A Data Centric Approach to Hydrographic Survey Information Management

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Oceans in Action, Stennis Space Center, 18 August 2016
• Introduction to Teledyne CARIS
• Legacy hydrographic data approach – Product Centric
• A Data Centric Approach
• The Challenges of Interoperability and Harmonization
• Conclusion
Introduction

• +35 years developing commercial GIS solutions
  – Specialized focus on GIS for the maritime community
  – Includes enterprise GIS for marine spatial data

• Use international standards and participate in industry working groups:
  – IHO, ISO/TC211, OGC and others
  – Ensures interoperability and maximum use of data

• Installations in over 85 countries
  – Includes government agencies, private companies and academic institutions
  – Used by 92% of the world’s hydrographic authorities

• The only GIS company to offer a Ping-to-Chart workflow solution
• Traditionally the survey to production workflow would be focused around the end product
  - For example: Traditionally single beam surveys were conducted at a line spacing based on the scale of the chart to be constructed

• This ensures the end product is ideally suited for the purpose in which it was intended for

• There are disadvantages to this approach
  - Whereas the product generated is fit for the specified purpose, this is not necessarily the case for other applications of the same data
  - This may result in the need for a resurvey of the same area, an expensive and time consuming proposition
A Data Centric Approach

• Instead of focusing on the end product, acquiring and processing data for multiple applications allow a shift for Hydrographic Offices from chart producer to marine spatial data provider.
Advantages of this Approach

• To realize efficiencies
  - Quicker turnaround of bigger survey datasets
  - More automation in processing and product compilation
  - Better utilization of human resources

• To cater for a broader customer base
  - New ad hoc products and services

• In line with Open Government and Open Data policies

• To support Common Operating Pictures (oil spill response, military applications etc.)
Challenges - Interoperability

• The basic challenge of interoperability has been solved through standards based technology

• In order to get maximum value from hydrographic data, hydrography needs to embrace interoperability further

• OGC and ISO Standards are supporting rapid discovery, access, fusion and application of location based information

• CARIS software continues to further utilize these standards in all its applications
  - Web Map
  - Web Feature
  - Web Coverage
  - Web Processing
  - Catalogue
  - Geographic Markup Language
  - Sensor Web Enablement
- Seabed Survey Data Model has been developed by the Oil & Gas industry to standardize survey deliverables

- Seabed ML is the non-proprietary exchange format for SSDM, developed by CARIS & Shell Malaysia

- It allows any GIS to work with SSDM
Challenges - Harmonization

- Hydrographic Offices and Oil & Gas companies can benefit from modern data management and GIS practices
- Increased focus on data not paper
- High resolution source and derived features
- Support for multiple data models
  - S-100, SSDM, VPF
- Standard metadata profiles
Challenges - Harmonization

• Interoperability and data harmonization is key to putting hydrographic data to work and realizing greater value from it.

• A good example of this is how a Common Operating Picture for Oil Spill Response would work.

(Figure Source: Shell)
The Future

• The surveyors toolbox is constantly expanding and the sensors used are generating bigger and bigger datasets

  • **OPTICAL**
    - Laser Scanner
    - LiDAR
    - Camera
    - Underwater Laser

  • **ACOUSTIC**
    - Multibeam Sonar
    - Sidescan Sonar
    - Synthetic Aperture Sonar
    - Imaging Sonar
    - Sub-Bottom Profiler
HD Camera

Bathy LiDAR

Sidescan Sonar

Multibeam Sonar
Elevation Data from Camera on a Topcon Sirius Pro

CSAR Point Cloud = 82 million points
Area = 300m x 700m
Bathy LiDAR – Fugro LADS MkII

Data from Shallow Survey 2005

CSAR Grid = 3m Resolution
Topographic and bathymetric data
Multibeam Sonar – Kongsberg EM2040

CSAR Grid = 20cm Resolution

Data from Shallow Survey 2015
10cm imagery
50cm bathymetry
Imagery resolution now maintained during draping
• The advantages of Hydrographic Offices utilizing a data centric approach to hydrographic survey information management allow for:
  - Reduced Ping-to-Chart time
  - Improved value for each survey – gather once, use many times
  - Compliance with Open Data Policies
  - Interoperability with a wider range of customers

• Tools to gather and maintain data in this approach are already available, however the hydrographic community can do more to enhance interoperability through open standards