Alternative Hydrographic Data Processing Paradigms

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2014 Canadian Hydrographic Conference

Background Summary

- Enabling Technologies: Proliferation/Maturation of Broadband Connectivity and Cloud Based Services provide an opportunity

- Couple these technologies with Parallel and Distributed Cluster Computing can streamline hydrographic data processing and response operations

- Two Case Studies presented
  - Remote Operator accesses Ship resources (Routine) Modeled after CHS/IIC Technologies (presented at Hydro 2011)
  - Stream data from an asset ashore (Emergency Response)

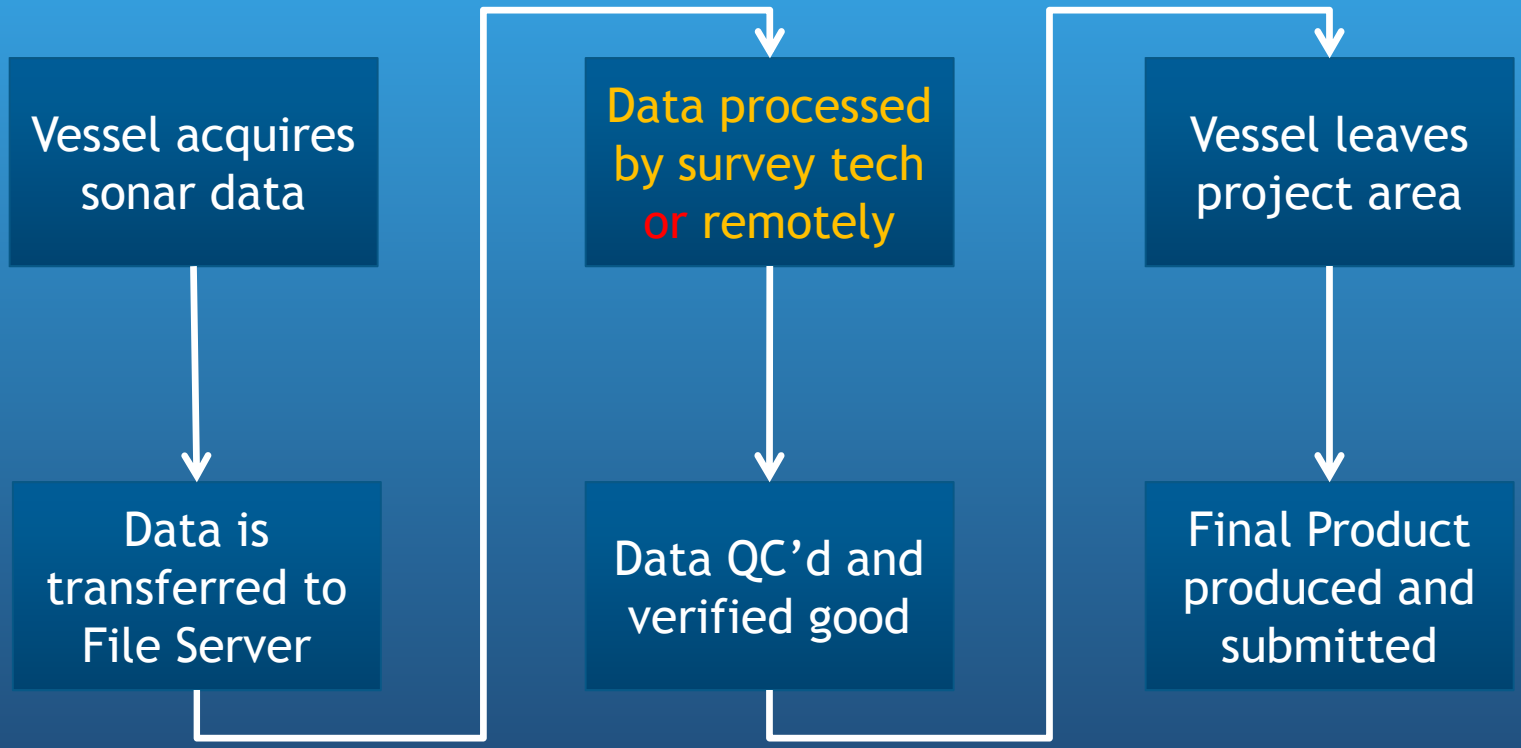
Case Study 1:
Remote Hydro Data Processing

NOAA Ship Ferdinand R. Hassler

Case Study 1:
Remote Hydro Data Processing

- Goal - To investigate, test, develop and document a process and procedure for processing 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 Windows Remote Desktop
- 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
Lessons Learned

- Currently in testing phase. Performance benchmarking.
- Latency using VSat is too high for in depth processing.
- Cellular 4G LTE (when available) is markedly better for Remote Desktop Sessions. (lower latency)
- Running automated batch processes were viable.
- Is Windows Remote Desktop the right tool? Evaluate other potential options.
- Experienced some issues with running certain software in a server environment.

Remote Data Distribution
Case Study 2

NOAA Office of Coast Survey

Navigation Response Teams (NRT)

Remote Data Distribution for Emergency Response

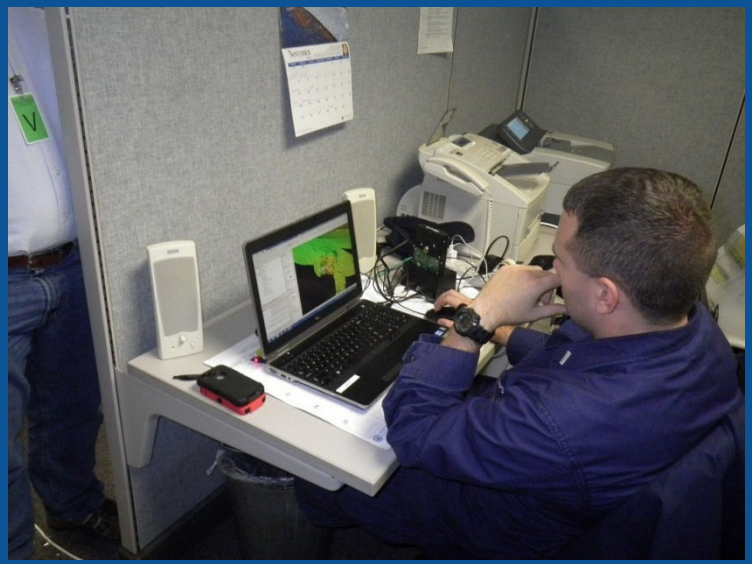
Navigation Response Teams (NRT)

- 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

Superstorm Sandy

- NY/NJ Metro Area Fuel shortage (time critical)
- Multiple Asset Response

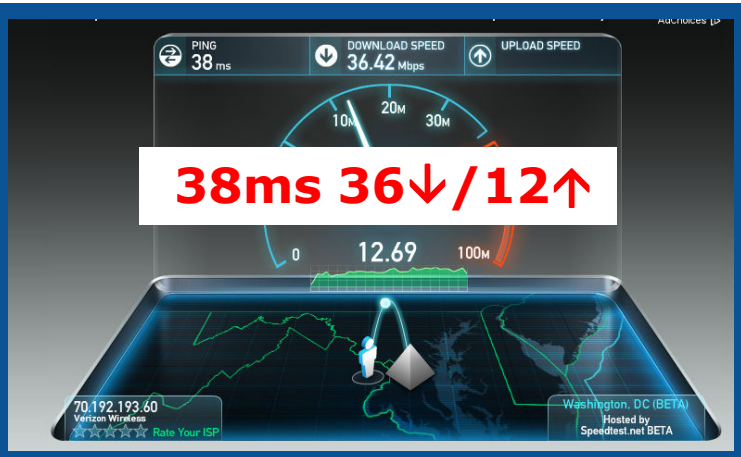


$5,000,000

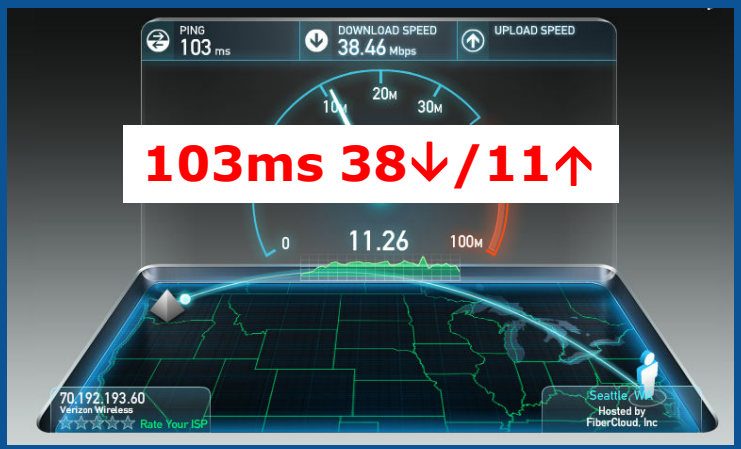
2013 U.S. Presidential Inauguration

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

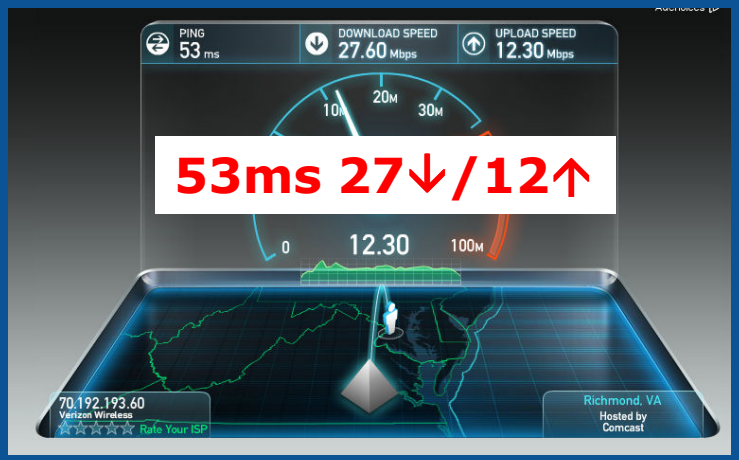
Network Speed Tests



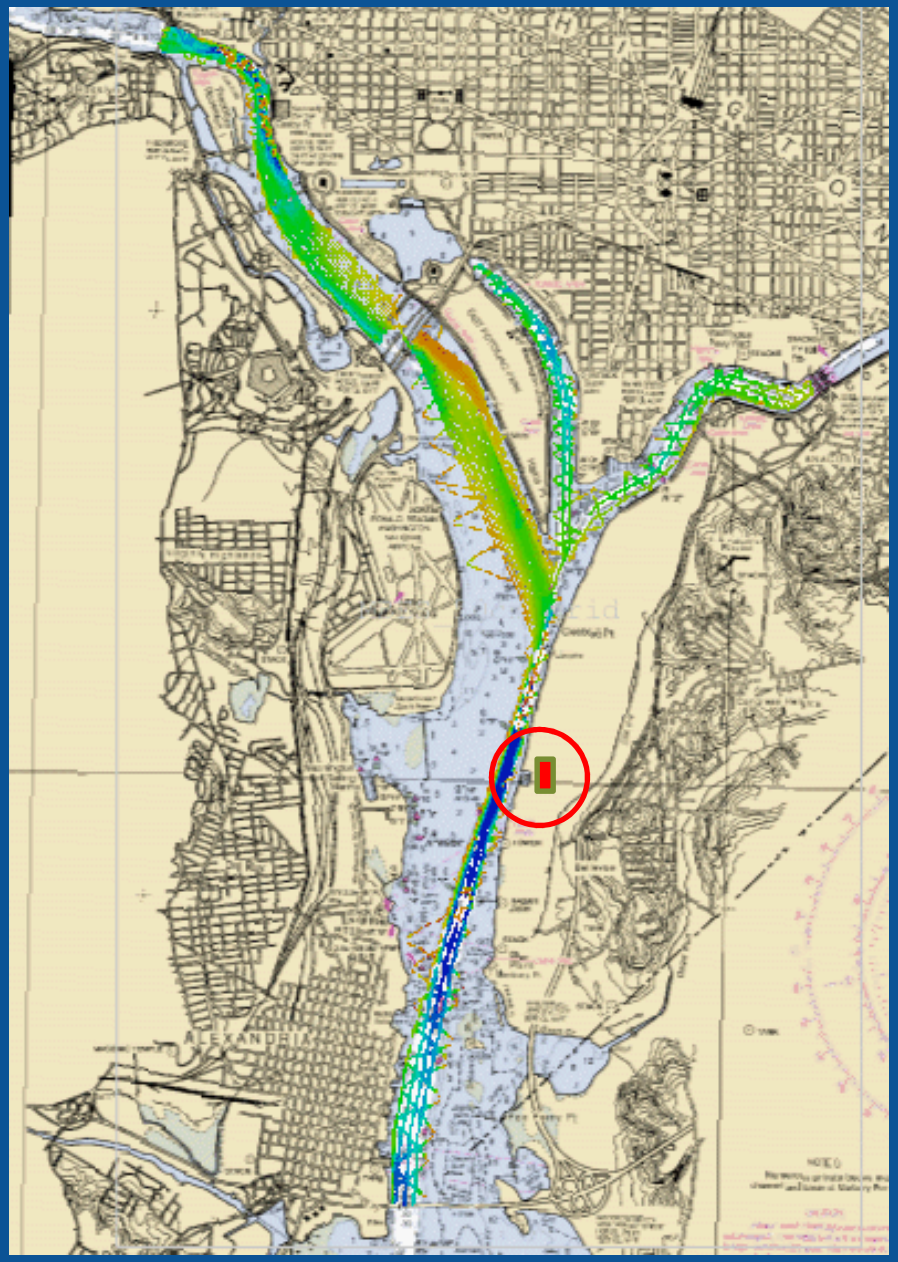
DC Metro Area



DC to Seattle,WA



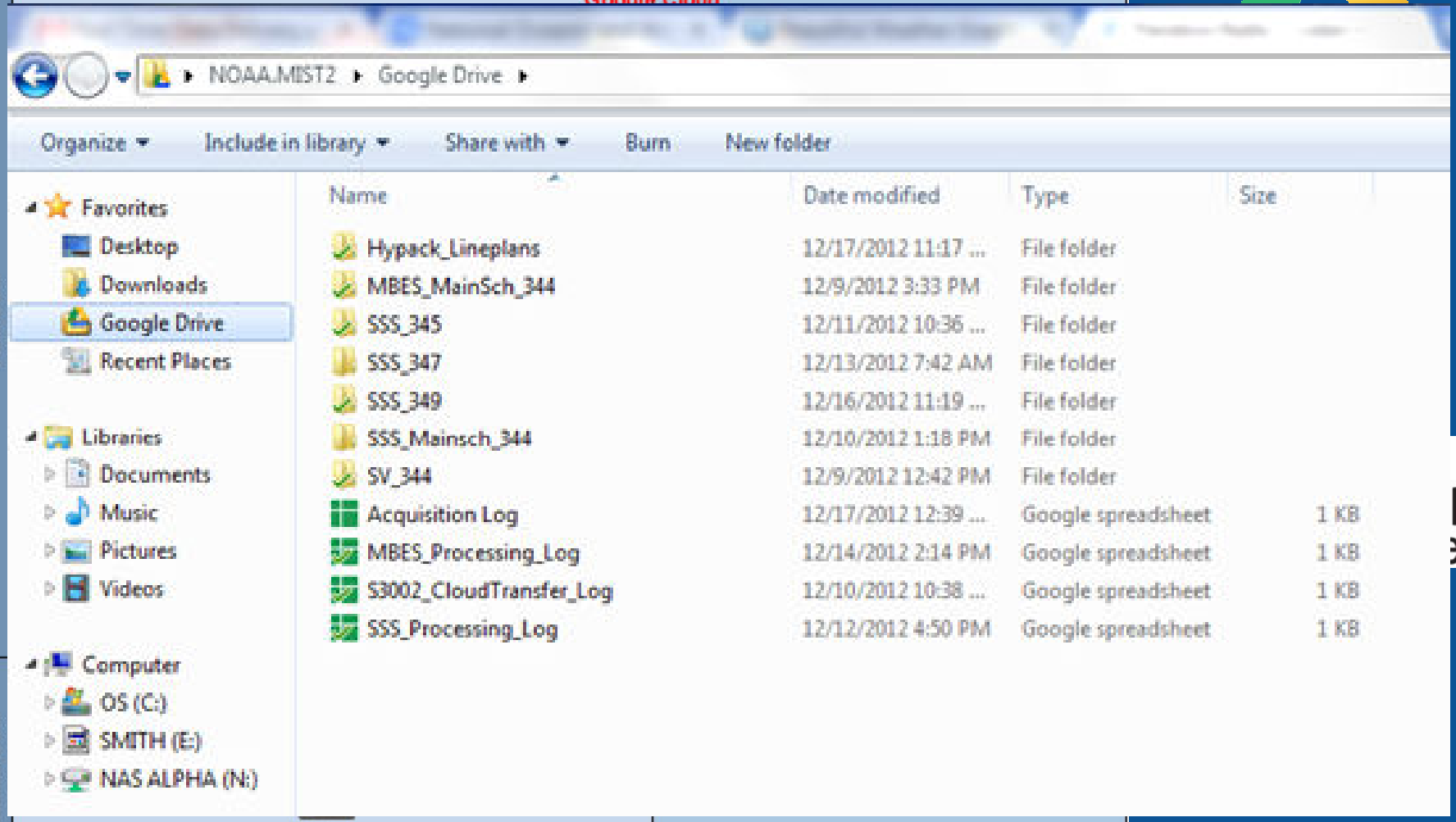
DC to Norfolk,VA



USCG Potomac Survey

Processing Center	NRT5 Survey Launch

Google Cloud



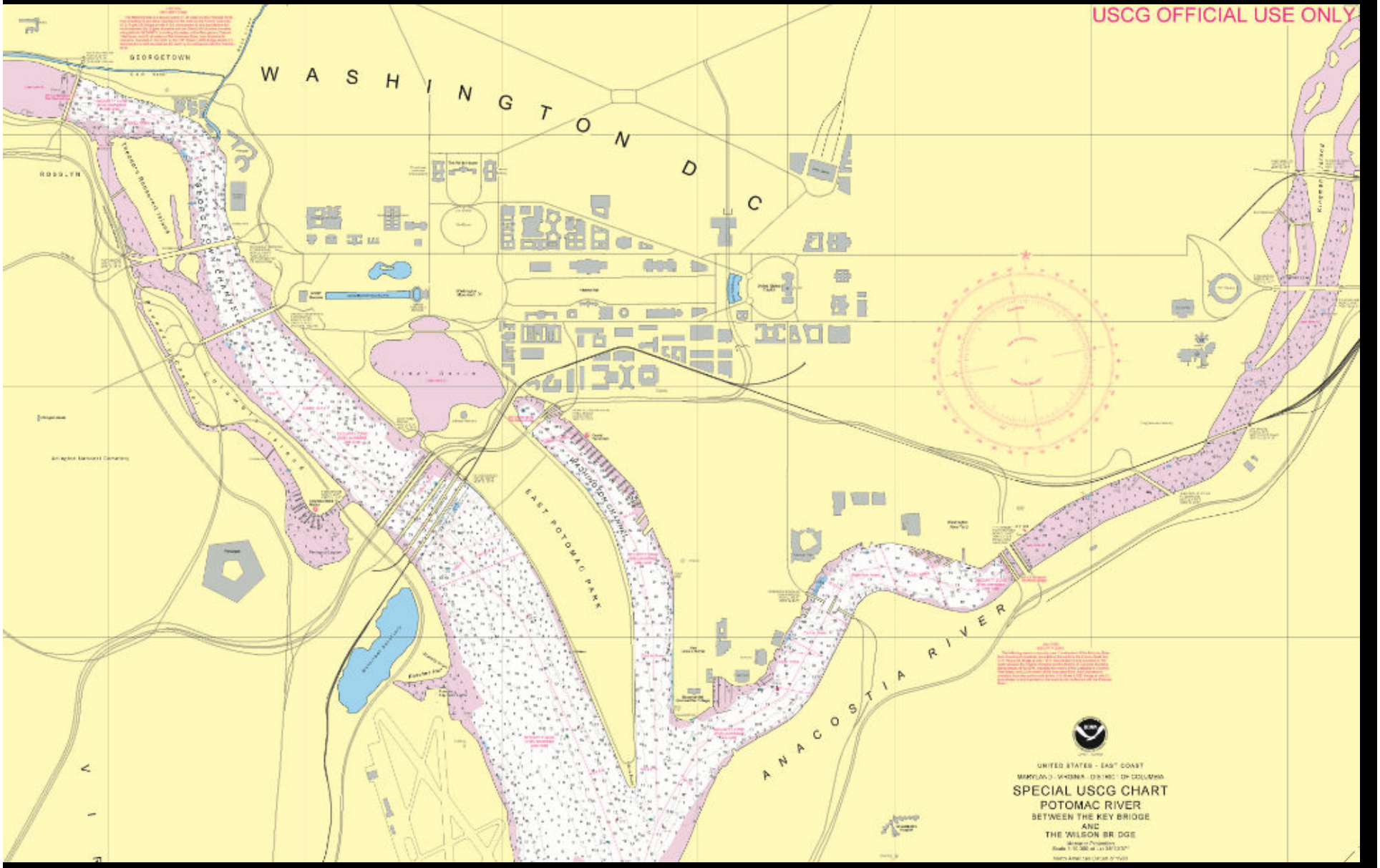
Raw Data

Processed Data

ALPHA NAS

Navigation Services

2012 U.S. Presidential Inauguration



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)

Turning data into information….

Broadband as Infrastructure

GX440

Mobile Gateway (4G LTE)

30’ Boat

Installation

Marine /GPS Antennae

Marine Antennae (4G LTE)

Integration/Diagnostics

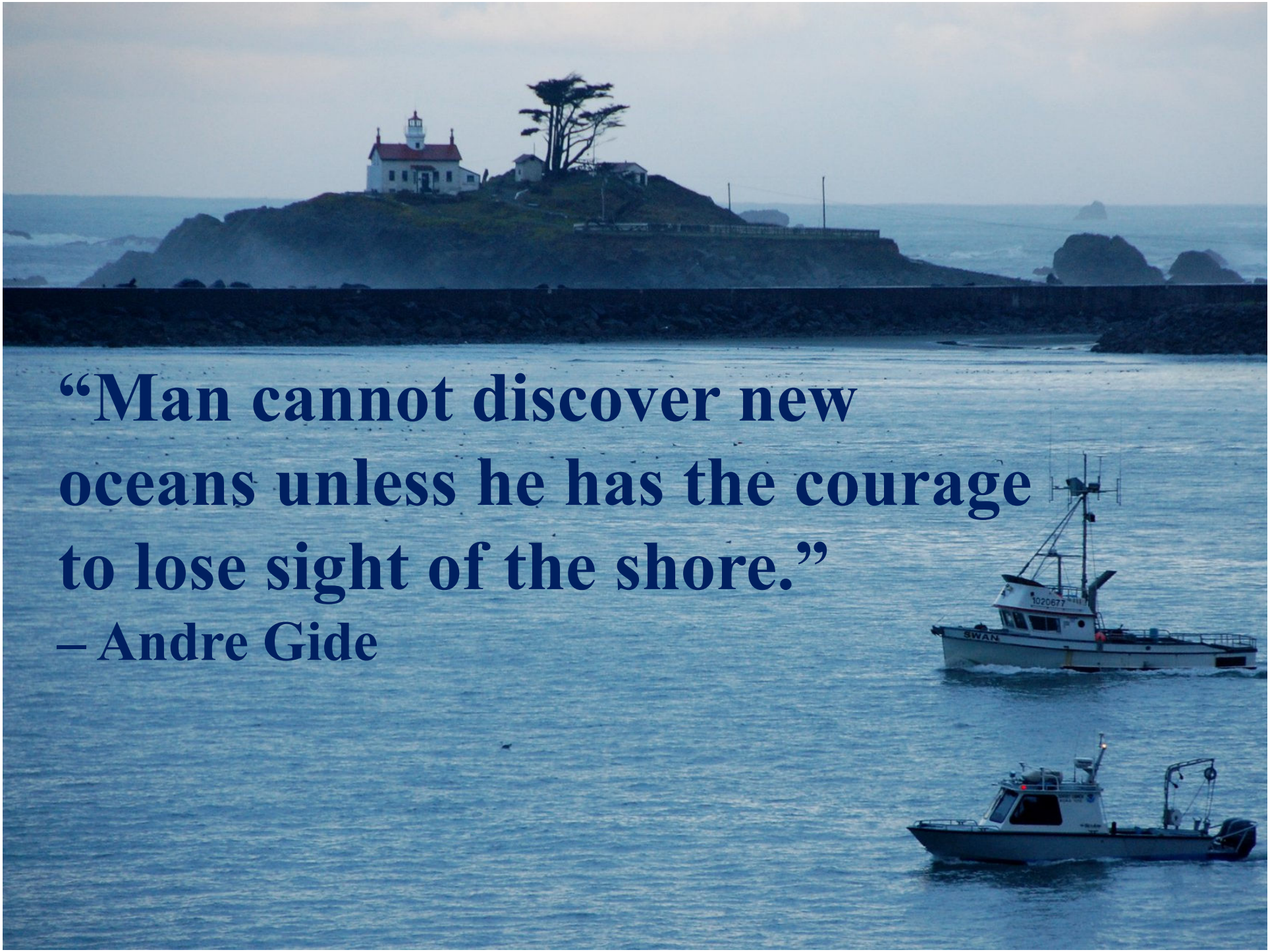
Maximizing RF Signal

Robust Connectivity

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

A Hybrid Solution: Case 1 and 2

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


“Man cannot discover new oceans unless he has the courage to lose sight of the shore.”
– Andre Gide
SWAN

Backup Slides

- Hurricane Irene (2011)

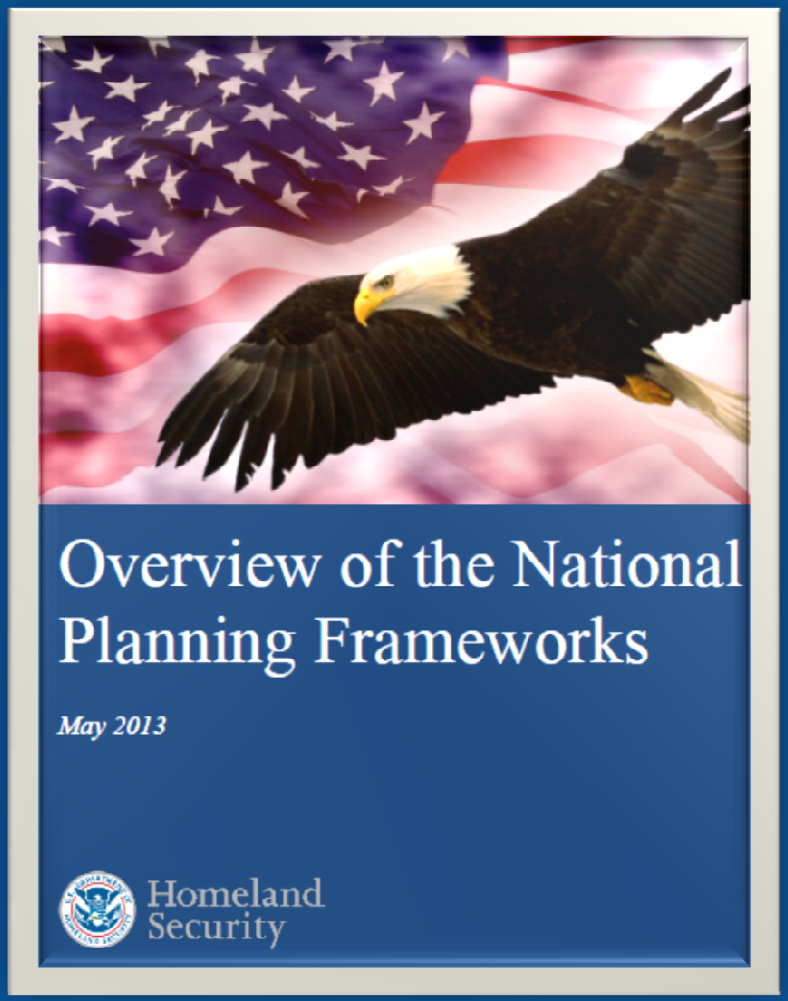
- "**Delays** in shipping, even minor ones, **cost** the economy millions each year, and NOAA's emergency navigation mobilization paid dividends in the Hampton Roads area of Virginia, where an average of **$5 million** worth of cargo is shipped in or out, **every hour**."

  – Office of Coast Survey

Driving Factors Part I

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

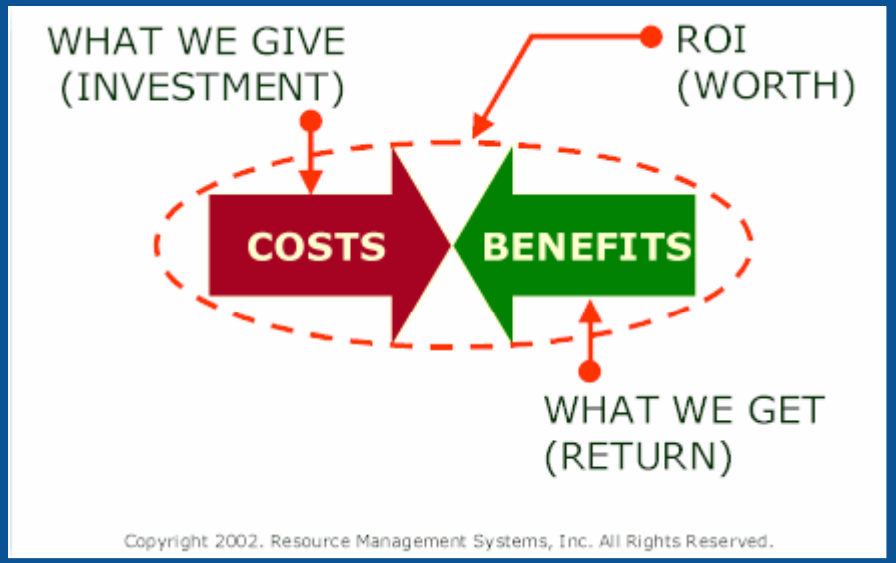
Driving Factors Part II



- FEMA National Response Framework (U.S. National Plan)
- ESF #1: “Emergency hydrographic surveys, search and recovery, obstruction location, and vessel traffic rerouting in ports and waterways.”
- ESF #3: “provides expertise and conducts/supports specialized salvage/wreck removal operations as part of a coordinated response and restoration strategy.”

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



NOAA moves 25,000 to Google Apps

Posted: Wednesday, January 4, 2012 +1 268 Tweet 173 Like 15

Posted by Kennith Jackson, Deployment Manager, Google Apps

The National Oceanic and Atmospheric Administration (NOAA) is ringing in the new year with a new email and collaboration system for its 25,000 employees, contractors and associates. They have all successfully moved to Google Apps for Government, making NOAA the largest federal agency to complete the switch to cloud-based email and collaboration tools.

NOAA employees work with the latest technologies like environmental monitoring satellites and high-tech weather forecasting tools. Now, they have cutting-edge email and collaboration tools to match.

According to NOAA CIO Joseph Klimavicz, the speed and ease of moving to Google Apps was an important factor in the agency's decision to select Google. Moving 25,000 people to a new system is no small task. To move a group this size to a unified email platform in just six months is a remarkable achievement.

The rapid deployment resulted from a well-coordinated effort by NOAA employees, prime contractor ERT Inc., and Google partners Unisys and Tempus Nova. NOAA issued a request for proposals in January 2011 and made the award to ERT in June. The team put in place an aggressive schedule to have the system implemented by December and delivered on the plan. NOAA staff now have a set of modern tools like instant messaging, video chat, and real-time, multi-user document collaboration to help the people of NOAA work together more effectively. What's more, NOAA estimates the cost to the taxpayer is approximately 50% less than developing a solution in-house.