Alternative Hydrographic Data Processing Paradigms

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INMARTECH 2014

Background Summary

- Enabling Technologies: Broadband Connectivity, Remote Data Compression Techniques and Cloud Based Services provide an opportunity
- Big savings to be had in terms of time and resources.
- Two Case Studies presented
  - Remote Operator accesses Ship resources. Modeled after CHS/IIC Technologies (presented at CHC 2011)
  - Stream data from an asset ashore (Emergency Response)

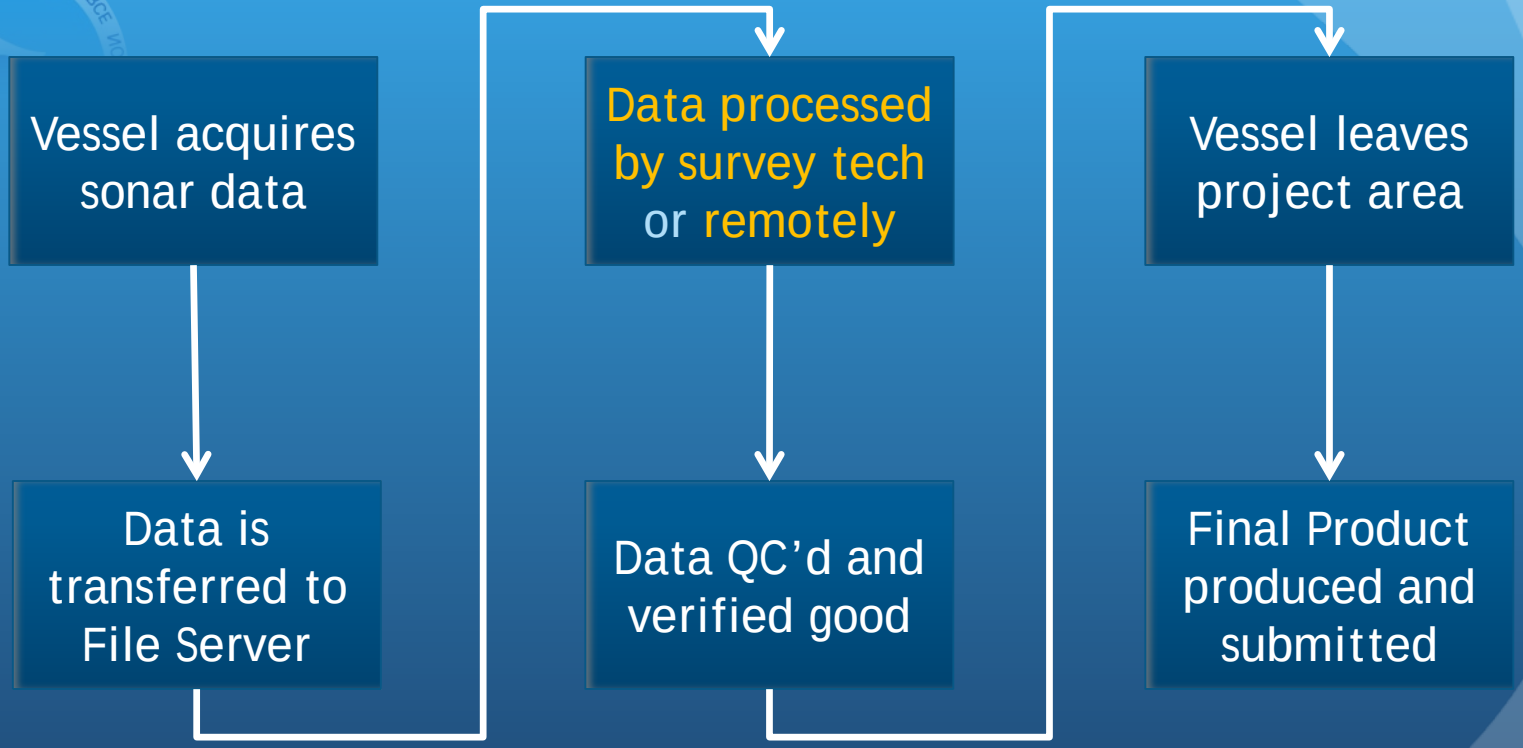
Case Study 1:
Remote Hydro Data Processing

NOAA Ship Ferdinand R. Hassler

Case Study 1: Remote Hydro Data Processing

- Goal - To remotely process hydrographic data onboard the NOAA Ship Ferdinand R. Hassler from shore.
- Hydrographic data never leaves ship
- The process must be reliable, maintain data integrity, be minimally invasive to the ship and be cost and time effective.

Case Study 1:
Remote Hydro Data Processing



Remote Hydro Data Processing

Processing Remotely – In Depth

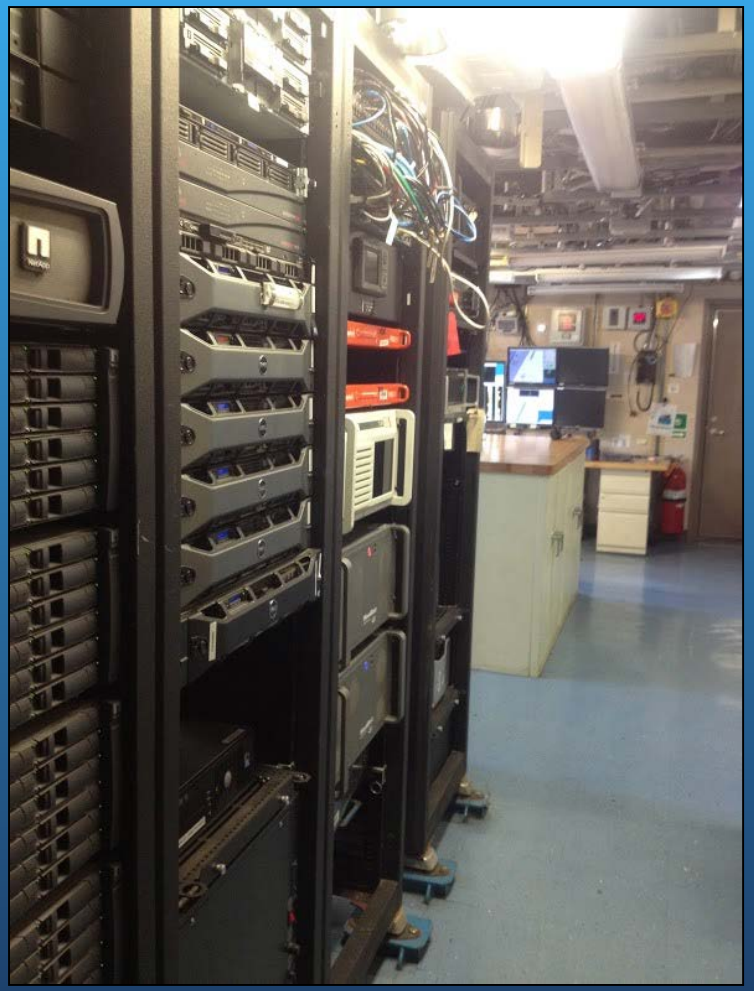
Data Processed remotely

- Hydrographer logs into local workstation
- Connects over RDP using Ericom technologies
- Hydrographer logs into ship network
- Performs processing tasks
- Informs ship survey department of tasks completed

Remote Hydro Data Processing

What are the benefits?

- Takes some of the burden off the ship personnel
- Provides some flexibility with the ship's scheduling
- Allows for more 24 hour operations
- Paves the way for future remote projects



Remote Hydro Data Processing
2014 Field Season

- Testing Remote Support with AHB assistance
- Testing viability of 4G Connection
- Chesapeake Bay, Approach to Portsmouth, NH and Rhode Island Sound.
- Approximately 10 weeks spent underway with remote support

Remote Hydro Data Processing
2014 Field Season

Hassler 2014 Field Season

File Edit View Insert Format Data Tools Add-ons Help Last edit was made 38 minutes ago by Kolleen Mortimer

PS Remote Processing Log

PS Remote Processing Log

Project: OPR-B307-FH14
DN: 177
PS Processor: [redacted]

	HDCS Lines	Surfaces	DR	Backscatter
H12696	Free	Free	Free	N/A
H12697	HSST	HSST	Free	N/A
H12698	Free	Free	Free	N/A
H12700	Free	Free	Free	N/A
H12707	Nav	Nav	Free	N/A
H12702	HSST	HSST	Free	Not Ready to Process

Communication:

Use this section to ask questions or to make general comments. Do not delete entered text as it is a record of correspondence.

Name	Comment/Question
[redacted]	

Hassler - Processing System - Logged on to [redacted] - PowerTerm WebConnect RemoteView

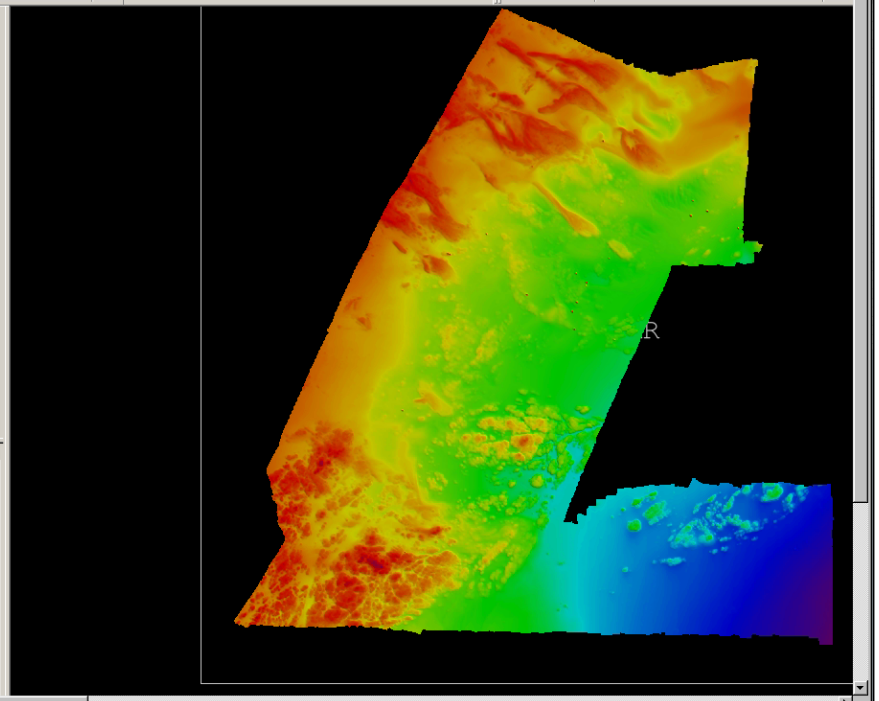
File Options Help

CARIS HIPS and SIPS

File Edit View Tools Process Select Window Help

H12696_preSAR
H12696_Combined_preSAR
Contributor
Deep
Density
Depth
Hypothesis_Count
Hypothesis_Strength
IHO
Mean
Node_Std_Dev
Shoal
Std_Dev
TVU Compliance
Uncertainty
User_Nominated
Designated
Bounding Polygon

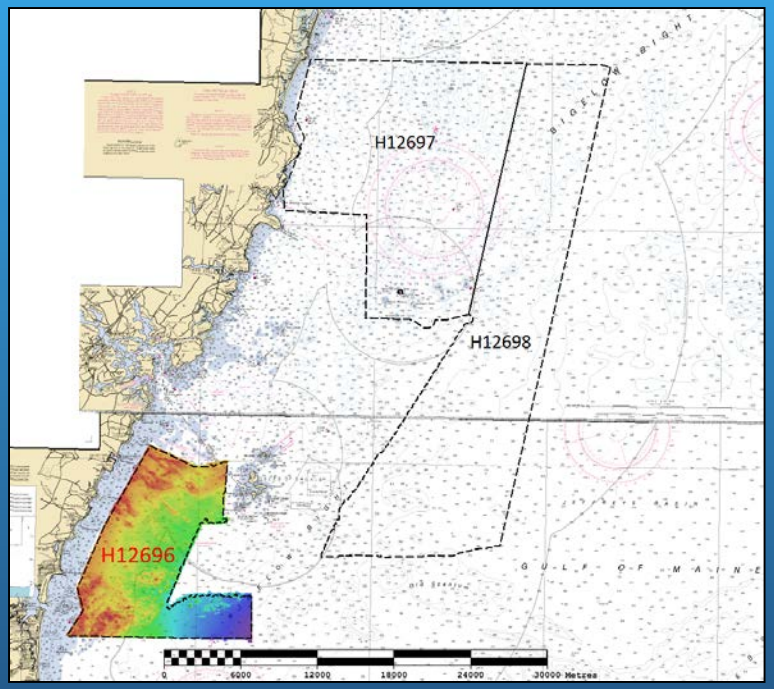
Project Layers Draw Order



Hassler - Processing System - Logged on to 10.48.8.181

Remote Hydro Data Processing
2014 Field Season - Issues

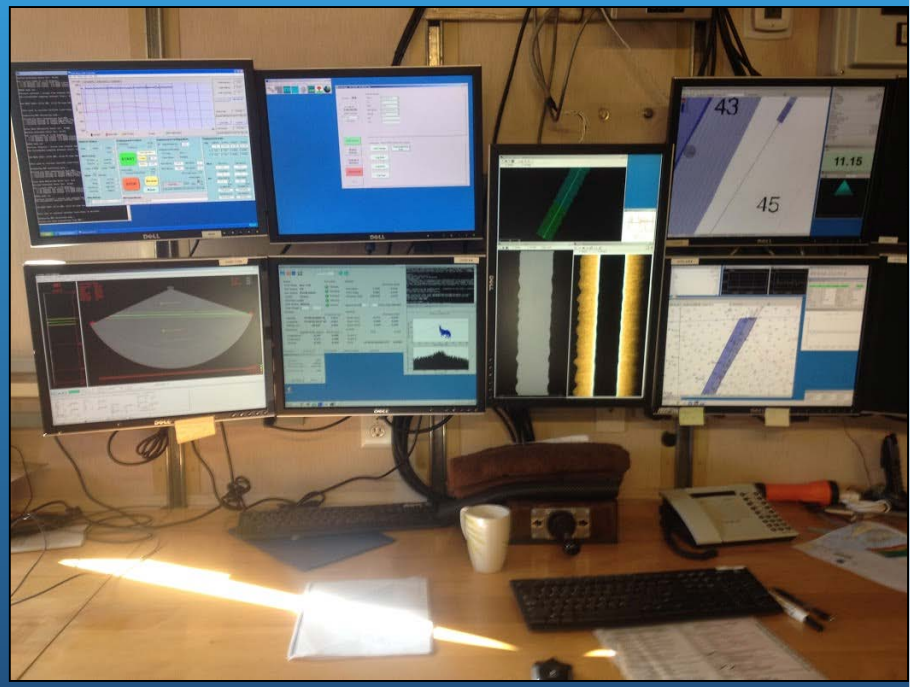
- Managing remote connection – users, logins, terminal server
- Local HASP licensing over RDP
- Visualizing Connection on ship
- Communication
- Latency, Latency, Latency…



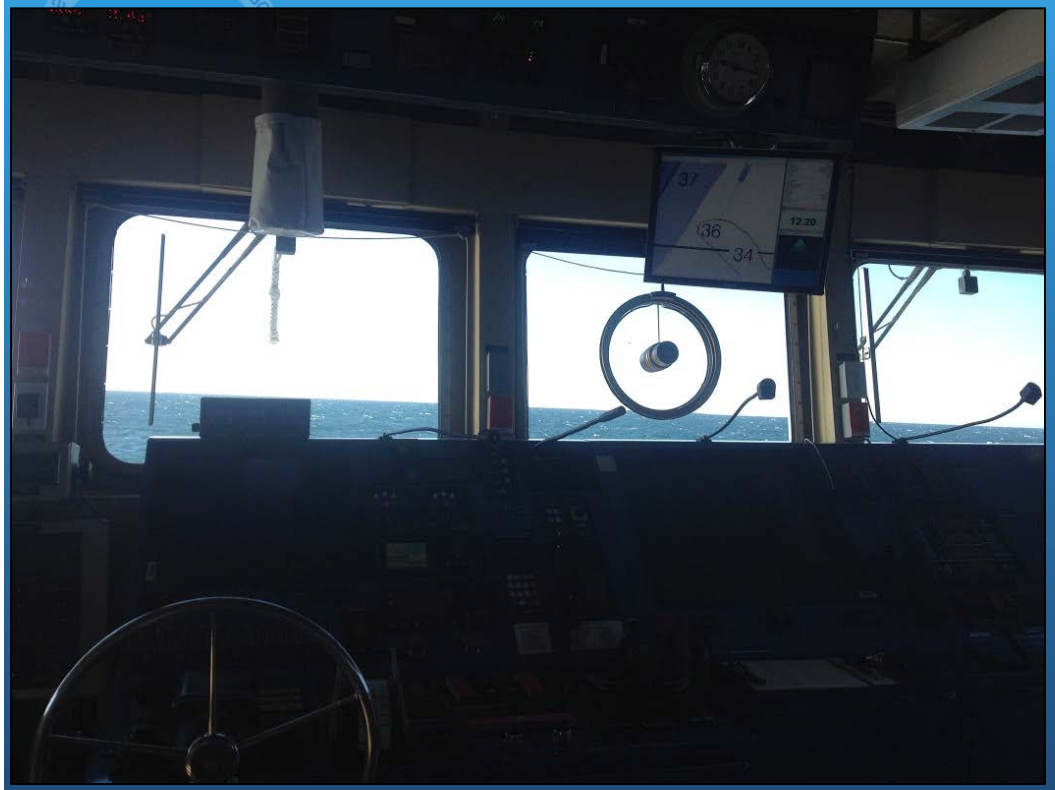

```
Pinging [redacted] with 32 bytes of data:
Reply from [redacted] bytes=32 time=673ms TTL=108
Reply from [redacted] bytes=32 time=685ms TTL=108
Reply from [redacted] bytes=32 time=701ms TTL=108
Reply from [redacted] bytes=32 time=653ms TTL=108

Ping statistics for [redacted]
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 653ms, Maximum = 701ms, Average = 678ms
```

Remote Hydro Data Processing
Lessons Learned

- Latency using VSat is too high for in depth processing.
- Cellular 4G LTE (when available) is markedly better for Remote Desktop Sessions. (lower latency)
- Robust RDP connection
- Running automated batch processes were viable.



Remote Hydro Data Processing
Looking Forward



- RDS Services – Shadow connection
- Permanent licensing method for all software packages
- Further enhance existing 4G infrastructure

Remote Data Distribution Case Study 2

NOAA Office of Coast Survey

Navigation Response Teams (NRT)

Remote Data Distribution for Emergency Response

Navigation Response Teams (NRT)

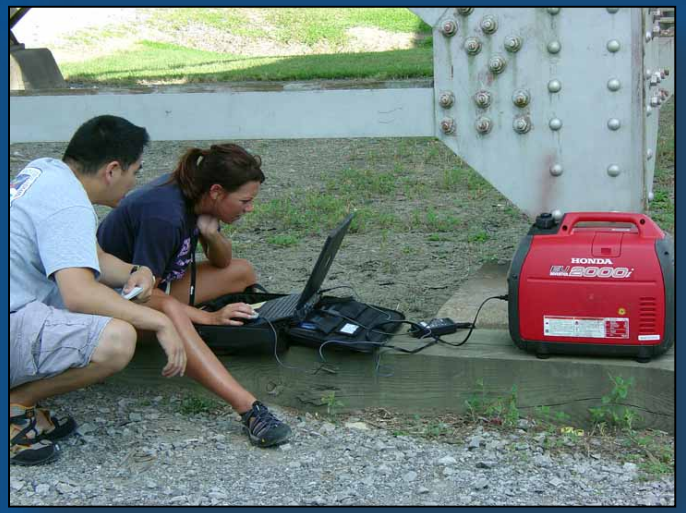
- Goal: Increase Coastal Resilience

- Case Study 2 facilitates an n:n relationship (e.g. multiple assets/multiple hydrographers)

- Transmit raw data (bathymetric/imagery) over wireless cellular broadband to a land based station

- Leverage high speed/bandwidth cellular networks and Cloud technologies such as Infrastructure as a Service (IaaS) that are Network Delay Tolerant

The Nature of Response Work

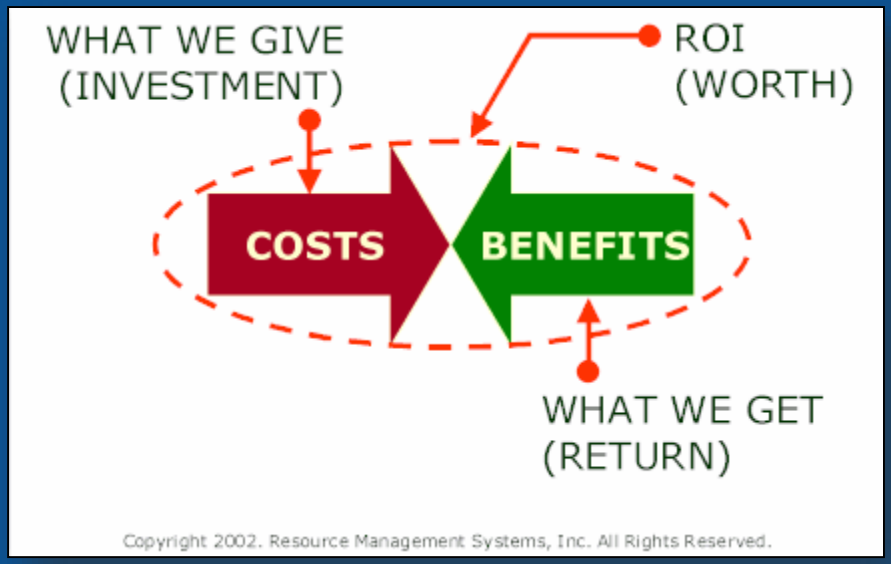


Driving Factors

- Delays in data processing.
- Increased workload on responders.
- High Stress Environment.
- Get the Ports opened faster!
- IaaS providers that are Network Delay Tolerant.
- Keep our valuable employees safe!

Remote Data Distribution

- Is now possible with current technologies.
- If we can open the port quicker by just 1 hour. ROI is realized.
- Cost $50k = (Hardware/Software/Service)
- This is 1% of the Port being closed for one hour



- Hurricane Irene (2011)

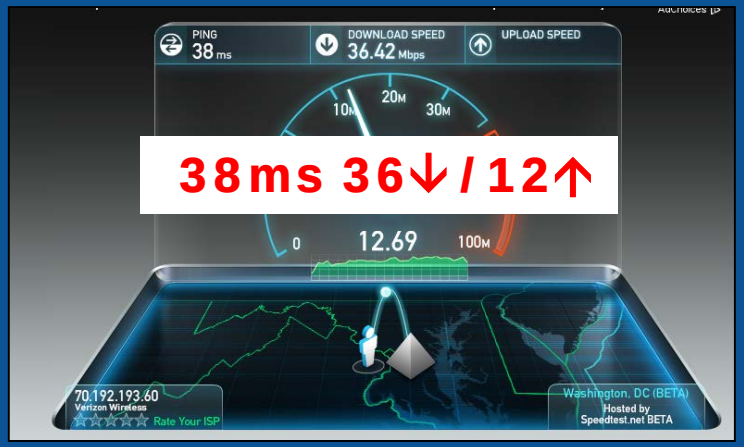
- "**Delays** in shipping, even minor ones, **cost** the economy millions each year, and NOAA's emergency navigation mobilization paid dividends in the Hampton Roads area of Virginia, where an average of **$5 million** worth of cargo is shipped in or out, **every hour**."

  – Office of Coast Survey

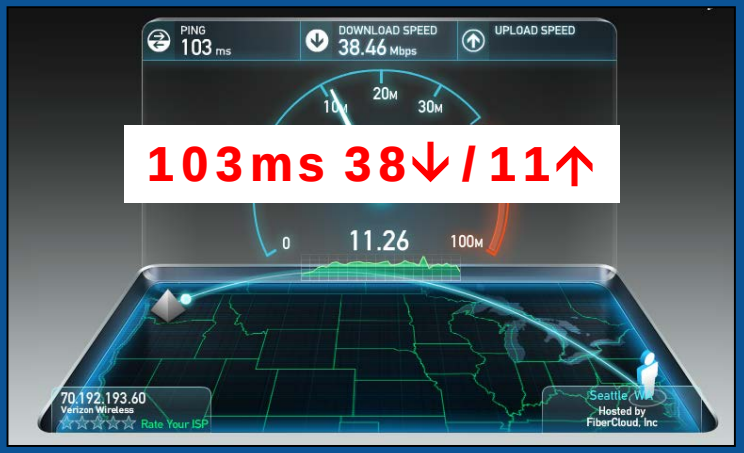
2013 U.S. Presidential Inauguration

- Remote Data Distribution Proof of Concept
- Homeland Security Support
- Potomac River Survey Nov 2012: Quick Turnaround!
- Goal: Reduce Ping to Data Processing Time

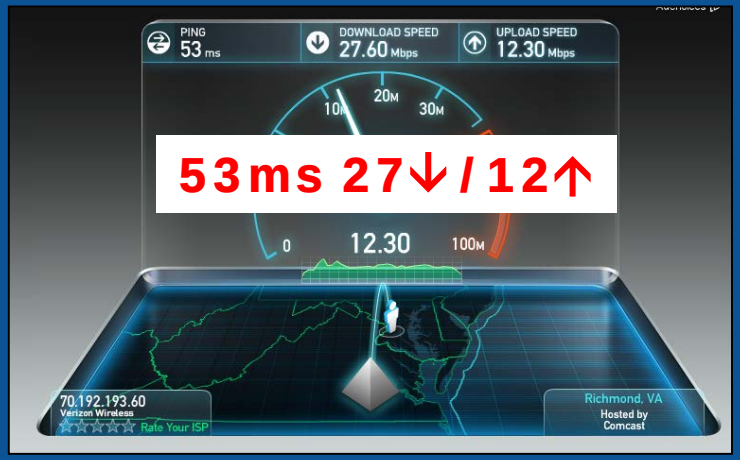
Network Speed Tests



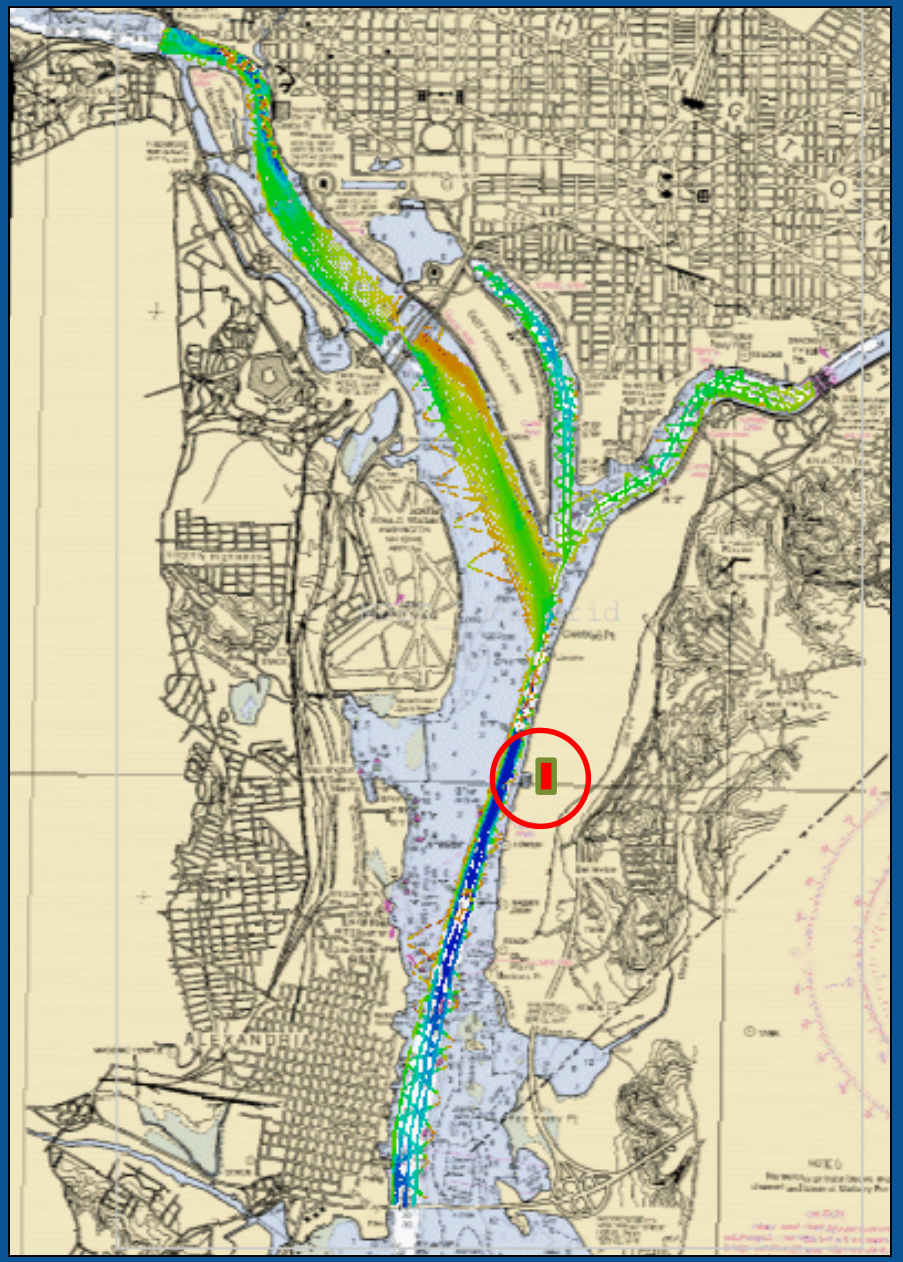
DC Metro Area



DC to Seattle, WA



DC to Norfolk, VA



Broadband as Infrastructure

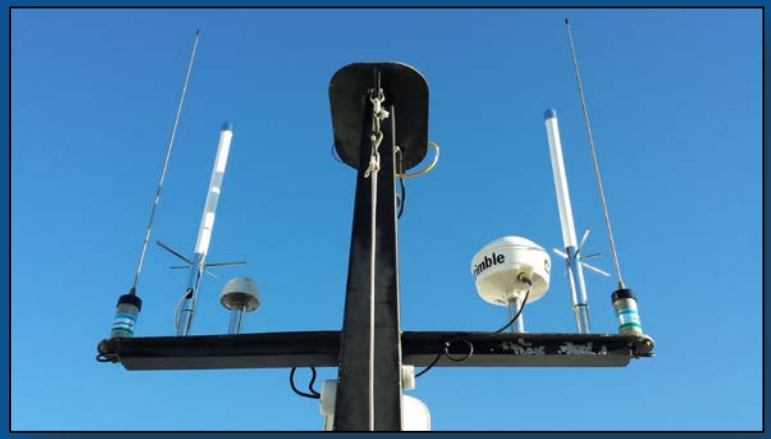
GX440

Mobile Gateway (4G LTE)

30’ Boat

Installation

Marine /GPS Antennae



Marine Antennae (4G LTE)

Integration/Diagnostics

Maximizing RF Signal

Robust Connectivity

- Cellular: Verizon/AT&T
  - Crisis Response Teams
- Ruggedized Mobile Gateways
- Machine to Machine Routers (M2M)

A Hybrid Solution

- Near Real Time Remote Data Processing Evaluation
- Collaborate with Industry Vendors/Partners
- 2 - 4 Node Blade Cluster w/ Integrated Storage

Looking further ahead

- Couple technologies: Wireless Broadband Infrastructure, Cloud Services, and parallel and distributed cluster computing

- Get Vendors to start thinking about optimizing for parallel processing and distributed computing

- Embrace Cloud Computing Technologies into hydrographic data processing (e.g. running in a server environment, IaaS)