Australian Government
Geoscience Australia

Geoscience Australia's GNSS Network and Data Archive

Current state and future directions

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Abstract

Geoscience Australia (GA) manages a network of 150 CORS across Australia, Antarctica and the Pacific. The primary objectives of this network are to maintain the National and International Geospatial Reference Systems and support scientific endeavours. In addition GA supports the data archiving and distribution of the 450 CORS that contribute to the Asia-Pacific Reference Frame (APREF) project. At the moment GA is in the process of shifting the focus of our GNSS network from a scientific model to one which supports science and industry, requiring higher data availability and reduced latencies. Further to this GA recognises a need to take advantage of its unique geographical location and move towards providing multi-GNSS data formats such as RINEX 3 and RTCM 3.2.

This poster presents the current state of the Australian CORS network and highlights our planned transition and expected challenges in moving from a scientific model to an operational model supporting modern data formats and streamlined metadata.

GA's regional GNSS data centre

Regional data centre statistics

As a regional data centre for the IGS and the primary data centre for the APREF project the quantity of data being archived at GA has significantly increased over the last five years (Figure 3). GA currently archives:

- Daily RINEX files from 728 stations,
- Hourly RINEX files from 150 stations,
- High-rate RINEX files from 150 stations.

GA's GNSS networks

GA operates three GNSS networks across Australia, Antarctica and the Pacific;

- the Australian Regional GNSS Network (ARGN) – 38 stations,
- the South Pacific Regional GNSS Network (SPRGN) – 14 stations,
- the AuScope Network – 98 stations.

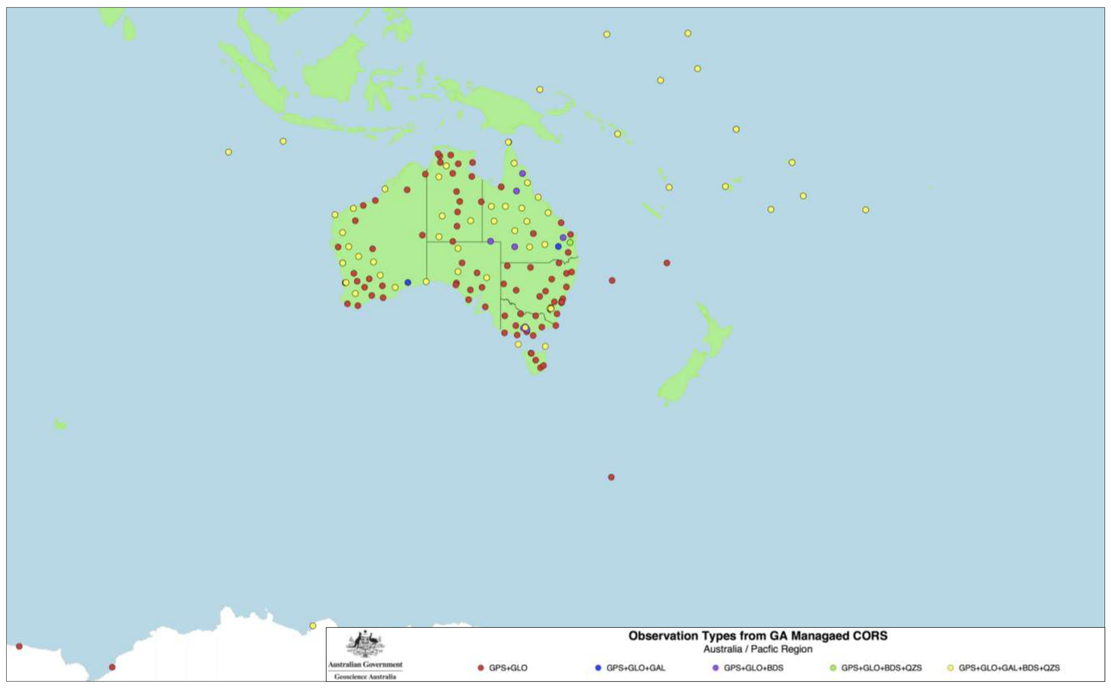

Figure 1: GA manages a network of 150 CORS across Australia, Antarctica and the Pacific. Approximately 50% of these stations are capable of observing more than two constellations and streaming data in RTCM 3.2 and RINEX 3 formats.

APREF network

The APREF project was initiated in 2010. Since then 21 agencies have joined, providing data from 450 CORS across 35 countries.

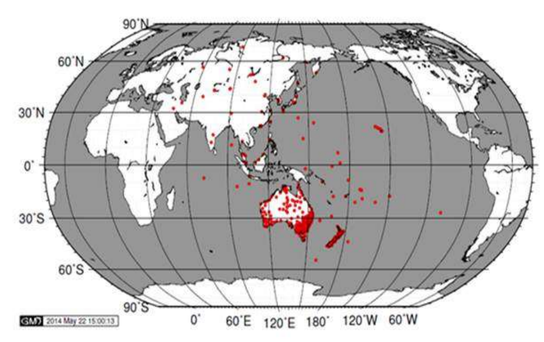

Figure 2: Through the APREF project GA is currently receiving daily data from over 450 GNSS stations

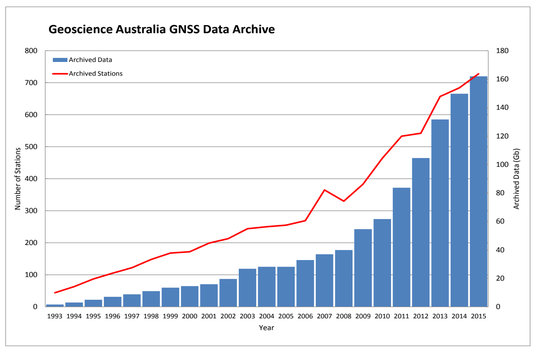

Figure 3: Between APREF and the IGS we are now archiving data from over 700 stations per day.

Modern data formats

RINEX 3 transition

Since 2014 GA has been contributing to the MGEX (multi-GNSS) project through the contribution of daily data files in the RINEX 3 format. Currently we are pushing files containing GPS+GLO+GAL+BDS+QZSS observations to CDDIS and IGN from 23 IGS stations across the Australia-Pacific region.

GA's data centre workflow, like many within the IGS, is heavily built around UNAVCO's TEQC software, which does not support RINEX 3. To support the MGEX project we had to look at alternative packages around which to base our workflow. Given the lack of a single software package that can translate binary formats into RINEX 3, the decision was made to undertake the translation component on-board the receiver. Once translated the RINEX 3 files are pushed via FTP to GA's data centre where GFZRNX is used to undertake basic QC, including editing of the header information. The GFZRNX tool was selected due to its active development and simple use.

We have now expanded this workflow to include many non-IGS stations in our network. We have over 60 stations providing RINEX 3 files using the long name format. These files are available for download from our public data archive (ftp.ga.gov.au).

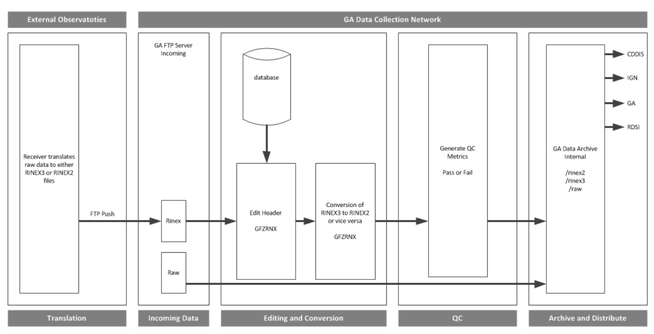

Figure 4: Our planned workflow to support both RINEX 2 and RINEX 3.

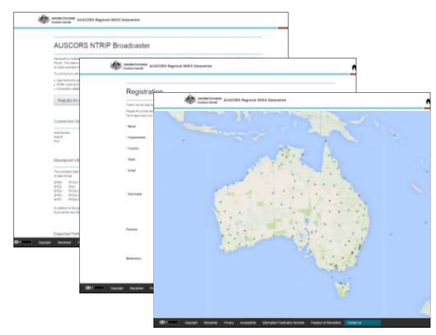

Figure 5: The redeveloped AUSCORS Ntrip Broadcaster is being hosted on our new regional GNSS datacentre portal.

Real-time data activities

GA provides 1 second data streaming from all of our GNSS stations via the AUSCORS Ntrip Broadcaster (http://auscors.ga.gov.au). This system has been recently redeveloped to better support our users. Improvements include:

- Connection via a new hostname (auscors.ga.gov.au),
- Server infrastructure is now virtualised.
- Software has been upgraded to BKG Professional; Caster (2.0.25),
- ~50% (73) of stations now provide both RTCM 3.1 and RTCM 3.2 mountpoints,
- The server is continually backed up with a restoration time of < 5 mins.

The largest problem we faced in supporting users in industry was providing streams with low latency and high data completeness. In order to do this we had to re-develop our communications infrastructure at the stations. We are now able to provide data latencies < 1.0 seconds with close to 100% completeness most of the time.

Metadata standards (GeodesyML)

One of the challenges with managing a growing network is maintaining the large amount of metadata resulting from almost daily changes to the stations. We are now at a stage where we can no longer manually manage these changes and monitor the quality and status of stations within the network.

As a solution GA is heavily involved in the development of GeodesyML which is a proposed application schema of the Geography Mark-up Language (GML). We are hoping to use GeodesyML as the base for the management of our network metadata data and the further automation of our network operations. The advantages of this are:

- Global unification of standards for encoding GNSS data and metadata,
- Data and metadata exchange across Internet using web services,
- Increased discoverability and interoperability.

Future directions

- Development of a database to store GNSS data and metadata,
- Development of web services,
- Workflow to support RINEX 2 and RINEX 3,
- Migration of the data centre into the cloud.

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