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

e-Navigation underway 2016

Brian Tetreault
Navigation Systems Specialist

US Army Corps of Engineers
Engineer Research & Development Center
Coastal and Hydraulics Laboratory

COASTAL & HYDRAULICS LABORATORY

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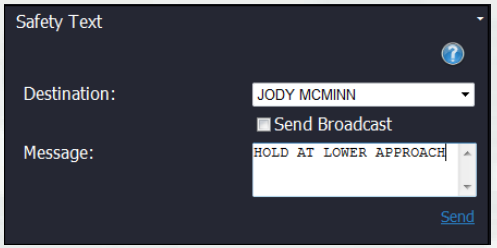
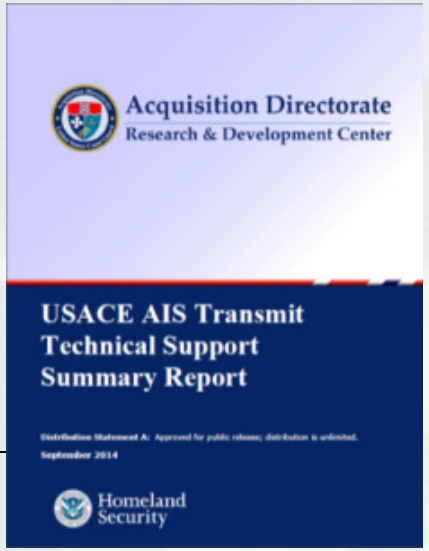
Outline

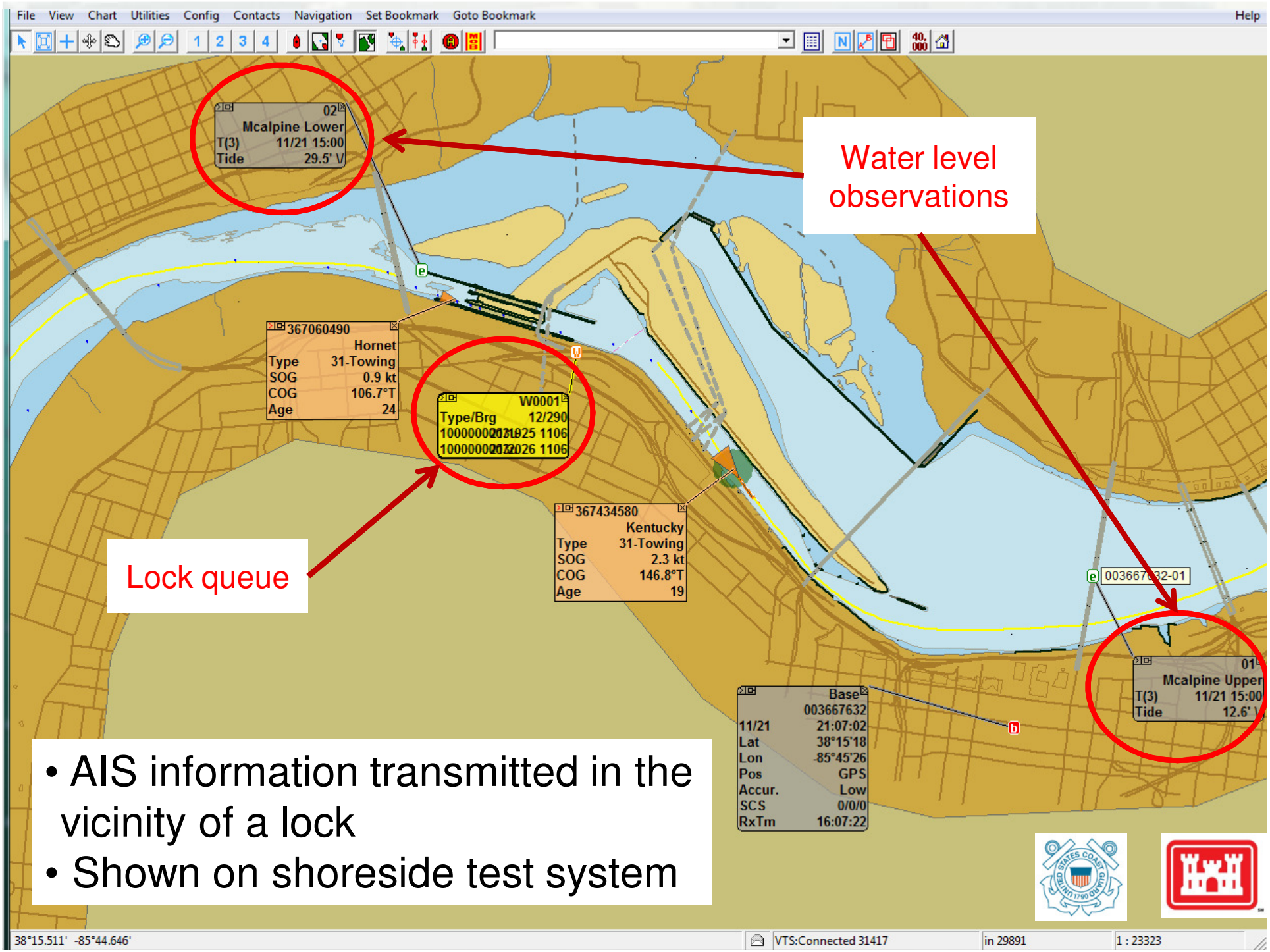
- Overview of AIS transmit efforts to date
- AIS Transmit Service requirements
  - Overview of AIS transmit functions
  - Why these functions are needed
  - Incorporation into “ASM Manager”
- Proposed functions to be addressed in guidelines, recommendations and standards
- Additional transmit developments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

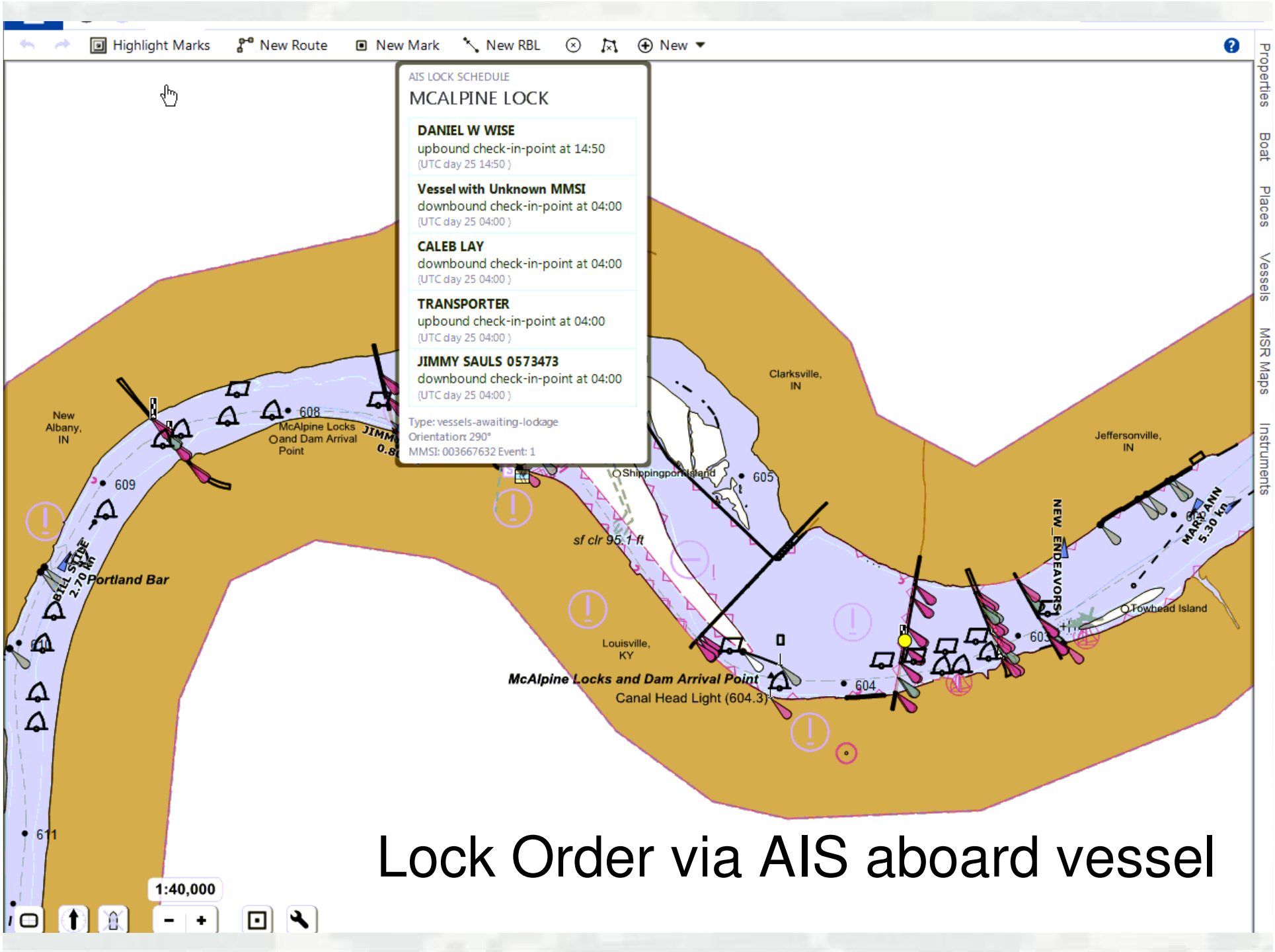
Transmission of navigation information via AIS



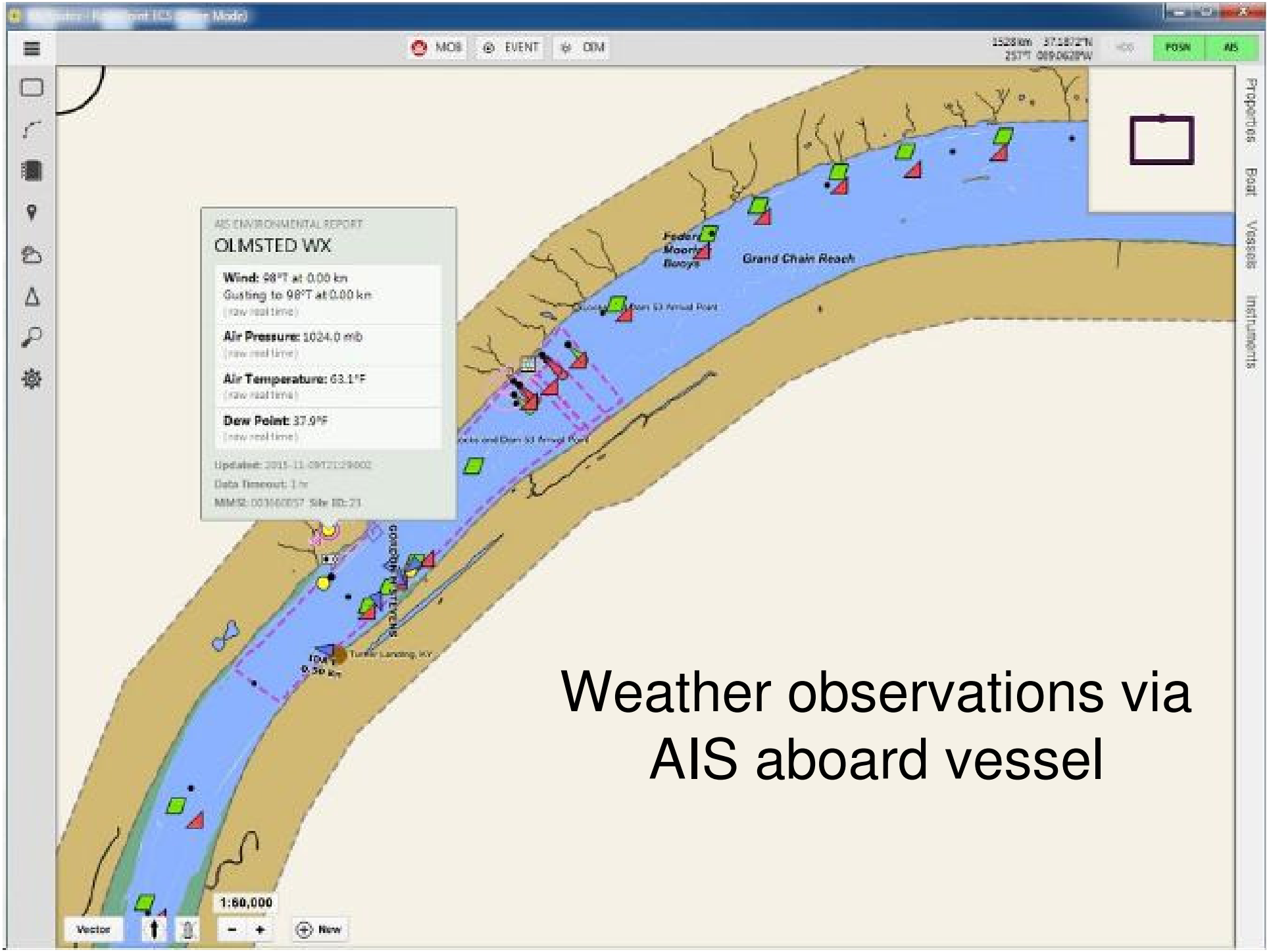
- International:
  - IMO Circ. 236 & 289 – “test” messages
  - IALA ASM collection (http://e-navigation.nl/asm)
  - Many administrations are transmitting various information
    - Weather, met/hydro observations, MSI, safety text messages, etc.
- US efforts
  - Test beds in Louisville, Tampa, Columbia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



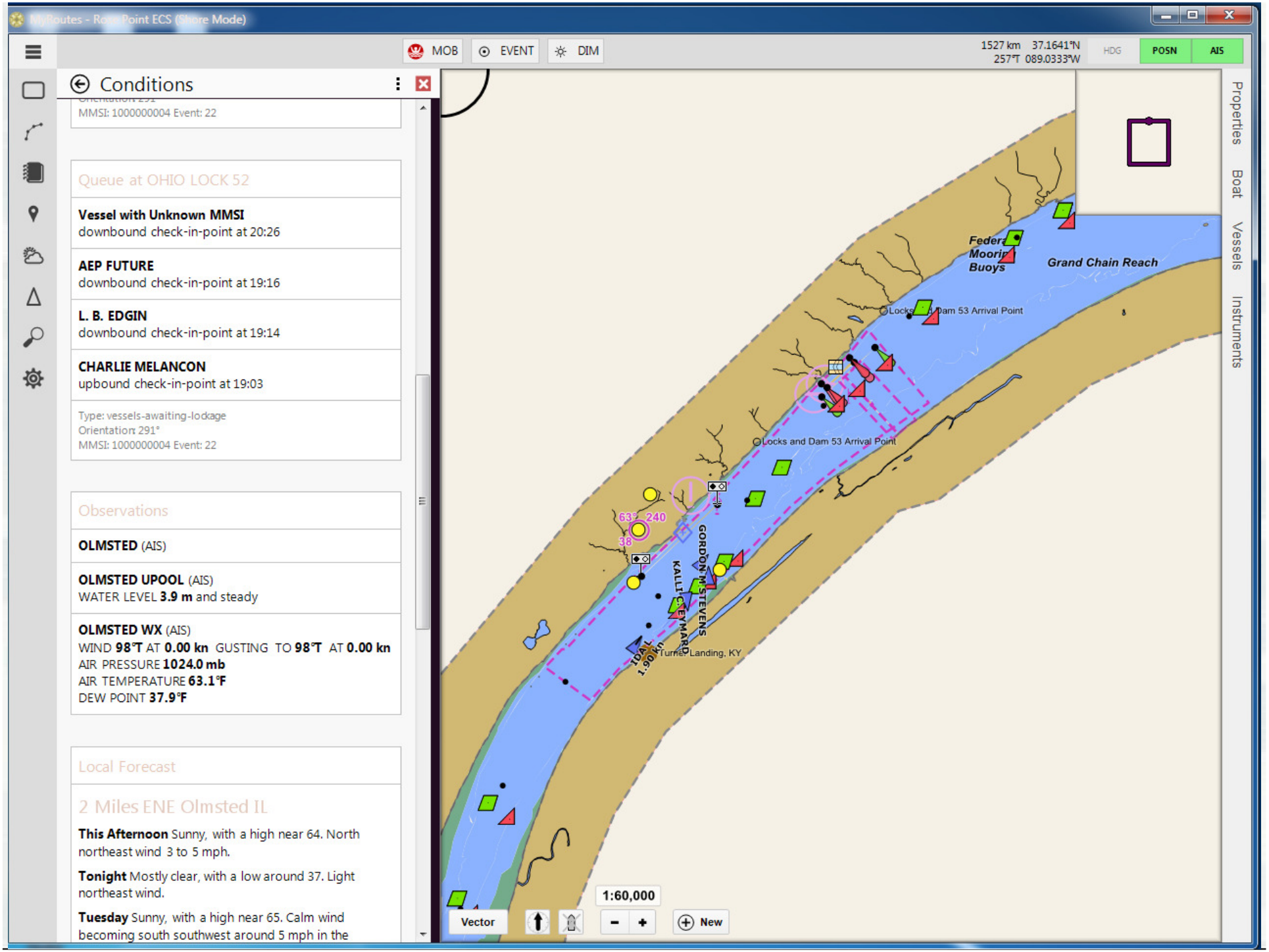

File View Chart Utilities Config Contacts Navigation Set Bookmark Goto Bookmark Help
02
Mcalpine Lower
T(3) 11/21 15:00
Tide 29.5' V
Water level observations
367060490
Hornet
Type 31-Towing
SOG 0.9 kt
COG 106.7°T
Age 24
W0001
Type/Brg 12/290
1000000025 1106
1000000026 1106
367434580
Kentucky
Type 31-Towing
SOG 2.3 kt
COG 146.8°T
Age 19
Lock queue
003667632-01
01
Mcalpine Upper
T(3) 11/21 15:00
Tide 12.6' V
Base
003667632
11/21 21:07:02
Lat 38°15'18
Lon -85°45'26
Pos GPS
Accur. Low
SCS 0/0/0
RxTm 16:07:22
• AIS information transmitted in the vicinity of a lock
• Shown on shoreside test system
38°15.511' -85°44.646'
VTS:Connected 31417
in 29891
1 : 23323



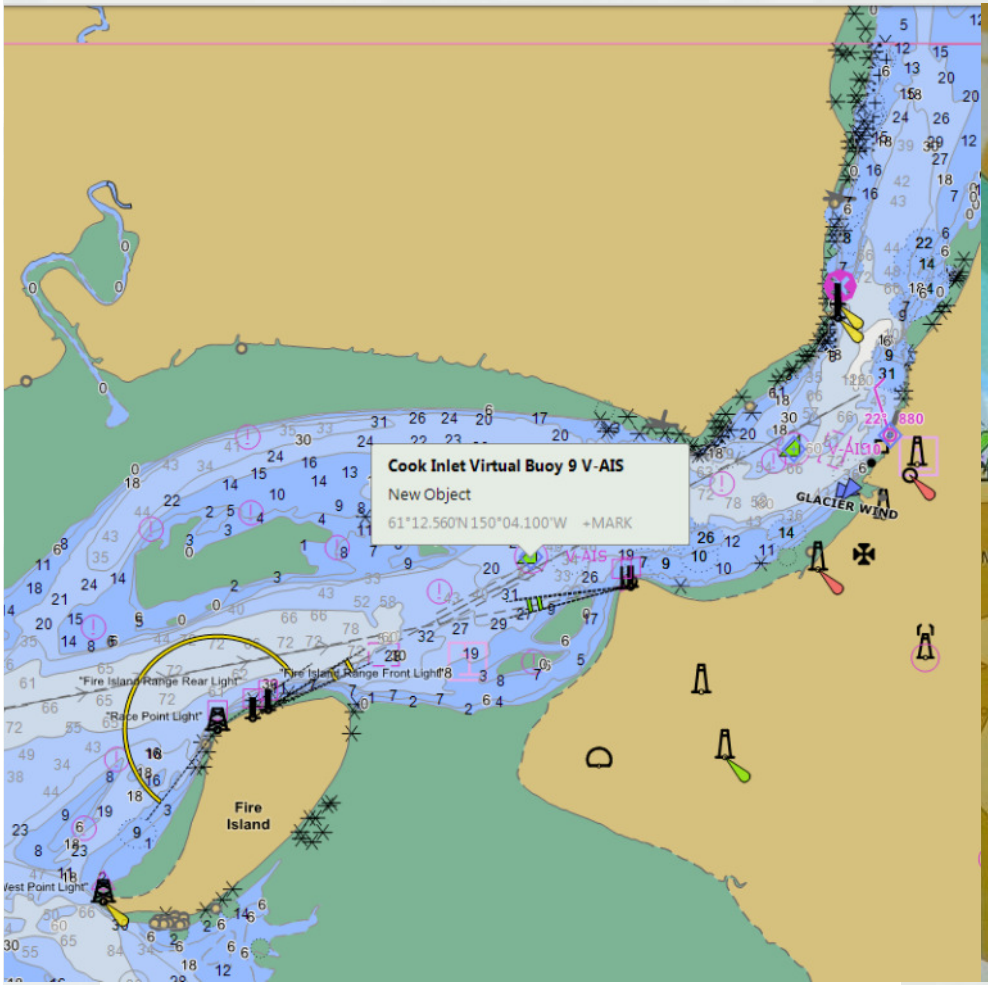
Lock Order via AIS aboard vessel



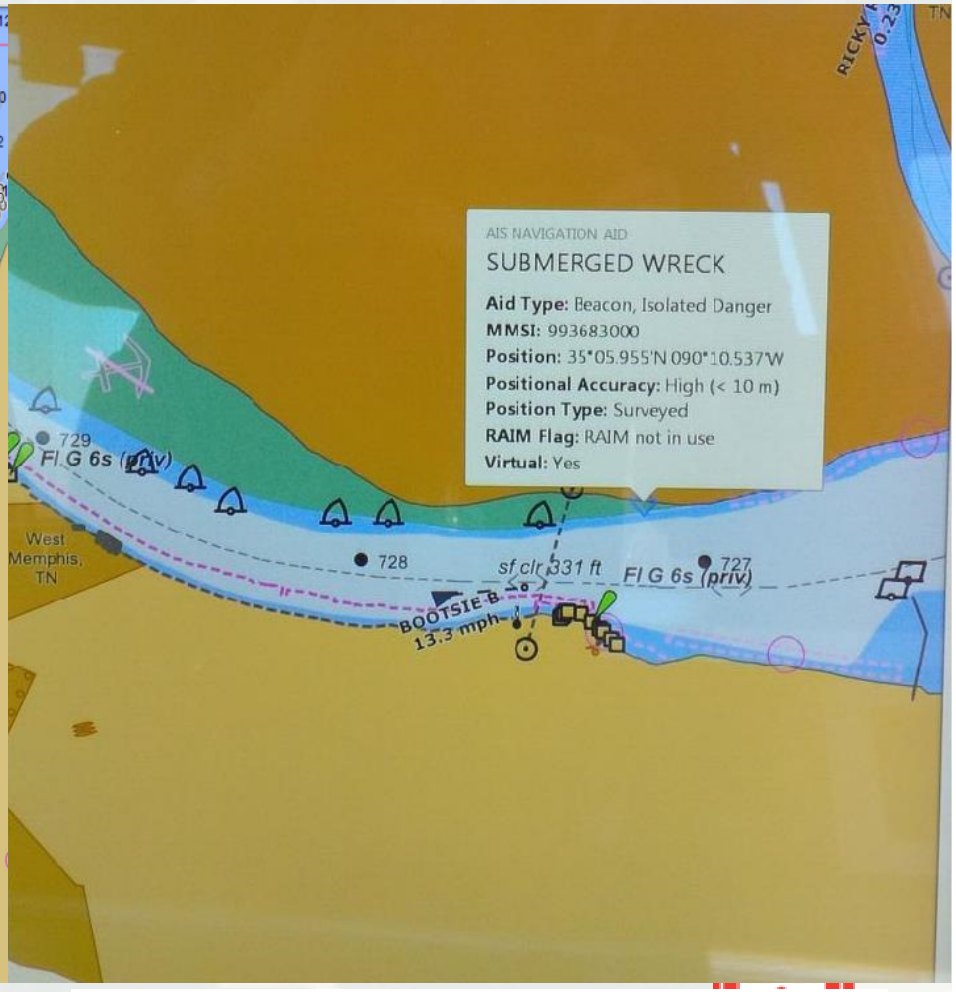
Weather observations via AIS aboard vessel


MyRoutes - Rose Point ECS (Shore Mode)
MOB
EVENT
DIM
1527 km 37.1641°N
257°T 089.0333°W
HDG
POSN
AIS
Conditions
MMSI: 1000000004 Event: 22
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-lockage
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 AT 0.00 kn GUSTING TO 98°T AT 0.00 kn
AIR PRESSURE 1024.0 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
Properties
Boat
Vessels
Instruments
Grand Chain Reach
Locks and Dam 53 Arrival Point
Locks and Dam 53 Arrival Point
GORDON M STEVENS
KALLI C. EYMARD
Turner Landing, KY
1:60,000
Vector
New

Virtual AtoN



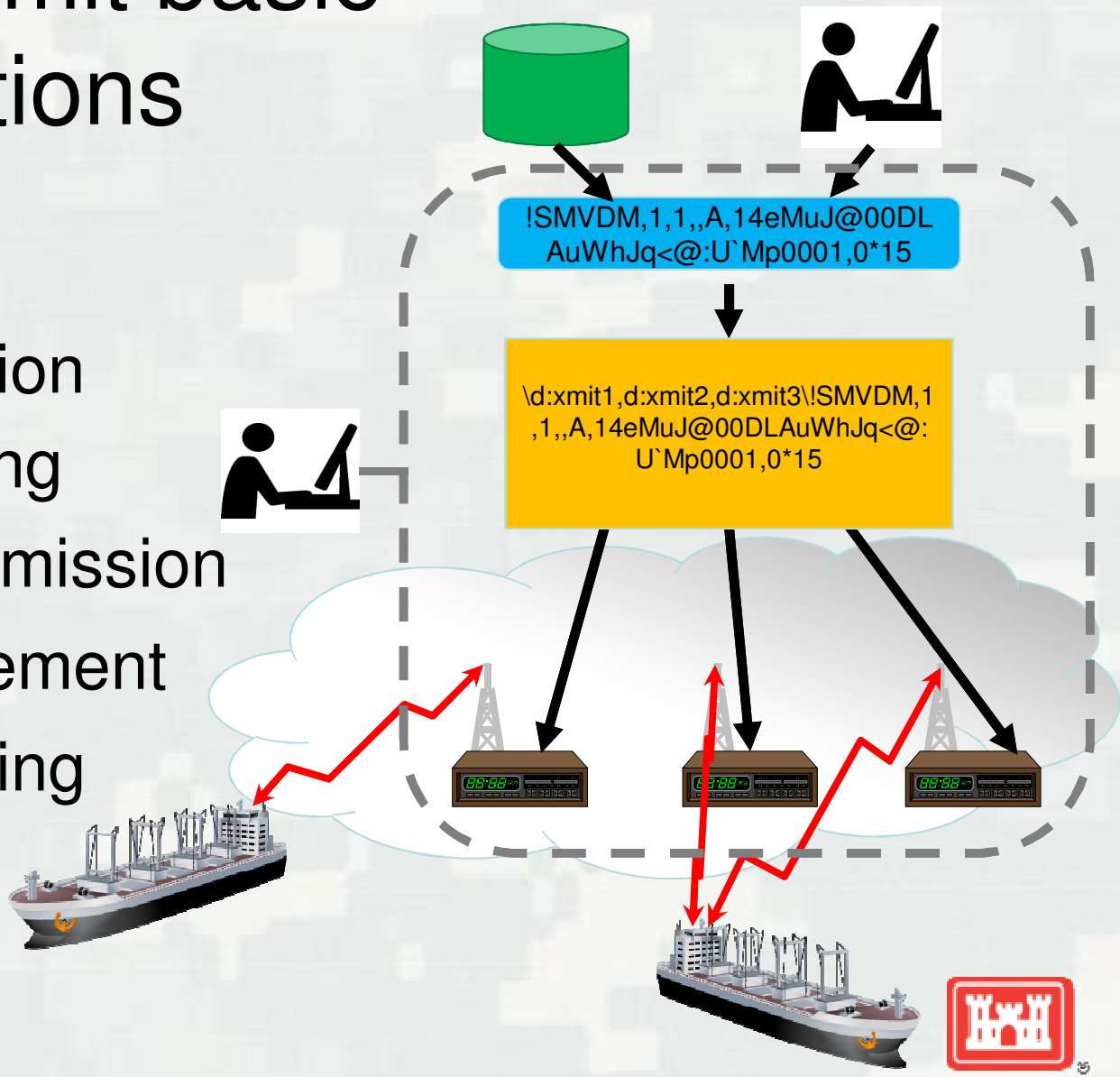
AIS V-AtoN in area where ice and tidal range prohibit physical AtoN



AIS V-AtoN marking submerged wreck in swift river waters

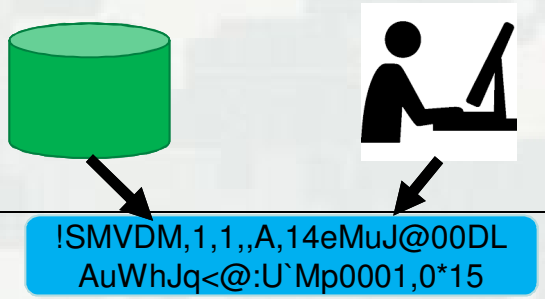
AIS transmit basic functions

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



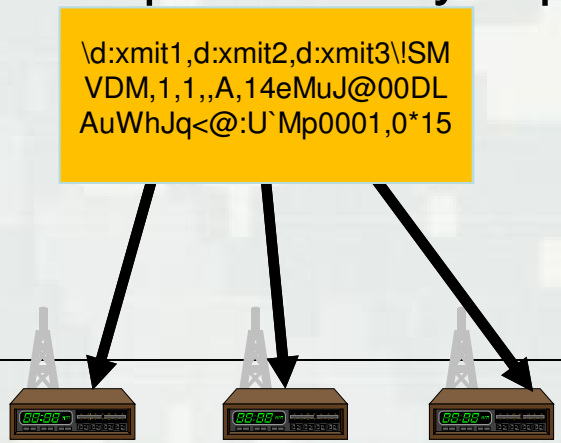
Message Creation

- 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



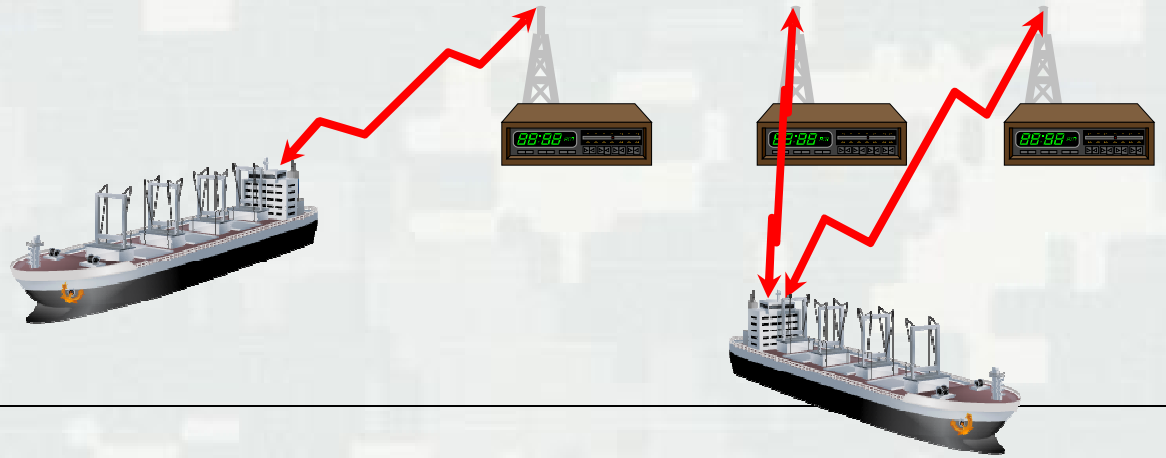
Message Routing

- 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



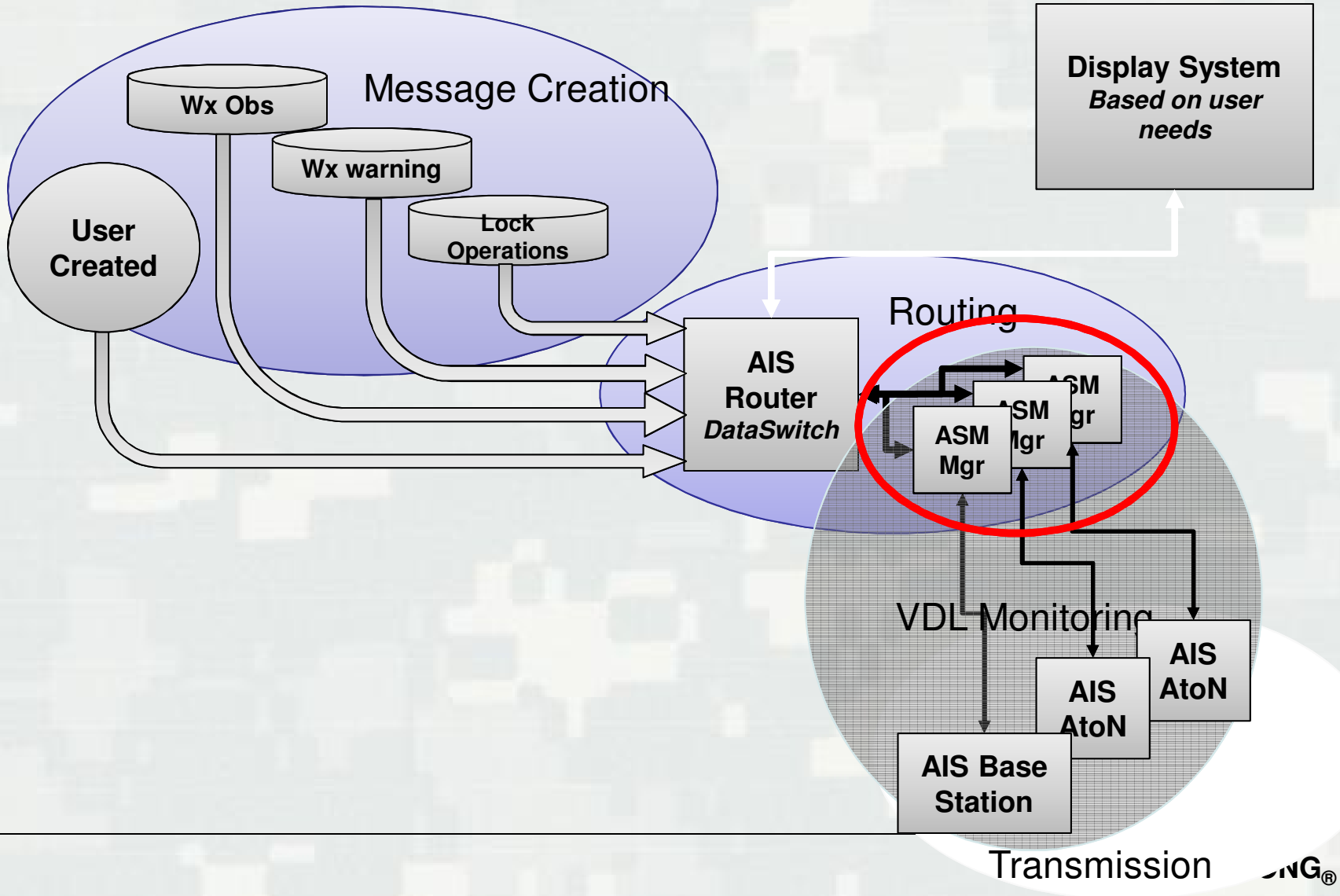
System management and monitoring

- 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

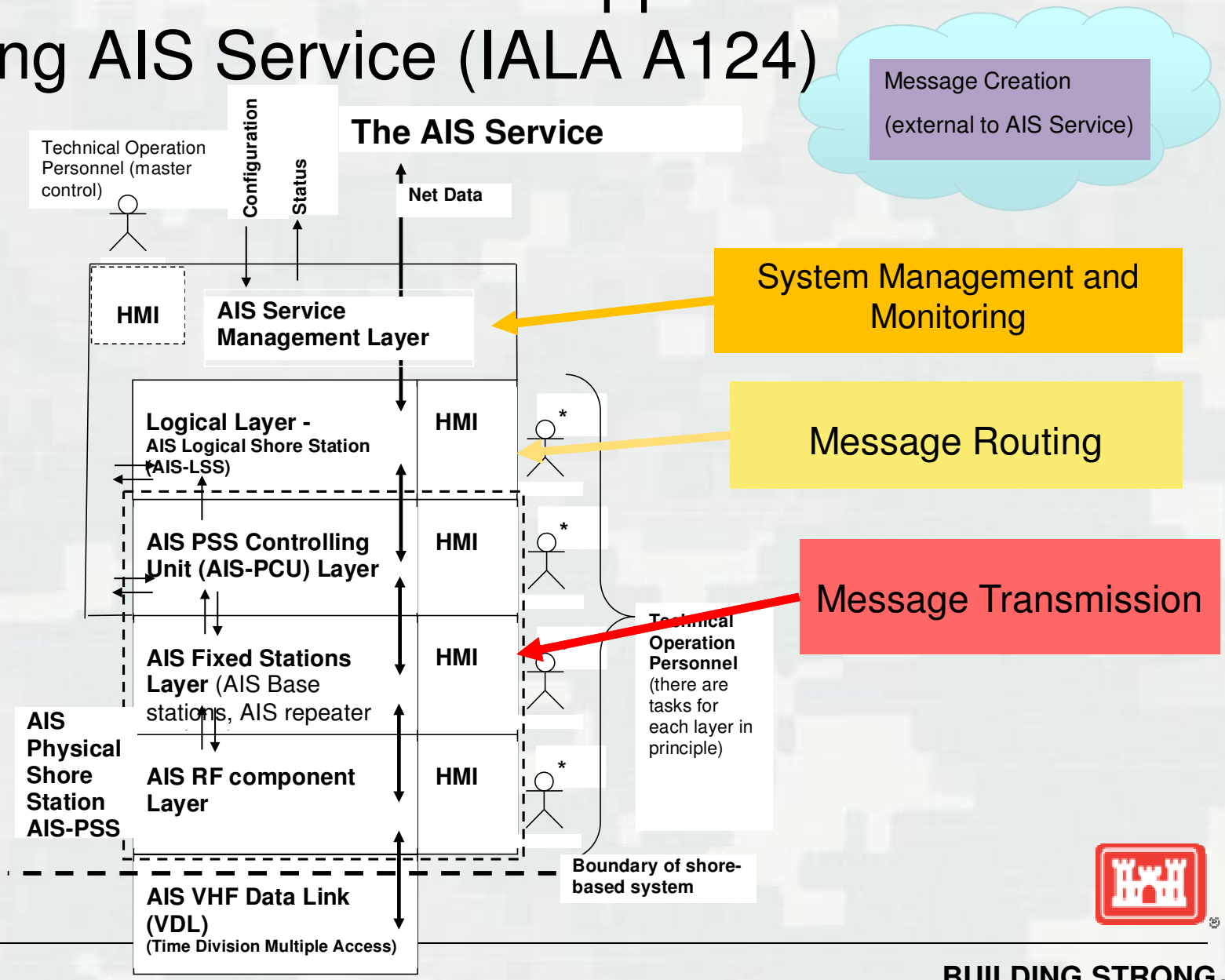
ASM Manager

- 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



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!

e-Navigation underway 2016

Thank you for your attention!

Brian Tetreault

brian.j.tetreault@usace.army.mil

Dr. Greg Johnson

gwjohnson@alionscience.com

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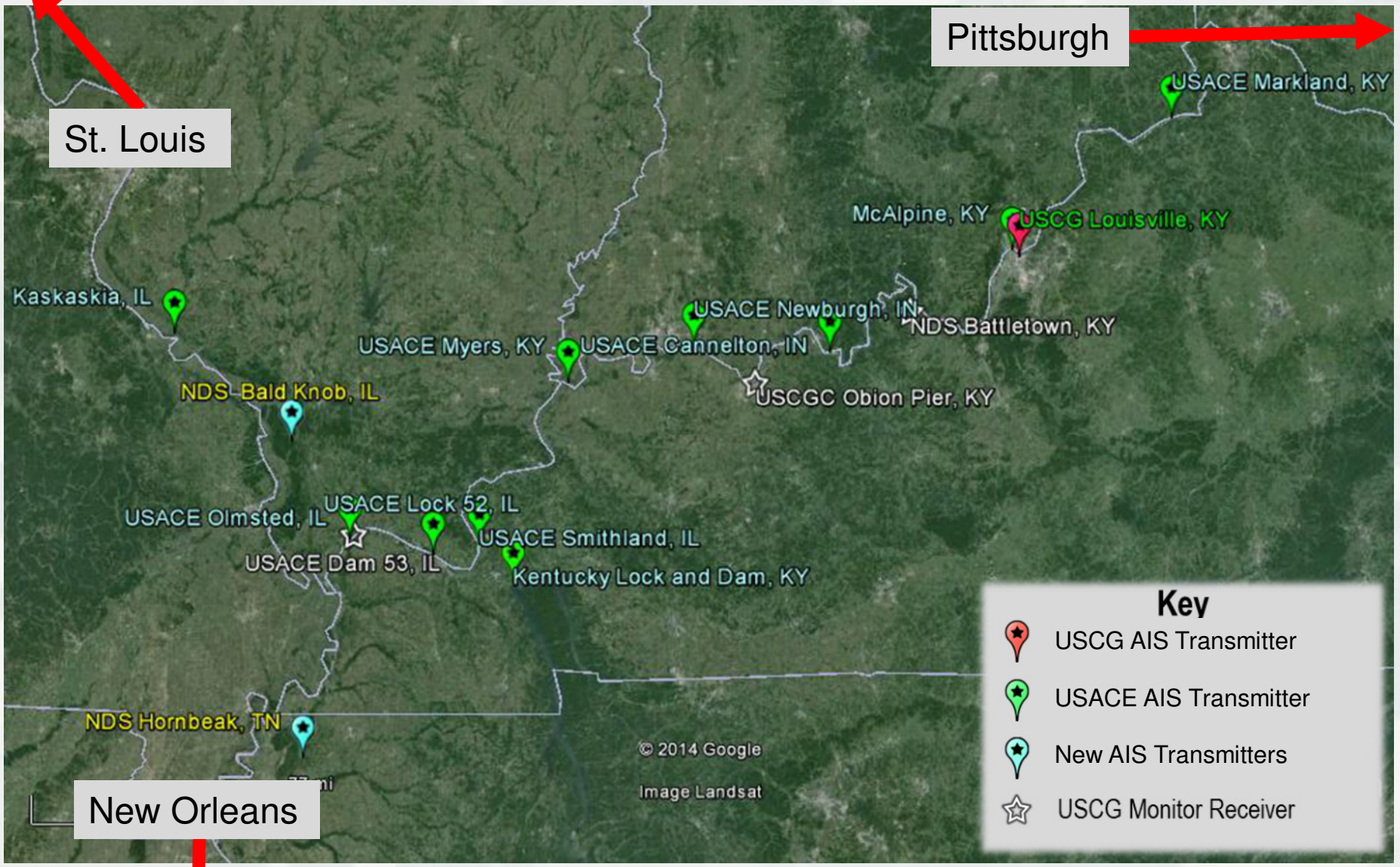
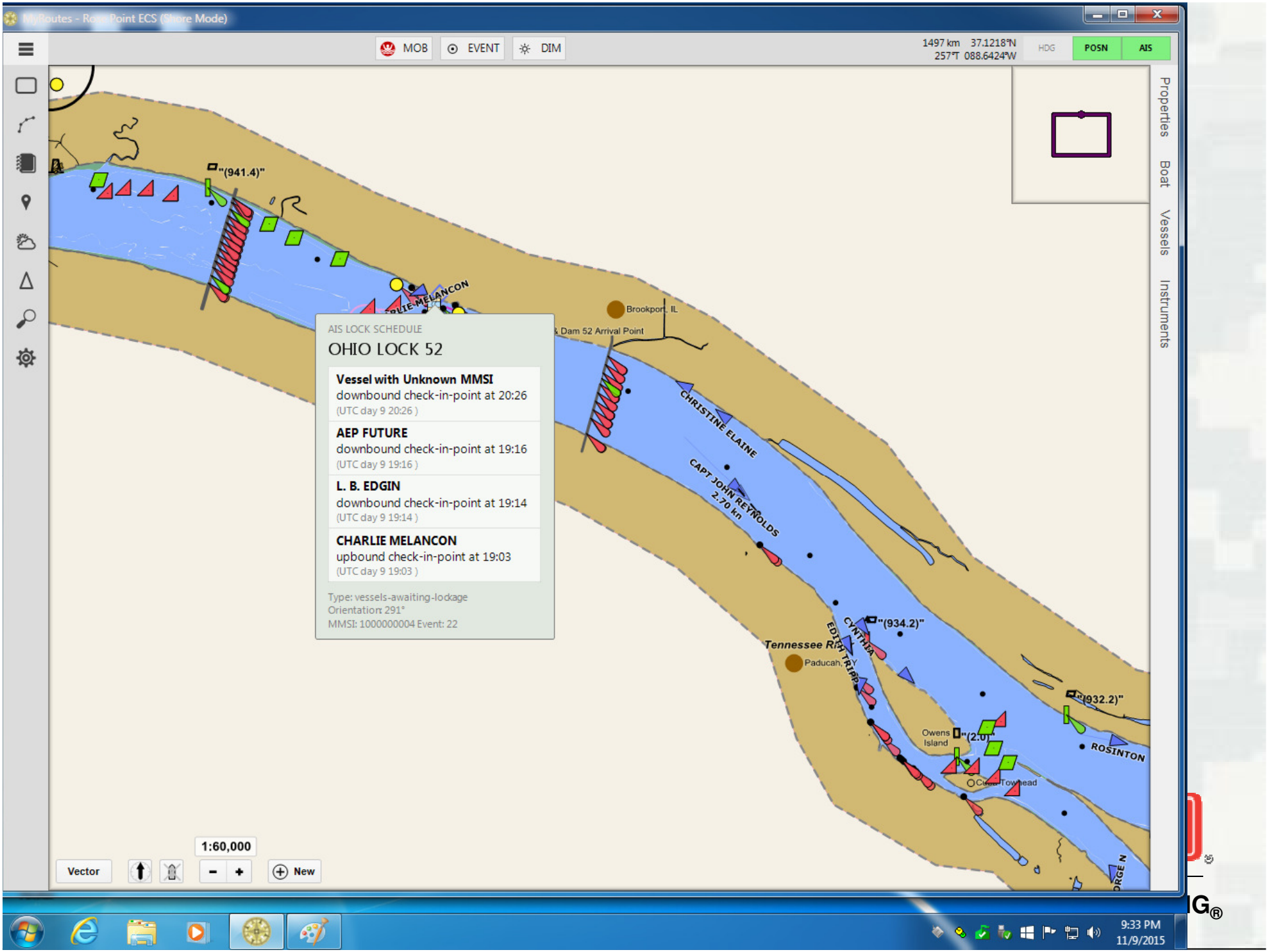
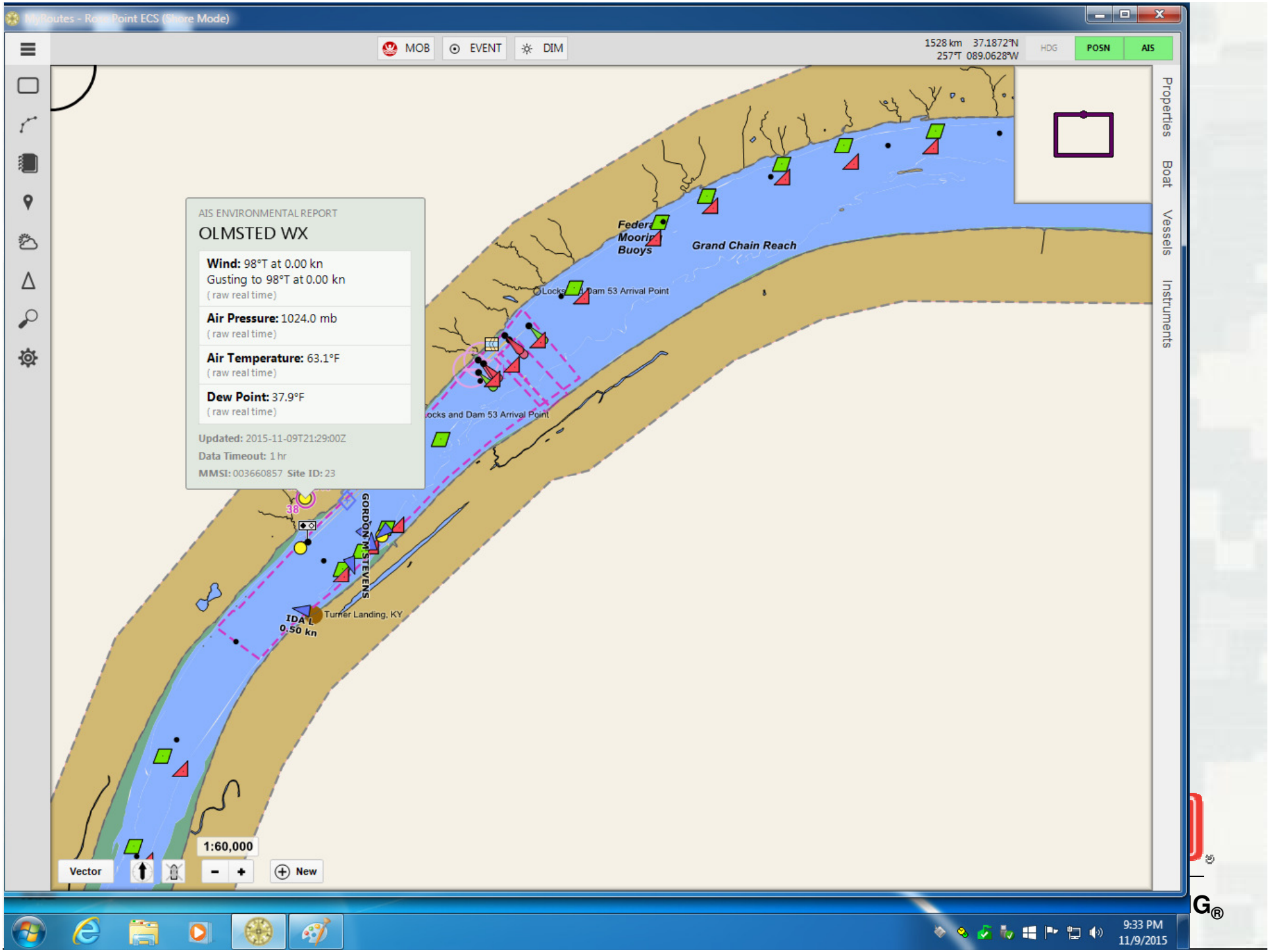
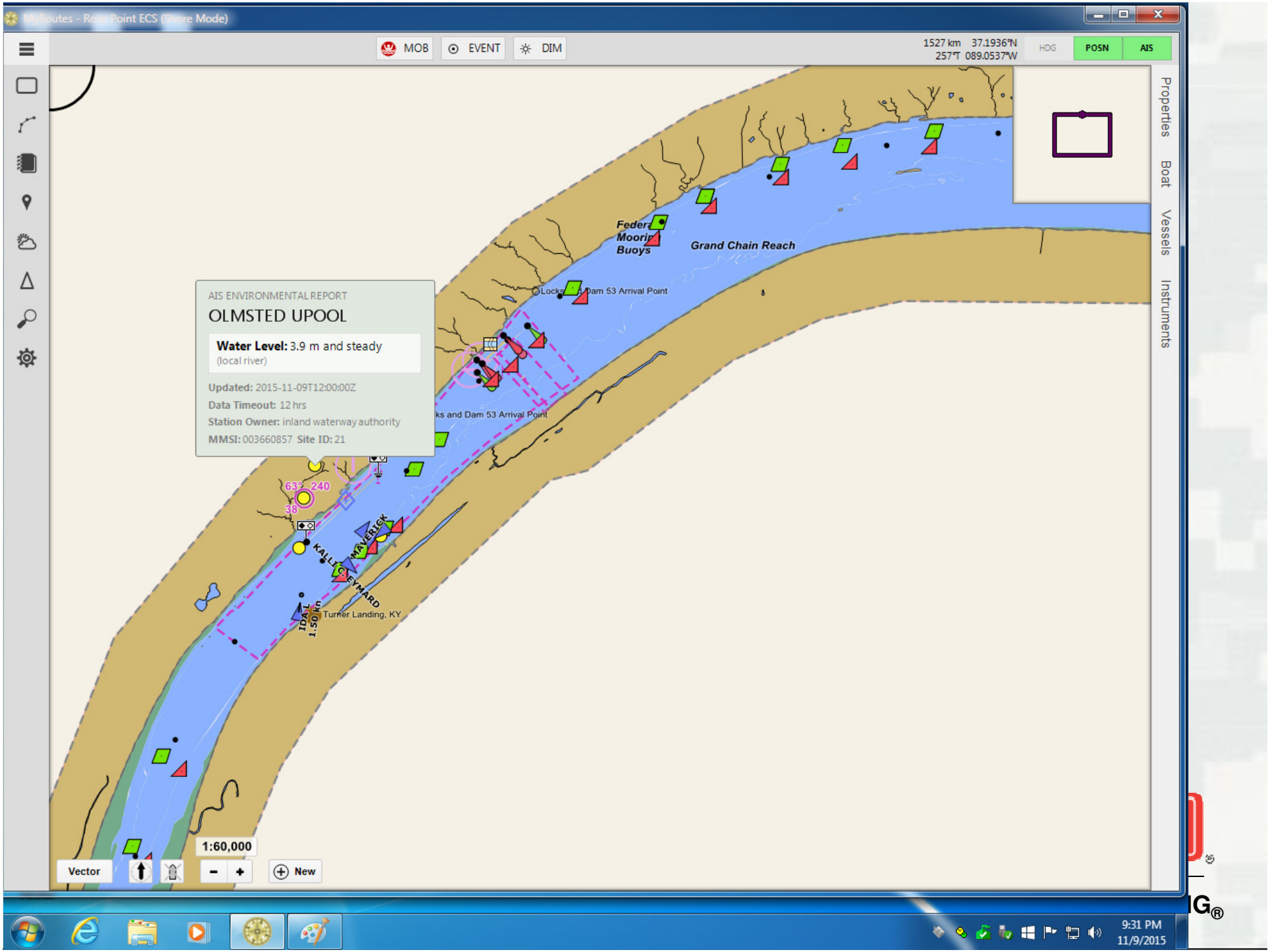
Ohio River eMSI Demonstration

Transmitters




MyRoutes - Rose Point ECS (Shore Mode)
MOB
EVENT
DIM
1497 km 37.1218°N
257°T 088.6424°W
HDG
POSN
AIS
Properties
Boat
Vessels
Instruments
"(941.4)"
CHARLIE MELANCON
Brookport, IL
Dam 52 Arrival Point
CHRISTINE ELAINE
CAPT JOHN REYNOLDS
2.70 kn
AIS LOCK SCHEDULE
OHIO LOCK 52
Vessel with Unknown MMSI
downbound check-in-point at 20:26
(UTC day 9 20:26)
AEP FUTURE
downbound check-in-point at 19:16
(UTC day 9 19:16)
L. B. EDGIN
downbound check-in-point at 19:14
(UTC day 9 19:14)
CHARLIE MELANCON
upbound check-in-point at 19:03
(UTC day 9 19:03)
Type: vessels-awaiting-lockage
Orientation: 291°
MMSI: 1000000004 Event: 22
"(934.2)"
EDITH TRIPP
CYNTHIA
Tennessee R
Paducah, KY
"(932.2)"
Owens Island
"(2.0)"
ROSINTON
1:60,000
Vector
New
9:33 PM
11/9/2015


MyRoutes - Rose Point ECS (Shore Mode)
MOB
EVENT
DIM
1528 km 37.1872°N
257°T 089.0628°W
HDG
POSN
AIS
Properties
Boat
Vessels
Instruments
AIS ENVIRONMENTAL REPORT
OLMSTED WX
Wind: 98°T at 0.00 kn
Gusting to 98°T at 0.00 kn
(raw real time)
Air Pressure: 1024.0 mb
(raw real time)
Air Temperature: 63.1°F
(raw real time)
Dew Point: 37.9°F
(raw real time)
Updated: 2015-11-09T21:29:00Z
Data Timeout: 1 hr
MMSI: 003660857 Site ID: 23
Grand Chain Reach
Dam 53 Arrival Point
ocks and Dam 53 Arrival Point
GORDON H STEVENS
Turner Landing, KY
IDA L
0.50 kn
38
1:60,000
Vector
New
9:33 PM
11/9/2015


MyRoutes - RossPoint ECS (Shore Mode)
MOB
EVENT
DIM
1527 km 37.1936°N
257°T 089.0537°W
HDG
POSN
AIS
Properties
Boat
Vessels
Instruments
Grand Chain Reach
Federal Mooring Buoys
Locks and Dam 53 Arrival Point
AIS ENVIRONMENTAL REPORT
OLMSTED UPOOL
Water Level: 3.9 m and steady
(local river)
Updated: 2015-11-09T12:00:00Z
Data Timeout: 12 hrs
Station Owner: inland waterway authority
MMSI: 003660857 Site ID: 21
63° 240
38
MAVERICK
KALLEY
EYMARD
IDA I
1.50 Kn
Turner Landing, KY
1:60,000
Vector
New
9:31 PM
11/9/2015