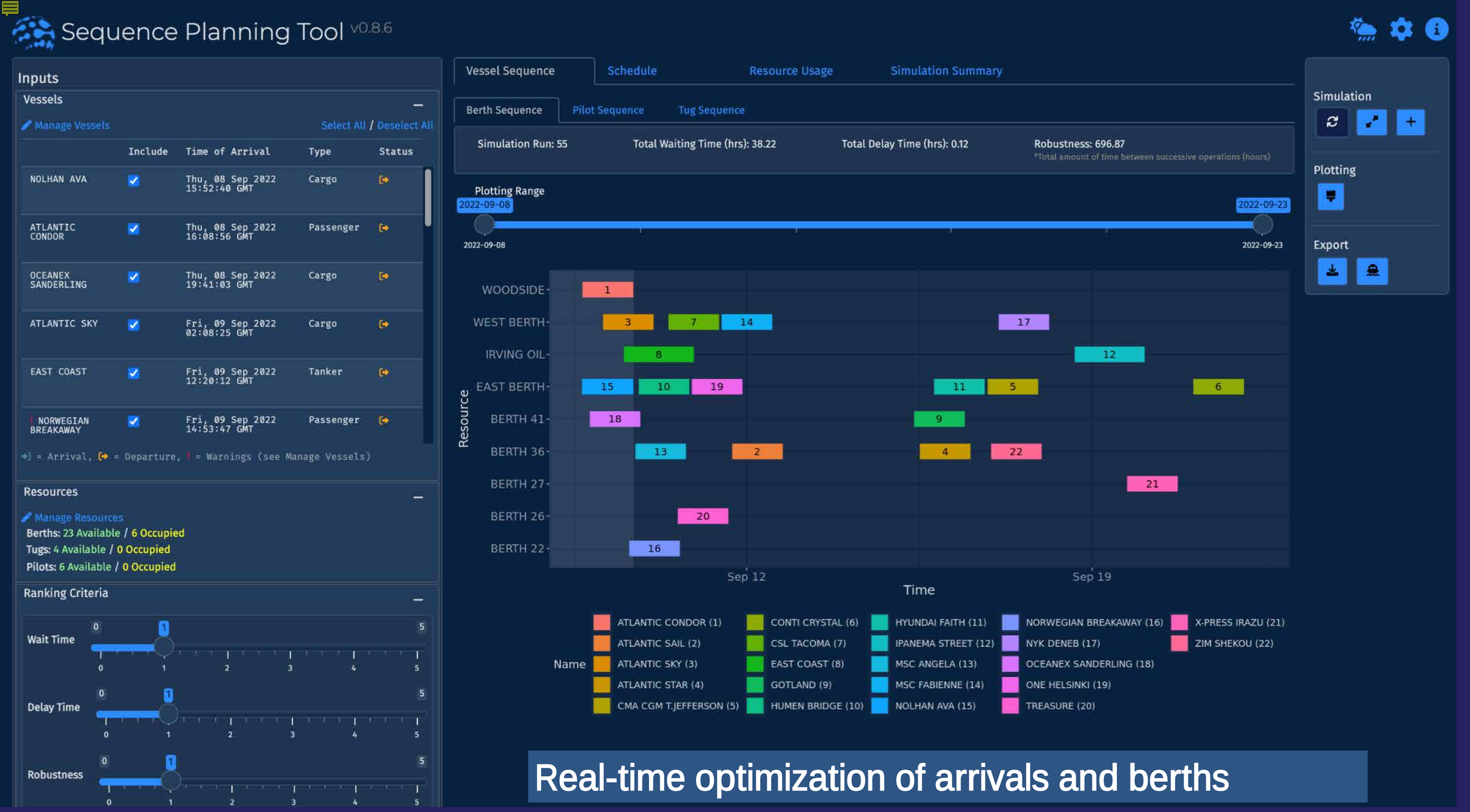
Search:

	MMSI	Name	Callsign	IMO	Time to Arrival	Predicted ETA
1	354415000	MSC FABIENNE	H3SF	9279965	17 hours and 10 minutes	9/10/2022, 9:08:23 AM
2	373119000	ONE HELSINKI	3FIW4	9588081	18 hours and 40 minutes	9/10/2022, 10:38:57 A
3	636016742	TREASURE	D5HO2	9184859	18 hours and 52 minutes	9/10/2022, 10:50:57 A
4	311057100	CSL TACOMA	C6ZJ7	9640956	22 hours and 46 minutes	9/10/2022, 2:43:59 PM
5	538003543	PEARL MIST	V7RM9	9412701	1 day, 2 hours.	9/10/2022, 6:47:59 PM

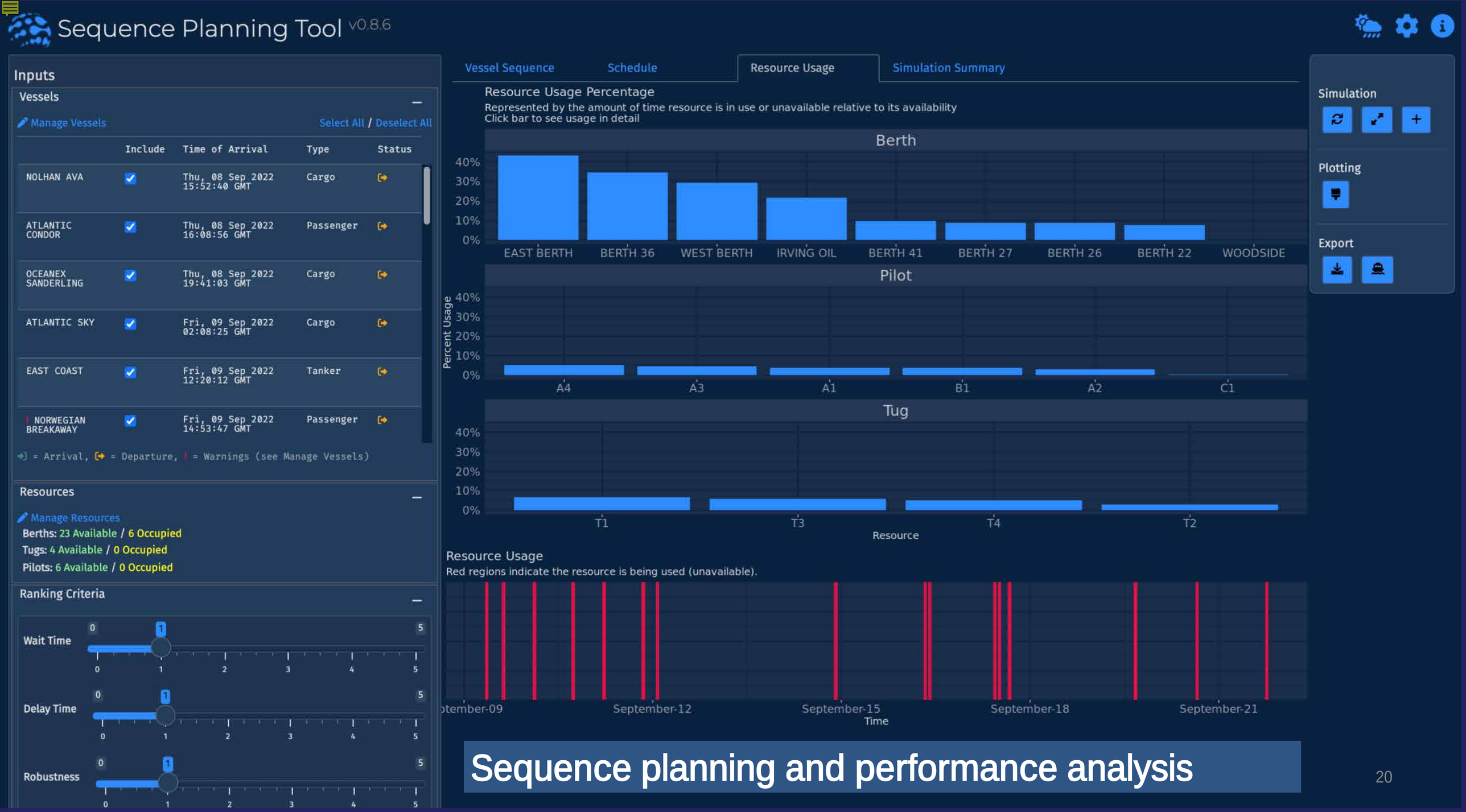
Real-time vessel ETA prediction and analysis



Real-time GHG assessment and trend analysis



Real-time optimization of arrivals and berths



Sequence planning and performance analysis

The Solution

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Robust Maritime AI Platform that integrates with existing systems through modularized design

Application

Multi-purpose tool that provides analytical, communication, scenario, and visualization capabilities

Dashboard

Interactive visual tools that provide insights to assist with targeted decision making

Data

Access to clean, current and reliable data for the use in analytical modelling and situational analysis

Report

Static visual information artifact that provides insights to assist with informed decision making

The Evidence

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Reduce Environmental Impacts for Ports, Terminals and Vessel Operators

Ports and Terminals:

- Optimize resources
- Maximize berth utilization
- Relieve congestion
- Reduce GHG emissions
- Competitive edge

Vessel Benefits:

- Avoid navigation constraints
- Arrive JIT
- Consume less fuel
- Reduce GHG emissions

Early Adopters

Initial Customers in the Maritime Sector

- Montreal Port Authority:
  - *AI-based Vessel Management Capability; GHG Forecasting & Ice Management*
  - *5-Year OCIANA⁻ subscription to support ETA Predictions and Alerts*
- Laurentian Pilotage Authority
  - *OCIANA⁻ Co-Development Project (Smart Geofencing System for Pilot Dispatch)*
- CSL
  - *OCIANA⁻ Co-Development Project*
- Halifax Port Authority
  - *OCIANA⁻ Co-Development Project (Vessel Schedule Optimization)*
- Port of NYNJ
  - *OCIANA⁻ Co-Development Project (Anchorage Management)*
- AirBus Space and Defence, Co-Innovation
  - *Advanced Maritime Risk Detection and Assessment Capabilities in support of maritime border security and surveillance.*
- Thales Canada
  - *Application of Novel AI Techniques to Performance Management Data in support of Equipment Health Monitoring.*
- Government of Canada
  - *Royal Canadian Navy,*
  - *Coast Guard,*
  - *CBSA*
  - *OCIANA⁻ Subscription*

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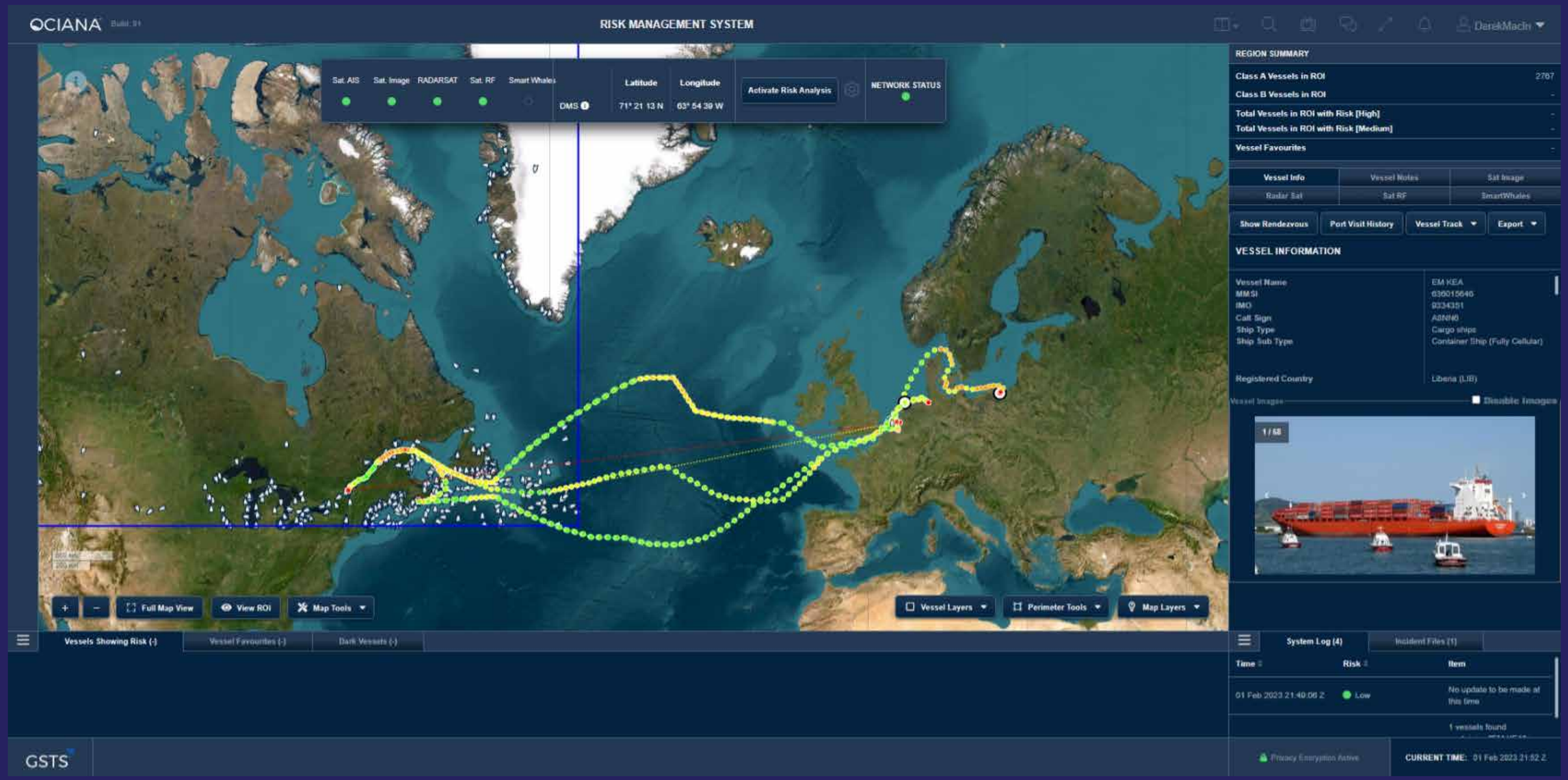
A Digital Corridor



The Vision

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Digitally Enabled Corridors

- Improving data collaboration and connectivity
- Enabling all stakeholders in the port call process (ports, terminal operators, ocean carriers) to improve efficiency and capacity.
- Leverages a common window (OCIANA platform) to:
  - receive better information sooner on vessel movements and vessel berthing delays,
  - coordinate better on planning as it pertains to berthing windows,
  - provide better support for dynamic decisions and surge capacity, and

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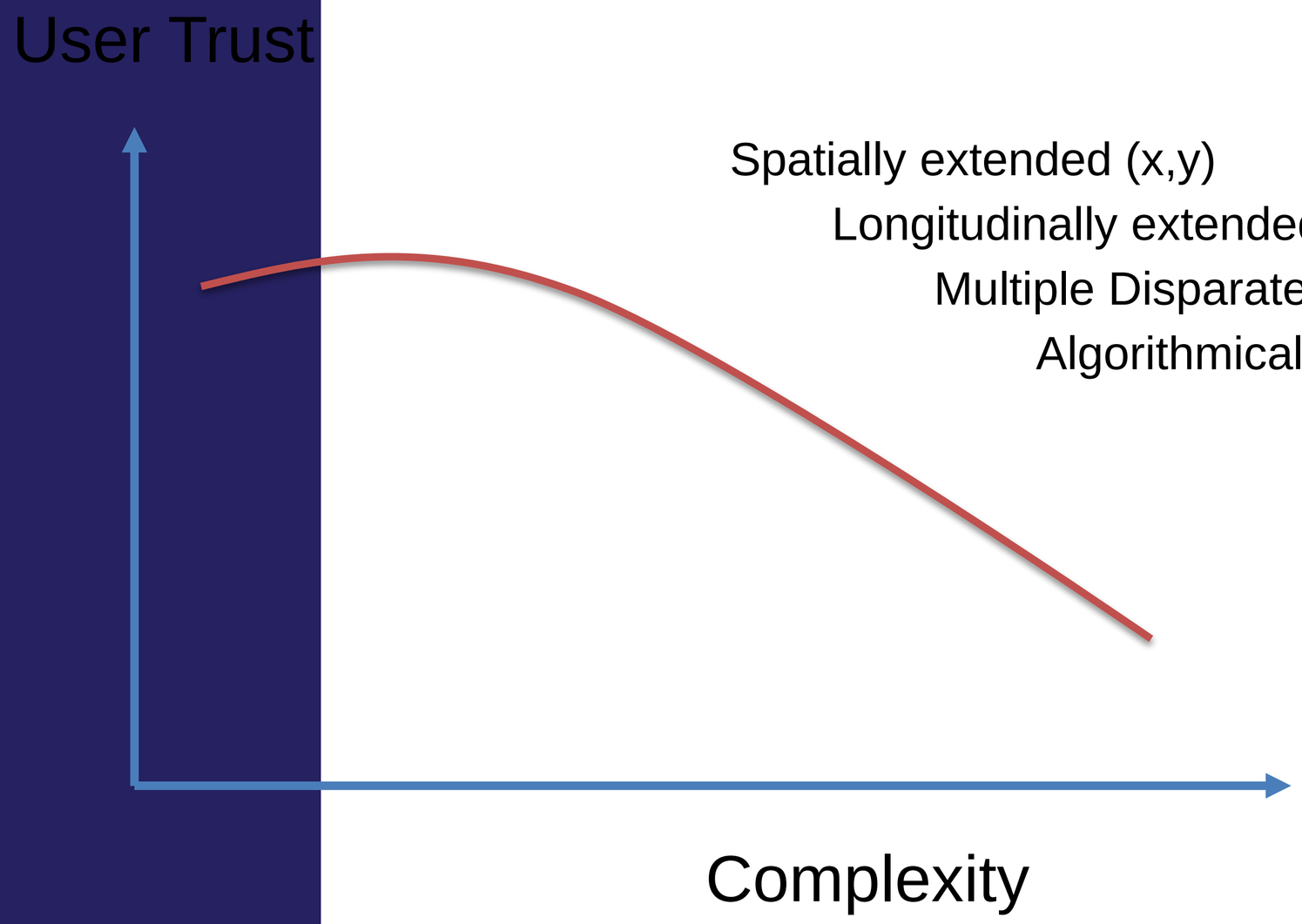
Contact: rob.marshy@gsts.ca

February 2023

KEY OUTCOMES



Spatially extended (x,y)

Longitudinally extended (t)

Multiple Disparate sensors (1,2,3..)

Algorithmically Unintuitive (a,b,c)

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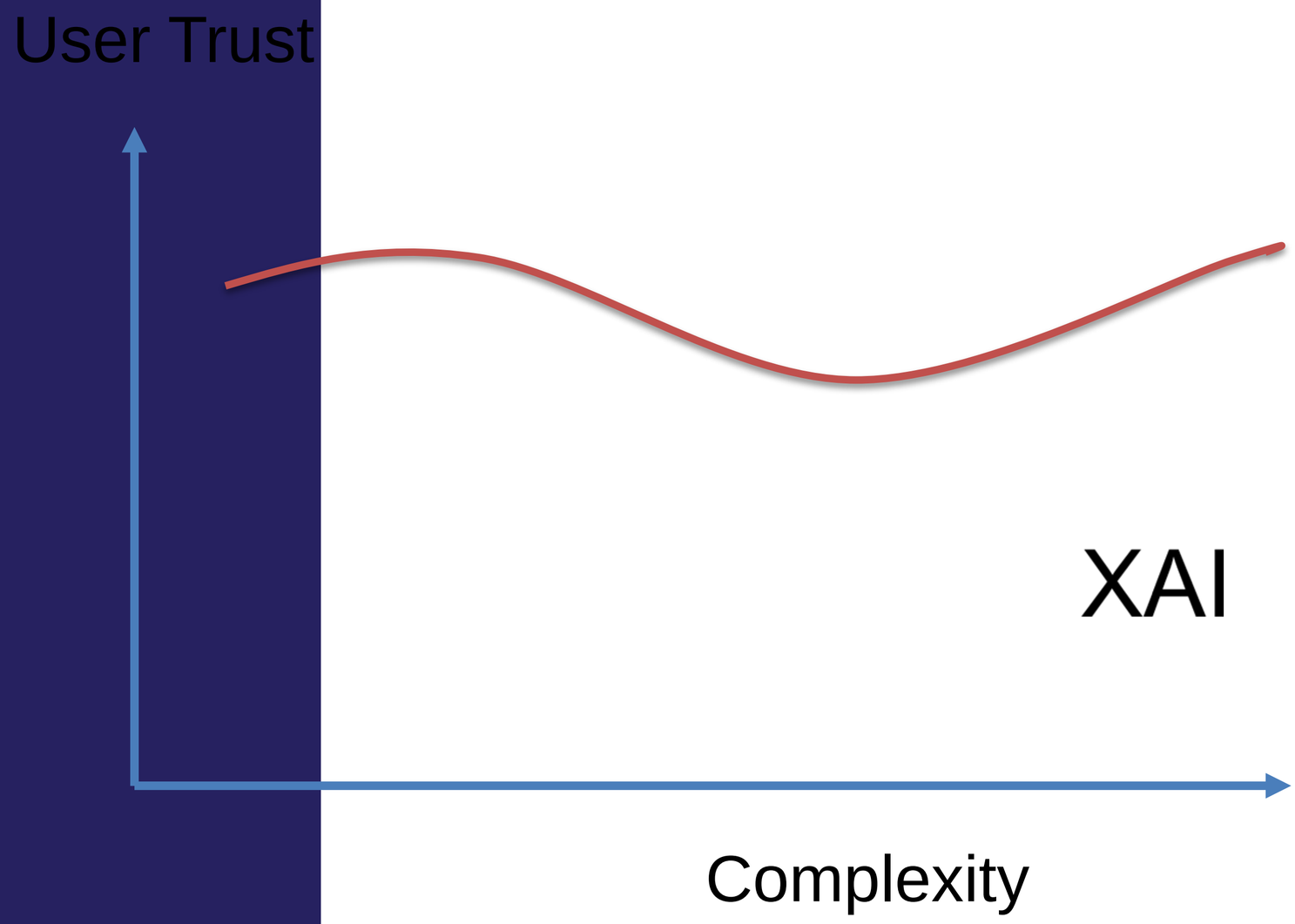
KEY OUTCOMES



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The Evidence

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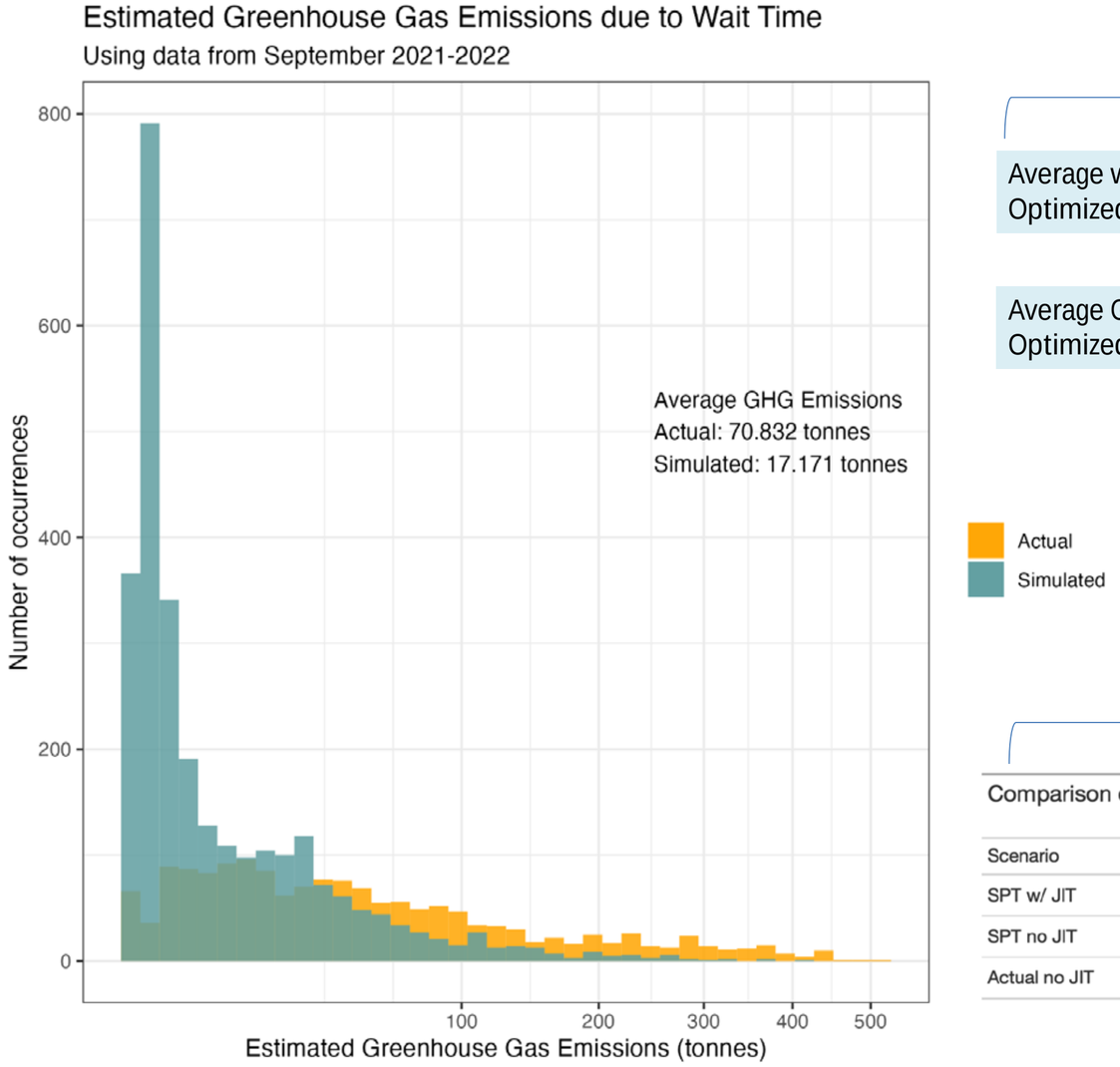
Analysis: Quantifying the Impact of Actionable Maritime Intelligence on Emissions



Simulation assumes 64-76 hours berth time, 3 hours to navigate from anchorage to port, 1.5 hours to setup berth following previous, 1 hours to setup tugs and pilots following previous.

Reducing Wait Times

Average wait time: 32.68 hours
Optimized average wait time: 15.09 hours

Average GHG emissions: 70.83 tonnes
Optimized average GHG emissions : 17.17 tonnes

Slowing Vessel Speed

Comparison of GHG Estimates for Trips using Combinations of SPT and JIT

GHG Estimates for an average trip to USNYC

Scenario	Estimated GHG (tonnes)	% Reduction from Actual
SPT w/ JIT	2421.16 (3579.76 SD)	15.00%
SPT no JIT	2772.66 (4122.49 SD)	2.00%
Actual no JIT	2832.13 (4159.56 SD)	0.00%