

Marine Spatial Data Infrastructures – What, Why and How

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SeaZone Solutions Ltd

Introduction

- What?
 - Marine SDI in the context of SDI
 - Components
- Why?
 - Applications
 - Benefits
- How?
 - SeaZone Hydrospatial

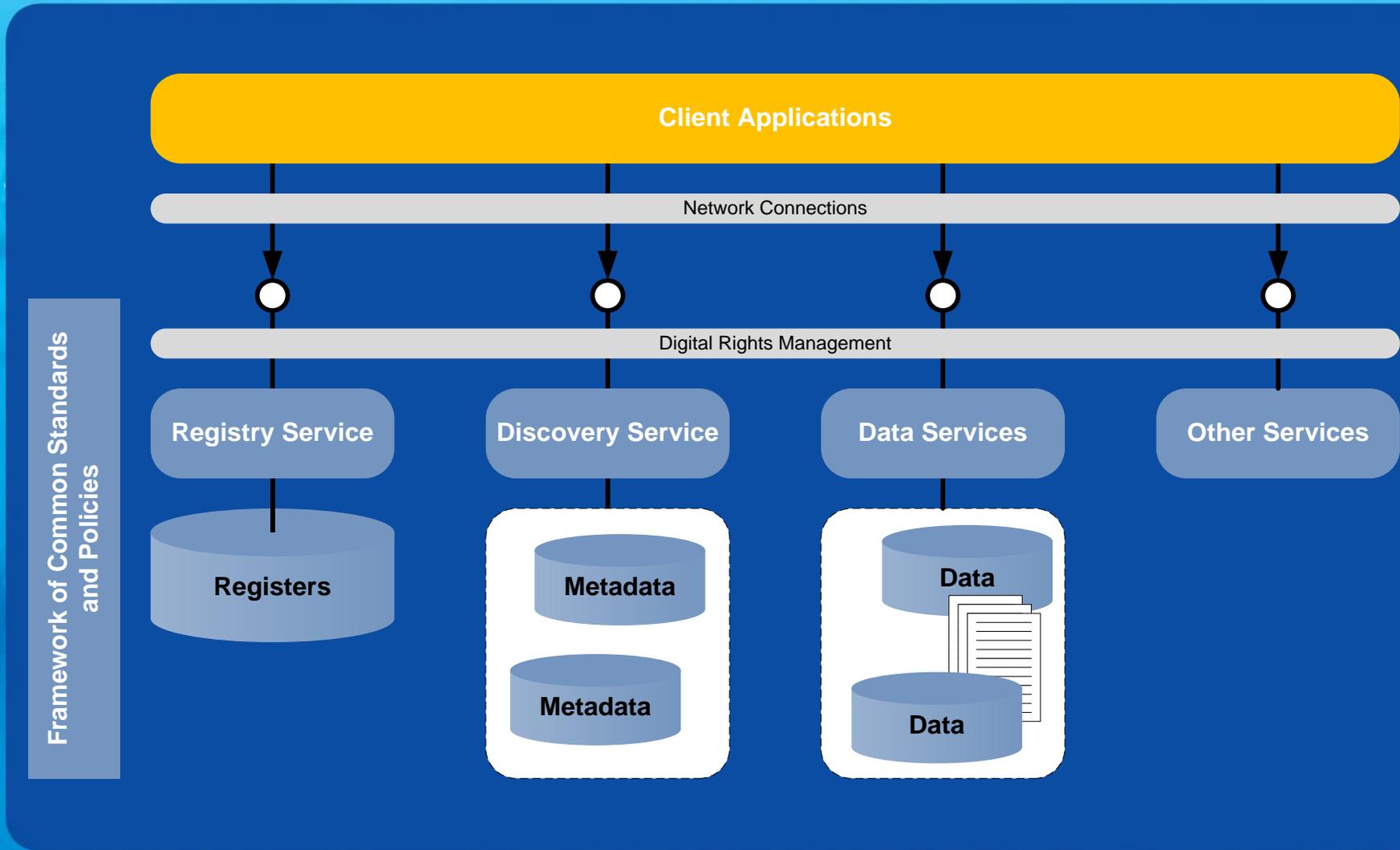
What?

Definition – Spatial Data Infrastructure

- A Spatial Data Infrastructure provides data over computer networks
 - Data are distributed across more than one repository
 - Data are managed by more than one organisation
- Additionally provides application services
 - Discovery service
 - Web coordinate transformation service
- Bound together by a common set of standards and policies
 - Data standards
 - Metadata standards
 - Data quality standards

Marine Spatial Data Infrastructure

- A manifestation of an SDI for the marine geographic domain
- This implies interoperability between marine and land data of the same thematic type
- Domain specific datasets
- Need for extension to standards (eg metadata for bathymetry)
- Third dimension perhaps used more widely than on land
- Temporal and dynamic environment
- Abstractions relied upon more so than on land (eg predictions of tides)



Content – A Differential

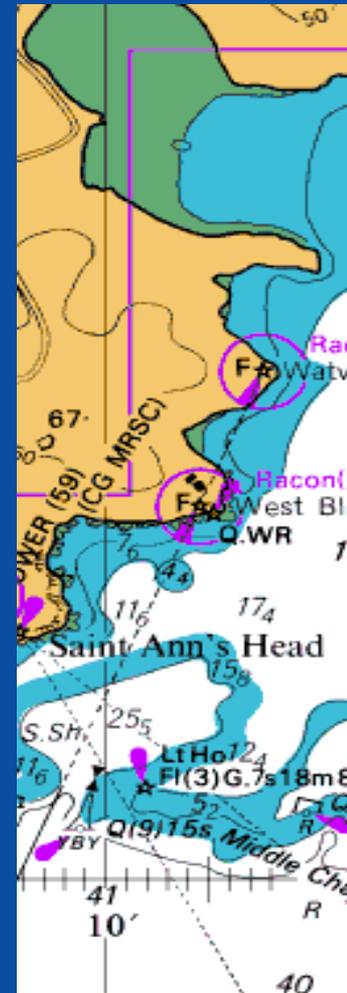
- Coordinate Reference Systems
 - Vertical CRS are referenced to dynamic surfaces
- Data sources
 - Navigational bias to marine reference data
- Feature catalogues
 - Conflict with topographic data at the coast
- Dynamic environment
 - Temporal components

Coordinate Reference Systems

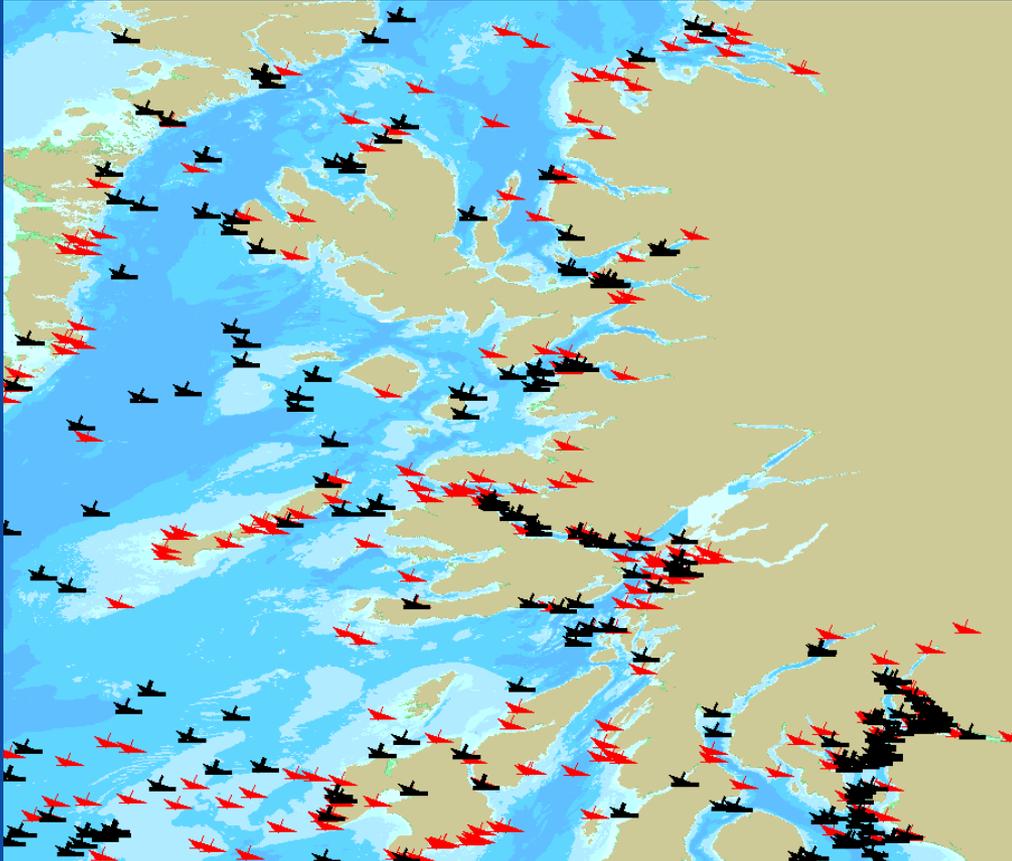
- The key to geographic data interoperability
- This is frequently overlooked
- Identifiable definitions of vertical CRS and coordinate transformations are lacking

Data Sources

- Designed solely for navigators
- Depicts a safety biased view of the world
- Charts are compiled as separate datasets
- Contain generalisations and conservative depths
- No interoperability with other datasets
- Electronic charting suitable for display only
- A small proportion of data are presented



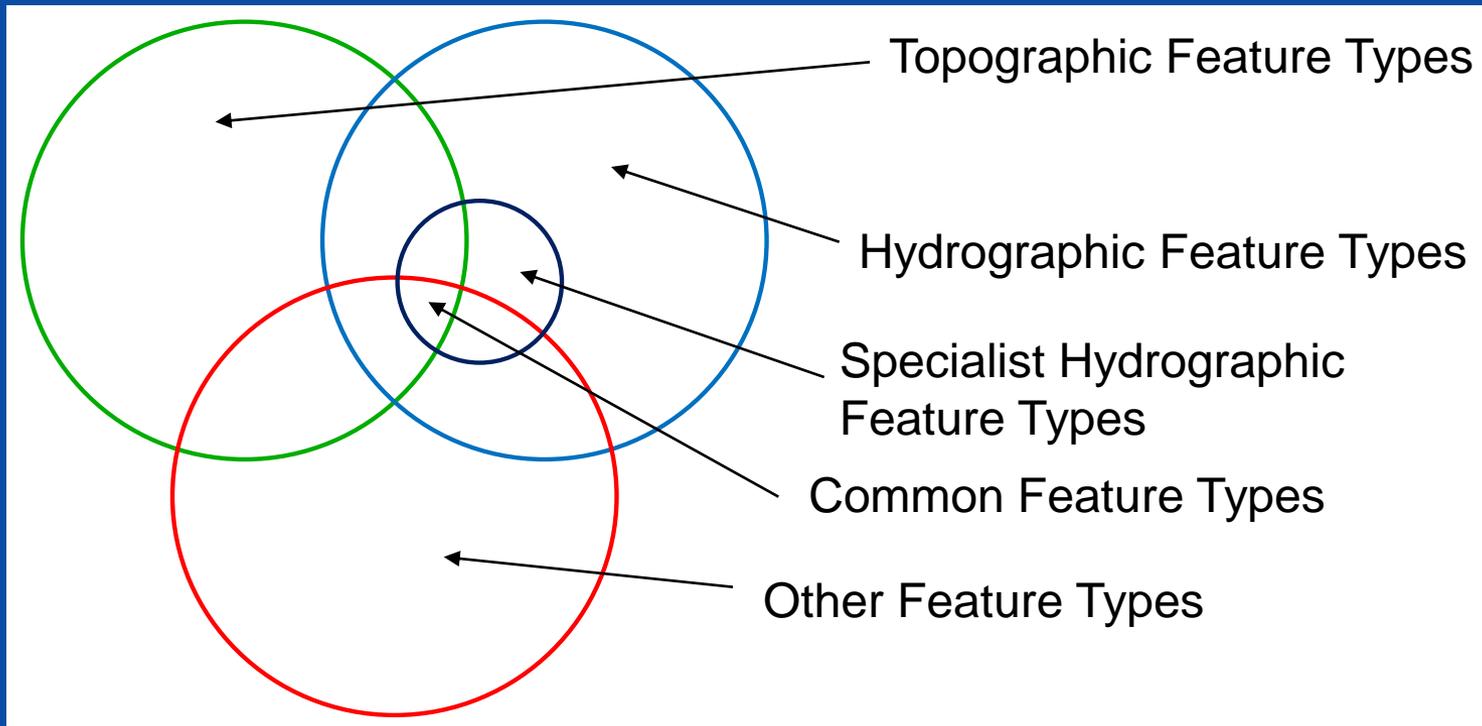
Wrecks Data



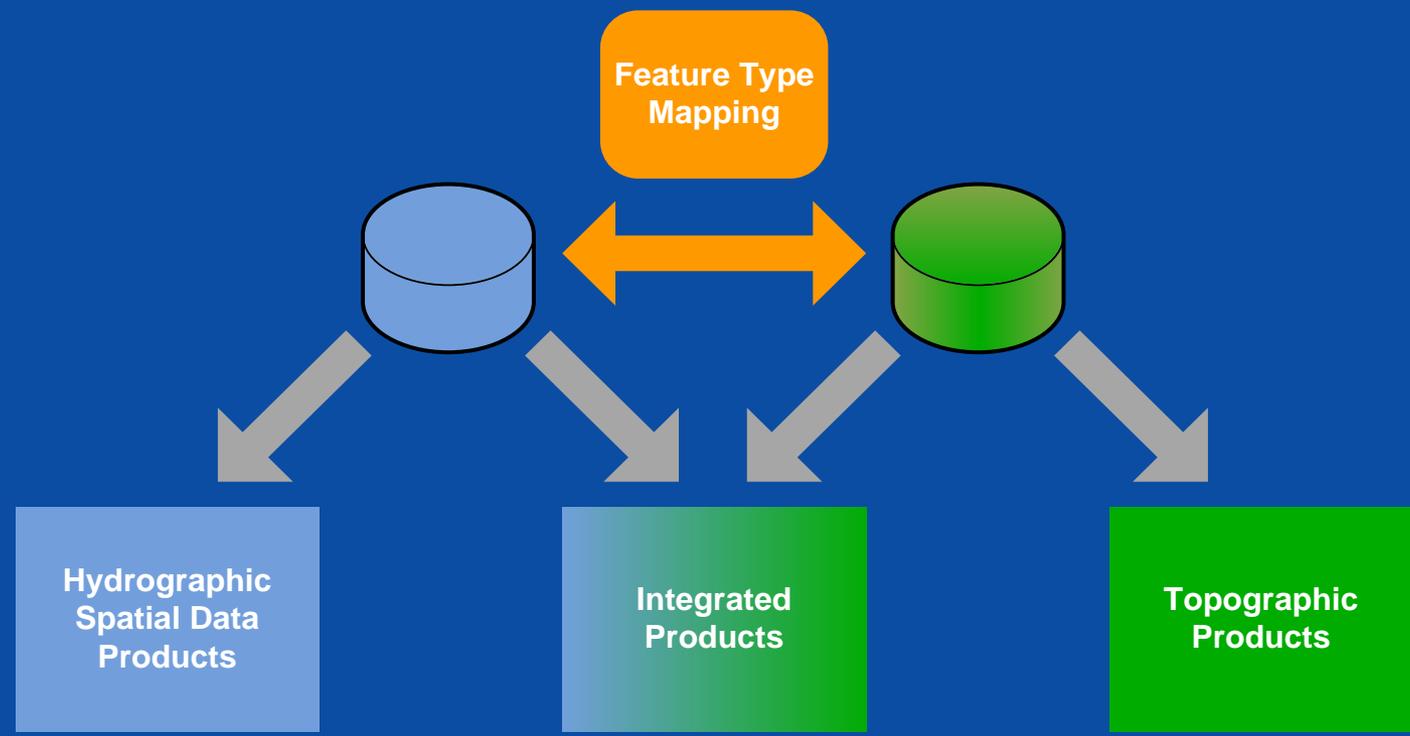
- Charted wrecks are shown in black
- Compare this with known wrecks shown in red

Feature Catalogues

- Overlapping features from land and marine organisations



Feature Type Mapping



Why?

Application Areas for MSDI

- Environment Protection
 - The protection and conservation of rich biodiversity against pressures from human activity and development
- Economic Development
 - Justification, planning, management and compliance of offshore and coastal development
- Risk Management
 - Management and mitigation incidents at sea, coastal erosion, flooding, rising sea levels, shipping and other activities

**ALL THESE ACTIVITIES REQUIRE
ACCESS TO COMPREHENSIVE
FIT FOR PURPOSE
DATA AND INFORMATION**

Benefits of MSDI

- Understanding what data we have
- Avoidance of data duplication
- Common reference data are used so we know we are talking about the same places
- Supporting the sharing of location-related information easily
- Facilitates the creation and dissemination of coherent and comprehensive data themes
- Facilitates inter-organisation working

A Use Case

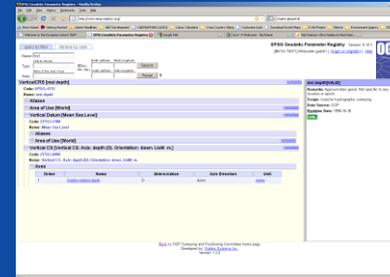
**Web Coordinate
Transformation
Service**



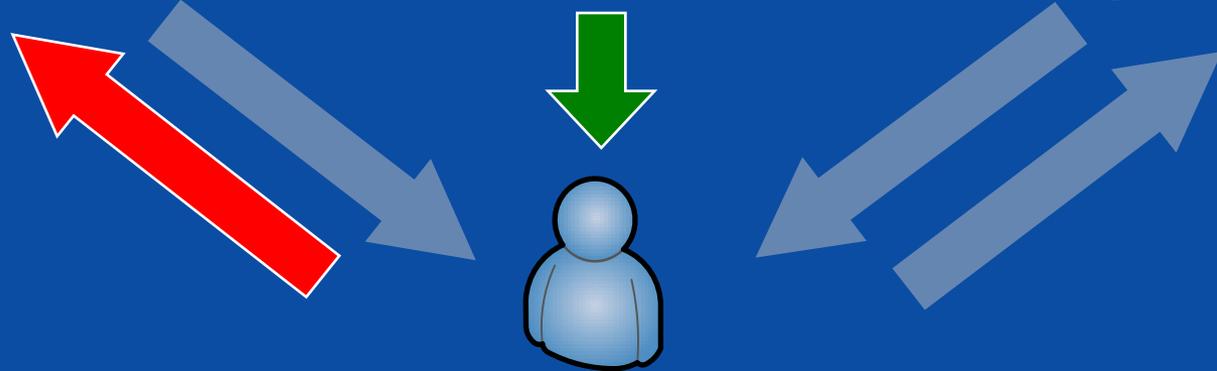
Discovery Service



Data Download Service



CRS Register



How?

Scope and Policy Development

- Who are the stakeholders?
- Who are the data / service providers?
- Who are the data / service users?
- Develop a road map for the SDI
- Develop the conceptual design of the SDI
 - Identify register and service needs
 - Identify and organise reference data

query by filter | retrieve by code

EPSG Geodetic Parameter Registry Version: 6.18.1
[BETA TEST] Welcome guest! | [login or register](#) | [help](#)

OGP

Name:

Type: ?

Area: **VerticalCRS (msl depth)** [metadata](#)

Code: **EPSG:5715**

Name: **msl depth**

Aliases

- Alternative name: **mean sea level depth**
- Naming system: EPSG alias
- Area of Use [World] [metadata](#)
- Vertical Datum [Mean Sea Level] [metadata](#)

Code: **EPSG:5100**

Name: **Mean Sea Level**

Aliases

- Area of Use [World] [metadata](#)

Vertical CS [Vertical CS. Axis: depth (D). Orientation: down. UoM: m.] [metadata](#)

Code: **EPSG:4489**

Name: **Vertical CS. Axis: depth (D). Orientation: down. UoM: m.**

Axes

Order	Name	Abbreviation	Axis Direction	Unit
1	Cravity-related depth	D	down	metre

Remarks: Approximates geoid. Not specific to any location or epoch.
Scope: Used for hydrographic surveying.
Data Source: OGP
Revision Date: 1996-10-18
[GML](#)

OGP EPSG Register

<http://www.epsg.org>

[Back](#) to OGP Surveying and Positioning Committee home page
Developed by: [Galileo Systems Inc.](#)
Version 1.2.0

```
<?xml version="1.0" ?>
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:skos="http://www.w3.org/2004/02/skos/core#"
  xmlns:dct="http://purl.org/dc/element/1.1/" ?>
  <skos:Concept rdf:about="http://vocab.ndg.nrc.ac.uk/terms/L111/5/D27" ?>
    <skos:externalID>STN:L111:5:D27</skos:externalID>
    <skos:prefLabel>Meisinki Tide Gauge datum</skos:prefLabel>
    <skos:altLabel>M60 </skos:altLabel>
    <skos:definition>Finnish national benchmark network mean sea level datum.</skos:definition>
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  </rdf:RDF>
```

NERC Data Grid Vocabulary Server

<http://vocab.ndg.nrc.ac.uk/client/vocabServer.jsp>

Spatial Reference epsg projection 5715 - msl depth

Home | [Upload Your Own](#) | [List user-contributed references](#) | [List all references](#)

Previous: [EPSG:5714: msl height](#) | Next: [EPSG:5716: Piraeus height](#)

Link to this Page
Input Coordinates: 0, 0 Output Coordinates: An error occurred.

EPSG:5715

msl depth ([Google it](#))

- WGS84 Bounds: -180.0000, -90.0000, 180.0000, 90.0000
- Scope: Used for hydrographic surveying.
- Last Revised: 1996-10-18
- Area: World

- Well Known Text as HTML
- Human-Readable OGC WKT
- Proj4
- OGC WKT
- JSON
- GML
- ESRI WKT
- PROJ File
- USGS
- MapServer Mapfile | Python
- Mapack XML | Python
- GeoServer
- PostGIS spatial_ref_sys INSERT statement
- Proj4s format

About

spatialreference.org

<http://www.spatialreference.org/>

CRS EU

Information and Service System for European Coordinate Reference Systems - CRS

Bundest für Kartographie und Geodäsie in cooperation with EuroGeographics and EUREF

Home | [Contact](#)

News
CRS Overview
CRS Description
References
Links
Legal & Privacy

Information and Service System for European Coordinate Reference Systems - CRS

This Information and Service System for European Coordinate Reference Systems was established to support the users of spatial information in Europe.

It is a common project of



Bundest für Kartographie und Geodäsie (Federal Office for Cartography and Geodesy), Germany.



EuroGeographics as the central hub for Europe's Geographic Information (GI) developments - a unique and diverse network working of all concerned with European GI, National Mapping and Cadastral Agencies (NMCAs), the European Commission and others.



EUREF (European Reference Frame) as Sub-Commission of IAGU's (International Association of Geodesy) Commission X on Global and Regional Geodesic Networks with the main task to establish and maintenance of the European Reference Frames.

The websites contain information of national European Coordinate Reference Systems and pan-European Coordinate Reference Systems for position and height.

On the sites the following information can be found:

- Description of national Coordinate Reference Systems
- Description of pan-European Coordinate Reference Systems (ETRS89 / EVRF 2000)
- Description of Transformation parameters from national Coordinate Reference Systems to pan-European Coordinate Reference Systems including
 - Quality of transformation
 - Verification data of transformation
 - possibility for online conversion and transformation of single points for test and verification purposes (position)

CRS-EU is applicable to all European Countries

The CRF-EU project was jointly organized with EuroGeographics and EUREF during the Geomatics Research Workshop 1999 and the Cartographic Project Workshop 2000 in Marne-la-Vallée. These Workshops laid the foundations for the definition of uniform European Coordinate Reference Systems (CRS-EU) which are based on the International Earth Reference System (IERS) position and height orientates on the international standard 1911. It contains also the descriptions of transformations of national Coordinate Reference Systems of European countries to pan-European CRS. In the future a service module will be enabled for the transformation and conversion of coordinates for test purposes.

CRS-EU

<http://crs.bkg.bund.de/crs-eu/>

CRS-EU is an extension and advancement of the former existing and now in this system integrated information system about European Coordinate Reference Systems CRS (<http://crs.bkg.de>)

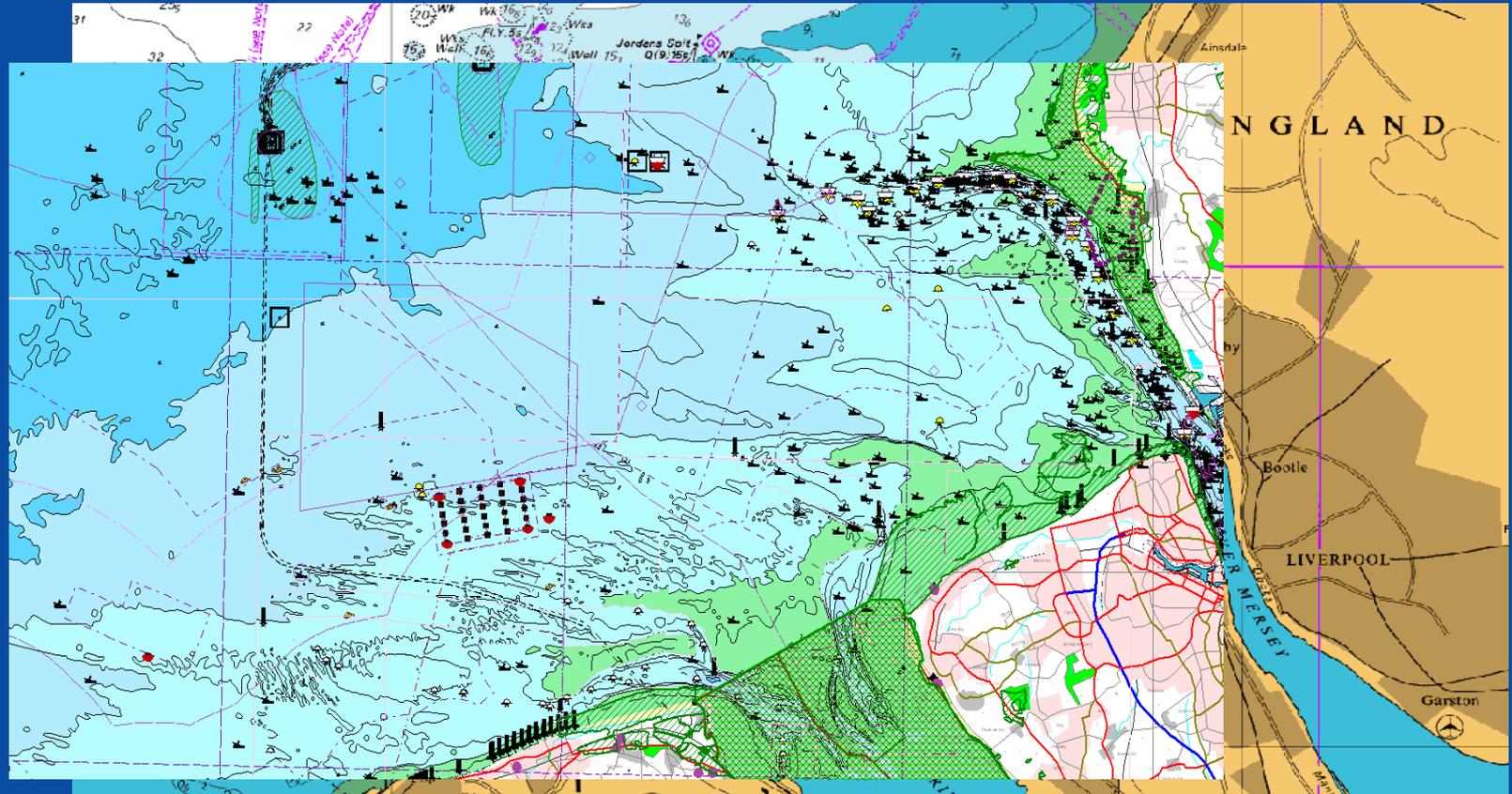
Marine Reference Data – SeaZone Hydrospatial

- First stab at creating a marine reference base
- Comparable with digital land topography and elevation data
- Suitable to a wide range of applications
- Established user base across public and private sectors
- Committed to improvement to meet future marine data needs

DATA



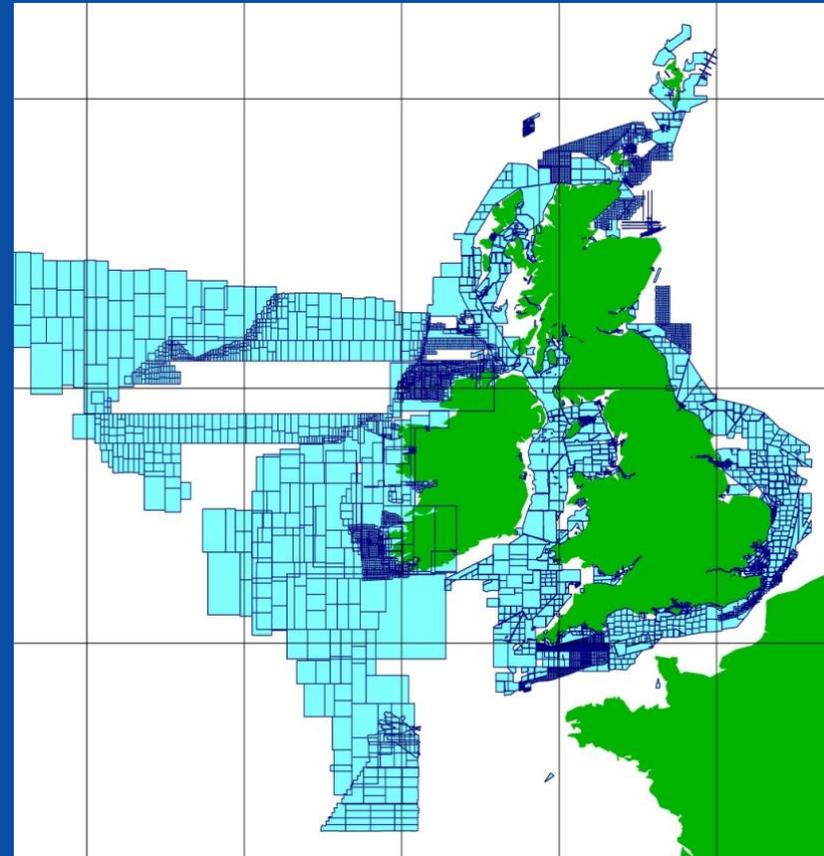
SeaZone Hydrospatial



Digital Survey Bathymetry

- High resolution survey data in XYZ format
- Quality controlled and assessed by UKHO
- Improved metadata creation & publishing
- Capturing paper survey sheets
- Extending coverage overseas
- Input to SeaZone Hydrospatial version 2

DATA



Investing in Data Improvement

- Engineering navigational and source data into a coherent, consistent, seamless marine base map
- Capturing depth soundings from survey sheets to create high resolution bathymetry surface
- Collaborating with BGS to create new generation high resolution 'Sea Bed Geology' dataset
- Harmonising marine and land data within Coastal Mapping Improvement Programme
- Working with OS and BGS to create and deliver interoperable reference base to support UK SDI

DATA



Coastal Mapping Improvement Programme

- Harmonising SeaZone HydroSpatial with OS MasterMap Topography Layer and Profile Plus
- Uses OSMM MHW line as base reference shoreline and UKHO Vertical Offshore Reference Frame (VORF) as input
- Key component of SeaZone's vision for HydroSpatial and to provide interoperable reference base for UK SDI
- First demonstration dataset for Thames Estuary in use by key customer with GB major ports delivered or planned
- Roll out for entire GB coastline scheduled over next few years with call for priority areas



Summary

- What?
 - Marine SDI has little to distinguish it from SDI in general.
 - Key factors are CRS and data sources.
- Why?
 - Application requirements.
 - Benefits from efficient data management
- How?
 - Establish registers of marine CRS (eg Vertical)
 - SeaZone's contribution to providing a definitive marine base reference map.