

An Update on the CDDIS

Abstract: The Crustal Dynamics Data Information System (CDDIS) supports data archiving and distribution activities for the space geodesy and geodynamics community. The main objectives of the system are to store space geodesy and geodynamics related data products in a central data bank, to maintain information about the archival of these data, and to disseminate these data and information in a timely manner to a global scientific research community. The archive consists of GNSS, laser ranging, VLBI, and DORIS data sets and products derived from these data. The CDDIS is one of NASA's Earth Observing System Data and Information System (EOSDIS) distributed data centers; EOSDIS data centers serve a diverse user community and are tasked to provide facilities to search and access science data and products.

The CDDIS data system and its archive have become increasingly important to many national and international science communities, in particular several of the operational services within the International Association of Geodesy (IAG) and its project the Global Geodetic Observing System (GGOS), including the International DORIS Service (IDS), the International GNSS Service (IGS), the International Laser Ranging Service (ILRS), the International VLBI Service for Geodesy and Astrometry (IVS), and the International Earth Rotation Service (IERS).

The CDDIS has recently expanded its archive to support the IGS Multi-GNSS Experiment (MGEX). The archive now contains daily and hourly 30-second and sub-hourly 1-second data from an additional 35+ stations in RINEX V3 format. The CDDIS will soon install an Ntrip broadcast relay to support the activities of the IGS Real-Time Pilot Project (RTPP) and the future Real-Time IGS Service. The CDDIS has also developed a new web-based application to aid users in data discovery, both within the current community and beyond. To enable this data discovery application, the CDDIS is currently implementing modifications to the metadata extracted from incoming data and product files pushed to its archive.

This poster will include background information about the system and its user communities, archive contents and updates, enhancements for data discovery, new system architecture, and future plans.

Data Discovery Developments

Current access methods:

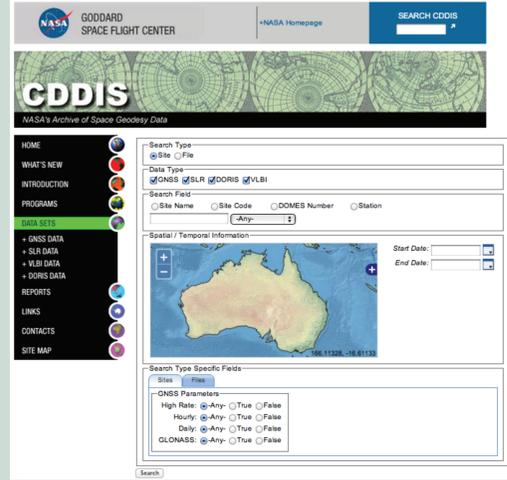
- The CDDIS contains data and derived products from over 1500 observing sites located at about 1000 locations around the world, going back in time as far as 1975.
- The archive is updated with new data/product files on varying time scales, dependent on the data type, from a sub-daily basis to monthly basis.
- The majority of CDDIS user community are analysts supporting the services within the IAG that produce derived products (e.g., positions of observing stations, Earth orientation parameters, precise satellite orbits, etc.) for use by a broader scientific community.
- Users require continuous access to data for generation of products on pre-determined schedules.
- The average user of the CDDIS accesses the contents of the archive through anonymous ftp by means of automated scripts executed on predefined schedules (typically sub-daily).
- Analysts can use this method for data transfer because they are familiar with the structure of the online archive and thus know what files they require, their availability schedule, and where to find them within the online structure.

Development:

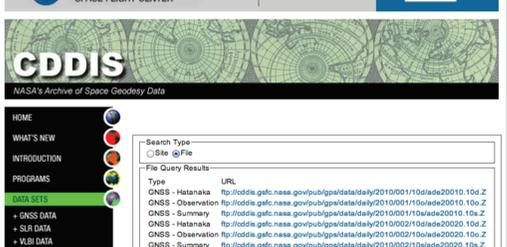
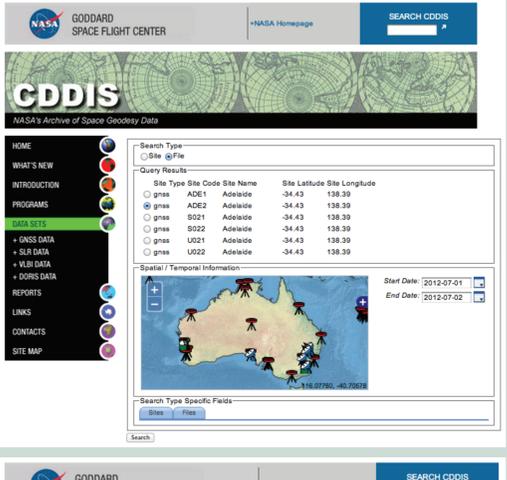
- SIO/SOPAC, UNAVCO, and CDDIS data centers are participating in an effort to modernize the GSAC (now GSAC-WS, the Geodesy Seamless Archive Center - Web Services) through a NASA ACCESS (Advancing Collaborative Connections for Earth System Science) proposal "Discovery and Delivery of Space Geodetic Data Products from Distributed Archives"
- The ACCESS team has developed the GSAC Service Layer (GSL), a Java-based application that is used at each repository (CDDIS, UNAVCO, SOPAC) to interface to the data center-developed GSAC Repository Implementation. The GSL is a middleware framework that provides different types of output (HTML, XML, wget scripts, etc.) from the data repository metadata databases. The GSL handles the incoming web service requests and routes it to the repository. A federated Repository Implementation has been developed that allows for an aggregate search across all repositories.
- The CDDIS has developed a custom interface, tailored to CDDIS user requirements, through its own GSAC Repository client based on an open source application framework. This application currently interacts with the GSL for both Site and File searches. This custom interface allows CDDIS to leverage the capabilities of the GSL while providing an interface tailored to CDDIS users. Parts of this interface could eventually be made more generic and rolled into the GSL.

Data Discovery Enhancements:

- New users of the CDDIS, both those familiar with space geodesy techniques as well as new research communities, would prefer a browsing interface to the archive contents.
- Furthermore, users also need to browse the archive for new or historic data sets.
- Therefore, the CDDIS has designed a web interface based search tool that queries the CDDIS metadata.
- Users have the ability to specify search criteria based on temporal, spatial, target, site designation, and/or observation parameters in order to identify data and products of interest for download.
- Results of these queries will include a listing of sites (or other metadata) or data holdings satisfying the user input specifications.
- Develop a search/metadata interface tool for CDDIS to:
 - Aid users in discovery of CDDIS data, products, and information
 - Aid staff in archive management
 - Promote CDDIS data holdings to a larger community (e.g., through metadata standards)
- Specify (any/all):
 - Temporal: Year, date/time, range
 - Spatial: Region, lat/lon, range
 - Target: Satellite (SLR, DORIS)
 - Designation: Station name/number/code
 - Parameter: Receiver type (GNSS), event timer (SLR), antenna type (GNSS, VLBI), ...
- Results:
 - List of sites satisfying specifications
 - List of data holdings satisfying specifications
 - Metadata relevant to selection



Above left: User selects "Site" as the search type and queries for all GNSS, SLR, VLBI, and DORIS sites in the Australian area.



Carey Noll/NASA GSFC (Carey.Noll@nasa.gov)
 Patrick Michael/Catholic University of America (Patrick.Michael@nasa.gov)
 Maurice Dube/SSAI (Maurice.P.Dube@nasa.gov)
 Nathan Pollack/SSAI (nathan.pollack@saihq.com)

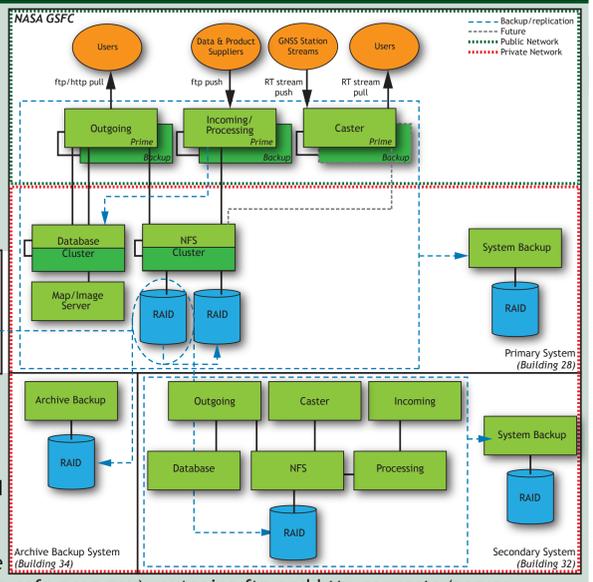
NASA Goddard Space Flight Center
 Code 690, Greenbelt, MD 20771
 USA



New CDDIS System Architecture

On May 09, 2012 CDDIS operations were transferred to new server environment. Although the new servers continue to utilize a distributed configuration for the CDDIS, other functions were further distributed for more efficient operations:

- outgoing servers: handle all web and ftp traffic
- incoming servers: accept transfers from authorized data suppliers
- database cluster: handles database for metadata management (internal), data transfer logs (internal), data discovery (external)
- processing/NFS server: archive processing and NFS access to RAID array
- caster server: provide real-time streams to authorized clients

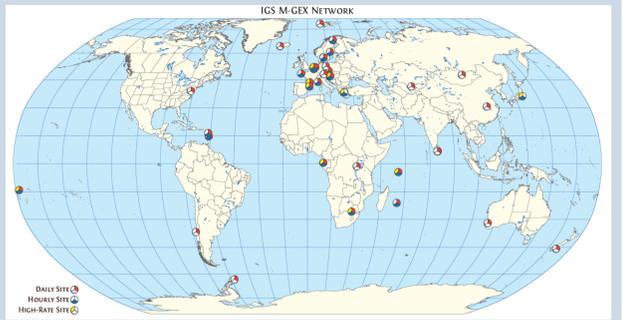


This new configuration allows for efficient and timely processing of incoming files as well as enhanced system reliability by separating user/archive functions. Distinct servers handle incoming data and product files (server cddis-in.gsf.nasa.gov), outgoing ftp and http requests (server cddis-out.gsf.nasa.gov), real-time caster (server cddis-caster.gsf.nasa.gov), and archive operations to the RAID storage.

- The new system is fully redundant with backup servers/clusters which can take over operations should a failure occur with the prime server. A secondary system installed in a second location at GSFC can accommodate CDDIS operations should the prime server be offline for an extended period of time. Both primary and secondary systems have backup systems.
- The archive is equipped with a multi-Tbyte RAID storage system and is scaled to accommodate future growth. The CDDIS archive increases in size by approximately 12 million files/1 Tbyte per year; the existing storage will accommodate the archive requirements for the near future.
- Additional archive backups are made to both local and off-site disk arrays.
- The cut over to the new system was accomplished with minimal downtime (3 hours for data download, 10 hours for data receipt)

MGEX Support

The CDDIS is one of three IGS data centers supporting the IGS Multi-GNSS Experiment (MGEX). Following a successful proposal to the IGS MGEX CfP, the CDDIS expanded its data archive and distribution service to include data from participating multi-GNSS receivers, products derived from the analysis of these data, and any required metadata for the experiment. The archive now contains daily and hourly 30-second and sub-hourly 1-second data from an additional 40+ stations in RINEX V3 format. The CDDIS developed software to extract metadata from the RINEX headers for use in reporting (see figure) and archive management. The software is also used to generate daily status files (see figure) similar to those provided in the CDDIS IGS operational directories. However, data quality information, as produced by teqc, is not available through this software.



- The MGEX data are available within the campaign subdirectory structure in the CDDIS archive: <ftp://cddis.gsf.nasa.gov/gnss/data/campaign>
 - Daily 30-second files:
 - [/gnss/data/campaign/mgex/daily/rinex3/YYYY/ddd/YYT](ftp://gnss/data/campaign/mgex/daily/rinex3/YYYY/ddd/YYT)
 - [/gnss/data/campaign/mgex/daily/rinex2/YYYY/ddd/YYT](ftp://gnss/data/campaign/mgex/daily/rinex2/YYYY/ddd/YYT)
 - [/gnss/data/campaign/mgex/daily/raw/YYYY/ddd/YYT](ftp://gnss/data/campaign/mgex/daily/raw/YYYY/ddd/YYT)
 - Hourly 30-second files:
 - [/gnss/data/campaign/mgex/hourly/rinex3/YYYY/ddd/HH/YYT](ftp://gnss/data/campaign/mgex/hourly/rinex3/YYYY/ddd/HH/YYT)
 - [/gnss/data/campaign/mgex/hourly/rinex2/YYYY/ddd/HH/YYT](ftp://gnss/data/campaign/mgex/hourly/rinex2/YYYY/ddd/HH/YYT)
 - [/gnss/data/campaign/mgex/hourly/raw/YYYY/ddd/HH/YYT](ftp://gnss/data/campaign/mgex/hourly/raw/YYYY/ddd/HH/YYT)
 - 15-minute 1-second files:
 - [/gnss/data/campaign/mgex/highrate/rinex3/YYYY/ddd/HH/YYT](ftp://gnss/data/campaign/mgex/highrate/rinex3/YYYY/ddd/HH/YYT)
 - [/gnss/data/campaign/mgex/highrate/rinex2/YYYY/ddd/HH/YYT](ftp://gnss/data/campaign/mgex/highrate/rinex2/YYYY/ddd/HH/YYT)
 - [/gnss/data/campaign/mgex/highrate/raw/YYYY/ddd/HH/YYT](ftp://gnss/data/campaign/mgex/highrate/raw/YYYY/ddd/HH/YYT)

IGS MGEX GNSS Data Holdings for 2012 (as of 13-Jul-2012 13:20:48)

Mon.	Site Name	Lat.	Lon.	Receiver	Start Date	Start Time	End Date	End Time	No. Files
ARBY	Alibonville	46.18	-101.32	TRIMBLE NETR9	16-Feb-12	12:07	12-Jul-12	12:18	132
BSPF	Breest	48.23	355.30	TRIMBLE NETR9	16-Feb-12	12:07	12-Jul-12	12:18	142
BRNS	Brennley	54.16	-41.32	TRIMBLE NETR9	16-Feb-12	12:07	12-Jul-12	12:18	132
CMSP	Conception	-36.51	286.58	LEICA CRX1200G	01-Feb-12	12:02	12-Jul-12	12:18	155
CTPR	Cherbury	-12.00	135.12	TRIMBLE NETR9	01-Feb-12	12:02	12-Jul-12	12:18	155
DLPT	Dellet	51.59	4.23	TRIMBLE NETR9	08-May-12	12:19	12-Jul-12	12:18	61
DTNG	Dillingham	38.05	23.54	TRIMBLE NETR9	14-May-12	12:15	12-Jul-12	12:18	47
FDNA	Futuna	-14.18	-178.07	TRIMBLE NETR9	02-Jul-12	12:19	09-Jul-12	12:18	8
GDPR	Goodridge	49.55	14.47	LEICA CRX1200G	01-Feb-12	12:02	12-Jul-12	12:18	142
GRAB	Green	47.04	15.30	LEICA CRX1200G	14-Feb-12	12:05	08-Jul-12	12:18	66
GRAB	Green	47.04	15.30	IFIPR 82_NIN_80C	08-Feb-12	12:09	27-Feb-12	12:18	51
GRAB	Green	47.04	15.30	TRIMBLE NETR9	16-Feb-12	12:07	12-Jul-12	12:18	86
GRAC	Grasse	42.45	6.25	TRIMBLE NETR9	16-Feb-12	12:07	12-Jul-12	12:18	113
GRAN	Granat	25.53	27.61	TRIMBLE NETR9	16-Feb-12	12:07	12-Jul-12	12:18	67
GRAN	Granat	25.53	27.61	TRIMBLE NETR9	01-Mar-12	12:06	12-Jul-12	12:18	113
JAMP	Lamont	14.36	-61.00	TRIMBLE NETR9	16-Feb-12	12:07	12-Jul-12	12:18	128
JAMP	Lamont	14.36	-61.00	TRIMBLE NETR9	27-Mar-12	12:18	12-Jul-12	12:18	75
MART	Martabek	60.35	17.16	TRIMBLE NETR9	01-Mar-12	12:06	12-Jul-12	12:18	116
MVLA	Marysville	64.08	338.03	LEICA CRX1200G	14-Feb-12	12:02	12-Jul-12	12:18	148
MVLA	Marysville	64.08	338.03	TRIMBLE NETR9	16-Feb-12	12:07	12-Jul-12	12:18	116
MVLA	Marysville	64.08	338.03	JAVAD TRP-C3TH	29-Apr-12	12:10	12-Jul-12	12:18	75
MVLA	Marysville	64.08	338.03	JAVAD TRP-C3TH	15-Jun-12	12:11	12-Jul-12	12:18	75
ORST	Obereggen/Enfelfingen	46.26	11.18	JAVAD TRP-C3TH	29-Apr-12	12:10	12-Jul-12	12:18	75
ORST	Obereggen	46.26	11.18	JAVAD TRP-C3TH	15-Jun-12	12:11	12-Jul-12	12:18	75
ORST	Obereggen	46.26	11.18	TRIMBLE NETR9	01-Mar-12	12:06	12-Jul-12	12:18	127
ORST	Obereggen	46.26	11.18	JAVAD TRP-C3TH	29-Apr-12	12:10	12-Jul-12	12:18	75
ORST	Obereggen	46.26	11.18	JAVAD TRP-C3TH	15-Jun-12	12:11	12-Jul-12	12:18	75
POPS	Potomac	52.23	13.04	JAVAD TRP-C3TH	29-Apr-12	12:10	12-Jul-12	12:18	74
POPS	Potomac	52.23	13.04	JAVAD TRP-C3TH	15-Jun-12	12:11	12-Jul-12	12:18	74
SEVC	Seydell	-4.40	55.29	TRIMBLE NETR9	05-Jul-12	12:15	09-Jul-12	12:18	7
SEVC	Seydell	-4.40	55.29	TRIMBLE NETR9	16-Feb-12	12:07	12-Jul-12	12:18	107
SOOK	Southern	06.32	79.31	JAVAD TRP-C3TH	29-Apr-12	12:10	12-Jul-12	12:18	75
TASH	Tashkent	41.18	69.17	JAVAD TRP-C3TH	29-Apr-12	12:10	12-Jul-12	12:18	75
TASH	Tashkent	41.18	69.17	JAVAD TRP-C3TH	15-Jun-12	12:11	12-Jul-12	12:18	75
ULAB	Ulaanbaatar	47.40	107.03	JAVAD TRP-C3TH	29-Apr-12	12:10	12-Jul-12	12:18	75
ULAB	Ulaanbaatar	47.40	107.03	JAVAD TRP-C3TH	15-Jun-12	12:11	12-Jul-12	12:18	75
USNS	USNS Washington	38.55	282.56	SEPP POLAR4TR	01-Feb-12	12:02	12-Jul-12	12:18	149
USNS	USNS Washington	38.55	282.56	TRIMBLE NETR9	01-Feb-12	12:02	12-Jul-12	12:18	149
USNS	USNS Washington	38.55	282.56	JPSI POLAR4TR	08-Jun-12	12:15	12-Jul-12	12:18	40
WABO	Wabunan	08.24	17.05	JAVAD TRP-C3TH	29-Apr-12	12:10	12-Jul-12	12:18	75
WABO	Wabunan	08.24	17.05	JAVAD TRP-C3TH	15-Jun-12	12:11	12-Jul-12	12:18	75
WZFR	Wetzlar	49.09	12.53	LEICA CRX1200G	08-Jun-12	12:16	30-Jun-12	12:18	7
WZFR	Wetzlar	49.09	12.53	JAVAD TRP-C3TH	15-Jun-12	12:11	12-Jul-12	12:18	117
WZFR	Wetzlar	49.09	12.53	JAVAD TRP-C3TH	29-Apr-12	12:10	12-Jul-12	12:18	75

MGEX Tracking Network Status for 08-Jul-12 12:07:08 12190 | GPS Week 1696 Day 1 | An of dates: Jul 11 2012 09:11:22

Mon.	Site Name	Lat.	Lon.	Receiver	Start Date	Start Time	End Date	End Time	No. Files			
abst	Abisko	68.00	20.00	ARMP	19MS9711.00	NOVE	0.0000	ARMP	9710M001	M	3.00	230
adus	Adelphi	19.00	100.00	BOBY	19MS9711.00	NOVE	2.0431	BOBY	1000M004	M	3.00	1190
adus	Adelphi	19.00	100.00	BOBY	19MS9711.00	NOVE	0.4889	BOBY	1310M010	M	3.01	50
adus	Adelphi	19.00	100.00	BOBY	19MS9711.00	NOVE	0.0071	BOBY	4170M004	M	3.01	715
adus	Adelphi	19.00	100.00	BOBY	19MS9711.00	NOVE	0.0000	BOBY	5945M001	M	3.00	47
adus	Adelphi	19.00	100.00	BOBY	19MS9711.00	NOVE	0.0000	BOBY	13502M09	M	3.00	1
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	92952M02	M	3.00	3631
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0653	PTMA	11502M06	M	3.01	15
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	11001M04	M	3.01	1493
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	10002M10	M	3.00	230
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	30302M09	M	3.00	50
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	97205M01	M	3.00	230
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	12727M01	M	3.01	253
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	12727M01	M	3.00	230
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	10205M01	M	3.01	119
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	32009M02	M	3.00	750
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	1.1000	PTMA	8403M001	M	3.00	5
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	1.1000	PTMA	14208M05	M	3.02	3
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	66008M06	M	3.00	230
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	07112M00	M	3.00	6
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	1.1000	PTMA	14104M03	M	3.02	6
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.0000	PTMA	39801M04	M	3.00	3631
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	1.2200	PTMA	32009M02	M	3.00	430
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	1.2200	PTMA	30005M09	M	3.00	50
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	1.1000	PTMA	24201M01	M	3.02	7
afra	Africa	60.00	0.00	PTMA	19MS9800.00	NOVE	0.1340	PTMA	40148M02	M	3.02	13
afra	Africa	60.00	0.00	PTMA								