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Shared Maritime Domain Awareness (MDA) for Smarter Shipping in the 21st Century

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Agenda

Vision/Prediction: Shared MDA will lead to smarter shipping, and it's already here

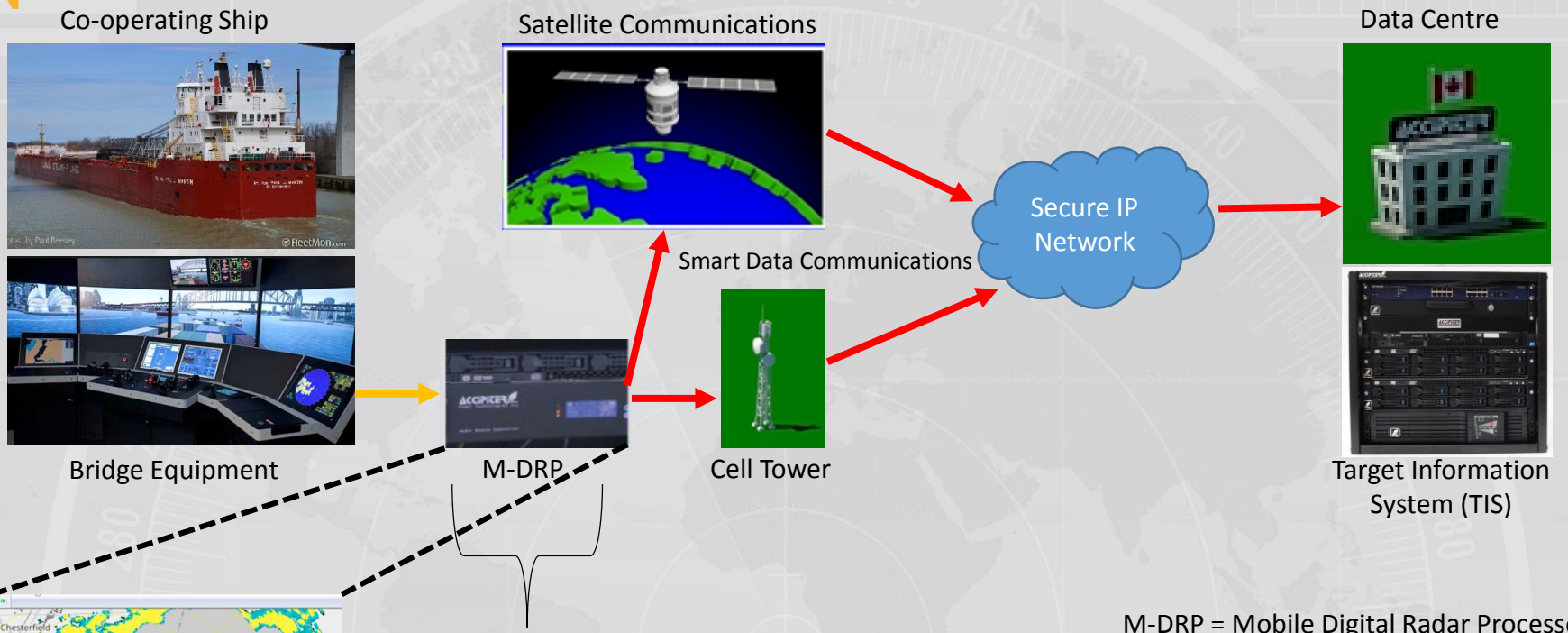
- What is Shared MDA?
  - Use Great Lakes St. Lawrence Seaway Shipping System (GLSLSSS) to illustrate
  - All shipping system stakeholders share radar-derived, maritime domain awareness to support individual play and team play. ***All vessel activity is captured, not just AIS-carrying ships***.
  - Provides decision support to each organization to optimize its own operations
  - Stimulates collaborative decision making (CDM) across the GLSLSSS
  - Fills awareness, safety and security gaps for Ports, Ship Operators, Pilotage Authorities, Terminal Operators, Seaway Authorities, CCG MCTS & USCG VTS. It supports e-Navigation.
- Why should I care?
  - Better ice awareness for unobstructed operations
  - Global Navigation Satellite System (GNSS) Backup (protect shipping against denial of service)
  - Operational efficiency (safely maximize the number of shipping runs each year). Optimizing speed can lead to significant fuel savings and lower GHG emissions as well.

What is Shared MDA?

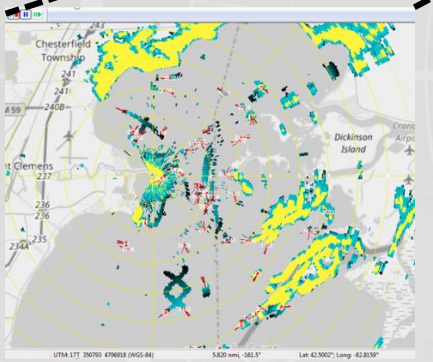
Shore-based and ship-based radars are connected to provide real-time MDA for vessel activity on the Great Lakes

What is Shared MDA?

Leveraging cooperating ships (crowdsourcing) with Accipiter® M-DRP appliance



M-DRP = Mobile Digital Radar Processor



M-DRP generates its own radar video, detections, & tracks from raw B-Scan signal. Ship radar undisturbed.

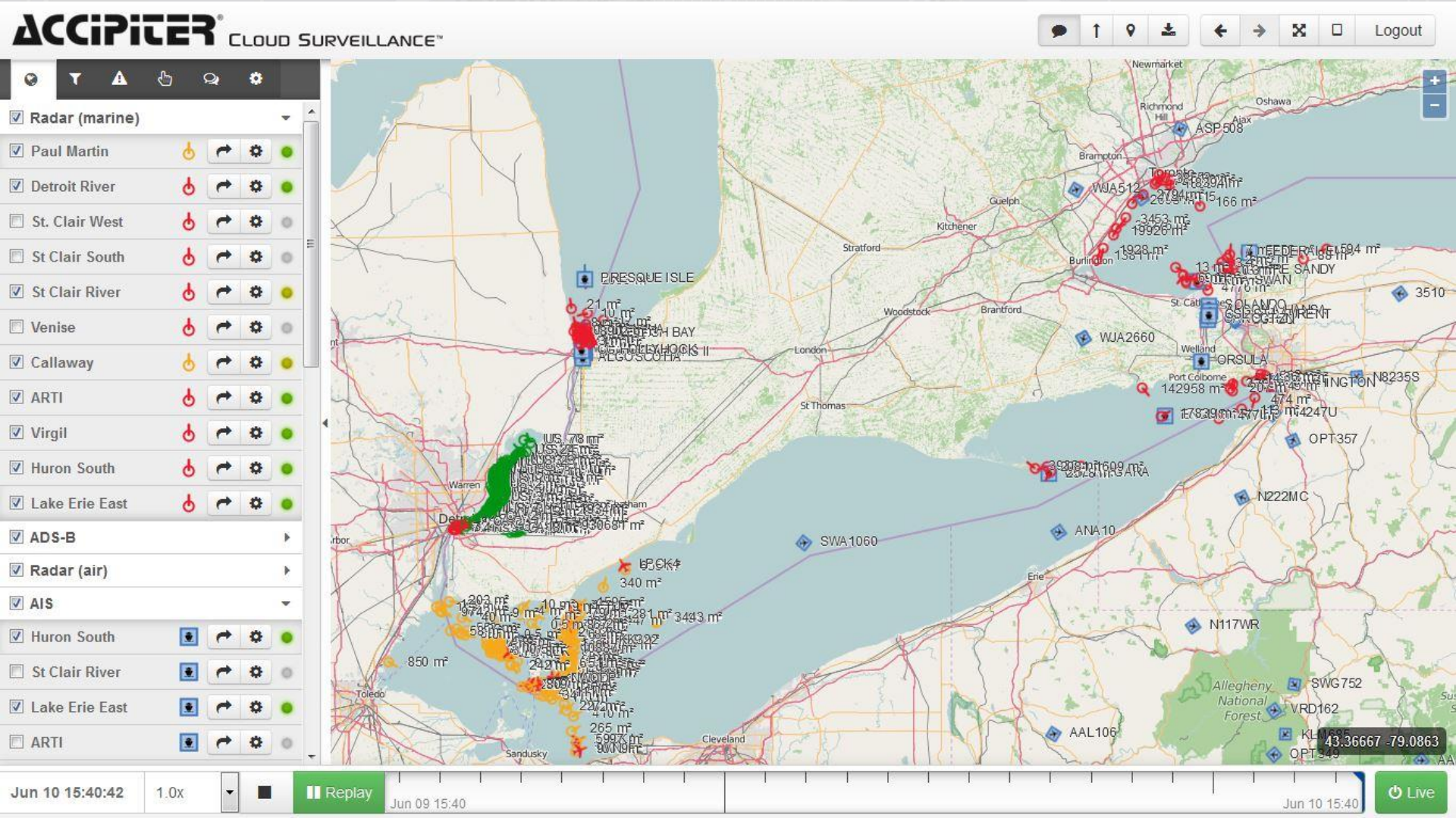
Currently Available Encrypted Real-time Data Sent to Data Centre

- Co-operating Ship GPS updates
- Vessel tracks produced by M-DRP vessel channel
- Aircraft tracks produced by M-DRP aircraft channel

Other shared data: AIS, ADS-B, ship-generated data, M-DRP generated weather data and ice data.

What is Shared MDA?

Radar, AIS and ADS-B, shore-based & ship-based are all integrated into this “app”

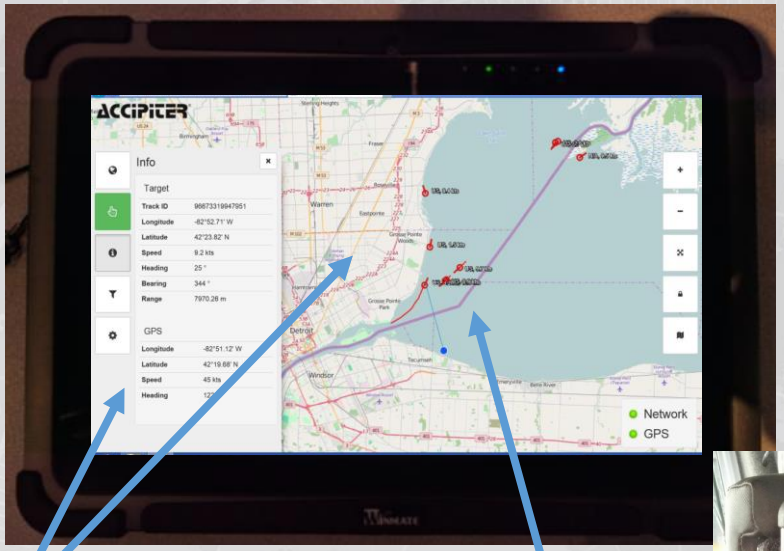


Runs in browser on standard government issued computer. No plugins required.

What is Shared MDA?

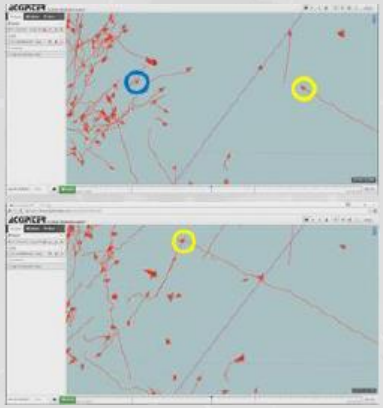
Without shared MDA, it is virtually impossible to understand pleasure craft activity and optimize your shipping operations around it

Accipiter® Mobile Response Tool for Response Vessels, Vehicles & Ships



- Tablet “app” developed for vessel and vehicle response units
- User centric display in relation to own-ship
- Snap to target of interest (TOI) for intercept
- Connectivity over 4G, LTE or Wi-Fi

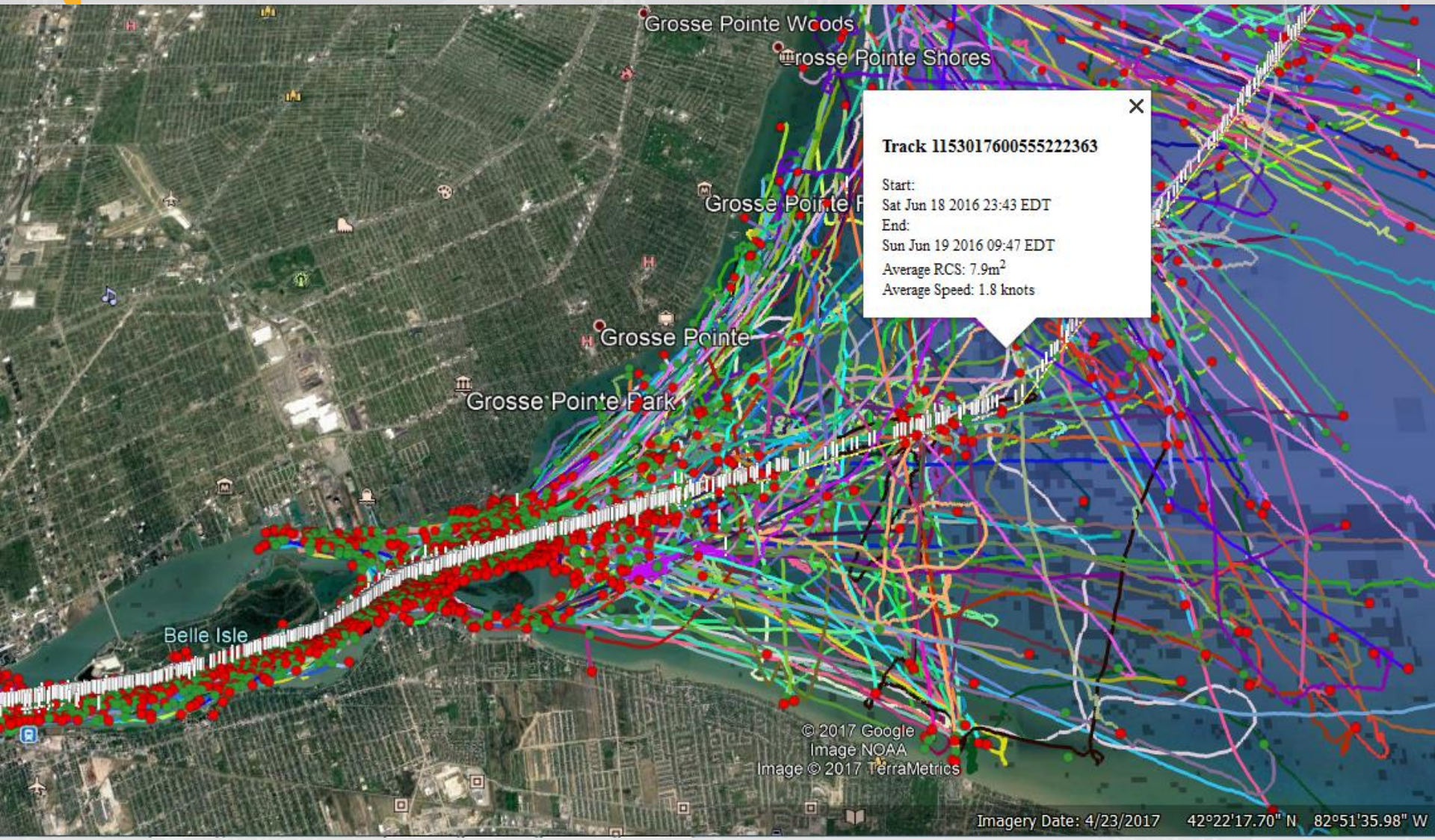
Real time attributes for selected target of interest (TOI) to assist in response and intercept



Daytime and nighttime display modes

What is Shared MDA?

Automation and analytics characterize historical marine traffic to support planning



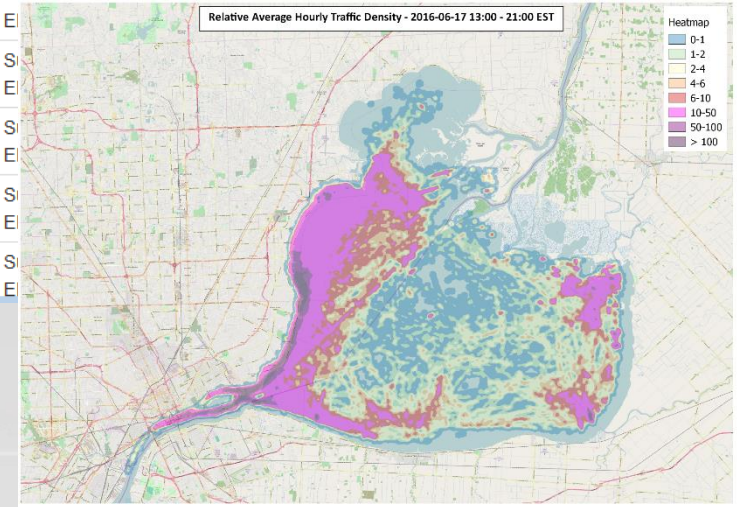
What is Shared MDA?

Big data complex event alerting & interactive analytics create useful MDA products

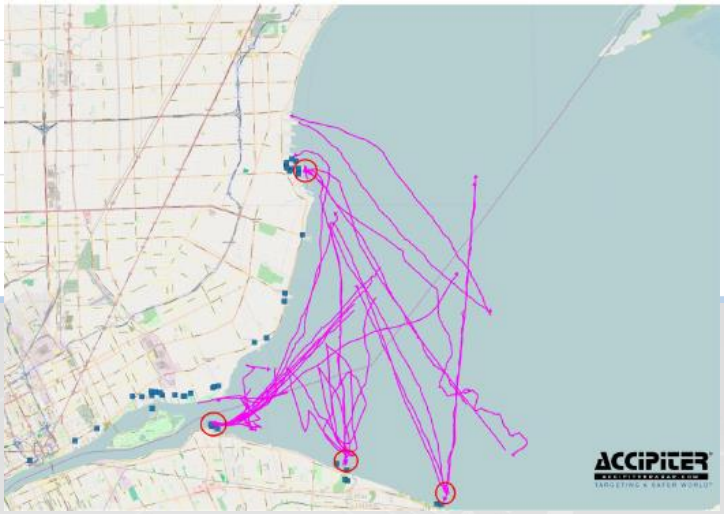
ACCIPITER Reporting | St Clair South | St Clair West | Virgil | St Clair Fusion | Venise Fusion | Export | Email | Print

Today | Filter | Select All | Clear Selection | Hide Duplicate Tracks | Summary | Details

Time	Alert Name	Track Start	Alert Time	Track End	Track Duration	Average RCS (m²)	Average Speed (Knots)	Track ID	Download KML
Sunday, Sep 4 2016 22:57 EDT	CAN to USA Mid-Lake	22:29	22:57	23:34	1h5m8s	10.9	4.5	378012294514118	
Sunday, Sep 4 2016 22:45 EDT	USA to CAN Mid-Lake	22:26	22:45	23:23	57m32s	97.1	10.1	96537306271127	
Sunday, Sep 4 2016 22:40 EDT	USA to CAN Mid-Lake	22:39	22:40	22:45	6m2s	8.3	19.7	378012332458663	
Sunday, Sep 4 2016 22:36 EDT	CAN to USA Inlet	22:25	22:36	22:57	32m8s	38.1	16.4	96537301814393	
Sunday, Sep 4 2016 22:32 EDT	CAN to USA Inlet	22:17	22:32	22:49	32m32s	31.3	9.7	96537270617604	
				54	28m30s	13.0			
				12	1h2m2s	32.1			



Generate traffic reports to answer your operational questions



Runs in browser on standard government issued computer. No plugins required.

It supports e-Navigation

See References Below:

- *Canada's vision is the widespread use of e-Navigation in Canada by mariners and shore authorities for greater marine safety, security, efficiency and environmental protection.*
- *The Canadian CONOPs is based on the premise that shore authorities will make data accessible to users via a single Canadian, national e-Navigation Portal (Maritime Information Portal).*
- ***It will be the responsibility of industry to develop the technology and tools to facilitate integration and use by mariners**.*
- *Tools will support all types of users, including the public, on vessels and on shore*

- As an innovative, Canadian industrial leader in shared MDA, we take this responsibility seriously, and have been pioneering this technology and tools for over a decade.

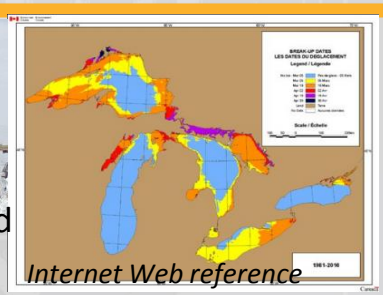
1. Daniel Breton et al (Senior Director, World Class Strategies, CCG), Improving Canada's Marine Navigation System through e-Navigation, International Journal of e-Navigation and Maritime Economy, 4 (2016) 023-030
2. Canadian Concept of Operations (2013)
3. Strategy for the Development and Implementation of E-Navigation, IMO (2008)

Why should I care?

Better ice awareness for unobstructed operations

Ice can form very rapidly due to temperature or wind changes
Example of ice formation in just 4 hours on Lake St. Clair
as temperatures drop rapidly.

Federal Biscay freed
Snell Lock 7Jan18



Internet Web reference

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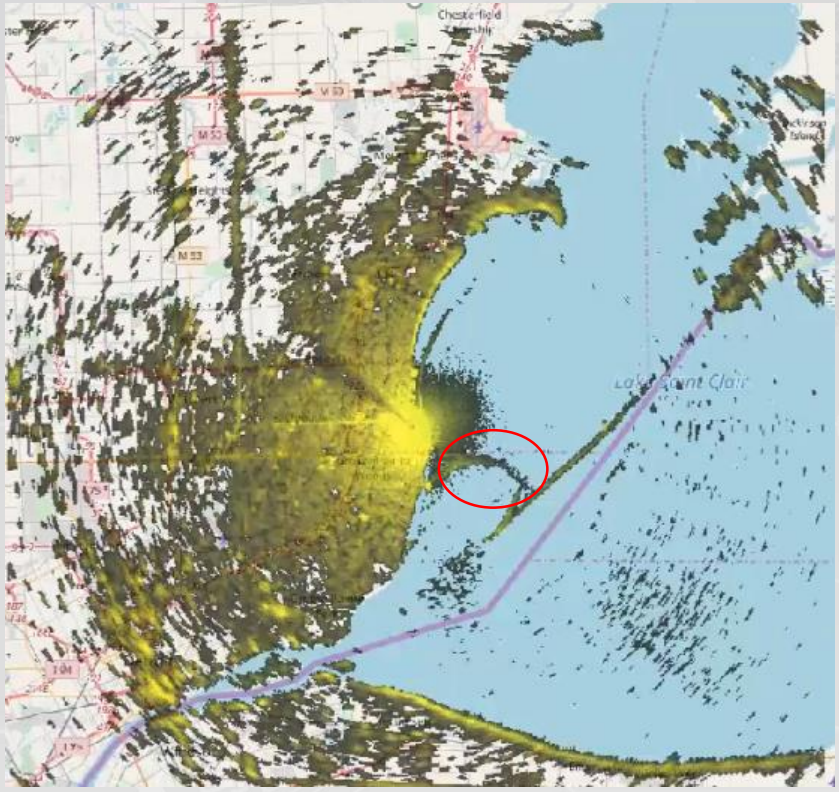

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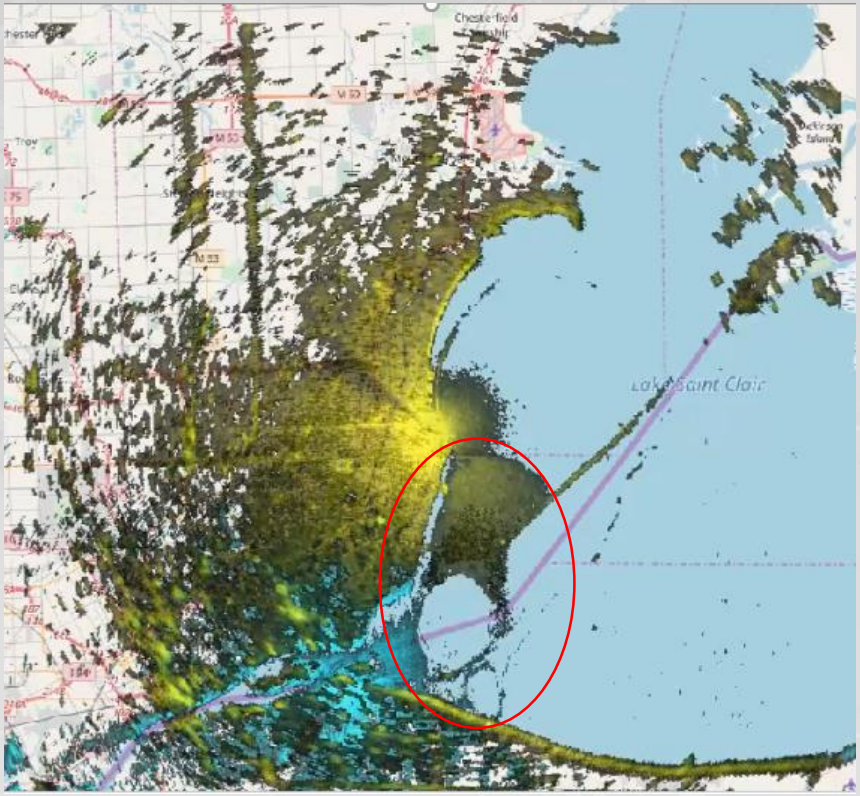
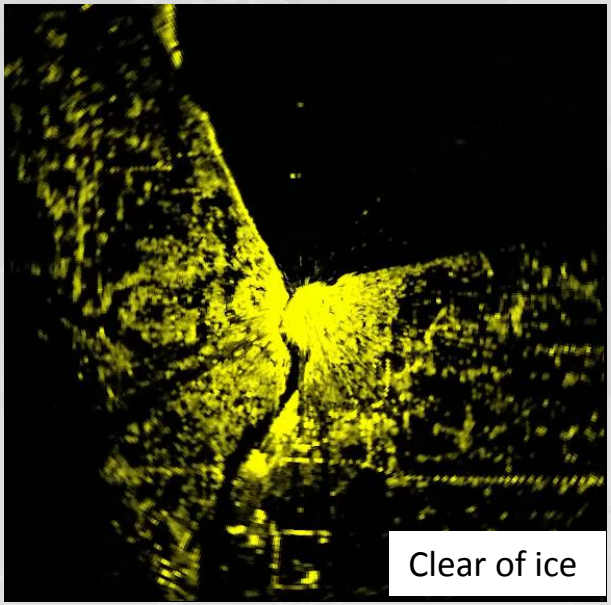
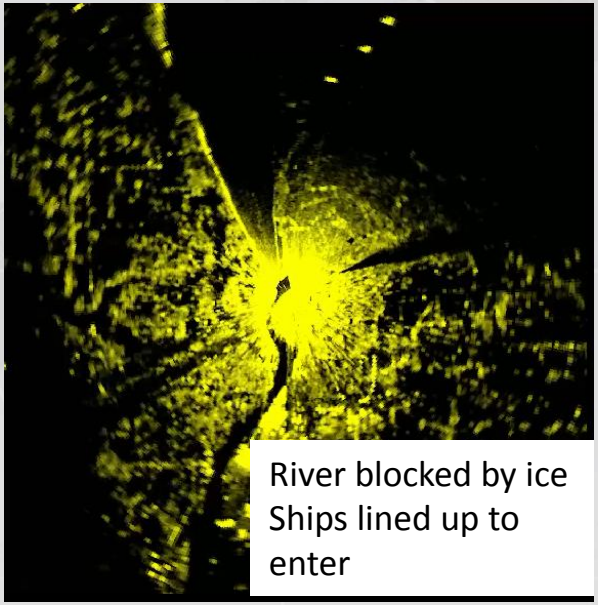


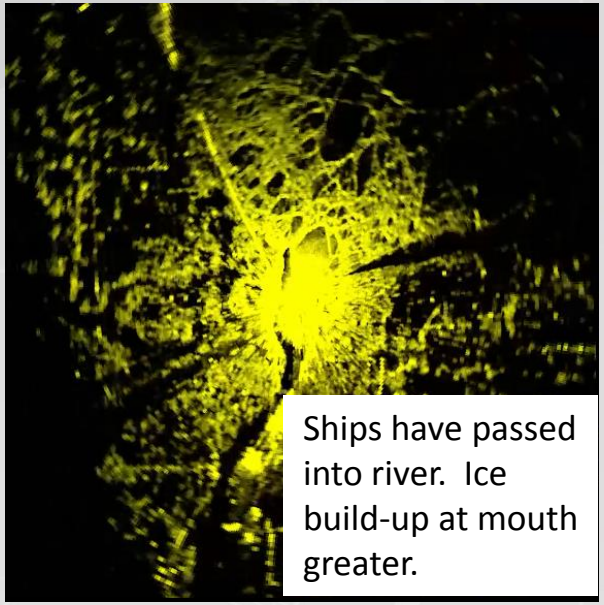
Better ice awareness for unobstructed operations

Ice formation at south end of Lake Huron and the mouth of the St. Clair River

- High resolution radar imagery shows texture of ice within a 24-hour period
- Winds change, and ice formation and movement change significantly with it.
- Three ships lined up in early 2017 waiting for ice to clear so they can enter the St. Clair River (final run of the season).

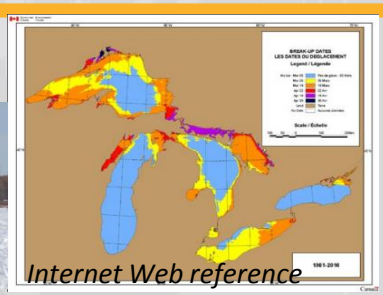






Why should I care?

Better ice awareness for unobstructed operations



St. Clair River

2018-01-13 12:00:00

River bend open

Past Weather in Sarnia —

Quick freeze

2018-01-13 21:00:00

Ice is forming on bend

2018-01-14 10:00:00

River bend is frozen over

Detroit River

2018-01-21 07:00:00

Ice flow in Lake

Wind change

2018-01-21 19:00:00

Icebreaker breaks up ice in river

Ice fractures and moves into river

2018-01-21 22:00:00

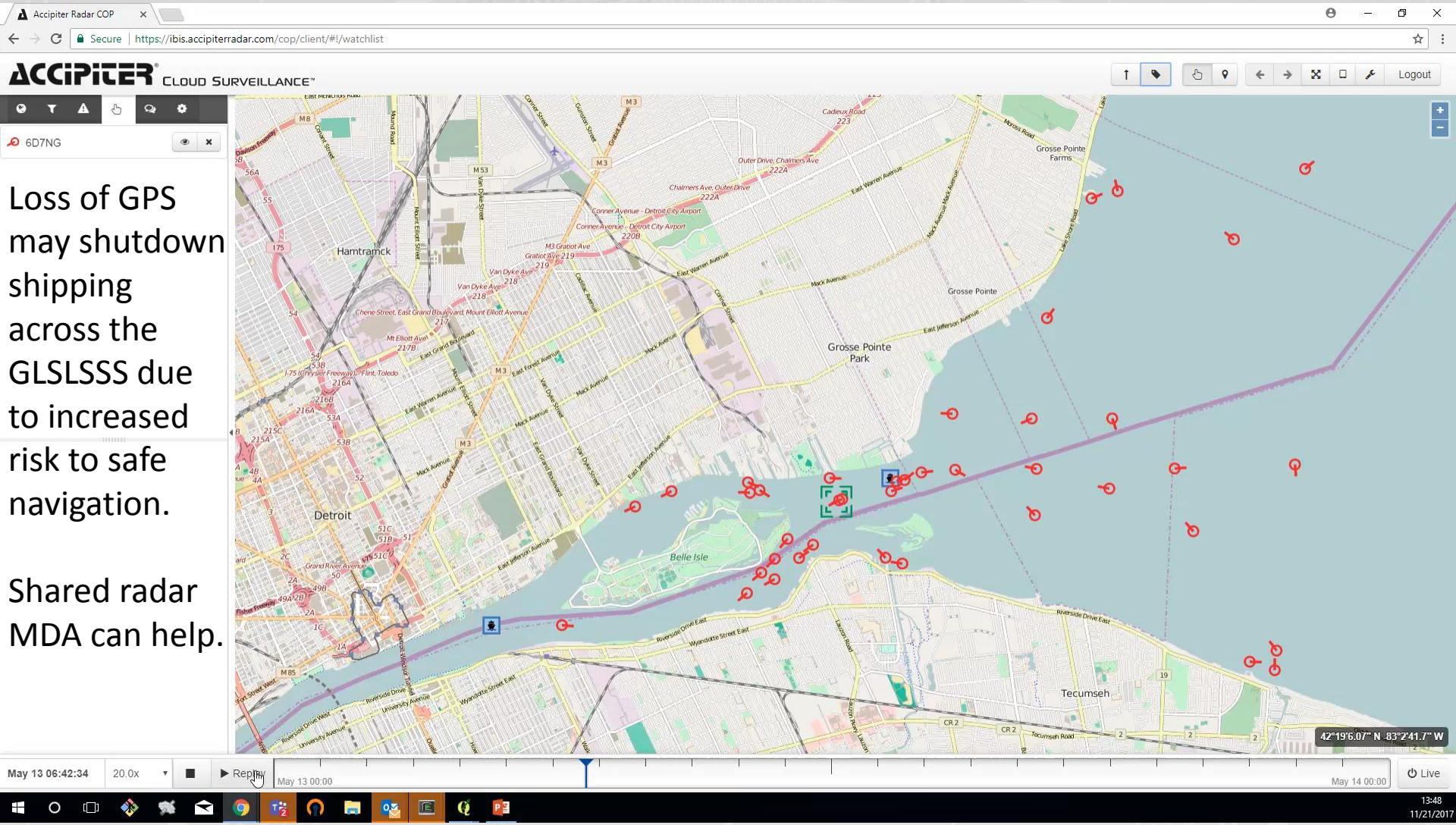
Shipping channel is open

Why should I care?

GNSS backup – protect shipping against denial of service

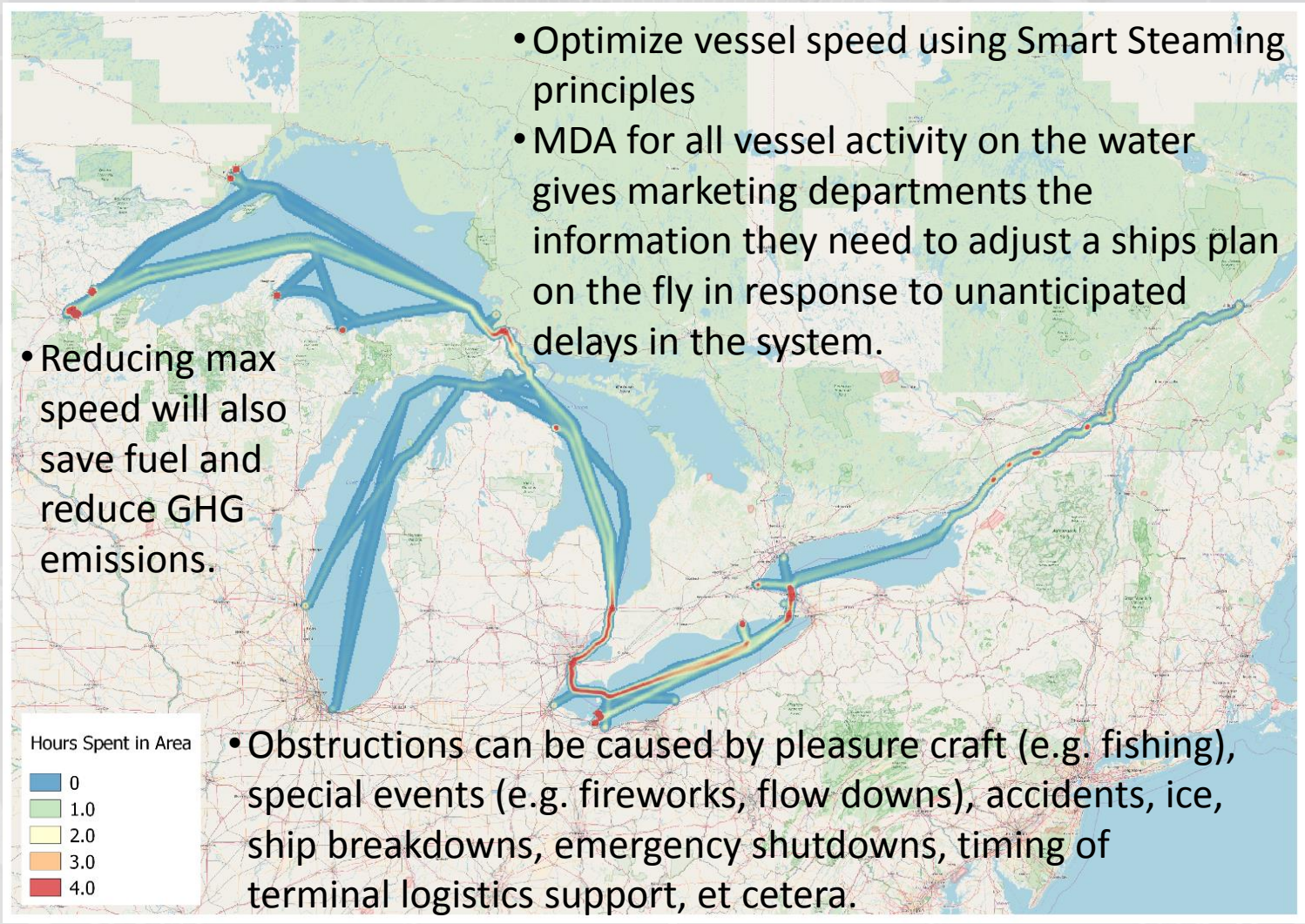
Loss of GPS may shutdown shipping across the GLSLSSS due to increased risk to safe navigation.

Shared radar MDA can help.



Why should I care?

Operational efficiency enhancement – safely maximize number of shipping runs



- Optimize vessel speed using Smart Steaming principles
- MDA for all vessel activity on the water gives marketing departments the information they need to adjust a ships plan on the fly in response to unanticipated delays in the system.
- Reducing max speed will also save fuel and reduce GHG emissions.
- Obstructions can be caused by pleasure craft (e.g. fishing), special events (e.g. fireworks, flow downs), accidents, ice, ship breakdowns, emergency shutdowns, timing of terminal logistics support, et cetera.

Conclusions & Questions

Shared, radar-derived MDA is on the way and shipping stakeholders can exploit it

- The roll-out is underway on the Great Lakes and will expand to the East and West Coasts and the Arctic
- The Shared MDA will help stakeholders collectively in collaborative decision making (scheduling, resource allocation, emergency response).
- Discussion is needed between developers like Accipiter and maritime stakeholders to optimize/develop stakeholder-specific “apps” matched to the type of decision support they need.
- Through the use of *Smart Radar* techniques, shared MDA will expand to all domain awareness (vessels, aircraft, ice mapping, surface texture, weather, birds).
- Safety, security, operational efficiencies and environmental protection are big winners.

Thank you