CDDIS Data Center: An Update

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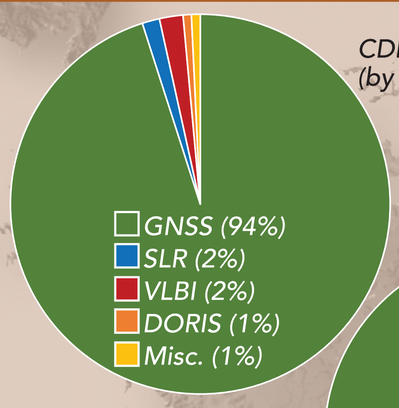
CDDIS
Crustal Dynamics Data Information System

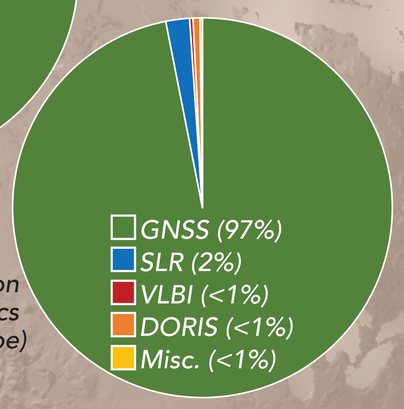
Abstract: The Crustal Dynamics Data Information System (CDDIS) supports data archiving and distribution activities for the space geodesy and geodynamics community. The archive consists of laser ranging, GNSS, VLBI, and DORIS data sets and products derived from these data. The CDDIS data system is a key component in several of the operational services within the International Association of Geodesy (IAG) and the Global Geodetic Observing System (GGOS), including the ILRS, the International GNSS Service (IGS), the International VLBI Service for Geodesy and Astrometry (IVS), and the International DORIS Service (IDS), as well as the International Earth Rotation and Reference Systems Service (IERS). With the influence of space geodesy data and their derived products in scientific studies over the last decade, CDDIS has seen its ingest volume explode to over 30 million files per year or more than one file per second from over hundreds of simultaneous data providers. In order to accommodate this increase and to streamline operations, CDDIS has recently performed a significant computer system upgrade requiring updates to the data upload and distribution architecture. This poster will include background information about the system and its user communities, archive contents, and information about these updates and enhancements to the CDDIS.

CDDIS Overview

- Crustal Dynamics Data Information System (CDDIS) is NASA's active archive of space geodesy data, products, and information (Global Navigation Satellite System/GNSS, Satellite Laser Ranging/SLR, Very Long Baseline Interferometry/VLBI, and Doppler Orbitography and Radio-positioning Integrated by Satellite/DORIS)
- CDDIS is one of 12 Distributed Active Archive Centers (DAACs) within NASA's Earth Observation System Data and Information System (EOSDIS)
- CDDIS is viewed as a key component of the IAG and its geometric services
- CDDIS has extensive partnerships through the IAG serving as one of the primary data centers for the geometric services and its observing system, GGOS (Global Geodetic Observing System)
  - + International GNSS Service (IGS)
  - + International Laser Ranging Service (ILRS)
  - + International VLBI Service for Geodesy and Astrometry (IVS)
  - + International DORIS Service (IDS)



CDDIS archive size (by data type)



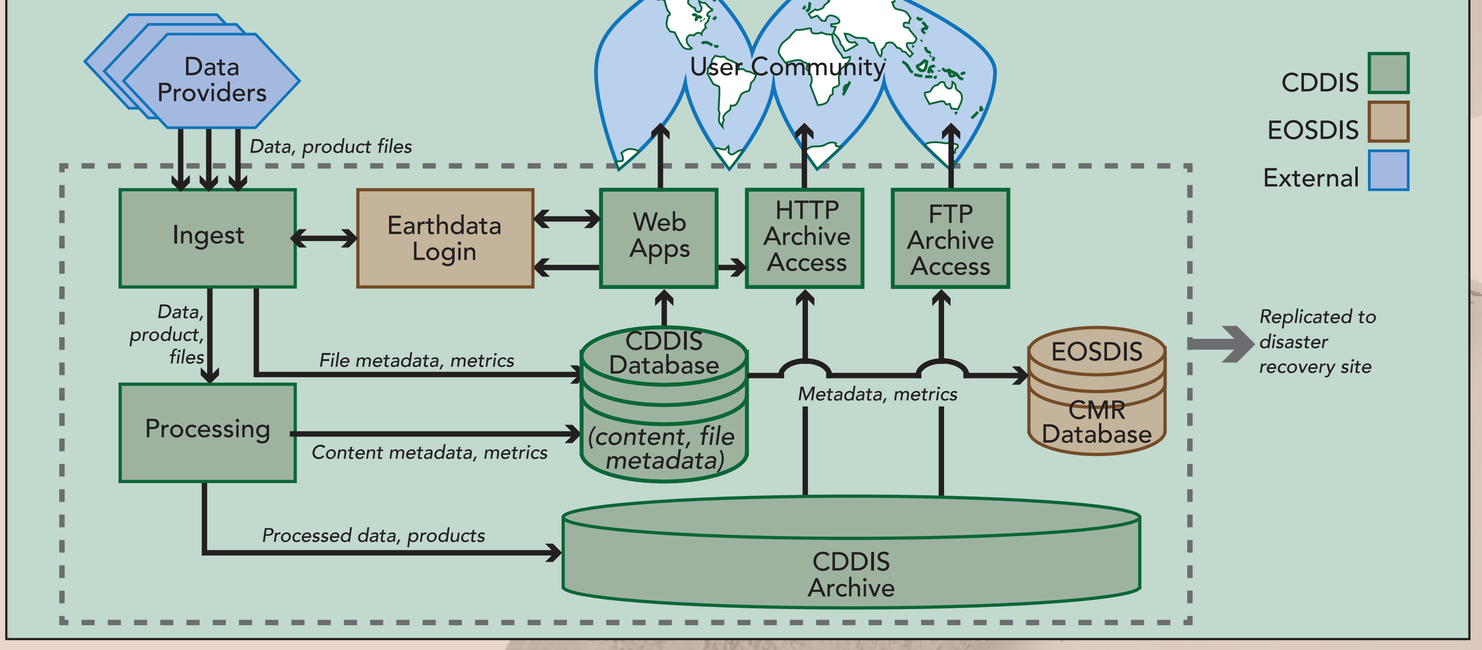
CDDIS distribution statistics (by data type)

What's New?

System Facilities/Architecture Improvements:

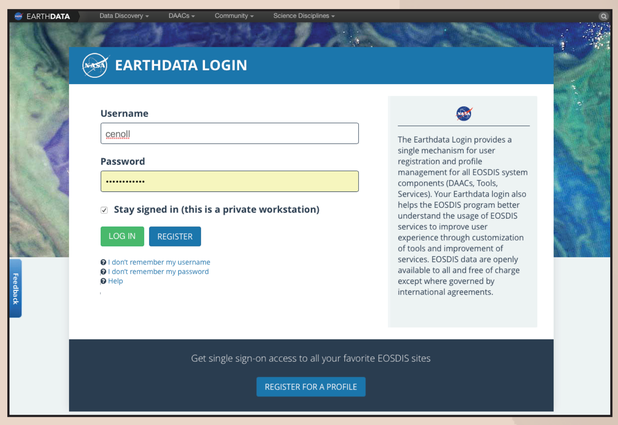
- Over the past 7 years CDDIS has experienced double-digit growth culminating in over 1.2B downloads and over 130Tb of data transferred in 2015
- On track to exceed 1.5B files and 180Tb in 2016
- Upgraded hardware procured and installed in new location providing better infrastructure (power, network connectivity, etc.)
  - + IT infrastructure designed for 4 "nines" uptime
  - + Multiple redundant 40Gb networks directly connected to the Internet
  - + New system implemented with virtual machine architecture for reliability and expandability
  - + Both production and disaster recovery (DR) systems located at different buildings at GSFC
  - + Unified storage across both production and DR systems
  - + File processing software re-designed for more efficient operations and additional QC

New CDDIS system architecture



New File Upload Procedure:

- Because of NASA security restrictions, CDDIS can no longer use non-secure FTP for file uploads from data providers
- New, upgraded system was designed to use HTTP protocol for file upload
- Implemented both web and command line interfaces
  - + Web interface for simple, interactive uploads
  - + Command interface for bulk uploads and scripting; users can make simple modifications to existing scripts for uploads to the new system
- cURL is the supported program for command line access but any program that can do HTTP GET and POST is usable
- Sample code (Java, bash) provided for bulk uploading and scripting
- New system uses EOSDIS Earthdata login
- Users must first register with EOSDIS to obtain a user ID for access to upload system
- For more information: *http://cddis.gsfc.nasa.gov/Data_and_Derived_Products/CDDIS_File_Upload_Documentation.html*



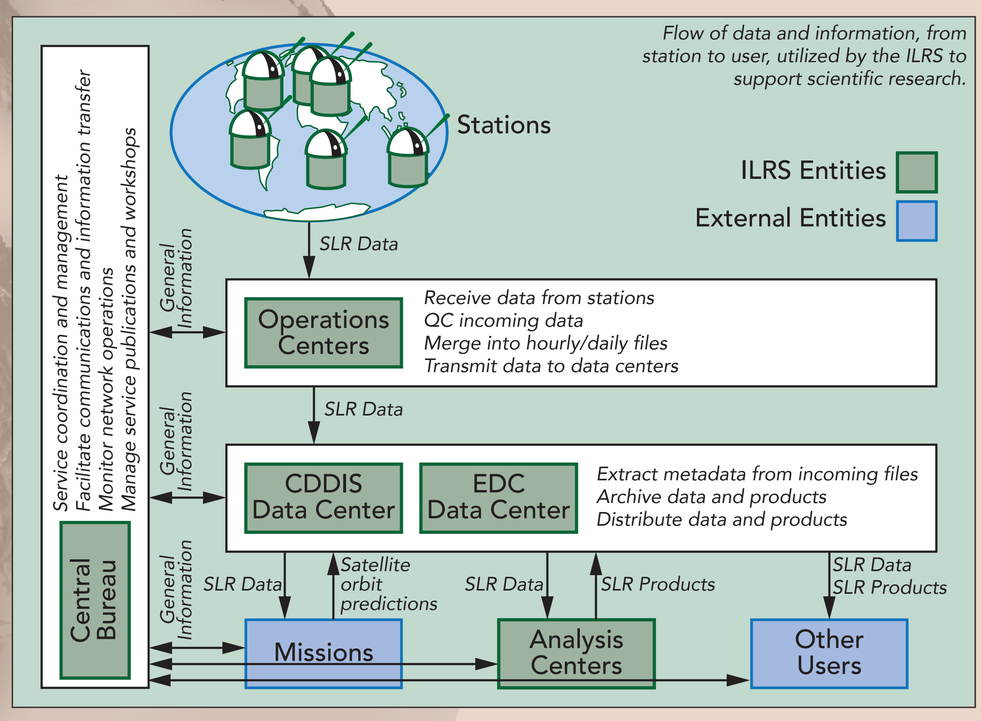
Earthdata login interface: Used to register and access file upload application (as well as CDDIS real-time GNSS streaming system)

File upload application for interactive upload of files

```
[/home/user]$ curl -c .urs_cookies -n -L http://depot.cddis.eosdis.nasa.gov/CDDIS_FileUpload/login/
Welcome to CDDIS File Upload
[/home/user]$ curl -X POST -b .urs_cookies -F "fileType=SLR" -F "fileContentType=products" -F "file[]=@ilrsa.eop.160901.v135.snx.Z"
http://depot.cddis.eosdis.nasa.gov/CDDIS_FileUpload/upload/
Successful upload: ilrsa.eop.160901.v135.snx.Z
Successfully uploaded 1 files, out of 1 attempted
```

Command line program example using cURL for scripted uploads

Supporting the ILRS

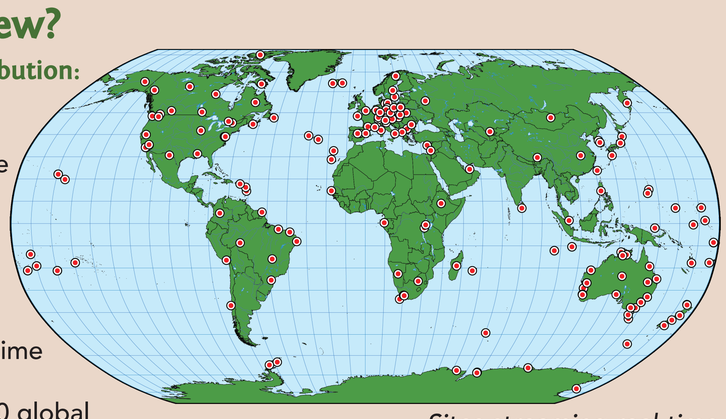


- **Network Stations:** continuous operation with timely flow of data to operations centers
- **Operations Centers:** interface to stations and perform data quality control and conversion to standard formats
- **Data Centers:** receive, archive, and distribute station data from operations centers and derived products from Analysis Centers
- **Analysis Centers:** generate derived products (e.g., station coordinates, precise satellite orbits, etc.)
- **Central Bureau:** manages service, coordinates activities at all levels, facilitates communication (e.g., website, mailing lists, etc.)
- **Governing Board:** general oversight of service, provide future direction

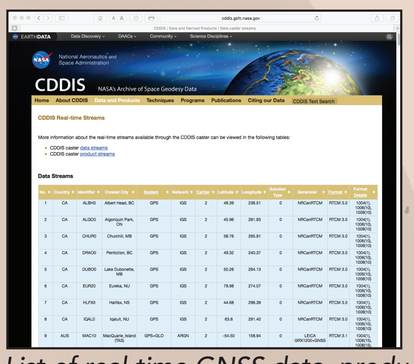
What Else Is New?

Real-Time GNSS Distribution:

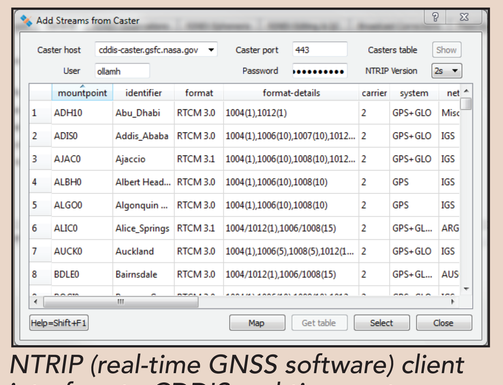
- CDDIS now operationally streaming real-time GNSS data and derived products in support of the IGS Real-Time Service (RTS)
- One of three real-time "casters"
- Data from over 250 global sites and 30 derived product steams
- Expanding to include additional streams
- Real-time system also uses EOSDIS Earthdata login
- Users must first register with EOSDIS to obtain a user ID for access to real-time GNSS caster



Sites streaming real-time GNSS data thru CDDIS caster



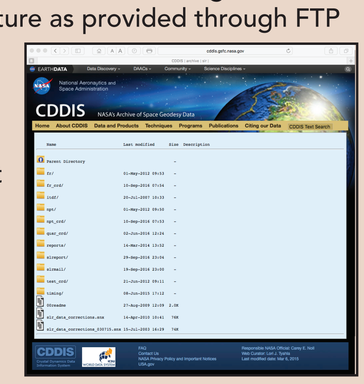
List of real-time GNSS data, product streams available thru CDDIS caster



NTRIP (real-time GNSS software) client interface to CDDIS real-time caster

What's Up Next?

- All web activities will transition fall 2016 to HTTPS per U.S. government policy
- HTTPS access to CDDIS archive
  - + Archives and users continue to move away from using FTP
  - + Therefore, CDDIS will implement access to it's full archive through HTTP
  - + HTTPS access will continue to use same structure as provided through FTP
  - + HTTPS access is as efficient as FTP transfer without the firewall/router issues of FTP
  - + Earthdata login (see left and above) will be used for access through HTTPS
  - + FTP access to CDDIS archive will continue but users are encouraged to explore HTTPS capabilities
- Improvements to CDDIS Site Log Viewer
  - + Automated ingest to reflect site log updates
  - + Link metadata to other applications
- Improvements to CDDIS operations
  - + Streamlining archive operations across data types
  - + Improved metadata for archive operations and data discovery



More Information/Feedback

- Data and products are acquired as part of NASA's Earth Science Data Systems and archived and distributed by the Crustal Dynamics Data Information System (CDDIS):
  C. Noll, The Crustal Dynamics Data Information System: A resource to support scientific analysis using space geodesy, Advances in Space Research,Volume 45, Issue 12, 15 June 2010, Pages 1421-1440, ISSN 0273-1177, DOI: 10.1016/j.asr.2010.01.018.
- The staff welcomes feedback on the CDDIS; contact Carey Noll (Carey.Noll@nasa.gov)

International Laser Ranging Service
IGS INTERNATIONAL GNSS SERVICE
IVS
IDS
IAG
IAG GGOS
EPS
ICSU WORLD DATA SYSTEM
EOSDIS

CEN 10/0/2016