Issues in standard harmonization of GRID and Units in both marine science and geographical information system

The 7th Science Day of GEBCO meetings

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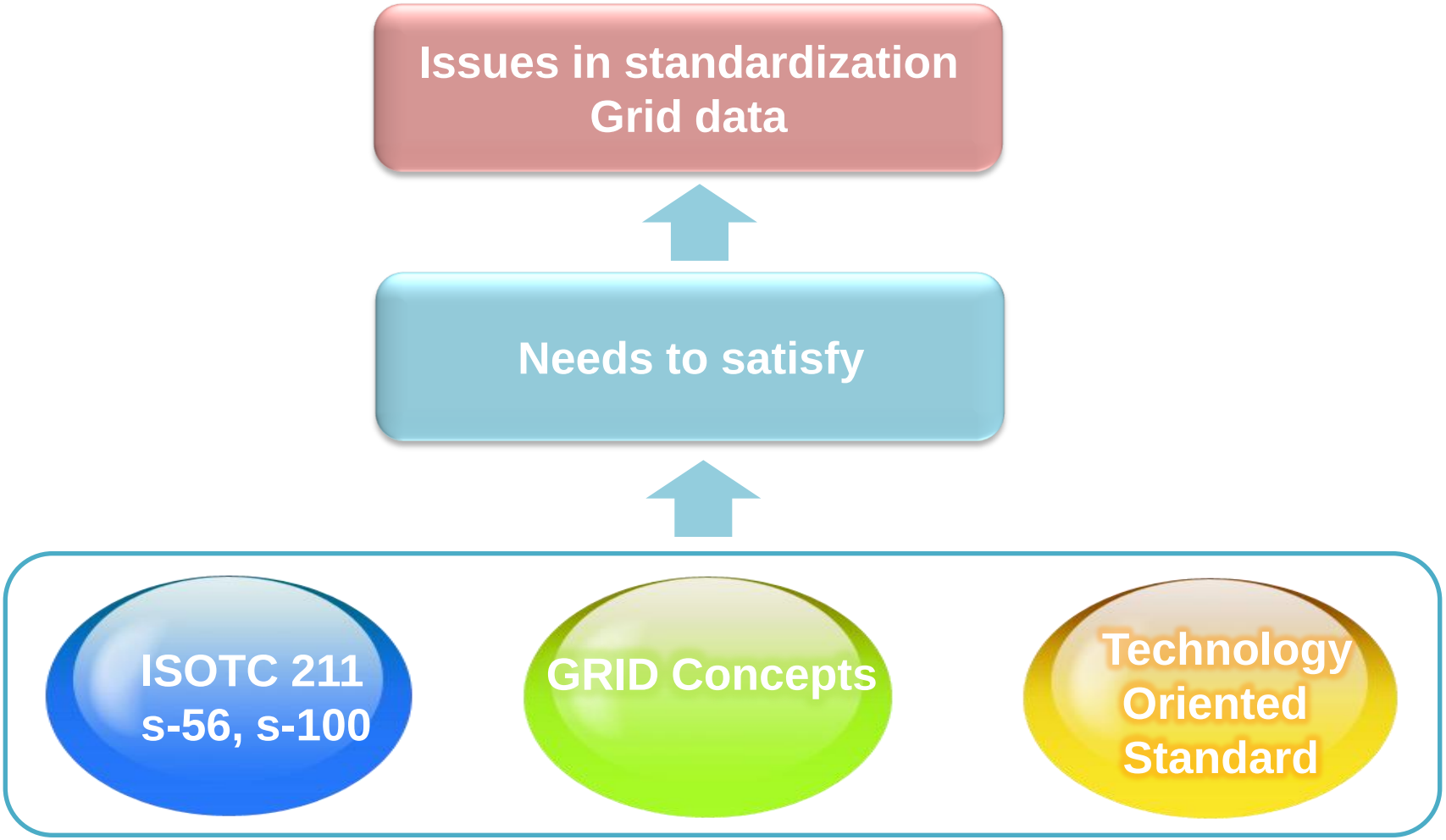
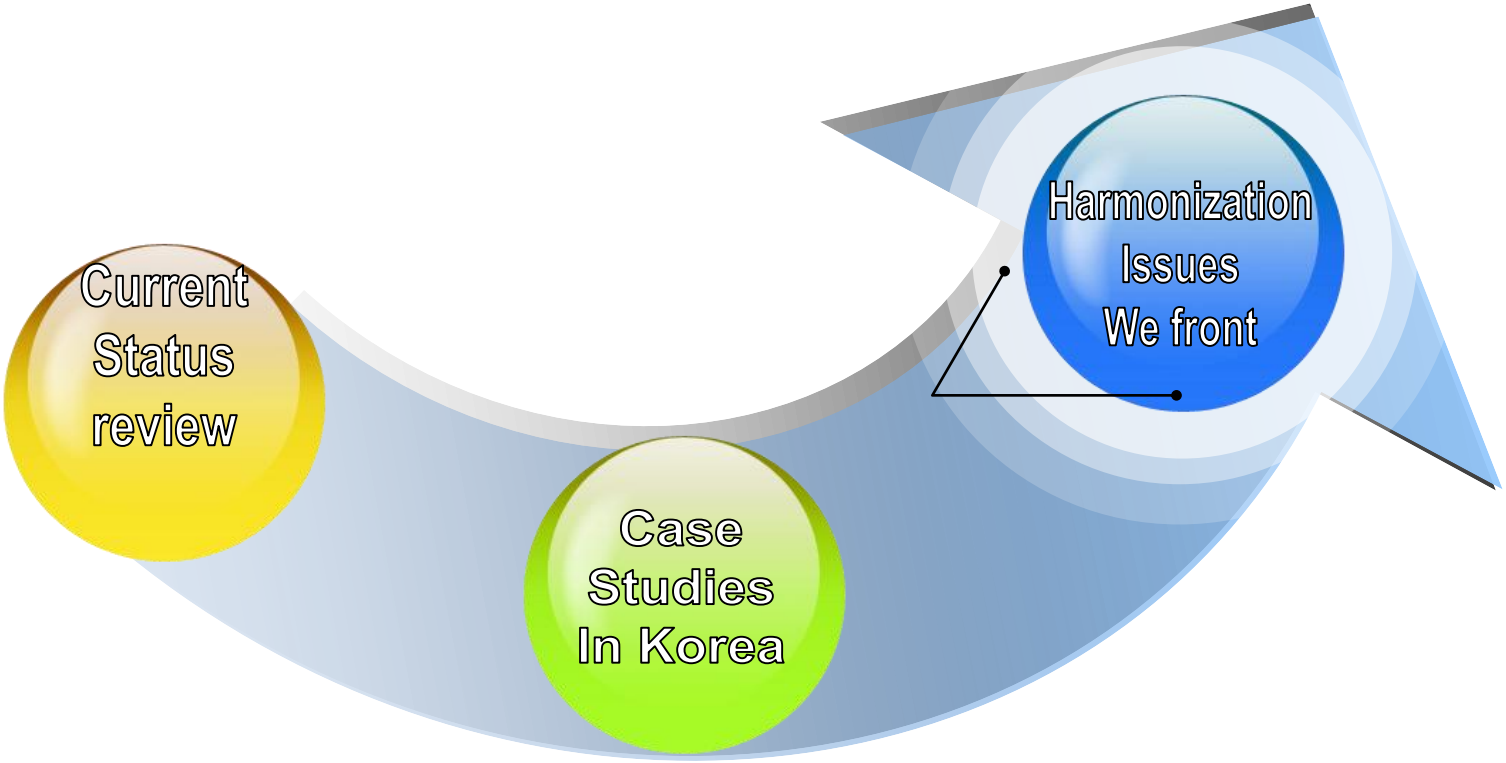
Purposes of work



Methods


Current Status review
Case Studies In Korea
Harmonization Issues We front

Issues in the past

The world of geo-statistics is primarily the abstract world of 0 D (point objects) geo--semantic and geo-statistical information, not to be confused with concrete 1D, 2D & 3D (spatial objects) geographic features modeled in the INSPIRE project, in Europe.

All micro data should be stored in the geo -statistical world of points and grids or alternative systems of regular tessellations.

ISO TC 211 people have focused on geographic feature rather than gridded data.

ISO 19000 series started to deal with geographic feature model at first, then added more standards in gridded data later.

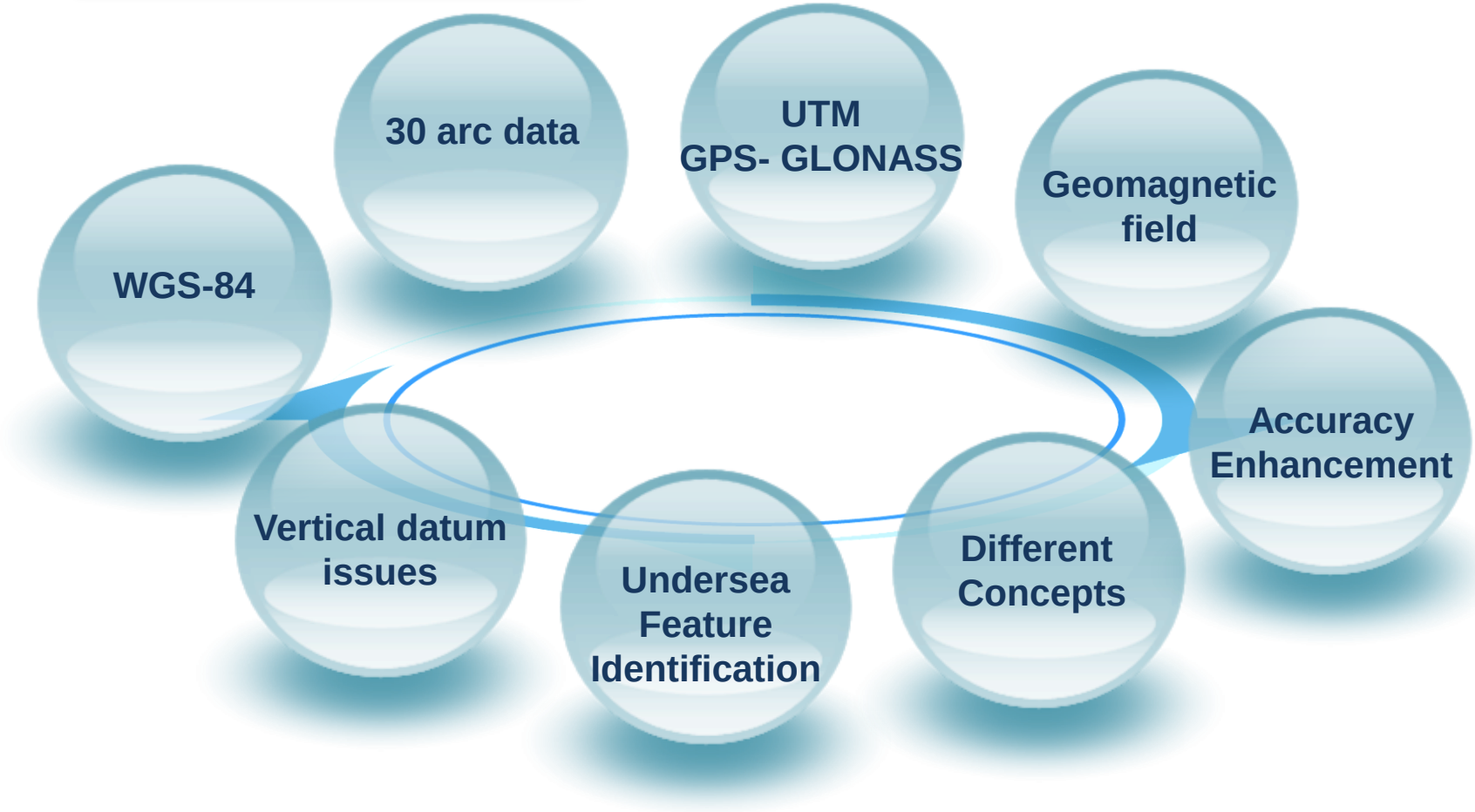
The GEBCO_08 Grid — a global 30 arc-second grid ,and 1 minute data

Geophysical data + survey data + interpolation -> continuous errata

Multi- beam data sets are not defined in ISO/TC 211 data model

GEBCO inner group

- GEBCO gridded data



GRID concepts: Why different?

Different Object

Physical Feature Example

Terrestrial Realm & Marine Realm & Atmospheric Realm

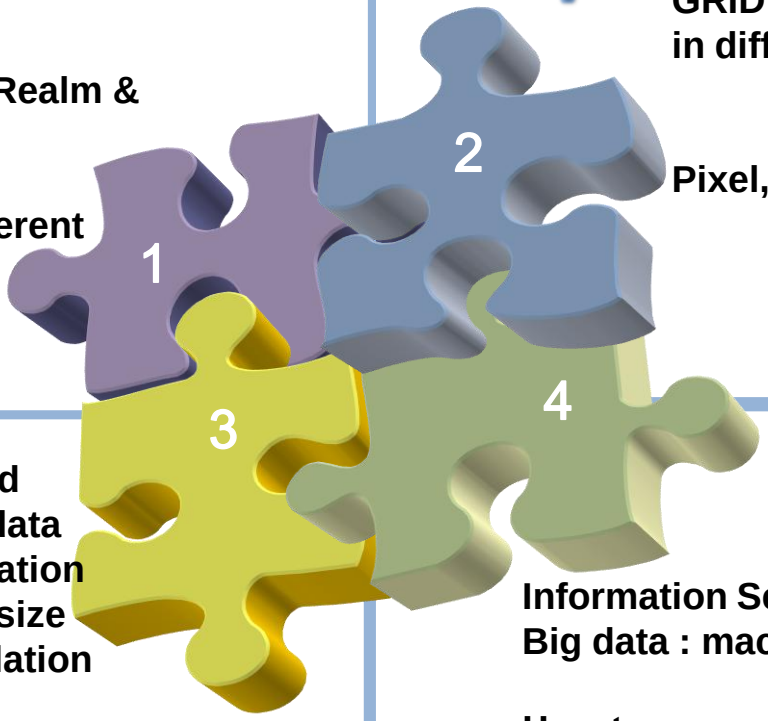
Grid Unit in interest are different among each realm

Different History

GRID concepts developed in different background

Pixel, grid, raster data

Different Concept



Access to object is limited
Generating Bathymetric data
- **Survey method, optimization**
- **Interpolation Unit= grid size**
- **extrapolation or Interpolation**

Service data Unit
- **Various data are integrated into grid**
- **Inter- discplinary works and models**

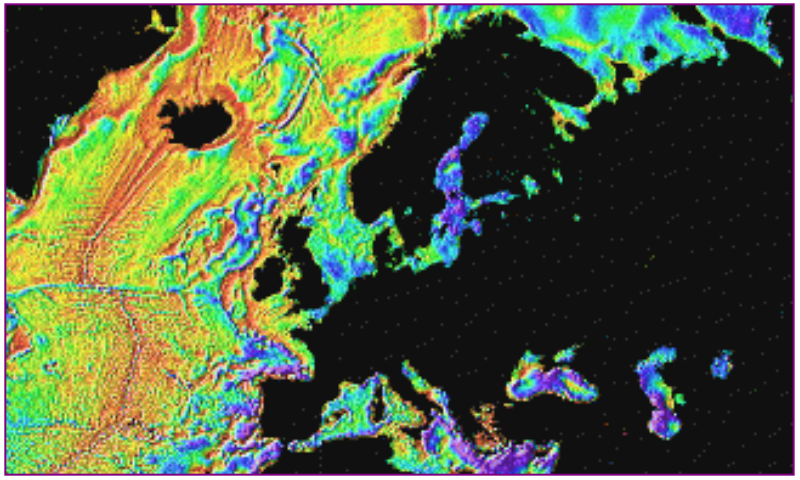
Information Service Realm
Big data : machine readable data

How to response to client's answers

Different History

Physical Feature Examples

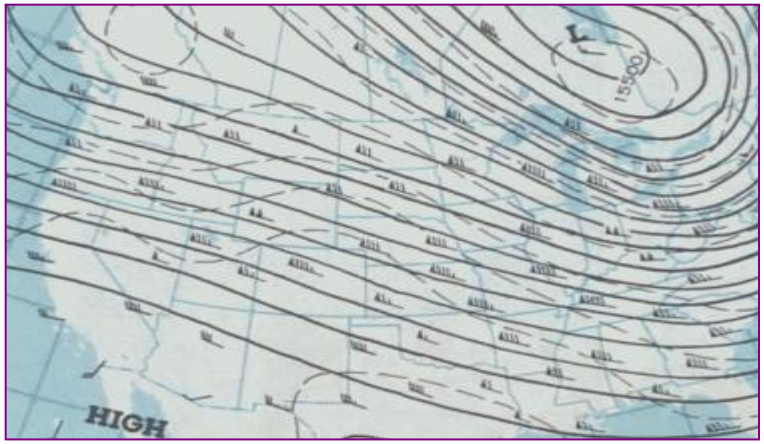
Physical Features Examples



Bathymetry

USGS, Topography

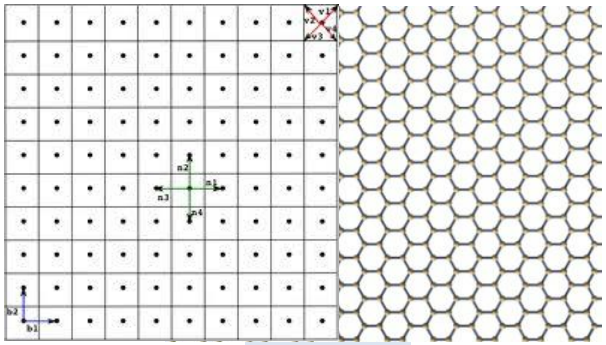
3D-modell



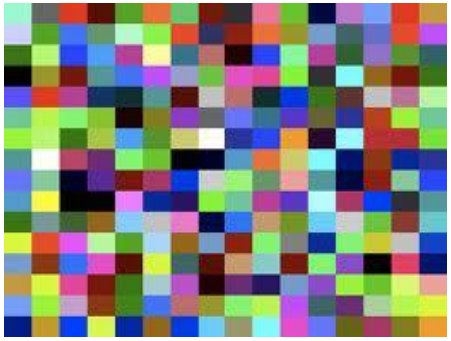
US, Meteorology

Different in GRID concept

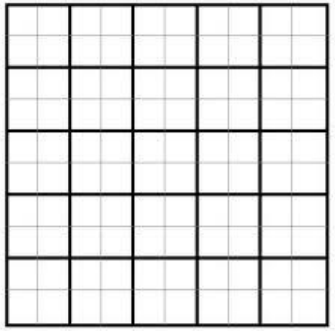
Data structure



lattice



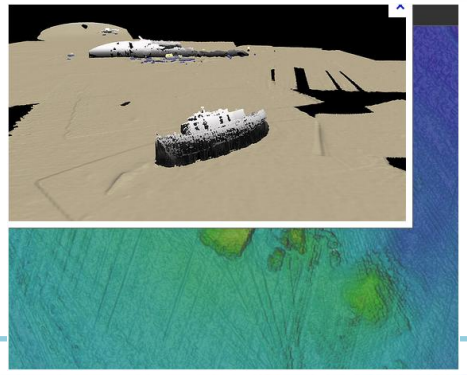
pixel



Grid

Framework + hierarchy

Interpolation Unit

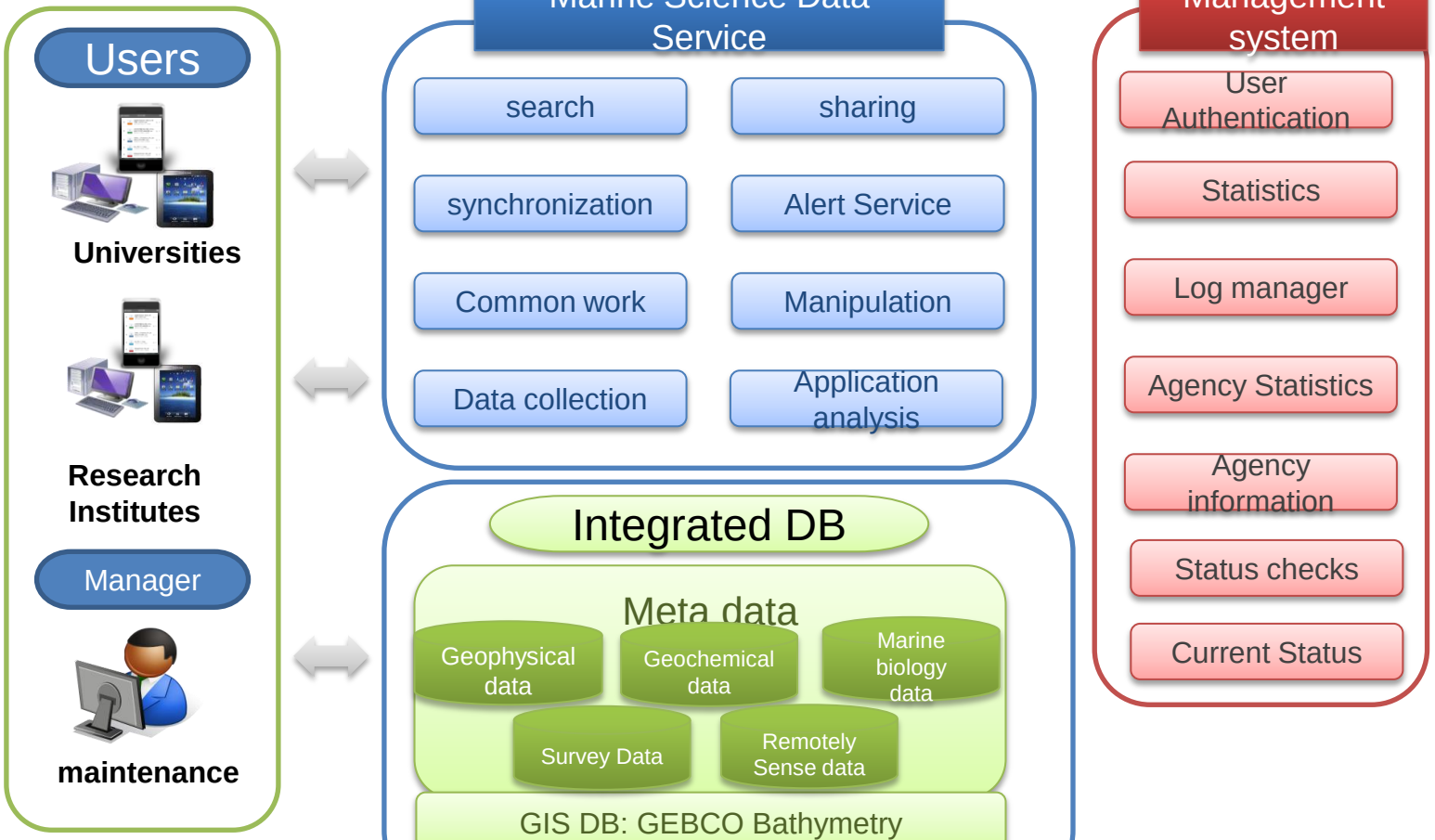


Point clouds

ex) In Wessex

GRID in Marine Science Information

Grid is regarded As Units for integrated data search

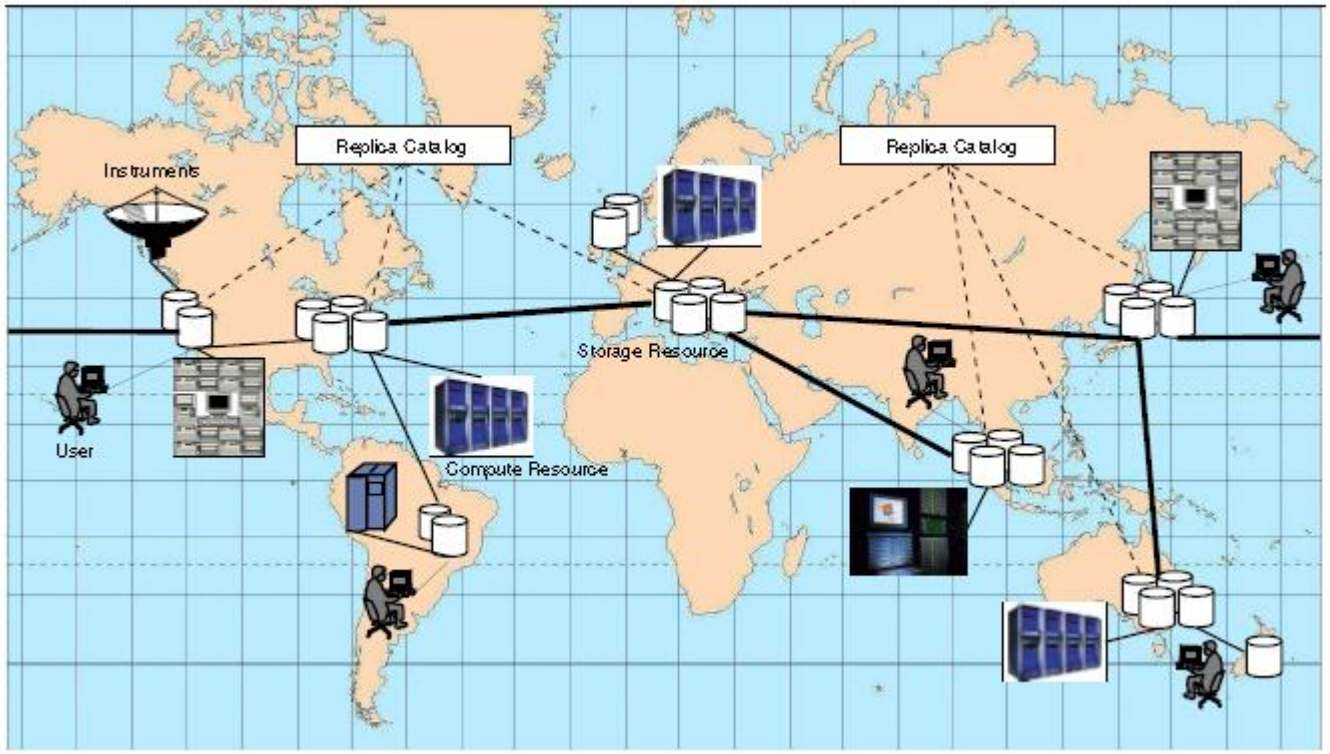


Grid is regarded As Units for data collection & data production

GRID in Computing Science

Data GRID

http://www.cloudbus.org/reports/DataGridTaxonomy.pdf



Data Grid areones being set up for analyzing the huge amounts of data that will be generated by the CMS (Compact Muon Solenoid), ATLAS (A Toroidal LHC AppratuS), ALICE (A Large Ion Collider Experiment) and LHCb (LHC beauty) experiments at the Large Hadron Collider (LHC)

Marine Science Information Service

name	agency	Ocean Science Data
World ocean database (WOD)	NOAANODC	biology data, buoy data, chlorophyll, nutrients ocean currents, oxygen, plankton, salinitysatellite data, sea level, snow &ice, profile data
ARGO international data center (GDAC)	ARGO	ARGO FLOAT 3000 centers temperature/salinity profiling floats
Ocean biological information system (OBIS)	Ocean (CoML)	126,000 species 28,400,000 findings
Satellite data for sea surface (AVISO)	AVISO	Large-scale circulation Meso-scale circulation. Operational oceanography Tides Mean Sea Level, Greenhouse effect Seasons Ice, Climate Atmosphere, wind and wave Hydrology and land Coastal applications, Biology, Navigation by area

GRID are regarded as data service unit
: resolution

Marine Science Unit standards

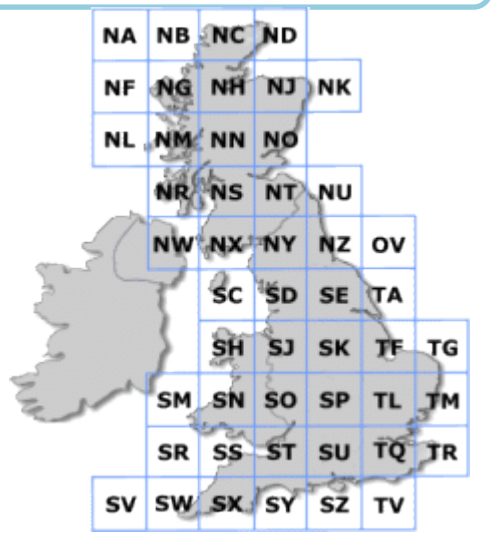
Salinity Unit Case

Definition	Symbol	Period (year)	Unit	Description	Accuracy
Absolute Salinity	SA			The mass fraction of all dissolved solid mineral substances in a certain mass of seawater	
Sorensen Salinity	SS	1901	‰	The mass (in grams) of the dry residue of all solid mineral dissolved substances contained in one kilogram of seawater provided that bromine and iodine are replaced with the equivalent amount of chlorine, all carbonates are transformed into oxides, and all organic substances are cremated at a temperature of 480℃	
Knudsen-Sorensen Salinity	SK-S	1902-1969	‰	Salinity is directly proportional to the amount of chlorine in sea water, where chlorine can be measured accurately by a simple chemical analysis.	0.01‰
Cox	SCOX	1969-1981	‰	It merely gives chlorinity as a function of conductivity of sea water relative to standard seawater	S>15‰: 0.004‰ S<15‰: 0.01‰
Practical Salinity Unit in 1978	S1978 PASS -1978	1982	psu or unitless	Salinity be defined using only conductivity of the sea water sample to the conductivity of the standard potassium chloride (KCl) solution at a temperature of 15 ℃ and standard at mospheric pressure	15℃: 0.0008 psu 0.0015 in case of T:-1.8-30℃, S: 2-42, P: 0-10000 dbar

National GRID SYSTEM in USA

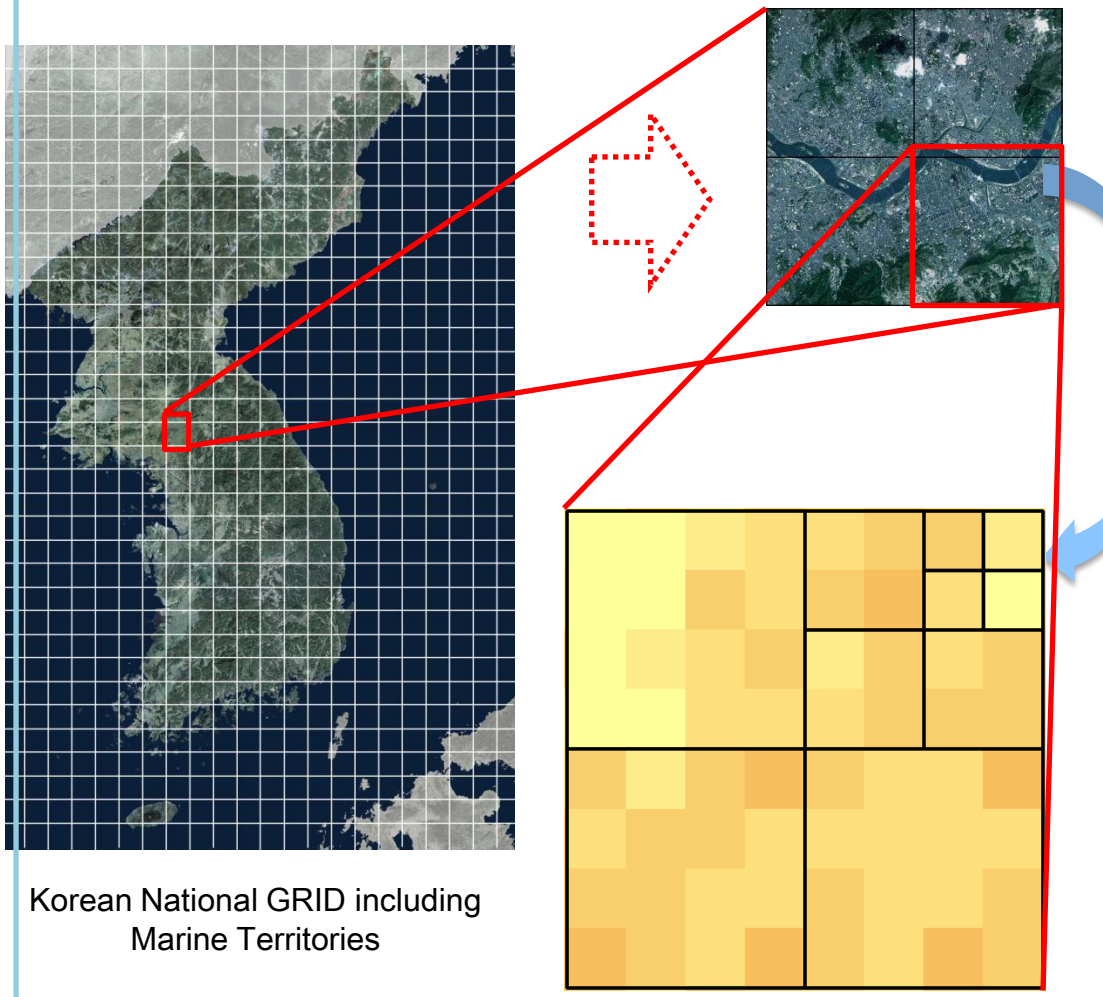
	(United States National Grid)
agency	• US FGDC
Purposes	• Location Based Service Enhancement • Efficient Disaster Response
GRID Frame	• 100km×100km • 1km×1km • 100m×100m • 10m×10m • 1m×1m
Numbering	• Two digit county unit • Four digit city unit • Six digit block • Eight digit household
Standard	• UTM⇒100km×100km(Square⇒1km×1km)

National GRID SYSTEM in UK



	NGRS	Good points
Purposes	• National Grid Reference System • Military purposes • One coordinate system	• Military technologies application to civil realms • To reduce the error virtual standard origins are setting
Grid Framework	• 100km × 100km • 10km × 10km • 1km × 1km • 100m × 100m • 10m × 10m	• Alphabet 2 digit • Alphabet 2 digit + number2 digit • Alphabet 2 digit + number 4 digit • Alphabet 2 digit + number 6 digit • Alphabet 2 digit + number 8 digit

National GRID SYSTEM in Korea



Korean National GRID including Marine Territories

Purposes	• National Grid Reference System • LBS service Enhancement	Marine requirement + coastal zone management + sea and ocean information +marine science information
Grid Frame work	• 10km × 100km • 4km × 4km • 1km × 1km • 100m × 100m • 30m × 30m	

Marine Science Information Service for Application

	Security	Tourism	Disaster	Resource	Marine Industry
Demands	Synthetic Environment Design	Beach, Tidal Flat Fishery Marine Sports Marine Landscape Marine Eco-Tourism	Oil Spill Red Tide Storm Surge Venerability Evaluation	Energy Bio resources Deep Sea water	Marine Plants Fishery Navigation Safety Port Information

	Environment	Policies	Climate
Demands	Water pollution Waste Cold Pool	Land Filling Coastal Management Management of Port Island Management	Sea level rising Sea Warming Sea Surface Temperature Ocean Acidification

Observation
Survey and Mapping

Common Grid Framework Required

Conclusions

1. GRID concepts are different in each field: survey and mapping, geophysical science, marine sciences, coastal management, computing science.

2. GEBCO has focused on Data Generation rather than Data Service.

3. Interoperability in standards in ISO TC 211 and Marine side will be encouraged, which covers multi-beam data.

4. National GRID frameworks are widely prepared for Terrestrial Parts The GRID framework should include Marine parts. Proper input from hydrography are required.

5. To meet the social demands, standards in Unit and Grid framework should be discussed with various aspects

Thank you