PRODUCT DATA SHEET

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RTCM SSR Correction Stream (1059, 1060)

Summary

Geoscience Australia's (GA) Ginan Analysis Centre Software (ACS) calculates and broadcasts GPS satellite orbit and clock corrections and biases on a real-time basis. These corrections and biases are based on real-time streaming observations from Geoscience Australia's continuously operating reference station (CORS) network covering Australia, New Zealand and the South Pacific as well as stations outside GA's network from across the world.

The corrections and bias messages are encoded in an RTCM (Radio Technical Commission for Maritime Services) standard, specifically RTCM 10403.1 (formerly RTCM SC-104) [1]. The standard grew from work carried out in 1985 but was not publicly released until 1990 with version 2 [2]. Since version 3 it has included support for state space representation (SSR) messages which Ginan calculates and encodes for broadcast via the internet using the *Networked Transport of RTCM via Internet Protocol* (NTRIP).

The NTRIP protocol has become a popular way to send GNSS corrections over the internet, especially the RTCM messages. The protocol was developed at the German Federal Agency for Cartography and Geodesy (BKG) and released in 2004 [4]. For more details, an extensive *About* page can be found at: https://igs.bkg.bund.de/ntrip/about

Access

Positioning Australia (PA) offers the GPS broadcast correction and bias messages via an NTRIP caster available at the mount point https://ntrip.data.gnss.ga.gov.au/SSRA00GAA0 .

Users can freely access this stream after registering for an account at https://gnss.ga.gov.au/stream (details @ https://geoscienceaustralia.github.io/ginan/resources/GinanProductsStreamsAccess20220422.pdf)

Once registered, use your favourite NTRIP client to connect to the stream (e.g. Ginan, RTKlib, BNC, etc.)

Technical details

Positioning Australia Correction and Bias Stream - SSRA00GAA0	
Version	Ver 1.0
Products Released	RTCM messages 1059 (Bias) and 1060 (Correction)
Release Times	Real-time (Continuously broadcast)
Constellations Covered	GPS (in future will include other messages that cover Galileo, GLONASS, BeiDou and QZSS)
Data Source	Real-time Phase and Pseudorange observation streams from a globally distributed network of GNSS receivers sourced from Geoscience

	Australia's (GA) CORS stations and others from the International GNSS Service (IGS) network. [5] Earth orientation data from the International Earth Rotation and Reference Systems service's (IERS) daily final values [6].
Mountpoint	The correction and bias stream is broadcast at: https://ntrip.data.gnss.ga.gov.au/SSRA00GAA0 A breakdown of the two messages is given below [1]

RTCM 1059 Message		
Part of Message	**Data Fields**	**Notes**
Header	Message Number	12 bits
	GPS Epoch Time 1s	20 bits
	SSR Update Interval	4 bits
	Multiple Message Indicator	1 bit
	IOD SSR	4 bits
	SSR Provider ID	16 bits
	SSR Solution ID	4 bits
	No. Of Satellites	6 bits. This data field is followed by Satellite specific part of the message.
Satellite Specific	GPS Satellite ID	6 bits
	No. of Code Biases processed	5 bits. All code biases processed for a given satellite follow this data field.
Code Specific	GPS Signal and Tracking Mode Indicator	5 bits
	Code Bias	14 bits

RTCM 1060 Message		
Part of Message	**Data Fields**	**Notes**
Header	Message Number	12 bits
	GPS Epoch Time 1s	20 bits
	SSR Update Interval	4 bits
	Multiple Message Indicator	1 bit
	IOD SSR	4 bits
	SSR Provider ID	16 bits

	SSR Solution ID	4 bits
	No. Of Satellites	6 bits. Followed by satellite specific part of the message
Satellite Specific	GPS Satellite ID	6 bits
	GPS IODE	8 bits
	Delta Radial	22 bits. Correction to the broadcast ephemerides – radial component
	Delta Along-Track	20 bits Correction to the broadcast ephemerides – along-track component
	Delta Cross-Track	20 bits Correction to the broadcast ephemerides – cross-track component
	Dot Delta Radial	21 bits Rate of change of correction to the broadcast ephemerides – radial component
	Dot Delta Along-Track	19 bits Rate of change of correction to the broadcast ephemerides – along-track component
	Dot Delta Cross-Track	19 bits Rate of change of correction to the broadcast ephemerides – cross-track component
	Delta Clock C0	22 bits
	Delta Clock C1	21 bits
	Delta Clock C2	27 bits

Stream Specification History

The Ginan stream SSRA00GAA0 broadcasts two messages: a message for correcting the orbit ephemerides and clock values broadcast by the GPS satellite constellation, and a message for establishing bias between signal codes.

The corrections and bias messages are encoded in a Radio Technical Commission for Maritime Services (RTCM) standard specifically RTCM Standard 10403.1. This standard was formerly known as RTCM SC-104 [1] produced by Special Committee 104 of the RTCM.

The preliminary version was established in 1985 but was not publicly released until 1990 with version 2.0 [2]. Version 2 supports Differential GPS (DGPS) and Real-Time Kinematic (RTK) uses and includes correction messages for GPS, GLONASS as well as various metadata that goes along with the DGPS/RTK infrastructure (radio beacon almanac, antenna information, data validity and health, etc [7])

A major update occurred with version 3, and the standard now includes support for state space representation (SSR) messages which Ginan calculates and encodes for broadcast. This version also includes support for corrections, proprietary and multiple signal messages for all the major navigation constellations (GPS, GLONASS, Galileo, Beidou, QZSS, SBAS) [8].

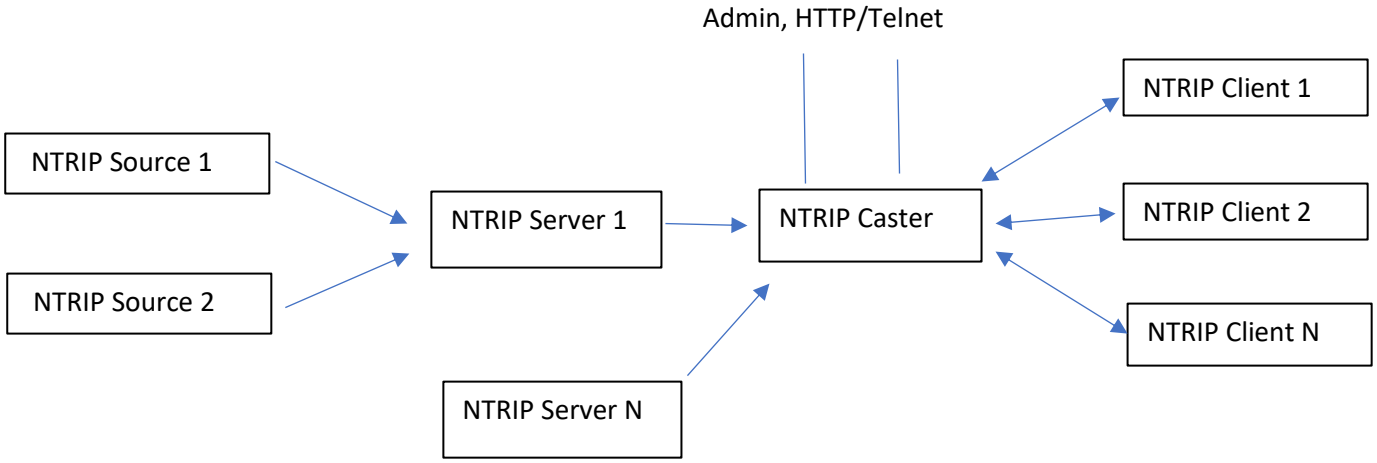

Fig 1: NTRIP Components (based off of Fig. 2 in [4])

The Ginan stream SSRA00GAA0 is broadcast via the internet using the *Networked Transport of RTCM via Internet Protocol* (NTRIP). The NTRIP protocol has become a popular way to send GNSS corrections over the internet, especially the RTCM messages. The protocol was developed at the German Federal Agency for Cartography and Geodesy (BKG) and released in 2004 [4]. The protocol is stateless, generic based off the Hypertext Transfer Protocol (HTTP/1.1) but tailored to GNSS data.

As seen in Figure 1 above, an NTRIP "network" is made up of four main components: The NTRIP Source, NTRIP Server, NTRIP Caster and finally the NTRIP client

- The NTRIP source produces the data (e.g. RTCM correction messages, or raw data from a GNSS receiver) to be sent out (each has an ID known as a mountpoint on the caster),
- the NTRIP server takes data from multiple sources to send onto the NTRIP caster,
- The NTRIP caster is the HTTP server that broadcasts messages from servers to NTRIP clients (end-users). The caster is based on the GNU General Public License developed Icecast software. The caster manages the handling of mountpoints (unique NTRIP source identifier), source table / source list (a list of all the available mountpoints), authentication, etc.
- The NTRIP client is end-user that takes the messages / data from the caster to use for their positioning needs.

Quality Assurance

On a continuous basis GA assesses the quality of the correction stream by using it to produce precise point positioning results for select continuously operating receiver stations (CORS) and comparing against other independent streams. For further details on quality monitoring please contact GA at clientservices@ga.gov.au.

Terms of Use

GA provides the correction streams free of charge but on an “as is” and “with all faults” basis without any warranty whatsoever. GA does not warrant that the correction streams shall meet any requirements or expectations or be fit for any intended purposes.

GA assumes no responsibility for errors or omissions in the contents of the Service and reserves the right to make additions, deletions, or modification to the contents on the Service at any time without prior notice.

GA does not guarantee the accuracy, relevance, timeliness, or completeness of any information or data available through the Service or on linked external websites.

References

[1] Radio Technical Commission for Maritime Services (U.S.). Special Committee, 104 (2006), RTCM Standard 10403.1 for Differential GNSS (Global Navigation Satellite Systems) Services: Version 3, https://www.worldcat.org/title/rtcm-standard-104031-for-differential-gnss-global-navigation-satellite-systems-services-version-3/oclc/86078934

[2] Januszewski, Jacek (October 2011). Mikulski, Jerzy (ed.). Satellite Navigation Systems, Data Messages, Data Transfer and Formats. Modern Transport Telematics: 11th International Conference on Transport Systems Telematics. Katowice-Ustron, Poland: Springer. doi:10.1007/978-3-642-24660-9_39. ISBN 9783642246593.

[3] Boriskin, Alexey; Kozlov, Dmitry; Zyryanov, Gleb (17–21 September 2012). The RTCM Multiple Signal Messages: A New Step in GNSS Data Standardization. Proceedings of the 25th International Technical Meeting of the Satellite Division of The Institute of Navigation. pp. 2947–2955.

[4] Lenz, Elmar (2004). "Networked Transport of RTCM via Internet Protocol (NTRIP) – Application and Benefit in Modern Surveying Systems" (PDF). FIG Working Week 2004

[5] https://igs.org/network/

[6] https://datacenter.iers.org/data/latestVersion/finals.daily.iau2000.txt

[7] https://www.use-snip.com/kb/knowledge-base/rtcm-2-message-list/

[8] https://www.use-snip.com/kb/knowledge-base/rtcm-3-message-list/