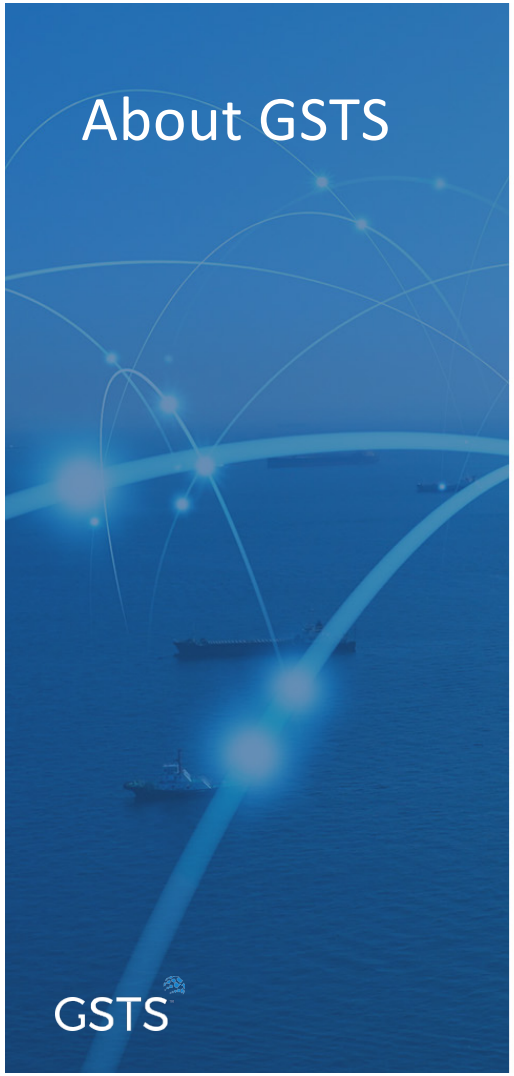


- Canadian Maritime AI Company - federally incorporated
- Data-driven solutions to enhance decision making in the maritime domain
- AI-based solutions based on historical and real-time data (AIS, Optical, SAR, RF, Oceanographic and Environmental)
- Solutions delivered through proprietary SaaS Platform – OCIANA

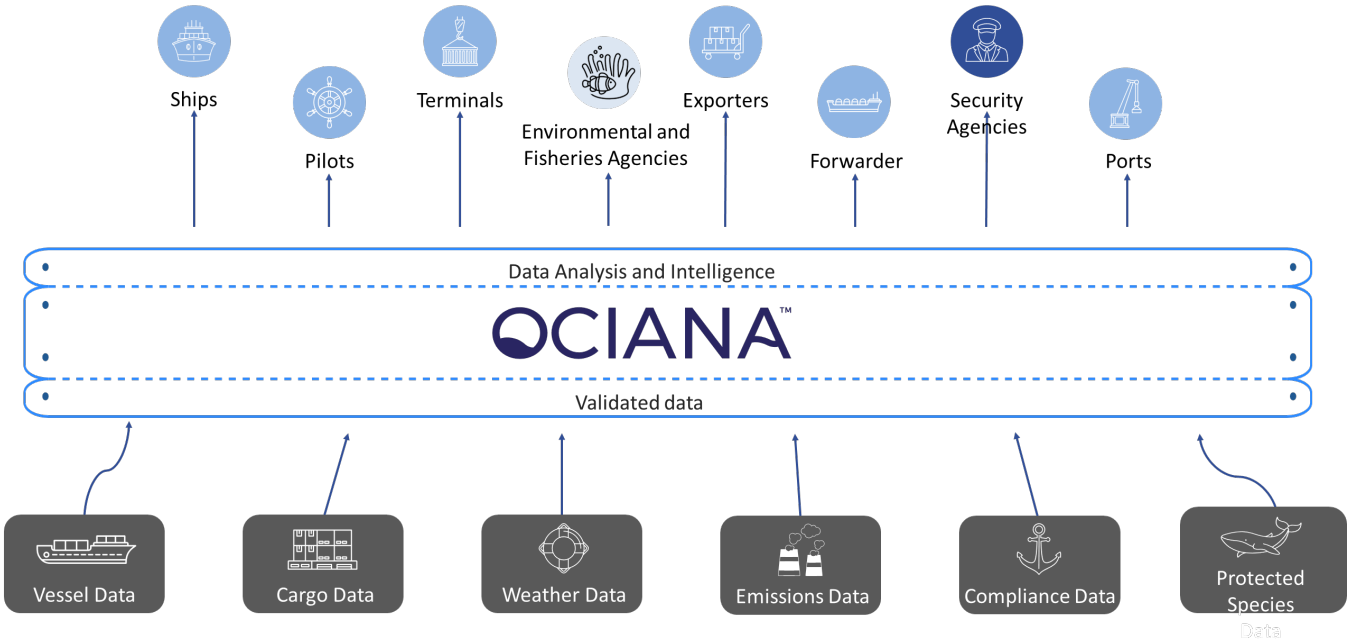
A Powerful AI driven Platform

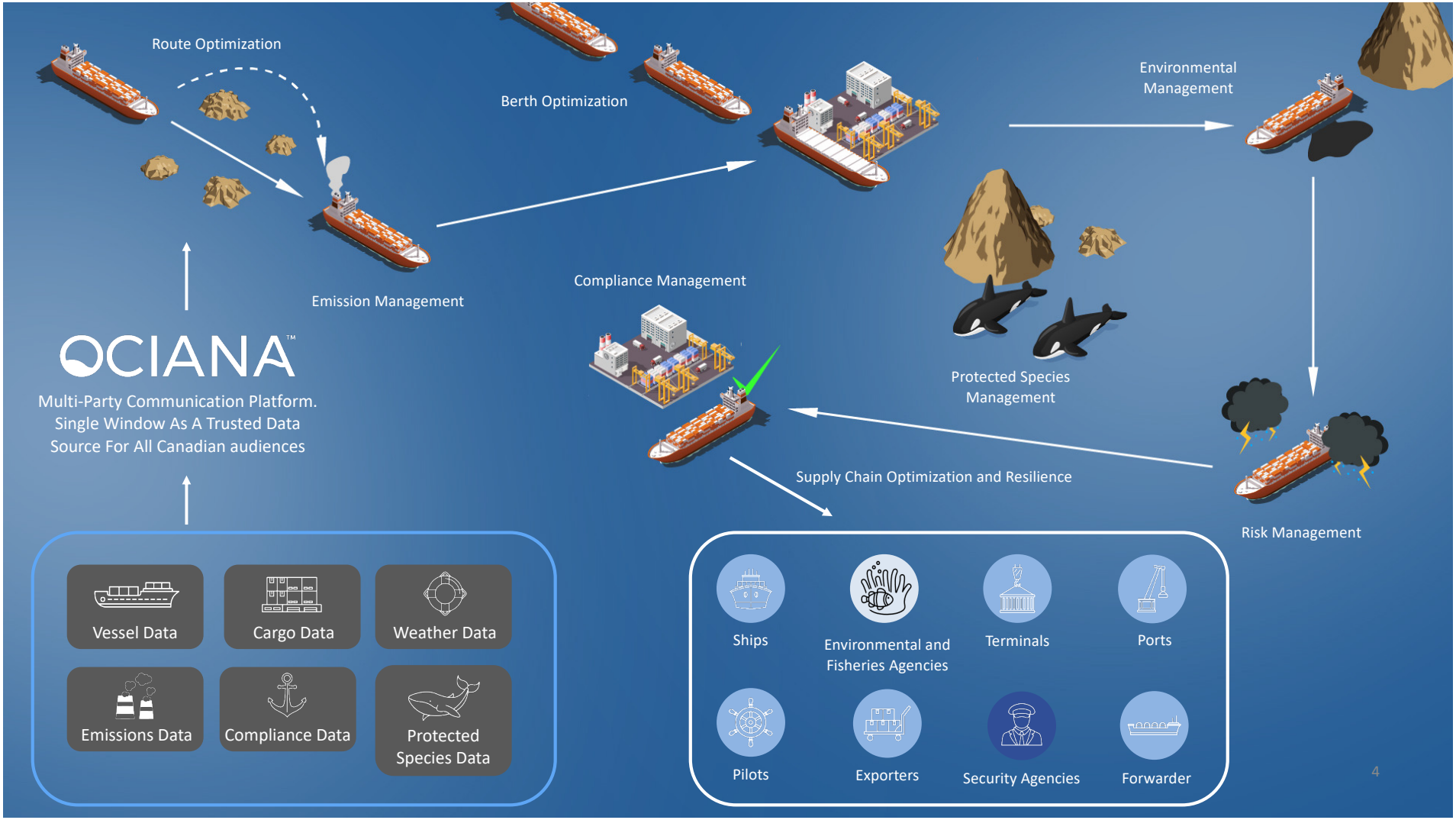
Flexible and Scalable

Maritime Operations And Risk Management

Can Integrate with or augment existing solutions

Single Platform Solution




Route Optimization
Berth Optimization
Environmental Management
Emission Management
Compliance Management
Protected Species Management
OCIANA™
Multi-Party Communication Platform.
Single Window As A Trusted Data
Source For All Canadian audiences
Supply Chain Optimization and Resilience
Risk Management
Vessel Data
Cargo Data
Weather Data
Emissions Data
Compliance Data
Protected Species Data
Ships
Environmental and Fisheries Agencies
Terminals
Ports
Pilots
Exporters
Security Agencies
Forwarder

AIS Class A

118 (1) The following vessels must be fitted with an AIS Class A:

(a) vessels that are 20 m or more in length, other than pleasure crafts;

(b) vessels that carry more than 50 passengers;

(c) vessels transporting substances, materials or articles to which the *International Maritime Dangerous Goods Code*, published by the IMO, applies;

(d) vessels carrying *pollutants*, as defined in section 165 of the Act, in bulk;

(e) dredges or floating plants that are located in any place where they constitute a collision hazard to other vessels; and

(f) towboats that are 8 m or more in length.

AIS Class A or B

(2) Every vessel, other than a vessel referred to in subsection (1), that is engaged on a voyage other than a sheltered waters voyage must be fitted with an AIS Class A or an AIS Class B if

(a) it is a passenger vessel; or

(b) the vessel is 8 m or more in length and carries a passenger.

In Canada:

What is a Dark Vessel?

Safety of Life at Sea (SOLAS), International Convenetion requires:

- all ships of 300 gross tonnage and upwards engaged on international voyages,
- cargo ships of 500 gross tonnage and upwards not engaged on international voyages and
- passenger ships irrespective of size

to be fitted with an automatic identification system (AIS)

Any vessel that is required to have AIS on but does not, can be considered dark[5]

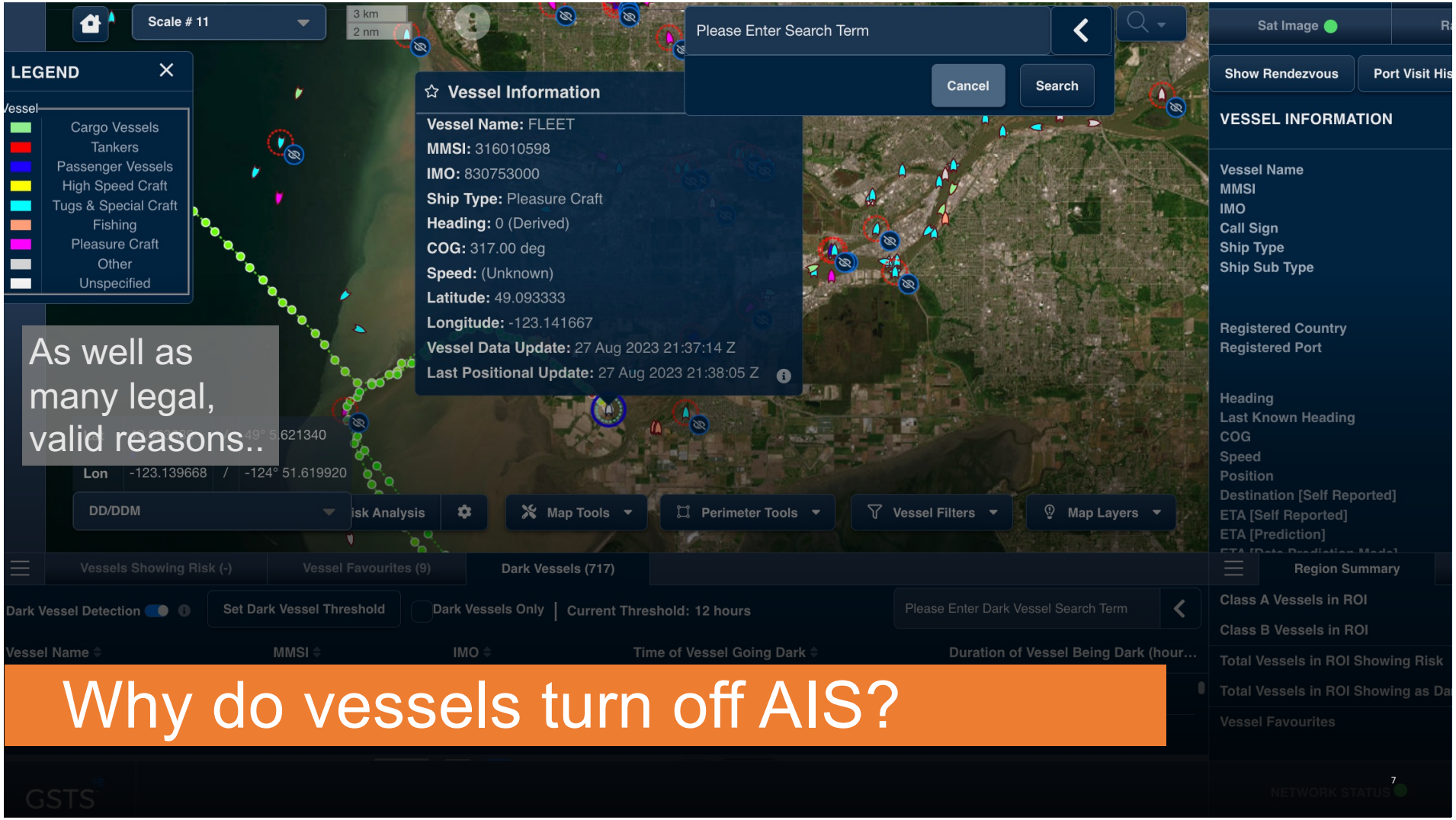
Why do vessels turn off AIS?

Illegal, unreported, and unregulated fishing

Source: Alex Hafford/AFP Image Forum/Getty Images

Illegal cargo

Source: Indonesian Maritime Security Agency



Why do vessels turn off AIS?

Risks of Inaction:

"Beyond the Horizon: Role of Technology in Mitigating Shipping Risk

Environmental Risks:

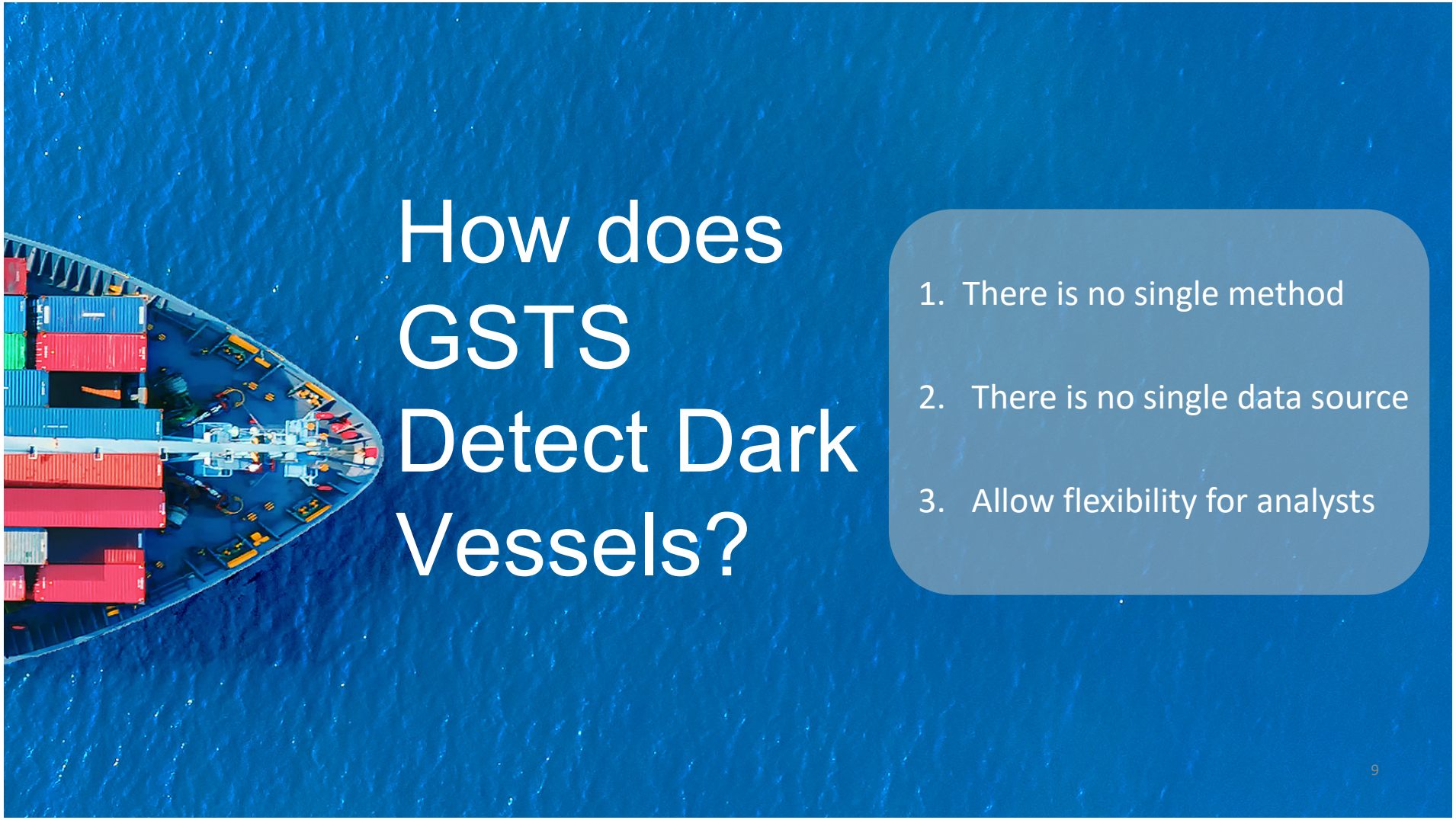
- Illegal at-sea transfers pose significant risk for environmental disasters
- Over-fishing and fishing in ecologically sensitive zones and protected areas

Security Risks:

- Movement of contraband cargo
- Sanctions violations

Operational Risks:

- Port schedule disruptions
- Port schedule optimization (e.g., SOP) in support of efficiency and decarbonization goals



How does GSTS Detect Dark Vessels?

1. There is no single method
2. There is no single data source
3. Allow flexibility for analysts

1. Image

- High and moderate resolution optical image inputs
- Vessel detection modelling using computer vision models
- Fusing detections with AIS messages to correlate identity and flag dark vessel risks

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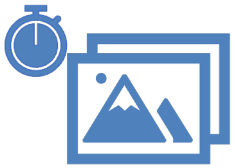
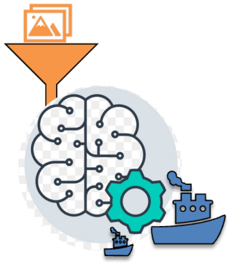
IMAGE-BASED VESSEL DETECTION AND DARK VESSEL DATA FUSION



COLLECTION - INGESTION

Image Ingestion
- Radar
- **Optical**

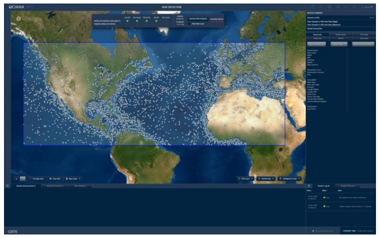


VDM -PROCESSING

Pre-processing imagery
Running VDM (Vessel Detection model)

DATA FUSION

Fusion AIS tracks + VD Validation



DELIVERING

Risk management

How Does The Image Dark Vessel Detection Capability Work?

- Data fusion matches an image detection to the closest AIS message.
- Spatial and temporal matching criteria context dependent
- Also have models for moderate and high resolution Radar imagery*

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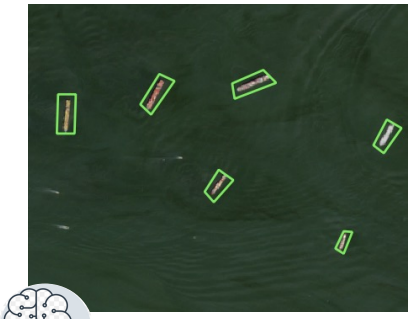
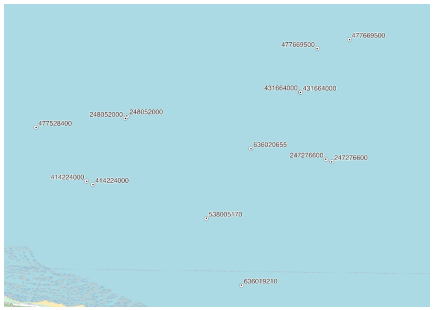
IMPLEMENTATION OF DARK VESSEL DETECTION



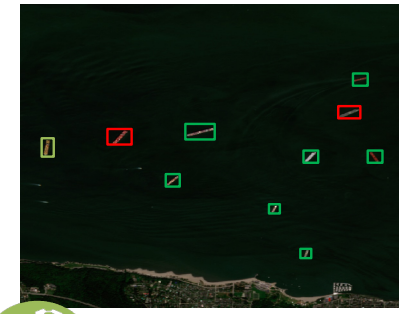
VDM

Detecting vessels in Imagery (Optical / SAR)



AIS DATA

Use AIS positions and tracks



FUSION

Spatial/Temporal match

Same time window

2. Profile

- Frequency of AIS messages varies based on a variety of factors
- Build expected message gap for each vessel
- Identity anomalies where message gap exceeds expected based on vessel, location & activity

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PROFILE-BASED DARK VESSEL DETECTION

BUILD PROFILE

AIS Ingestion
- Per vessel
- Regular updates
- By region, activity

IDENTIFY ANOMALIES

At a regular schedule monitor message gaps and compare to profiles

ADD RISK RESULTS

Where dark anomalies are found, add to risk results and surface results to users

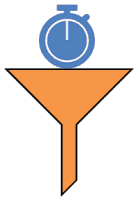
3. Threshold

- Operators also require simple, alterable, explainable tools to build maritime intelligence
- Set threshold to see vessels who have not reported in X hours

THRESHOLD-BASED DARK VESSEL DETECTION

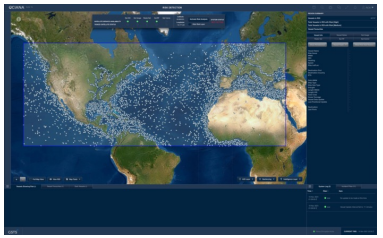
SET THRESHOLD

User set in Ociana UI



COMPARE CURRENT GAPS

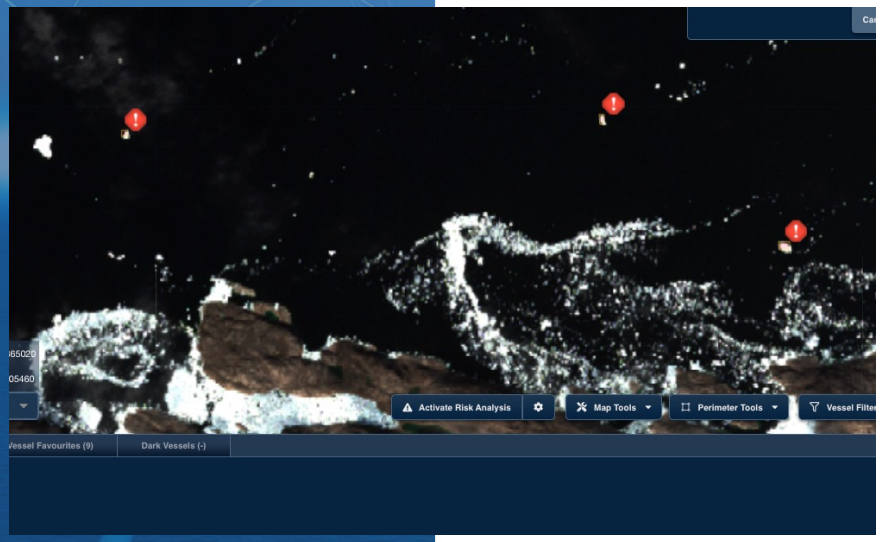
Calculate all current message gaps and compare to threshold



SURFACE RESULTS

Where dark anomalies are found, surface results to users

Challenges and Ongoing R&D



Validation:

- Very challenging to validate DV models
  - Built a scraping framework to collect publicized maritime events
- Imagery-based models require extensive an ongoing validation and retraining

Vessel Identity:

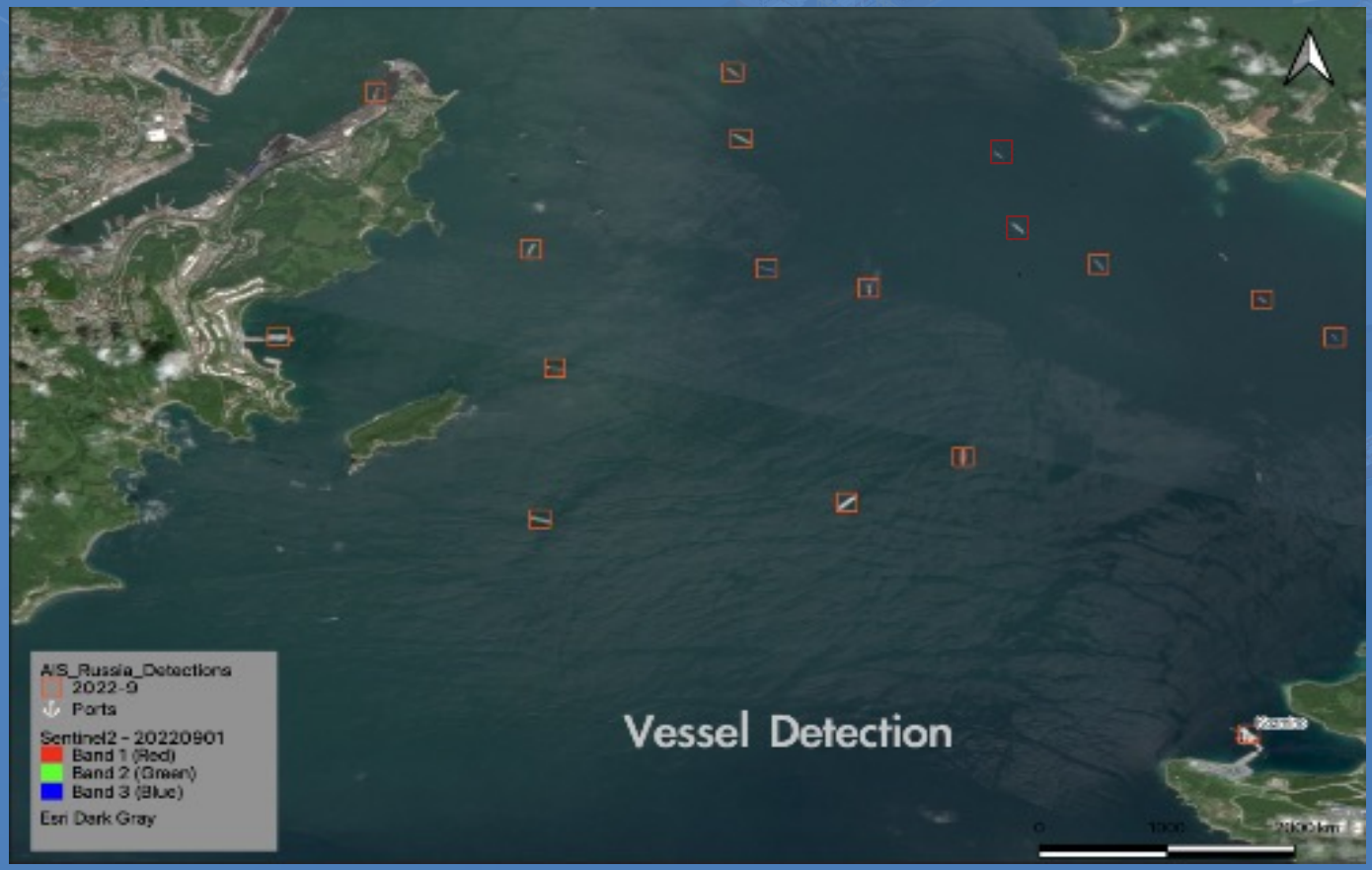
- AIS spoofing intersects with DV activity
- Integration of identity analysis fusion with DV models

High Resolution and Tasking:

- Models for <1 m optical and radar – how to automate tasking into the platform

Example: Oil Tanker Detections

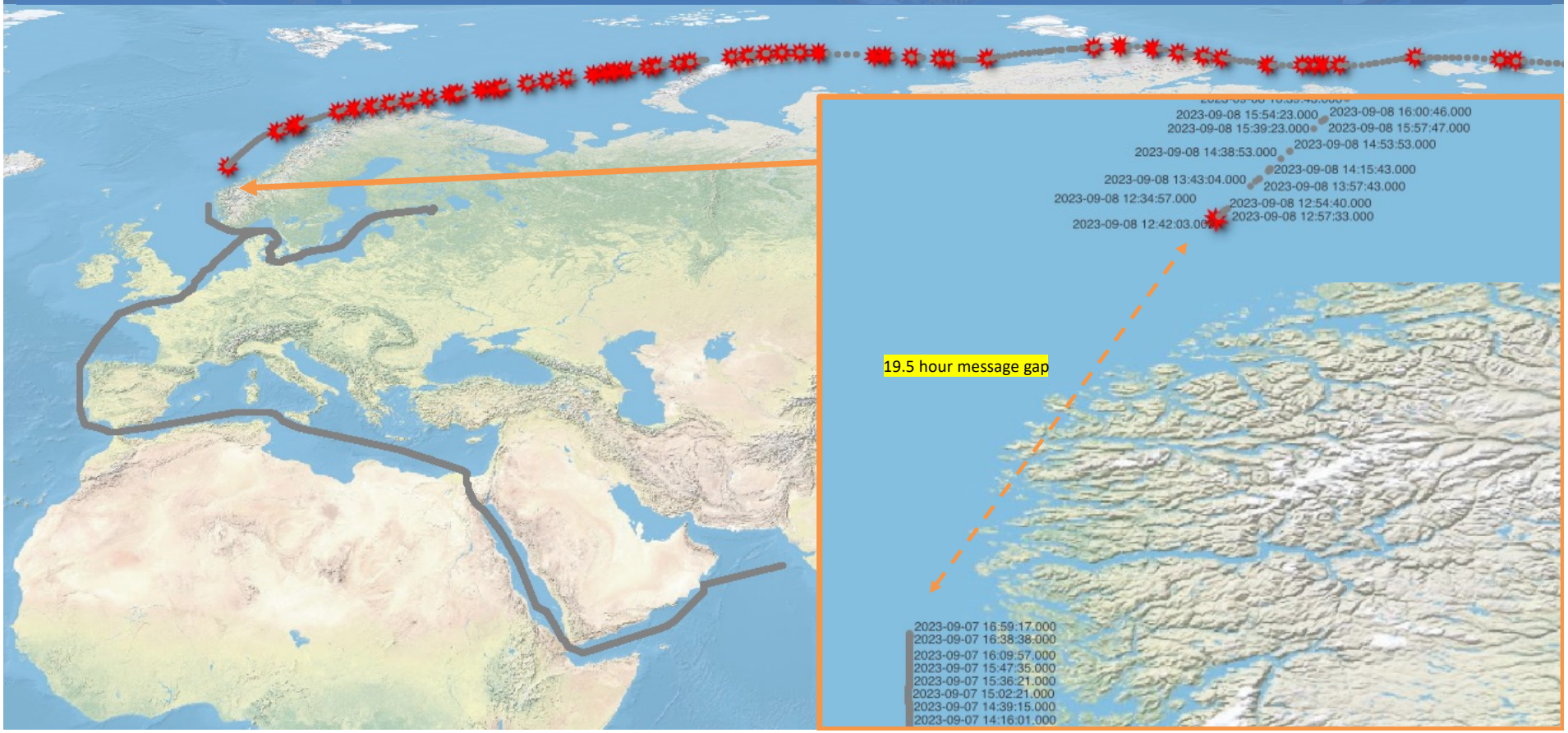
Detections in September 2022, near Vladivostok, RU



Example: Oil Tanker, 2023-Aug:Sept

Within expected message gap threshold

Exceeds expected message gap threshold



Example: What is the Operational Impacts of Dark Vessel Port Calls

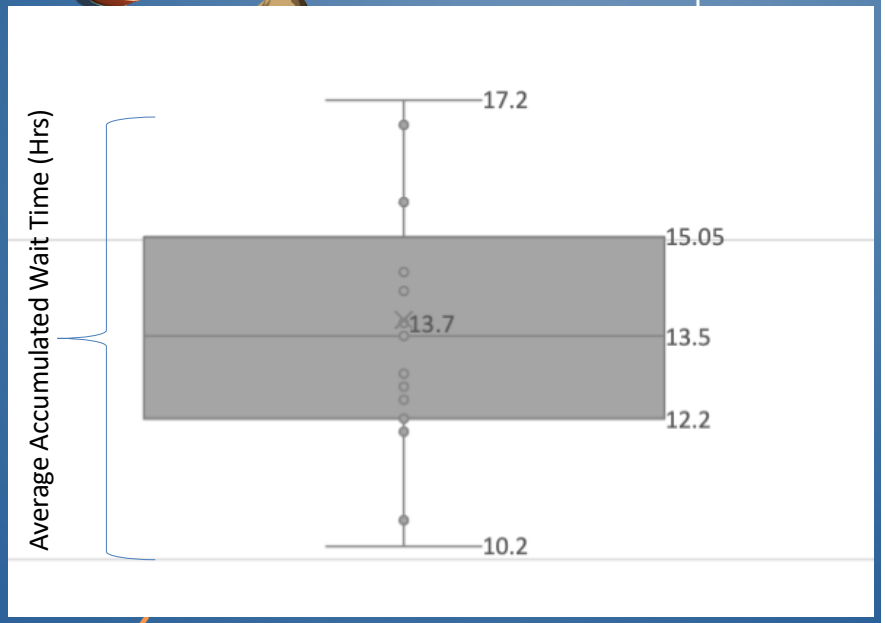
Simulation study examining impact of calls from previously dark vessels

% of Rep with disruptions = indicates the percentage of the experiments with Waiting and Delay times identified (values below 1 [h] are neglected).

% Ops with disruption (highest) = indicates the highest percentage of vessels' operations simulated that were identified with Waiting or Delay time at each experiment (values below 1 [h] are neglected).

Avg accumulated WT [h] = indicated the average value for the total amount of Waiting Time hours accumulated for each experiment, considering only the operations with WT above 1 [h].

Avg accumulated DT [h] = indicated the average value for the total amount of Delay Time hours accumulated for each experiment, considering only the operations with DT above 1 [h].

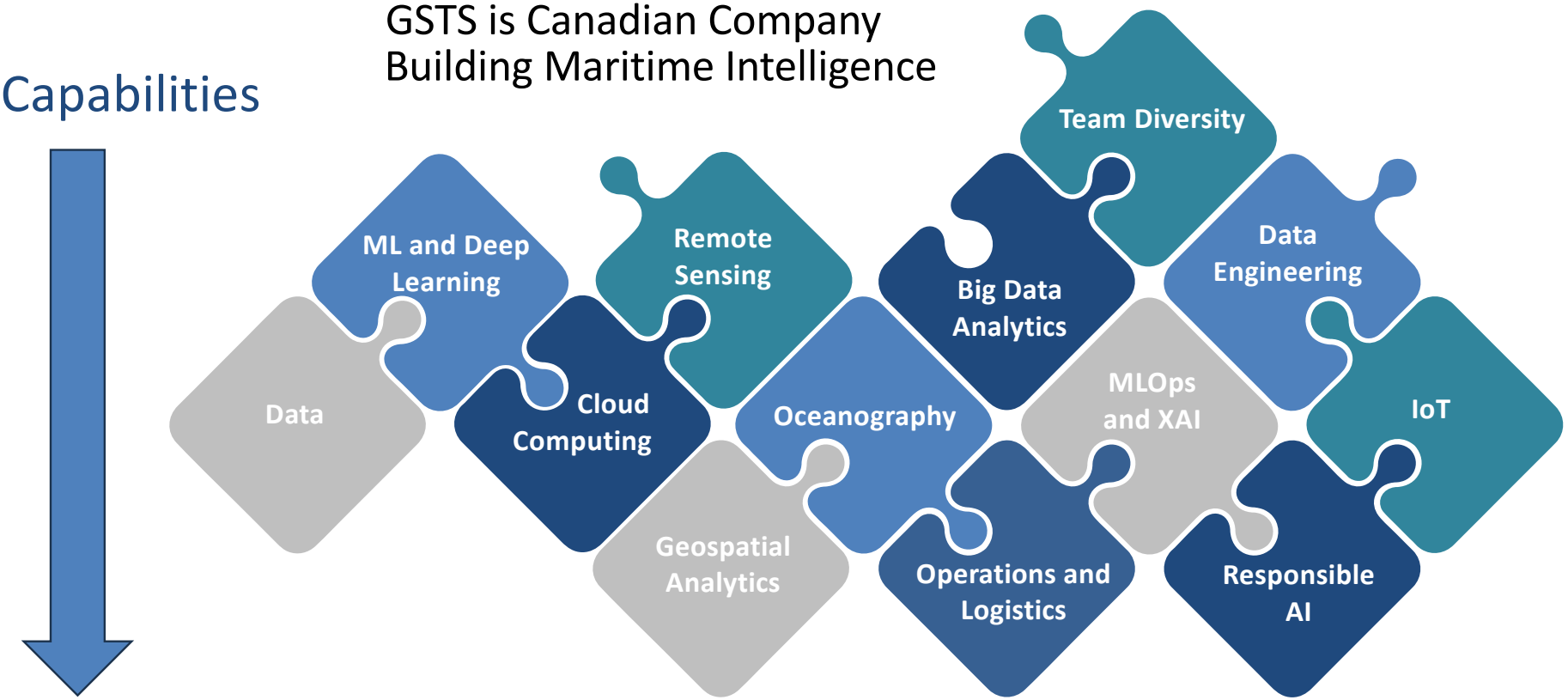


Summary

- Dark vessel detection is essential for reducing environmental, security, and operational risks in the maritime domain
  - Increase dark vessel activity and shifting patterns resulting from geopolitical tensions
- Multiple tools and data sources required to build maritime intelligence
- Providing access to dark vessel tools in Maritime AI Platfform provides single-pane view of maritime risks and large area surveillance/situational awareness
- AI brings new challenges as models require extensive data, training in a variety of environments, sensor types, sea states, etc.

GSTS is Canadian Company Building Maritime Intelligence

Capabilities



AI

Commercialization	IP Strategy	Data Governance	Infrastructure	Training
Research supports product development. CI/CD	3 Patents, 1 pending, 5 additional identified. Trade Secrets	Federated Data, Data Policies, Cybersecurity	State of the art tools	Continuous team training