SmartAtlantic

The Benefits of Real-time Metocean Data in Port Operations

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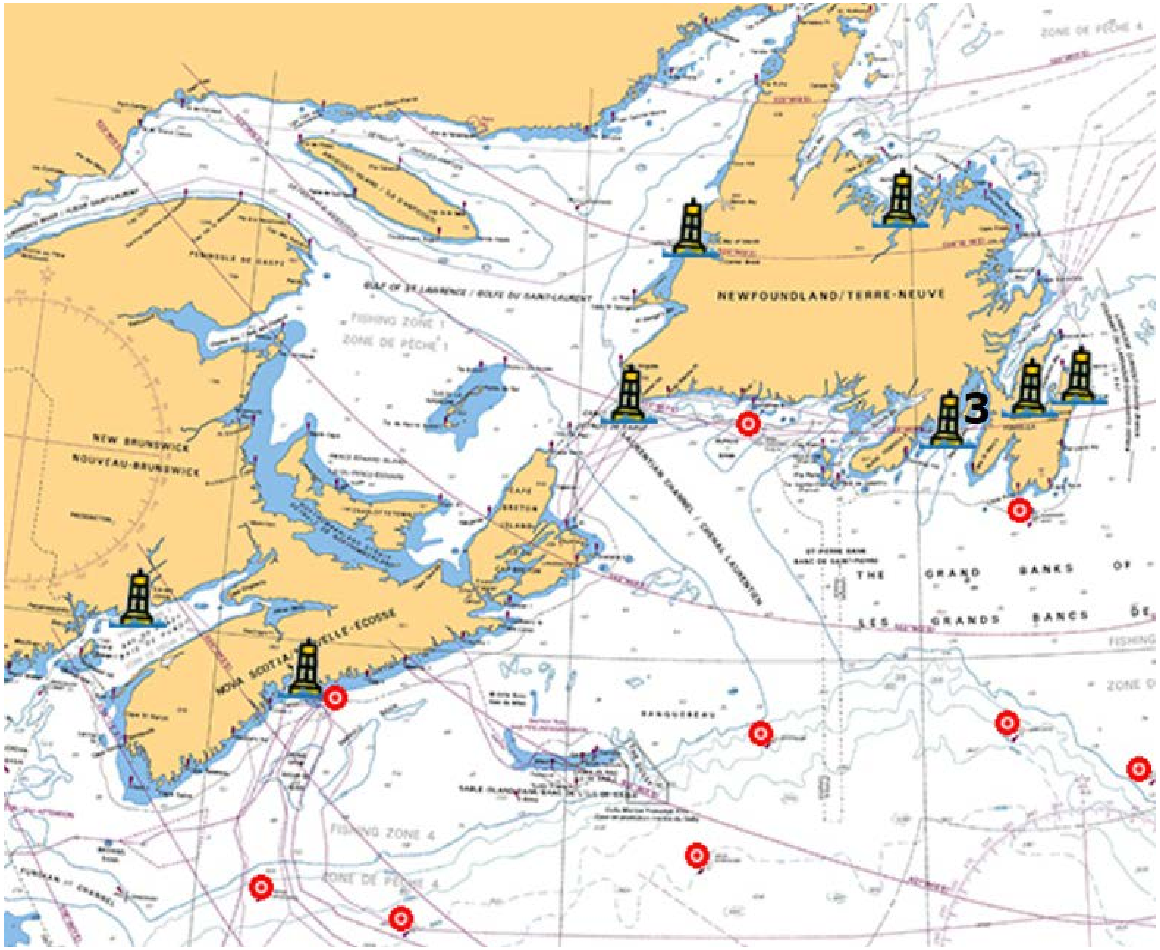
Agenda

- The SmartAtlantic Buoy Network
- Buoy System
- Data Management
- Cutting Fuel Costs and GHG Emissions
- Weather Windows for Vessel and Cargo Operation
- Minimizing the Cost of Severe Weather Delays

The SmartAtlantic Buoy Network



CANADIAN MARINE PILOTS' ASSOCIATION

Institute for **OCEAN RESEARCH** Enterprise

Memorial
University of Newfoundland

The SmartAtlantic Buoy Network

2006

- AXYS partners with the Memorial University of Newfoundland to support SmartBay, a demonstration project whose goal is to improve the safety and security of life at sea by strengthening the technology and information used to make maritime decisions. One AXYS 3 Metre buoy is deployed in Placentia Bay.

2010

- Two additional buoys are deployed as part of this project - one WatchKeeper buoy at Come by Chance Point and one 3 Metre buoy at the Pilot Boarding Station at the end of Red Island.

2012

- Smart Bay receives funding to add 8 AXYS buoys to the network – 4 x 3 Metre buoys, 2 x WatchKeeper buoys and 2 x TRIAXYS wave buoys. The buoys are deployed in the Port Aux Basques Harbour, around St John's Bay, and in Herring Cove.

2013

- Memorial University of Newfoundland's Centre for Applied Ocean Technology (CTec) partners with the Institute for Ocean Research Enterprise (IORE), who lead the deployment of the 3 Metre buoy in Herring Cove, uniting both initiatives under the SmartAtlantic Alliance banner.

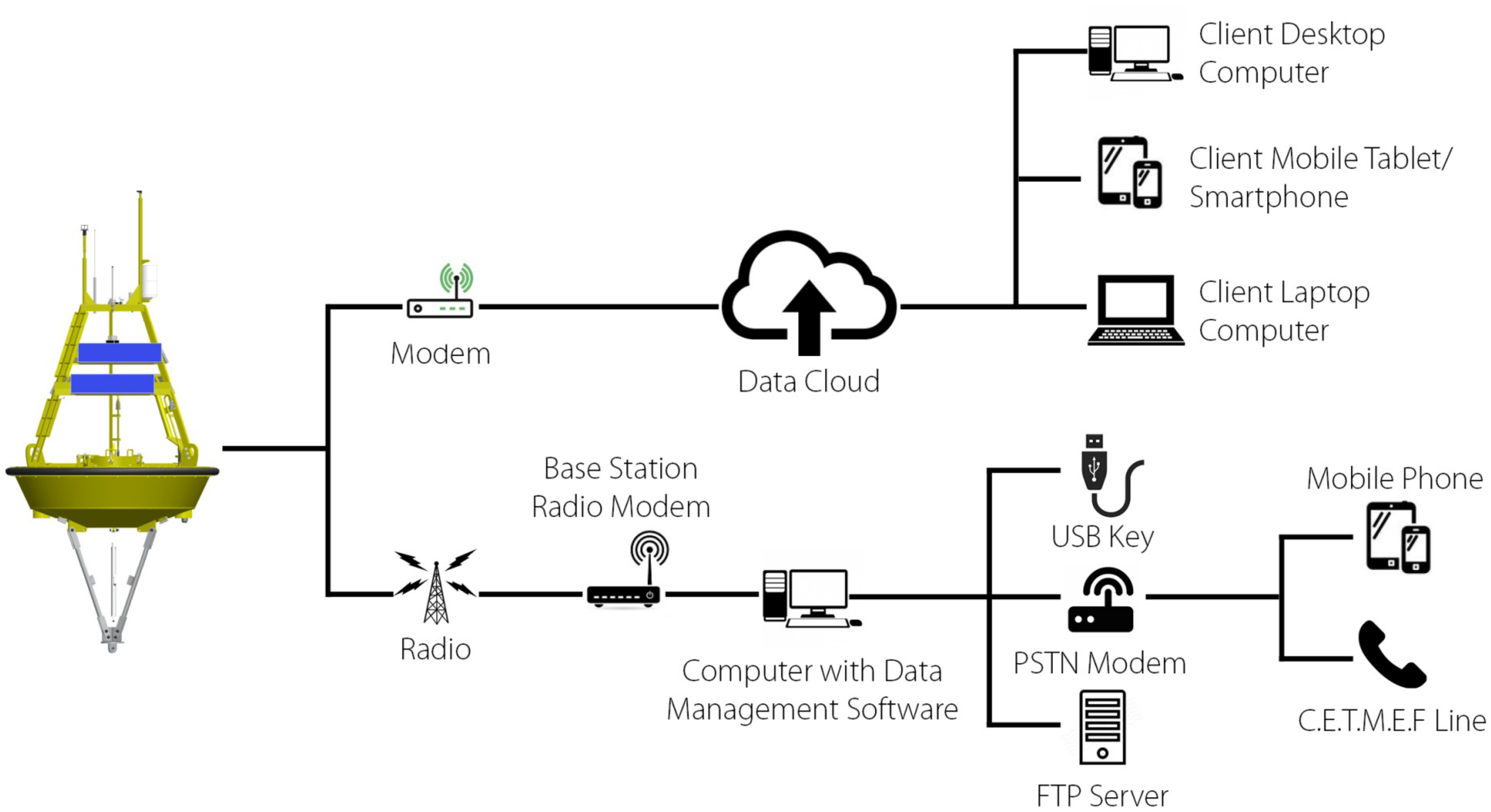
2015

- A 3 Metre buoy is deployed in the Bay of Fundy in the approach to Saint John Harbour.

Buoy System

- **Controller:** AXYS WatchMan500™
- **Sensors:** Dual anemometers, Air Temp/RH sensor, Barometer, Pyranometer, Directional Wave Sensor, ADCP
- **Telemetry:** HSPA/GPRS modem, ISatData Pro terminal, type 1 AtoN AIS, bluetooth (in-field wireless comms)
- **Mooring:** custom design for each buoy and deployment location
- Dual 180° Surveillance Cameras, 330W solar / 800 amp hour battery bank

Data Management



Canada's ECA Standards

- **Effective January 1, 2015 ships 400 GRT and greater operating within the NA-ECA and throughout Canadian waters south of 60°N are required to achieve SOx emissions equivalent to using fuel with a sulphur content less than 0.1% (1,000 ppm) - a 96% reduction.**

- **A "fleet averaging regime" was developed for Canadian ships operating in the "Great Lakes and St. Lawrence waters" whereby compliance with the sulphur content standards is determined by the average sulphur content of all the fuel used by a firm's fleet.**

- In waters outside of the NA-ECA, north of 60°N and including all of Hudson's Bay, James Bay and Ungava Bay, the global standards set under MARPOL for controlling sulphur oxides apply. This currently comprises a 3.50% limit on the sulphur content of marine fuel and after January 1, 2020, the Amendments set the standard to 0.50%.

- Ships built in 2016 or later will be required to meet a stringent NOx standard in the ECA, representing an 80% reduction from current standards

- Emissions can be reduced through the use of lower sulphur fuels and / or use of after treatment technologies (scrubbers, selective catalytic reduction)

Weather Buoys Predict Berthing Delays

Most vessels will be inside the ECA for the Port of Halifax within 24 hours of their ETA at the pilot boarding station.

SmartATLANTIC Herring Cove Buoy high resolution forecasting of wind and seastate conditions provide 36-hour outlook to help industry predict likelihood a pilot will be able to bring a vessel in when it arrives.

Halifax pilots will attempt to bring in a vessel in seas up to 6m at the pilot boarding station, dependent upon certain criteria.

Industry therefore has more than 24-hour notice to expect a possible 4-6 hour weather delay due to waves of 6m or greater upon arrival at the Port.

Slow Steaming to Adjust Vessel Arrival at Pilot Boarding Station

- Estimate a vessel speed reduction of about 3 knots would defer the arrival by about 4-6 hours.
- Reducing vessel speed = reducing amount of very expensive 0.1% low sulphur fuel consumed and GHG emissions.
- Reducing vessel speed = eliminating costs of weather delay upon arrival

Benefits to Industry: *Cutting Fuel Costs and GHG Emissions*

Using SmartATLANTIC Herring Cove Buoy and Environment Canada Offshore Halifax Buoy for Halifax winter arrivals could save fuel costs and cut GHG emissions equal to removing 535 cars from the road for one year!

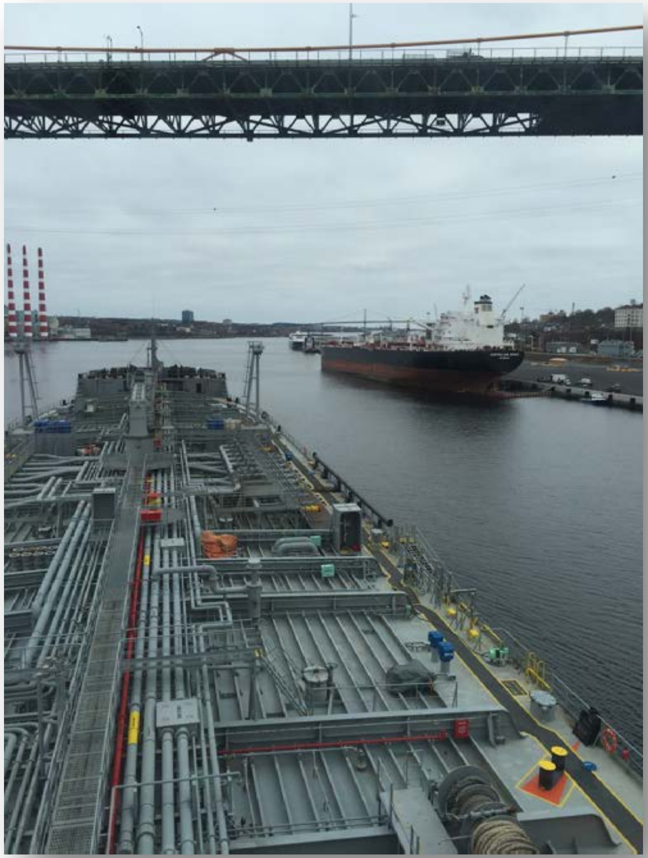
Ship Type	Vessel Size	# Ships Impacted	Fuel Saving (metric tonnes)	0.1% Sulphur Fuel Cost Saving (000's CDN $)*	Green House Gas Reduction (metric tonnes)
Containership	>50,000 GRT/ avg. 4700 TEU	26	390	$312	1,248
Tankers	Handy size	10	100	$80	320
Auto carriers	53,000 -70,000 GRT	7	84	$67	269
Bulk carriers	29,000 – 43,000 GRT	8	80	$64	256
General cargo	20,000 – 30,000 GRT	10	90	$72	288
General cargo	10,000 – <20,000 GRT	2	10	$8	32
General cargo	< 10,000 GRT	8	32	26	102
TOTALS		**71**	**786 metric tonnes**	**CDN $775,000**	**2,515 metric tonnes**

* Based on St. Lawrence price for 0.1% sulphur fuel @ CDN $986/tonne, market price January 8, 2015.

Finding Weather Windows for Vessel & Cargo Operations

Benefits of Weather Buoys

- Safety of navigation
- Enhanced protection for vessel, cargo, people and environment



Case Study: M.V. Australian Spirit

- Dec. 10, 2014: call for help comes in from M.V. Australian Spirit, a loaded crude tanker adrift 40 NM from Halifax
- Sailing from Placentia Bay, NL to New York when it suffered catastrophic rudder failure
- Cargo: 775,000 barrels Hibernia crude oil
- Main engine operational
- Vessel's steering gear operational but no load on steering gear.
- Needs to get into port ASAP to assess problem/affect repairs/discharge cargo
- Halifax is closest port of refuge

Vessel Specs:

- LOA 257m
- Beam 45m
- Draft 12.2m
- DWT 111,905

Case Study: M.V. Australian Spirit

- No rudder!
- Transiting water too deep to anchor
- Weather conditions: Gale force winds, heavy rain and heavy seas
- 775,000 barrels of crude onboard
- Approx. 3,000 m3 bunker
- Regular caller at Placentia Bay, Newfoundland

Case Study: M.V. Australian Spirit

- Operational Challenge:
  Find the safe weather windows
- Gale blowing on December 10th with strong winds and heavy seas continuing on the 11th
- Thick of fog on December 12th
- Need to tether tug escort for transit to Bedford Basin underneath both Halifax Harbour Bridges (significant wave cannot exceed max. 2.5m)
- Vessel's steering gear is operational but rudder is completely gone.
- Ship-to-Ship transfer of cargo to be done in Bedford Basin.
- Resources: 3 pilots/4 tugs

Case Study: M.V. Australian Spirit

» The Ship was piloted into the harbour arrived safely in Bedford Basin 12-Dec-2014.

» Load was safely transferred to the Americas Spirit

» Australian Spirit was towed to Portugal for final repairs.

Minimizing the Cost of Severe Weather Delays

*Weather-related delays cost the Halifax marine community in excess of **$2.6 million annually** – money that could be saved, to a large extent, by using high resolution weather and wave height forecasting to better plan port operations.*

Conclusion

- Develop accurate port action plans for extreme weather events to maximize revenue and minimize risks
- Reduce demurrage costs by understanding weather windows
- Reduce costs of vessel delays with better planning
- Reduce GHG emissions
- Effective use of resources through proper planning

Thank You!

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