Key Interoperability Standards for Earth Science Research and Applications

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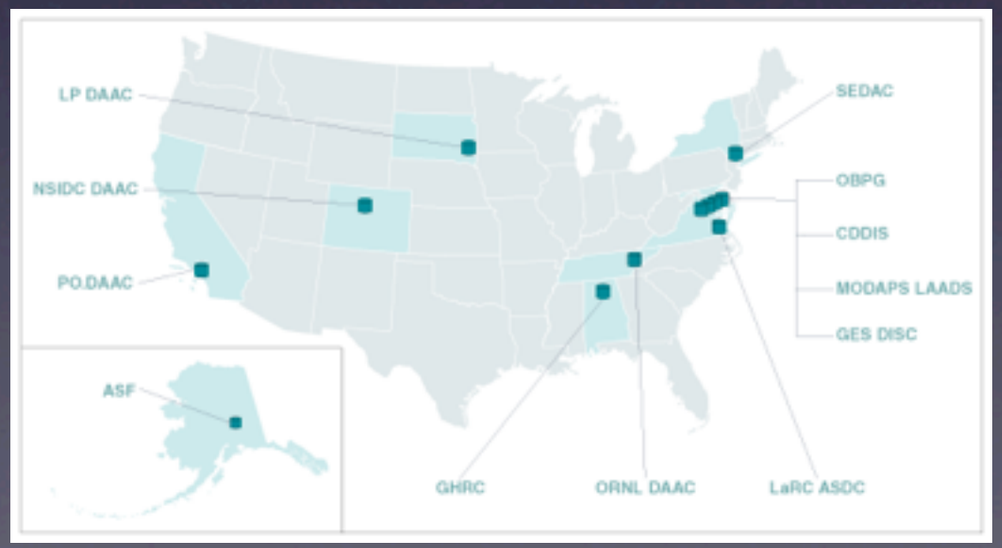
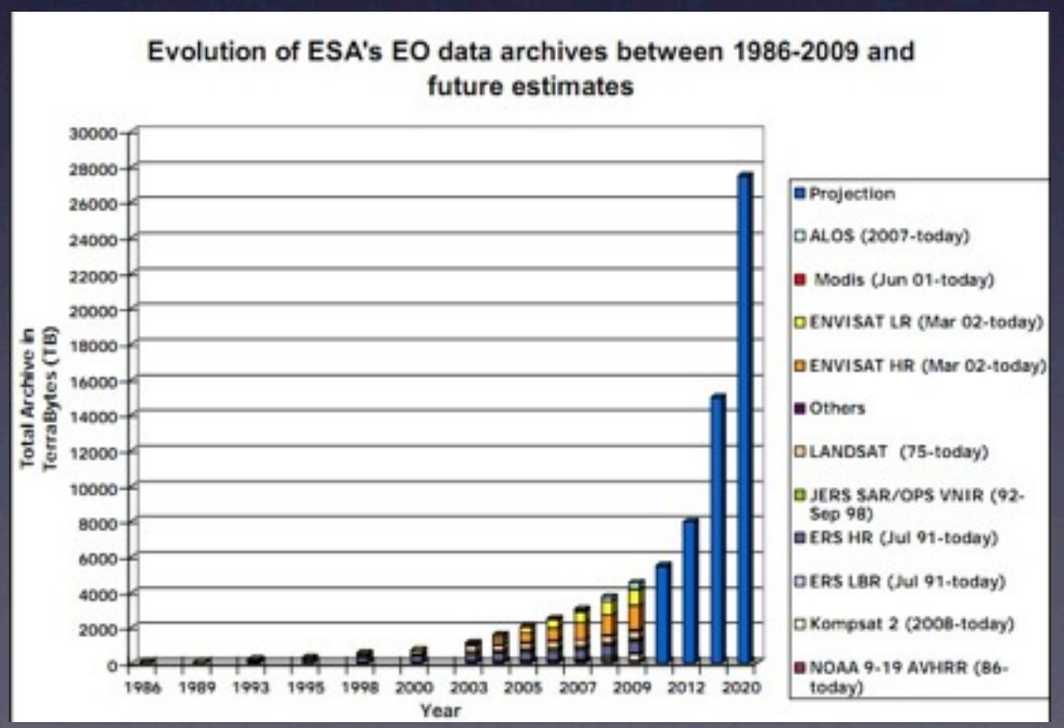
The Challenge

- Earth observation systems continuously generate massive volumes of data, with no single access point for those data
- How do potential users discover, access, and use those data?

Distribution of NASA's 12 DAACs



http://nasadaacs.eos.nasa.gov/about.html



From: Mirko Albani & Vincenzo Beruti (2010) "Long Term Preservation of Earth Science data: activities in Europe and Earth Observation LTDP common guidelines" Presentation at the FIRST/LTDP Workshop,

Meeting the Challenge

- Documentation (metadata) for discovery and use
- Accessibility in useful formats and volumes (i.e. file sizes)
- Availability and Integration into existing tools and workflows

Documentation

(metadata)

Metadata
ISO 19115 (UML)
ISO 19115-2 (RS Extensions)
ISO 19139 (XML)

Search
OGC Catalog Services

Harvesting
OAI-PMH

GEO GROUP ON EARTH OBSERVATIONS

nbii

fgdc FederalGeographicDataCommittee

Global Change Master Directory
Discover Earth science data and services

geodata.gov U.S. MAPS & DATA

UNEP

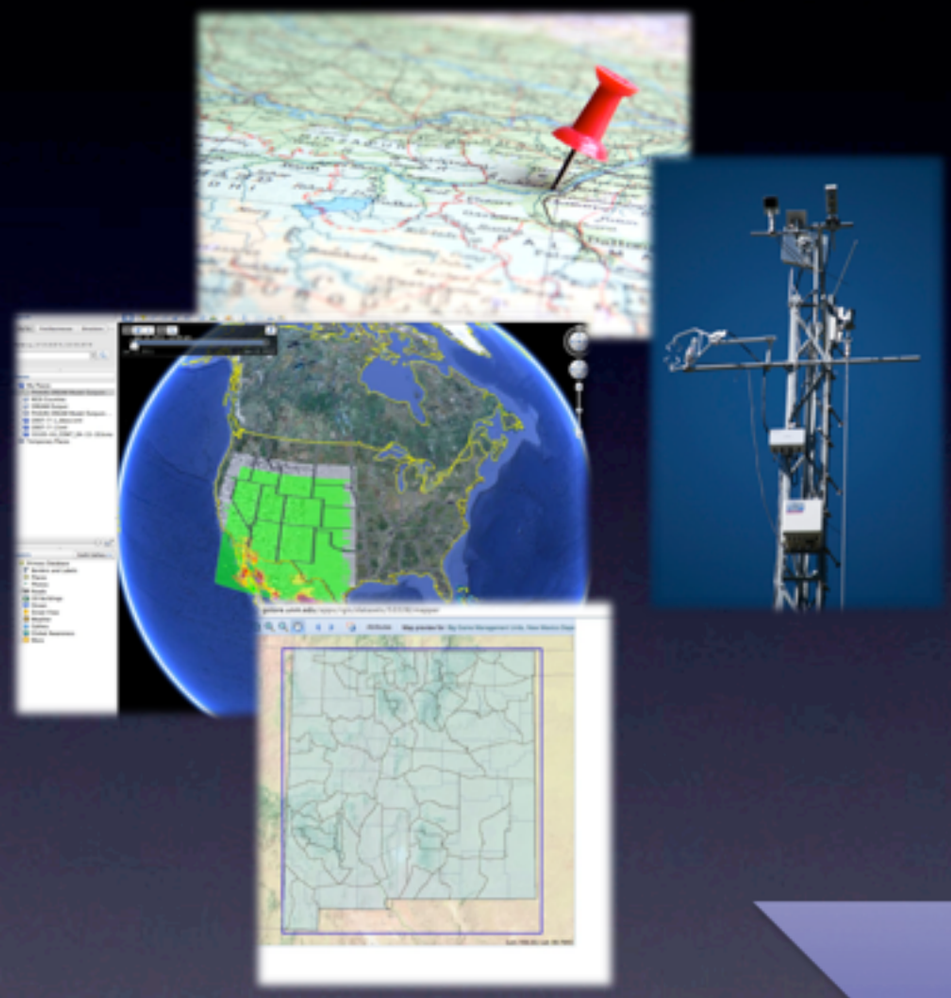
HIC

FAO FIAT PANIS

And many

Discovery → Access → Use

Access



Visualization
OGC WMS

Data
OGC WFS
OGC WCS
OGS SWE*
OPeNDAP

General (Processing/ Access/Discovery)
REST (HTTP [IETF])

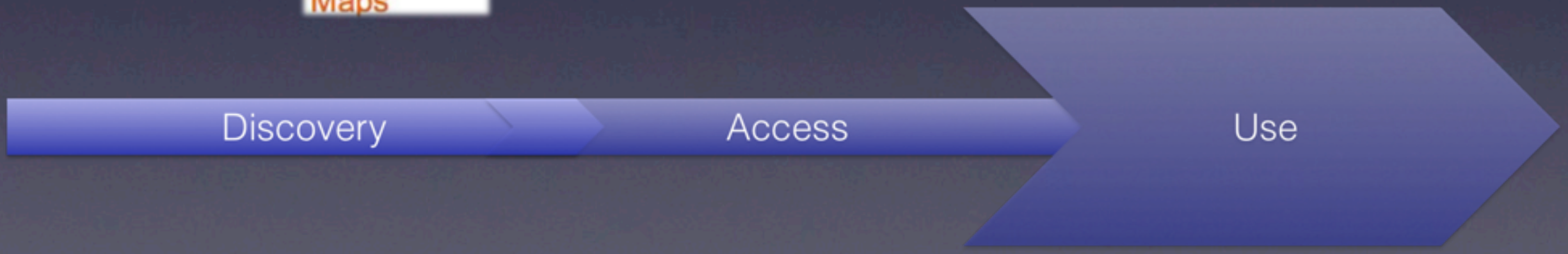
CSV
HDF
XML
NetCDF
KML
GeoTIFF
XLS

Discovery → Access → Use

Use

Desktop Applications
Statistical Analysis Tools
Geographic Information Systems
Modeling Systems

Online Applications
Online Mapping Apps
Interactive Analytic Tools



Conclusions

- The ongoing explosion of Earth Science data requires the development of integrative capabilities across distributed data sources
- These capabilities can be provided through the broad adoption and use of open interoperability standards for discovery, access, and use
  - ISO, OGC and OAI standards for metadata and catalog services
  - OGC, Web (W3C & IETF), and OPeNDAP for data visualization, access and processing
  - Implementation of these standards within the tools commonly used in Earth Science research and applications.

Online Resources

- ISO 19115: http://www.iso.org/iso/catalogue_detail.htm?csnumber=26020
- ISO 19115-2: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=39229
- ISO 19139: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=39229
- OGC Cat: http://www.opengeospatial.org/standards/cat
- OAI-PMH: http://www.openarchives.org/pmh/
- OGC WMS: http://www.opengeospatial.org/standards/wms
- OGC WFS: http://www.opengeospatial.org/standards/wfs
- OGC WCS: http://www.opengeospatial.org/standards/wcs
- OGC SWE: http://www.opengeospatial.org/standards/swes
- OPeNDAP: http://www.opendap.org/
- W3C SOAP: http://www.w3.org/TR/soap/
- REST Service Model (based upon IETF HTTP): http://en.wikipedia.org/wiki/Representational_State_Transfer