

About UNAVCO

UNAVCO is a non-profit, University-governed consortium that facilitates geoscience research and education using geodesy; the consortium has over 180 members and associate members. UNAVCO's activities include operation of the 1100 station Global Navigation Satellite System (GNSS) Plate Boundary Observatory (PBO), one of the three principal components of the EarthScope project. UNAVCO's Data Center provides data management, archiving, distribution, and interoperability services for GNSS, Strain, Terrestrial Laser Scanning (TLS), and Interferometric Synthetic Aperture Radar (InSAR) data. UNAVCO also provides science support through community coordination, field engineering, technology innovation, and instrument testing, acquisition, and deployment and supports state-of-the-art global geodetic infrastructure that is developed and operated through international collaborations. UNAVCO is funded by NASA to support the IGS Central Bureau and other activities. Archiving data and metadata for long-term preservation is part of UNAVCO's mission. Data curation, including UNAVCO-developed software for data content reading from multiple formats, translation and quality checking are standard. UNAVCO maintains a modern IT infrastructure emphasizing reliability and security. In-house virtualization and SAN storage technology is supplemented with cloud-based IaaS. A colocation service is used for critical backups and failover capability. UNAVCO is a Member of the ICSU World Data Systems.

RINEX 3 at UNAVCO

Under a pilot project begun in 2016, UNAVCO has been making GNSS data available in RINEX 3 format. An initial set of four stations provided under the pilot project has expanded to over 100 stations. These UNAVCO-operated stations are situated mainly in the western US and utilize mainly Septentrio PolaRx5 receivers. We use Septentrio tools for raw to RINEX3 translation. For Trimble receivers, we use on board translation and download of the RINEX3 formatted file. We have experimented with tools available from GFZ (gfzrxn) for RINEX3 data file editing and University of Pecny (Anubis) for QC. RINEX 3 data are available on data-out.unavco.org/pub/rinex3. For the foreseeable future UNAVCO will provide RINEX 2.11 in addition to RINEX 3 for all stations where RINEX 3 is produced (and RINEX 2.11 for all others).

UNAVCO Strategies for RINEX 3 Handling



QC Generation from RINEX 3 – options testing in progress



Gearing up for handling RINEX3 at UNAVCO has required infrastructure modifications, adding complexity to UNAVCO's data handling. For example, we had no compatible architecture for third party tools like gfzrxn, Anubis, and sbf2rxn, so these had to be added (as virtual machines).

IGS Network Coordination

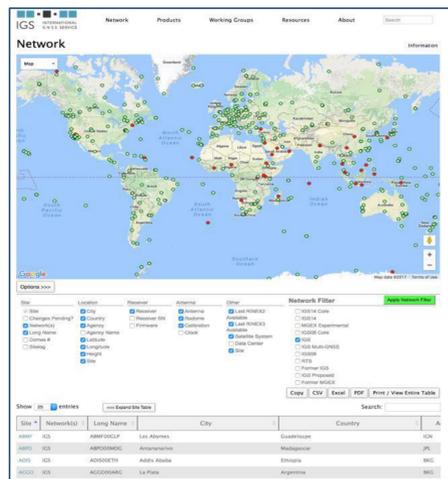
As part of its support to the IGS Central Bureau, UNAVCO provides network coordination for the IGS Network. Network Coordination includes:

- Facilitating the adding and decommissioning of IGS stations
- Coordination for additions of new equipment to rcvr_ant.tab and antenna.gra files
- Providing user support for Site Log Manager (SLM)
 - 94 Registered Users
 - Approximately 40 site log updates per month
- Answering general questions submitted to IGS trouble ticket system

The Network Coordinator works with Central Bureau staff, the Infrastructure WG chair, the Antenna WG Chair, and others to support daily operations.

The Network Coordinator also monitors and updates software on the server in the cloud and on JPL systems that maintain ancillary and QC information for presentation on the web site.

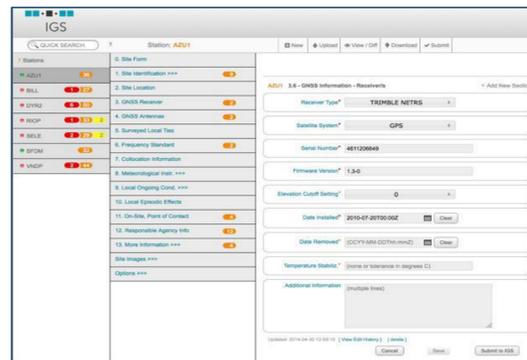
The Network Coordinator manages all aspects of maintaining the Site Log Manager system (SLM) metadata. With direction from IGS Central Bureau staff, the Network Coordinator and UNAVCO technical staff make any necessary changes to the software and manage backups.



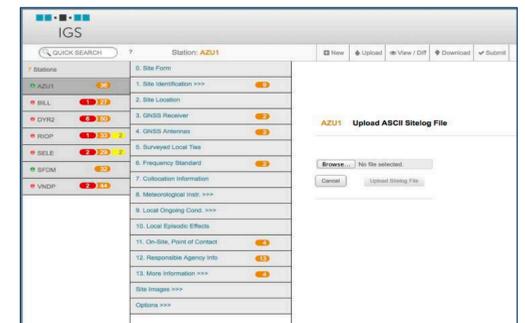
The Site Log Manager database provides much of the information that is presented in the Network Map section of the igs.org website.

IGS Metadata Management with Site Log Manager

The IGS Central Bureau, with technical and software support from UNAVCO, developed an on-line, browser-based user interface tool for managing station metadata called the Site Log Manager. The Site Log Manager was put into production in 2015 and currently has 94 registered users. The metadata is maintained in a MySQL database. The system operates on a Virtual Machine in the cloud. The tool provides an efficient way for station operators to submit metadata updates and for the Central Bureau and Network Coordinator to quickly review and approve the changes.



Metadata presentation for browsing or editing by authorized users.

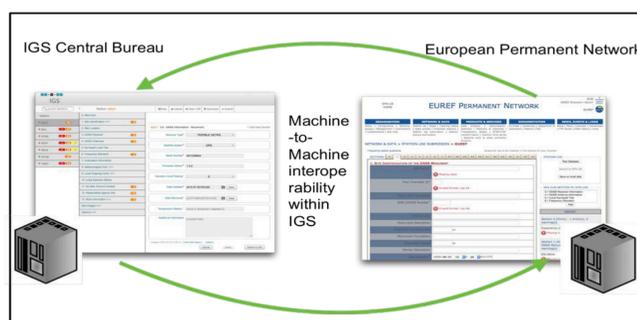


Text Site Log upload through Site Log Manager

IGS Metadata Exchange with XML

For the past three years the IGS Data Centers Working Group has been working towards standardizing and modernizing the IGS metadata systems to achieve the aims of better metadata management, improved consistency and completeness, and improved discoverability and usability to IGS and other stakeholders. The IGS is leveraging work done by the eGeodesy project of the ICSM, which has codified the full suite of information that facilitates geodesy measurements and data in the GeodesyML schema. GeodesyML is an Application Schema of GML (Geography Markup Language), which is the standard for Open Geospatial Consortium-compliant web services. The GeodesyML schema encompasses far more than Site Log content, but for IGS purposes we can optionally use just the Site Log subset.

Vision for a New Metadata System

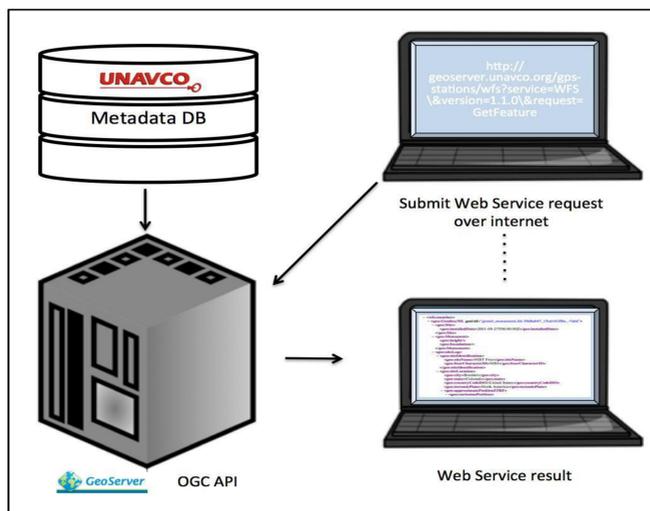


The vision for IGS metadata exchange with XML includes (for example) simplification of updates to/from EPN to Central Bureau and other metadata systems. Site Log Manager system will incorporate XML-schema-based vetting of content including parsing and validation, consistency checking, and verifying completeness.

Progress Toward Implementation of an XML Site Log Metadata System at UNAVCO

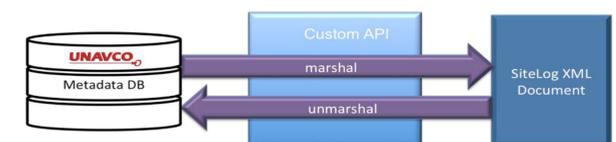
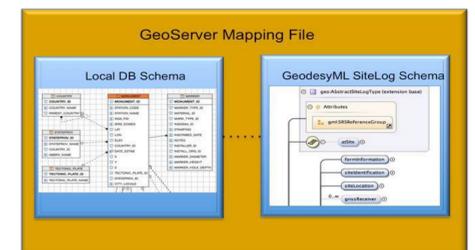
To further explore implementation of GeodesyML/ Site Log XML, UNAVCO has elected to start by using the GeoServer geospatial Application Server. Analogous to Apache for HTTP, GeoServer is a web application server that serves geospatial data. GeoServer is an open source software project that implements several open standards from the Open Geospatial Consortium (OGC) including Web Feature Service (WFS). WFS is a web service that can be used for metadata transmission with the GeodesyML application schema of GML.

UNAVCO has set up an internal test and development environment consisting of virtual machines that are used for metadata storage in a relational database, with metadata output via OGC web services using our local instance of the GeoServer Application Server. Utilizing the application schema plugin mechanism, our GeoServer test instance has been successfully configured to deliver a subset of GeodesyML encoded Site Log metadata.



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Institutions wishing to implement a system with Machine-to-Machine interaction as envisioned will need to undertake significant technology development. For delivering GeodesyML with WFS through GeoServer, the creation of the GeoServer Application Schema mapping file defining the relation between columns of the local database and GeodesyML is a major part of this technology development. This mapping file is currently a work in progress at UNAVCO.



In addition to or instead of using GeoServer, a custom API that provides web services and infrastructure for marshaling and unmarshaling of GeodesyML encoded metadata to/from a local database is an option. UNAVCO's experience with GeoServer in the current test environment will aid in decisions about how to implement GeodesyML for the Site Log Manager system.