Australian Government
Geoscience Australia

POSITIONING AUSTRALIA

GINAN (Analysis Centre Software) Project Overview

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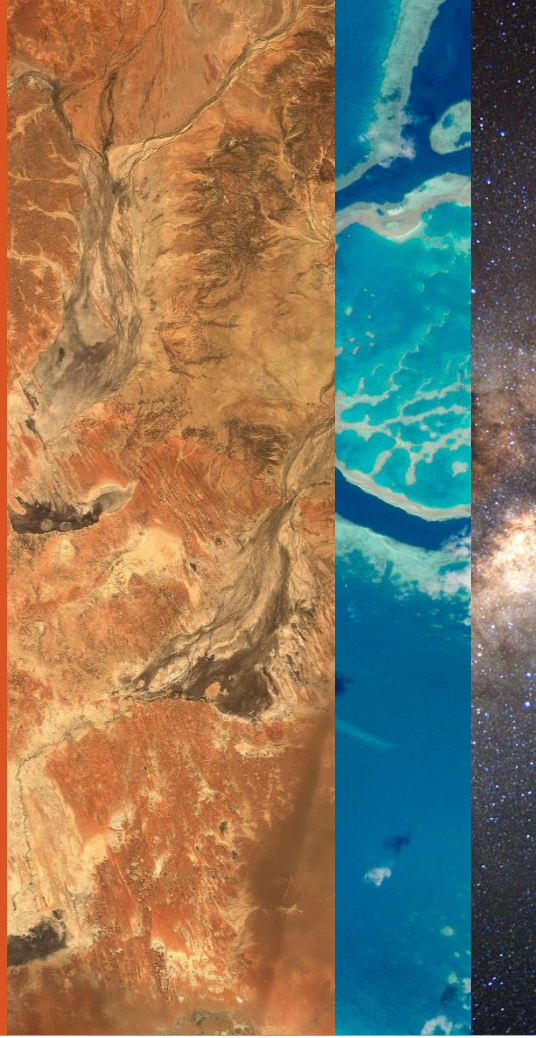

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Geoscience and Positioning Australia

Geoscience Australia (GA) is Australia's pre-eminent public sector geoscience organisation.

GA applies science and technology to describe and understand the Earth for the benefit of Australia.

The Australian Government is making a significant investment in the Positioning Australia program through GA. The program contains three major projects:

- The commercial procurement and operation of a Satellite Based Augmentation System (SBAS) called SouthPAN.
- The enhancement of the National Positioning Infrastructure Capability (NPIC) which will see upgrades to and an expansion of the GNSS Continuously Operating Reference Station (CORS) network.
- Ginan, an open source Precise Point Positioning (PPP) toolkit.

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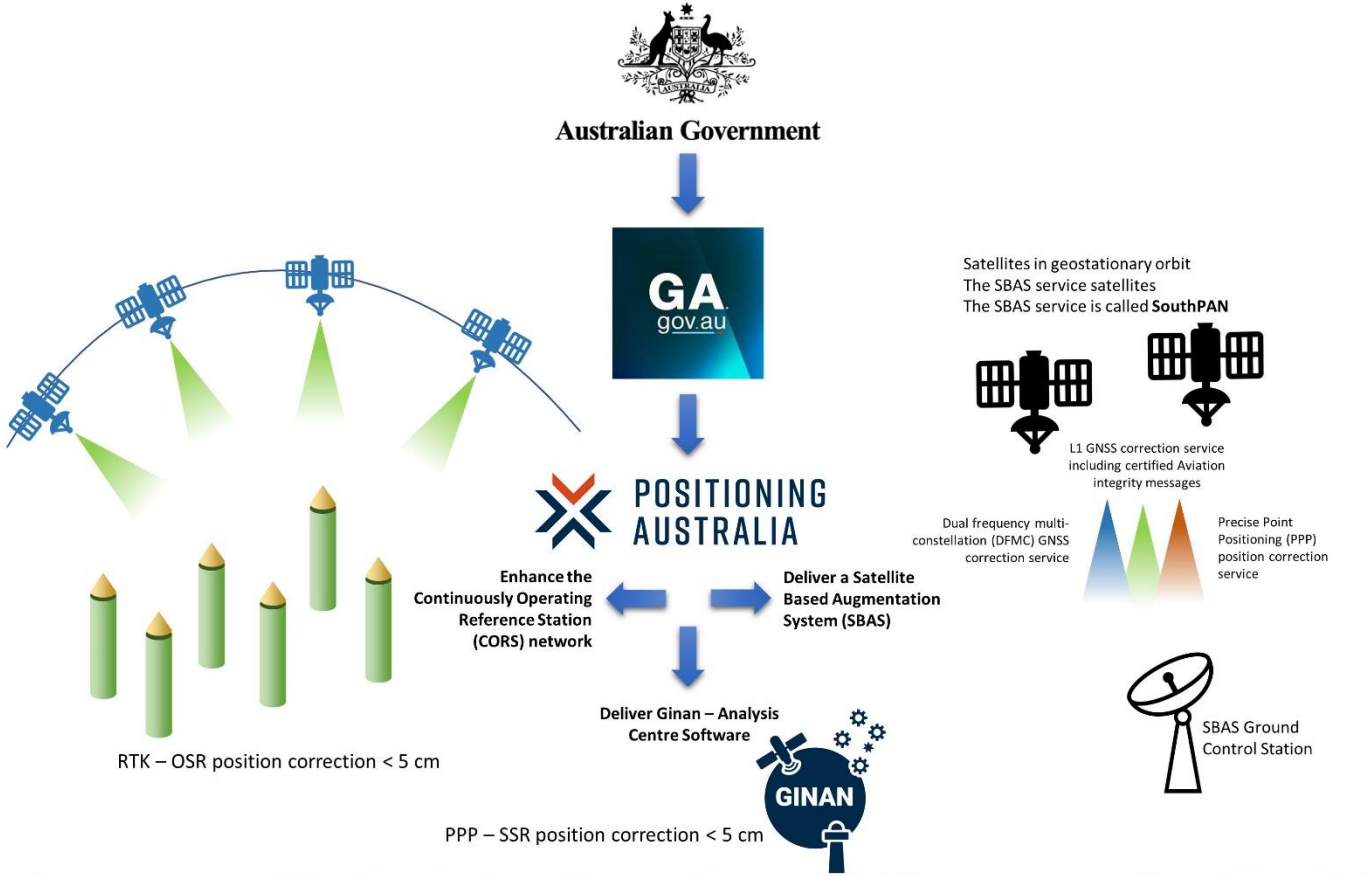

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The Context of the Ginan Project

The Australian Government, through Geoscience Australia, is funding the design, development and operational service of a Global Navigation Satellite System (GNSS) position correction system - the Ginan service and toolkit.

The application of the Ginan correction service by a GNSS device has the potential to increase positioning accuracy from meters to centimetres across Australia.

The suite of software systems (the Ginan toolkit) that create the service contain correction models and algorithms, and will be available under an open source licence.

Ginan will give individuals and organisations no-cost access to the Ginan software and service as a public good.

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The Aims of the Ginan Project

Provide a comprehensive GNSS analysis toolkit capable of producing correction messages that allow users with compatible GNSS receivers and an internet connection to get to a position accuracy of a few centimetres across Australia.

Encourage the development of innovative position dependent technology and services that will be of economic benefit to Australia – to grow the market for original equipment manufacturers (OEMs), technology integrators, service providers, the science community and end users, and realise the full benefits of GNSS.

Enhance Geoscience Australia's internal expertise in multi-GNSS so that the organisation can continue to provide expert advice on GNSS system performance to domestic and international GNSS users.

Help Geoscience Australia create the next generation of geodetic datums, keep track of multi-GNSS performance over Australia, and produce the positioning products so that Geoscience Australia can realise the full benefit of the navigation systems that operate in our region.

Provide a state-of-art GNSS analysis toolkit to our universities and research organisations to enable Australia to lead the development of geospatial technology.

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Ginan Theory

Working out where you are on the Earth using navigation satellites relies on two things:

- Knowing exactly where those satellites are, and
- Knowing exactly how far away you are from each satellite.

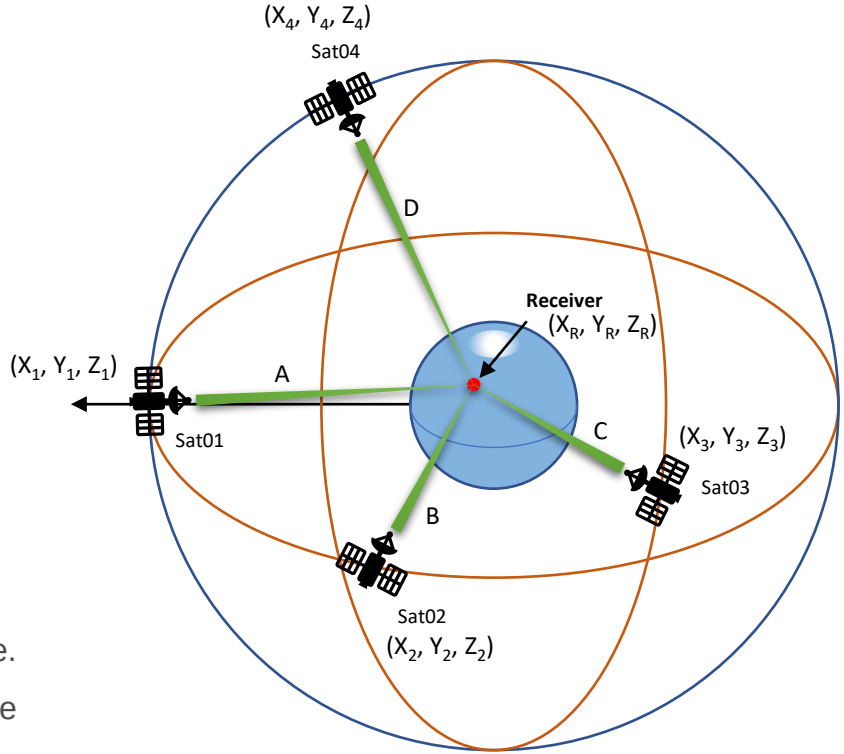
But the nature of global navigation satellite systems means that some errors or unknowns creep in which makes the calculated position less accurate than it could be.

Ginan is there to reduce those errors by creating corrections:

- Calculating precise GNSS satellite orbit and clocks,
- Calculating satellite and receiver biases,
- Calculating delays due to the Ionosphere and Troposphere.

Ginan can create the corrections and apply them to determine precise positions.

This technique is called Precise Point Positioning (PPP).



If you know A, B, C and D and all the X, Ys and Zs then you can calculate X_R, Y_R and Z_R.

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Using Ginan

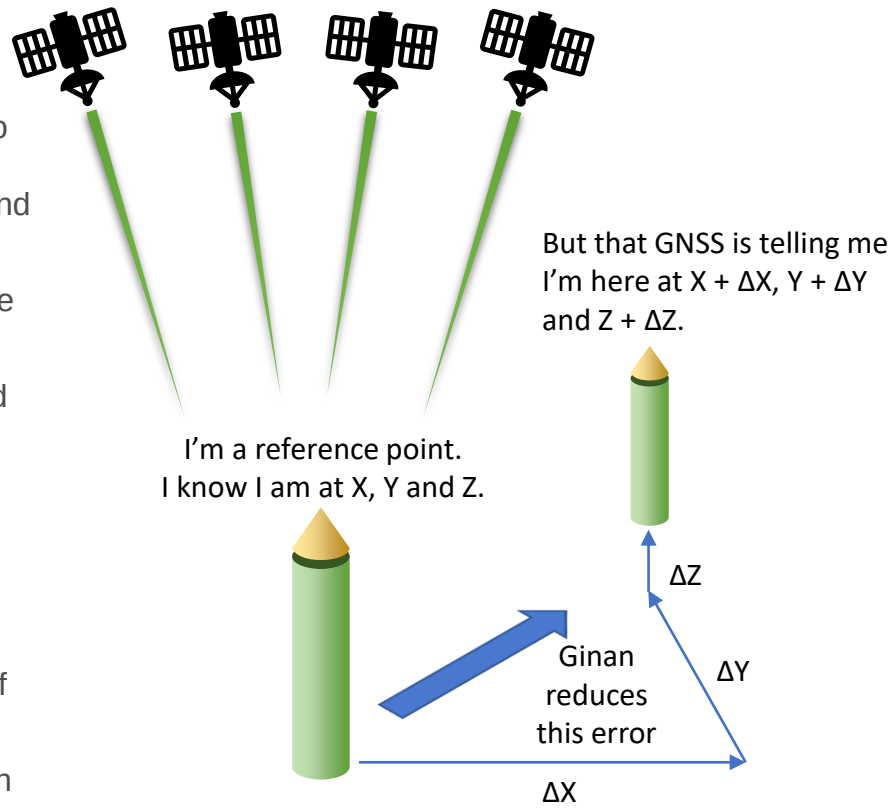
With access to the correction streams through a connection to Geoscience Australia's internet broadcaster (NTrip Caster), a compatible receiver can use those precise orbit and clocks, and biases to adjust the satellite ranging signals.

The Ionospheric and Tropospheric models are used to remove atmospheric delays to the ranging signals.

In this way the ranging signals become a lot more precise and ultimately so does the final position.

A user will be able to:

- Download the Ginan software, run it to produce their own products and modify it for their own research and development projects.
- Download file products created by an operational version of Ginan run and maintained by Geoscience Australia.
- Connect to Ginan streams which provide position correction data in real-time.



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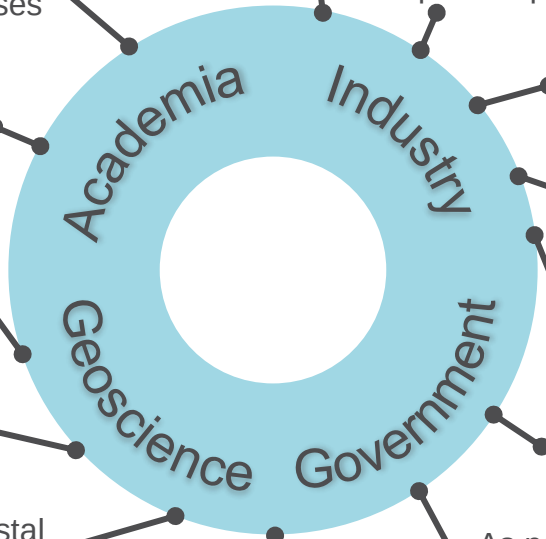
Users and Use Cases



On-selling correction products and streams with value-adding services

Making the user platform part of systems to bring precise positioning to phones and cars (Android, iOS)

Running the user platform as embedded software for autonomous vehicles (land, sea, air)

Precise orbit determination for LEO satellite fleets

Giving precise positioning to the Internet of Things (IoT) for new applications

An alternative source of positioning data to check the performance of SouthPAN

As part of a system to monitor the performance of GNSS signals over the South Pacific

Use products such as the ZTD file to improve weather forecasting and climate change monitoring

Improve the performance of crustal movement and earthquake monitoring

Work to maintain and improve Australia's geodetic datums

Supply of Ginan as open source software and correction products and streams as a public service

As a toolkit to help solve complex position, navigation and timing research challenges

As an aid to teaching GNSS technology for space navigation and surveying courses

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Precise positioning enables …

Greater efficiency in the use of space e.g.: automated systems that allow close quarter “platooning” of vehicles giving roads greater capacity.

- Precise positioning allows distances between vehicles to be reduced while safety is maintained.

Enhanced management of resources e.g.: locating and identifying individual trees in plantations to keep specific growth records.

- Systems can optimise harvesting operations while revealing the productivity of coupes within the plantation.

Creation of new entertainment and infotainment opportunities e.g.: augmented reality scenes becoming available at specific sites.

- It has the potential to add a whole new level of granularity to games like Pokemon Go!

Opportunities for process improvements in the maintenance of assets e.g.: operations simulations using large scale, highly detailed digital twins.

- We make all the mistakes in our precise virtual world to get it right in the real world.

Improved understanding of the movement of the Earth’s crust and gives insight into earthquakes, sea level changes and the atmosphere.

- Precise positioning increases the sensitivity in the recording of crustal movements.

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Ginan Project

Ginan is a software development project that relies on the outcomes of some innovative research by Geoscience Australia and FrontierSI personnel.

Core team of 13, mostly based at Geoscience Australia in Canberra.

It has small satellite projects of its own including research into precise point positioning on mobile phones and the development of Ionospheric models.

The project will deliver a minimum viable product (MVP) Ginan 1.0, which includes correction products and streams, by July 2022.

An undifferenced, uncombined, ambiguity resolved, real-time (UD UC AR RT) processing engine will become available after July 2022.

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Ginan Engagement

The engagement process seeks to find the features that will make Ginan a compelling option for users.

Agencies

Commercial organisations

Universities

GNSS Analysis Team

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You know where you are with Ginan

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Questions?

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