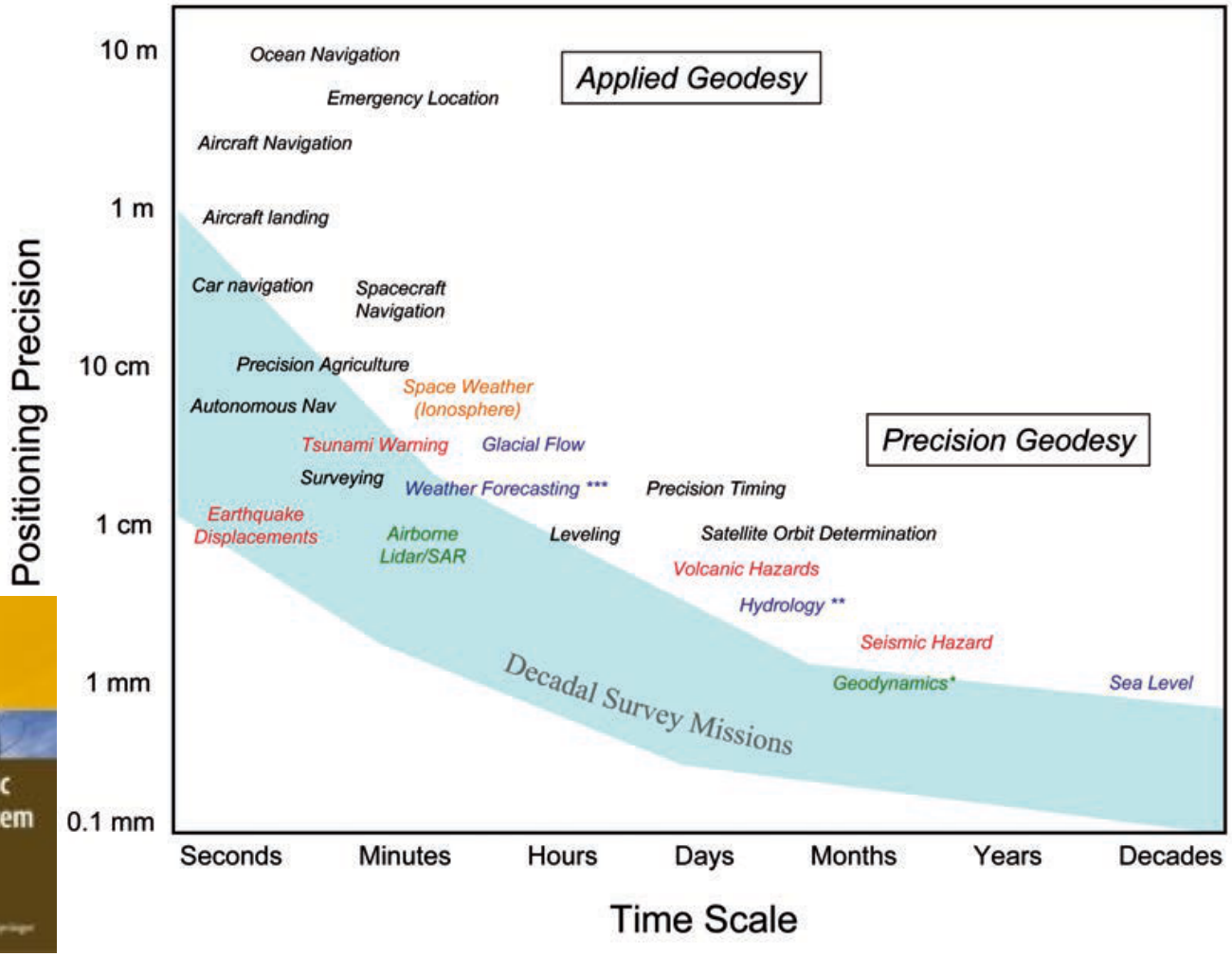
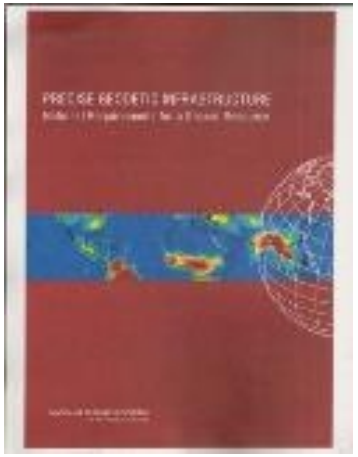
Australian Government
Geoscience Australia

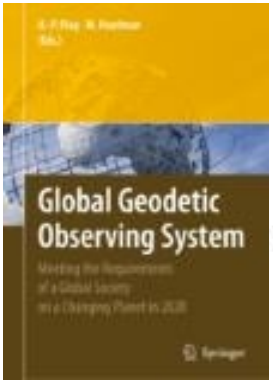
Geoscience Australia's National Positioning Infrastructure Branch

Setting the context

Gary Johnston
Branch Head







National Research Council report on Precision Geodetic Infrastructure (2010)

What's Important to Industry?

Accuracy

- How close is my Position to the 'truth'?

Integrity

- Can I trust my Position?

Accessibility

- Where can I receive corrections to improve my Position?
- Is it cost prohibitive?
- Is it supported by user equipment?

Resilience

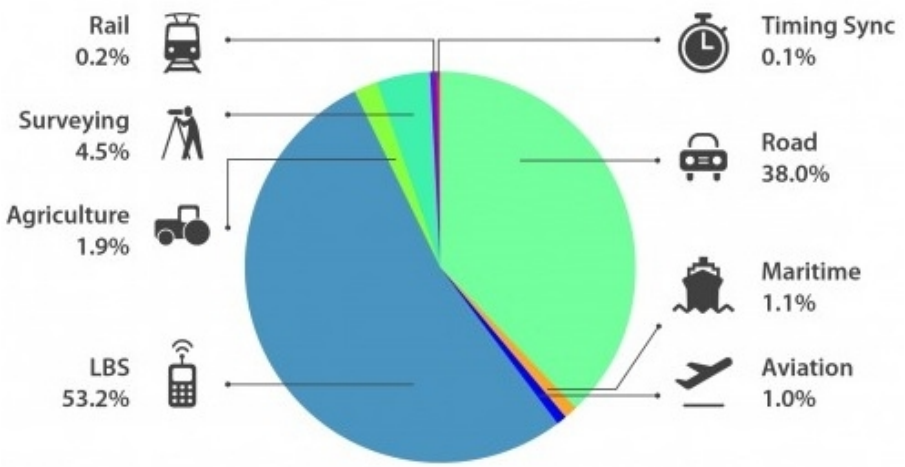
- How susceptible is it to spoofing and jamming?

IAG / GGOS – General Goals

- **1 mm position and 0.1 mm/yr velocity** accuracy on global scales for the ITRF
- **continuous measurements** (time series of EOP, station positions and baselines)
- measurements in **near real-time**
- **highest reliability** and **redundancy**
- **low cost** for construction and operation of geodetic infrastructure

GNSS Future

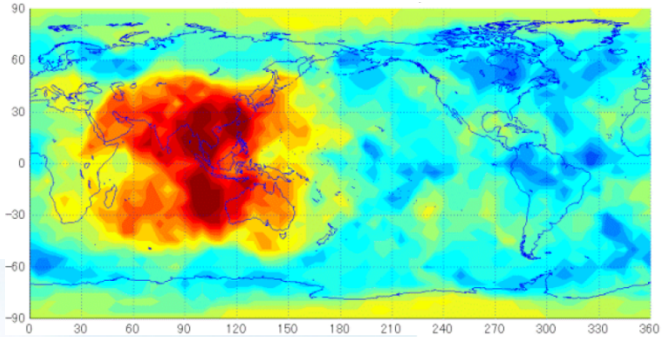
GNSS Market Report 2015

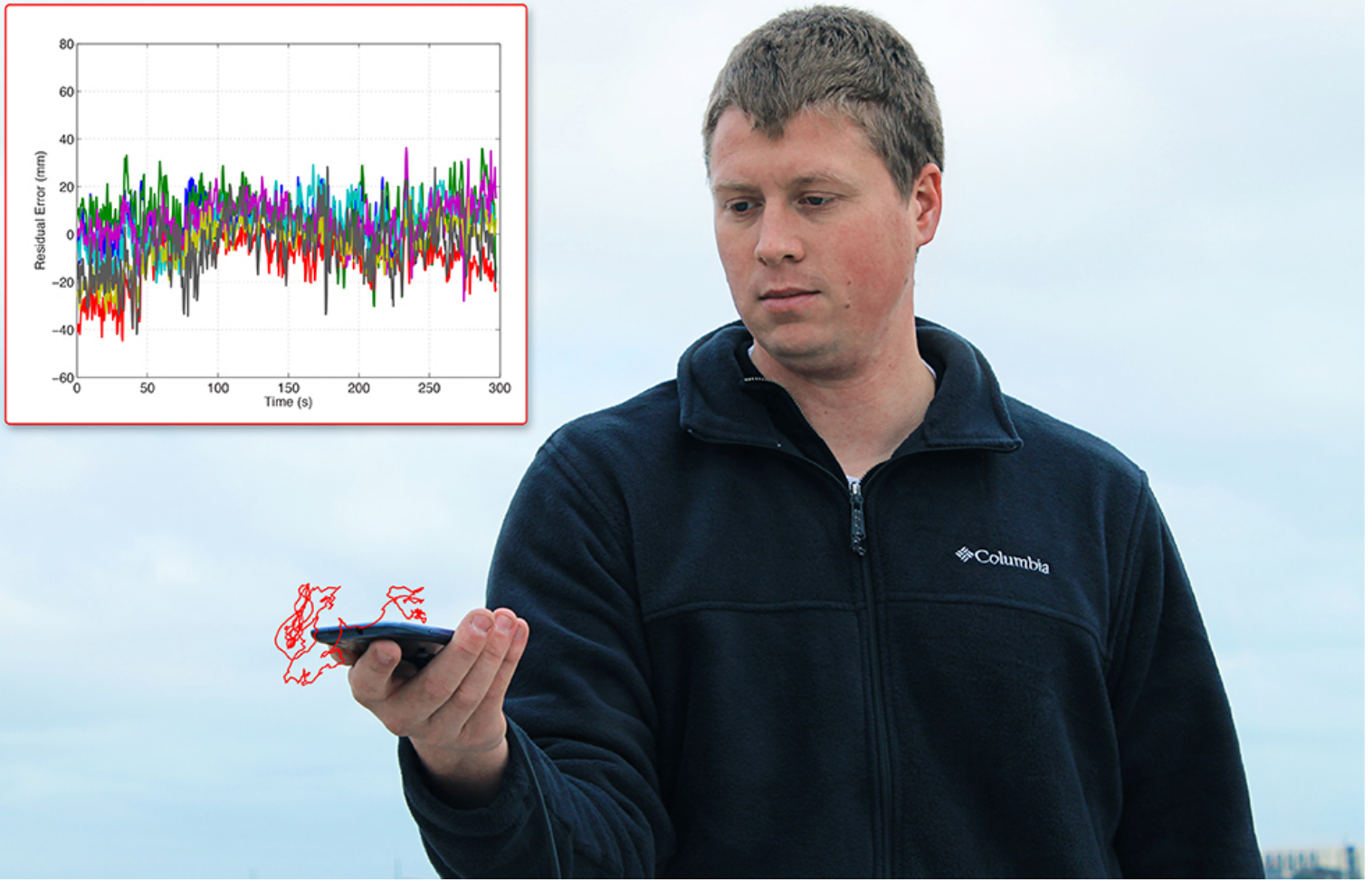


Cumulative Core Revenue (GNSS Chipsets) 2013 - 2023 (European GNSS Agency, 2015)
http://www.gsa.europa.eu/market/market-report

- 1 GNSS device per person on the planet by 2019
- App downloads that rely on positioning will reach 7.5 billion by 2019 (2.8b in 2014)
- High-end Multi GNSS smartphones will replace some specialised devices

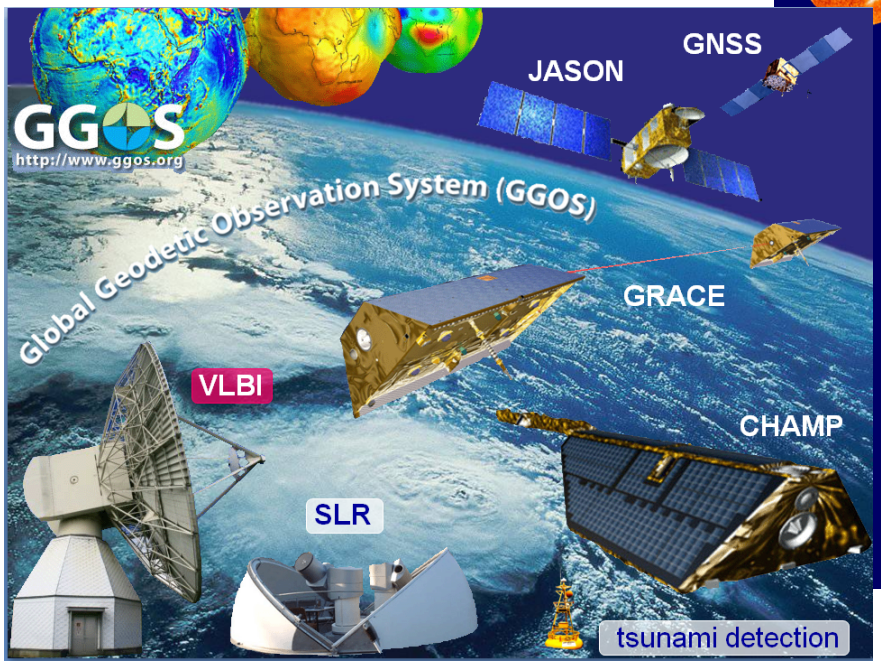
GNSS Future

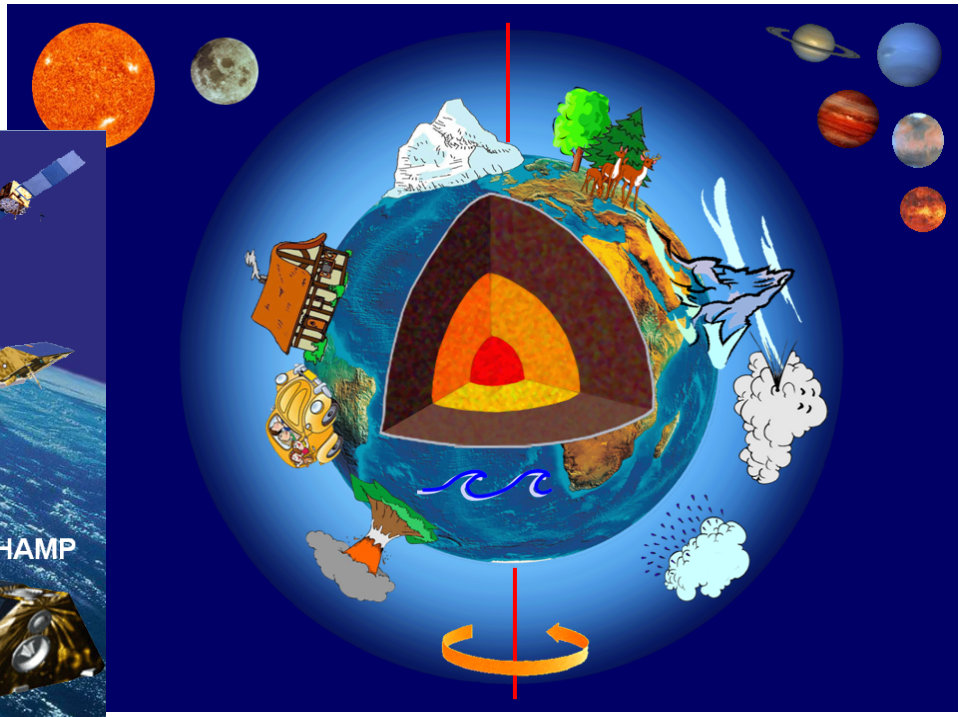




Approach

- Combination of all available Geodetic observations
- Improve our understanding of the ”System Earth“





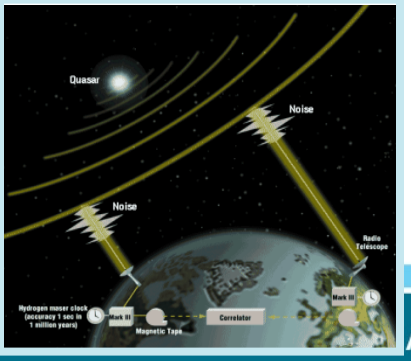
IAG / GGOS – observation techniques / products (1)

International Terrestrial Reference Frame (ITRFxx)

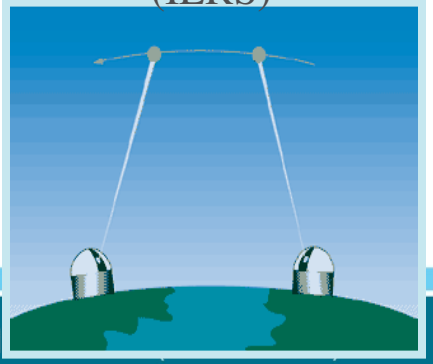
International Earth Rotation and Reference Systems Service (IERS)

Radio source positions, precise GNSS orbits and clocks,
Earth orientation parameters (EOP), station coordinates and velocities

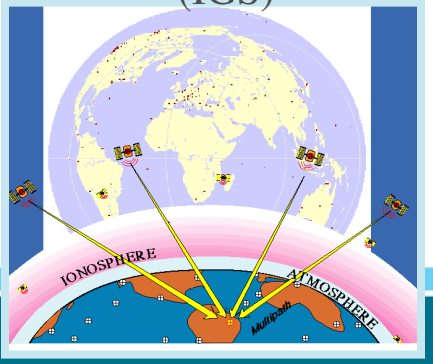
Very Long Baseline Interferometry (IVS)



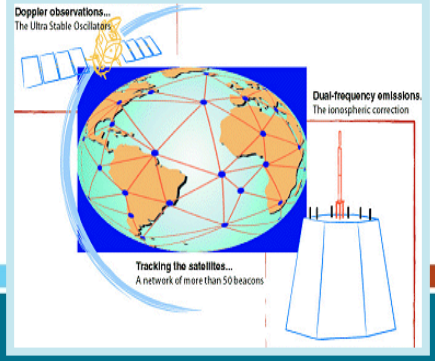
Satellite Laser Ranging (ILRS)



Global Navigation Satellite Systems (IGS)

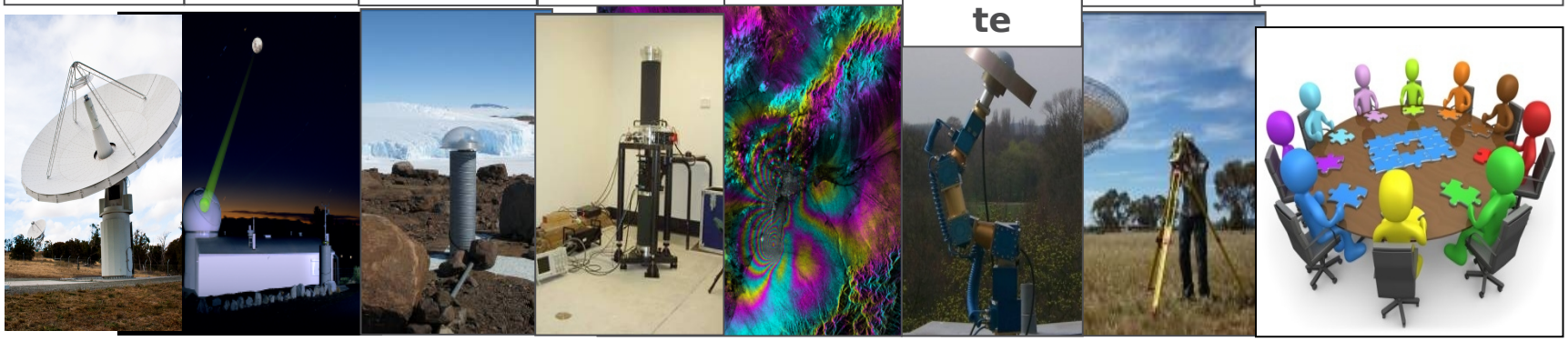


Doppler Orbit Determination and Radiopositioning Integrated on Satellite (IDS)



Geodetic Capability at GA

VLBI	SLR	GNSS	Gravity	Radar	Calibrate	Survey	Leadership



- Provides data to the International community for ITRF production
- Manages Australia's Dynamic Reference Frame
- Provides access to accurate and high integrity PNT in the same reference frame
- Undertakes targeted application research using ensemble of geodetic techniques
- Provides strategic leadership across government on PNT, including advice on GNSS system characteristics

United Nations A/RES/69/266

General Assembly

Distr.: General
11 March 2015

Sixty-ninth session
Agenda item 9

Resolution adopted by the General Assembly on 26 February 2015

[*without reference to a Main Committee (A/69/L.53 and Add.1)*]

69/266. A global geodetic reference frame for sustainable development

The General Assembly,

Reaffirming the purposes and principles of the Charter of the United Nations,

Reaffirming also its resolution 54/68 of 6 December 1999, in which it endorsed the resolution entitled "The Space Millennium: Vienna Declaration on

GGRF Road Map Recommendations

The highlights of the 5 categories of action issues are:

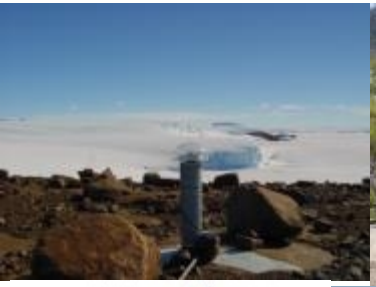
- Actions must be taken to maintain and upgrade current national infrastructure and secure all Member States accurate access to the Global Geodetic Reference Frame;
- Member States are urged to support efforts to develop geodetic standards, and more openly share their data, standardised operating procedures, expertise, and technology;
- Actions must be taken to raise geodetic competence and skills, as a lack of geodetic capability currently limits utilisation of the global geodetic reference frame in many countries, and hinders their achievement of the sustainable development goals. It also threatens the development and sustainability of the Global Geodetic Reference Frame;
- Actions must be taken to raise the general awareness around the value proposition of the Global Geodetic Reference Frame
- Actions must be taken to improve the Global Geodetic Reference Frame governance mechanism, as this is needed to ensure the sustainability and improvement of the Global Geodetic Reference Frame.

Geodetic Infrastructure

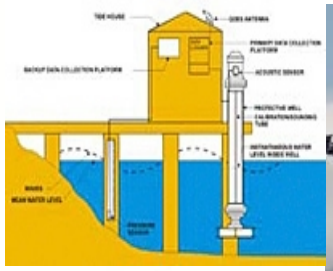
Current situation

- Significant investment in geodetic infrastructure by member States
- Coordination undertaken by the International association of Geodesy (IAG) and its technique services
- Geographical distribution of infrastructure is biased towards Northern
- Gaps in the networks of infrastructure exist, even in the North
- Many of the legacy infrastructure are aging and difficult to maintain, and some do not meet current and planned future specification requirements
- Operating costs for geodetic infrastructure are a risk for sustainable operation
- GNSS contributes to the GGRF in a variety of ways
- GNSS is the primary means of accessing the GGRF
- Coordination across nations, regions and globally is not always fully effective





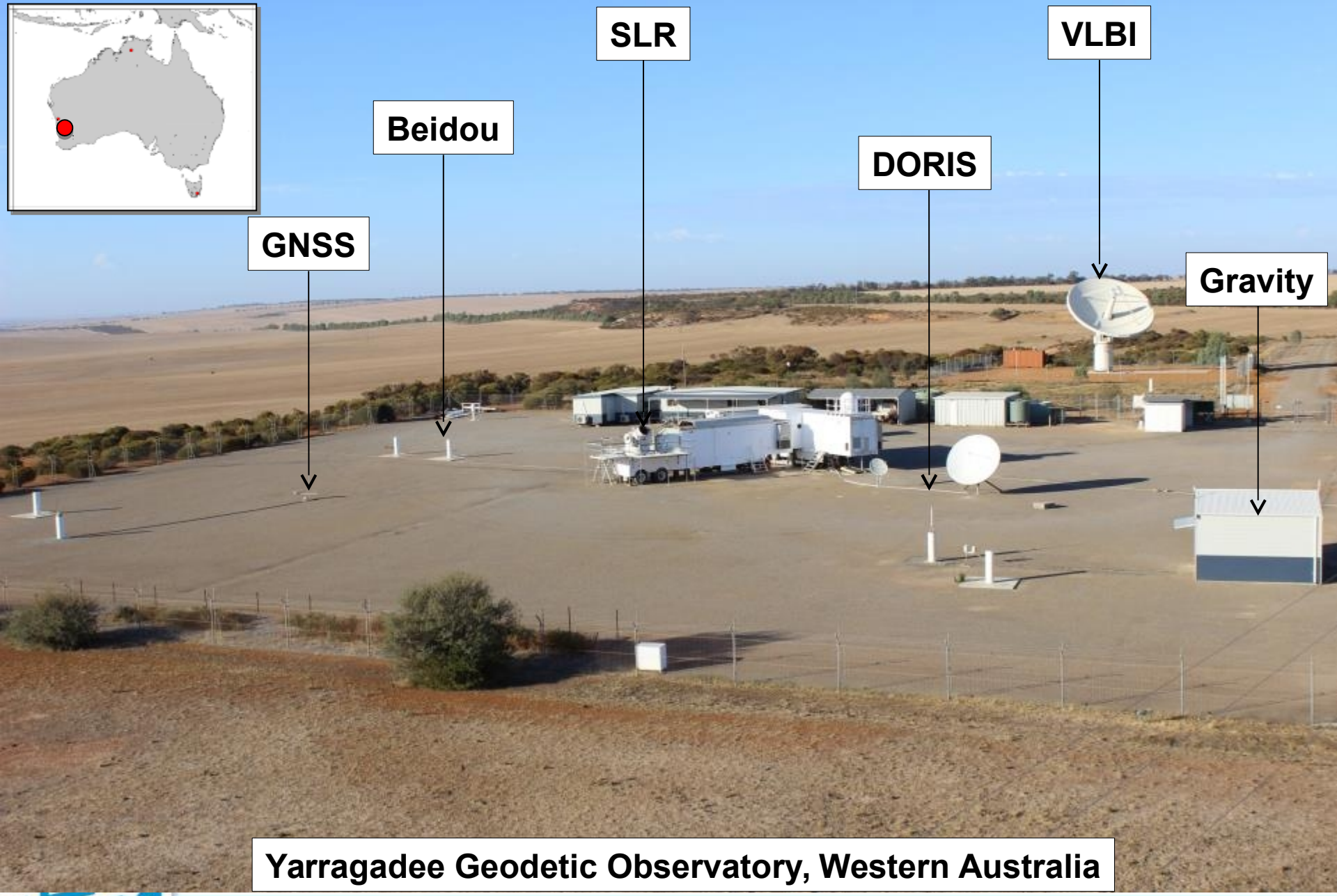





UN-GGIM | United Nations Initiative on Global Geospatial Information Management

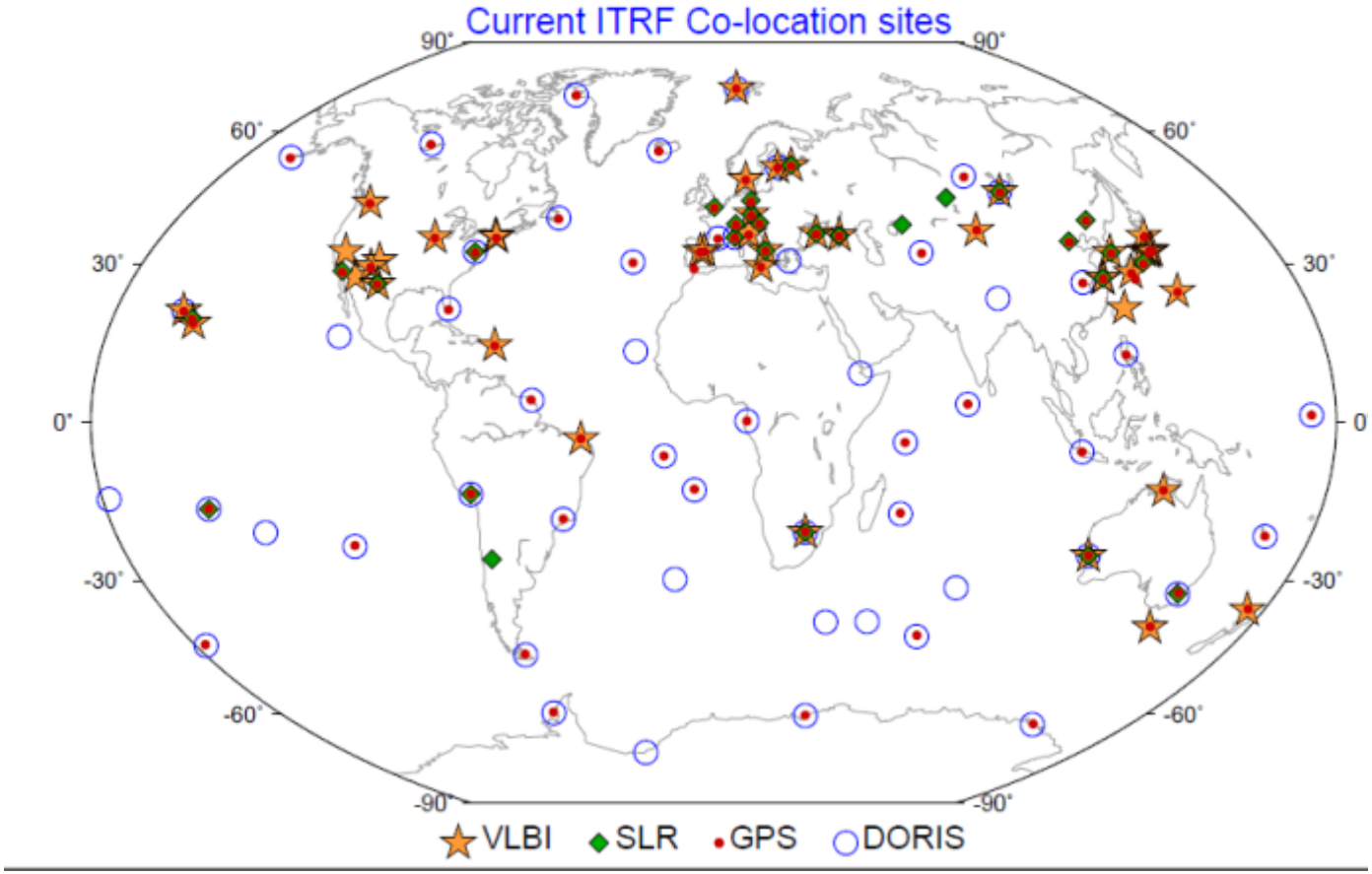
Positioning geospatial information to address global challenges

ggim.un.org



Yarragadee Geodetic Observatory, Western Australia

Current Distribution

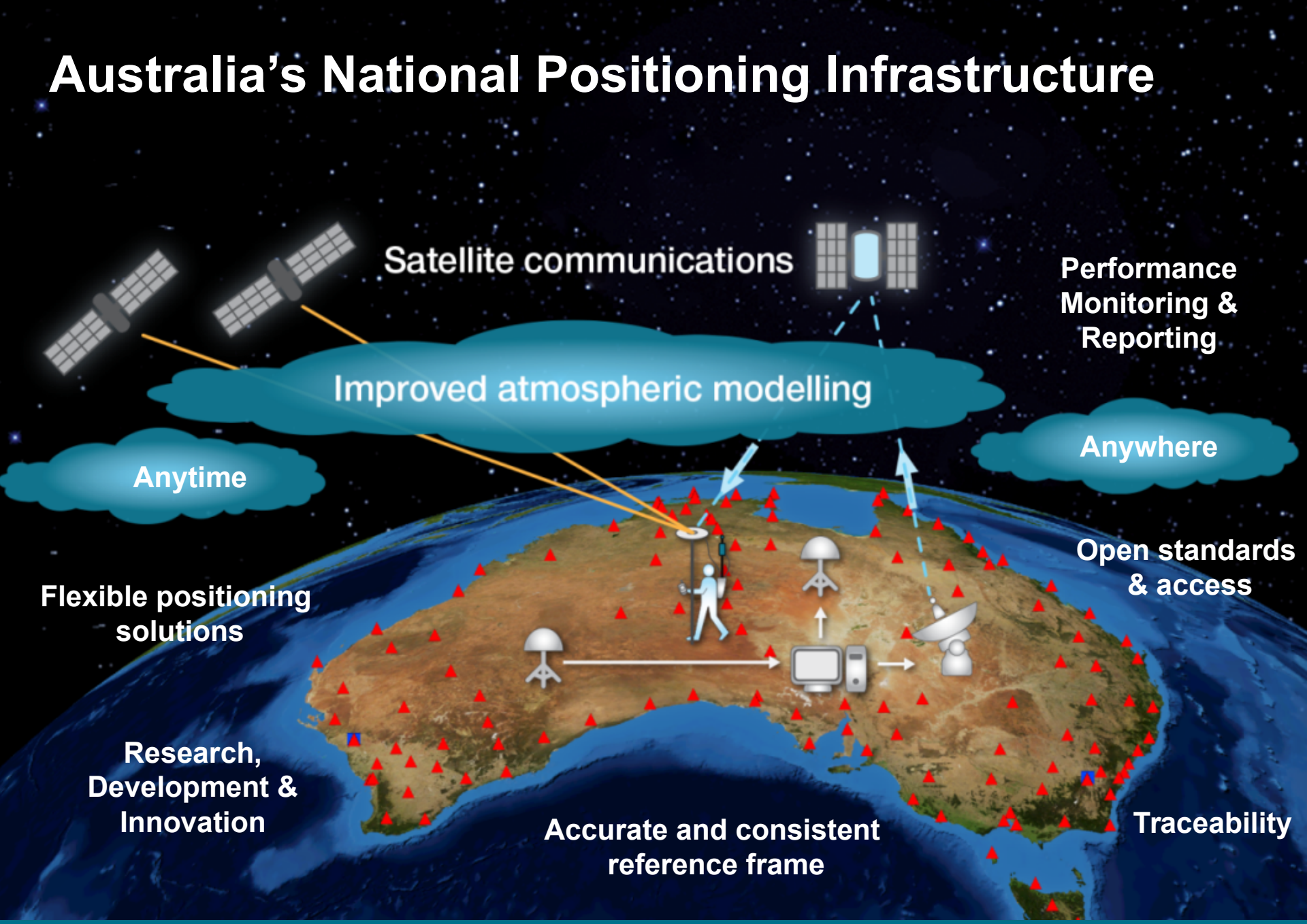


Geodetic Infrastructure

Recommendations

- Member States establish sufficient geodetic infrastructure to allow efficient and accurate access to the GGRF. Member States who have the capacity to assist those countries with less capacity do so through bi-lateral and multi-lateral agreements or other arrangements
- Member States, working within a coordinated science plan developed by the IAG, commit to maintain current investments in the existing Core Observatories in order to ensure the continuation of the provision of services
- Member States make efforts to upgrade the current observing systems at geodetic observatories, in particular VLBI and SLR instruments to next generation technologies
- Member States support the IAG's continued efforts to quantify through simulation the global distribution and specification requirements for geodetic observatories
- Member States commit to fill the gaps where Core Observatories are needed in order to ensure an optimal geometry and coverage wherever they may exist

Australia's National Positioning Infrastructure

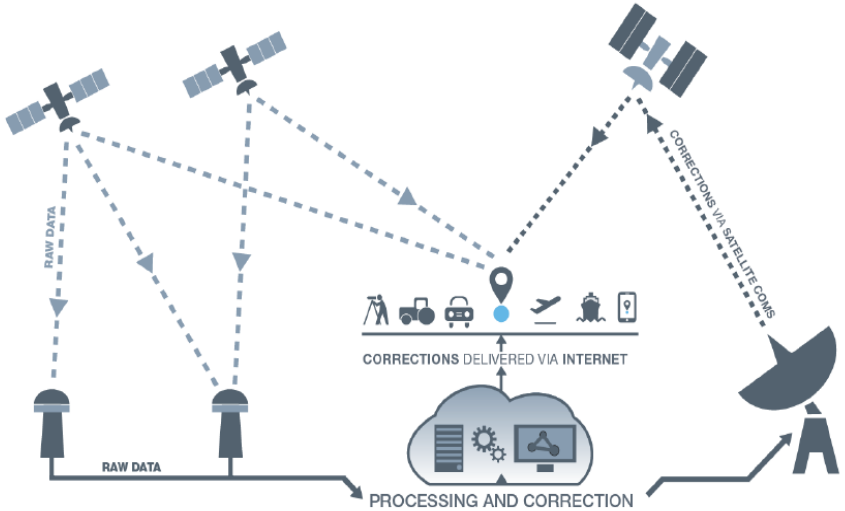


2018-19 Australian Federal Budget

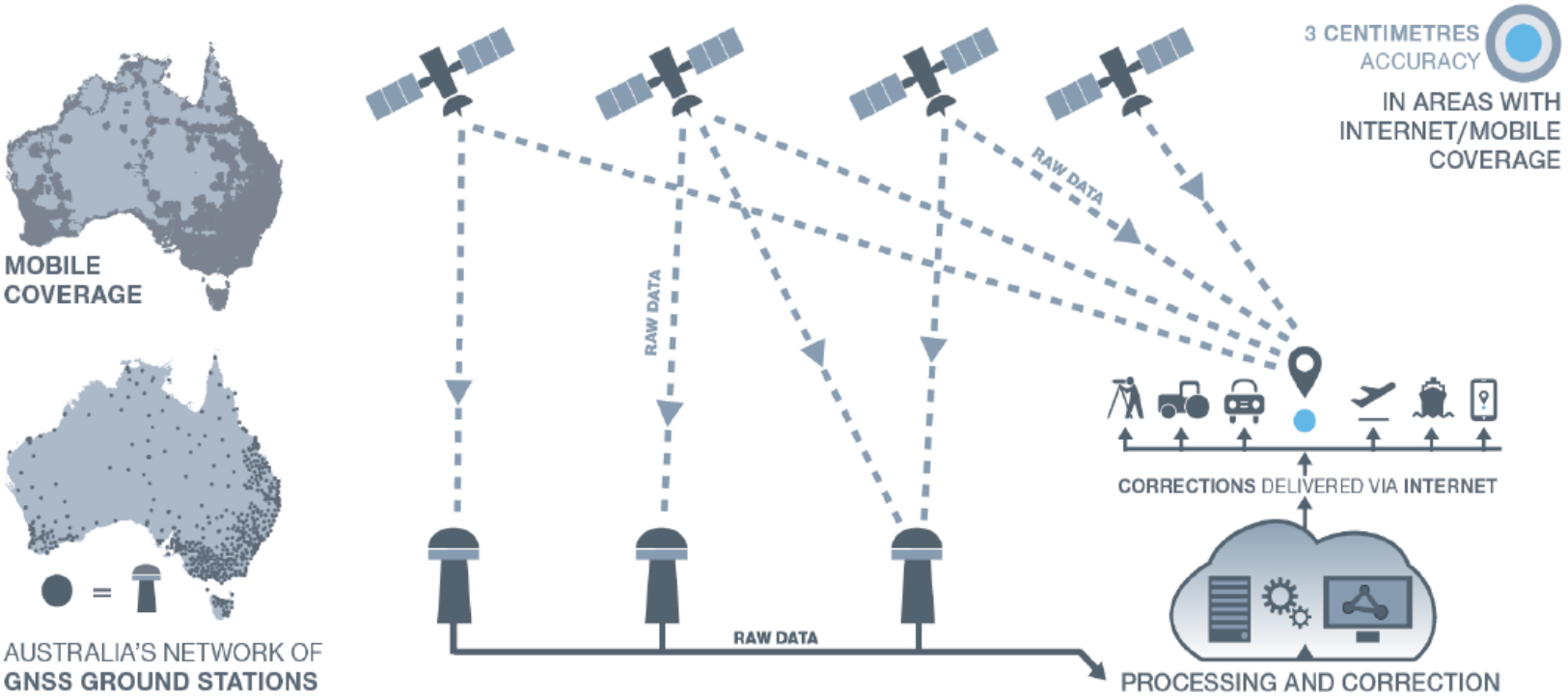
- Allocates $225 million for better satellite positioning
  - AUD $161 million for a Satellite-Based Augmentation System (SBAS)
  - AUD $64 million to establish a National Positioning Infrastructure Capability (NPIC)
  - Ongoing operational funding ($50 million / year)

Program Progress: future capabilities

- L1 SBAS (GPS)
- DFMC SBAS (GPS and Galileo)
- L1 PPP (GPS)
- L5 PPP (GPS and Galileo).



Program Progress: National Positioning Infrastructure



Program Progress: timeframes

Inmarsat 4F1

Australia/NZ SBAS Test-Bed

Australia/+ SBAS Test-Bed Follow-On

Australia/+ SBAS (additional GEOs)

2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024

GNSS CORS Build/Upgrade

Geodetic GNSS Software (Open Source)

Summary

- Positioning underpins all spatial data, which underpins the economy, sustainable development and emergency management
- Geodesy underpins all positioning
- Geodesy is a global science (by definition). Geoscience Australia provides the national focal point for global geodesy on behalf of Australian governments.
- In order to achieve our National goals we contribute to a global community of scientists
- We influence global agenda's to ensure our national requirements are met
- We aim to leverage global best practice by further enhancing Australia's National Positioning Capability