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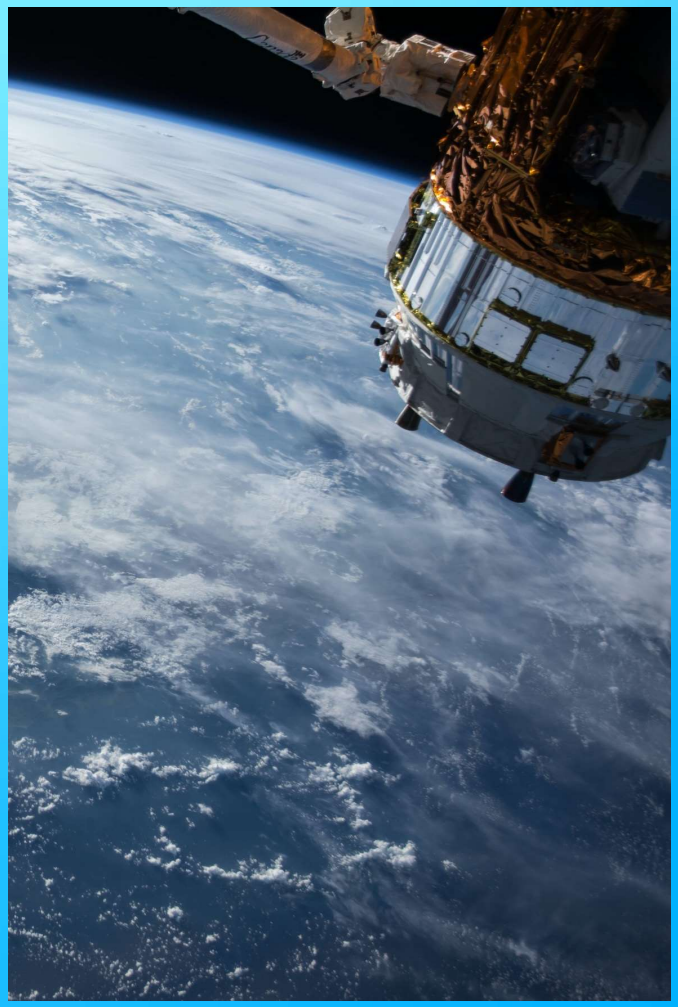
Innovation for Hydrospatial Information Management - IHO and OGC

The Story so far

International Seminar on Marine Geospatial Information
11-May-2022. Singapore



What is OGC?

A hub for thought leadership, innovation, and standards for all things related to location

Our Vision

Building the future of location with community and technology for the good of society

Our Mission

Make location information Findable, Accessible, Interoperable, and Reusable (FAIR)

Our Approach

A proven collaborative and agile process combining consensus-based standards, innovation project, and partnership building

Who Are Our Members?

Commercial

- Business Development
- Competitive Technical Advantage
- Global: Brand Exposure
- Funding for Innovation

Government

- Innovation & Market Support
- Trusted Advice
- Support & Certification
- International Partnerships
- Operational Policy

Research & Academia

- Applied Research Partners
- Funding for Innovation
- International Collaboration
- Citations

The OGC Community

- Innovative Solutions
- Best Practices
- Open Standards

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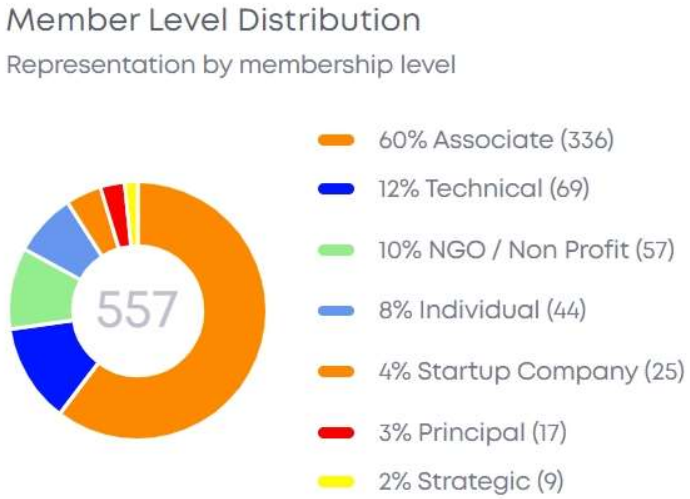
Strength in Numbers

- Global Growth Continues – increasingly from outside the traditional Geospatial Industry
- Answering the call for increased innovation, and the need for collective problem solving (e.g. Impact on Marine, Climate Resiliency, Disasters)
- F.A.I.R. location data, information and knowledge is even more important – everywhere , especially across domains (e.g Land/Water Interface)




Tech and Innovation

Many Tech Trends…

- New sensors
- Small sats
- LIDAR
- IoT
- Drones/CAVs
- …

- GNSS
- 5G
- Global grids
- Indoor
- Underground
- …

- Cloud
- Edge
- Streaming
- Internet
- APIs
- …

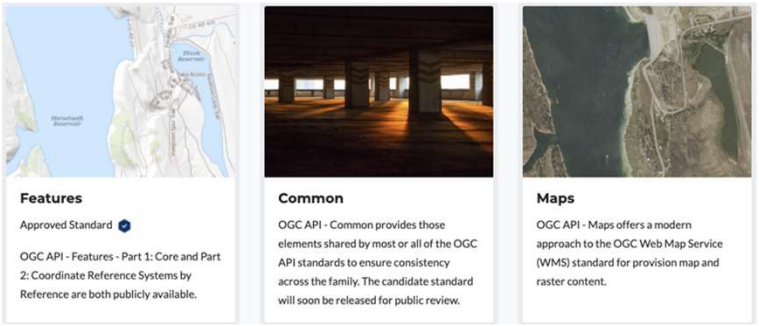
- 3D
- AR, VR, MR
- Gaming & simulation
- Maps on the web
- Natural language
- …

- Artificial Intelligence
- Machine Learning
- Big data analytics
- Linked data
- Analysis Ready Data
- …

- Weather
- Disaster risk
- Pandemics
- Human activity
- Hydro/soil/air/etc
- …

Technologies & Innovations

OGC APIs – Building Blocks of the Future



Features

Approved Standard

OGC API - Features - Part 1: Core and Part 2: Coordinate Reference Systems by Reference are both publicly available.

Common

OGC API - Common provides those elements shared by most or all of the OGC API standards to ensure consistency across the family. The candidate standard will soon be released for public review.

Maps

OGC API - Maps offers a modern approach to the OGC Web Map Service (WMS) standard for provision map and raster content.

Tiles

OGC API - Tiles provides extended functionality to other OGC API standards to deliver tiled data, such as Map Tiles.

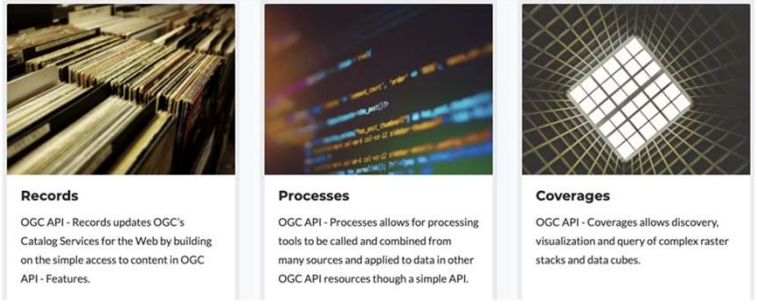
Styles

The OGC API - Styles defines a Web API that enables map servers, clients as well as visual style editors, to manage and fetch styles...

EDR

Environmental Data Retrieval (EDR) API provides a family of lightweight interfaces to access Environmental Data resources. Each resource addressed by an EDR API maps to a defined query pattern.

https://ogcapi.ogc.org/



Records

OGC API - Records updates OGC's Catalog Services for the Web by building on the simple access to content in OGC API - Features.

Processes

OGC API - Processes allows for processing tools to be called and combined from many sources and applied to data in other OGC API resources though a simple API.

Coverages

OGC API - Coverages allows discovery, visualization and query of complex raster stacks and data cubes.

DGGS

Enables applications to organise and access data arranged according to a Discrete Global Grid System (DGGS).

Routes

Enables applications to request routes in a manner independent of the underlying routing data set, routing engine or algorithm.

The Innovation Program

OGC Innovation: Engineering Services: Applied research for geospatial challenges

OGC Innovation: Concept Development Studies: Applied research, market analysis, and state of art analysis

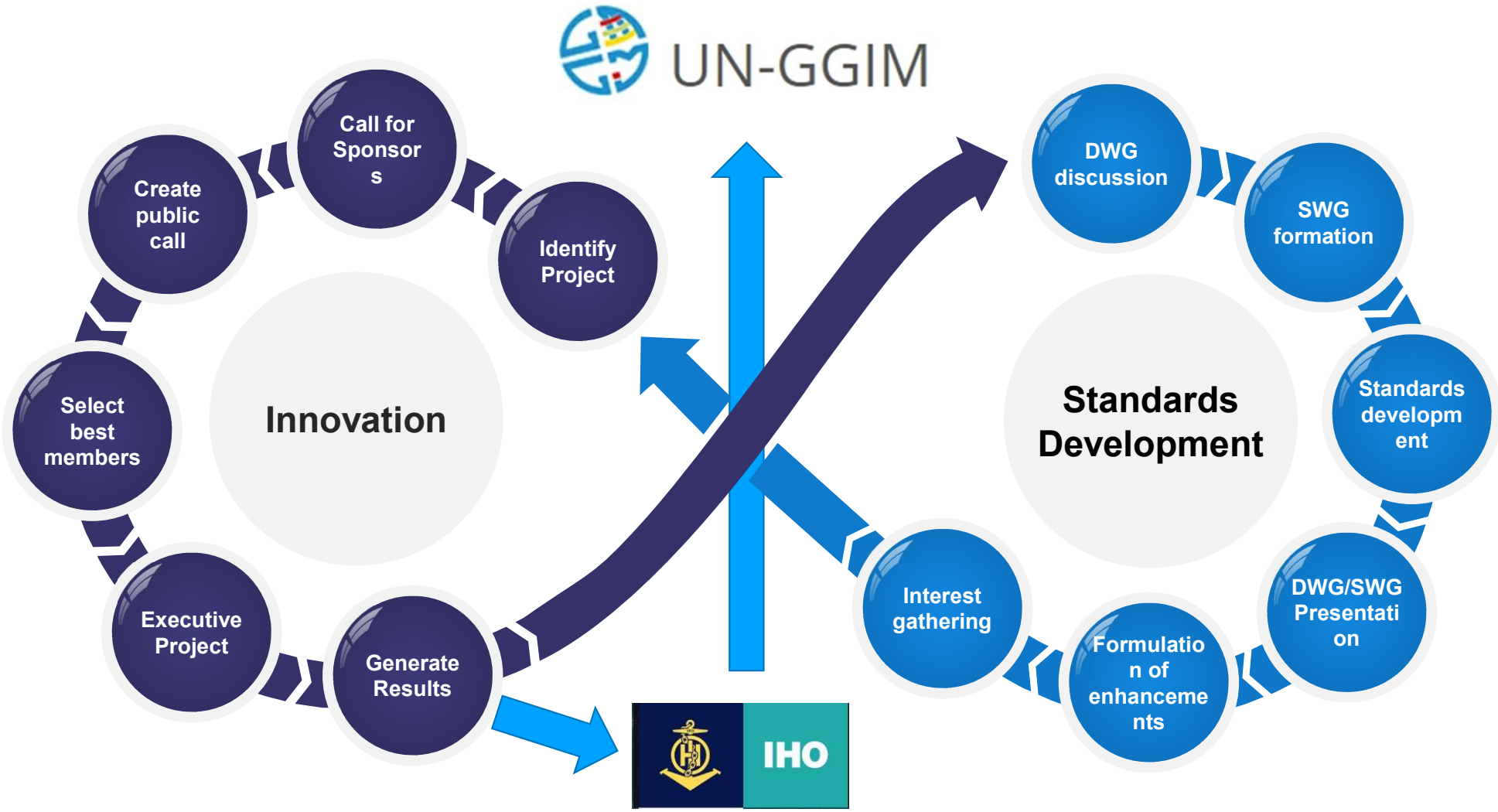
Domain Working Group (DWG) Discusses geospatial challenges, research results, and solutions for a specific domain.

OGC Innovation: Pilots & Testbeds: Collective problem solving & best practice generation

Standard Working Group (SWG): Develops a single standard or series of standards.

Compliance Program (CITE): Compliance tests for OGC Standards

Innovation Continuum



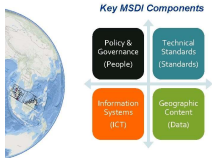
Partnerships – Critical!

- Collective Problem Solving – Innovation
- Multiplier effect + reduce redundant work
- Maximize Investments
- Long History on collaboration – which is accelerating

Slide Courtesy of UKHO – Maturity Work Item example


The Story so far….

Approximate Timeline



OGC Marine DWG Approved

2016

Now

Supporting Work

Standards Guide Edition 3 (Aligned with IGIF)

"Where do I start?"

Next challenges Phase IV+

IHO Open Geospatial Consortium

First joint IHO MSDIWG and OGC Marine DWG Meeting

IHO Open Geospat Consorti UN-GGIM

First joint IHO MSDIWG , UN-GGIM MG and OGC Marine DWG Meeting

The IHO-OGC Federated MSDI Pilot

The FMSDI Pilot

- Built on multi- stakeholder IHO-OGC MSDI Concept Development study

- Demonstrate aspects of multi-country/region , Federated Marine Spatial Data Infrastructure (SDI) to:
  - **Stakeholders** - inclusivity!
  - **Delivery** - Demonstrate how federated Marine SDI can provide simple, secure access using Modern Standards based approaches (OGC APIS, IHO S-1XX)
  - **Areas of interest -** Baltic and North Sea (potentially Arctic, South East Asia, others)

  OGC- IHO collaborative Pilots work extremely well – Example : IHO-OGC Maritime Limits and Boundaries Pilot

Thanks to our founding Sponsors!

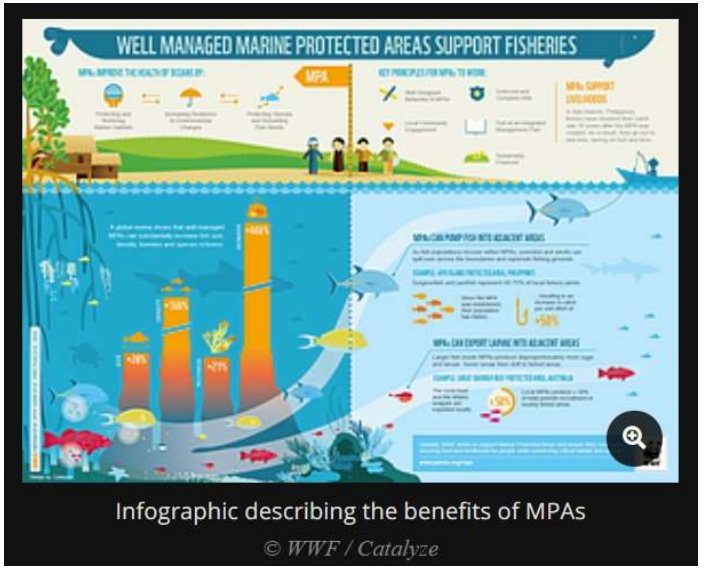
Danish Geodata Agency

UK Hydrographic Office

NGA NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY

Scope

- Marine **Data Availability and Accessibility** Study (MDAAS) via Stakeholder Consultations
- Examine S-122 data availability, how to better utilize S-122, and what **appropriate governance** considerations should be taken
- Explore where the S-1XX product specifications provides **sufficient, good quality data** and how to **incorporate additional domain** data (land content standards, meteorological, oceanography, etc.)
- **Demonstrations of use cases** leveraging the S-122 framework that is developed and a demonstration bringing together the additional data domains – **OGC APIs**!
- **Guided by** the UN-GGIM Integrated Geospatial Information Framework (IGIF) to develop a roadmap for MSDI maturity, defining when, where, and how the S-1XX product specifications are integrated



Infographic describing the benefits of MPAs
© WWF / Catalyze

S122 – Marine Protected Areas

Supports UN-GGIM

Outcomes

- **"Show me" Demonstration** - technology demonstration from global community experts showcasing federated Marine SDI for selected Land/Sea use cases across domains and jurisdictions – forward looking (OGC API)

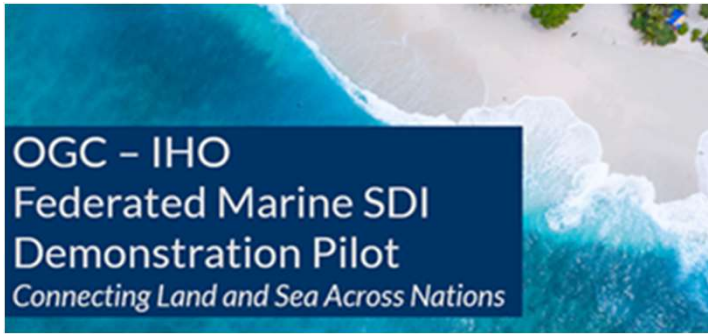
- **Impact on OGC Standards** - Lessons learned, gaps, and the need for changes to the OGC Standards Baseline that will inform the OGC Standards Program.

- **Impact on IHO Standards** - Practical testing of relevant S-100 based IHO standards will accelerate the process for adoption and implementation of IHO standards to help to inform the work of the IHO HSSC Working Group

- **Impact on Next Steps –** what is next (demonstrating creation and delivery of IHO S.1XX product specs using OGC standards? Data Management –data cubes, Discrete Global Grids ?)

- Advancing FAIR (and increasingly FAIR+) approaches

How do we unlock the ability to share the wealth of non-navigational marine data collected by the international community ?



FMSDI initiative

Phase I

Phase I consists of an RFI on resource collection with a primary focus on Marine Protected Areas (MPA).

Phase II

Phase II which is currently running includes:

Task 1- Developing a federation of S-122 Standard MPA data sets;

Task 2- Developing various data services Exploring the data fidelity, mobility, and versatility of S-1XX Product Specification as well as other marine standards and data;

Task 3- Designing a UNGGIM-IGIF derived Marine SDI maturity model which provides a roadmap for MSDI development.

Phase III

The third phase, which is expected to start later in Summer 2022, will primarily extend the use cases developed in the second phase and add the **Arctic region** as a new location to the demonstration scenarios.

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Phase I: RFI Data Resources

Danish Geodata Agency

Organization	Notes	Link
HELCOM - Baltic Marine Environment Protection Commission	Reported tabular data is collected and made available via HELCOM MPA database	http://mpas.helcom.fi
	Spatial data on MPA areas is also available as spatial dataset (shapefile). The spatial data can be accessed via web service	https://maps.helcom.fi/website/mapservice/?datasetID=d27df8c0-de86-4d13-a06d-35a8f50b16fa
	Metadata record for the above shapefile	http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/d27df8c0-de86-4d13-a06d-35a8f50b16fa
	OGC WMS	https://maps.helcom.fi/arcgis/services/MADS/Biodiversity/MapServer/WMSServer?request=GetCapabilities&service=WMS
	ArcGIS REST	https://maps.helcom.fi/arcgis/rest/services/MADS/Biodiversity/MapServer/54
UK Hydrographic Office	UK Offshore Marine Protected Areas | JNCC Resource Hub	https://hub.jncc.gov.uk/assets/ade43f34-54d6-4084-b66a-64f0b4a5ef27
The Danish Agency for Culture and Palaces	Data can be downloaded through 2 locations	https://www.kulturarv.dk/ffreg/ https://www.kulturarv.dk/fundogfortidsminder/
	The data can also be accessed via webservice	https://www.kulturarv.dk/ffpublic/wms/ows?service=wms&version=1.1.0&request=GetCapabilities https://www.kulturarv.dk/ffpublic/wfs?version=1.0.0&request=GetCapabilities

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Phase I: RFI Data Resources

Danish Geodata Agency

Organization	Notes	Link
Danish Geodata Agency	Danish Environmental Portal	https://arealinformation.miljoeportal.dk/html5/index.html?viewer=distributior
	Geodata info	www.geodata-info.dk
	Additional resources	https://dataforsyningen.dk/ https://datafordeler.dk/ mim.dk
Finland Traficom	All Traficom data sets can be found from our geoportal	https://julkinen.traficom.fi/oskari/
	Calls to interfaces	https://www.traficom.fi/en/statistics-and-publications/spatial-dataset-materia
	Additional resources	https://kartta.paikkatietoikkuna.fi/?lang=en
Lithuanian Transport Safety Administration	We use public data from national spatial data center	www.geoportal.lt
German Federal Maritime and Hydrographic Agency	The GeoSeaPortal is part of the integrated German and European MSDI network	https://www.geoseaportal.de/mapapps/?lang=en
Swedish Hydrographic Organization	Many GIS stakeholders rely on the national SDI for data discovery	www.geodata.se/geodataportalen

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Phase I: RFI Data Resources

Danish Geodata Agency

Organization	Notes	Link
Flemish Hydrography	Data custodian for various relevant datasets as they are included on navigational charts. It concerns the 6 MPA's described in the Marine Spatial Plan.	https://www.geopunt.be/catalogus/webservicefolder/688b3a9c-025b-4872-b1c6-06126a821e25
Geoscience Australia	A whole-of-government data access and visualisation application. WCS harvester compiles web services into a common framework	https://nationalmap.gov.au/
	Maritime boundaries thematic mapping applications. Internal curated datasets are made available with analysis tools	http://maps.ga.gov.au/interactive-maps/#/theme/amsis
	Seafloor thematic mapping application. Internal curated datasets are made available with analysis tools	https://portal.ga.gov.au/persona/marine
	Location Index (Loc-I) is a framework that provides a consistent way to seamlessly integrate data on people, business, and the environment. Open datasets are converted to linked data for research and development	http://www.locationindex.org/
AusSeabed	Seafloor topography GeoTIFF's available for download	https://portal.ga.gov.au/persona/marine
	AWS S3, eCat GeoNetwork	https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search#/home

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Updated Phase II: Scheduling

Milestone	Date	Event
M05	**January 5 - 7, 2021**	Kick-off Workshop
M06	**January 8 - 20, 2022**	Scenario Development
M07	**January 10 - 27, 2022**	Phase 1 TIE (Technology Integration Experiment) Testing
M08	**January 24 - 28, 2022**	Phase 1 Documentation Completion
M09	March 31, 2022 -> **April 15, 2022**	**Phase 2 TIE Testing**
M10	March 31, 2022 -> **April 29, 2022**	**Draft ER: Thread 2 & 3 Documentation Completion**
M11	**May 15, 2022**	**Submitting Final ER before June TC deadline**
M12	**June 13-17, 2022**	**Demonstration of Results at the OGC member meeting**

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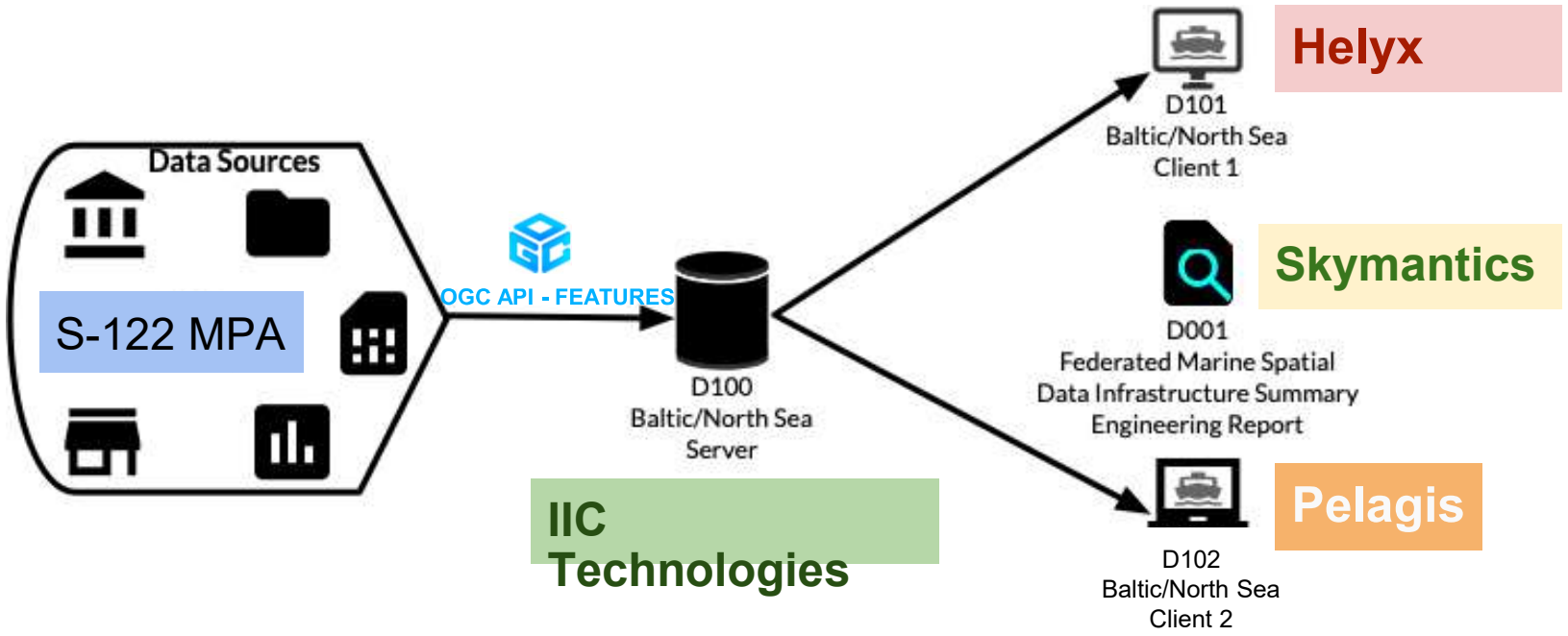
Phase II - Task 1: BNS

Baltic Sea / North Sea – S122: Federated Marine Protected Area Data

Demonstrate improved access to Baltic/North Sea MPA data for a wider variety of end users outside of the traditional MSDI domain.



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Phase II - Task 1: BNS

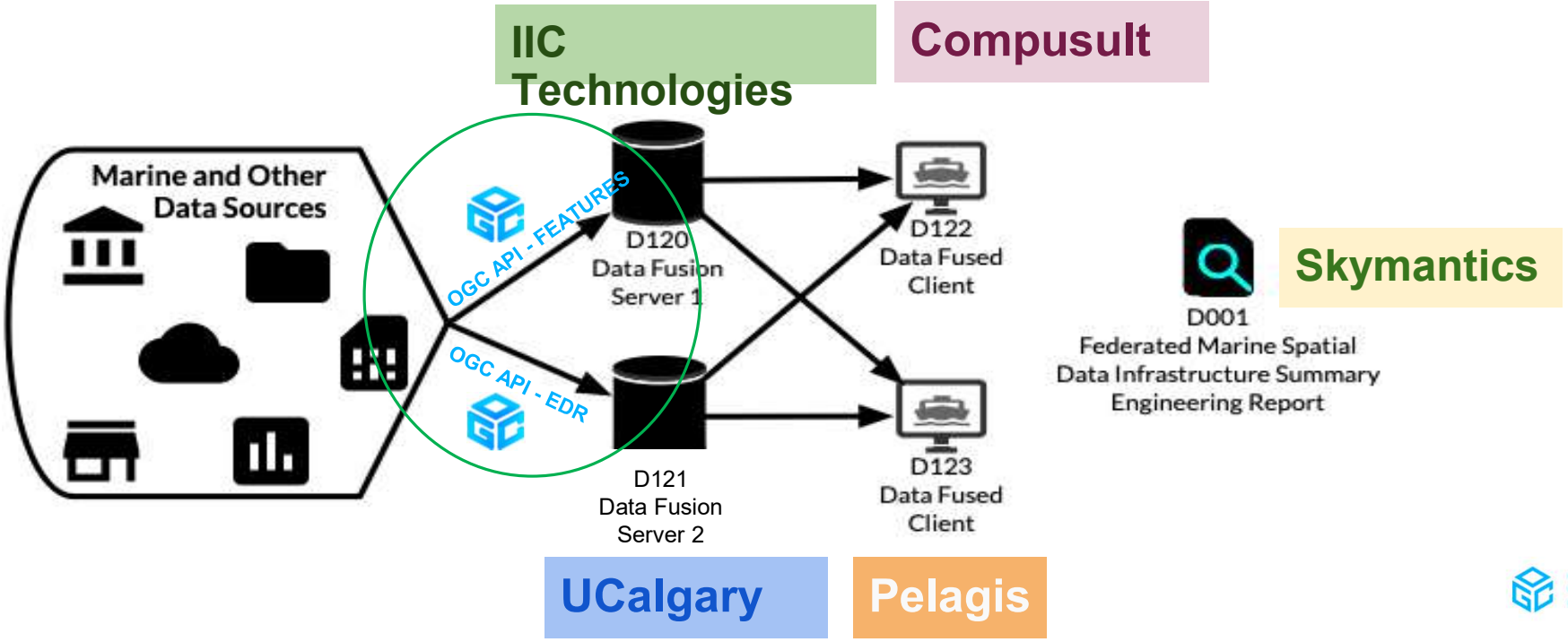
- **Use Case(s)**
  - Location-based analytics and support for loosely connected clients for the Baltic/North Sea region

- **Outcomes**
  - Identification of S-122 data, who produces it, where is it held, how it is accessed
  - UML Models for S122
  - Technology demonstration for the usage of a Federated MSDI framework actively being informed by S-122 data – forward-looking – e.g. OGC APIs

Phase II - Task 2: Fusion

Fusion Service: Data Fidelity, Mobility and Versatility

To have a greater fidelity, mobility, and versatility, participants will go beyond MPA data and examine a broader set of data and standards. These include other data sets and standards to develop a firmer more holistic view of a region: terrestrial data, meteorological data, earth observation data, online sensors, etc.



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Phase II - Task 2: Fusion

- **Outcomes**
  - Demonstrating how the various data can be brought together to enhance data analysis and understanding
  - Documenting where S-1XX product specifications excel, where supporting data is needed, and how these data are being combined and used.

- **Use Case(s): Shipping routes through the Baltic/North sea with enhanced awareness of S-122 MPAs (builds on Phase I)**

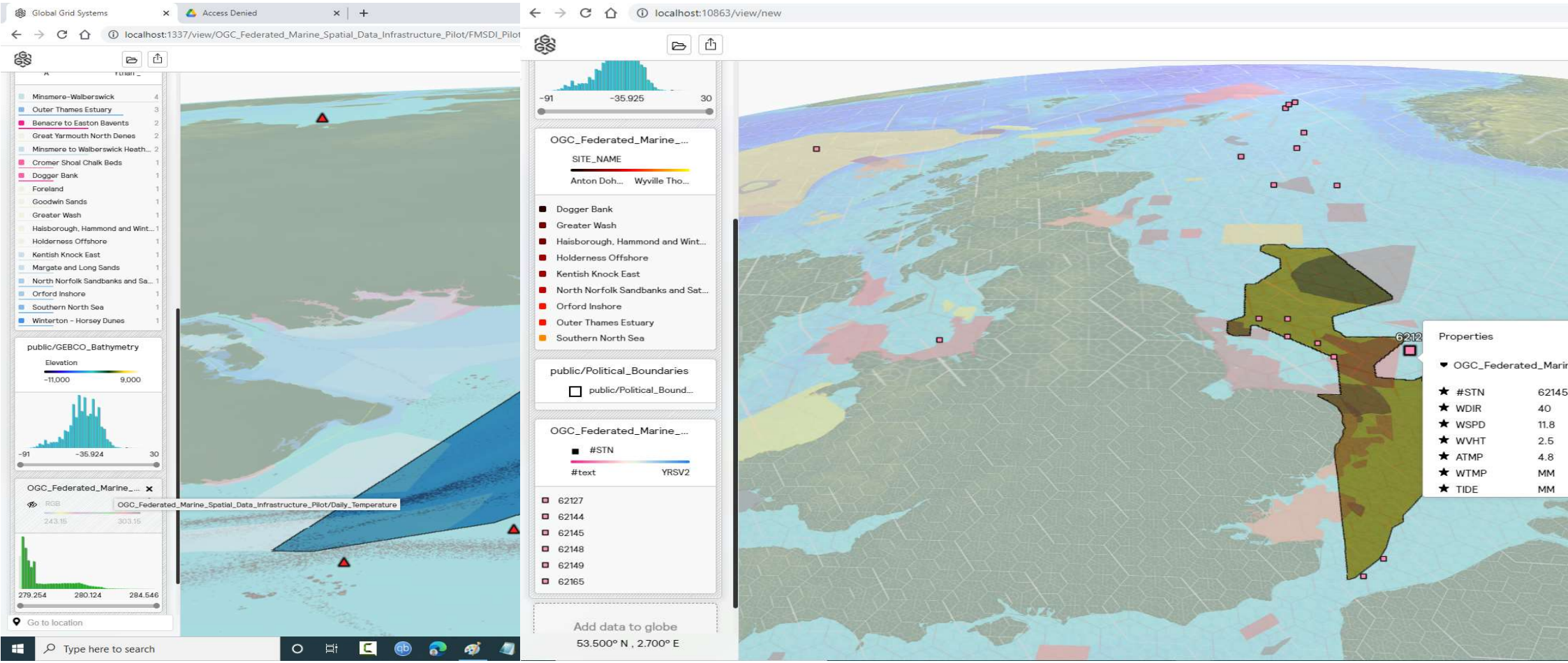
Demonstration of a use case for an online/on-demand vessel planned “route” (so, known) submitted for analysis usingS-1xx data and fused data which is included in one or more OGC API endpoints on the server.

Datasets available from the server denote MPAs and areas of environmental protection from various providers. The aim of the analytics process is to produce basic results and demonstrate the ability to feed into the downstream analysis. Suggestions for demonstration:

- Proximity to various areas/regions
- Whether vessels (of particular types) avoid or evade certain areas
- Whether behaviour changes in any statistically significant way around certain areas
- Showing a list of data/properties which is available - e.g., surface temperature, precipitation, wind speed, direction, elevation
- Providing back statistical summaries (counts, min, max, medium).

Phase II - Fusion Servers

Discrete Global Grid System – D121 EDR Server to DGGS Client. Note the Client is querying/selecting the Protected Area and the response is shown in the legend…



Phase II - Task 3: IGIF-MSDI Maturity Roadmap

- **Use Case(s): IGIF-MSDI Maturity Roadmap**
  - Scoring a new MSDI and tenured MSDI along the roadmap to reveal potential MSDI enhancement or areas of focus
  - *Opportunity for additional sponsors (separate call coming)*

- **Outcomes**
  - A well-defined roadmap following the IGIF domains of focus with indicators for areas of improvement and areas of focus for enhancing a new of existing MSDI

Phase III: Scheduling

Milestone	Date	Event
M01	**May 16, 2022**	Release of Call for Participation
M02	**May 31, 2022**	Close of Call for Participation
M03	**Jul 5-6, 2022**	Kick-off Workshop
M04	**Aug 1, 2022**	Engineering Report Draft
M05	**Jul-Oct, 2021**	Deliverable Development
M06	**Oct-Nov, 2022**	Technology Integration Experiment (TIE) Testing
M07	**Nov 15, 2022**	Final Engineering Report Due
M08	**Dec, 2022**	Demonstration of Results at the OGC Member meeting

PHASE IV in Planning stage (likely to be in the fall)

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Phase V (2023 +) ?

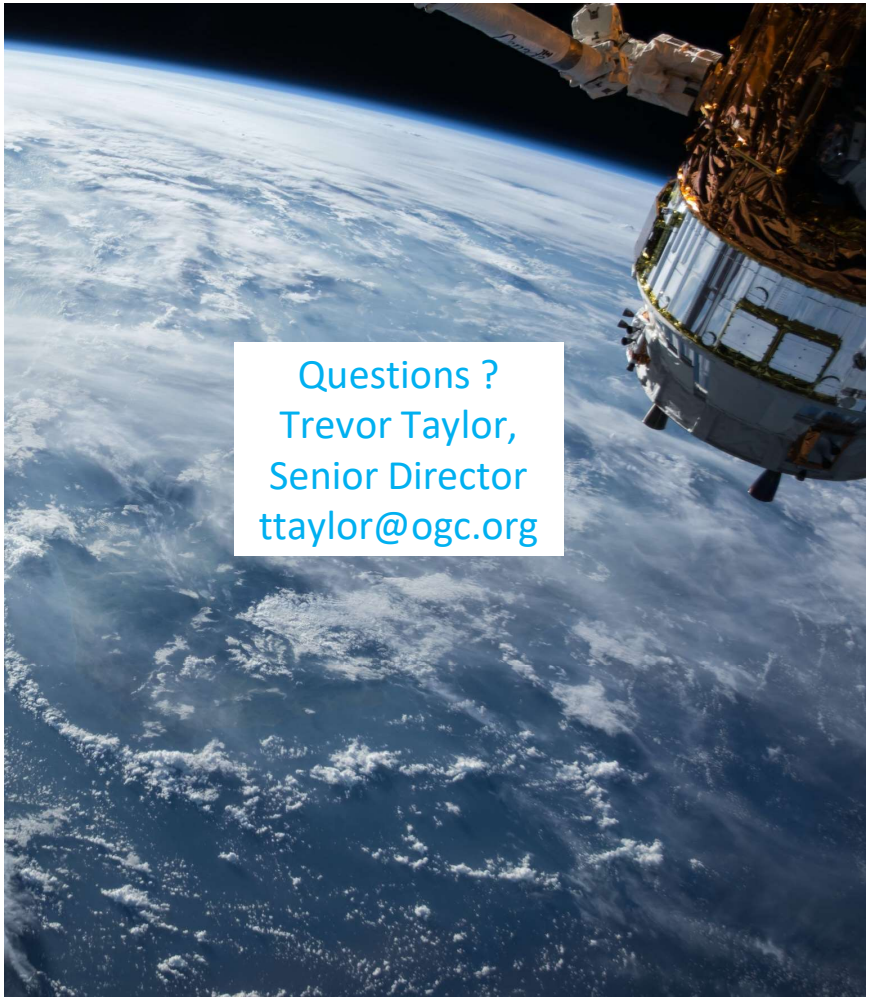
Building on progress to date – what should the focus be ?

Policy Drivers ?
- Climate Change,
- Disasters,
- Environment,
- Open Science

Potential Themes ?
- Sea level Rise,
- Coastal Erosion,
- Species tracking, Continued Cross Boundary / Domain sharing (e.g. Arctic)

Related Technology and Standards ?
- Discrete Global Grid
- 3D Visualisation and Data Management –
- Simulation and Modelling
- Cloud Native
- S 1.XXX ?

Outreach and Consultation – Next Events



Thank You

Community

500+ International Members
110+ Member Meetings
60+ Alliance and Liaison partners
50+ Standards Working Groups
45+ Domain Working Groups
25+ Years of Not for Profit Work
10+ Regional and Country Forums

Innovation

120+ Innovation Initiatives
380+ Technical reports
Quarterly Tech Trends monitoring

Standards

65+ Adopted Standards
300+ products with 1000+ certified implementations
1,700,000+ Operational Data Sets
Using OGC Standards