ECHO System and Data Model Overview

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Coordinating NASA’s Earth Observing System

- NASA’s Earth Observing System (EOS)
  - Mission is to collect Earth remote sensing data for global change research program

- NASA’s Earth Observing System Data and Information System (EOSDIS)
  - A petabyte-scale archive of environmental data that supports global climate change research
  - Designed to receive, process, distribute and archive several terabytes of science data per day
  - Provides a distributed information framework supporting EOS investigators and other users
  - Open Data Policy – Data are openly available to all and free of charge except where governed by international agreements
  - By having open application layers to the EOSDIS framework, we allow many other value-added services access to NASA’s vast Earth Science Collection
  - Interoperates with data archives of other agencies and countries
Extensive Data Collection

- NASA’s Earth Observing Satellites (EOS) monitor daily events and long term environmental changes
- EOSDIS data collection includes over 3,500 data types
  - **Land**
    - Cover & Usage
    - Surface temperature
    - Soil moisture
    - Surface topography
  - **Atmosphere**
    - Winds & Precipitation
    - Aerosols & Clouds
    - Temperature & Humidity
    - Solar radiation
  - **Ocean Dynamics**
    - Surface temperature
    - Surface wind fields & Heat flux
    - Surface topography
    - Ocean color
  - **Cryosphere**
    - Sea/Land Ice & Snow Cover
  - **Human Dimensions**
    - Population & Land Use
    - Human & Environmental Health
    - Ecosystems
Distributed Centers of Expertise

Data centers are collocated with centers of science discipline expertise in order to provide the best support for the user community.
ECHO Architecture

- ECHO is NASA’s middleware layer between Earth science data and users via a service-oriented architecture. Designed to improve the discovery and access of NASA data.

- Acts as an order broker between end users and EOSDIS Data Centers who provide metadata for their data holdings and other Earth science-related data holdings.

- User-defined specialized “clients” can be easily developed to give science data users of their community access to data and services using ECHO’s open APIs.

Developed as a part of NASA’s core data systems but fully adaptable to the needs/requirements of science communities.

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Next Generation Client - REVERB

- Reverb is the primary web-based client for discovering and ordering cross-discipline data from all of ECHO’s metadata holdings.
- Reverb allows users, including those without specific knowledge of the data, to search science data holdings, retrieve high-level descriptions of data sets and detailed descriptions of the data inventory, view browse images, and submit orders via ECHO to the appropriate data providers.
- Users are able to submit queries using spatial and temporal criteria and examine search results for relevancy using built-in tools.
- Exposes the ECHO service registry with relevant ECHO metadata

http://reverb.echo.nasa.gov/reverb
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METADATA CONCEPTS
Some Definitions

Providers – DAACs and other Data Hosts

Collections – groups of related granules or ISO datasets; defines common attributes about the granules.

Granules – individual spatial or temporal data elements (ISO datasets)

Resources – Anything referenced by granules or collections. Format specific. For example, browse metadata is a resource.
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DATA FLOW
REST API

- Searching
- Ordering

Multi-format Retrieval
- ECHO10
- JSON
- ISO 19115

ECHO Catalog

Direct Clients

ESIP OpenSearch

Mirador Giovanni ...

Reverb

Client Data Retrieval
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USAGE METRICS
• **Data Metrics Weekly Activity Metrics**
  • >99.9% Uptime
  • 2TB Data Index covering PBs of data

• Current Public Holdings:
  • Collections: 2798
  • Granules: 105 million
  • Growing by ~100k granules/week

• Other Fun Facts
  • 60K+ registered users, utilizing EOSDIS URS
  • 12 Active Data Partners
  • 34 million ECHO hosted Browse Images
  • 11 Operational Clients
  • Several Clients in Test & Evaluation
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ENGAGEMENT AND FUTURE WORK
Embracing Change

We understand that ECHO’s data formats won’t work for everyone.

That’s OK.

- Format Translators
- Format Indexers
- Retaining Pristine Format
- Validation/Verification Flexibility

Credit: FreeDigitalPhotos.net
Current Limitations (Future Opportunities)

• ISO 19115 is based on a snapshot
• Future Mission Planning: SMAP
• Validation is going to be a challenge, looking forward for collaboration and guidance
• Services Integration
QUESTIONS?

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