Arctic Vessel Monitoring
Geofencing/Alert Awareness

A presentation by
Buddy Custard, Capt, USCG (Ret.)
Dr. Shawn Butler
Project Team

- **Principal Investigators**
  - Buddy Custard, Alaska Maritime Prevention & Response Network
  - Dr. Shawn Butler, University of Alaska Anchorage

- **Supporting Team:**
  - Ed Page, Capt, USCG (Ret.), Marine Exchange of Alaska
  - Aaron Poe, Aleutian and Bering Sea Islands Land Conservation Council

- **Student Participation:** Max Zaki and Lonnie Young

- **Project Champion:** Hank Blaney, USCG HQ CG-255

- **Project Advocates:** Kristin Mabry, NOAA; Joel Garlich-Miller, USFWS; Dr. Lori Polasek, ADF&G; Dr. Lauren Divine (Aleut Community of St. Paul)
Student Participation

- Max Zaki (current)
  - Assist with identifying the requirements for managing geofences
  - Study Ozone Widget Framework (OWF)
- Lonnie Young (Fall 2018 Semester)
  - Assisted with identifying other agency geofence requirements and pre-established zones for possible geofences.
Advance Arctic Maritime Domain Awareness & Management by capitalizing on Automatic Identification System (AIS) technology, aiding the Coast Guard, other agencies, and Arctic stakeholders to assess, monitor, and act as needed to reduce adverse impacts presented by maritime activity in Arctic waters.
AIS (Automatic Identification System) receivers (terrestrial and satellite) in the Arctic annually provide millions of lines of data on maritime vessel activity. This data can be modified towards generating automated alerts and reports to various Coast Guard operations managers and other decision-makers to rapidly distill, analyze and prioritize threats, optimizing the allocation of limited resources to enhance maritime safety, security and environmental protection.
**Project Objectives**

- Users can customize geofences / alerts.
- Vessel tracking systems can share geofencing/alert files.
- Users can filter geofences to better discriminate vessel type and activities.
- Government agencies and vetted stakeholders can receive alerts and notifications through a variety of platforms.
- Coastal Communities can receive tailored notification and alerts via social media.
Research & Development Method

- Build on existing and emerging Alaska AIS network and geofencing technology to enhance the use of the unclassified vessel tracking and monitoring system used by the USCG in Alaska.
- Develop new software and protocols that will enhance AIS technology by applying automated geofencing alerts for vessel monitoring and notification.
Project Phases

**Phase 1**
Validate end-user geofencing and alert requirements (Completed)

**Phase 2**
Develop enhanced AIS geofencing and alert notification software (Ongoing)

**Phase 3**
Evaluate the software against stakeholder requirements (Fall / Winter 2019)
ADAC: Research for the Arctic Operator… For Today and For the Future

Timeline of Key Project Milestones

- Identified vessel alerting and management workflow process
- Identified customer and stakeholder requirements
- Commenced developing software requirements
- Commenced developing geofence request portal

- **April 2019**
  - Identified vessel alerting and management workflow process
  - Identified customer and stakeholder requirements
  - Commenced developing software requirements
  - Commenced developing geofence request portal

- **July 2018**
  - Award contract for Original Scope of Geofencing software enhancements

- **15 April 2019**
  - Award contract for Original Scope of Geofencing software enhancements

- **15 July 2019**
  - Software Enhancements Completed. Start test & evaluation

- **15 May 2019**
  - Obtain cost estimate for enhanced software automation for Pactracs & the request portal

- **15 Aug 2019**
  - Secure funding for automation

- **01 September 2019**
  - Award contract for automation

- **31 December 2019**
  - Submit Final Report and Transition Plan

- **01 December 2019**
  - Finalize software & geofence request portal

Completed
Other Key Accomplishments to date

• Established advisory committee and met (4Q2018 & 1Q2019) to provide project requirements and oversight.
• Validated end-user geofencing and alert requirements through stakeholder engagements
  ➢ Presented at the following events:
    ➢ Alaska Tribal Conference on Environment Management, the
    ➢ Indigenous People’s Council for Marine Mammals, the
    ➢ Alaska Marine Science Symposium, and the
    ➢ Alaska Forum on the Environment. (Received positive feedback and support for the project)
  ➢ Met with members of USCG D17 staff twice (Dec 18 & Feb 19) to gather their project requirements and provide updates.
• Developed geofencing and alert process map
Key Accomplishments to date (cont.)

- Evaluated current software capabilities and changes needed to better address the needs of the USCG and other end users.
- Developed software requirements.
- Started to identify established environmentally protected areas.
- Developed a prototype web-based tool:
  - Refine project requirements by illustrating geofencing functions.
  - Management tool to request a geofence / alert.
- Initiated identification and development of process changes to geofencing / alert management system.
Key Ideas To Date

• Creating geofences & alert requires a management system to prevent redundancies, ensure visibility across programs, and align with mission requirements, e.g., hierarchical relationship.

• Outreach efforts have determined the need to modify the AIS software to assess vessels’ adherence to marine protected areas’ restrictions, including but not limited to:
  - denial of entry of certain classes of vessels,
  - no fishing, speed restrictions, proximity alerting for tanker lightering operations, dynamic moving alerting areas, etc., and
  - identification of standard filters, zones and alerts that can be used by multiple users, such as standard “drop-down” menu items.

  ➢ Need to develop implementation plan.

  ➢ Need to coordinate with CG 1View to ensure coherent system.
Arctic Vessel Monitoring Geofencing/Alert Process Map

Filters
- vessel’s navigation status
  - All
  - Under way using engine
  - At anchor
  - Not under command
  - Restricted manoeuvrability
  - Constrained by her draught
  - Moored
  - Aground
  - Engaged in fishing
  - Under way sailing

Zones
- In this area

Alerts
- Result in a notification

Example Alert:
- Jen Karnik
- Subject: Tanker in Summit Island Zone...
- To: Shawn Maudlin
- Sent by SiTech Web VT5
  www.sitech.com

ADAC Annual Review – April 11, 2019
Filters help you capture only the vessels that interest you.

- Already know your vessel(s)?
  - Filter by MMSI, Name, IMO, or Call Sign
- Focused on tankers? Personal craft? Fishing vessels?
  - Filter by Vessel Type
- Curious about loiterers?
  - Filter by Navigational Status and/or Speed
- Wondering about size?
  - Filter by Length
Zones let you define a particular place, or area of interest.

• Zones can be created four different ways
  • Lines – the smallest zone, created with only two points
  • Circles – variable sizes centered on one point
  • Polygons – the most flexible of zones
  • Dynamic – fixed to a vessel

• Zones are importable/exportable
  • Use zones from your other applications (GIS, etc.)
  • Choose from pre-drawn options (match collaborators) and download coordinates
Geofencing – Alerts

Filters → Zones → Alerts

Alerts when vessel(s) of interest are in your zone(s) of interest

- Enter or exit your zone(s)
- Condition changes
  - Vessels in zone speed up or slow down beyond a threshold
- Emailed, texted, or pushed to other applications
- Customized reports
Example: Vessel of Concern

Filters

- NAV STATUS
  - ALL
  - UNDER WAY USING ENGINE
  - More than 3 knt
  - More than 3 knt
  - AT ANCHOR
  - NOT UNDER COMMAND
  - RESTRICTED MANEUVERABILITY
  - CONSTRAINED BY HER DRAUGHT
  - MOORED
  - AGROUND
  - ENGAGED IN FISHING

Zones

- Magenta line represents vessel track over the last 24 hours.

Alerts

UTC: 17-08-15 07:31, Local: 17-08-14 11:31, Alarm: Vessel not under command, Type: Upon Activation, MMSI: 338417000, Name: SIKULIAQ, Call Sign: WDG7520, Type: Other, SOG: 0.4knt, COG: 324˚, Lat: 71˚56.911’N, Lng: 160˚55.942’W, Dest.: 72° North, ETA: 2017-08-14 19:00, Msg: A vessel has reported not under command.

Sent by SITex Web VTS
www.sitech.com
Example: Vessel Entering Area to be Avoided

Filters
- All
- Under way using engine
- At anchor
- Not under command
- Restricted manoeuvrability
- Constrained by her draught
- Moored
- Aground
- Engaged in fishing
- Under way sailing

Zones
Less than 50nm off shore

Alerts

www.sitech.com
Example: Dynamic Geofencing – Tanker Lightering

A 1 nm dynamic buffer around a tanker. As the tanker changes position, the geofence goes with it (centered on an MMSI rather than static coordinate. The orange track is a lightering tug.

Notify vessel captain when vessels enter within 1 nm of the vessel.
Shell needed to ensure support vessels avoided known fragile ecosystems in the Ledyard Bay Critical Habitat Unit.
Example: Avoiding Subsistence Fishing Areas

An ~20 nautical mile buffer around St. Lawrence Island. The green track is a container vessel, while the blue track is a fishing vessel.

Notify local residents when vessels (excluding fishing vessels) enter the area at speeds greater than 10 kts.
Example: Website Home Page to Create Geofence / Alert

- Establish ownership of the portal
- Why and what the site is supposed to do
- Entice use of the site
- Offer links to other Arctic resources
Example: Website “The Basics” – Explaining the setup of a Geofence

- Explain geofencing using the three components:
- Prep users before they get into the real creation of a geofence
• Explain geofencing using the three components
• Prep users before they get into the real creation of a geofence
Example: Activated Geofence – User Alert

Vessel in Ledyard Bay, On Enter, 367399170, NACHIK, 18-09-06 10:19. Local: 18-09-06 02:19

AG Arctic Geofencing <jenkarnik@mxak.org>
9:13 AM
To: Shawn Mauldin


Texts contain the same information, but do not include a picture.
Planned Outcomes

• Geofencing capabilities developed to meet USCG and other stakeholders needs
• Web accessible tool to request AIS generated alerts or reports for USCG units, agencies and other authorized stakeholders
• Delivery of requested alerts or information via e-mail, text messages or other identified means.
• Enhance USCG, resource trustees, other agencies and maritime stakeholders use of AIS data to enhance safe, secure and environmentally sound maritime operations in the Arctic.
Transition Plan

- Incorporate upgraded software into current Alaska Coast Guard unclassified AIS software display system (PacTracs)
- Develop implementation plan.
Implementation for Marine Mammals

- The Alaska Conservation Foundation received funding from the Wildlife Conservation Society (WCS) for 2019 and 2020 to use the products from this project for marine mammals preservation and management.
- The WCS interest focuses on ‘creating space’ for marine mammals to adapt to changing environmental conditions.
- This funding is to help define the process by which marine mammal management agencies and tribes use the tool.
- Expect continued engagement from many members of this Advisory Group + U.S. Geological Survey.
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Questions and Comments

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