IIC and the Hydrographic Data Value Chain

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IIC & the Hydrographic Data Value Chain

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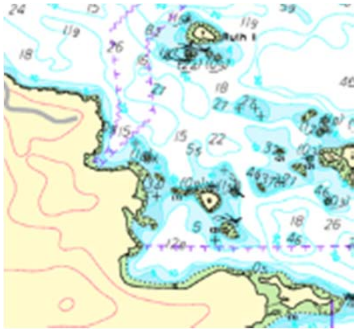
- **Background on IIC**
- **The Hydrographic Data Value Chain**
- **IIC and MSDI**
- **MSDI Pilot Project (for CHS)**
  - **Project Scope**
  - **Results**
  - **Challenges**

Who is IIC Technologies?

- Company Overview
  - Established in 1993
  - Over 1900 employees, 8 offices, 4 continents
  - 400 Geospatial specialists & 250 Marine Charting specialists
  - Focus on Geospatial Sciences
- A Turnkey Surveying, Mapping, and Charting Services Company
  - Over two dozen international government agencies
- Six Divisions, focused on Geospatial Sciences
  - Marine
  - Geospatial
  - Geo Surveys
  - Strategic Solutions
  - Engineering
  - Training (IIC Academy)

Providing mapping services and solutions since 1993

Recognized worldwide for quality, professionalism and customer service



Where Are We Located?

- Able to leverage specific expertise from across its offices worldwide while providing responsive, localized customer service and production capability

- Eight locations, Five production offices, four project support offices, two R&D offices, & one training Academy, all working seamlessly together

What Do We Do?

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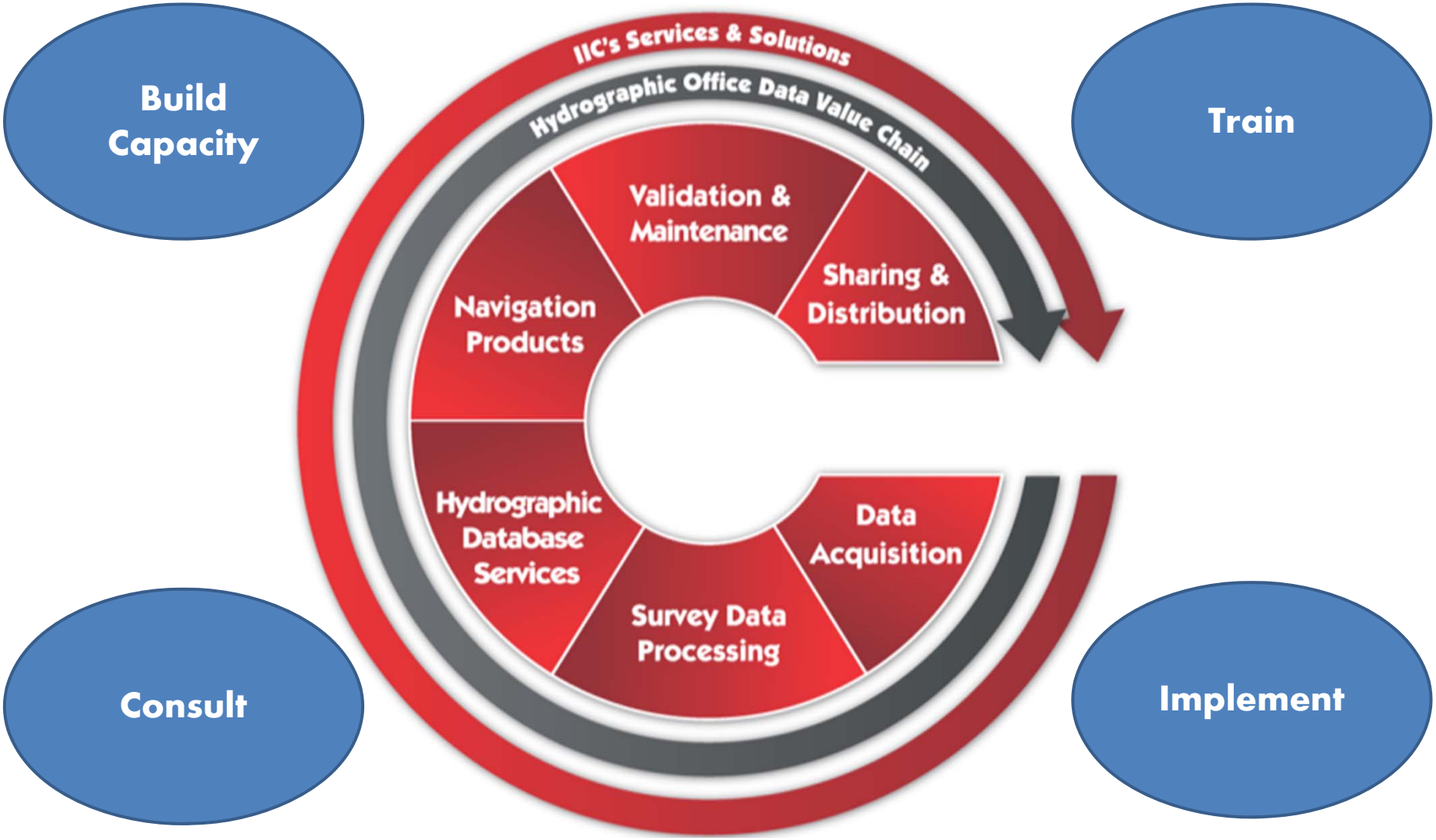
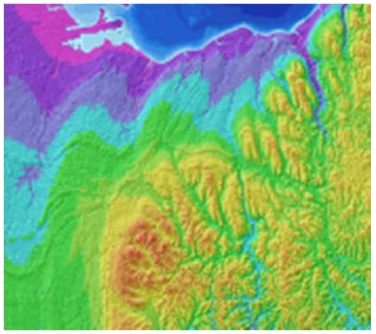


How Do We Do It?

- Resources
  - Hires a mix of recent graduates and those with deep domain knowledge
  - Emphasis on a large in-house training programme and a mentoring system to develop, challenge, and retain employees.
  - Utilizes knowledge matrix to match specialized expertise with project requirements
  - Leverage skills of resources across multiple offices to suit project

- Involved in International Committees, including:
  - IHO S100WG, ENCWG / ISO 19100 Standards Series
  - NATO Geospatial Maritime Working Group (GMWG)
  - Regional Commissions

- Partnership Relationships with our Clients
  - Continually working together to find solutions and to do things better
  - Invest in Quality (ISO 9001 Quality System since 1997)



- Host of “Electronic Charting Workshop”
  - Bringing together technical managers and decision makers from hydrographic offices in a workgroup forum in Vancouver to discuss a selection of topics of shared interest.

Who We Do It For

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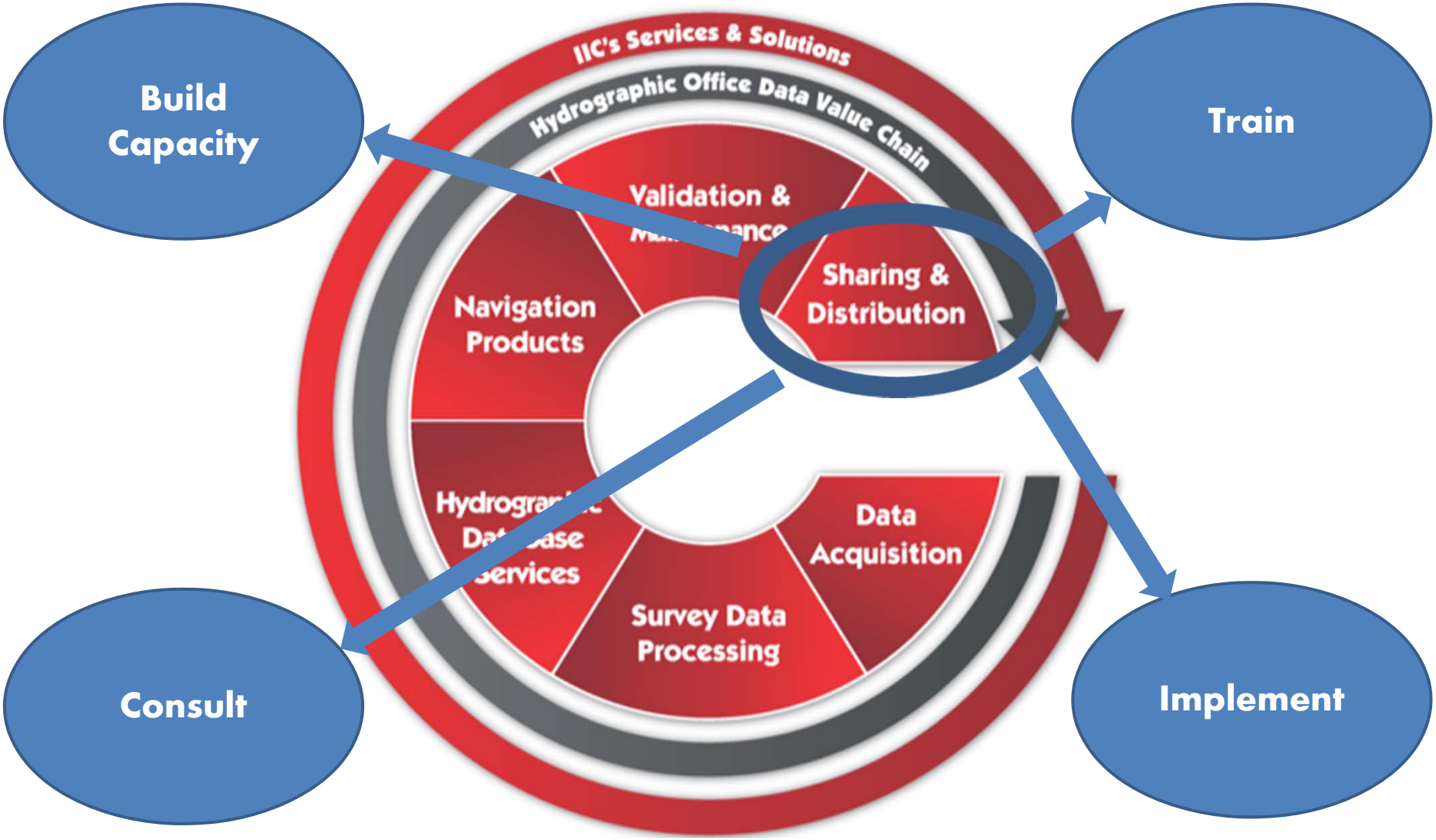
Some current clients (this list represents 30 separate projects)

- Australian Hydrographic Service (AHS)
- GEOINT New Zealand (GNZ)
- Land Information New Zealand (LINZ)
- UK Hydrographic Office (UKHO)
- UK Ordinance Survey (UK OS)
- UK Ministry of Defence (MOD)
- Canadian Dept. of Defence (DND)
- Canadian Hydrographic Service (CHS)
- Natural Resources Canada (NRCAN)
- Norwegian Hydrographic Office
- NOAA
- US Army Corps of Engineers (USACE)
- Brazilian Navy Hydrographic Office
- KSA General Commission for Survey
- Danish Geodata Agency
- Indian Hydrographic Office
- Indian Survey & Mapping Organization
- Government of Chile (Latitude)
- French Hydrographic Office
- Panama Canal Authority

IIC & Marine Spatial Data Infrastructure



SDI and MSDI

Spatial Data Infrastructure (SDI) emphasizes "unlocking" all of the geospatial data so it can be better utilized by all interested parties. The concept encompasses the hardware, software and system components required to support the integrated management and interoperability of spatial data, including the processes, standards, policies and structural relationships of all those involved.

Marine Spatial Data Infrastructure (MSDI) embraces marine geographic data. This is all-inclusive and includes data outside of that collected to support navigation, for example oceanographic data and marine cadastre data.

Approach to MSDI

A suggested approach to structuring hydrographic and other types of data for MSDI deployment consists of three core elements;

- use of internationally recognized and adopted **standards**,
- the establishment of a **technical infrastructure** to allow the discovery, viewing, and potentially, the download of the information, and
- the capturing of **comprehensive metadata** to describe the content, value and limitation of the data which is essential for effective discovery of information of interest.

Canadian MSDI Pilot Description

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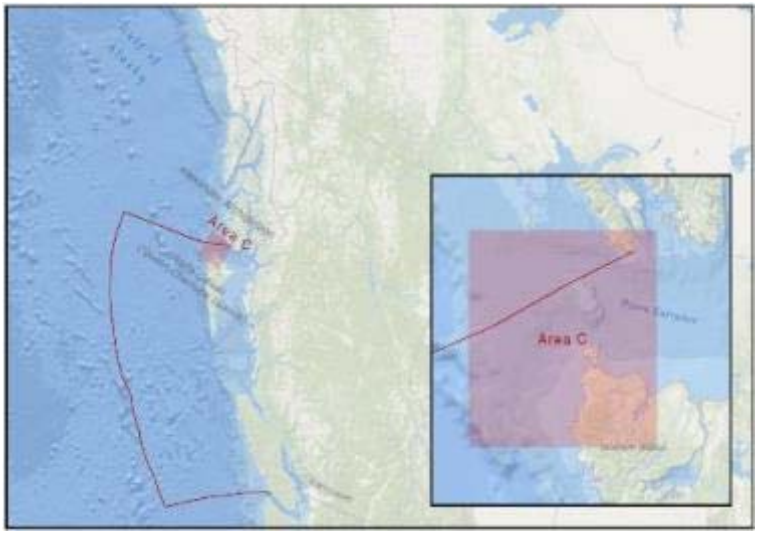
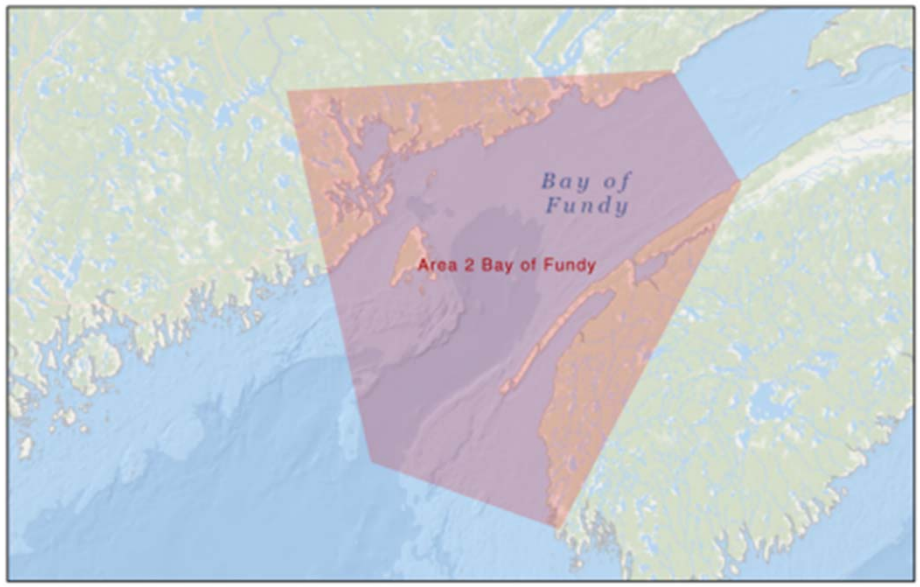
Three Goals…

- To provide '**data discovery**' of the geospatial datasets by been able to visualize and query their boundaries and contents by creating detailed metadata in a standardized format and publishing it to a web-based application or "web app".
- To provide **visualization and querying** of the data itself at the feature level within the web app
- To populate the **web app** with the metadata and feature level data

MSDI Pilot Locations



Dixon Entrance, West Coast
10,000sqkm



Bay of Fundy, East Coast
19,000sqkm

Canadian MSDI Pilot Description

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Canada
Fisheries and Oceans Canada

National Resources Canada

Others
…

Gather Data Sources

Organize Data into Feature Layers

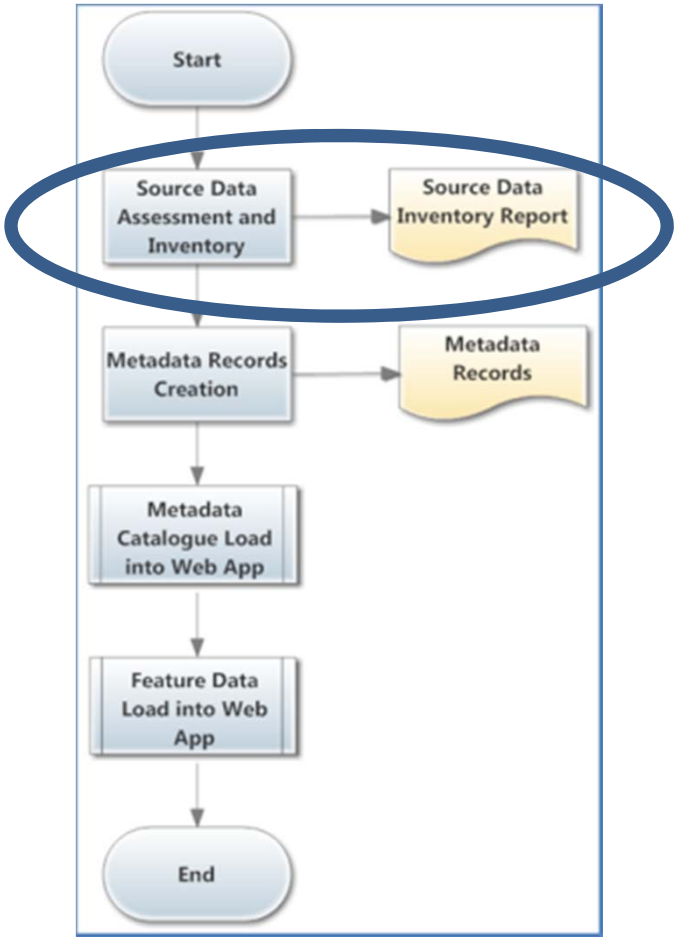
Data Consolidation

Create ISO 19115/HNAP Metadata

Publish Data

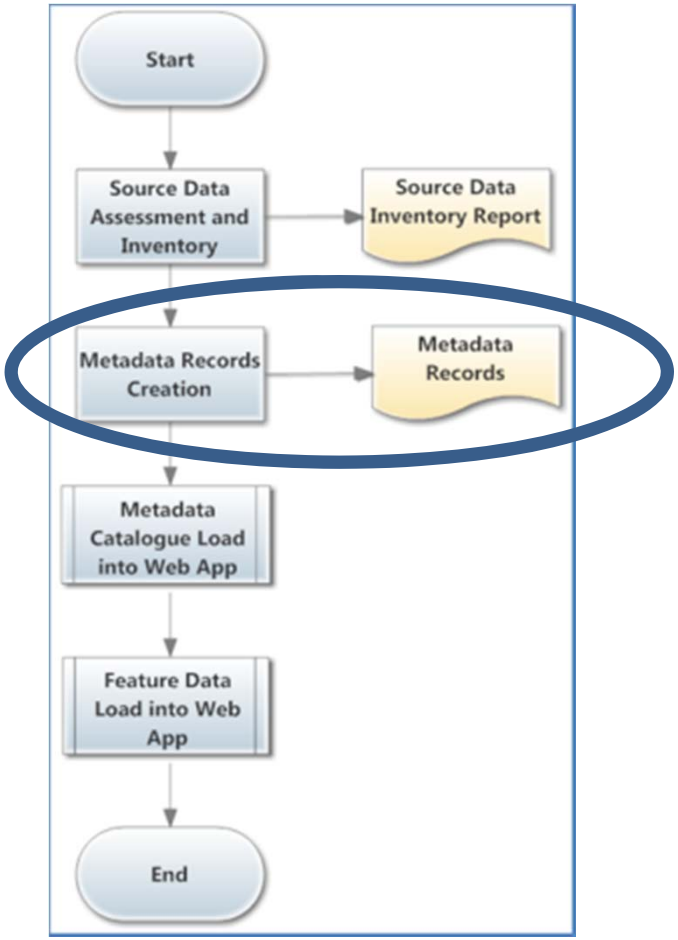
Feature Level Data (Data Query)

- Gather and analyze data sources (hundreds of feature types)
- Convert tabular and other textual information into geospatial format
- Due to limited scope of pilot project, convert all spatial data to feature-level SHP files
- Challenges included data harmonization and separating feature level data from “product sources”



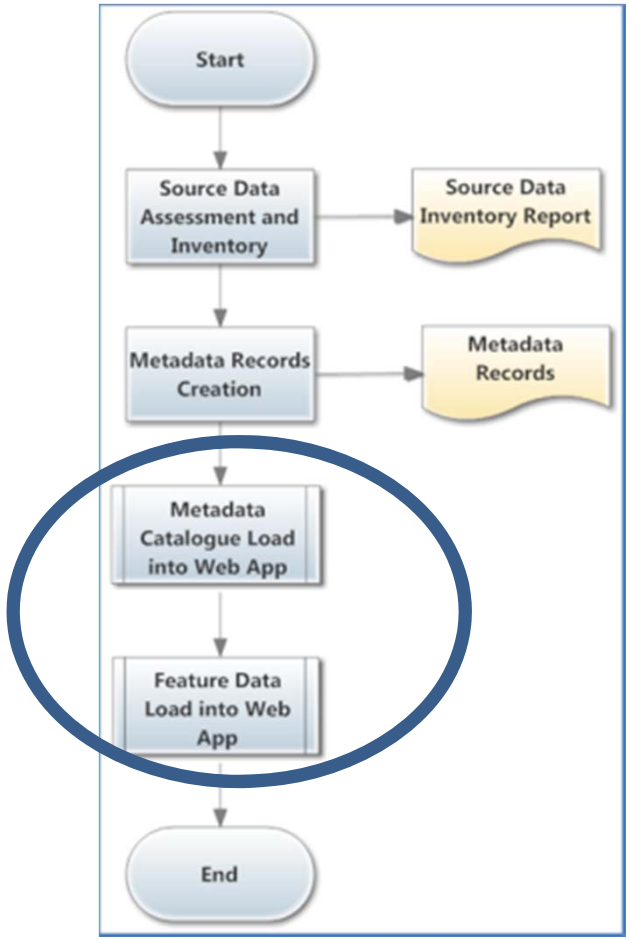
Metadata (Data Discovery)

- Metadata required to enable Data Discovery
- ISO 19115
- Harmonized North American Profile (HNAP)
- About two dozen attributes were determined to be mandatory attributes, with a MSDI metadata template designed accordingly.
- Due to a lack of information for some datasets and robust HNAP authoring tools for existing data, this was a time consuming process

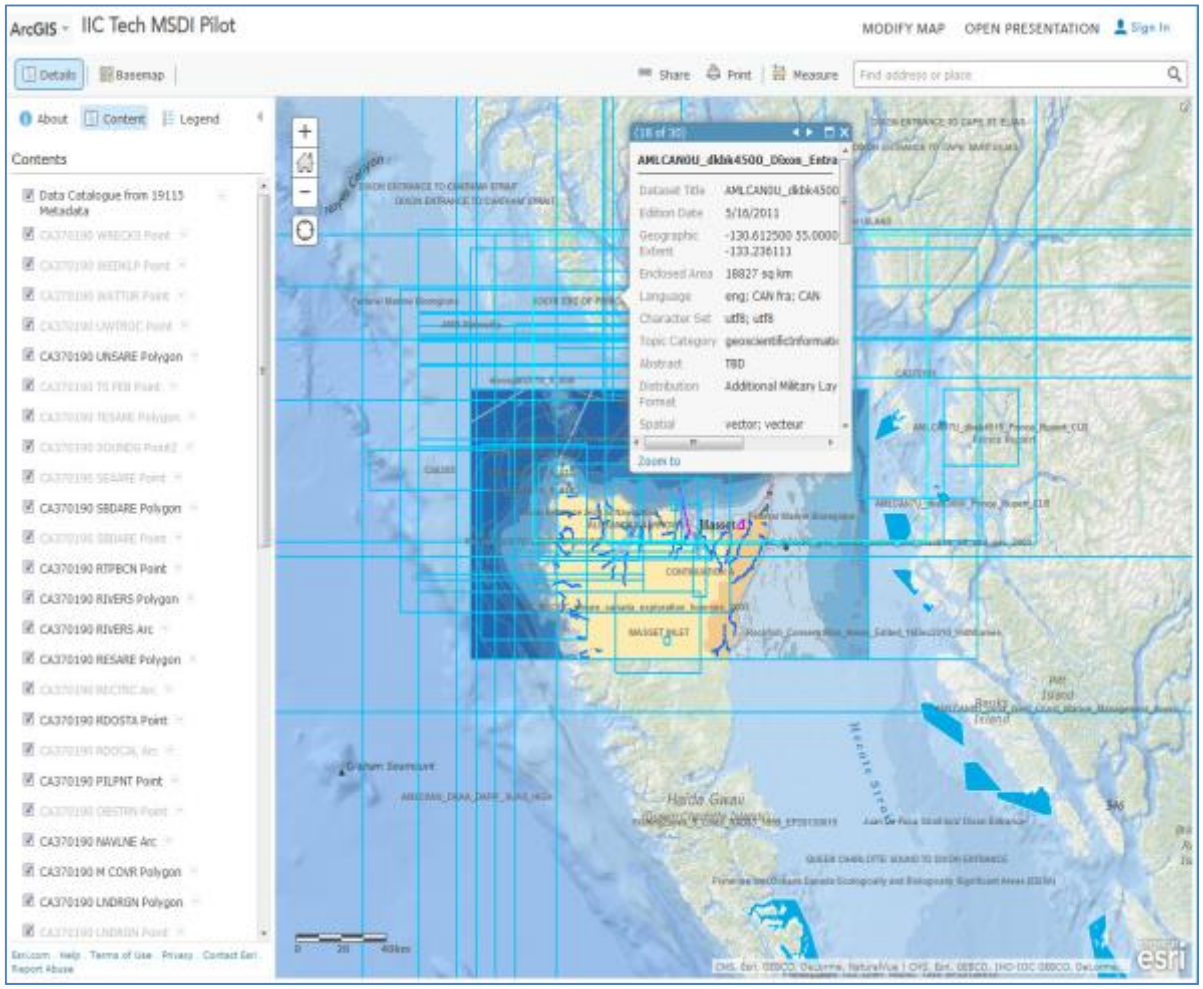


Web App (Data Visualization)

- Something fast and simple to showcase the data, but at the same time in line with Canadian Government SDI architecture
- The ArcGIS Online service was selected as it met the requirements above and showed some of the potential of a deployed system.
- Showcased both catalogue and feature level functionality.
- Dealing with screen clutter was the main challenge



Web App (ESRI ArcGIS Online)



Project Challenges

Capturing Consistent Metadata

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- Although some metadata software tools exist to assist with collection.
  - they are often built into larger GIS tools or various geo-portals
  - don't support proper validation other than checking for structural compliance with the ISO 19139 schema.

- To overcome issues of capturing consistent metadata, a XML metadata template was developed that was compliant with ISO 19115 and XML authoring tools were used to capture the required data discovery metadata. This process was still a challenge as some basic information was frequently not available and manual XML authoring can be time consuming and error prone.

Approach

This situation not only highlights the need for access to quality metadata-authoring tools with integrated, rules based validation, but also the need to have metadata information present when datasets are exchanged for any reason.

Data Formats and Content

- The diversity of data frequently used in the marine domain makes it difficult to handle many distinct geospatial dataset types using one common platform (in cases where feature viewing/query & and the data catalogue are available directly).

- Some data sources are more “product-like” in nature, resulting in some datasets having the same features duplicated, creating the need for deconfliction and harmonization of some data types

Approach

For this project, all data was converted to SHP to enable feature level display of data within the ArcGIS Online test platform, which worked but did result in visualization issues (e.g. portrayal and clutter).

Data Visualization Challenges

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- The vast quantity of data, and different types of data, that can be made available in an MSDI leads to the potential of screen clutter and data visualization issues, all of which negatively affect data discovery and ease of use of the system.

Approach Options

(1) Provide robust filtering tools so the user can search/display only the relevant types of data that will potentially be of interest.

(2) Do not have feature level data within the catalogue viewer itself, and just display the geographical extents and other metadata for the types of data that the user is searching for, with links to the data source.

(3) Keeping the MSDI visualization as simple as possible while ensuring that the data discovery aspect itself is very robust (via strong metadata cataloging), gives the user the ability to quickly search for and download the data of interest.

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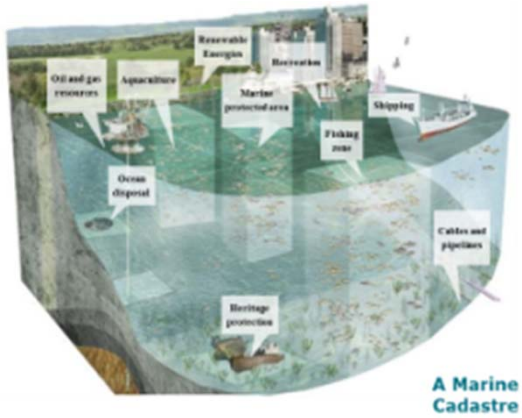
MSDI Phase II

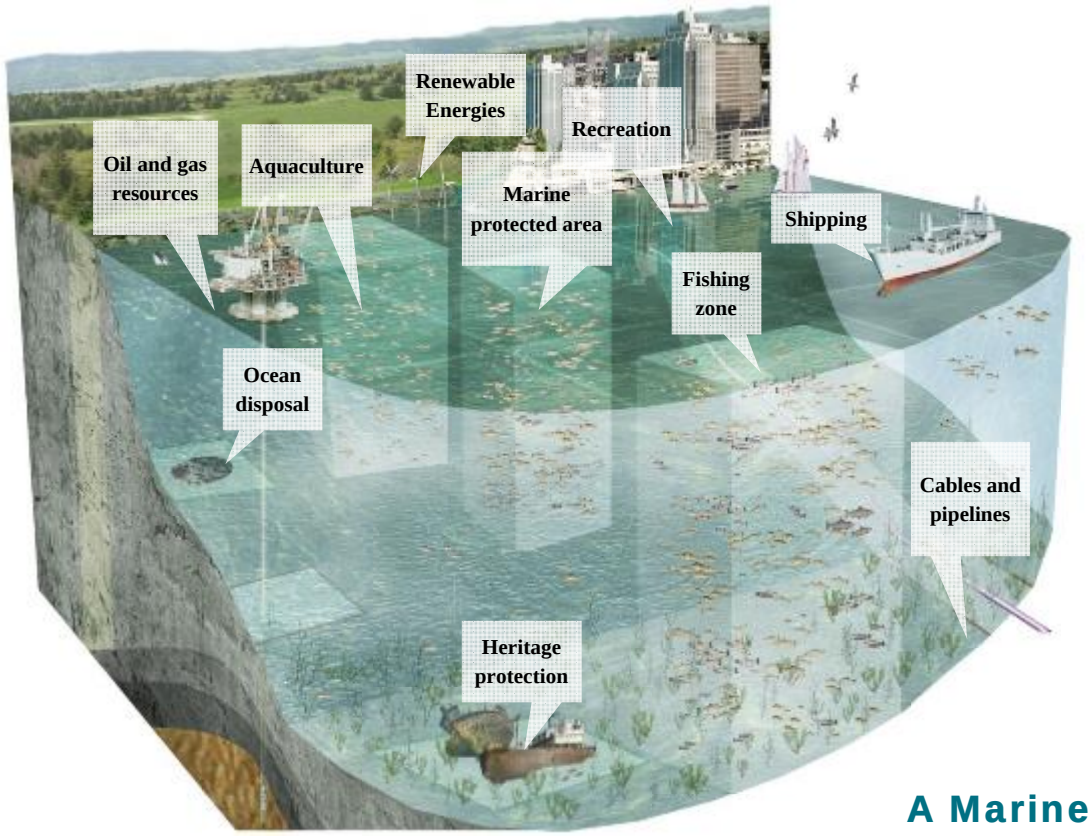
MSDI Phase II

- The main objective of this work is to:
  - Enhance the Marine Spatial Data Infrastructure (MSDI) pilot project to add more data layers
  - Add a portion of the Beaufort Sea as a 3rd pilot area
  - Deal with some of the challenges outlined in Phase I
  - Develop and integrate marine cadastre data (S-121 / ISO 19152)
  - Implement a more sophisticated infrastructure (WMS/WFS), tying in data seamlessly from various government databases



Motivation - Marine Cadastre

A marine cadastre is an integrated system of registries that allows for the systematic public recording of **all recognized legal rights, responsibilities and restrictions** related to the ocean space (legislative base, people, data infrastructure). (NRCan/DFO task group, 2010)



A Marine Cadastre

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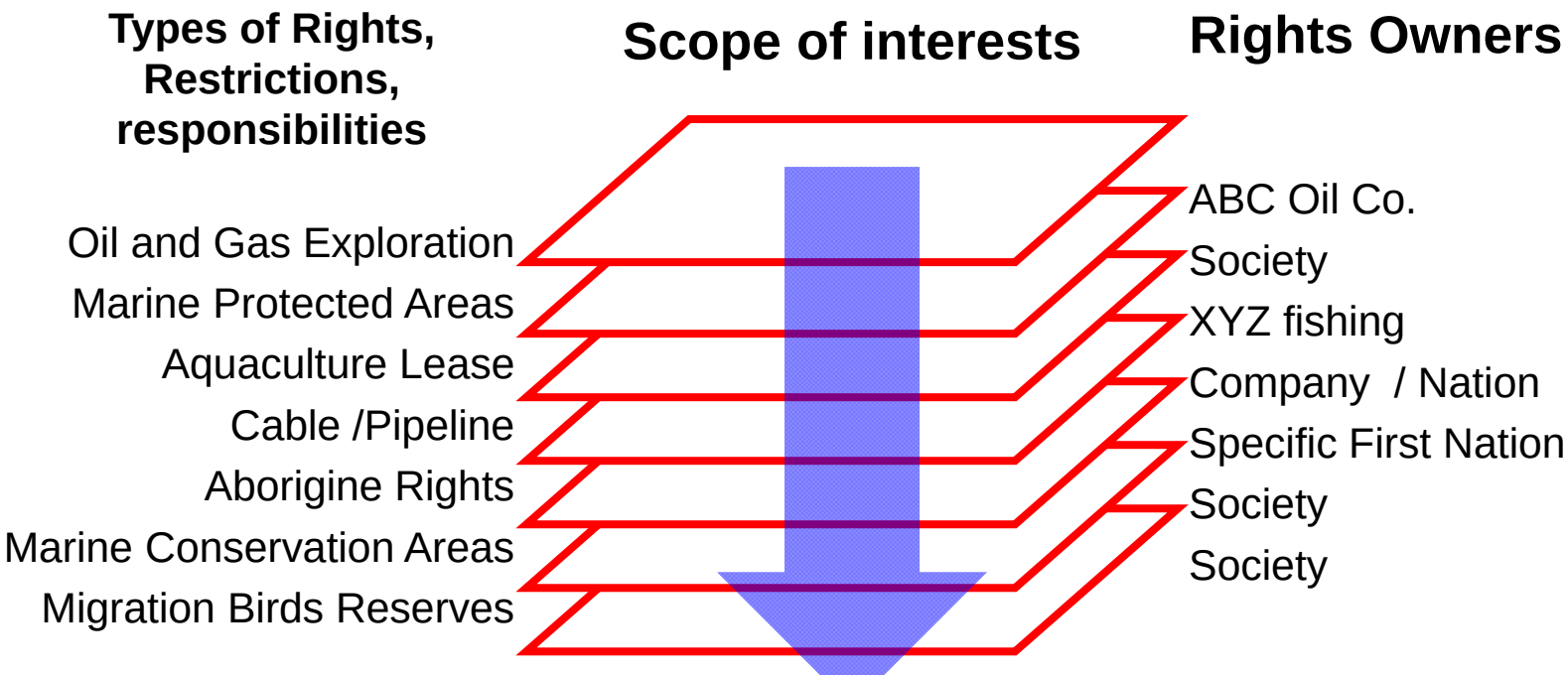
A multi-purpose Marine Cadastre: Towards Integrated Ocean Management



Rights Infrastructure (Marine Cadastre)

Geospatial Data Infrastructure

Thank You!

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