Data Access Services

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Annual DMAC Workshop

12 Sep 2012

IOOS DMAC Subsystem Implementation Guidance

- a) Open Data Sharing:
- b) Provision of Data to WMO GTS:
- c) Service-Oriented Architecture (SOA):
- d) Recommended Data Access Services:
- e) Common Data Formats:
- f) Common Vocabularies and Identifiers:
- g) Metadata:
- h) Storage and Archiving:
- i) Data Management Planning and Coordination:
- j) IOOS® Maturity Levels and Certification Standards:
- k) Consideration for Long-term Operations:

IOOS DMAC Subsystem Implementation Guidance

- OPeNDAP Data Access Protocol (DAP) and/or Open Geospatial Consortium (OGC) Web Coverage Service (WCS) for *access to gridded data*
- OGC Sensor Observation Service (SOS) for *access to in situ observations*
- OGC Web Map Service (WMS) for access to georeferenced image data;
- and Other service types,

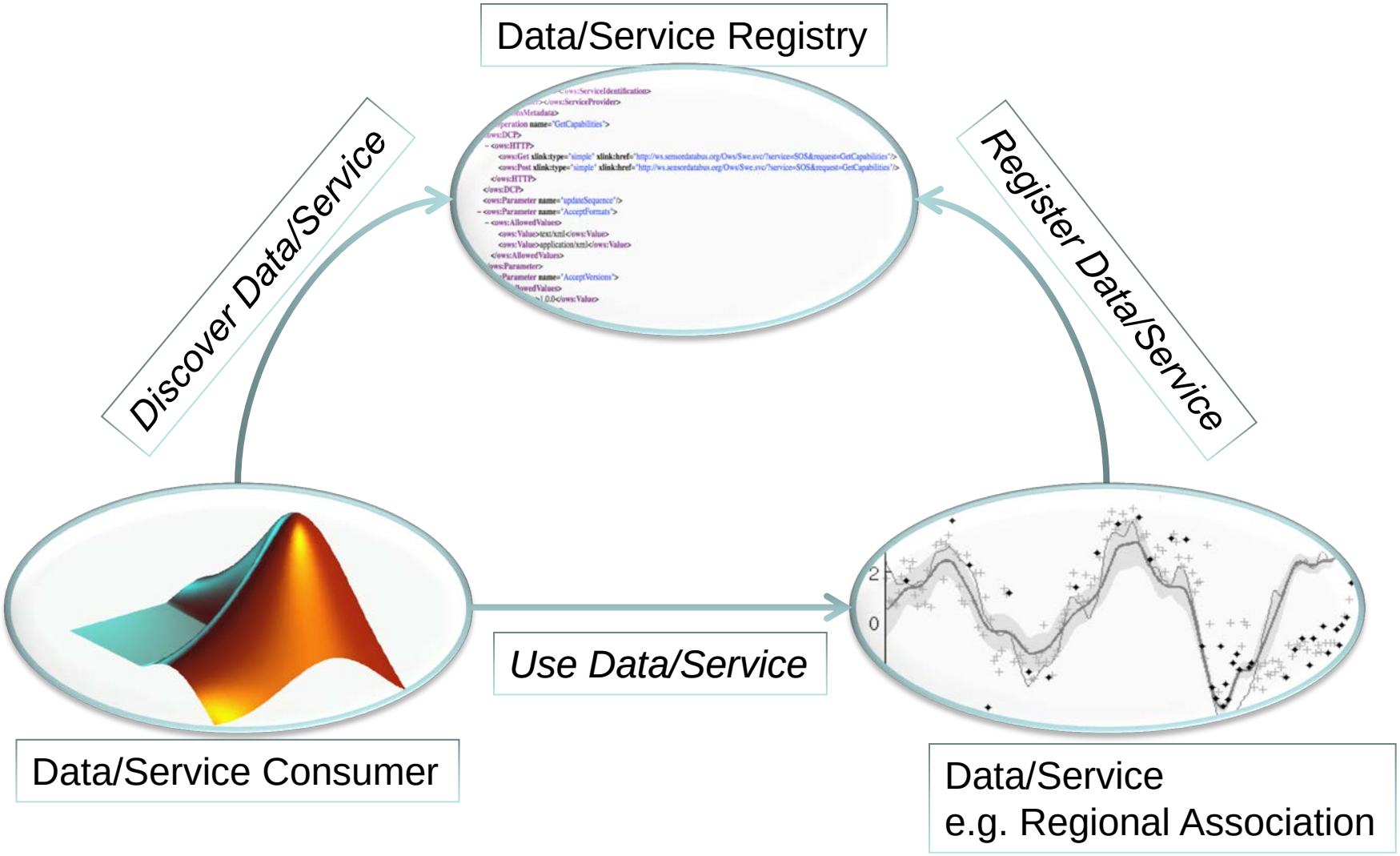
IOOS DMAC Subsystem Implementation Guidance

- The overall objective of this approach, regardless of which specific services are adopted, is the participation in an *ongoing community standards processes* that result in *common data model* and/or common data taxonomies. Specific versions of each recommended technical specification *will be stipulated* to IOOS® partners.

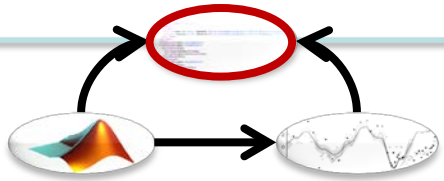
IOOS DMAC Subsystem Implementation Guidance NEEDS REVISION

- OPeNDAP Data Access Protocol (DAP) and/or Open Geospatial Consortium (OGC) Web Coverage Service (WCS) ~~for access to gridded data~~
- OGC Sensor Observation Service (SOS) for access to in situ observations
- OGC Web Map Service (WMS) for access to georeferenced image data;
- and Other service types

Data Integration supports frameworks we can build useful services upon.

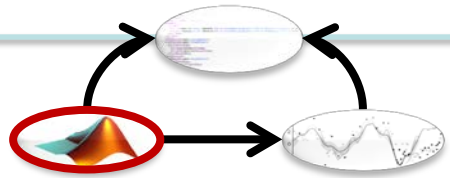


Technologies applied to Data Registries/Catalogs



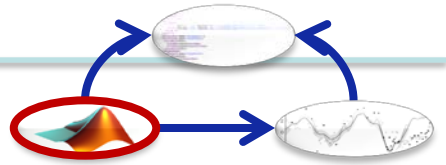
- ISO 191** Geospatial metadata standards
- ncISO – Harvester supporting netCDF ➔ ISO 191** translation
- ESRI Geoportal Server
- GI-CAT, Geonetwork
- Opensearch, OGC CS/W
- ERDDAP
- THREDDS

Technologies applied to Service Clients

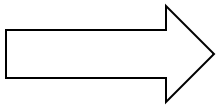


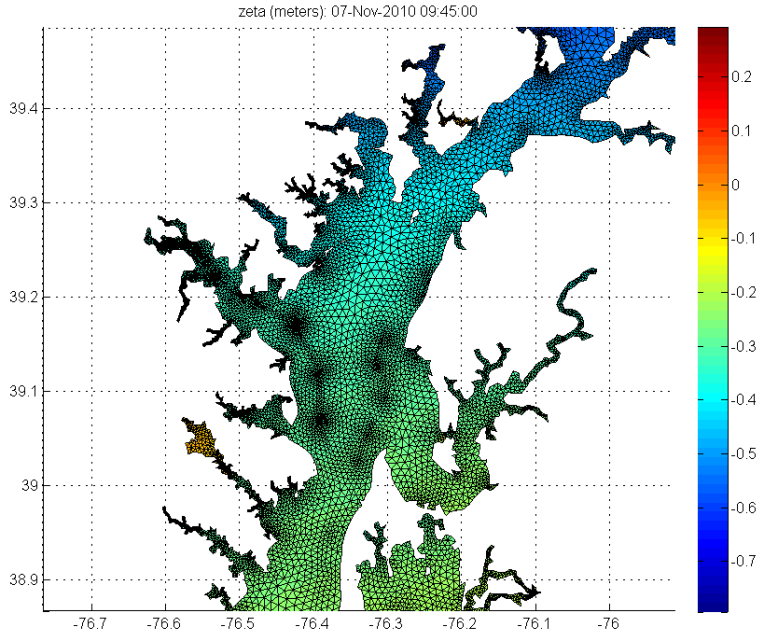
- nctoolbox
- Environmental Data Connector
- ERDDAP
- Javascript library for SOS parsing
- Python library for SOS parsing
- IAI Proteus SOS Client

Clients in action



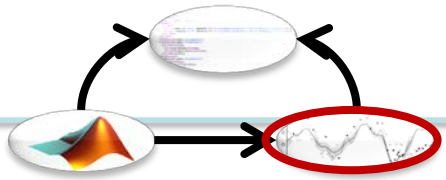
```
>> links = opensearch(q)
>> nc = ncugrid(links.dap{1})
>> z  =  nc.data('zeta',…)
>> grid = nc.grid('zeta',…)
>> plot(grid)
```





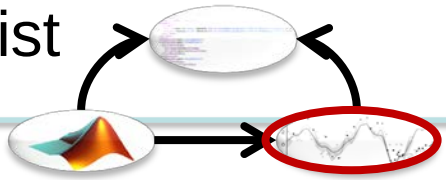
Built on open source software supported by NSF/Unidata, NOAA, USGS, and several industrial partners.

Technologies applied to Data Services



- netCDF – Climate and Forecast conventions – OPeNDAP
- THREDDS (data cataloging and distribution with a flexible plugin environment)
- Hyrax (opendap.org)
- Sensor Web Enablement (Framework/family of services, encoding standard, family of services)
- SOS (OGC Sensor Observation Service)
- ERDDAP
- W*S (OGC Web * Service, primarily WMS)

Technologies applied to Data Services: the short list



OPeNDAP

OGC®

Making location count.

ncSOS: A THREDDS plugin implementing the SOS interface

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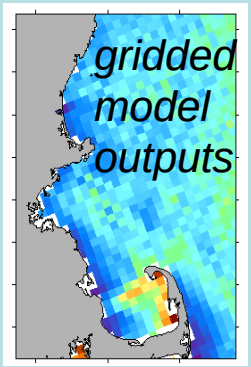
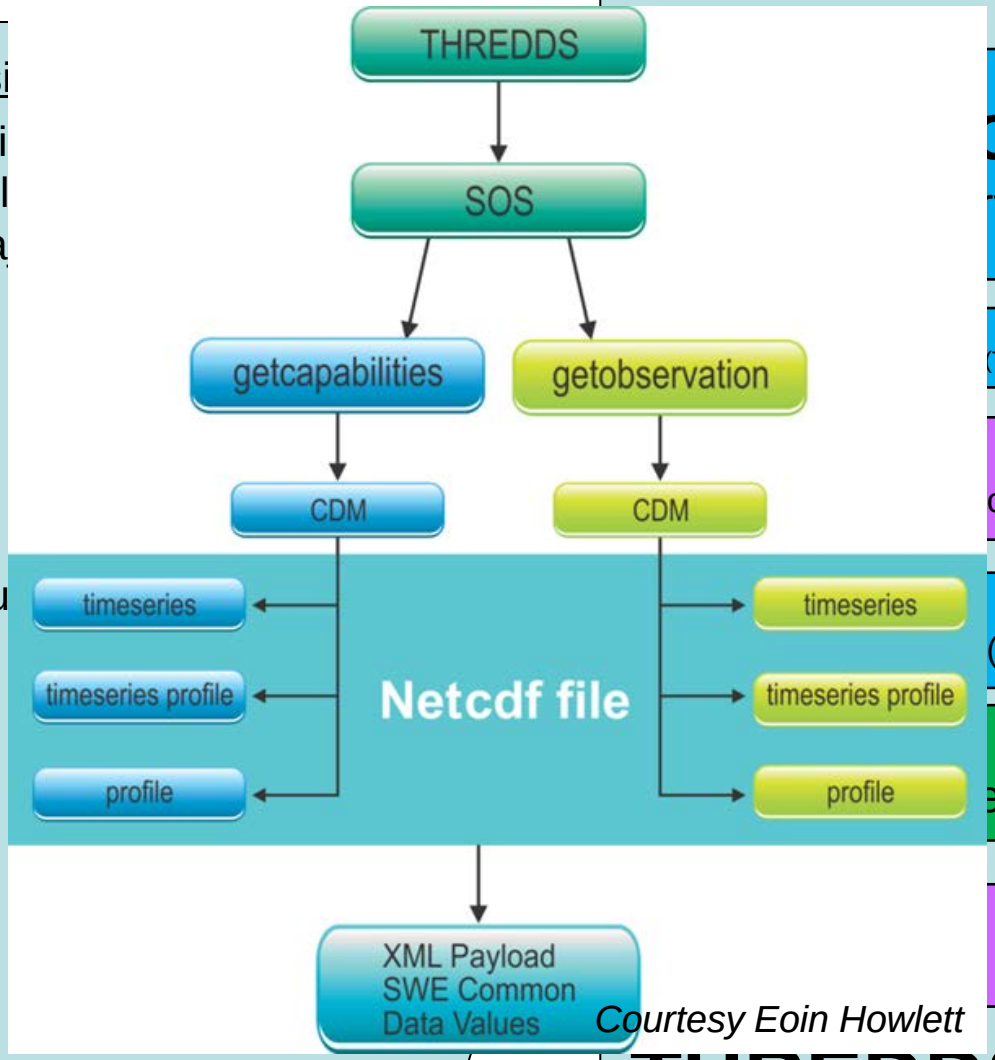
Poi
Col
Tra

Structured Grids
(increasingly unstru



CF/ACDD



Courtesy Eoin Howlett

OS
rvation Service)

ISO
(TDS Catalog ➔ ISO 1911*)

col)

WCS
(Web Coverage Service)

e)

Etc…

THREDDS

Example THREDDS Catalog with ncSOS

Catalog
http://testbedapps-dev.sura.org/thredds/catalog/inundation/observations/noaa_nos/catalog.html

Data Set
http://testbedapps-dev.sura.org/thredds/catalog/inundation/observations/noaa_nos/catalog.html?dataset=inundation/observations/noaa_nos/8771510_Galveston_Pleasure_Pier_Ike_WL.nc

GetCapabilities
http://testbedapps-dev.sura.org/thredds/sos/inundation/observations/noaa_nos/8771510_Galveston_Pleasure_Pier_Ike_WL.nc?service=SOS&version=1.0.0&request=GetCapabilities&useCache=true

GetObservation
http://testbedapps-dev.sura.org/thredds/sos/inundation/observations/noaa_nos/8771510_Galveston_Pleasure_Pier_Ike_WL.nc?request=GetObservation&service=SOS&version=1.0.0&responseFormat=text%2Fxml%3B%20subtype%3D%22om%2F1.0.0%22&offering=urn:tds:station.sos:8771510&procedure=urn:tds:station.sos:8771510&observedproperty=Pred_6&eventtime=2008-09-08T00:30:00Z/2008-09-16T00:00:00Z

Initial development as part of Coastal Ocean Modeling Testbed project by ASA (Applied Science Associates) (testbed.sura.org)

Services above are in beta, contact Kyle if they aren't live when you visit.

52North.org: SOS-T

Designed for RDBMS back end systems.

Full SOS transactional profile (includes RegistorSensor, InsertObservation)

Out of the box load capability for many “national backbone” observing systems (via the transactional profile)

http://code.google.com/p/ioostech/wiki/SOS52North

What do we mean by interoperable data services (in situ)?

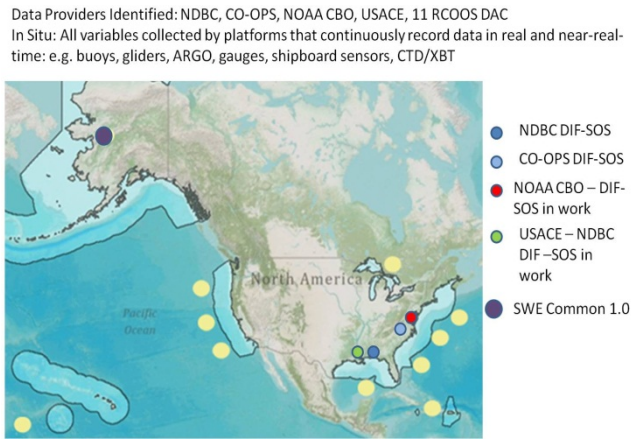
IOOS PO Priorities

- SOS (SWE milestone 1.1) Implementation at 11 regions
- Increase in # regional data sets registered in Service Registry (Geoportal) and visualized in Data Catalog
- Data Catalog updates and automation of obs asset inventory
- Assess and prepare for SOS v2.0
- Biological observations: What does DMAC Biology Services actually mean?

Challenges

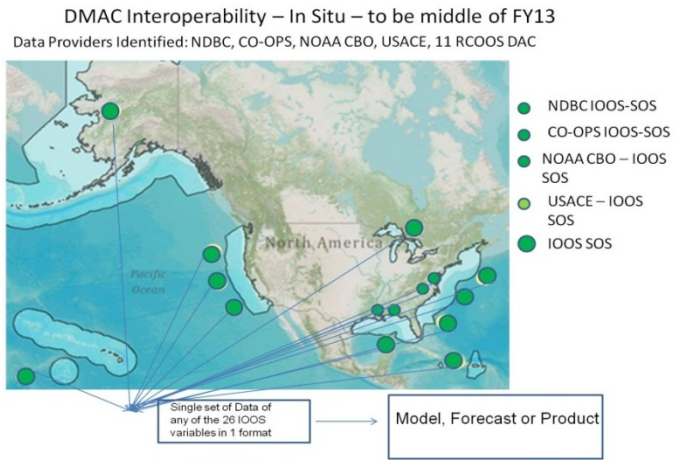
- Open Source!!! We need to encourage developers working on NOAA issues to utilize Open Source tools and technologies as they develop, not just as they consume.
- Data Catalog standards/software lag behind service registry standards. We want more sophisticated queries that reveal resources about platforms, not just high level data set information.
- Standards landscape is more sophisticated than any one group or developer can effectively track. Code sharing is great but is it enough? (training, outreach, other means of communication)

Recent and near term efforts will lower the barrier of entry for every region deploying SOS services



- Early adoption ➔ immature standard
- No commercial server options ➔ Build your own, or use developmental code with poor support
- Encoding standards were complex and poorly documented

- 52North.org port supporting IOOS format
- ncSOS THREDDS plugin
- Simplified encoding format with direct translation to netCDF



By Jan 2013

	SOS			DAP	ERD-DAP	Services in Registry
RA/Partner	**52North**	**ncSOS**	**Other**			
AOOS						
CaRA						
CeNCOOS						
GCOOS						
GLOS						
MARACOOS						
NANOOS						
NERACOOS						
PacIOOS						
SCCOOS						
SECOORA						

What do we mean by integration?

COM
CPD
CRE
CRM
DCP
DSL
EVG
GLR
ICO
IMO
LIM
LOP
LSU
LUM
MAK
MAR
MBA
MYS
MTU
NEA
NEQ
NER
NOS
NWA
NWC
NWE
ORC
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PRS
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UHI
UMI
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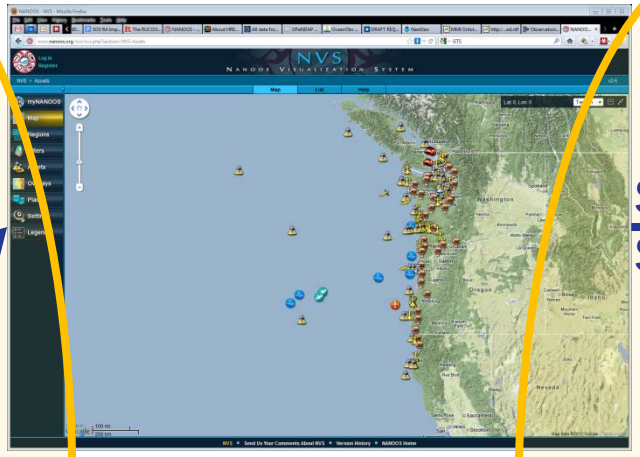
Individual agreements

Individual agreements

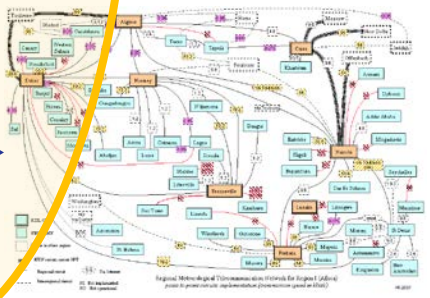


IOOS Regional Association
1 of 11

Std Web Services

National Oceanic and Atmospheric Administration
National Data Buoy Center
Center of Excellence in Marine Technology

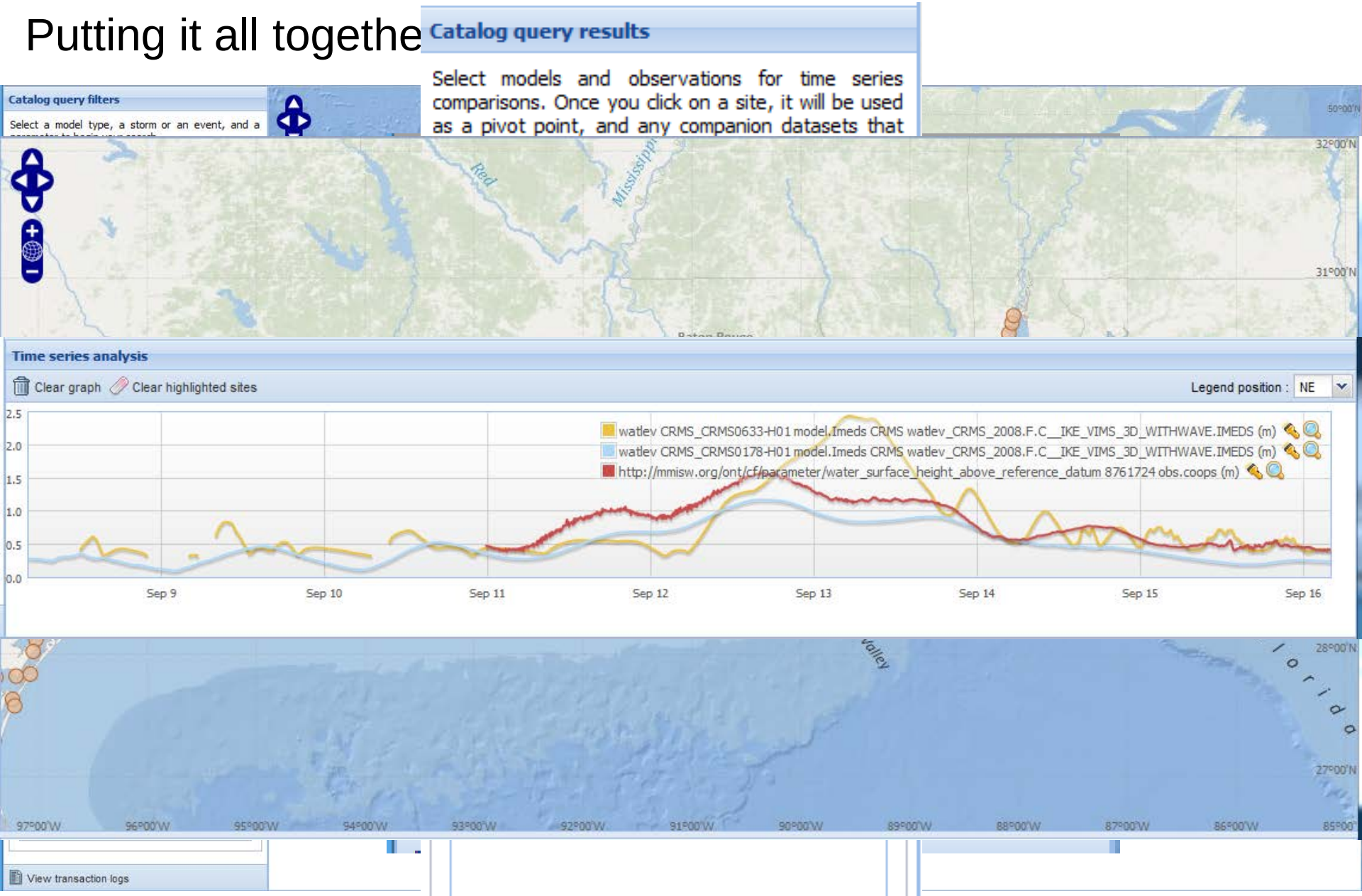
WMO Codes



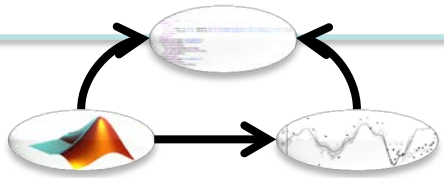
GTS

http://nvs.nanoos.org shown above, is one of eleven RAs and integrates 167 assets from Federal, Tribal, State, County, University and Commercial organizations as well as international partners.

Putting it all togethe

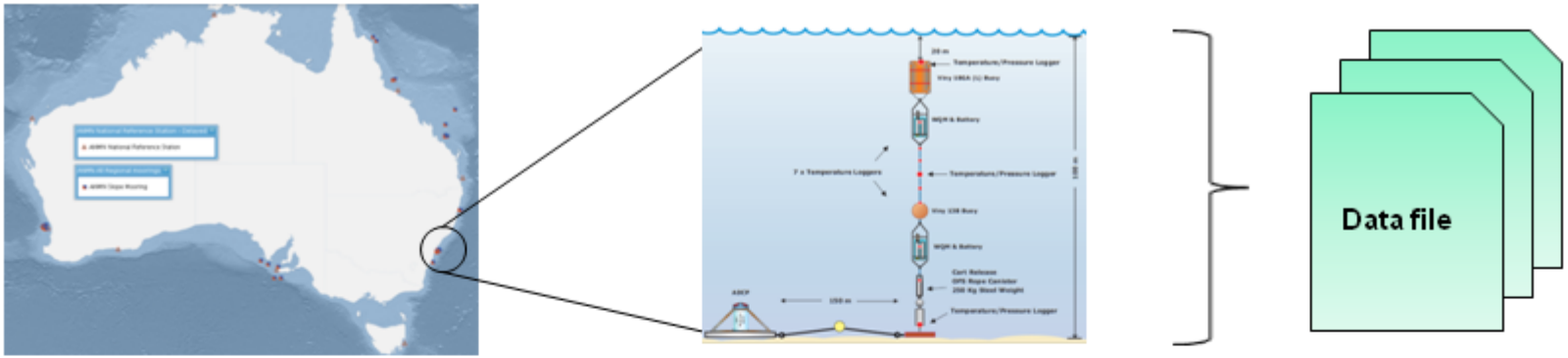


Software as the deliverable, advances the technologies faster than pilot projects.

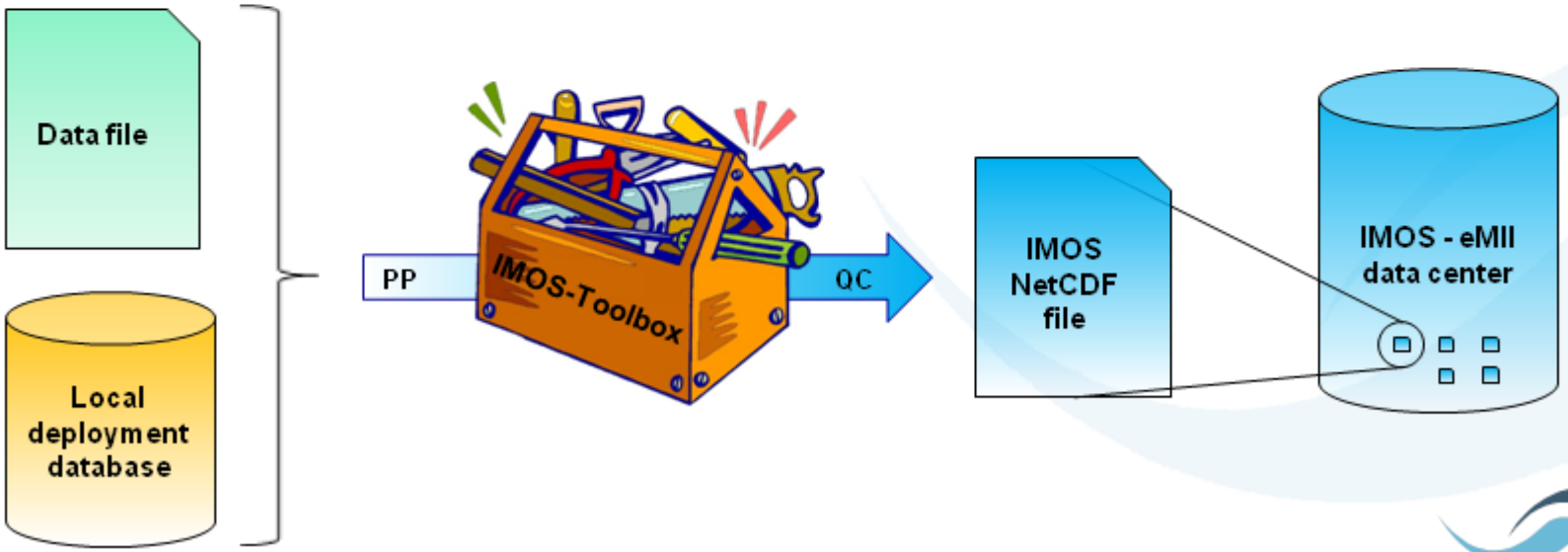


- nctoolbox - http://code.google.com/p/nctoolbox
- 52North SOS - https://github.com/axiomalaska/52north-sos
- ncSOS - https://github.com/asascience-open/ncSOS
- SOS Parser - http://code.google.com/p/oostethys/source/browse/#svn%2Ftrunk%2Fcomponent%2Fclient%2Fjavascript
- ncISO - http://www.ngdc.noaa.gov/eds/tds/
- Environmental Data Connector - http://www.pfeg.noaa.gov/products/edc/
- pyoos - https://github.com/asascience-open/pyoos
- NetCDF Java Library – Unstructured - https://github.com/asascience-open/NetCDF-Java-UGRID

NOTE: IOOS did not fully support any one of these software development efforts, but by leveraging open source tools some of the integration objectives have been achieved



Convert data files from ANMN sensors to IMOS NetCDF QC'd files



http://code.google.com/p/imos-toolbox/