Dissemination of enhanced Marine Safety Information (eMSI) via AIS:
Requirements for an AIS transmit service

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Outline

- Overview of AIS transmit efforts to date
- AIS Transmit Service requirements
  - Overview of AIS transmit functions
  - Why these functions are needed
  - Incorporation into “ASM Manager”
- Proposed functions to be addressed in guidelines, recommendations and standards
- Additional transmit developments (if time allows)
  - Joint US Coast Guard and Corps of Engineers test bed
  - Virtual Aids to Navigation (V-AtoN)
Transmission of navigation information via AIS

- **International:**
  - IMO Circ. 236 & 289 – “test” messages
  - IALA ASM collection (http://e-navigation.nl/asm)
  - Many administrations are transmitting various information
    - Weather, met/hydro observations, MSI, safety text messages, etc.

- **US efforts**
  - Test beds in Louisville, Tampa, Columbia River, Stellwagen Bank
  - US Coast Guard and Army Corps development work
    - Build on test beds
    - Integrate USACE and USCG AIS capabilities
    - Expand scope of information to be transmitted
  - Identification of requirements
    - Information needs
    - Functional needs
    - AIS transmit architecture
• AIS information transmitted in the vicinity of a lock
• Shown on shoreside test system
Weather observations via AIS aboard vessel
BUILDING STRONG

Queue at OHIO LOCK 52
Vessel with Unknown MMSI
downbound check-in point at 20:26
AEP FUTURE
downbound check-in point at 19:16
L. B. EDGIN
downbound check-in point at 19:14
CHARLIE MELANCON
upbound check-in point at 19:03
Type: vessels awaiting lodage
Orientation 291°
MMSI: 1000000004 Event: 22

Observations
OLMSTED (AIS)
OLMSTED UPOOL (AIS)
WATER LEVEL 3.9 m and steady
OLMSTED WX (AIS)
WIND 98 T @ 0.00 KN GUSTING TO 98 T AT 0.00 KN
AIR PRESSURE 1024.00 mb
AIR TEMPERATURE 63.1°F
DEW POINT 37.9°F

Local Forecast
2 Miles ENE Olmsted Il
This Afternoon Sunny, with a high near 64. North northeast wind 3 to 5 mph.
Tonight Mostly clear, with a low around 37. Light northeast wind.
Tuesday Sunny, with a high near 65. Calm wind becoming south southwest around 5 mph in the
Virtual AtoN

AIS V-AtoN in area where ice and tidal range prohibit physical AtoN

AIS V-AtoN marking submerged wreck in swift river waters
AIS transmit basic functions

- Message Creation
- Message Routing
- Message Transmission
- System Management
- System Monitoring
Message Creation

► Manage messages originating from different sources
► Manage retrieval of messages created by other services – authoritative sources
► Validate messages prior to transmit
  • Proper format
  • Not expired
► Provide virtual MMSI support
  • Where the same information is transmitted from multiple transceivers a virtual MMSI allows a receiver to recognize the information as identical
Message Routing

- Manage messages sent to transmitters to specified rate
  - Addresses VDL loading issues
- Manage queue to not transmit old or duplicate messages
- Prioritize outgoing messages
  - User-defined parameters
- Using TAG blocks, route message to the correct transmitter(s) for desired area of transmission
- Route acknowledgements back to message originator
- Manage repetition of periodically repeated messages
Message Transmission

- Ensure all messages are transmitted
  - Manage queue to ensure messages are transmitted unless expired
- Monitor the AIS transceivers for acknowledgements indicating success or failure of message transmission.
  - Return message to transmit queue for next transmit cycle.
- Ensure all messages have opportunity to be transmitted.
  - Based on priority, previous failure to transmit, delay due to full queue
System management and monitoring

- Monitor and manage the VDL
  - Ensure sufficient slots are reserved for the desired number of messages.
  - Ensure transceivers configured correctly.
  - Monitor the VDL to ensure the system is functioning as desired.
  - Track AIS channel frame loading (using FSR sentence)

- General monitoring
  - Check for error errors, generate alerts
  - Provide monitoring and logging capabilities and user interface to allow display of message queue, display of message information, deleting messages from the queue, stopping program operation.
  - Maintain queue statistics and provide to administrators
ASM Manager

- Stand-alone application developed to implement the identified functions
- Provides message management services that are not currently part of either transmitter stations or logical shore stations
- Manages ASM transmission as described in functions
- Benefits:
  - Message creator does not need to know transmitter locations
    - Messages routed to correct transceiver based upon desired transmit area
  - Ensures messages are valid before transmission - only valid/authorized messages transmitted
  - Monitors ASM demand and adjusts transmit rate so as to not overload VDL
  - Allows for user-specified priorities based upon message type and content
  - Ensures messages are transmitted
  - Keeps messages in queue until acknowledgement is received from transmitter
  - Routes acknowledgement back to user
AIS Transmit Architecture

- User Created
- Wx Obs
- Wx warning
- Lock Operations
- Message Creation
- AIS Router
- DataSwitch
- AIS AtoN
- ASM Mgr
- VDL Monitoring
- AIS Base Station
- Display System Based on user needs

Routing

Transaction
AIS transmit functions mapped to existing AIS Service (IALA A124)
Functions to be addressed in guidelines, recommendations and standards

- Standard transmit architecture
- Standard TAG block usage
- Acknowledgement management
- Data management requirements
  - Eliminate duplicate transmissions
  - Ensure delivery
  - Ensure only newest copy of data is sent
- Define appropriate location of functions (e.g., PSS, LSS, AIS-SM)
- of repeaters to enhance ASM dissemination
- Standards for AIS message creation services
- Monitoring for system reliability, assurance of message delivery
- Categorization of messages to assign appropriate dissemination service (e.g., AIS, ASM, VDE, web services, etc.)
Additional related issues outside scope of AIS transmit service

- Standards for ASM development
  - Draft RTCM SC12100

- ASM management
  - Use and management of IALA collection
  - “Approved” messages

- Advertisement of ASM service availability
  - What can mariners expect
Ohio River eMSI Demonstration

- Purpose: gain practical experience transmitting e-MSI information and gain useful feedback from users who elect to participate in the system
  - Use new and existing transmitter locations operated by both the United States Coast Guard (USCG) and the United States Army Corps of Engineers (USACE).
  - 1-2 year demonstration
  - Lower Ohio River and the adjacent parts of the Mississippi and Tennessee rivers
  - Transmit navigation and operational information:
    - Lock/Dam Status, queue
    - Water levels – observed and predicted
    - Weather observations
  - Industry participation desired!
Thank you for your attention!

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Ohio River eMSI Demonstration
Transmitters

Key
- USCG AIS Transmitter
- USACE AIS Transmitter
- New AIS Transmitters
- USCG Monitor Receiver

St. Louis

New Orleans

Pittsburgh

BUILDING STRONG®
OHIO LOCK S2

Vessel with Unknown MMSI
downbound check-in point at 20:26
(UTC day 9 2016)

AEP FUTURE
downbound check-in point at 19:16
(UTC day 9 2016)

L.B. EDGIN
downbound check-in point at 19:14
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CHARLIE MELANCON
upbound check-in point at 19:03
(UTC day 9 1965)

Type: vessel awaiting lockage
Orientation 291°
MMSI 1000000004 Event: 22
ABS ENVIRONMENTAL REPORT

OLMSTED WX

Wind: 98 T at 0:00 kn
Gusting to 98 T at 0:00 kn

Air Pressure: 1024.0 mb

Air Temperature: 62.1°F

Dew Point: 57.6°F

Updated: 2015-11-09T21:29:00Z
Data Timeout: 1 hr
BUILDING STRONG

ASS ENVIRONMENTAL REPORT
OLMSTED UPOOL

Water Level: 3.9 m and steady
(average)

Updated: 2015-11-09 12:00:00
Data Timeout: 12 hrs
Station Owner: Inland Waterway Authority
MMSI: 005660557 Site ID: 21