

Overview of UNAVCO

UNAVCO, a non-profit university-governed consortium, facilitates geoscience research and education using geodesy. The website is at <http://www.unavco.org>.

The UNAVCO consortium membership consists of more than 100 US Full Members and over 80 Associate Members (domestic and international). Through our Geodetic Infrastructure and Geodetic Data Services Programs, UNAVCO operates and supports geodetic networks, geophysical and meteorological instruments, a free and open data archive, software tools for data access and processing, cyberinfrastructure management, technological developments, technical support, and geophysical training. The UNAVCO Education and Community Engagement Program provides educational materials, tools and resources for students, teachers, university faculty and the general public.

Under a 2013 award from the National Science Foundation (NSF), UNAVCO operates the Geodesy Advancing Geosciences and EarthScope (GAGE) Facility. In this role, UNAVCO deploys and operates instrumentation that collects a variety of data to support geodetic with instrumentation systems are deployed globally. UNAVCO provides data management, curation, archiving and distribution services for geodetic data collected or acquired by UNAVCO and by US investigators performing geodesy research with NSF funding. Under certain circumstances non-NSF or NASA funded contributed research data and products are also handled. UNAVCO has been a Regular Member of the ICSU World Data System since 2015.

The Geodetic Data Services (GDS) program manages a complex set of metadata and data flow operations providing a wide range of geodetic/geophysical observations to scientific and educational communities. Sensors currently include Global Navigation Satellite System (GNSS) (downloaded files and high rate data streaming in real time (RTGNSS), borehole geophysics instrumentation (strainmeters, tiltmeters, seismometers, accelerometers, pore pressure and meteorological sensors), long baseline laser strainmeters, and terrestrial laser scanners. Field data are acquired either from continuously operating sites or episodic “campaign” surveys conducted by the community. UNAVCO also acquires and distributes satellite synthetic aperture radar (SAR) data from foreign space agencies. GDS services include data operations (managing metadata; data downloading, ingesting and preprocessing); data products and services (generating processed results and QA/QC and state-of-health monitoring); data management and archiving (distribution and curation); cyberinfrastructure; and information technology (systems and web administration). In order to perform this work, GDS maintains a highly specialized technical staff, onsite and offsite computer facilities with networking, servers and storage, and manages a number of sub awards to university groups who provide additional products, software and training.

Key Data and Products

Key data products include GNSS unprocessed and processed data from over 3,000 continuous stations; Terrestrial and Airborne Laser Scanning swaths, point clouds and rasters; raw and processed space borne SAR (Synthetic Aperture Radar) and InSAR (Interferometric Synthetic Aperture Radar) images; borehole strain and seismic data (raw and processed); and raw and processed meteorological observations collocated at selected geodetic stations. Key software developed and supported by UNAVCO for community use include GNSS preprocessing codes, and GNSS data and metadata management software

systems. Through sub awards UNAVCO provides community support for GNSS processing codes.

Facility CI

UNAVCO's CI is intended to provide robust, reliable, secure hardware and software systems that ensure data and metadata integrity from the field sensor to the user. Data are managed through multiple software and systems processes covering acquisition, data communications, ingestion, quality checking, preprocessing and processing, and archiving. Increasingly, web services are used to deliver capability for internal handling as well as discovery tools, visualization, and data delivery processes. UNAVCO maintains internet connectivity with two routes to the outside: a primary link on Internet2 through the Front Range Gigapop, and a failover Comcast commercial Internet link. In-house virtualization with VMWare on newer (less than 5-year old) Dell servers hosts the majority of services; this is supplemented by older Sun server and storage hardware (ten years old); SAN storage technology (Oracle, Infotrend) is supplemented with cloud-based IaaS. A colocation service is used for critical backups and failover capability. The wide range of data types and tools for processing and preprocessing is supported by a variety of software stacks developed starting in the 1990's and evolving through the present with 10 years as the median age. In addition, UNAVCO is investigating deploying several services in the cloud (commercial and NSF XSEDE) through the Earthcube GeoSciCloud project.

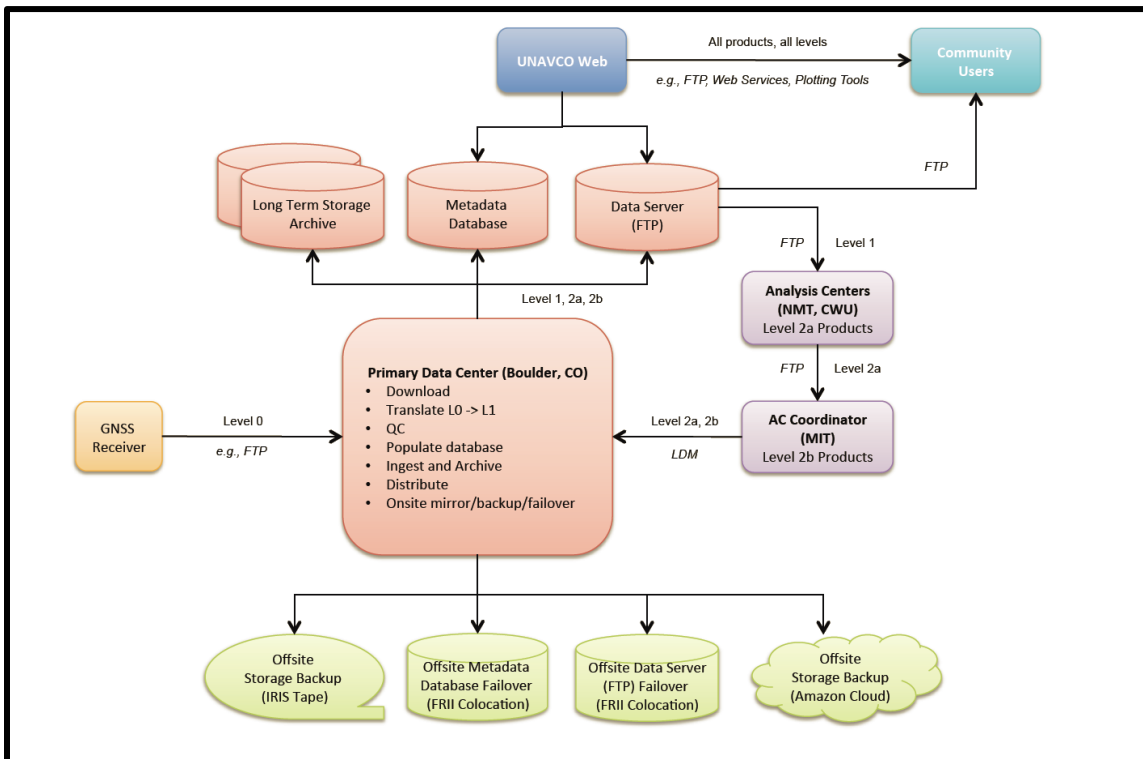


Figure 1. Schematic for UNAVCO's CI for GNSS data and products showing data coming from the field through data and products delivered to users. This schematic, though limited to the GNSS data type, is generally representative of the CI used for other data types (TLS, SAR, borehole strain and seismic, meteorological) handled by UNAVCO.