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Maritime

In partnership with

esri

Ocean GIS

Geospatial Information for 71% of our Planet

by Rafael Ponce

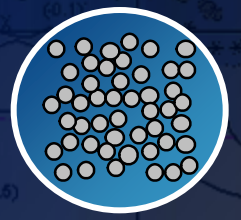
MACHC12 – Industry Day

St. Kitts & Nevis, 5-December-2011

esri

Presentation Overview

- GIS and its relevance
- Marine Spatial Data Infrastructure (MSDI)
  - IHO and MSDI
  - Building a MSDI
- Cloud computing and crowd sourcing
  - ArcGIS online: GIS in the Cloud
  - Bathymetry in the Cloud
  - Ocean Basemap
  - Other authoritative content
- Geospatial data in action
  - A Geoportal
  - INSPIRE
  - SDI implementations
- GIS for Hydrography: a Modern Hydrographic Workflow
  - QPS Fledermaus
  - Bathymetric Information System
  - Nautical Information System
- Enterprise Maritime Data Management
  - No more stovepipe systems
- Esri in Capacity Building and Education: new opportunities for MACHC



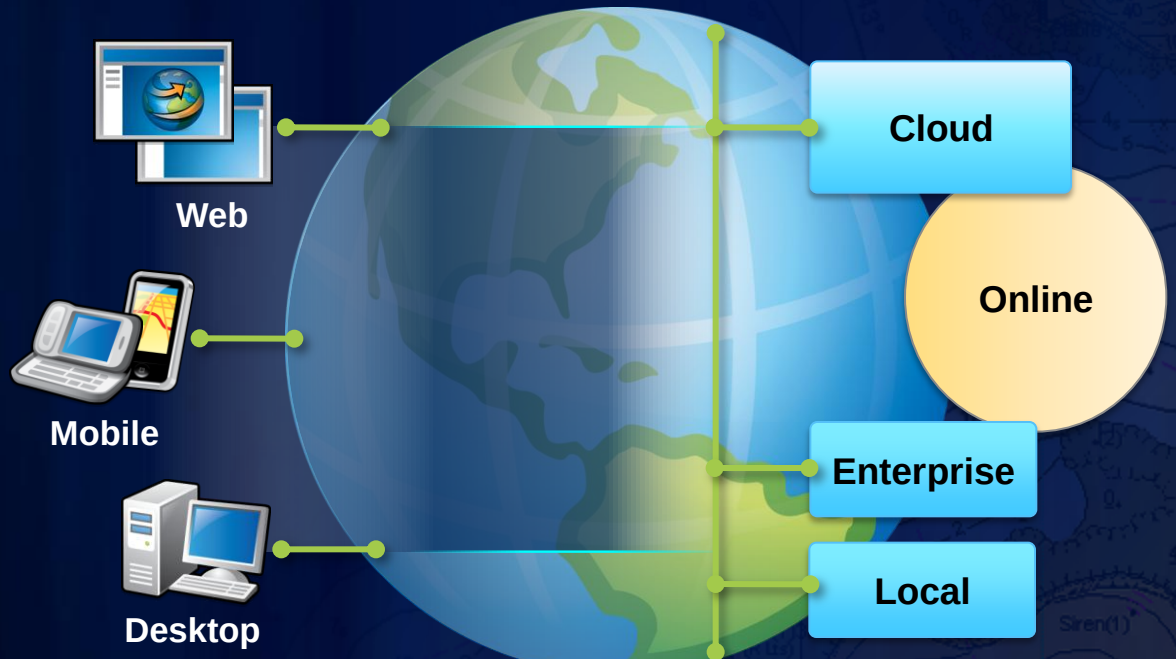
A New GIS Pattern Is Emerging

Making GIS Accessible to Everyone

. . . *Virtually Anywhere and on Any Device*

GIS and its relevance

Three main levels in a System for Geographic Information



New GIS Simplifies Sharing Your Work

Maps, Data, Tools, and Models . . .

. . . Automating the Process of Creating Services

GeoDesign Considers All the Geographic Questions

The World As It Is

How Can We Describe Geography?

Data Inventory

How Does Geography Operate?

Process Models

How Can We Alter Geography?

Capability/ Sustainability Models

What Are The Alternative Scenarios?

Designing/ Sketching

A B C

The World As It Could Be

How Should Geography Be Changed?

Decisions/ Values

What Are The Consequences Of Change?

Evaluation/ Analysis

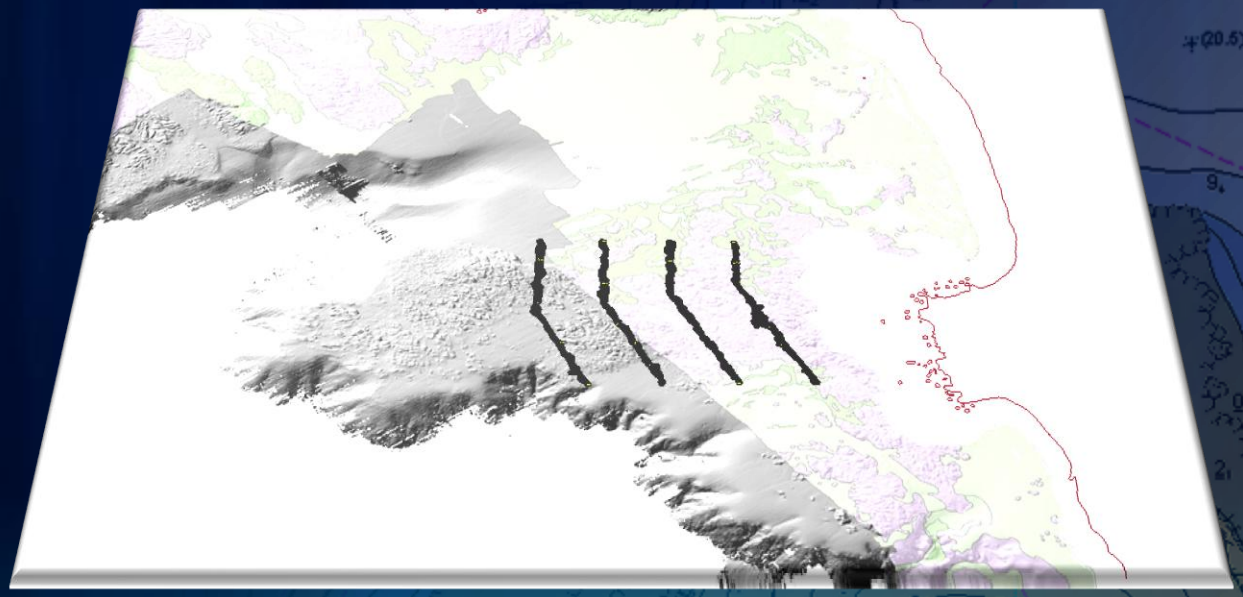
Geo-Accounting

. . . A Rapid & Adaptive Process

. . . Creating a Sustainable Future

What is Spatial Data?

- Data that identifies the geographic location of features (natural and constructed) and boundaries on Earth.
- Stored as coordinates and topology and can be mapped.
- Often accessed, manipulated and analyzed through a Geographic Information System (GIS).



Spatial Data Is Very Valuable to Government

and to everybody…

Port Management

Conservation

Science/Modeling

Land Management

Congestion

Crime

Defense/Security

Emergency Management

Pollution

Water

Agriculture/Forestry

Business Efficiency

Natural Resources

Economic Recovery

Biodiversity

Global Warming

Human Health

Energy

Oceans

Land Use

Population

Education

Logistics

Public Safety

Development

Facility Management

Humanitarian Relief

Urbanization

Law Enforcement

National Security

Environmental Protection

✓ ***Improving Planning, Management, and Decision Making . . .***

GIS Supporting Place-Based Policies

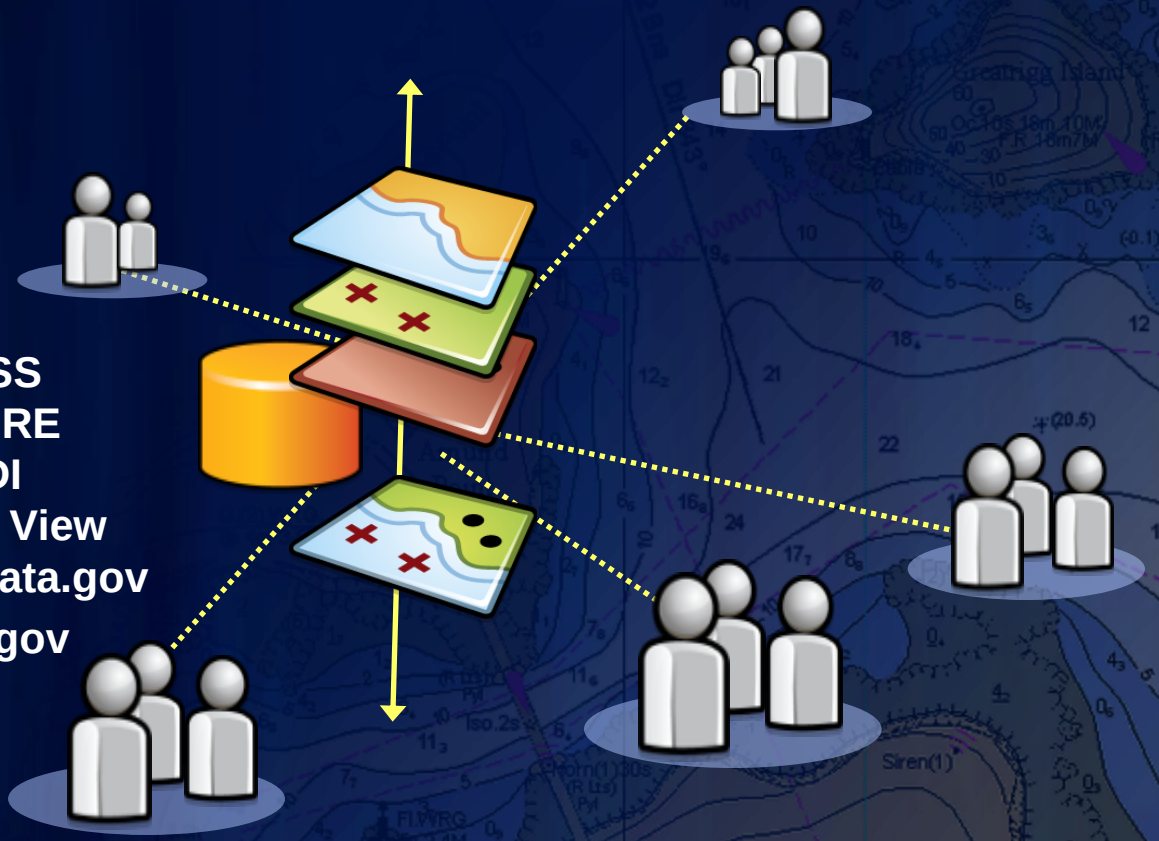
Increasing the Impact of Government Programs & Projects

- Targeting Priority Places
- Coordinating Projects & Programs
- Developing Coordinated Plans
- Supporting Integrated Decision Making

Using Geography & GIS as a Framework for Integrated Problem Solving

Data Sharing Has Been a Key to This Success

Many Agencies Consider Sharing Part of their Mission

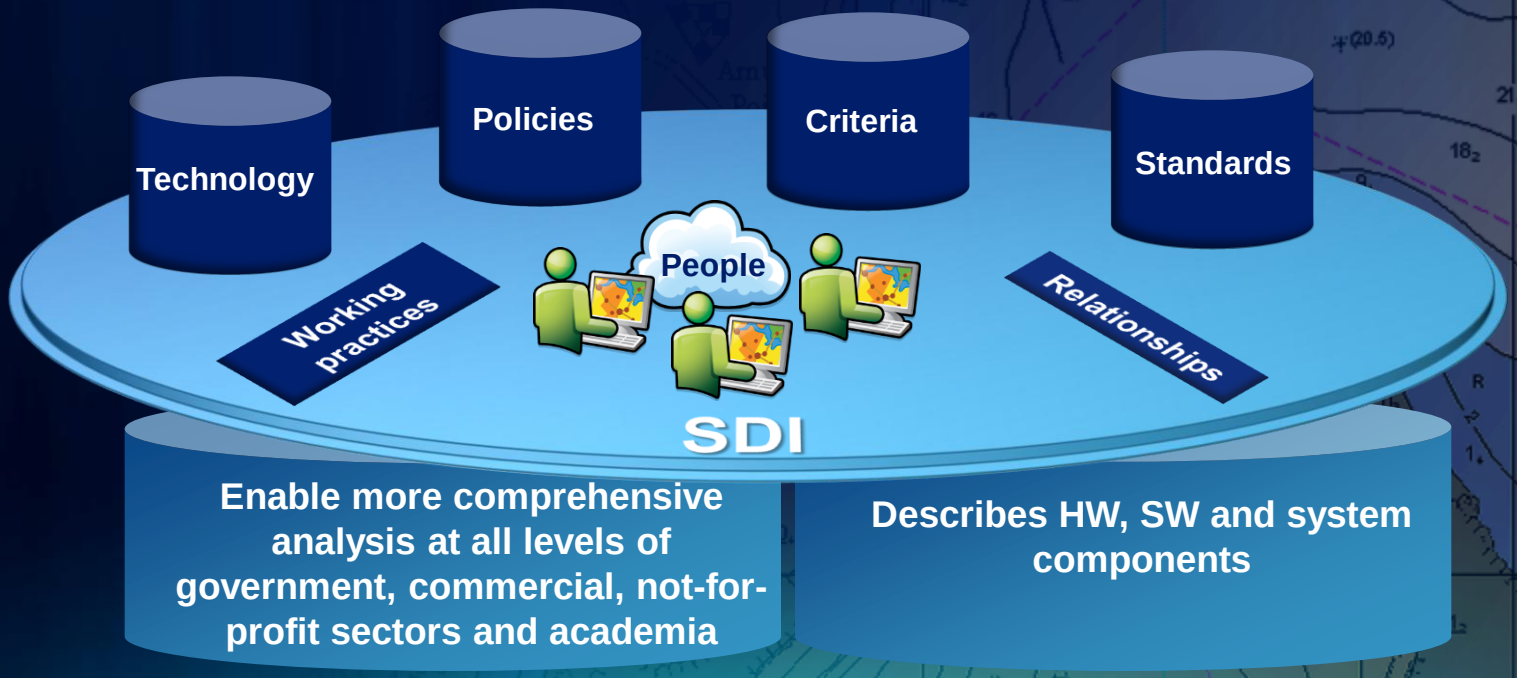


GEOSS
INSPIRE
UNSDI
Open View
Geodata.gov
Data.gov

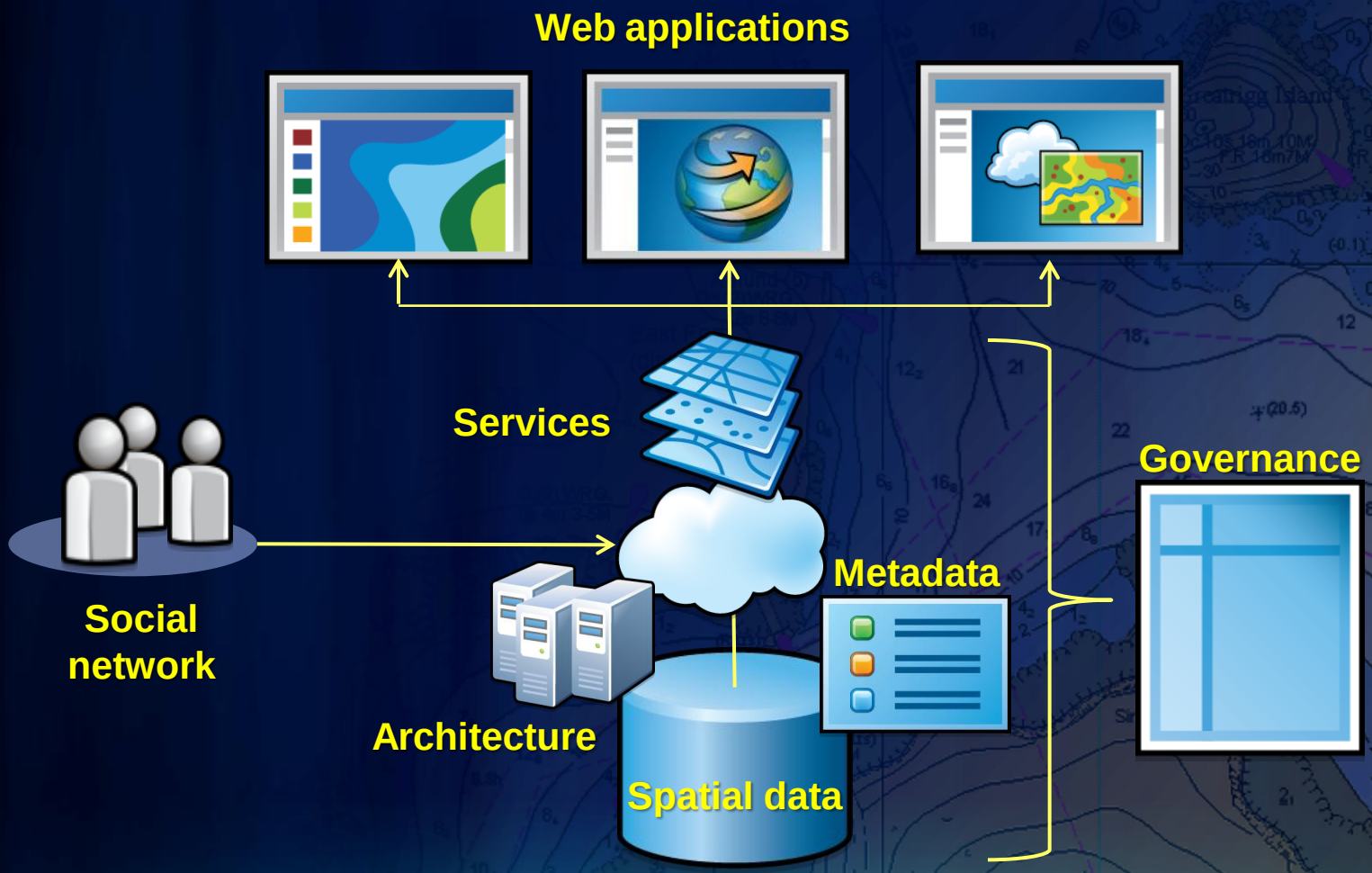
Spatial Data Infrastructure

Constituents

- SDI is “the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data.” (Ref: Global Spatial Data Infrastructure Cookbook).

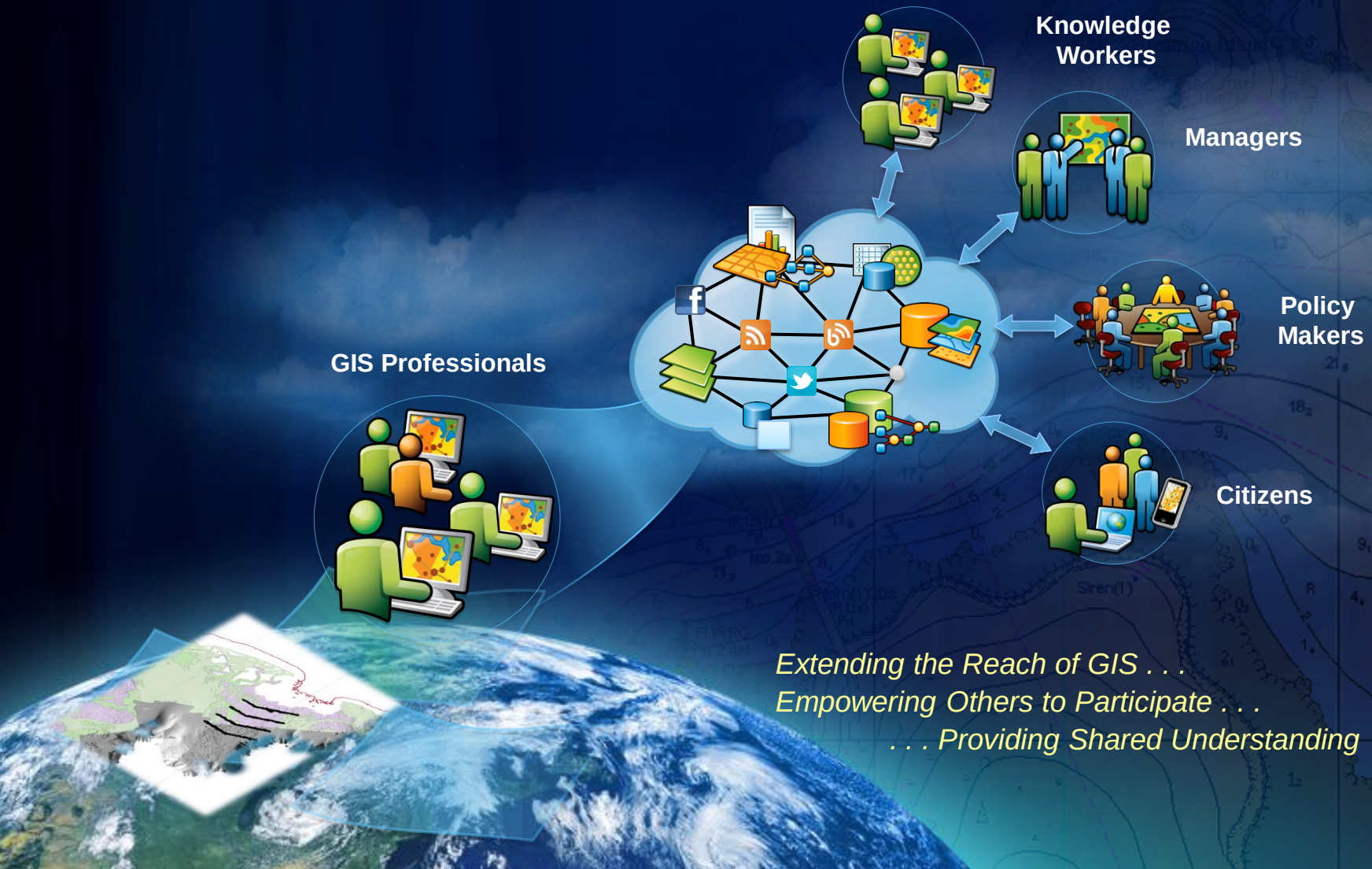


SDI key components



Marine SDI

Providing Access to a Vast Network of Marine Knowledge



Extending the Reach of GIS . . .
Empowering Others to Participate . . .
. . . Providing Shared Understanding

Marine SDI

Definition

- ***"MSDI is the component of an SDI that encompasses marine geographic and business information in its widest sense. This would typically include seabed topography (bathymetry), geology, marine infrastructure (e.g. wrecks, offshore installations, pipelines and cables), administrative and legal boundaries, and areas of conservation, marine habitats and oceanography."***

(IHO Pub. C-17, Spatial Data Infrastructures "The Marine Dimension". Guidance for Hydrographic Offices. Ed. 1.1 February 2011).

Building a MSDI

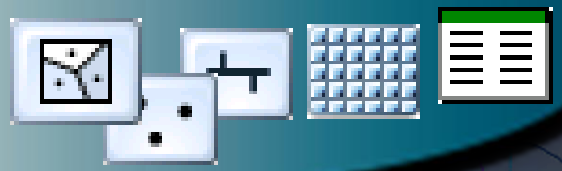
Basic elements

- Core Data
- Database
- Data models
- Geographic Information System
- Geoportal
- Web services

Building a MSDI

Core Data

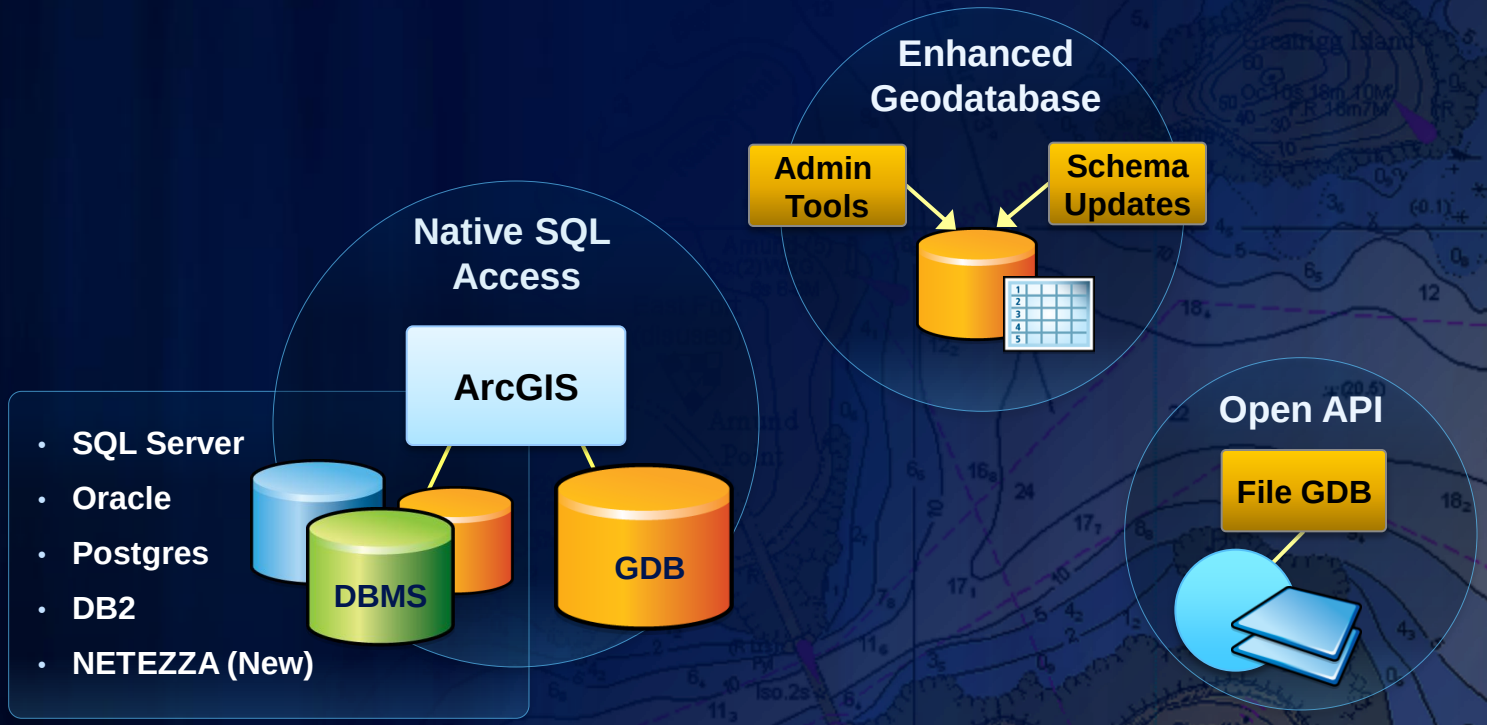
- Infrastructure
  - Piers
  - Port facilities
  - Breakwaters
  - Oil platforms
  - Navigational aids
  - More…
- Terrain elevation
  - Near shore
  - Transition zone
- Bathymetry
  - Vector
  - Raster
- Oceanography
  - Physical
  - Chemical
  - Biological
- Meteorology
- Non-physical features
  - Cadastral parcels
  - Political boundaries (territorial sea, EEZ)



Standardize data sets organized as Features, Rasters and Tables

Building a MSDI

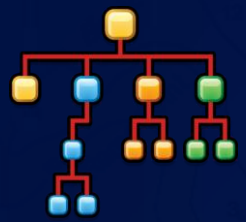
Standard Spatial Databases



. . . Making Management and Access Simple

Data Models

ArcMarine, Nautical and Bathymetry



Marine data collection

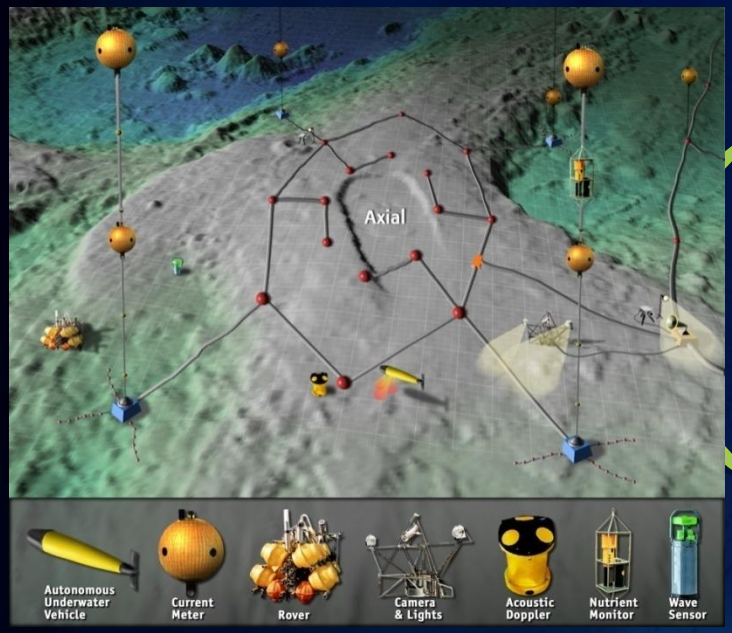


Image published in the ArcMarine book by permission of the Neptune Program, www.neptune.washington.edu, University of Washington Center for Environmental Visualization

Short-term Mobile Observations

Long-term Fixed Observations

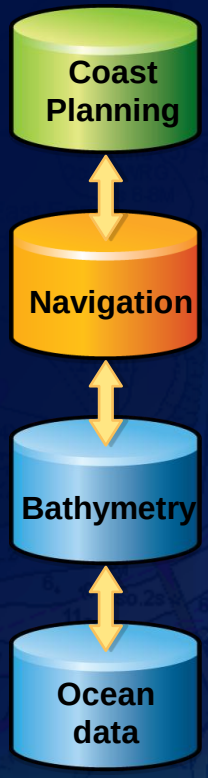
Temporal and Spatial relationship

A Marine GIS as the Core of MSDI

Marine Data and Information System

Production System Inputs

- Hydrographic data
- Oceanographic data
- Mariners
- Other Agencies
- Other Countries
- Public

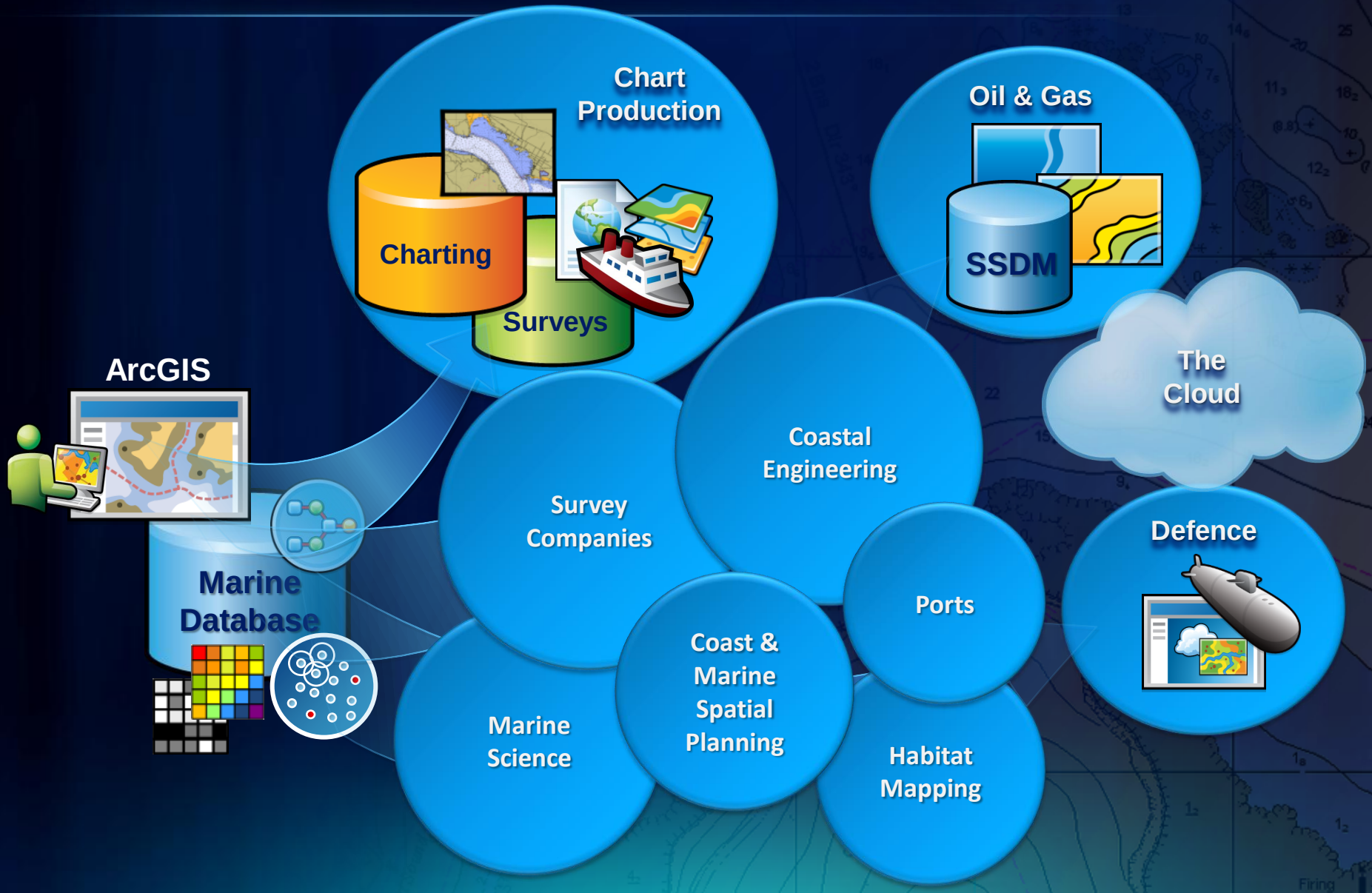


Production System Outputs

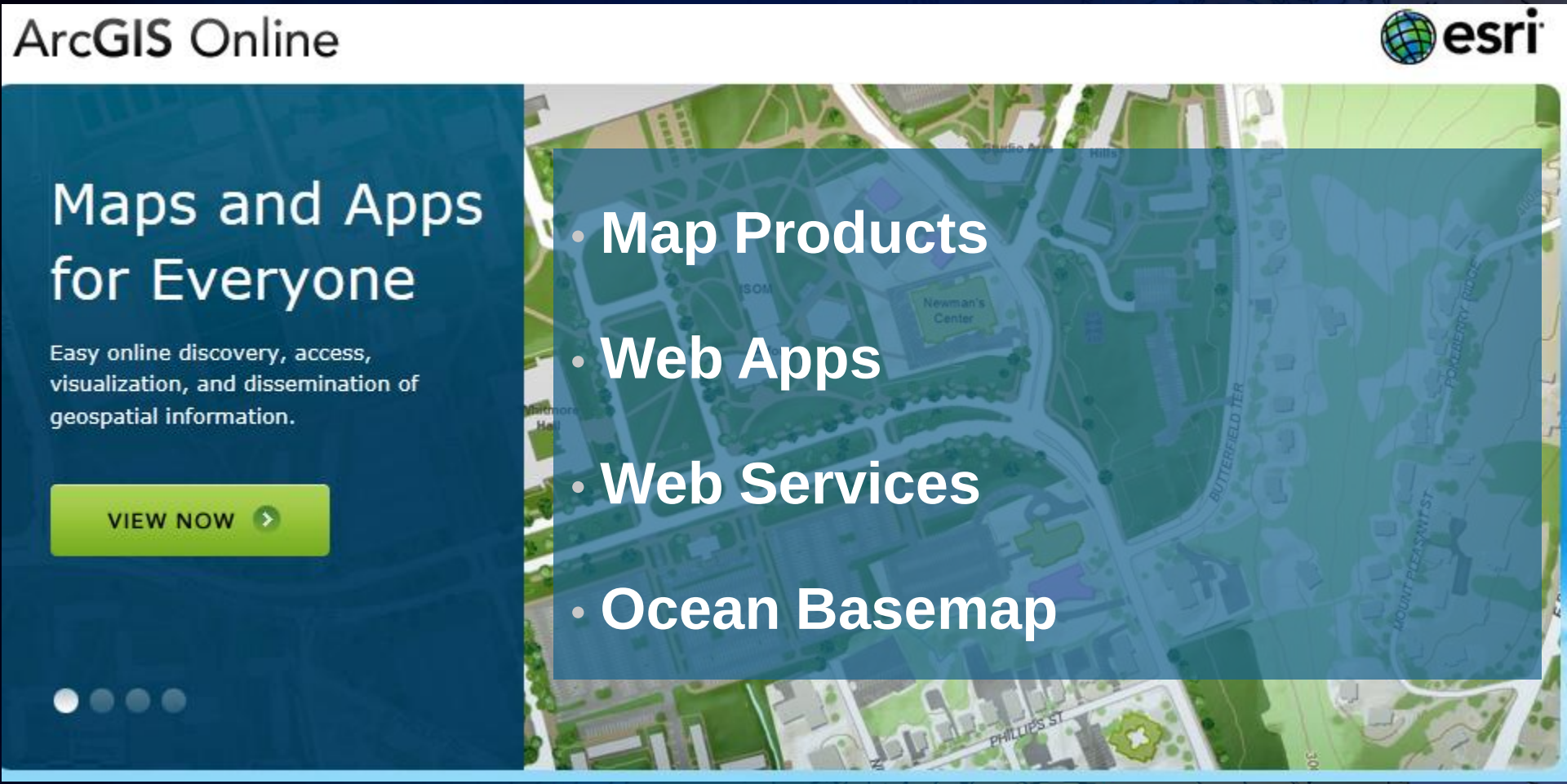
- Navy Users
- Marines
- Mariners
- Armed Forces
- Government Agencies
- Scientists
- Mobile Applications
- Server Based Analysis

…Interoperability, flexibility and scalability

From GIS to anywhere…

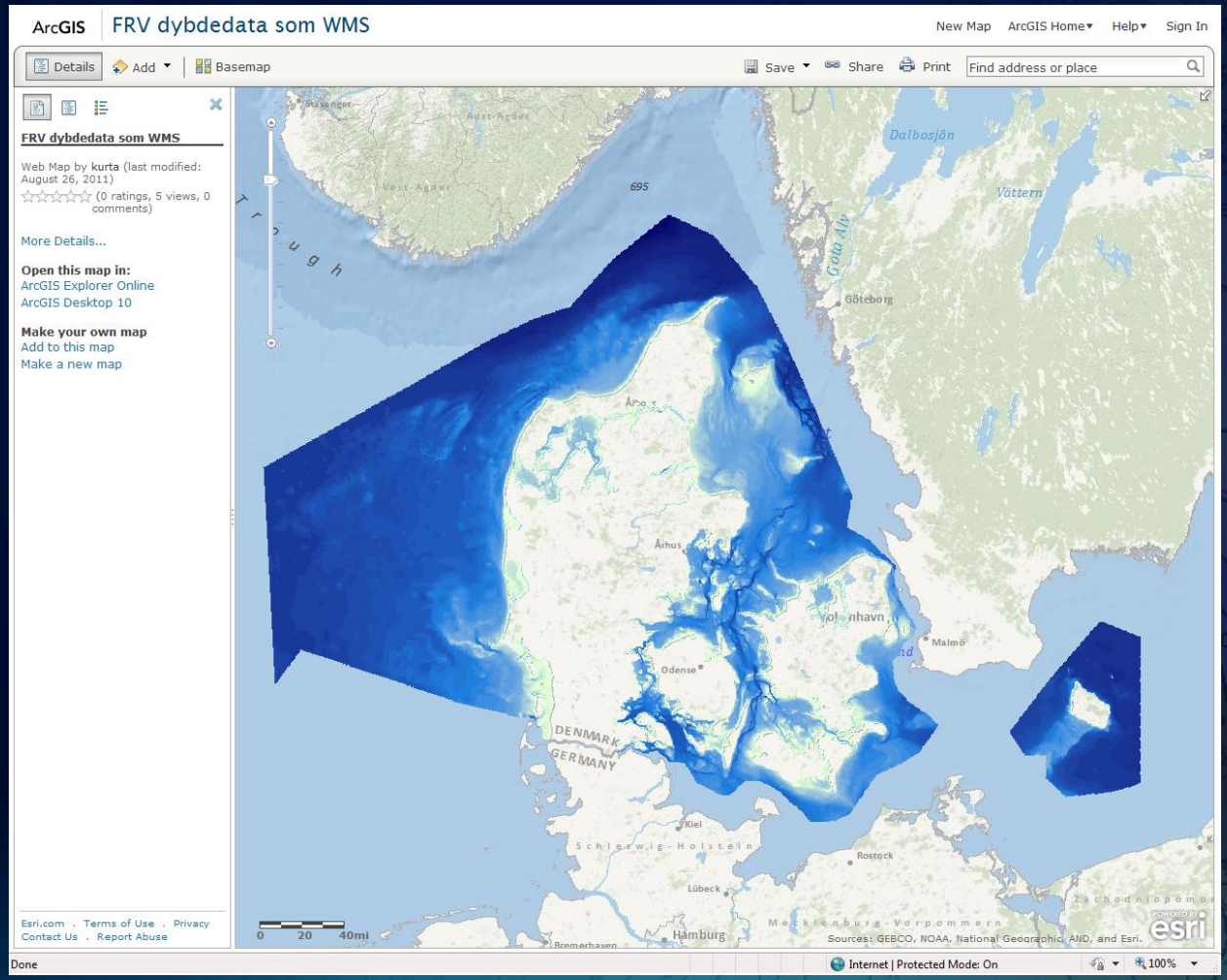


ArcGIS Online: Cloud computing (and Crowdsourcing)



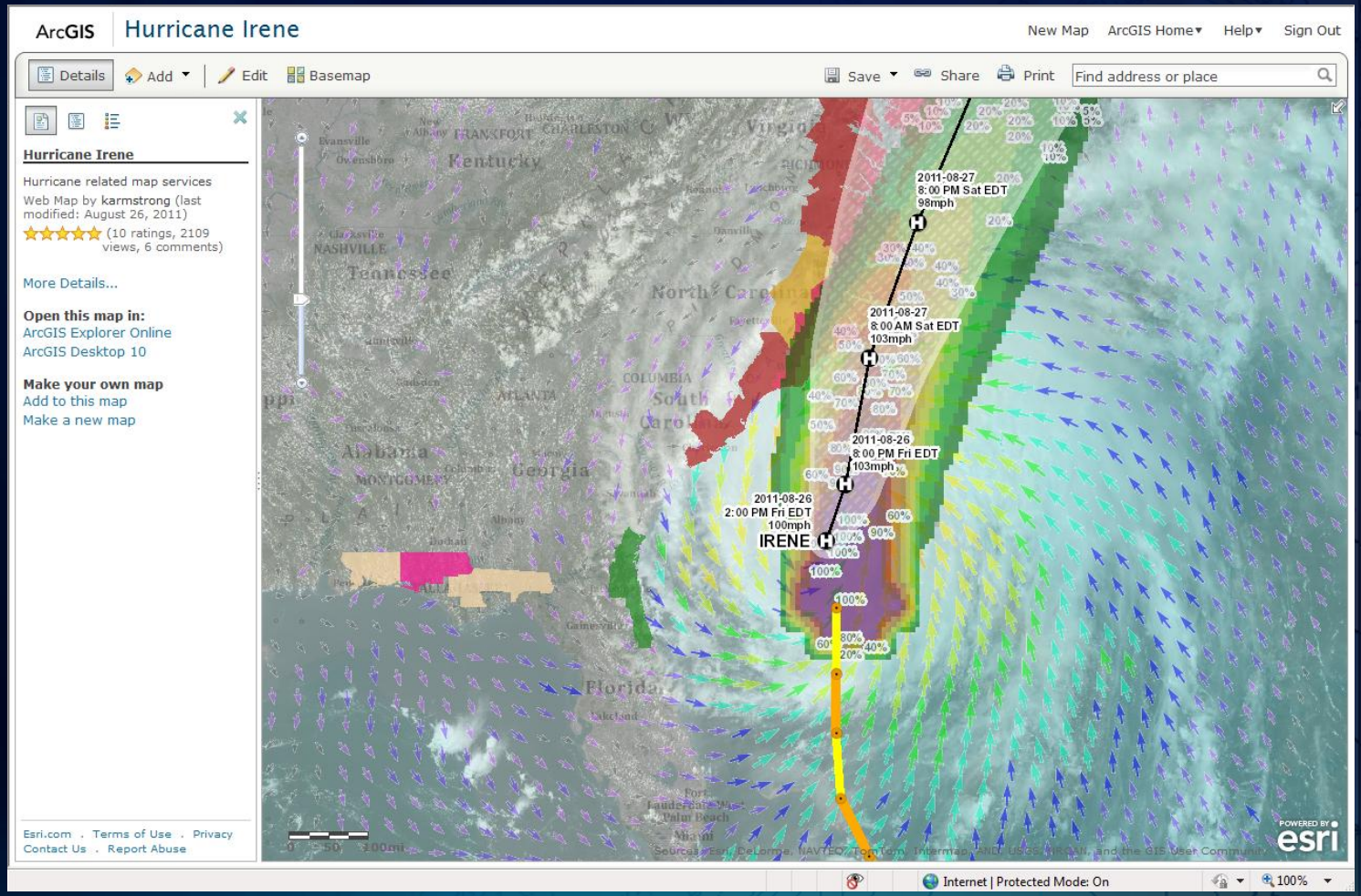
An Ocean Basemap

A Marine SDI product



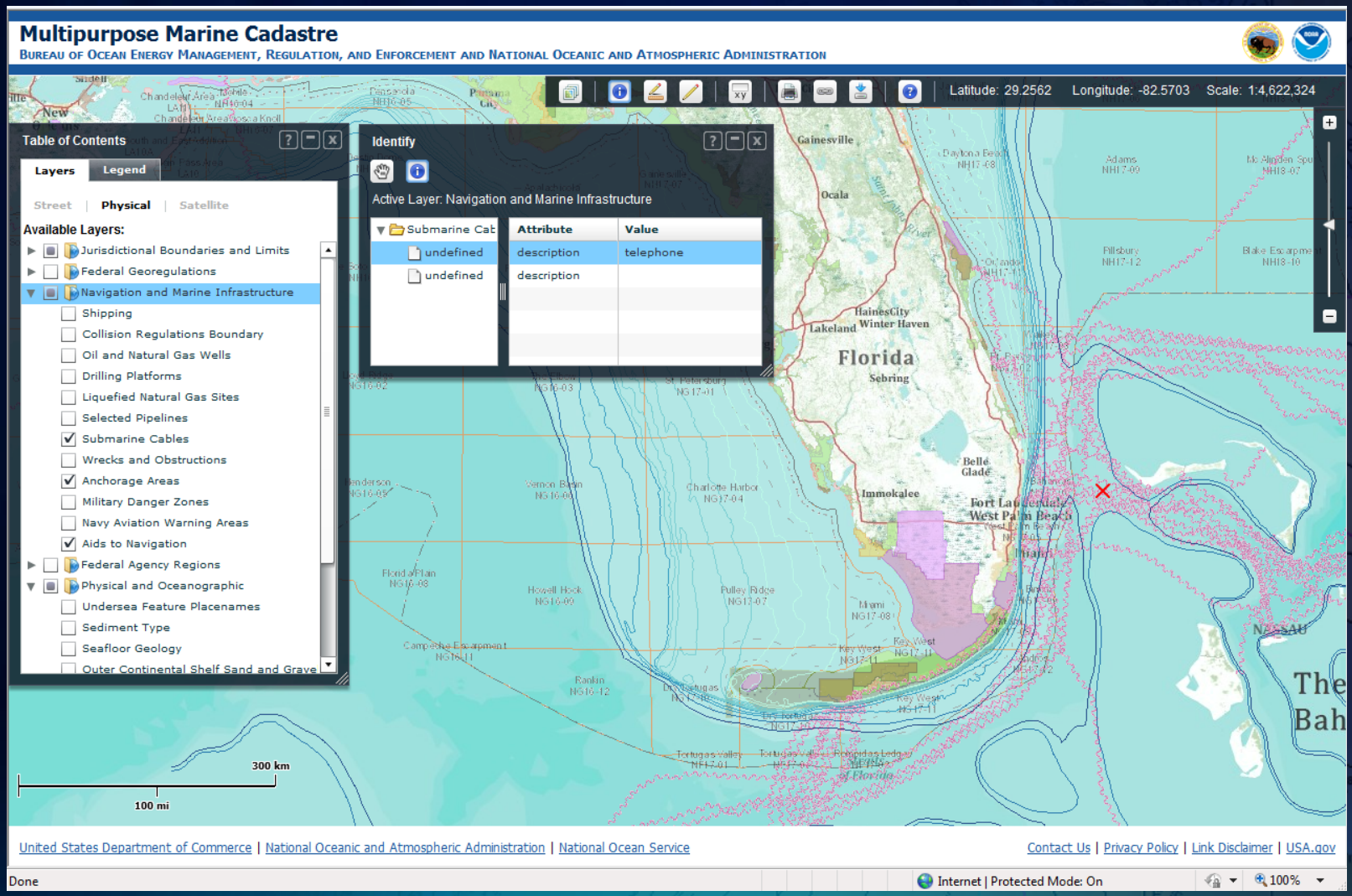
Hurricane Irene (Aug-26-2011)

A Marine SDI Product



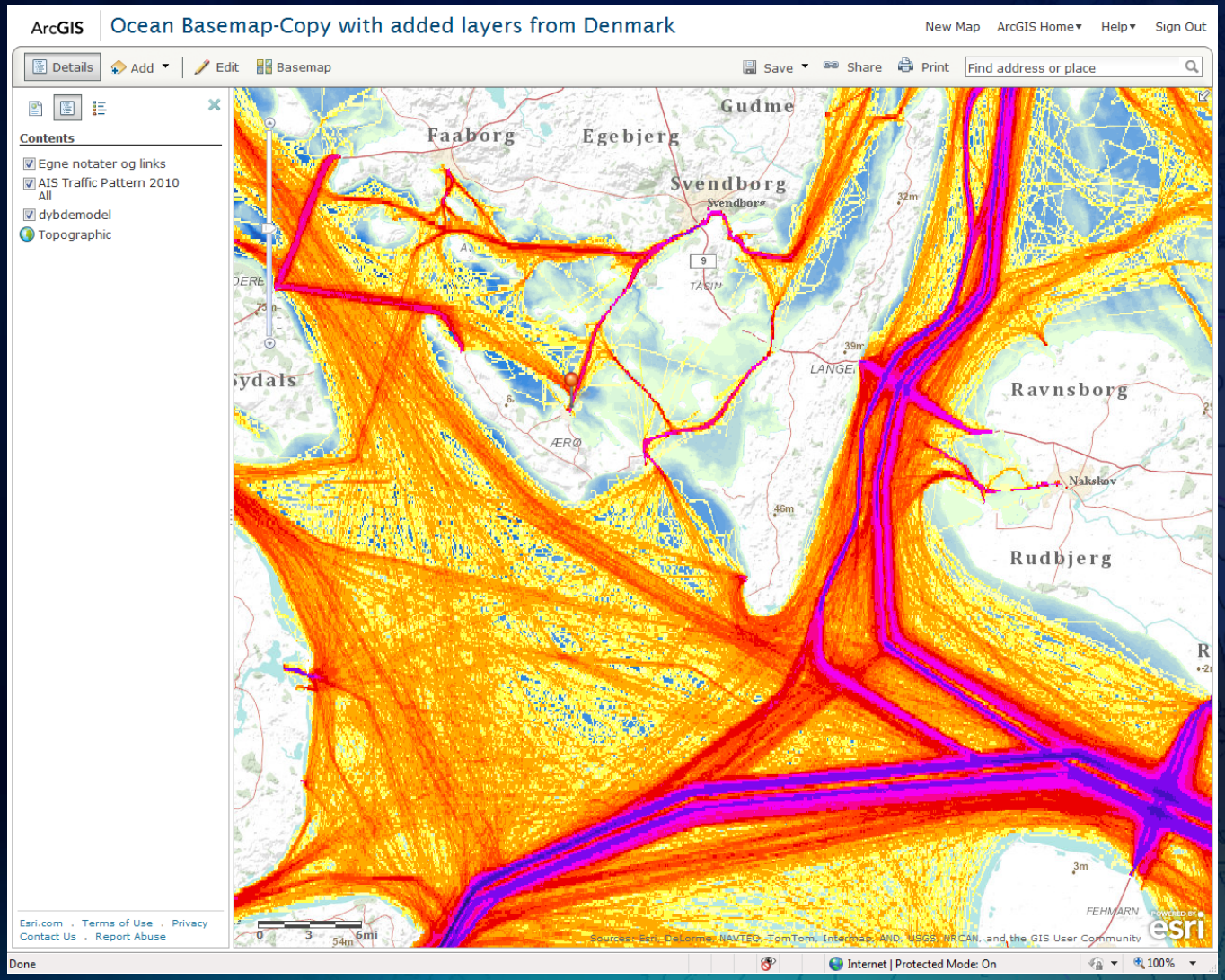
US NOAA and BOEMRE Multipurpose Marine Cadastre

A Marine SDI Web App

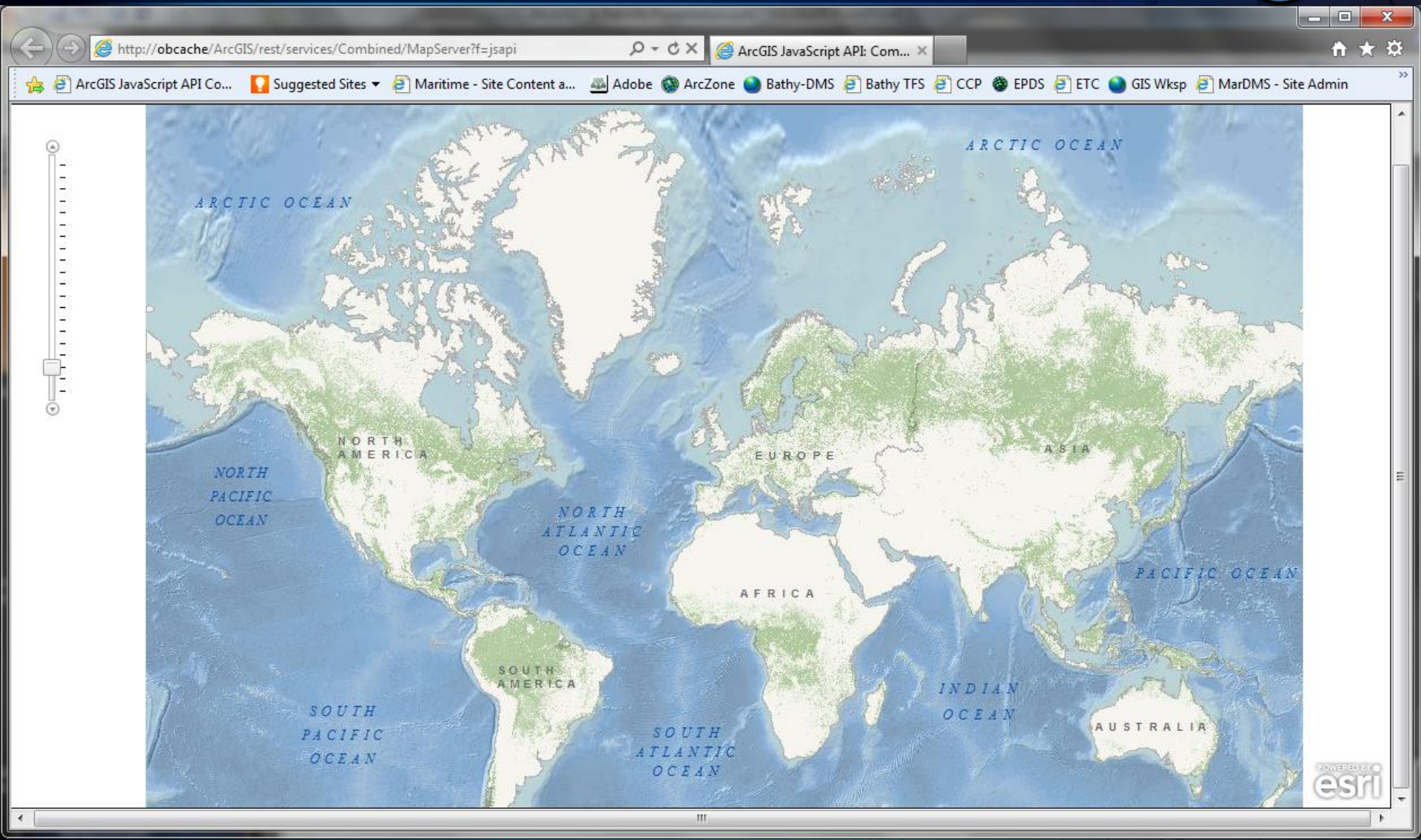


Ocean Basemap with AIS Traffic Patterns

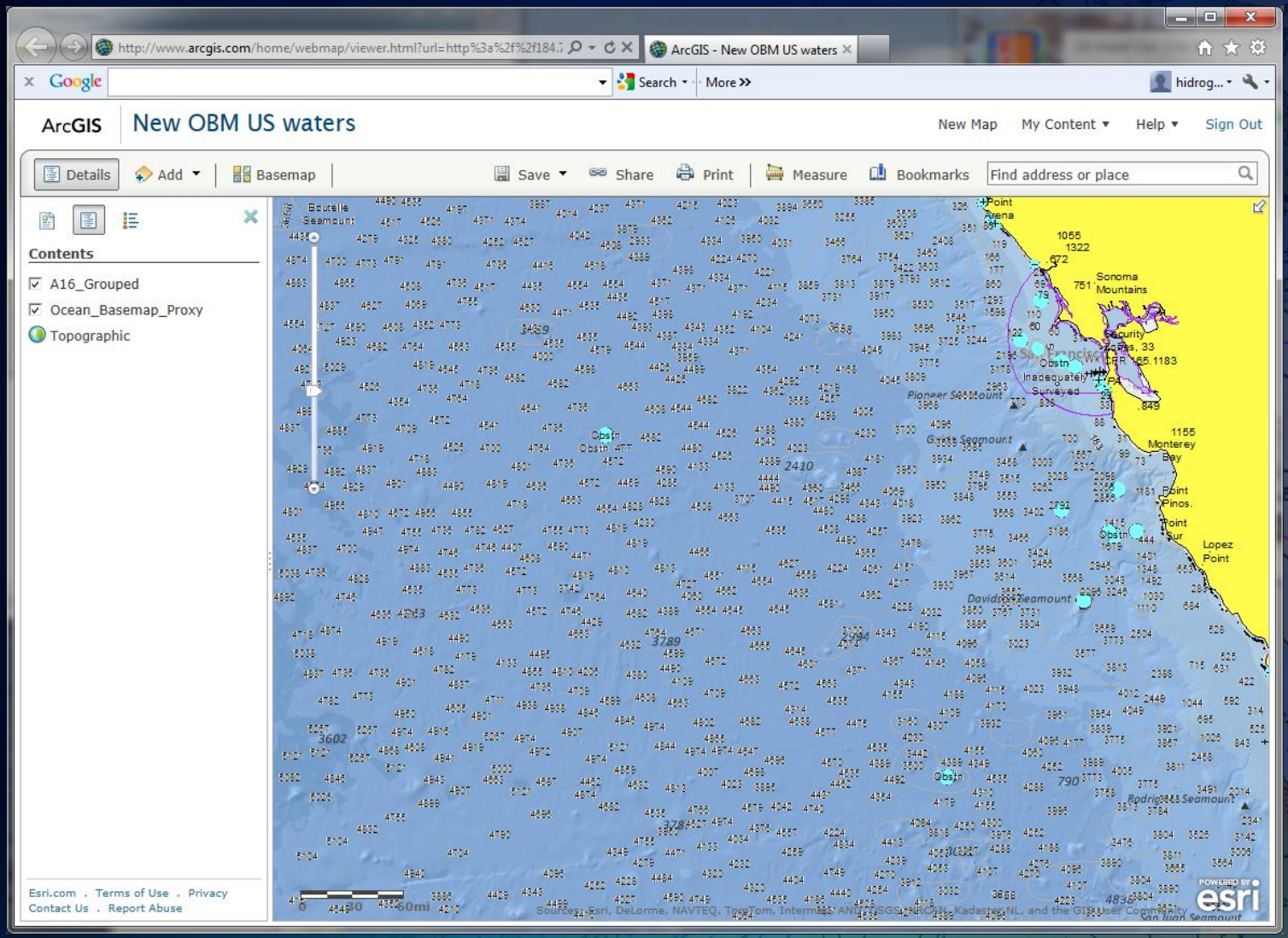
A Marine SDI Web Service



Maritime Online– Esri Ocean Basemap



Next OBM release (December 2011)



Maritime Online – St. John BIOMapper

Biogeography **I**ntegrated **O**nline **M**apper

Benthic Habitat Mapping off St. John, U.S. Virgin Islands National Park and Virgin Islands Reef National Monument

esri Understanding our world.

ArcGIS World Elevation Image Services

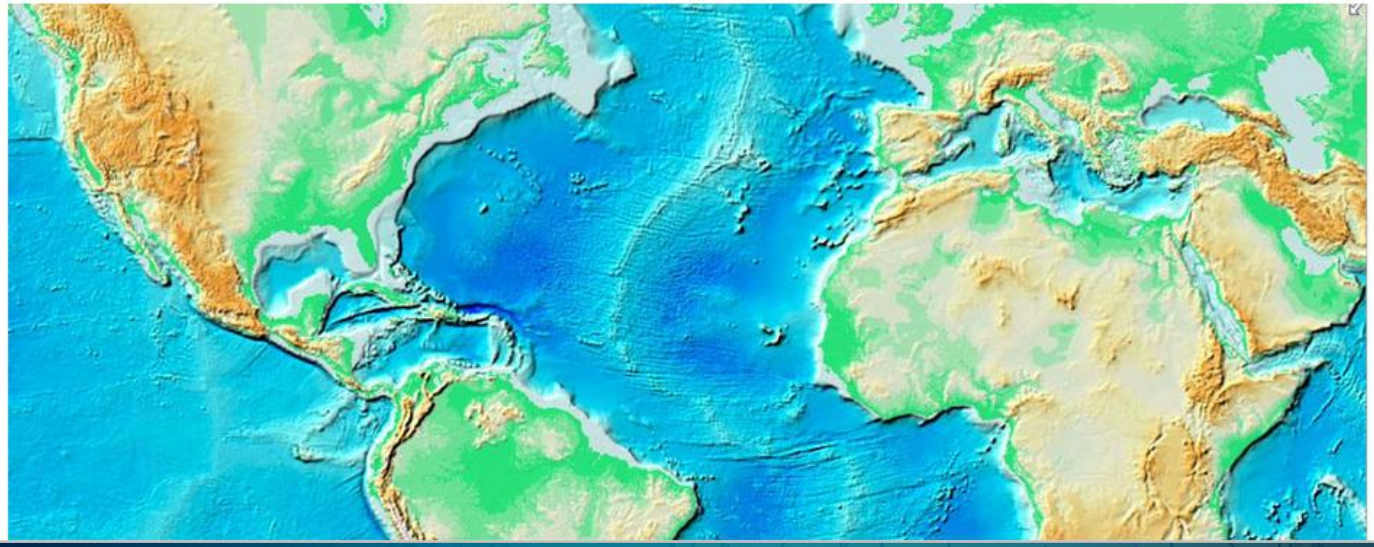
Dynamic elevation image services provide simple, online access to large collections of multi-resolution, multi-source elevation data covering the globe. They provide:

- Simple, direct access to global elevation data
- Easy-to-interpret, visual symbologies (such as hillshade, slope, and aspect) and associated metadata
- Direct access for web and desktop applications that require height, slope, or aspect
- The ability to export small sections for local use

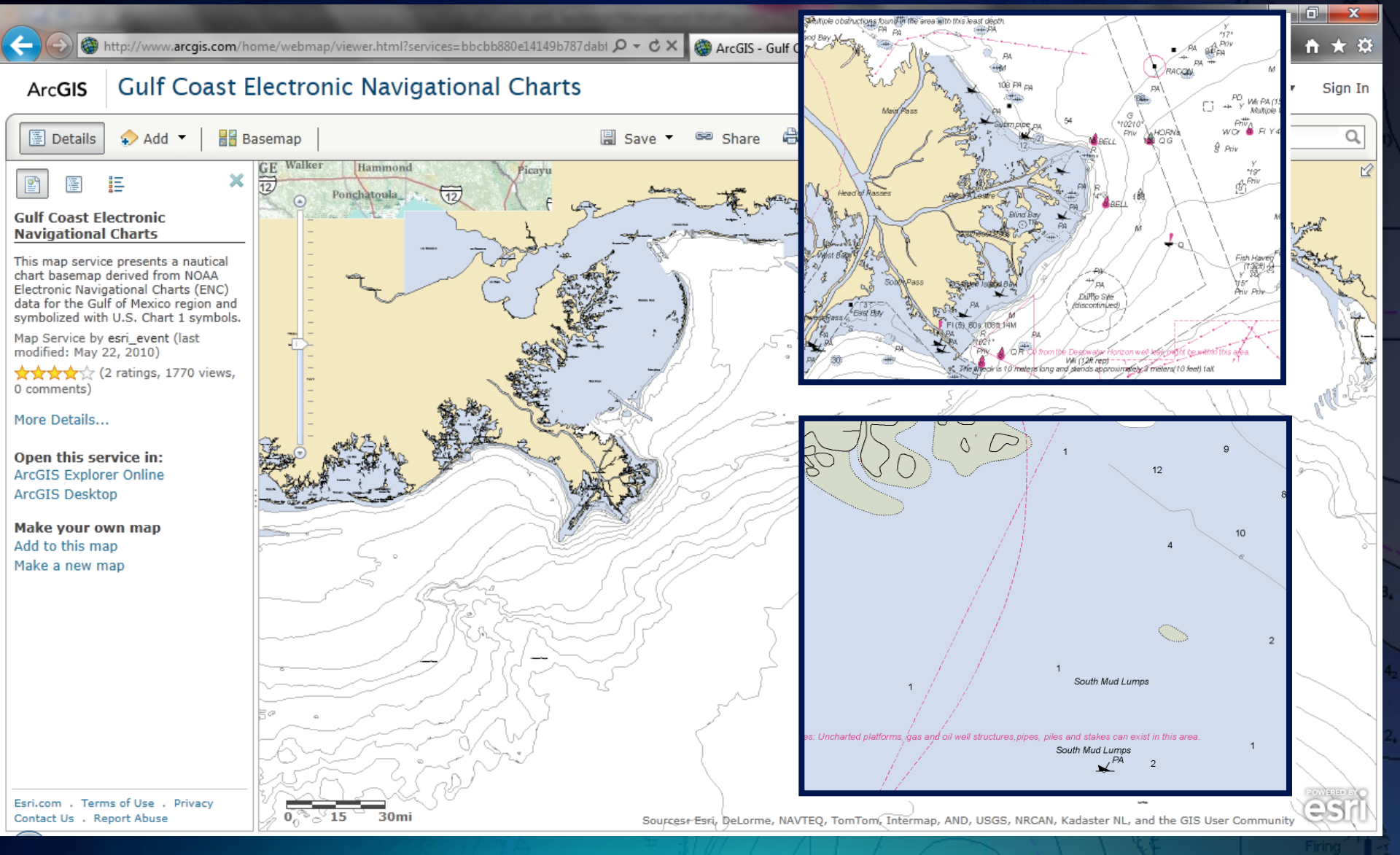
There are a variety of elevation surface representations available. The earth's surface is represented as a terrain (without features like trees and buildings), as a surface (with trees and buildings), and as a combined topographic and bathymetric surface (to represent land and under water). The data sources include multiple sources of elevation data, ranging from 230m Global GMTED, to the USGS NED coverage, to submeter Lidar data for small areas.

The ArcGIS World Elevation services are currently available as a public beta. Please begin by clicking the '**Join This Group**' button in the upper right hand corner for the World Elevation group on ArcGIS Online, and from there you can proceed to the beta site. Learn more about the ArcGIS World Elevation services before joining the beta.

Please contact us for more information on these services.



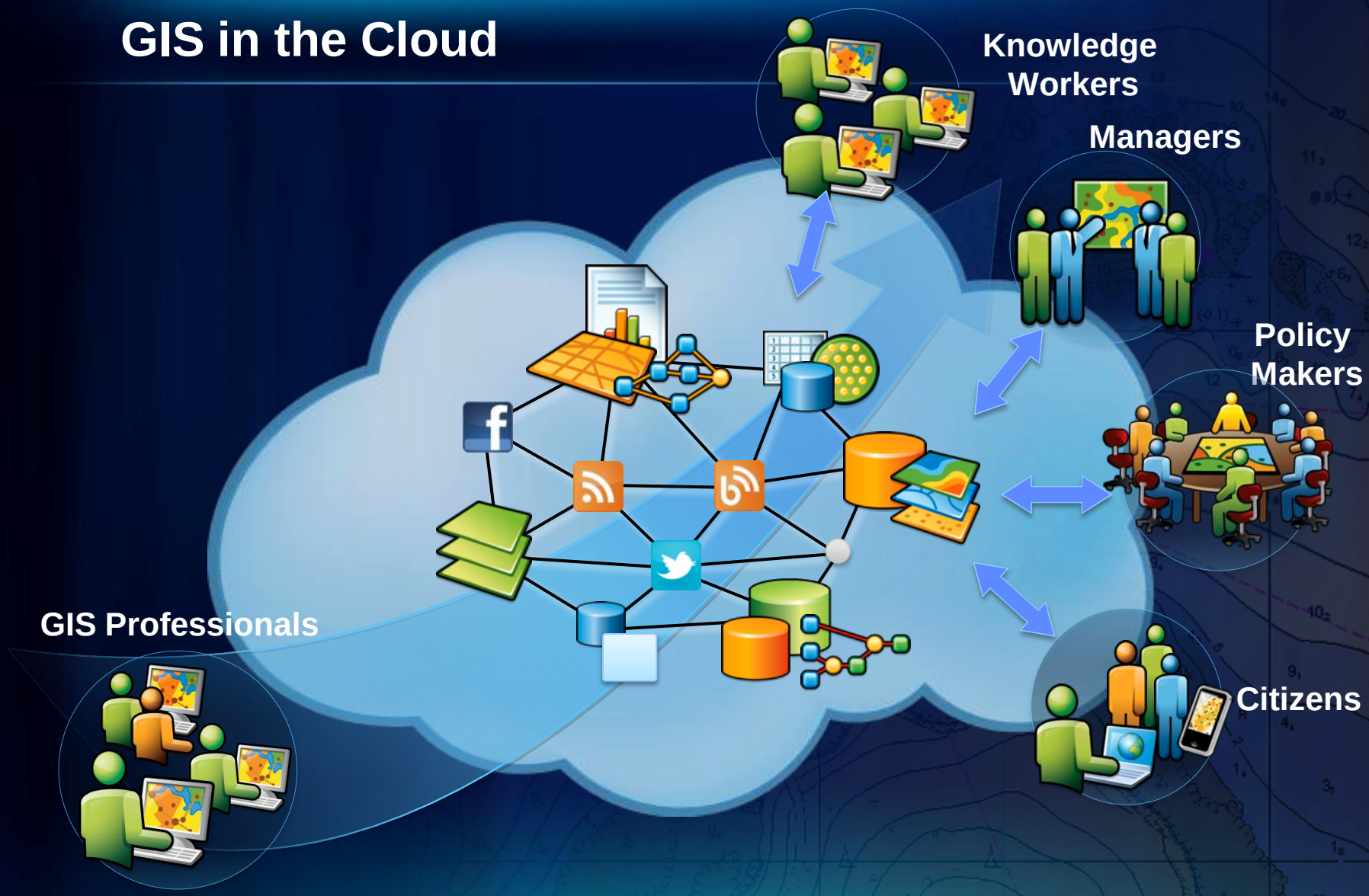
Maritime Online – Nautical Chart Service (coming soon)



ArcGIS Online is the new GIS platform

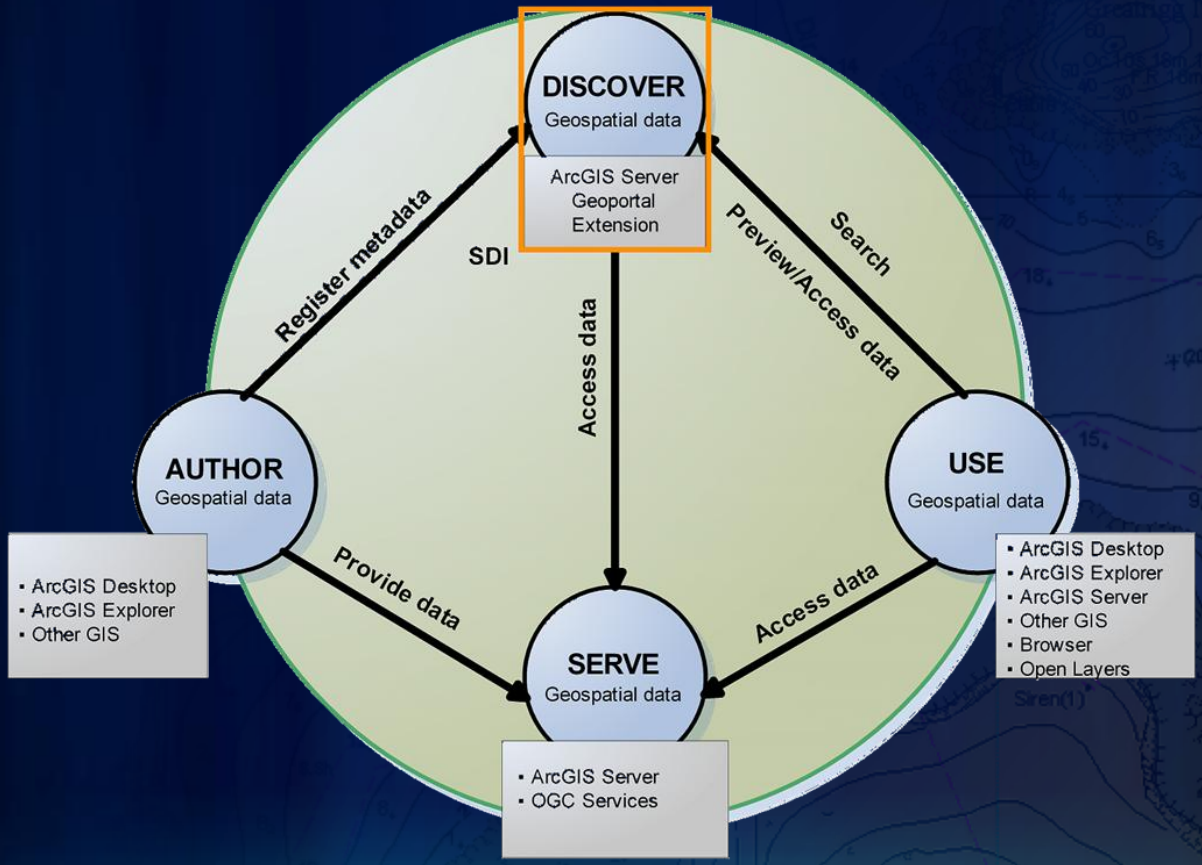
- ArcGIS Online is Cloud based
  - Geospatial content management
  - Esri & GIS User authored
  - Wide variety of platforms
- Create & Share maps/data
- Access & Discover
  - Maps, services, tools, data
- Share Content
  - Public, Private, Groups

GIS in the Cloud



A Geoportal

For searching and accessing data



Esri's free, open source geoportal server
www.esri.com/geoportal

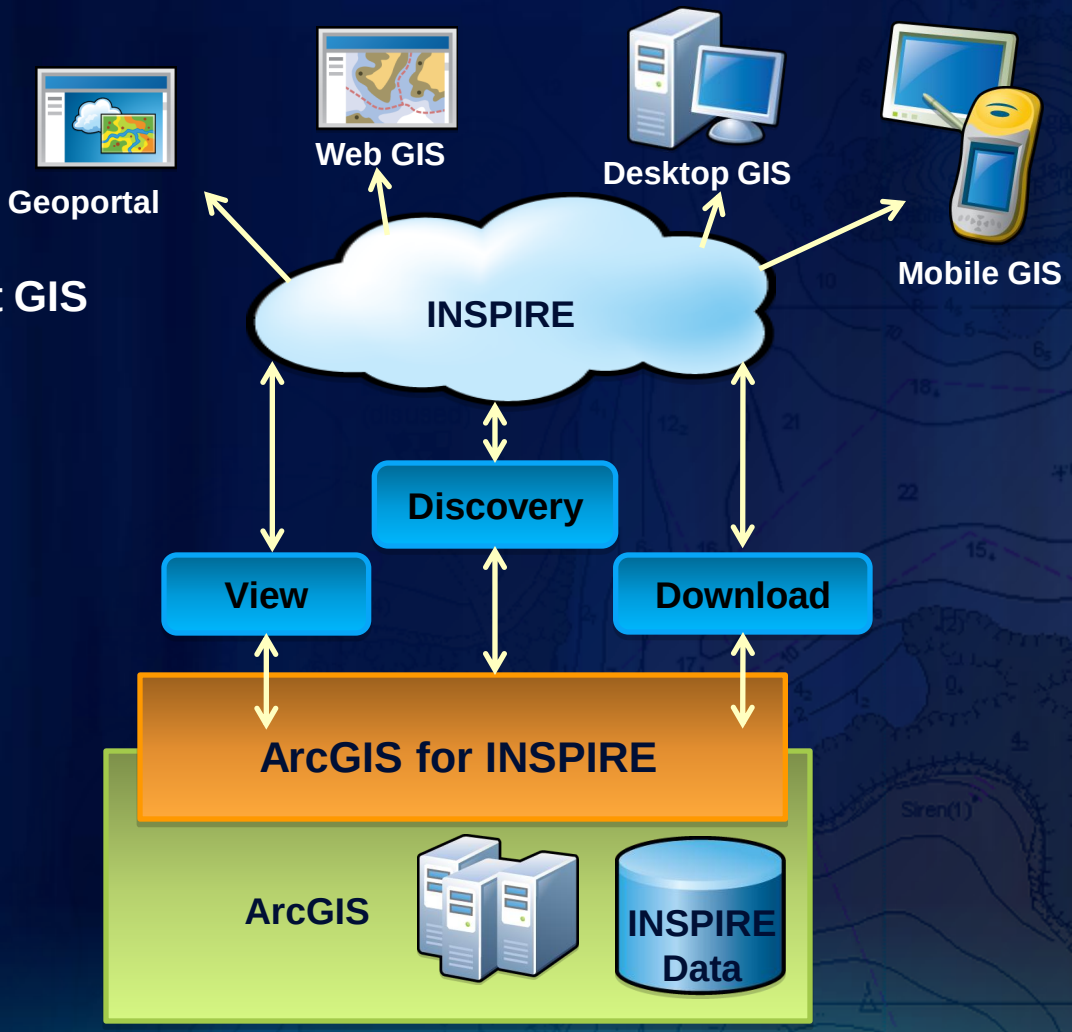
INSPIRE (Authoritative content)

Marine SDI as one of its main components

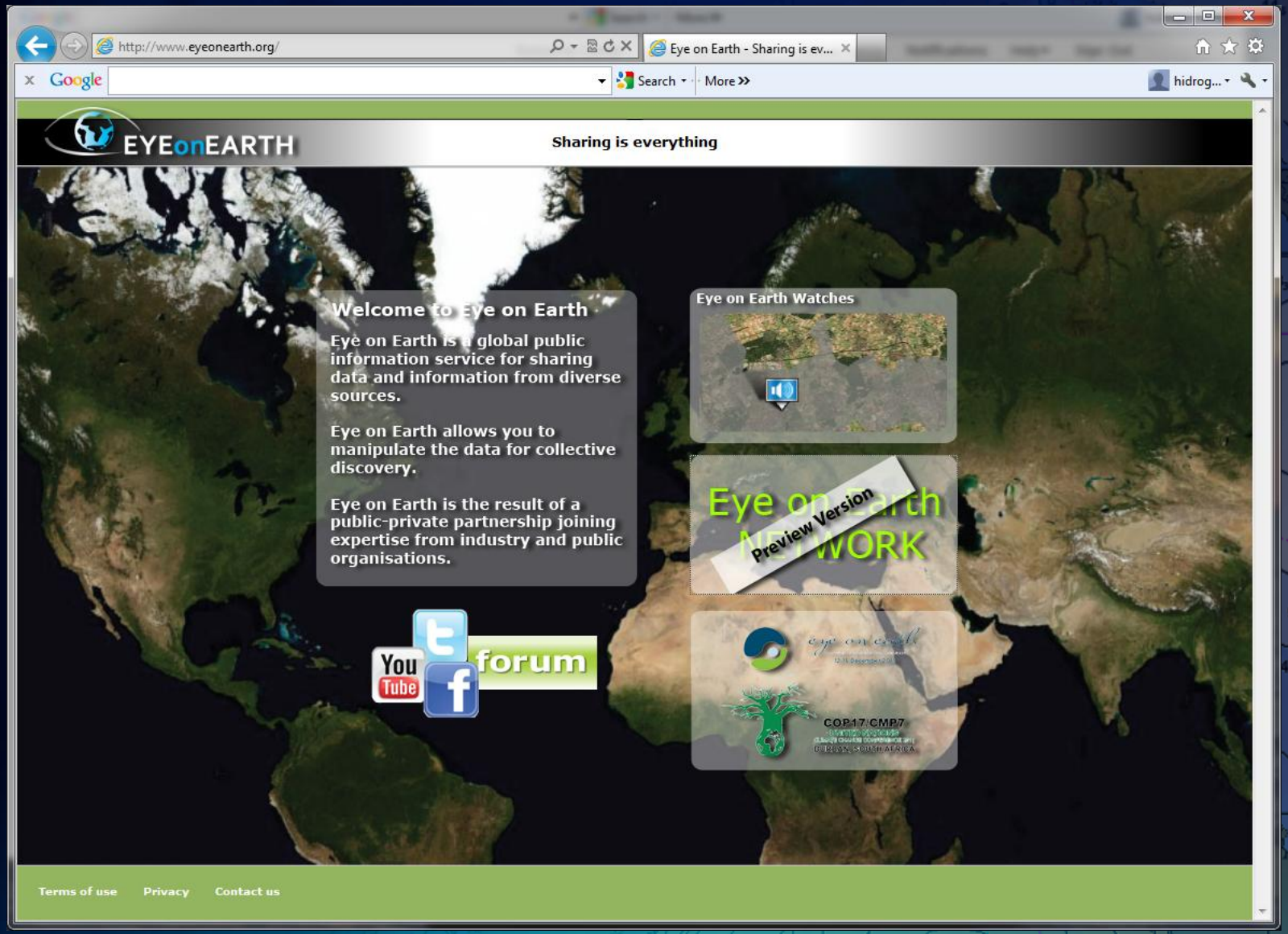
http://www.inspire-geoportal.eu/

INSPIRE

- INSPIRE compliant GIS
- Rules & Technical Guidance for
  - View
  - Discovery
  - Download
  - Metadata



Eye on Earth (Crowdsourcing)



Esri supported SDIs in Europe

Austrian Umbrella Organization for Geographic Information (SNIG)

Portugal National System for Geographic Information (SNIG)

British Geological Survey Science Portal

Esri Maritime Technology

Maritime

Esri Maritime technology

Data Models

Data Bases

Tools

QC/QA

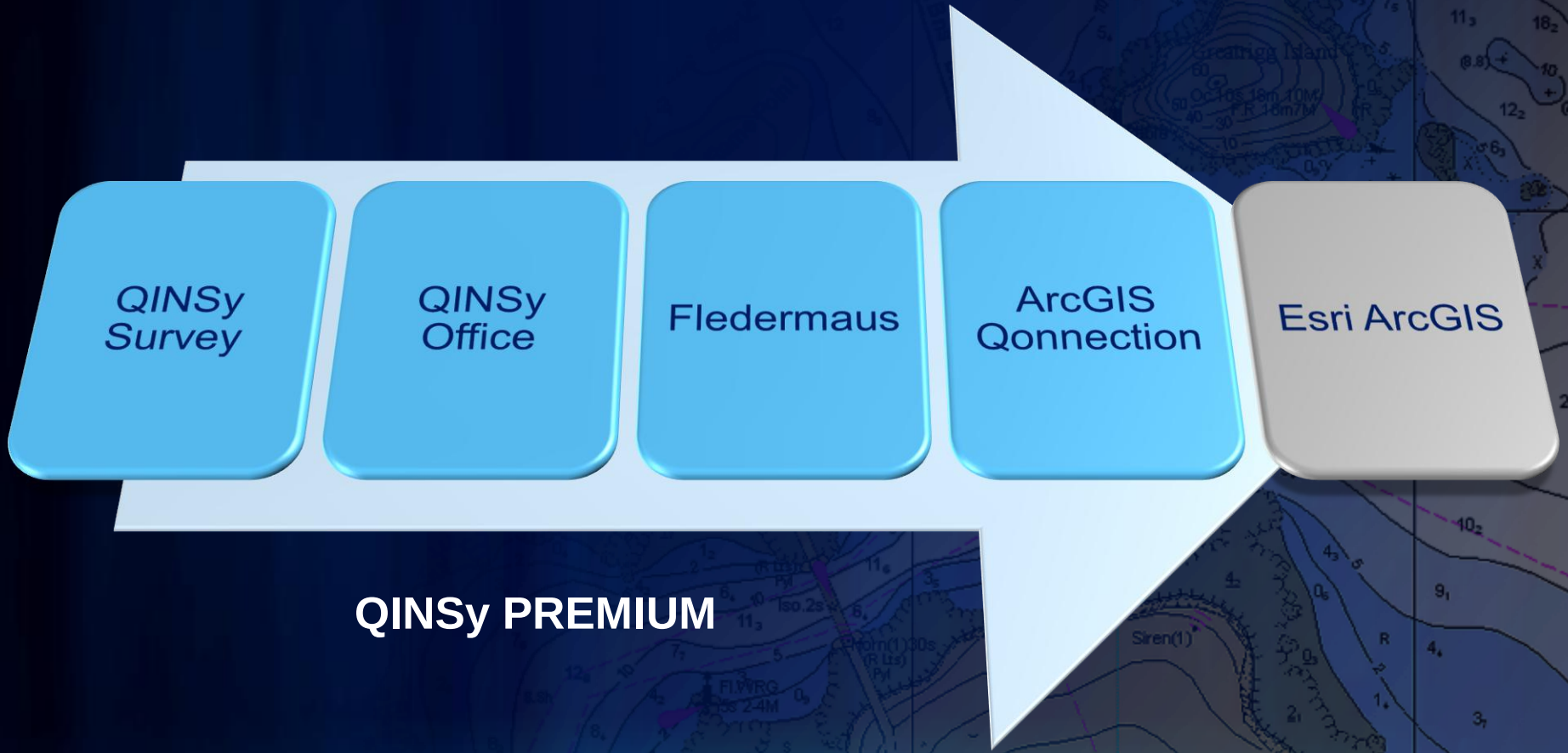
Workflows

Server

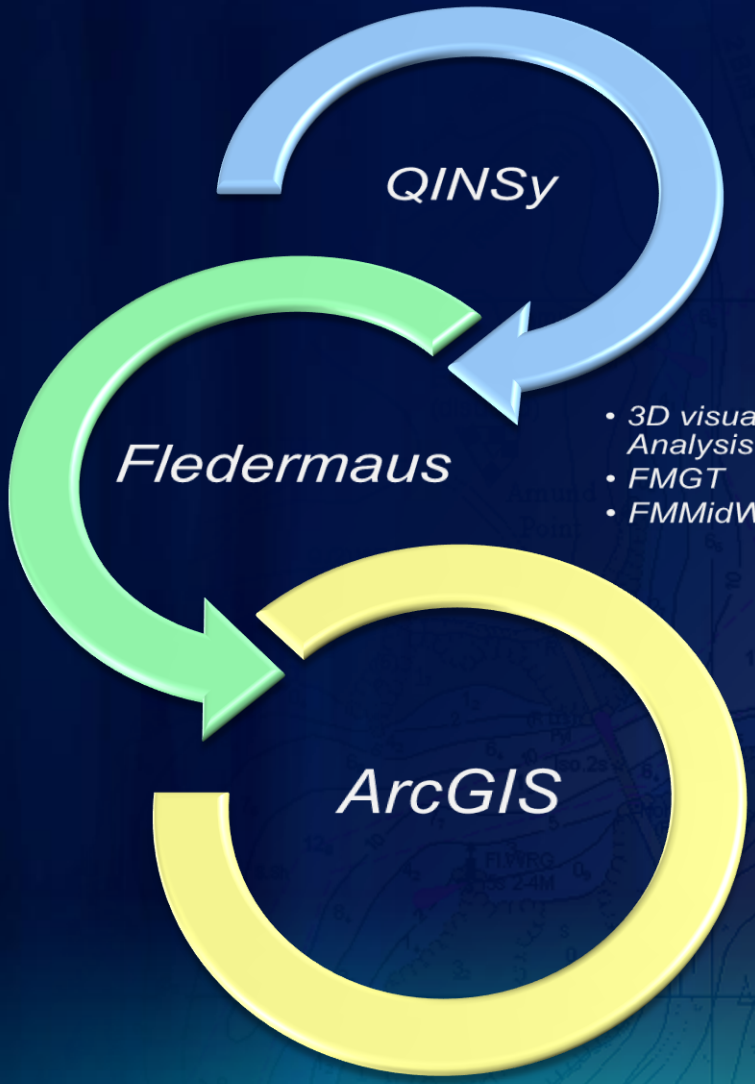
A complete platform

The Modern Hydrographic Workflow

The Modern Hydrographic Workflow



QINSy PREMIUM

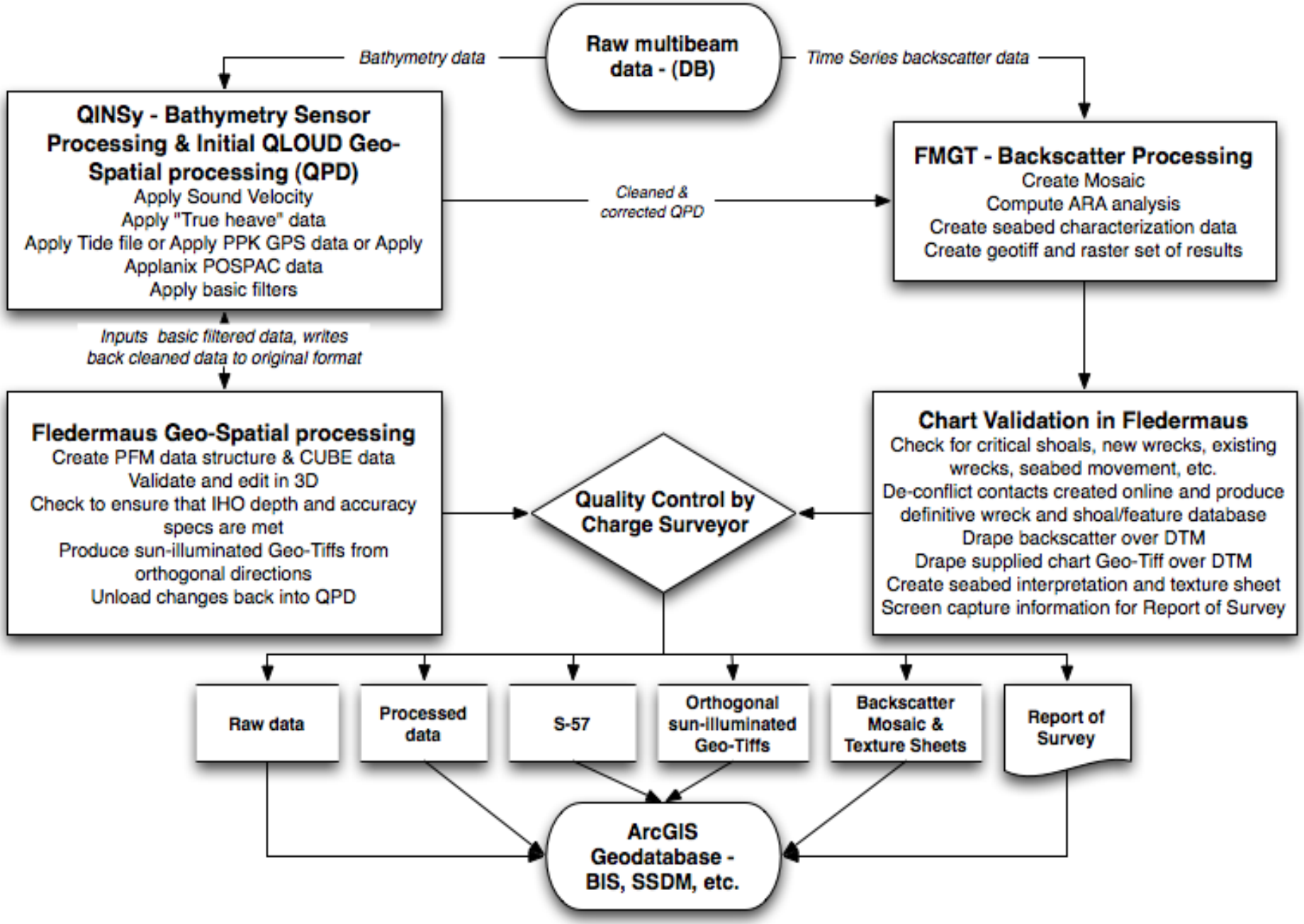


- Data Acquisition
- Data Processing

- 3D visualisation & Data Analysis
- FMGT
- FMMidWater

- GIS application
- Analysis & Intelligent data storage
- Update Navigation production database
- Publishing to the Cloud

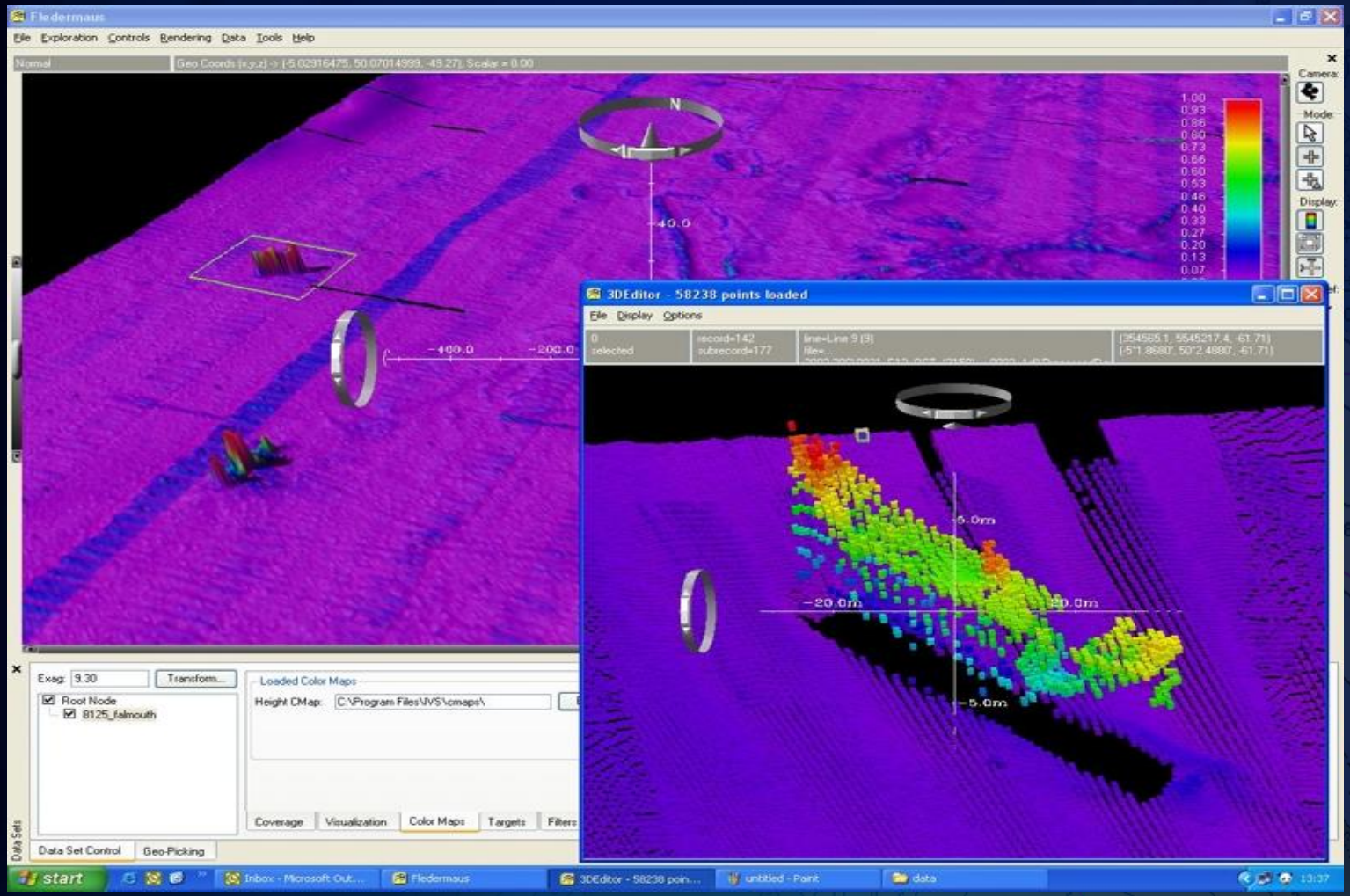
THE MODERN HYDROGRAPHIC WORKFLOW



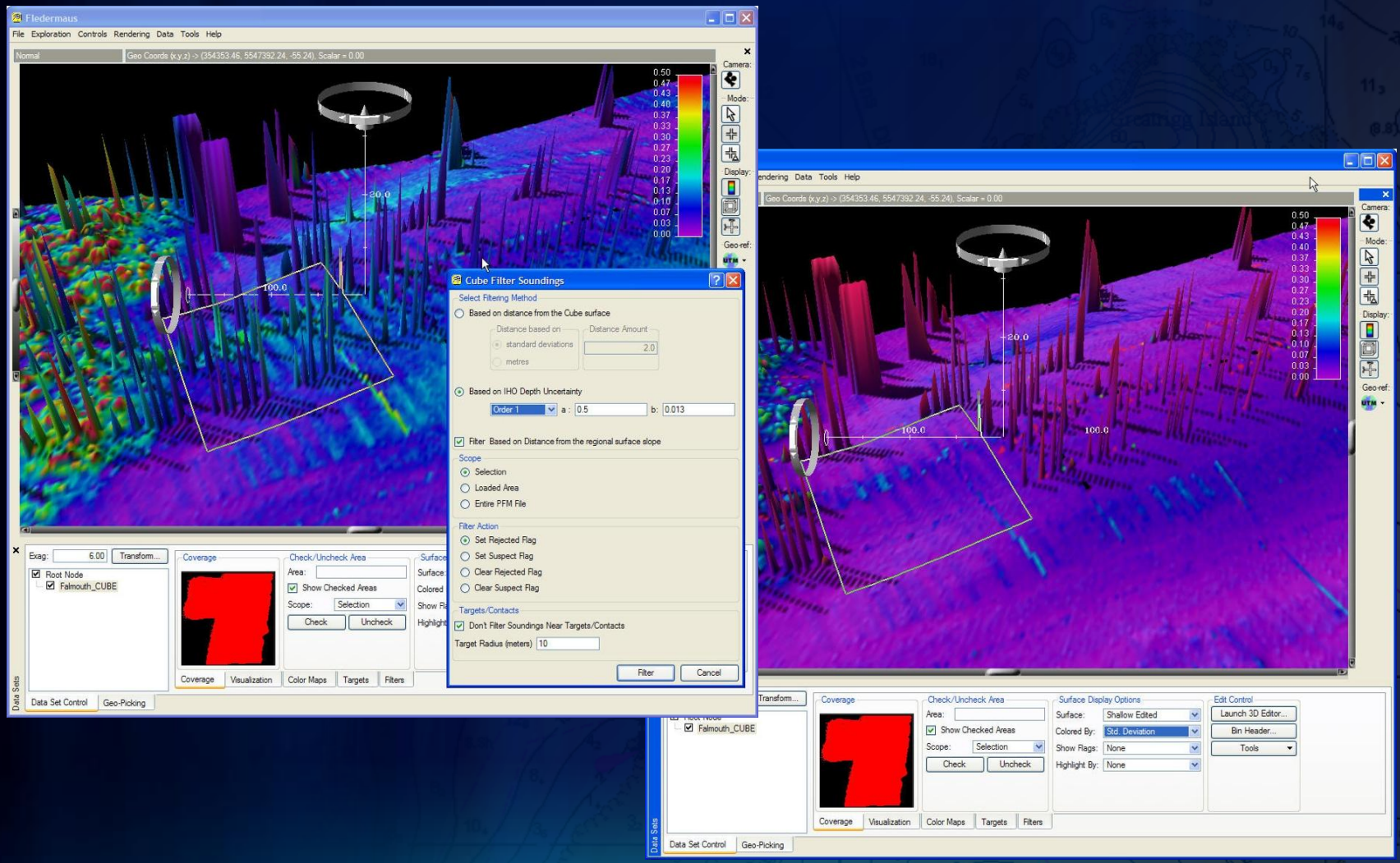
FM Bundles and Modules

- FM Hydro – CUBE, data validation and QC
- FMGT – Geocoder Toolbox
- FMMidwater – water column processing
- FMGIS – ArcGIS connection

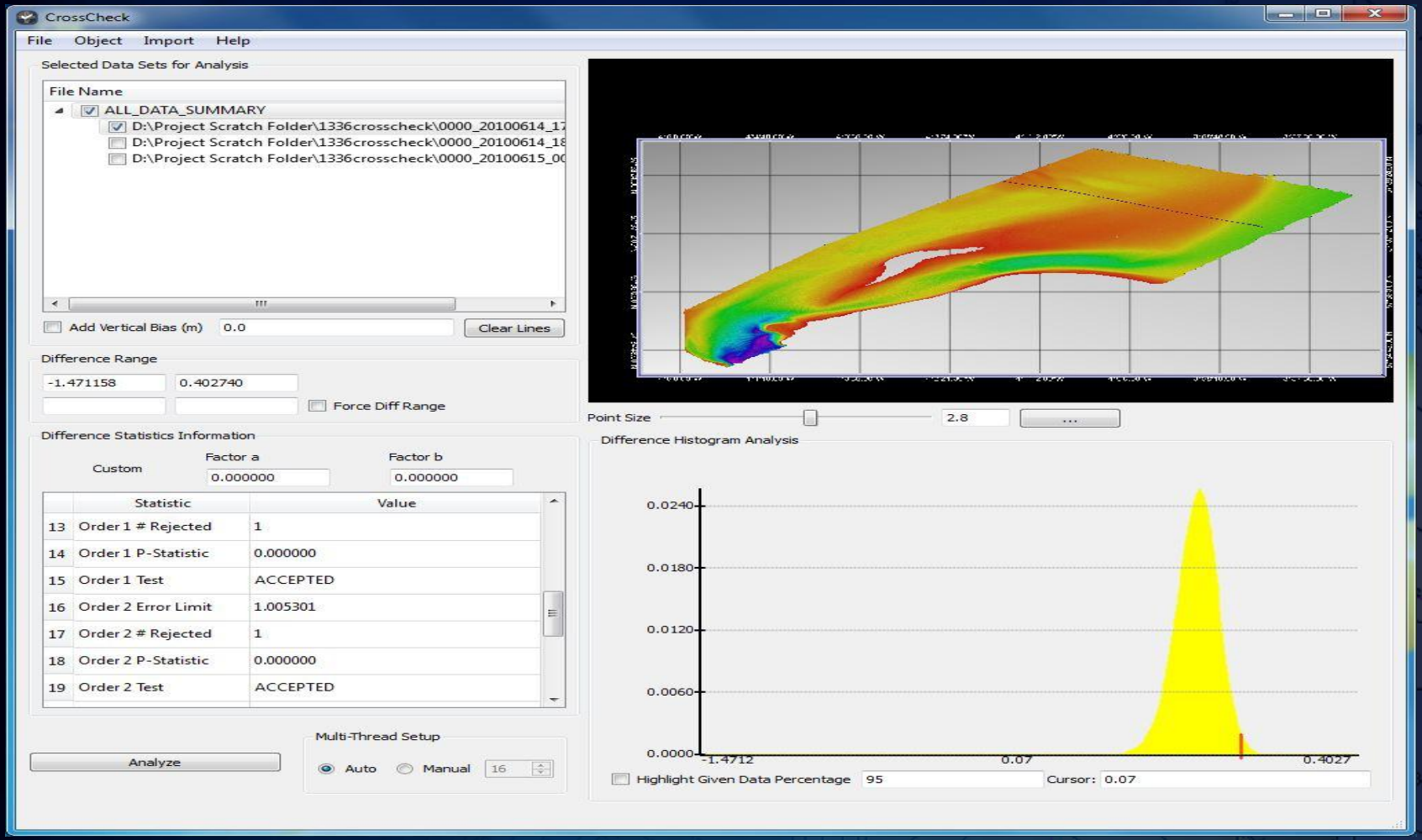
FM Hydro – CUBE and validation



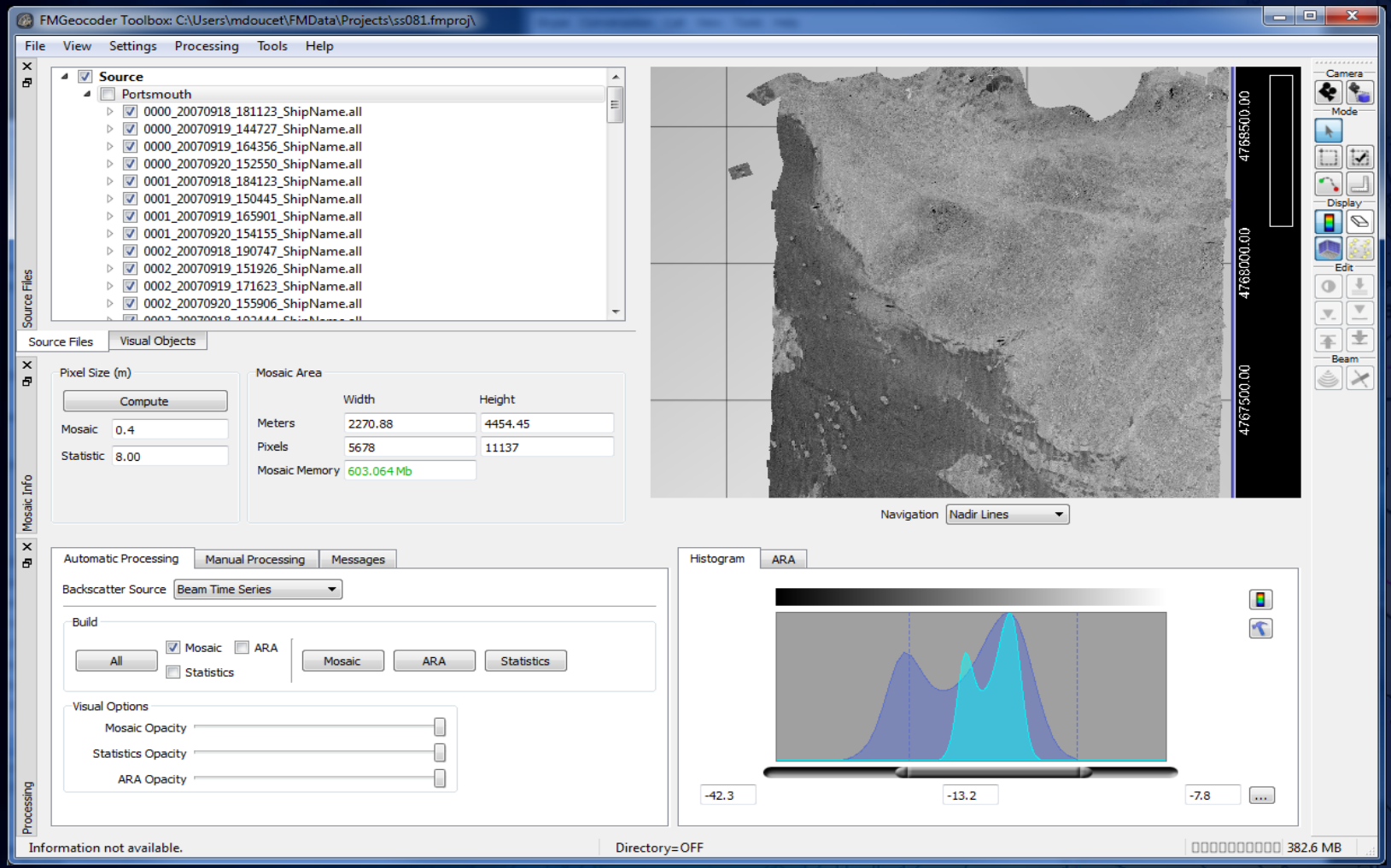
FM Hydro – filter soundings



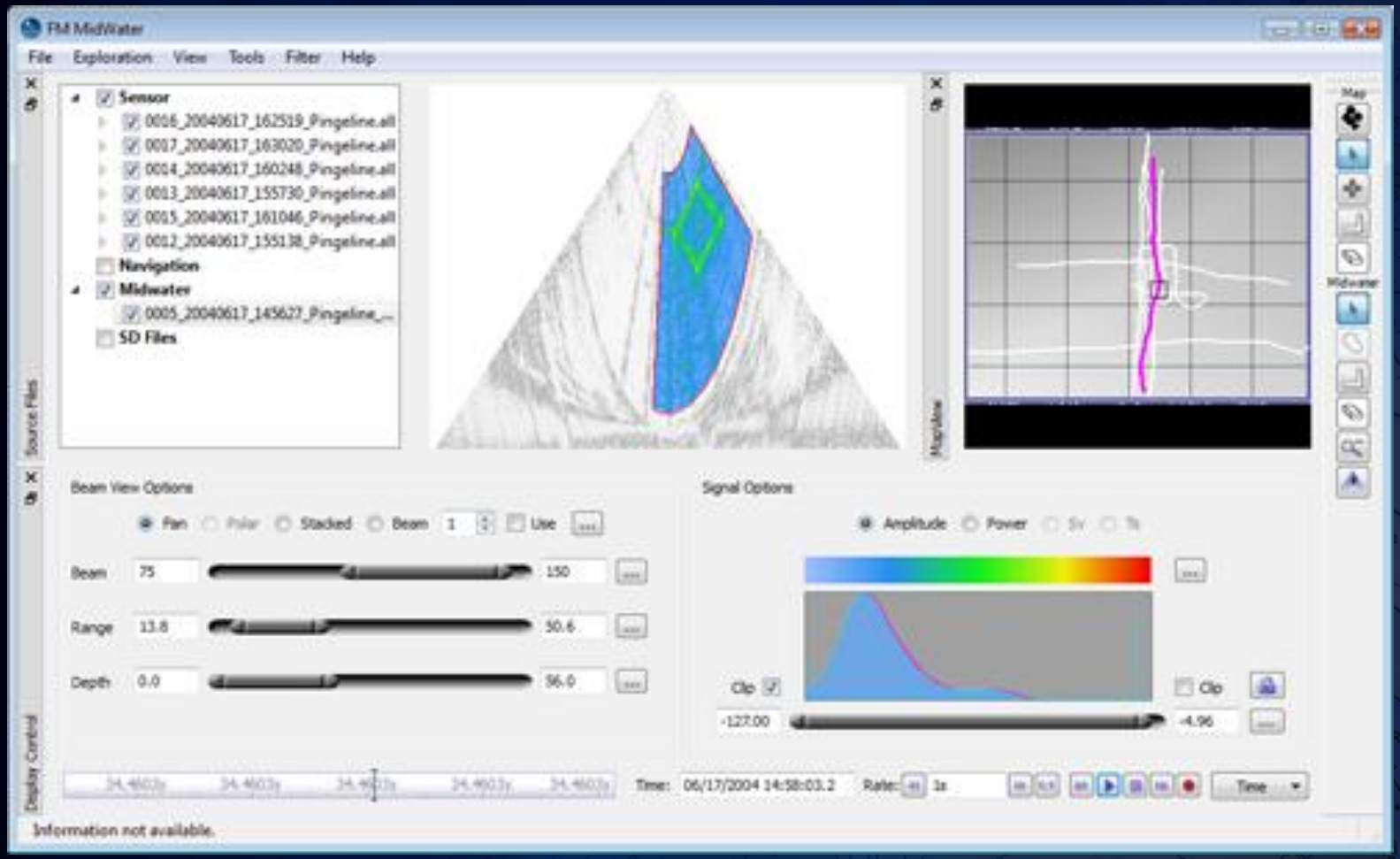
FM Hydro – cross check



FMGT - Geocoder Toolbox



FM Midwater


FM MidWater
File
Exploration
View
Tools
Filter
Help
Sensor
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Midwater
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SD Files
Source Files
Map
Midwater
Beam View Options
Pan
Polar
Stacked
Beam
1
Use
Beam
75
150
Range
13.8
50.6
Depth
0.0
56.0
Signal Options
Amplitude
Power
Clip
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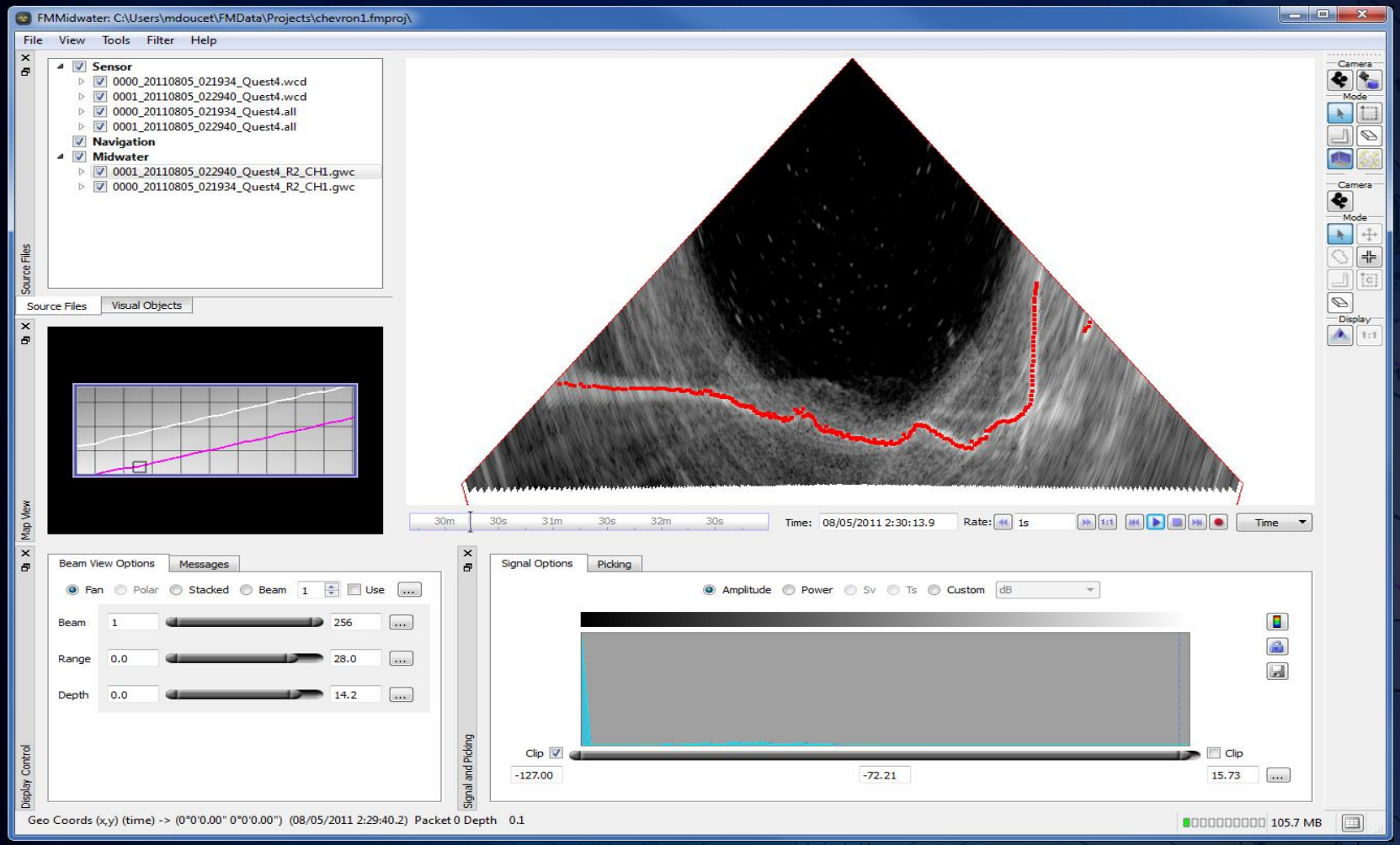
-4.96
Time:
06/17/2004 14:58:03.2
Rate:
1s
Time
Display Control
Information not available.

FM Midwater


FMMidwater: C:\Users\mdoucet\FMData\Projects\chevron1.fmproj\
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Sensor
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Visual Objects
Map View
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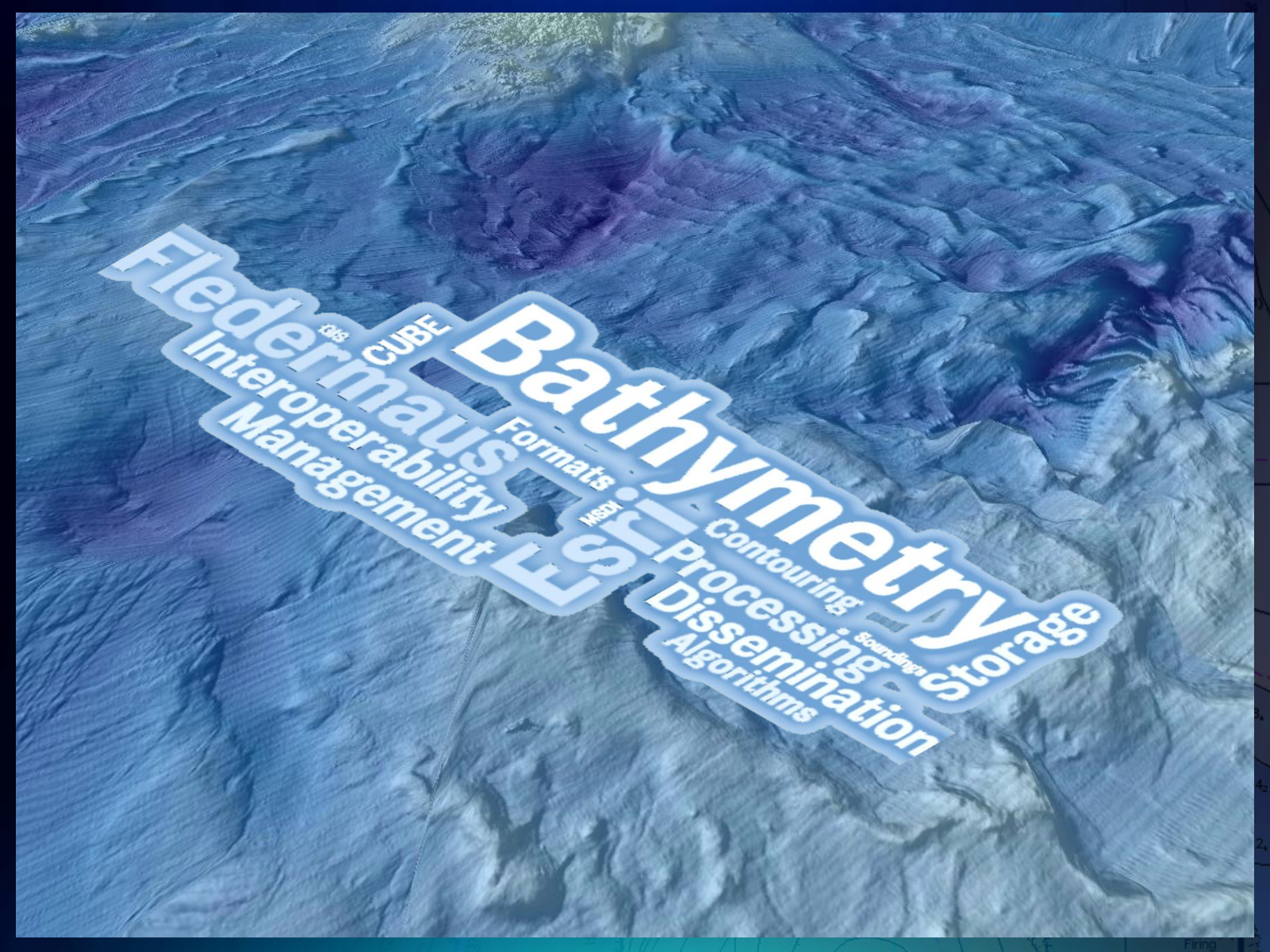
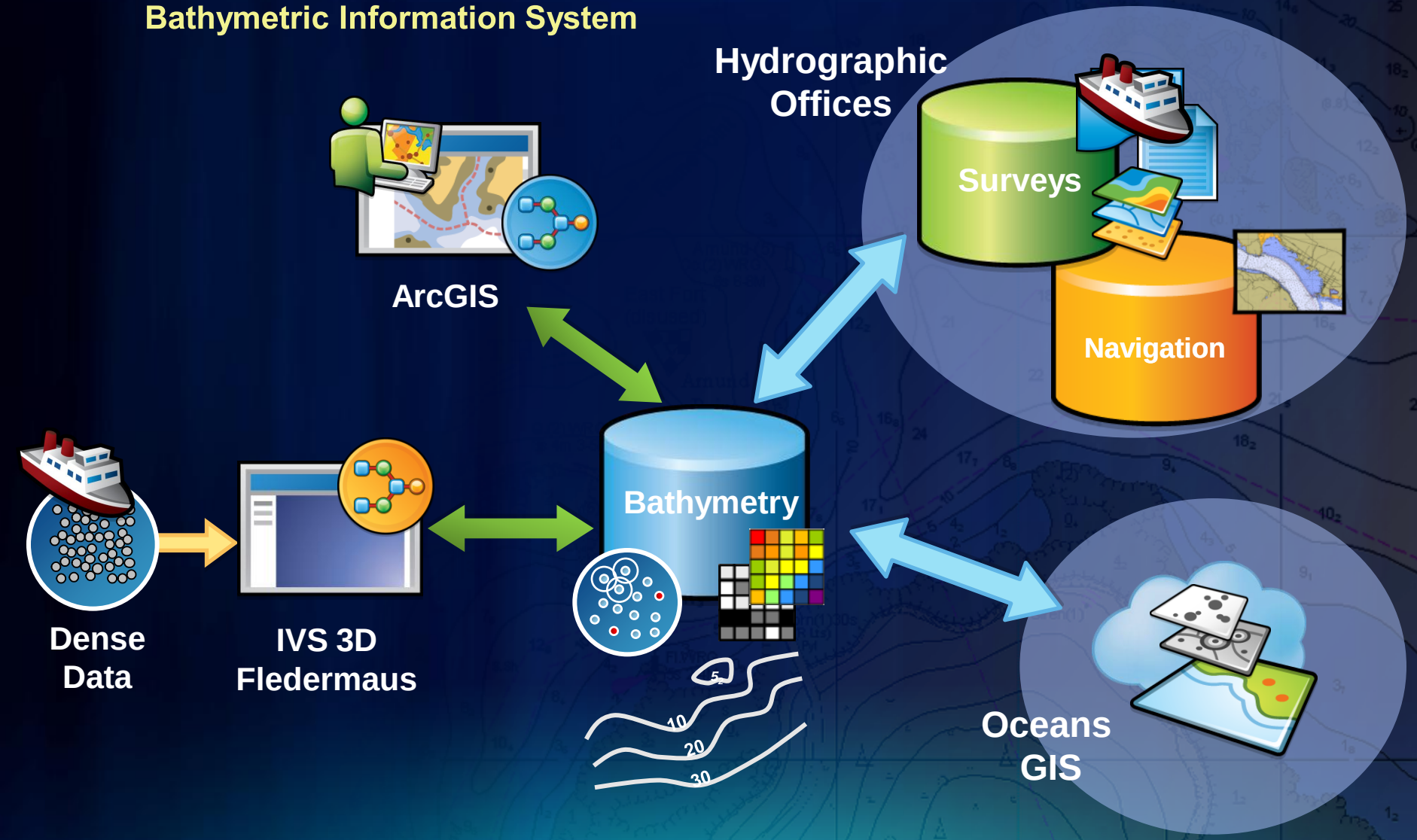
Messages
Fan Polar Stacked Beam Use
Beam
Range
Depth
Display Control
Signal Options
Picking
Amplitude Power Sv Ts Custom dB
Clip
-127.00
-72.21
15.73
Signal and Picking
Geo Coords (x,y) (time) -> (0°0'0.00" 0°0'0.00") (08/05/2011 2:29:40.2) Packet 0 Depth 0.1
105.7 MB


Bathymetry
Fledermaus
CUBE
Formats
Contouring
Storage
Processing
Dissemination
Algorithms
Interoperability
Management

Nautical Solution - Bathymetry

Bathymetric Information System



A Bathymetric Vision for Esri

- ***An Enterprise GIS system for the management and deployment of bathymetric data, metadata and products that is commercially available.***

- **Comprised of:**
  - **ArcGIS Nautical Solution**
    - **Server, Desktop**
  - **Fledermaus by IVS 3D/QPS**

Nautical Solution – Bathymetry @ 10.1

COTS Software

Adaptation & Configuration

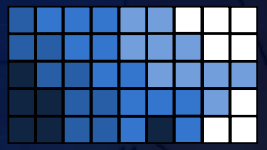
- Model Builder
- Python
- Data Interoperability
- ArcObjects
- ArcEngine

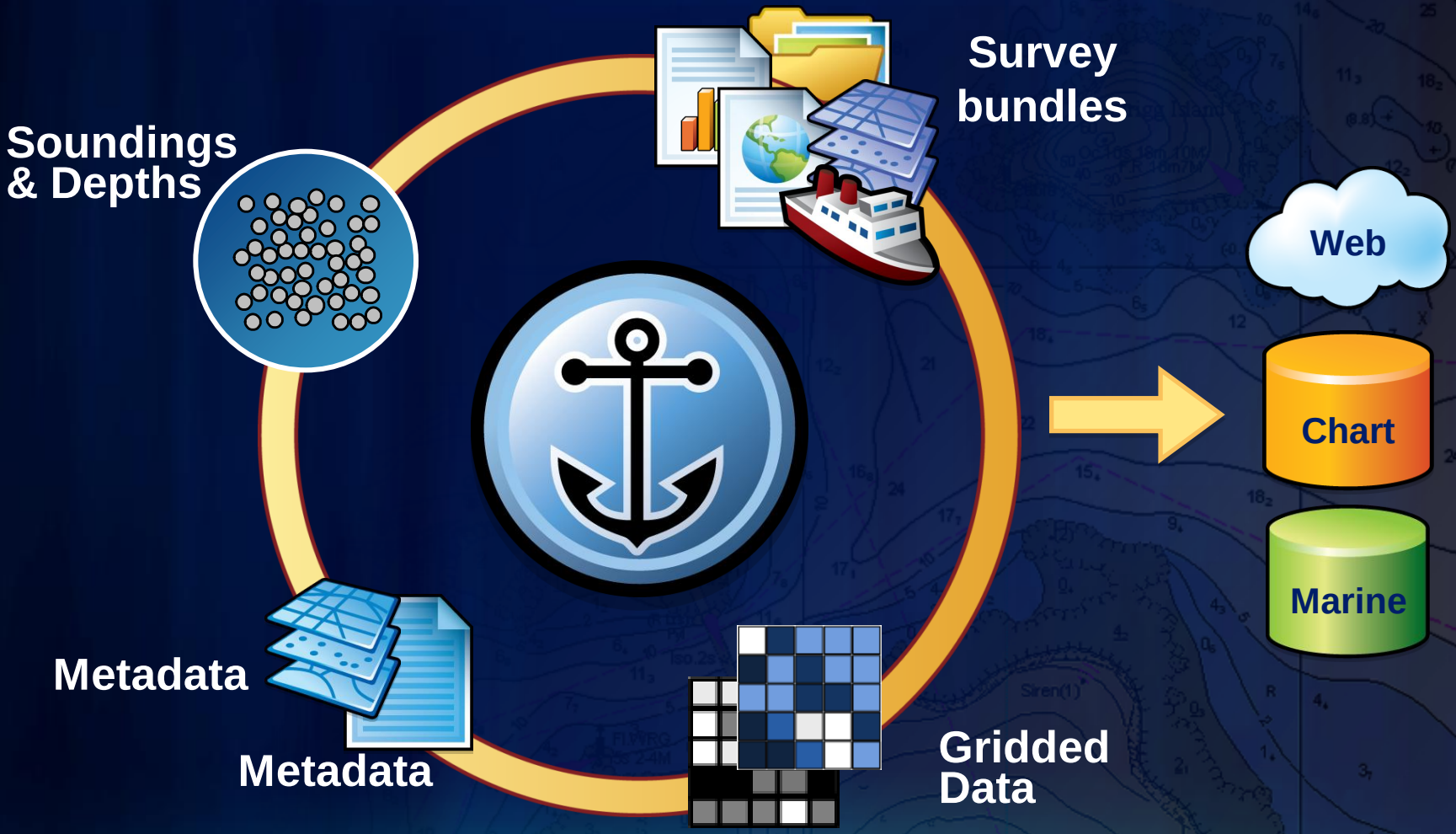
- Workflows
- Data model
- Geoprocessing tools
- Analysis Models
- Documentation

…plus…

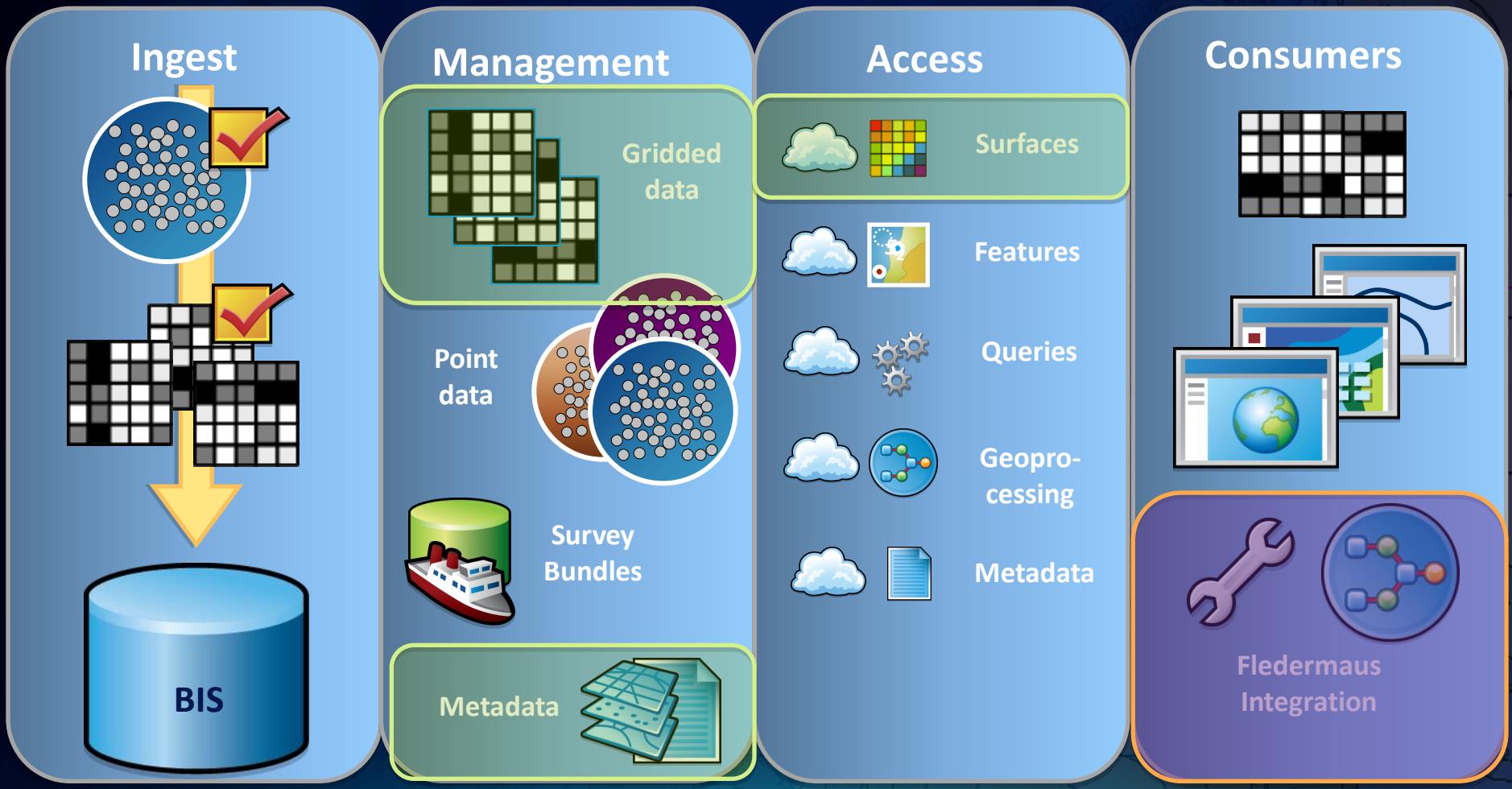
- Metadata Engine
- BIS Explorer
- Surface Builder
- Survey Management
- Fledermaus Integration

Nautical Solution - Bathymetry



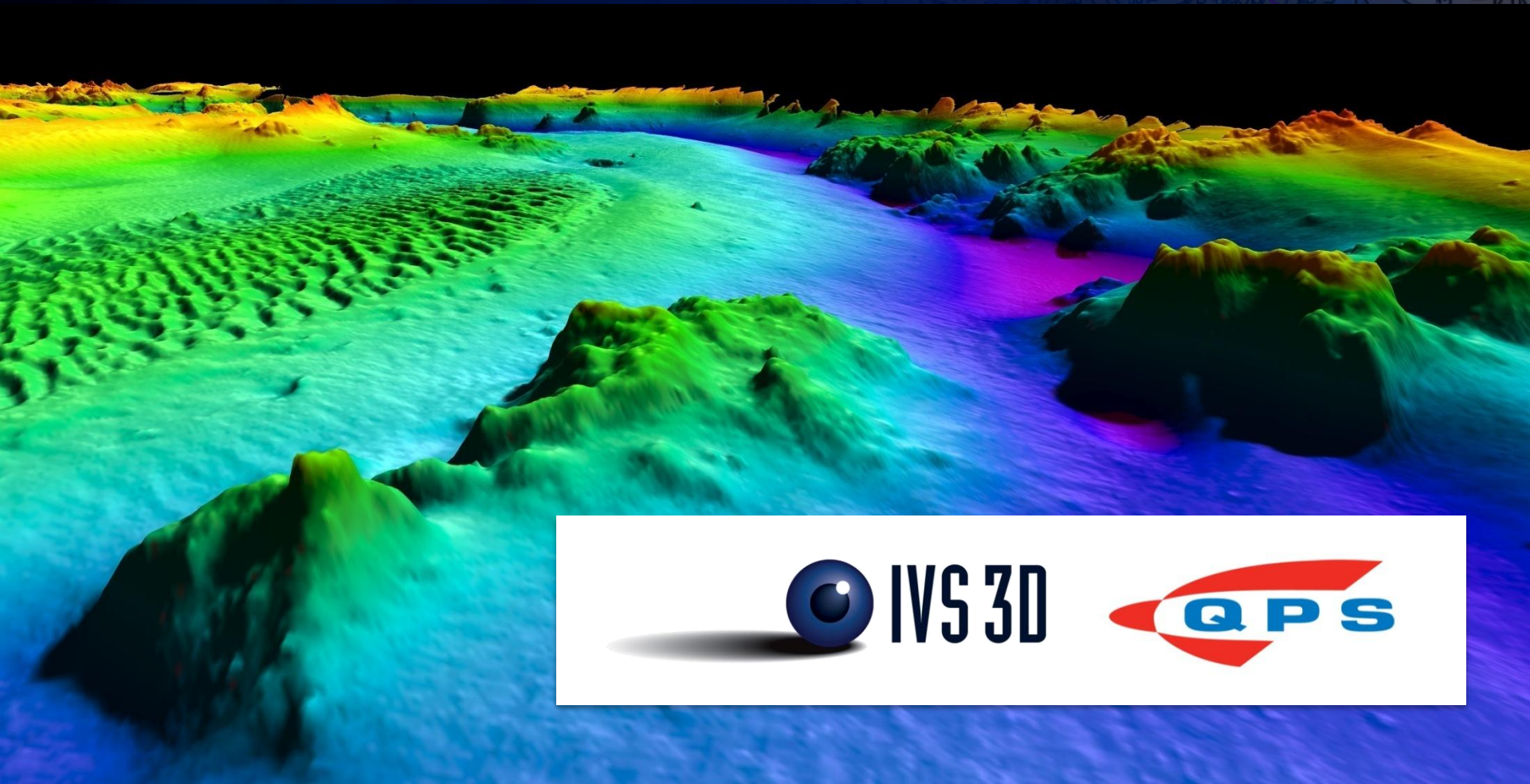


Nautical Solution - Bathymetry



A Partnership in Bathymetry

- A single solution built from 2 application platforms
  - Seamless integration between Fledermaus and ArcGIS
  - Quality Control and persistence through metadata
  - End to end workflow utilizing a common GIS platform



Ocean GIS

Three tiers

Bathymetry Management for…

Soundings & depths

Raster data

Critical metadata

Survey information

BIS

Hydrography

Oceanography

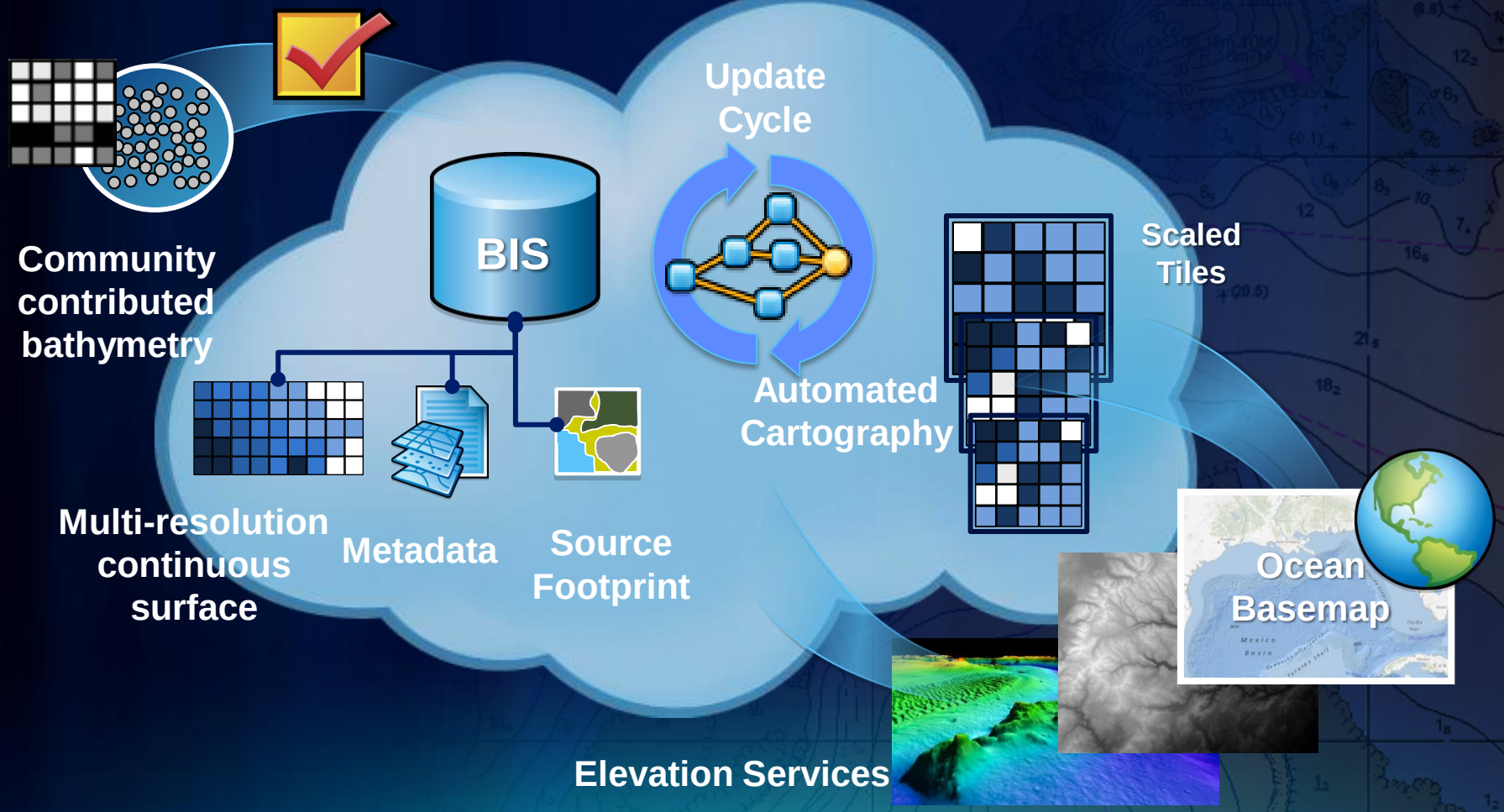
Coastal Zone Development

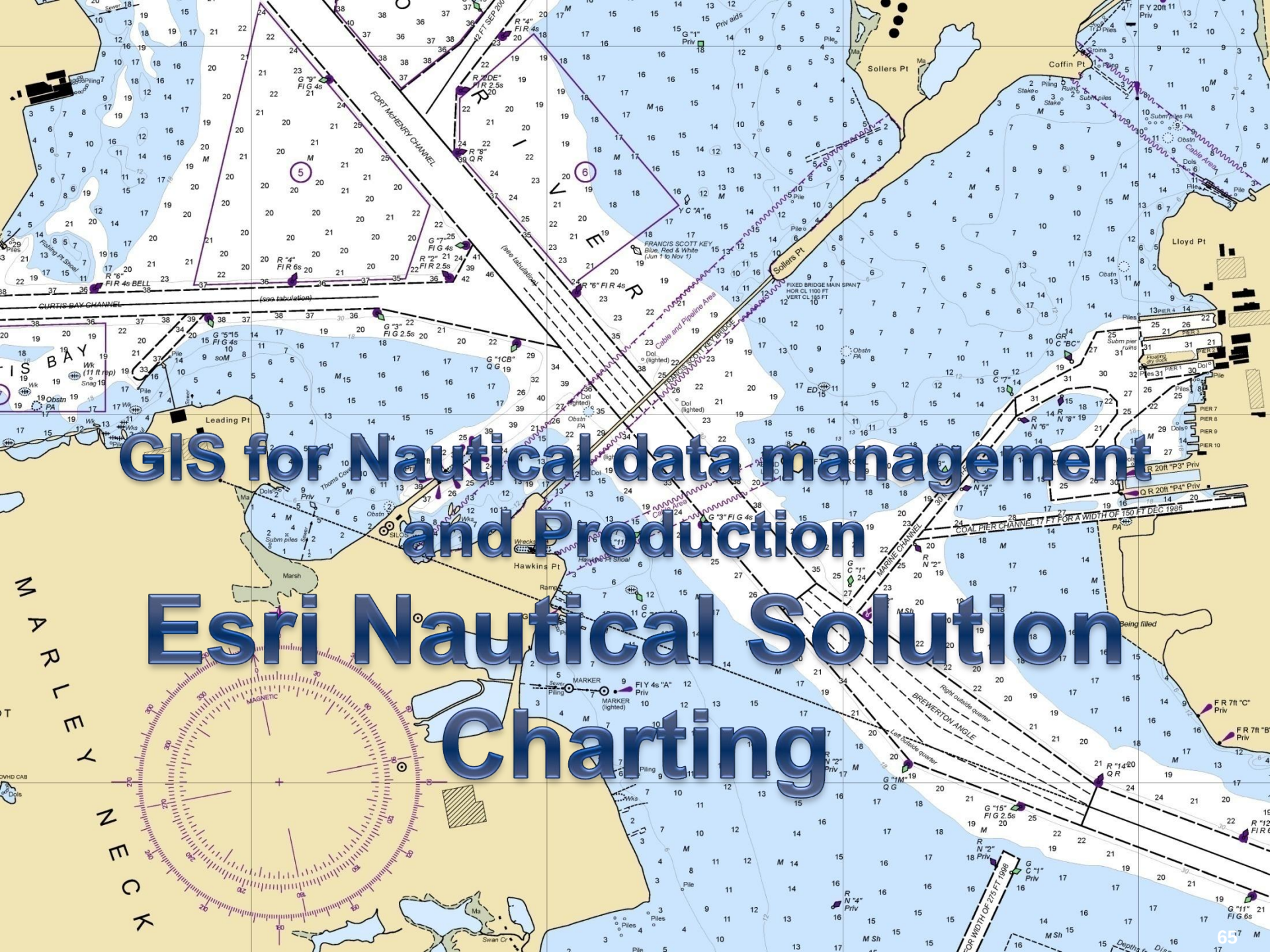
Ports

Bathymetry in the Cloud

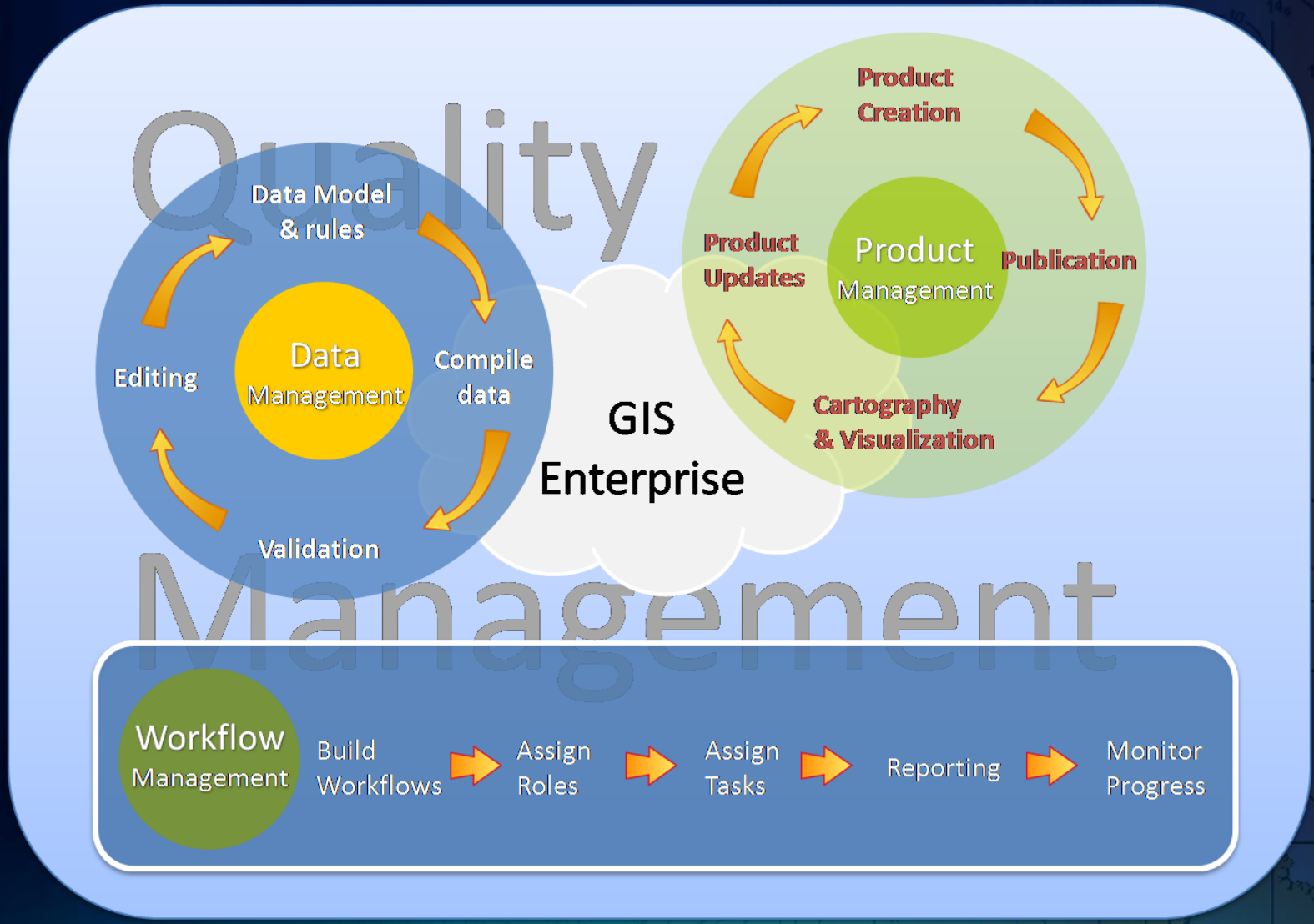
- A new generation of ArcGIS Server
- Easier to publish web content to:
  - Portals | Cloud | Web Services
- Easier to use, accessible by many

Bathymetry in the Cloud and Ocean GIS




GIS for Nautical data management and Production
Esri Nautical Solution
Charting

Esri Nautical Solution Philosophy



Esri Nautical Solution

A complete Nautical Information System

Traditional Products

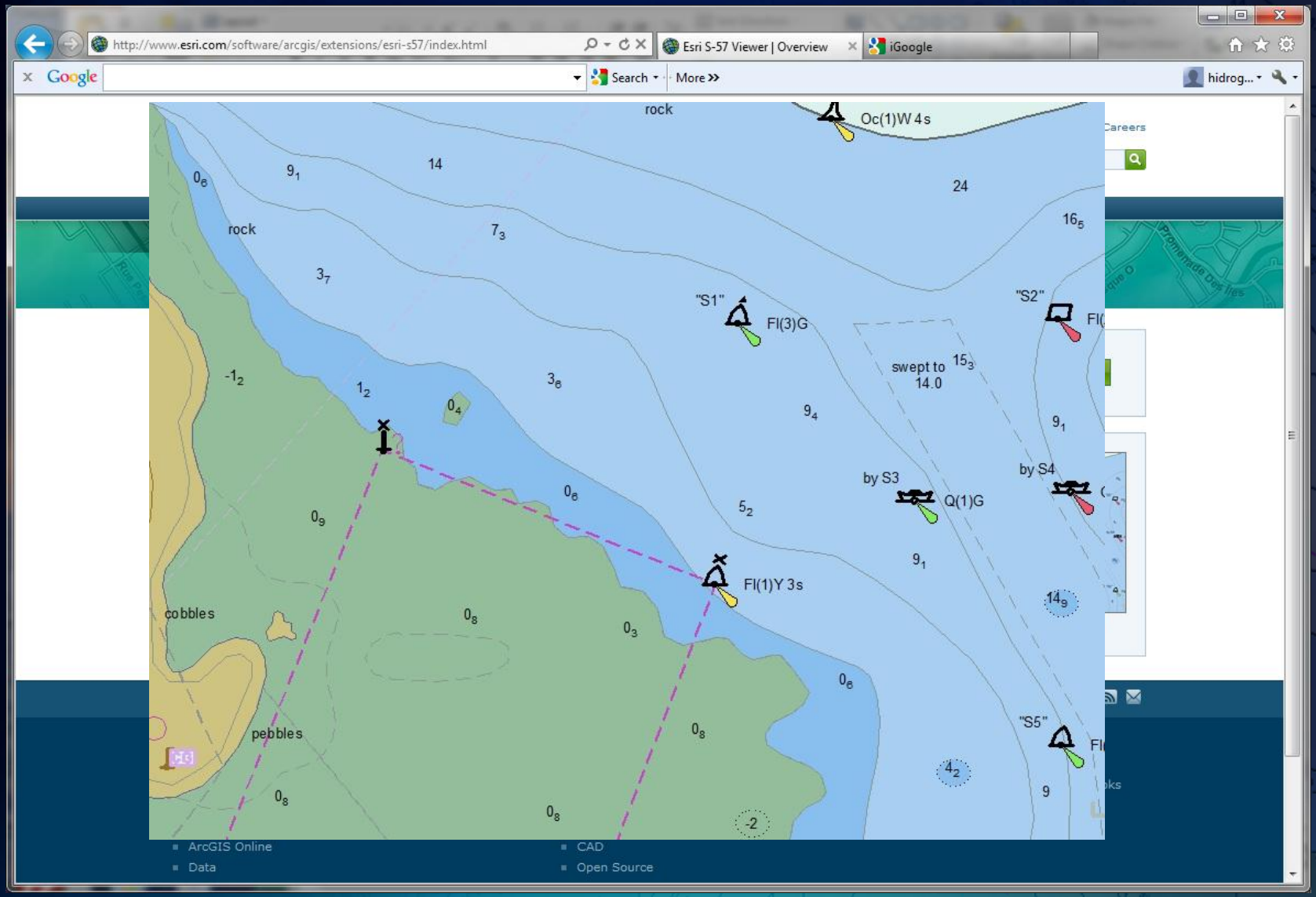
- Charts
- ENCs (S-57)
- Inland ENCs
- River Books
- DNCs
- Defense Charts

Web Services

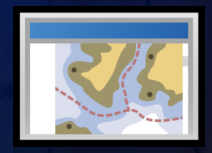
Nautical Solution successes this year

- This year NOAA OCS went live with the NCSII system
- 800+ cells produced with the Nautical Solution
- YRWA producing S-57 and CJ-57 products
- HNHS moving into real production early next year
- KMS building a NIS from scratch for Greenland

Esri S-57 Viewer

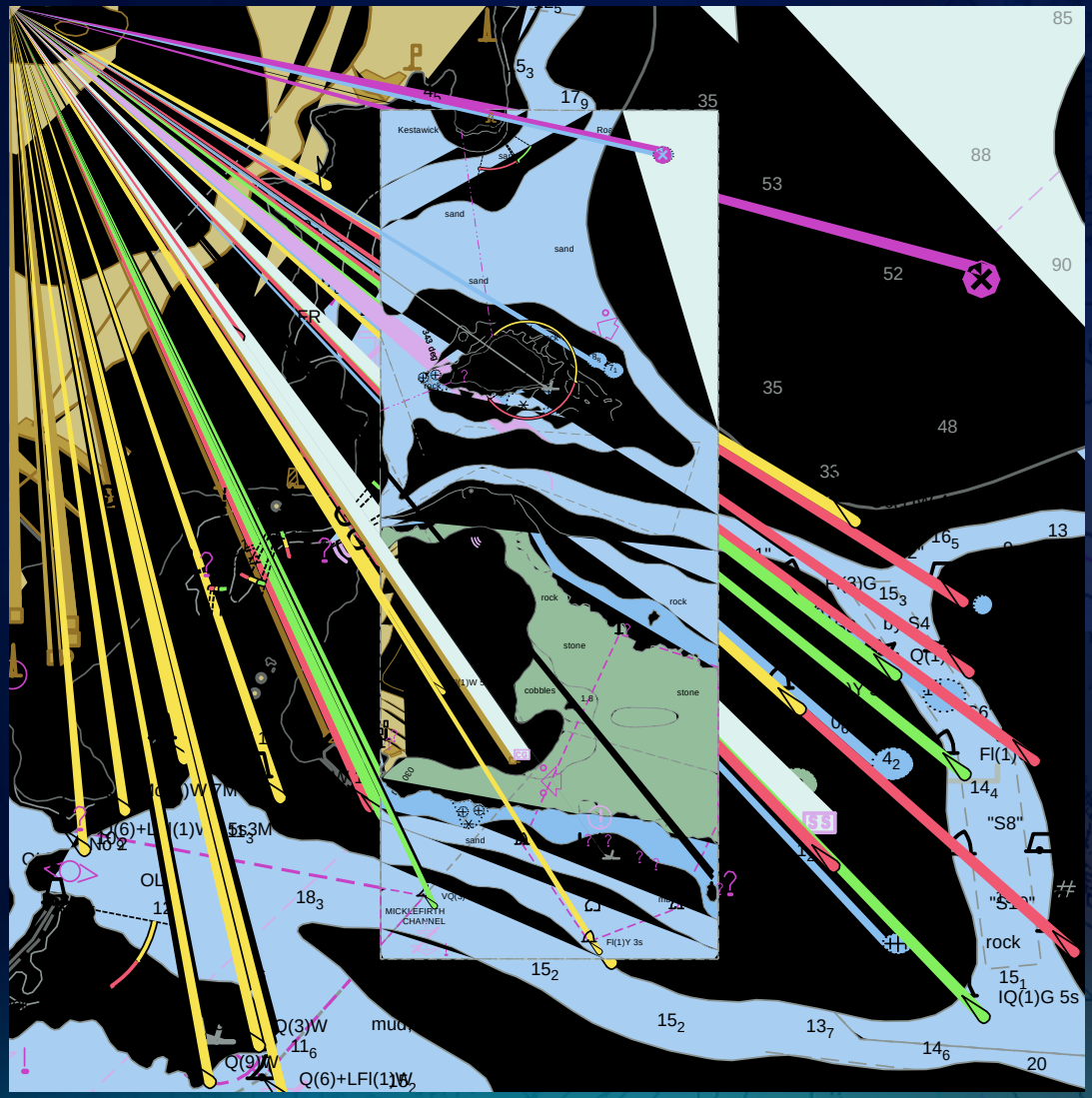


Maritime technology – S-57 Viewer



- Viewing S-57 data is key for nautical users
- Lightweight application extension to ArcMap
  - Works with 9.x and 10.x platform
  - Works with Engine and Server
- Used in Command & Control systems
- Used by people with a need to view S-57 data in ArcGIS

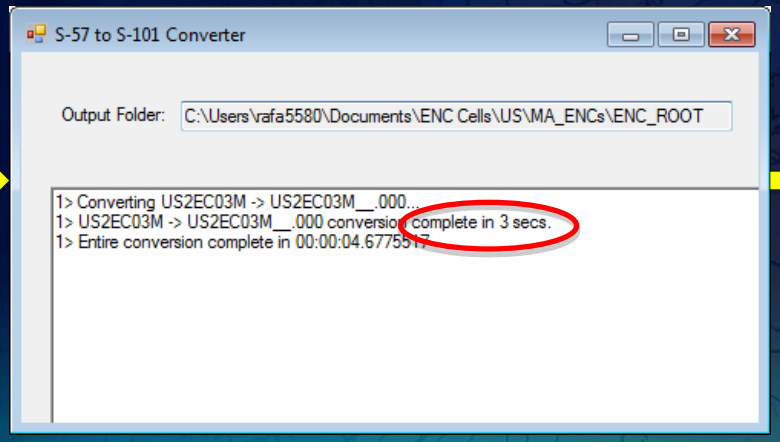
New Esri Converter from S-57 to S-101

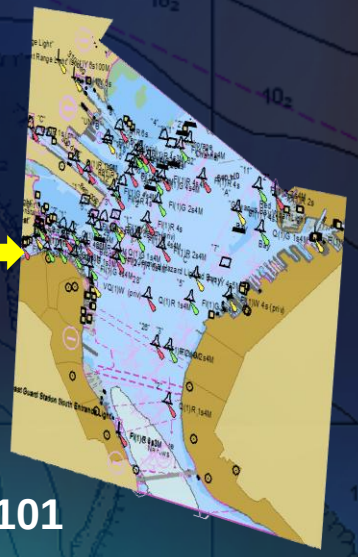


S-57 to S-101 Converter

- In line with IHO S-100 Universal Hydrographic Data Model
- Co-funded with NOAA
- To be released to the public through the IHO web site
- Esri is the first in creating the next generation of ENC in the S-101 standard
- Easy and crystal clear conversion from S-57 to S-101
- Big impact in the hydrographic community

S-57





S-101

Enterprise Maritime Data Management (MDM)

Challenges

- Production Management and Workflows
- Bathymetric Source Ingestion
- Centralized Data Management
- Dissemination

Production Management

Challenge:

- Tracking complex maritime production tasks with aggressive time constraints
- Accessing detailed job status and production metrics to manage resources and priorities

Concept:

- A web-based production management dashboard that provides status, metrics, and on-the-fly resource assignment to help meet production deadlines and mitigate risk.

Workflows

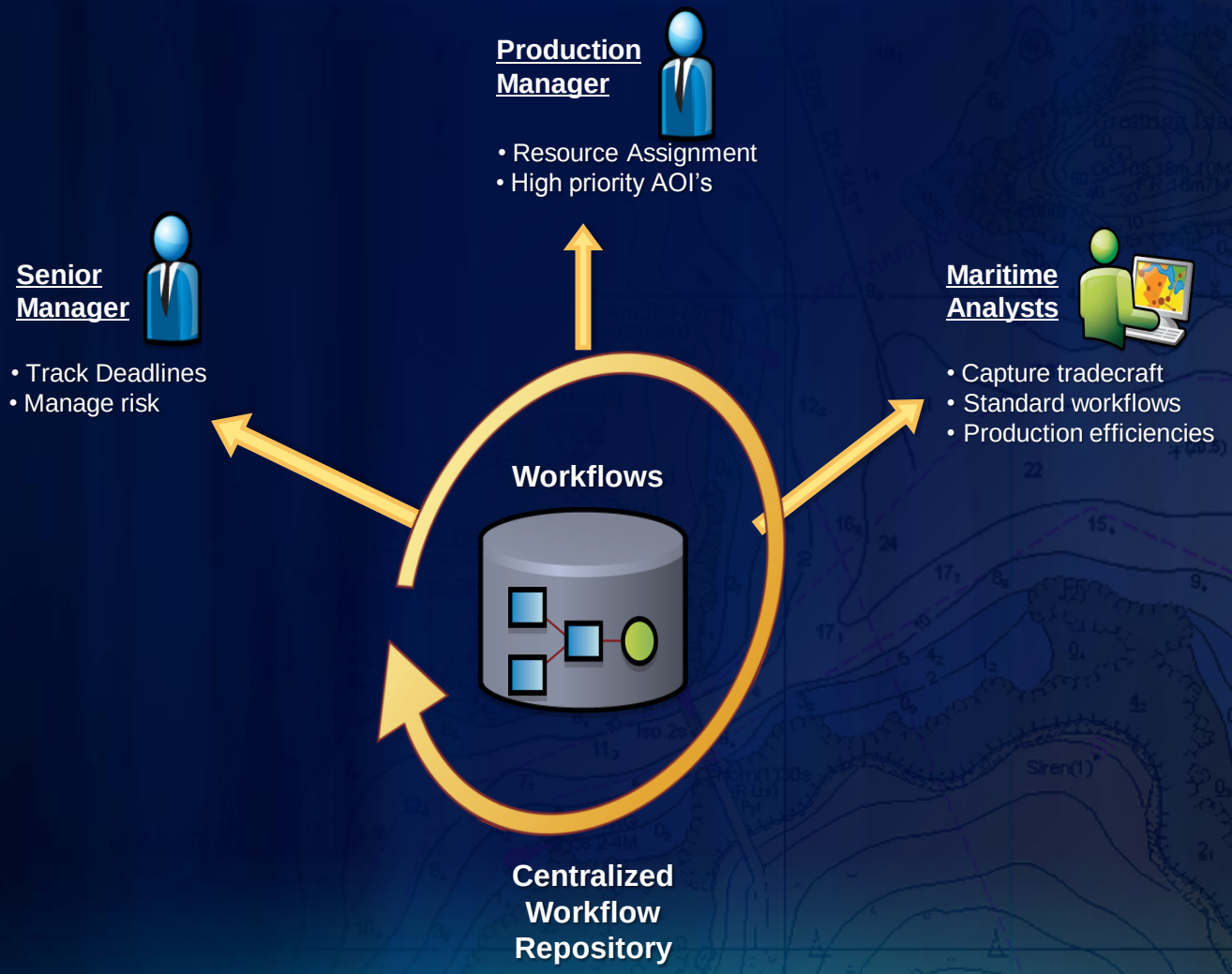
Challenge:

- Capturing tradecraft from SME's, standardizing best practices, and sharing them across the enterprise

Concept:

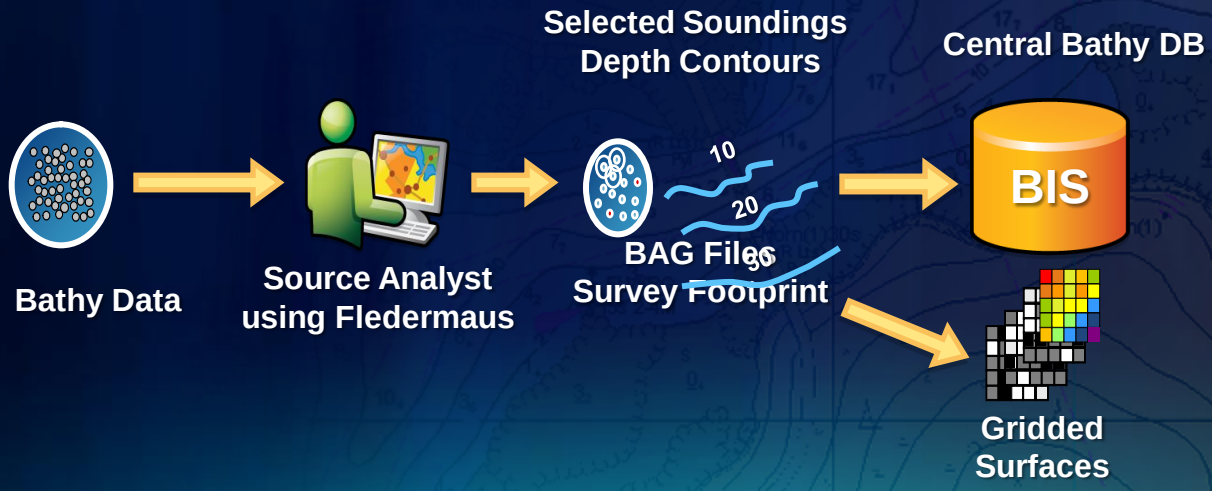
- Workflow tools to capture tradecraft, store jobs in a central repository, and provide step by step procedures with email alerts to gain efficiencies and shorten production cycles.

Production Management and Workflow Interaction



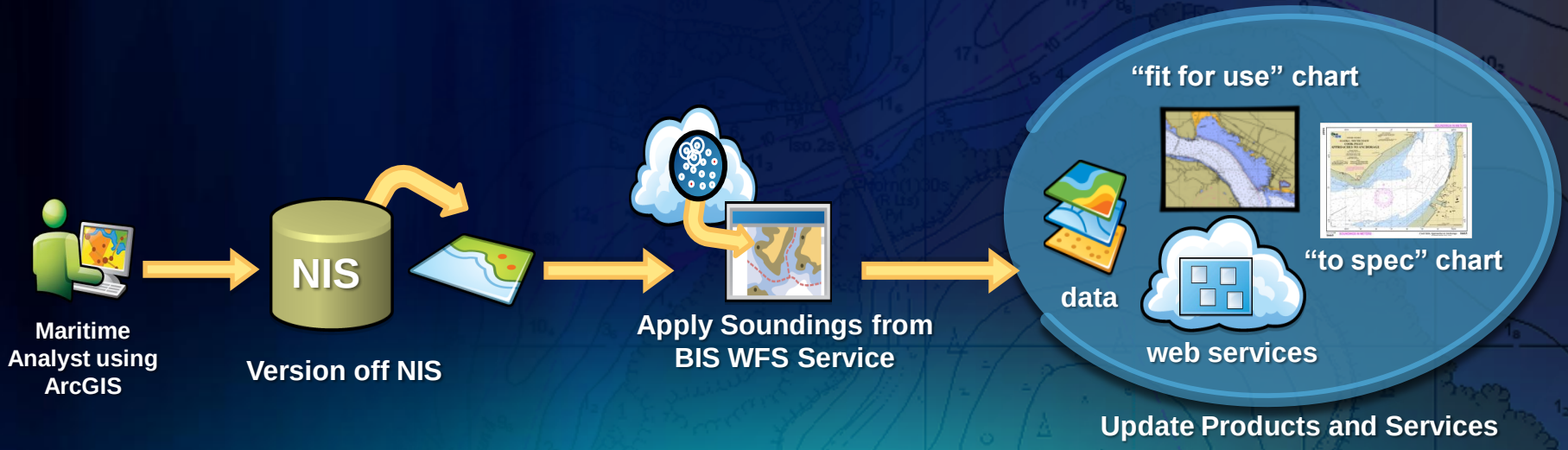
Bathymetric Source Ingestion

- **Challenge:** Managing the import of various bathymetric sources to leverage in the production processes.
- **Concept:** An integrated suite of tools to ingest, process, and manage disparate sources into a centralized geodatabase of bathymetric information available for production use.



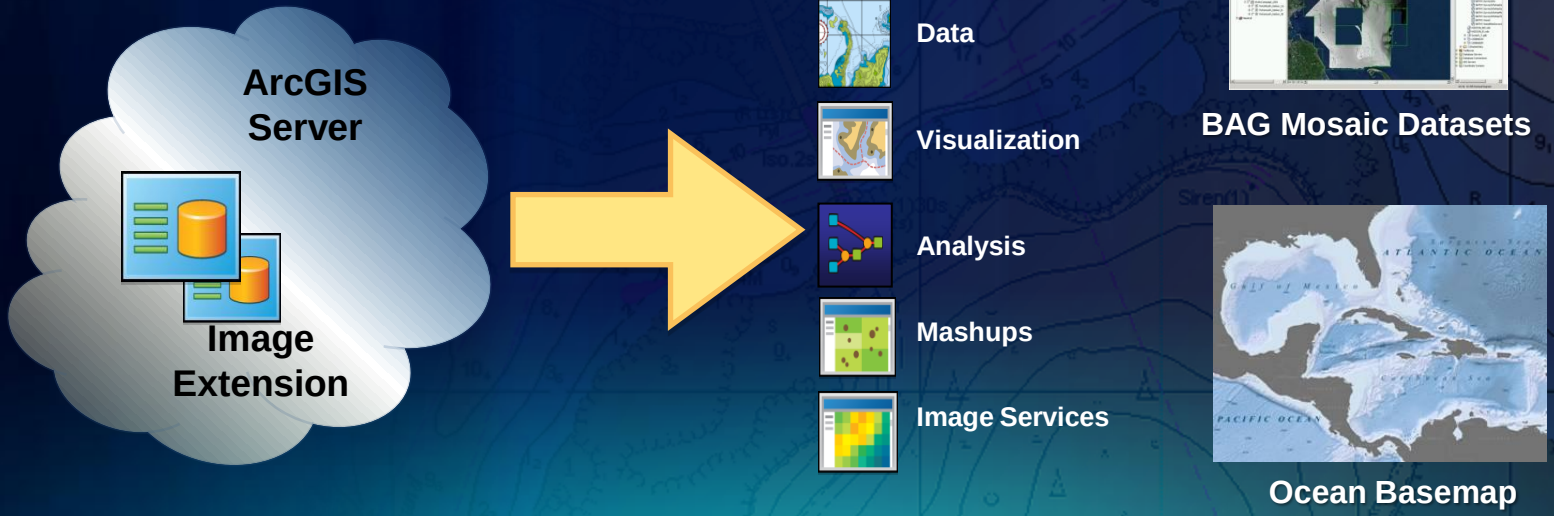
Centralized Data Management

- **Challenge:** Meeting time sensitive production demands with best available data which is currently stored and maintained within multiple locations in multiple formats.
- **Concept:** An authoritative central database for all production and operational needs that eliminates duplication of effort. Outputs may include web services, spec products, proof plots and planning tools.



Dissemination

- **Challenge:** Providing authoritative content to the user community in a time dominant and efficient manner.
- **Concept:** Leverage an authoritative centralized database to facilitate dissemination of multiple data products and services to meet mission needs.



Esri opportunities for Capacity Building

Why we could be considered?

- Esri is a founder member of the OGC and has Principal member status (voting level)
- Active participation at key IHO technical working groups (TSMAD and CSPCWG)
- Active member of RTCM
- Contribution to Hydrographic training courses (STET Maritime, Singapore)
- Close collaboration with the United Nations University
- Several Capacity Building activities around the world:
  - Mapping and GIS Capacity Building in American Samoa
  - Capacity Building Initiative on GIS-Based Hazard Risk Information Systems
- A complete Education Infrastructure

A complete Education infrastructure

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Esri GIS Education Community

esri

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- Web mapping
- Free mapping tools like ArcGIS Explorer PC Desktop or Online
- Complete mapping with ArcGIS
- Learn with ArcLessons
- Connect: Facebook & Twitter

Welcome to the Esri GIS Education Community - an ecosystem for the exchange of ideas and experiences, curriculum, software, and data between GIS educators and learners around the globe.

New at the Community Blog

Curiosity Headed to Mars, Needed on Earth Too
Published: 11/30/2011
On November 26 NASA launched our next expedition to the Red Planet—the Mars Science Laboratory (MSL) with its car-sized rover ...

Fun with GIS #99: Chaos Cave
Published: 11/29/2011
GIS has hit literature! "Chaos Cave: A Revolutionary Adventure" by Lesley Downie takes young readers into a time-travel and ...

T3G 2012: Advance your GIS Professional Development for Educators
Published: 11/22/2011
- Are you passionate about GIS and its potential benefits for students of all ages? - Do you love sharing GIS with other ...

New GIS Career Video: GIS Analyst-Forester
Published: 11/22/2011
The growth of GIS and other geospatial careers is more visible each day. Recently Esri, with the help of Career Corner Digital, ...

Fun with GIS #98: Tree Planters
Published: 11/21/2011

What's New

- **Discover ArcGIS.com**
- Explore Careers in GIS
- GIS + STEM = Success

Esri Education Programs

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- K12 Statewide Licenses
- Universities with Site Licenses

New Higher Education GIS Programs

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> "I always pick up new information to work smarter not harder."
>
> Judith Needham, Arizona
> *Making Better Map Layouts with ArcGIS*

Overview

One hour of real-time, expert GIS training streamed directly to your desktop. Seminars are interactive, free and require no registration — attendance is on a first-come, first-served basis.

→ Subscribe to reminders of upcoming live training seminars.

Next Seminar

Introduction to ArcGIS Viewer for Silverlight

Learn how to create custom web applications that support map visualization, editing, and analysis using this intuitive viewer.

Thursday, December 8, 2011		
9:00 a.m. PST (U.S. & Canada)	Add to calendar	Attend Seminar
11:00 a.m. PST (U.S. & Canada)	Add to calendar	This button will be active about 30 minutes before the seminar's scheduled start time.
3:00 p.m. PST (U.S. & Canada)	Add to calendar	

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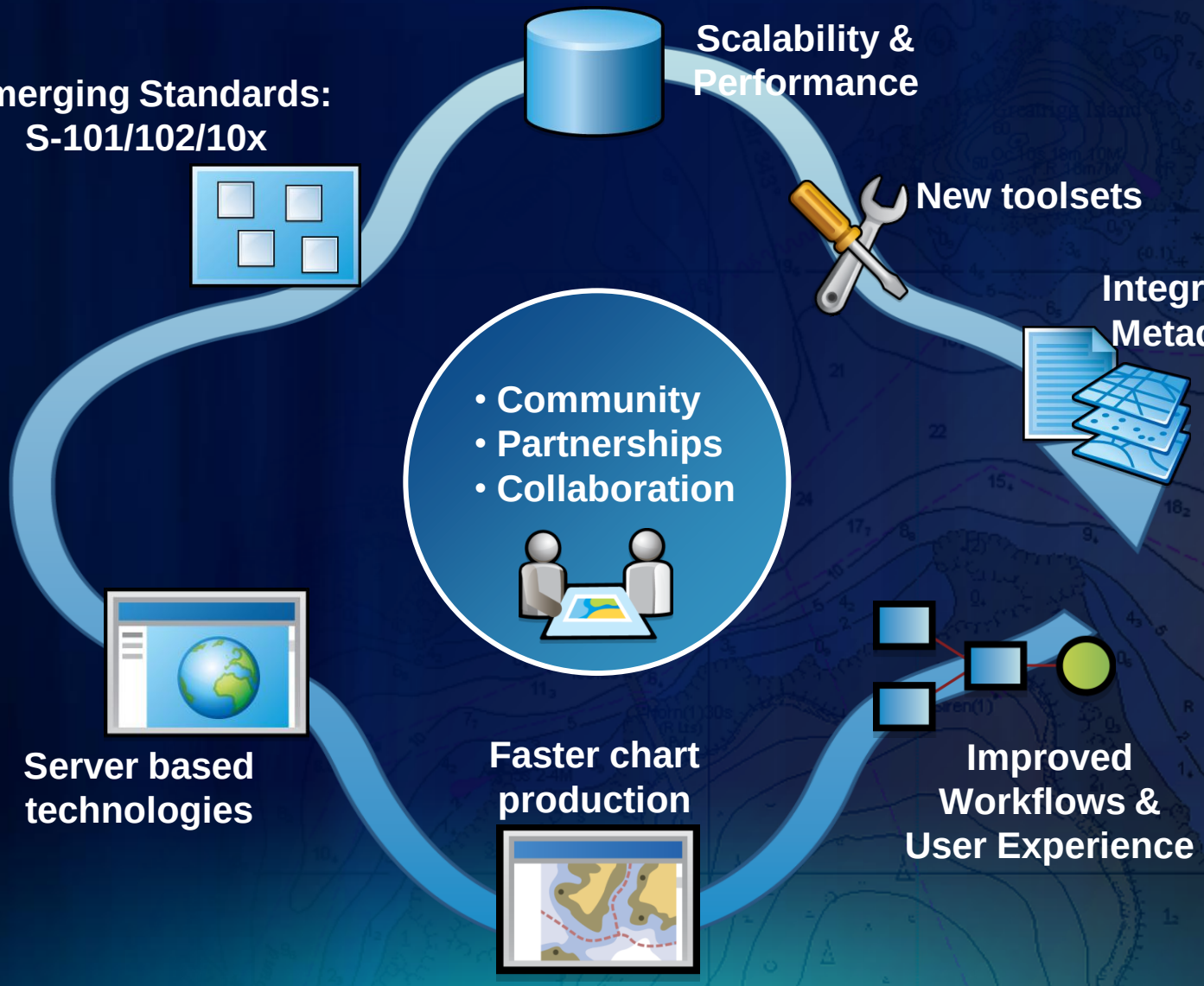
Esri free GIS courses and seminars online

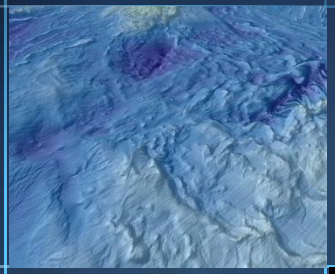
- Getting Started with GIS (for ArcGIS 10)
- Esri Production Mapping Cartography Recordings
- Introduction to ArcGIS Data Reviewer
- Using ArcGIS Data Reviewer to Assess Data Quality
- ArcGIS Data Reviewer Recordings
- Esri Nautical Solution Recordings
- Versioning 101 – ArcUser Article
- Versioned Editing Workflows for the Multiuser Geodatabase
- Getting Started with ArcGIS Workflow Manager

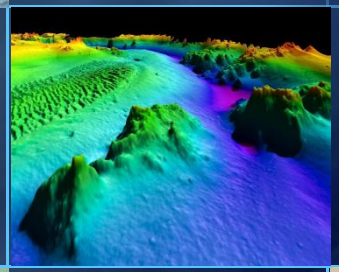
What opportunities Esri offers to the MACHC Member States?

- **Support in creation of GIS capabilities**
- **Support in the creation of Charting capabilities**
- **Support in the creation of Hydrographic training courses according to IHO S-2:**
  - Essential 5 Hydrographic Data Management
  - Essential 6 Environmental Science
  - Optional Unit 1 Nautical Charting Hydrography
  - Optional Unit 2 Hydrography to Support Port Management and Coastal Engineering
  - Optional Unit 3 Offshore Geophysical Surveying
  - Optional Unit 4 Offshore Construction Hydrography
  - Optional Unit 5 Remote Sensing
- **Educational licensing agreements**
- **Class support: remote (webcast) and on-site**

Maritime Directions







Conclusions

Esri is growing fast in Oceans GIS technology

Nautical Solution for Charting significantly better at 10.1

Bathymetric capabilities at 10.1

Maritime Online is a new direction for Esri

Cloud Computing and Crowd sourcing at the forefront of our development

Partnerships are key for success

More Capacity Building opportunities

Thank you!
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