

A wireframe globe is centered in the background, overlaid with a network of white nodes and connecting lines. The globe is semi-transparent, showing the continents. The background is divided into three large triangular sections: light blue on the top left, dark blue on the bottom left, and light green on the top right.

Dissemination of Real-Time and Post-Mission value added GNSS data – A Global Operator’s Perspective

Noor Raziq – GNSS Network Manager Australia

The Fiji GNSS CORS workshop

18 – 20 September 2018

- when it has to be **right**

Leica
Geosystems



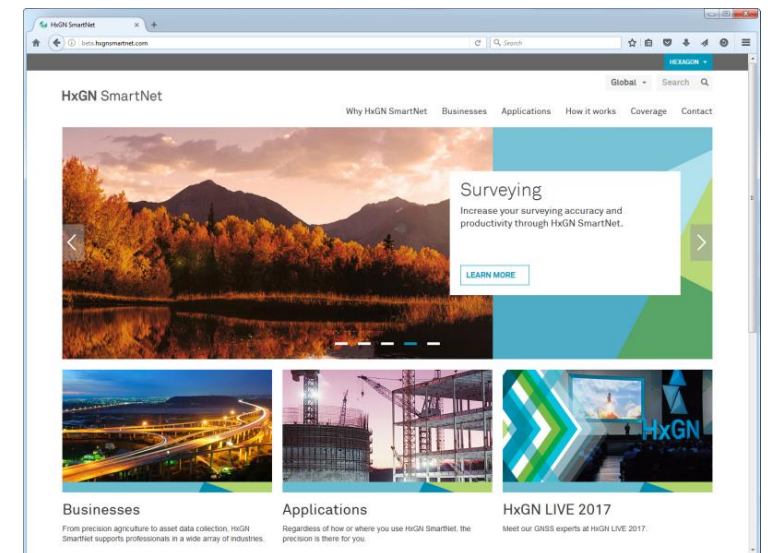
HEXAGON

Outline

- HxGN SmartNet
 - Introduction
 - How do we do it in Australia
 - Real time and post processing GNSS data dissemination
- Fiji CORS
 - What do we have and where to
 - How to do it in Fiji and Pacific
 - Importantly how not to do it
- HxGN SmartNet Operations
 - Hands On Demonstration
 - Later in the session

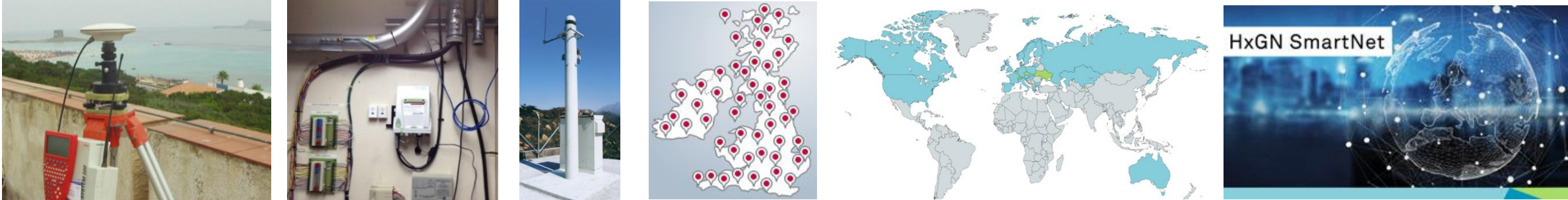
HxGN SmartNet – Correction Service

- Cloud based service to provide **centimeter-level** accuracy to GNSS rovers via mobile internet **in seconds** with **24/7/365 availability**
- Largest network with over 4,500 Reference Stations world-wide available in 22 countries is providing **Open Standard GNSS correction** for RTK positioning
- Over 11 years experience in the correction service market with a globally experienced team



Evolution to HxGN SmartNet

From single base solution to a world-wide network correction services build on technology from Leica Geosystems



HxGN SmartNet Applications & Businesses



Land Surveying



Agriculture



Machine Control & Construction



GIS



Utilities



UAV



Automotive



Agriculture



Logistics



Telecoms



Asset Data Collection



IoT Applications

HxGN SmartNet: Commercial Service Offering

Commercial service offering differs from country to country (market driven)

B2C offering

- Real time correction data streams as
 - Flat rate subscription
 - Consumption-based subscription
- Download of post processing products (RINEX files, Online Post-Processing, etc.)
- Mobile app and web page access

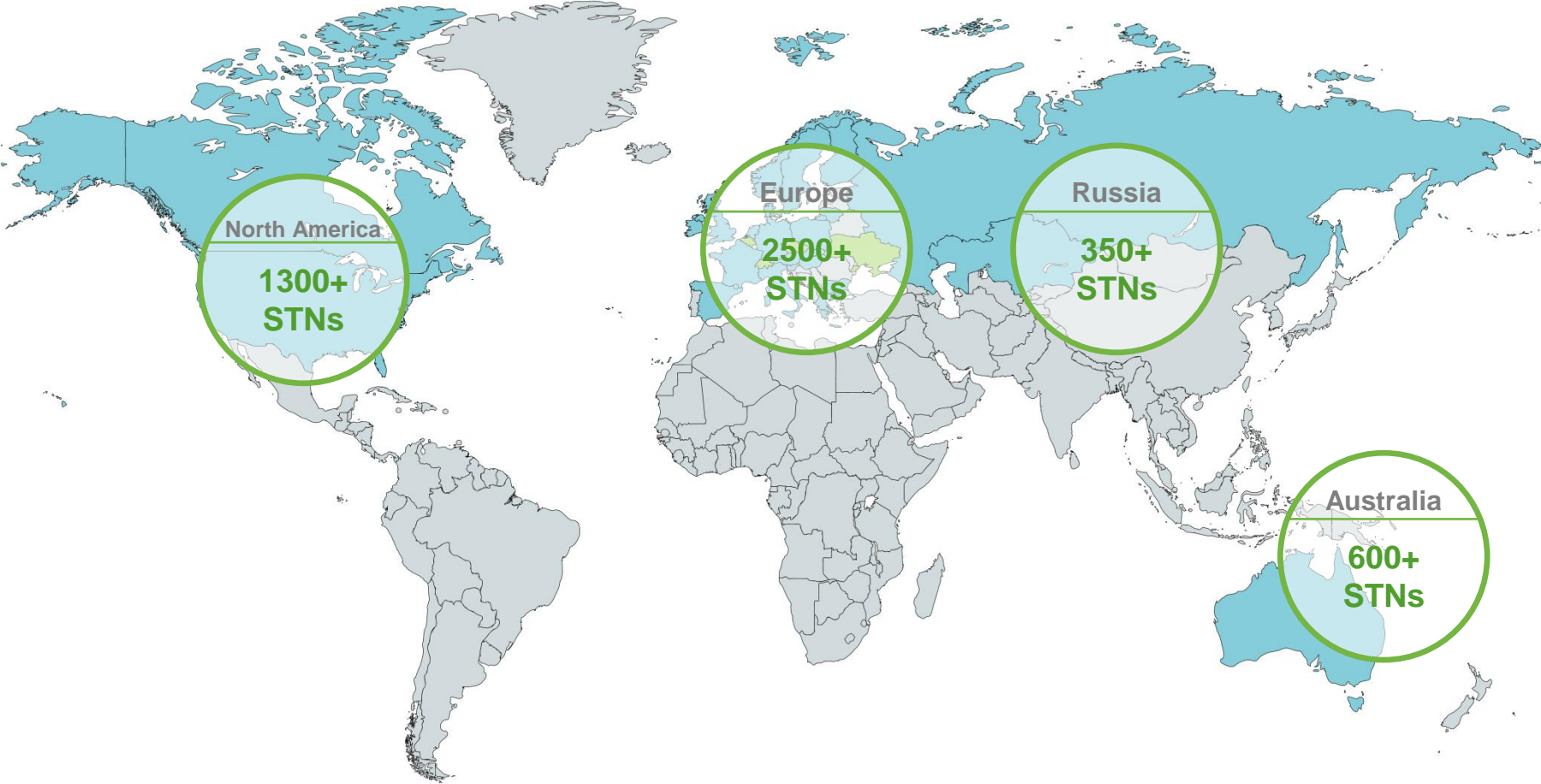


B2B offering

- Enterprise subscription models (Consumption or based on the number of users)
- Integration of API for automation of subscription administration
- Integration of API for post processing automation (using X-pos technology)

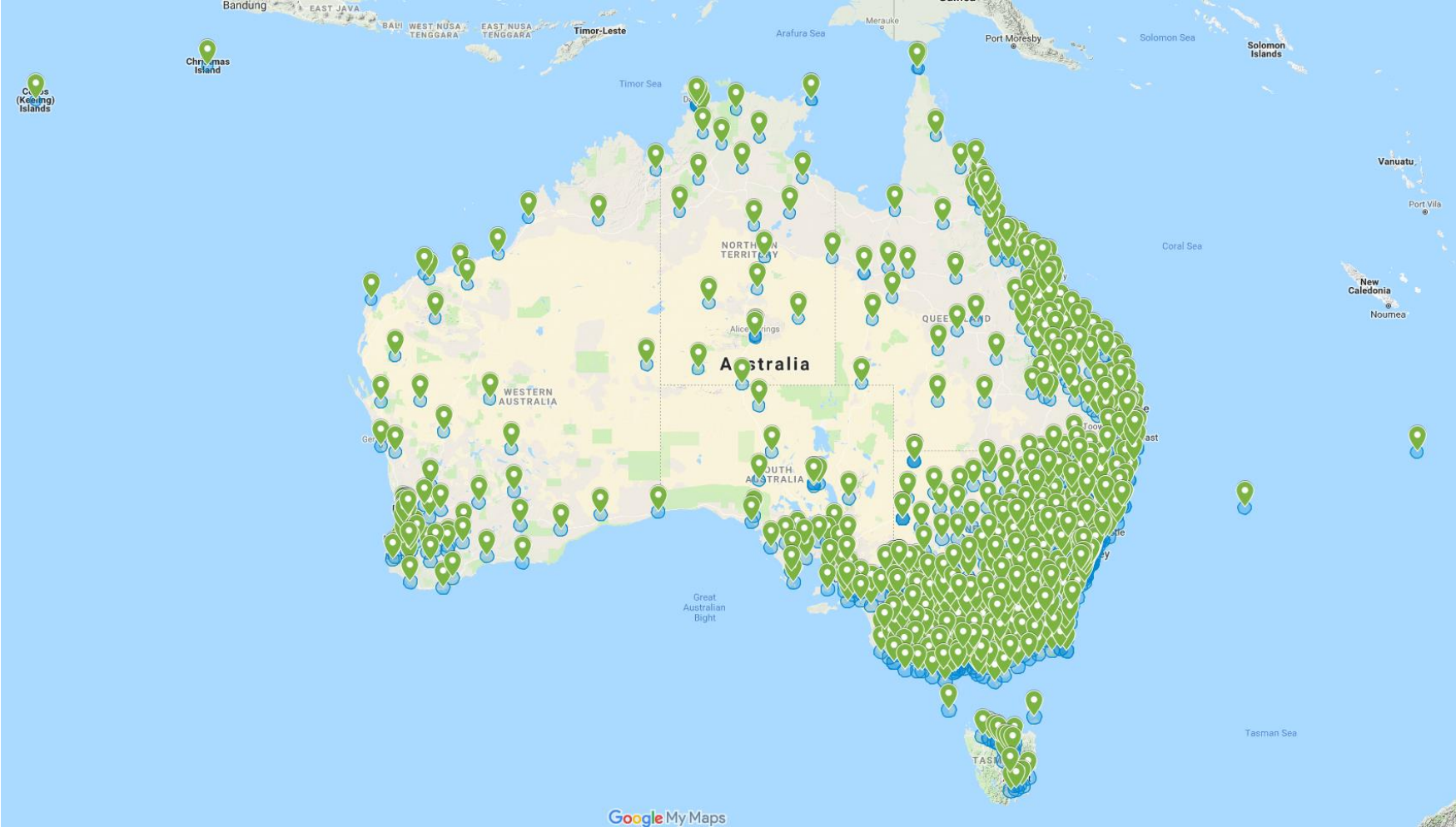


Correction Service on a worldwide scale build on over 4,500 reference stations



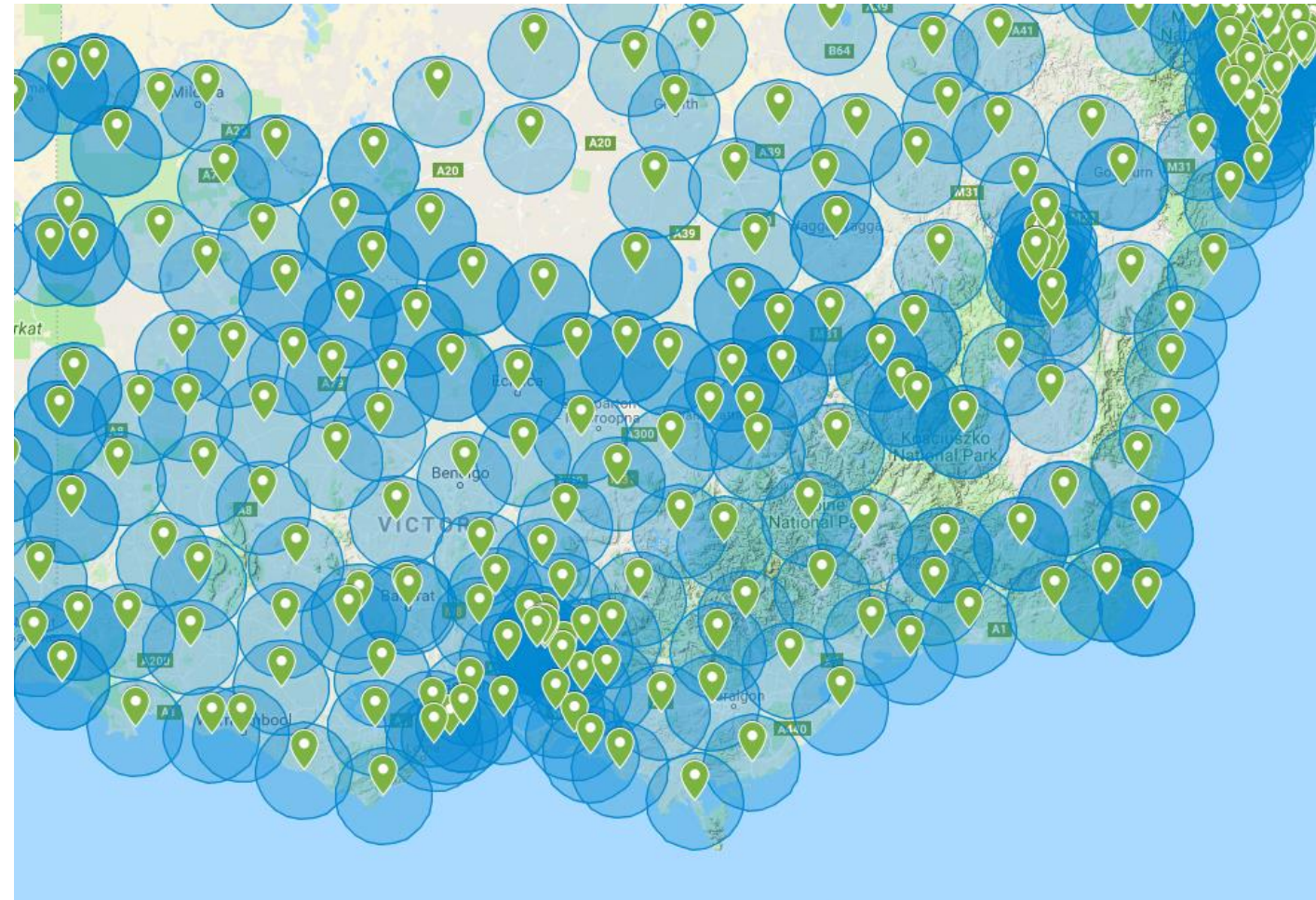
HxGN SmartNet - Australia

- Largest provider of CORS service (630+) in Australia since 2009.



HxGN SmartNet - Australia

- Coverage – Victoria (122 sites)
 - Agreement with DELWP VIC = 114
 - GA = 1
 - HSN = 7
 - Integration of cross-border sites (SA & NSW)



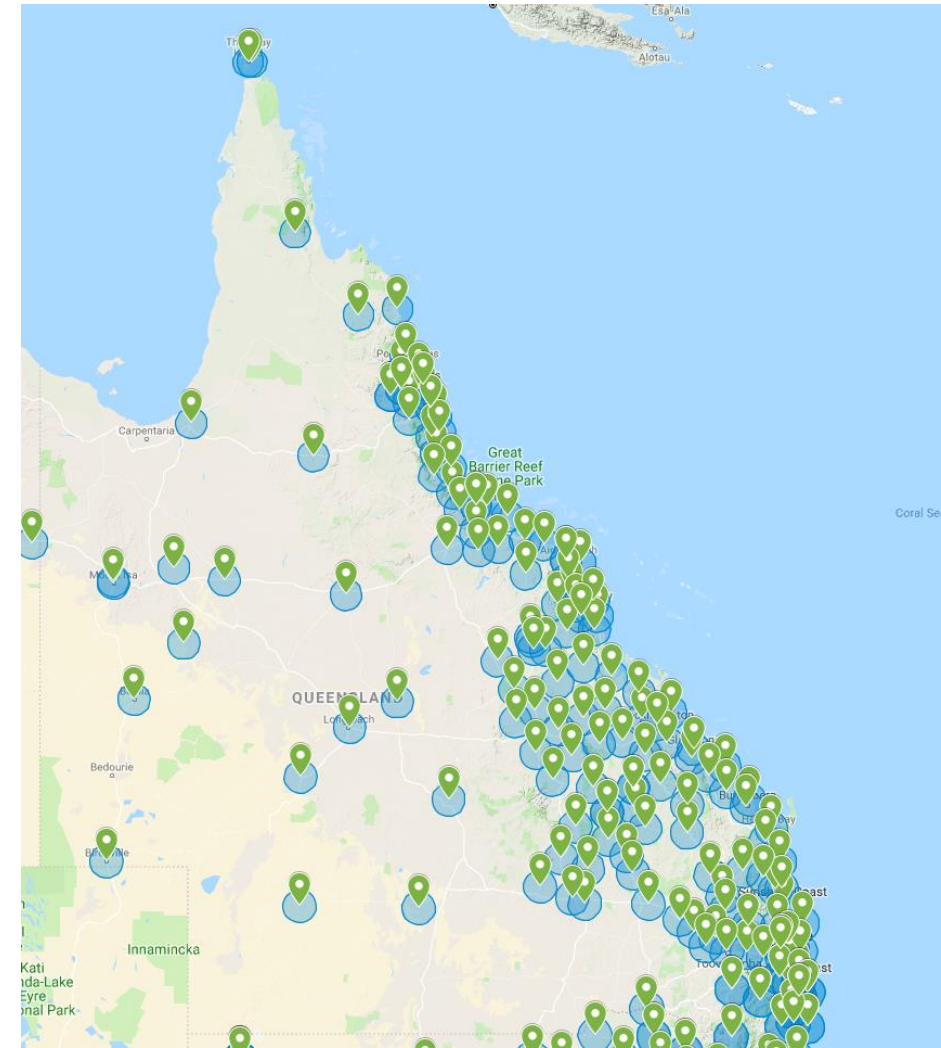
HxGN SmartNet - Australia

- Coverage – New South Wales (216 sites)
 - DFSI-SS = 180
 - GA = 11
 - HSN = 25
 - Continuous coverage from SA and VIC through to QLD



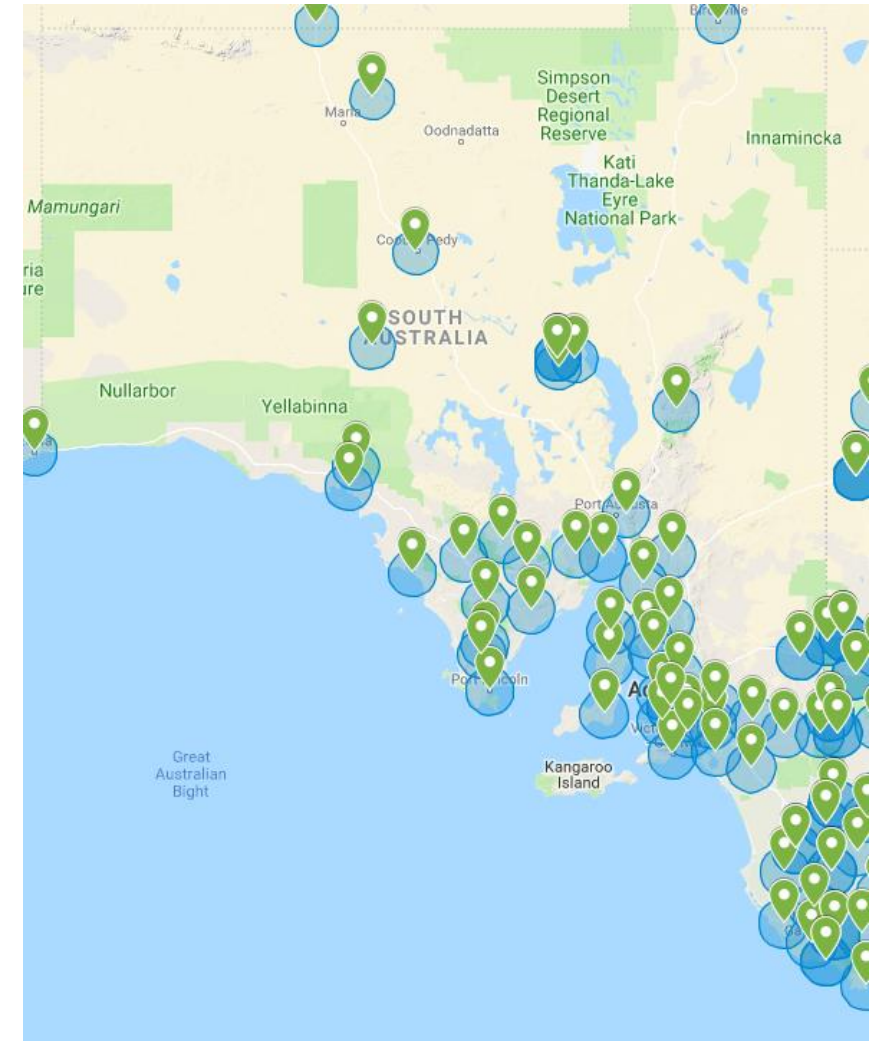
HxGN SmartNet - Australia

- Coverage – Queensland (143 sites)
 - GA (DNRME) = 35
 - HSN = 108
 - SE QLD, Fitzroy Basin, Townsville, Mackay & Cairns
 - Unparalleled coverage



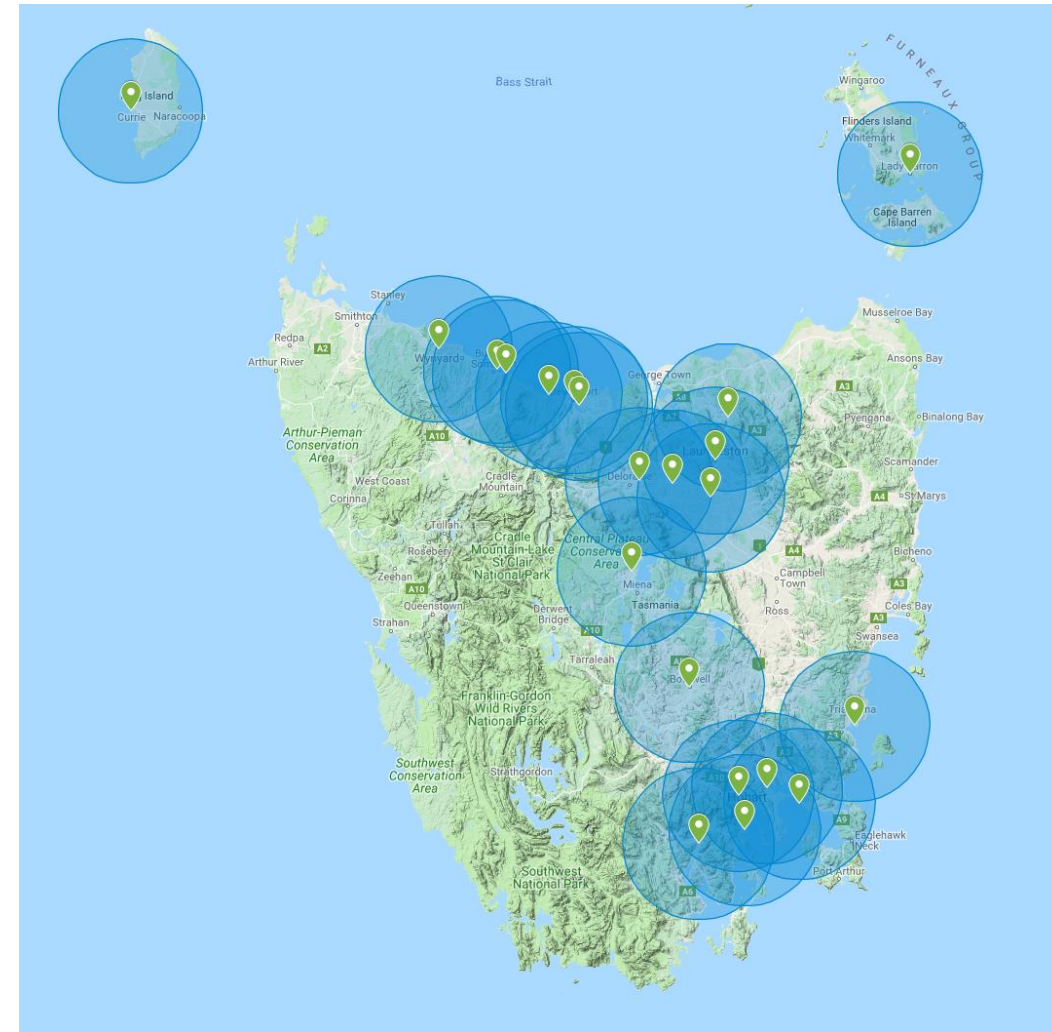
HxGN SmartNet - Australia

- Coverage – South Australia (48 sites)
 - GA = 11
 - HSN = 37
 - Coverage is expanding
 - Offer cross border service – SA & VIC



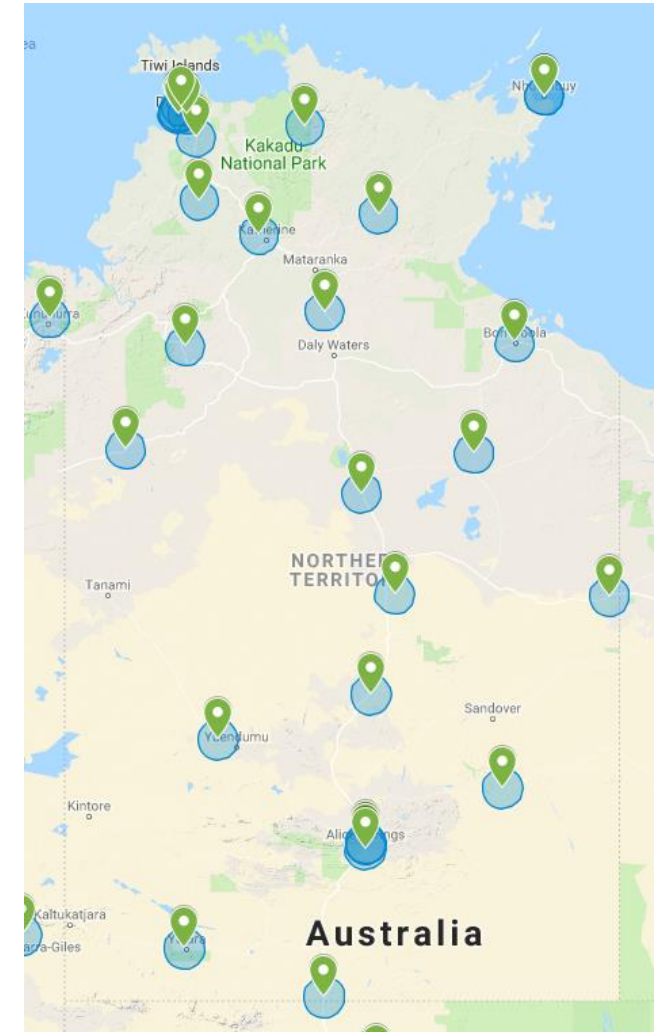
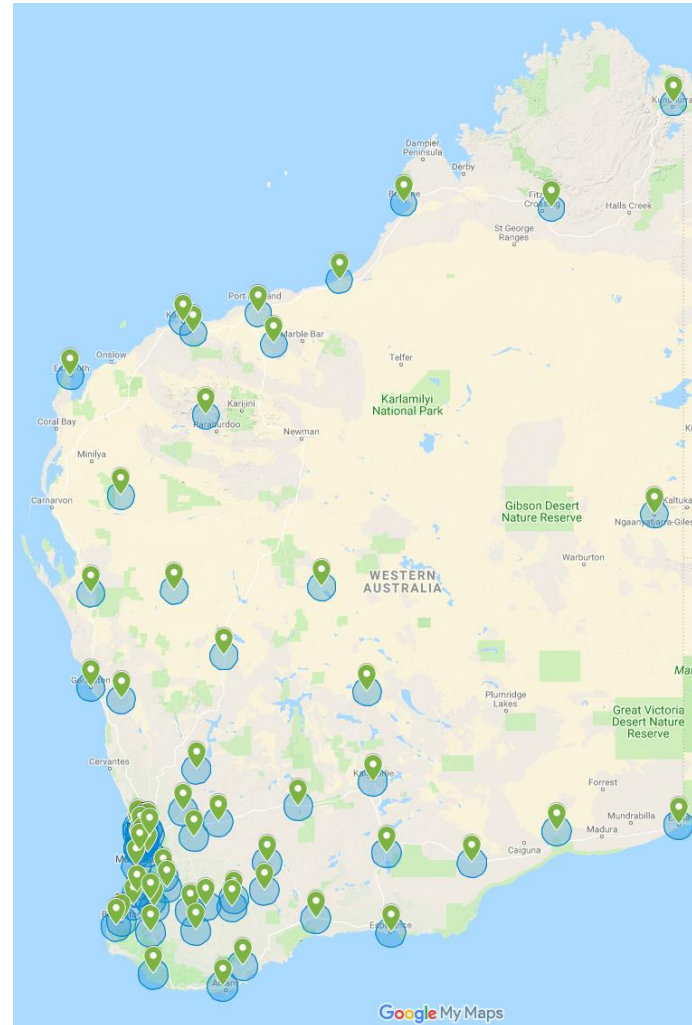
HxGN SmartNet - Australia

- Coverage – Tasmania (21)
 - GA = 9
 - HXN = 12
 - Predominately Ag usage in North
 - Plans to expand coverage between the main towns



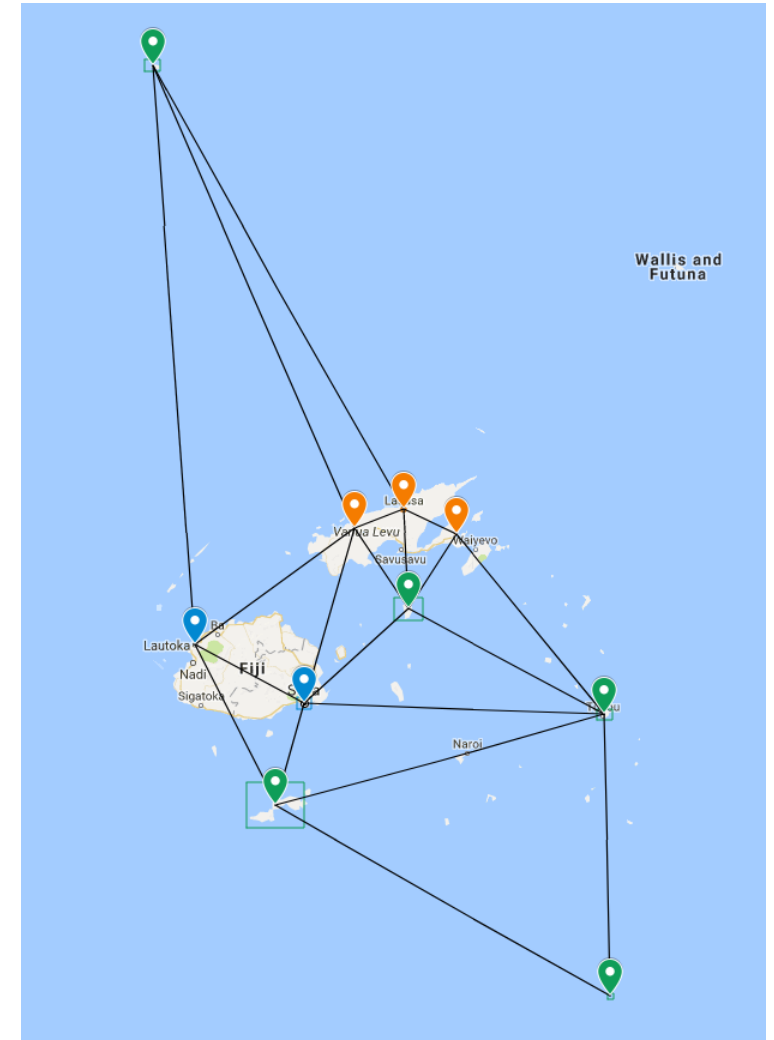
HxGN SmartNet - Australia

- Coverage – Western Australia and Northern Territory (92 sites)
 - GA (Land NT + LandGate) = 55
 - HSN = 37
 - Coverage is growing
 - Focus on expansion around metro Perth



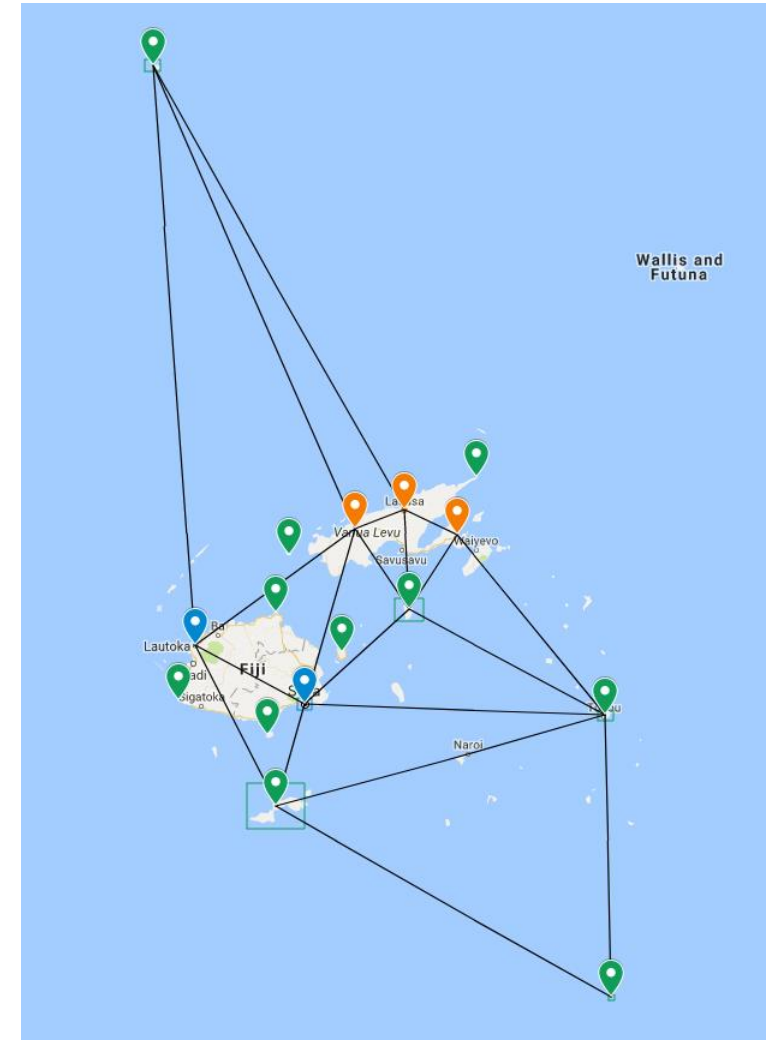
Fiji CORS Network

- Current Network – Base Stations
 - Geosciences Australia / South Pacific Community Sites
 - LTK
 - SUV
 - High Target Sites
 - LAB
 - TAV
 - NAB
 - Leica Geosystems
 - ROT
 - KOR
 - KDV
 - LAK
 - ONO



Fiji CORS Network

- Future
 - Base stations currently being installed
 - More Base Station
 - Upgrade of stations
 - Networking Software Installation and Operation
 - What software
 - Public Private Partnership
 - Business model
 - Expected adoption by the industry / private and public sector
 - Operation and maintenance



GNSS Data Dissemination

- Seems simple
 - Get data from base stations
 - Provide to end users



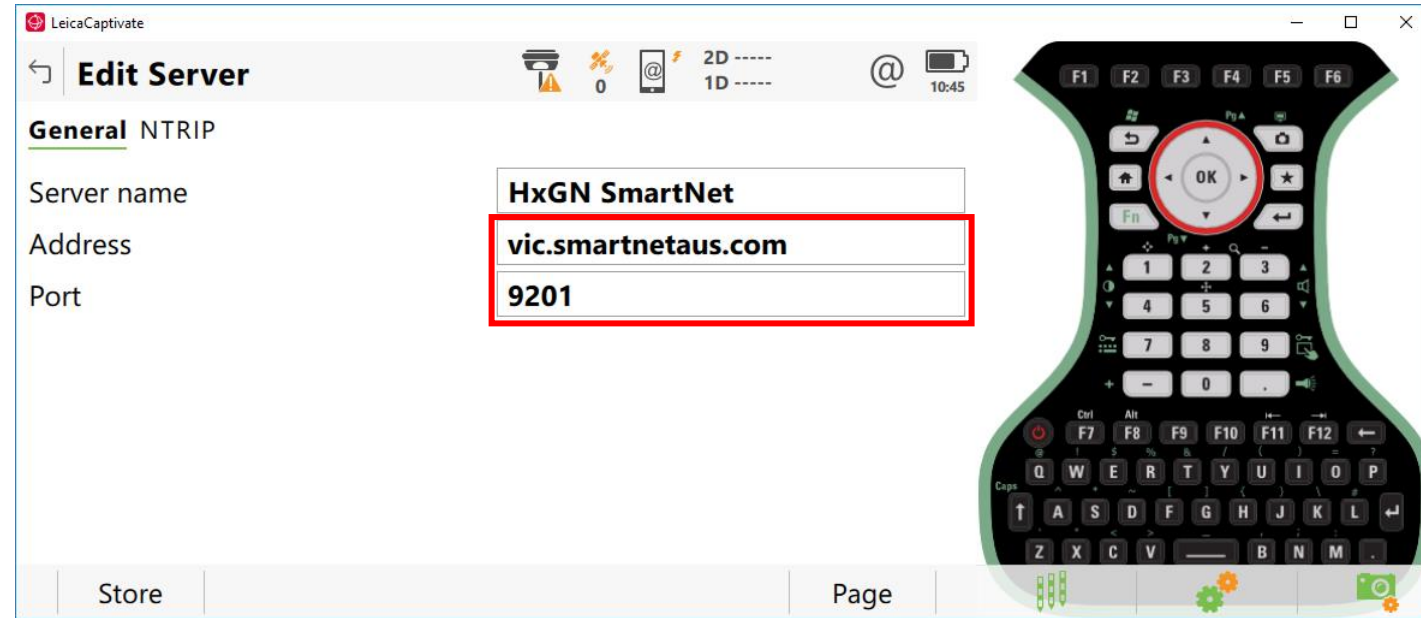
GNSS Data Dissemination

- Extensive Network
 - 630+ sites
- Range of Users
 - Different applications
 - Agric
 - Survey
 - Machine Control
 - UAVs
 - Utilities finding
 - PPK users
 - Different work areas
 - State
 - National
- Real Time Data
 - Most users
- Post Processing Data
 - PPK users
- Processing Methodology
 - Network
 - MAC
 - VRS
 - FKP
 - SSR
- GNSS
 - GPS only
 - GPS+GLONASS
 - Everything
- Datums
 - GDA94
 - GDA2020



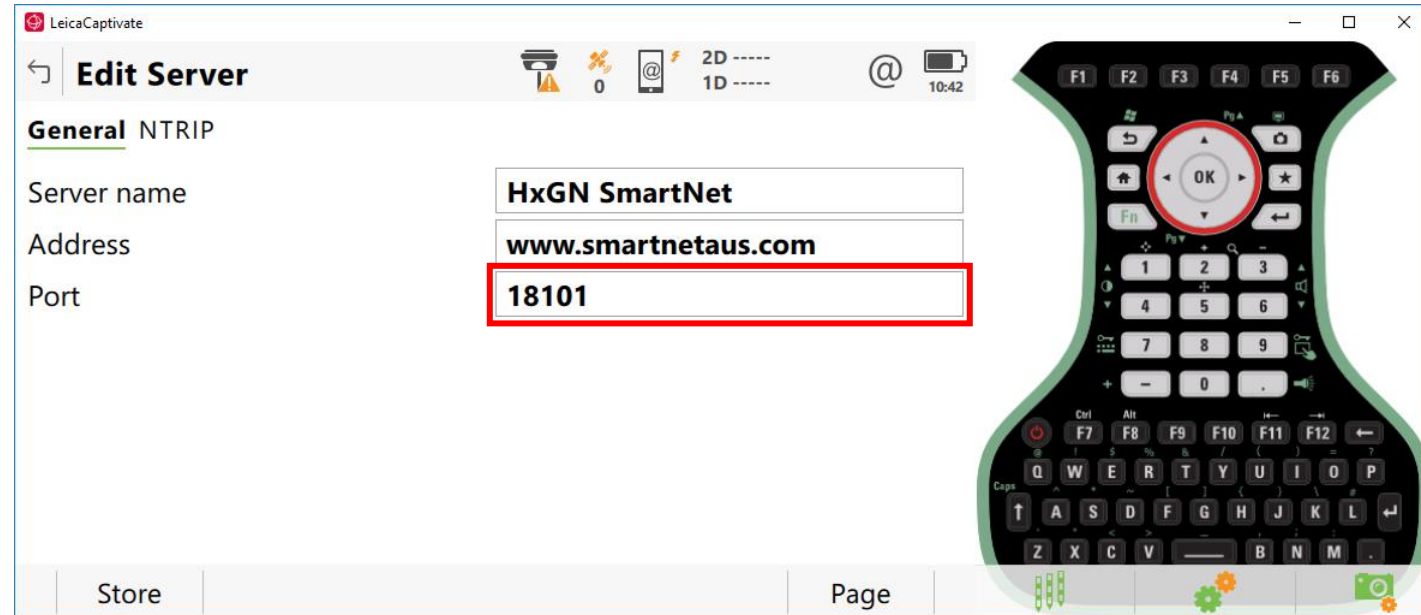
Real-Time Data Dissemination

- Application Based Division
 - Survey and everything else except some GIS
 - Agric
 - Some GIS



Real-Time Data Dissemination

- Geographic Based Division
 - Single State License => Following Post Code
 - Most users
 - NSW
 - VIC
 - QLD
 - SA
 - WA
 - TAS
 - NT
 - National License
 - Some users
 - Will need to change port number when move states
- Currently working on an ubiquitous National and possibly Global solutions
 - Change settings automatically when crossing borders



Real-Time Data Dissemination

- Formats

- Mount Point Names

- MSM
 - RTCM 3.x
 - RTCM 2.3
 - CMR+

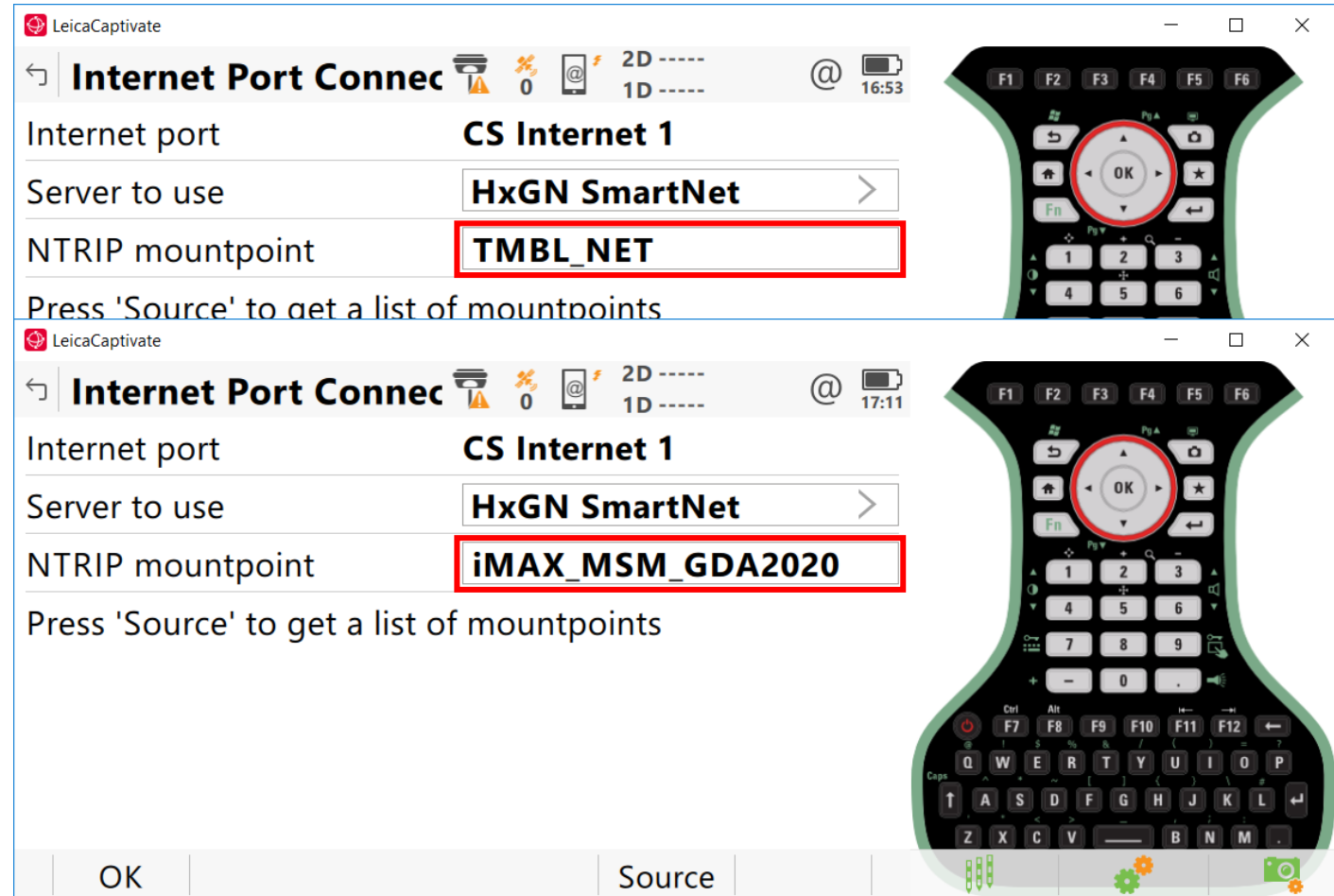
- Correction Methodology

- Mount Point Names

- MAC
 - VRS
 - iMAX
 - Others

- Datums

- Mount Point Names

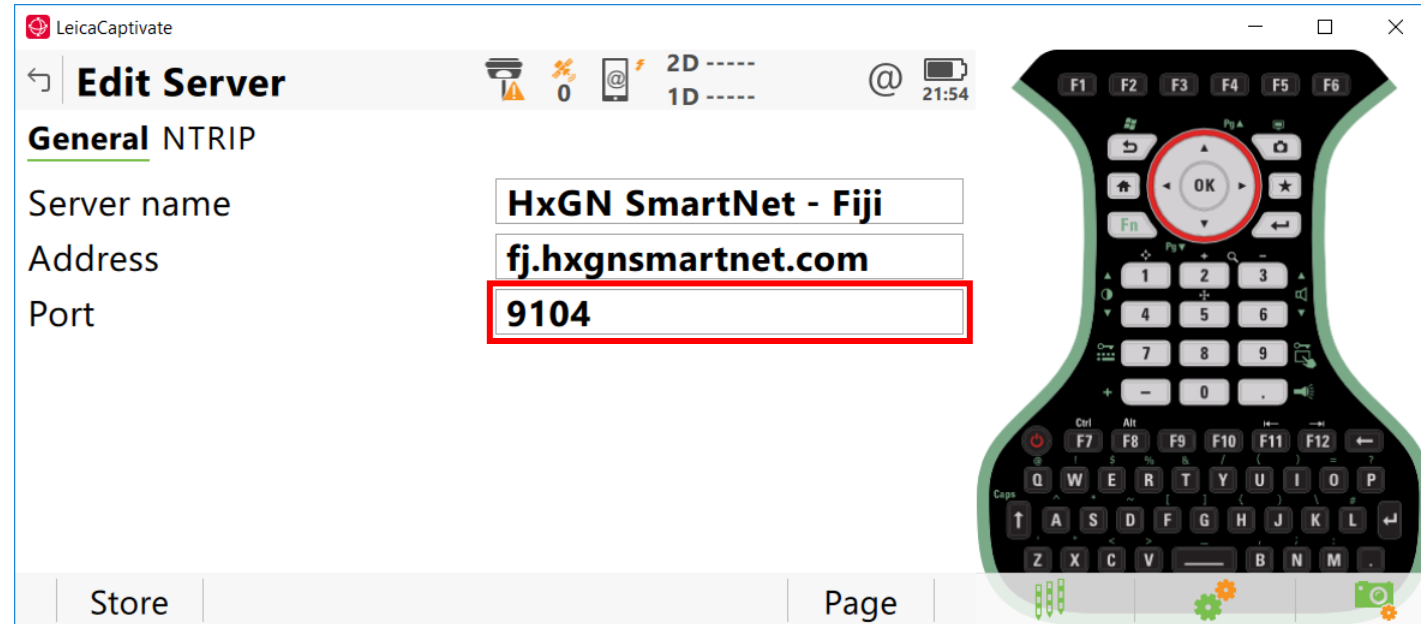


Fiji CORS – Real Time Data Dissemination

- DNS Name = fj.hxgnsmartnet.com

- Ports

- Survey = 9101
- GIS = 9102
- Agric = 9103
- MC = 9104



Post-processing Data Dissemination

- RINEX files

- Multi-GNSS RINEX 3.XX from the new portal
- RINEX 2.XX from the old portal
- Basic QC information
 - Data completeness
 - Multipath

SNA-Melb Obs File Availability

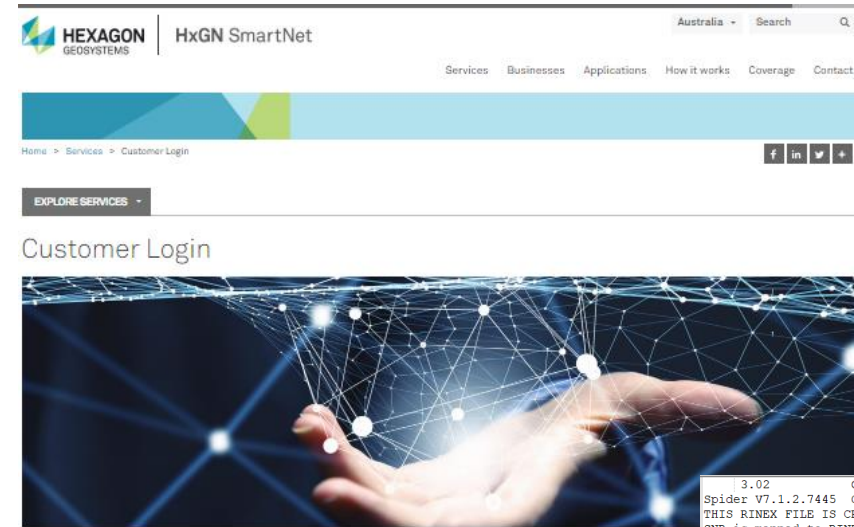
[Site Overview](#) | [Quality Plots](#) | [File Summary](#) | [File Availability](#)

File availability for the last 30 days

Date	DOY	Files*
16 Sep 2018	259	abcdefghijklmnopqrstuvwxyz
15 Sep 2018	258	abcdefghijklmnopqrstuvwxyz
14 Sep 2018	257	abcdefghijklmnopqrstuvwxyz
13 Sep 2018	256	abcdefghijklmnopqrstuvwxyz
12 Sep 2018	255	abcdefghijklmnopqrstuvwxyz
11 Sep 2018	254	abcdefghijklmnopqrstuvwxyz
10 Sep 2018	253	abcdefghijklmnopqrstuvwxyz
9 Sep 2018	252	abcdefghijklmnopqrstuvwxyz
8 Sep 2018	251	abcdefghijklmnopqrstuvwxyz
7 Sep 2018	250	abcdefghijklmnopqrstuvwxyz
6 Sep 2018	249	abcdefghijklmnopqrstuvwxyz
5 Sep 2018	248	abcdefghijklmnopqrstuvwxyz
4 Sep 2018	247	abcdefghijklmnopqrstuvwxyz
3 Sep 2018	246	abcdefghijklmnopqrstuvwxyz
2 Sep 2018	245	abcdefghijklmnopqrstuvwxyz
1 Sep 2018	244	abcdefghijklmnopqrstuvwxyz
31 Aug 2018	243	abcdefghijklmnopqrstuvwxyz
30 Aug 2018	242	abcdefghijklmnopqrstuvwxyz
29 Aug 2018	241	abcdefghijklmnopqrstuvwxyz
28 Aug 2018	240	abcdefghijklmnopqrstuvwxyz
27 Aug 2018	239	abcdefghijklmnopqrstuvwxyz
26 Aug 2018	238	abcdefghijklmnopqrstuvwxyz
25 Aug 2018	237	abcdefghijklmnopqrstuvwxyz
24 Aug 2018	236	abcdefghijklmnopqrstuvwxyz
23 Aug 2018	235	abcdefghijklmnopqrstuvwxyz
22 Aug 2018	234	abcdefghijklmnopqrstuvwxyz
21 Aug 2018	233	abcdefghijklmnopqrstuvwxyz
20 Aug 2018	232	abcdefghijklmnopqrstuvwxyz
19 Aug 2018	231	abcdefghijklmnopqrstuvwxyz
18 Aug 2018	230	abcdefghijklmnopqrstuvwxyz

* - See below for the meaning of the colours.

Status	Meaning
Green	File is available.
Red	File is not available.
Blue	Unknown file availability. File has not been processed by Leica SpiderQC SMARTNET VERSION.



Spider Business Center

Spider Business Center combines all the elements you need to efficiently operate your infrastructure, including powerful and secure user and access management, network and GNSS status monitoring, and access to status information and post-processing services (RINEX download).

[LOGIN >](#)

SpiderWeb

Smart or Virtual RINEX Files can be downloaded via SpiderWeb to benefit from a network solution in post-processing. Alternative to Spider Business Centre, RINEX data can also be ordered through the RINEX Job Service on the SpiderWeb portal.

Please note that SpiderWeb service will be discontinued once Smart RINEX service is made available on the Spider Business Center portal.

[LOGIN >](#)

How can

Want to learn more? We have questions.

[CONTACT US >](#)

```

3.02 OBSERVATION DATA M: MIXED RINEX VERSION / TYPE
Spider V7.1.2.7445 GA 20180402 060756 UTC PGM / RUN BY / DATE
THIS RINEX FILE IS CREATED FROM RTCM V3.0 DATA COMMENT
SNR is mapped to RINEX snr flag value [1-9] COMMENT
LX: < 12dBHz -> 1; 12-17dBHz -> 2; 18-23dBHz -> 3 COMMENT
24-29dBHz -> 4; 30-35dBHz -> 5; 36-41dBHz -> 6 COMMENT
42-47dBHz -> 7; 48-53dBHz -> 8; >= 54dBHz -> 9 COMMENT
Product COMMENT
Site Information : COMMENT
Melbourne Observatory COMMENT
Victoria COMMENT
Australia COMMENT
MOBS COMMENT
50182M001 MARKER NAME
Ryan Ruddick Geoscience Australia OBSERVER / AGENCY
3007645 SEPT POLARX4 2.9.6 REC # / TYPE / VERS
CR20020709 ASH701945C_M NONE ANT # / TYPE
-4130635.7881 2894953.0968 -3890531.4629 APPROX POSITION XYZ
0.0000 0.0000 0.0000 ANTENNA: DELTA H/E/N
G 12 C1C L1C S1C C2L L2L S2L C2W L2W S2W C5Q L5Q S5Q SYS / # / OBS TYPES
R 9 C1C L1C S1C C2P L2P S2P C2C L2C S2C SYS / # / OBS TYPES
E 9 C1C L1C S1C C7Q L7Q S7Q C8Q L8Q S8Q SYS / # / OBS TYPES
C 6 C1L L1L S1L C7I L7I S7I SYS / # / OBS TYPES
J 9 C1C L1C S1C C2L L2L S2L C5Q L5Q S5Q SYS / # / OBS TYPES
DBHZ SIGNAL STRENGTH UNIT
INTERVAL
1.0000
2018 04 02 05 45 0.0000000 GFS TIME OF FIRST OBS
2018 04 02 05 59 59.0000000 GFS TIME OF LAST OBS
0 RCV CLOCK OFFS APPL
G L2S -0.25000 SYS / PHASE SHIFT
G L2X -0.25000 SYS / PHASE SHIFT
R L2P 0.25000 SYS / PHASE SHIFT
E L8Q -0.25000 SYS / PHASE SHIFT
24 R01 1 R02 -4 R03 5 R04 6 R05 1 R06 -4 R07 5 R08 6 GLONASS SLOT / FRQ #
R09 -2 R10 -7 R11 0 R12 -1 R13 -2 R14 -7 R15 0 R16 -1 GLONASS SLOT / FRQ #
R17 4 R18 -3 R19 3 R20 2 R21 4 R22 -3 R23 3 R24 2 GLONASS SLOT / FRQ #
18 18 1929 7 GLONASS COD/PHS/BIS
LEAF SECONDS
END OF HEADER
    
```

Post-processing Data Dissemination

- Online PPK Processing Engine
- X-POS Positioning Server
 - Leica Geosystems Infinity Kernel
 - Static or Kinematic
- Customised Processing Parameters
 - Single Base Processing
 - Loose Network Processing – Many base stations
 - Tight Network Processing – Combined network solution
- Detailed Reports
 - With full error ellipses and uncertainty values

GNSS Processing Report - Summary HxGN SmartNet

Request Details

General Processed at: 2018-03-23 10:38:08 SBC version: 7.1.0.183	User Details User name: TestUser01 Name: SNA Test Company: Email: support@smartnetaus.com
---	--

Point Results

Point-ID	Solution Type	Occupations / Baselines	WGS84 Latitude	WGS84 Longitude	WGS84 Ellip. Height [m]	SD Latitude	SD Longitude	SD Height
MOBS	Phase Fixed	2/5	-37° 49' 45.8970"	144° 58' 31.2060"	40.6646 m	0.0030 m	0.0018 m	0.0028 m

Point-ID	Solution Type	Occupations / Baselines	WGS84 Cartesian X	WGS84 Cartesian Y	WGS84 Cartesian Z	SD X	SD Y	SD Z
MOBS	Phase Fixed	2/5	-4130635.7850 m	2894953.0883 m	-3890531.4543 m	0.0026 m	0.0022 m	0.0029 m

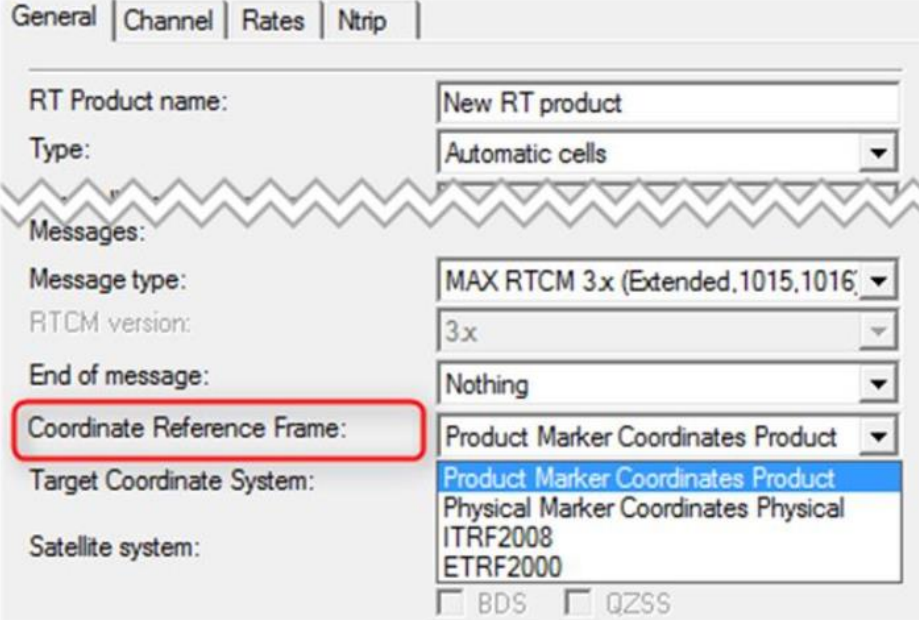
Target Coordinate System

Name:	GDA94_MGA Zone 55_NSW_VIC
Ellipsoid:	GRS 1980
Projection Type:	TransverseMercator
Geoid Model:	AG09_NSW_VIC
CSCS Model:	-

Point-ID	Coordinate System	Northing	Easting	Ellip. Height	SD Easting	SD Northing	SD Height
MOBS	GDA94_MGA Zone 55_NSW_VIC	581180.0373 m	321419.5988 m	35.8897 m	0.0030 m	0.0018 m	0.0028 m

HxGN SmartNet Multiple Reference Frames Support

- Maintenance of **multiple reference frames** in one installation
- Send out raw data and RTK corrections in a selected reference frame
 - allowing the rover user position directly in their chosen reference frame without the need for transformation.



The screenshot shows the 'General' tab of the HxGN SmartNet configuration interface. The 'Coordinate Reference Frame' dropdown menu is highlighted with a red box. The options in the dropdown are: Product Marker Coordinates Product, Physical Marker Coordinates Physical, ITRF2008, and ETRF2000. The 'Product Marker Coordinates Product' option is currently selected and highlighted in blue. Other visible fields include: RT Product name: New RT product; Type: Automatic cells; Message type: MAX RTCM 3.x (Extended, 1015, 1016); RTCM version: 3.x; End of message: Nothing; Target Coordinate System: Product Marker Coordinates Product; and Satellite system: ITRF2008, ETRF2000. There are also checkboxes for BDS and QZSS.

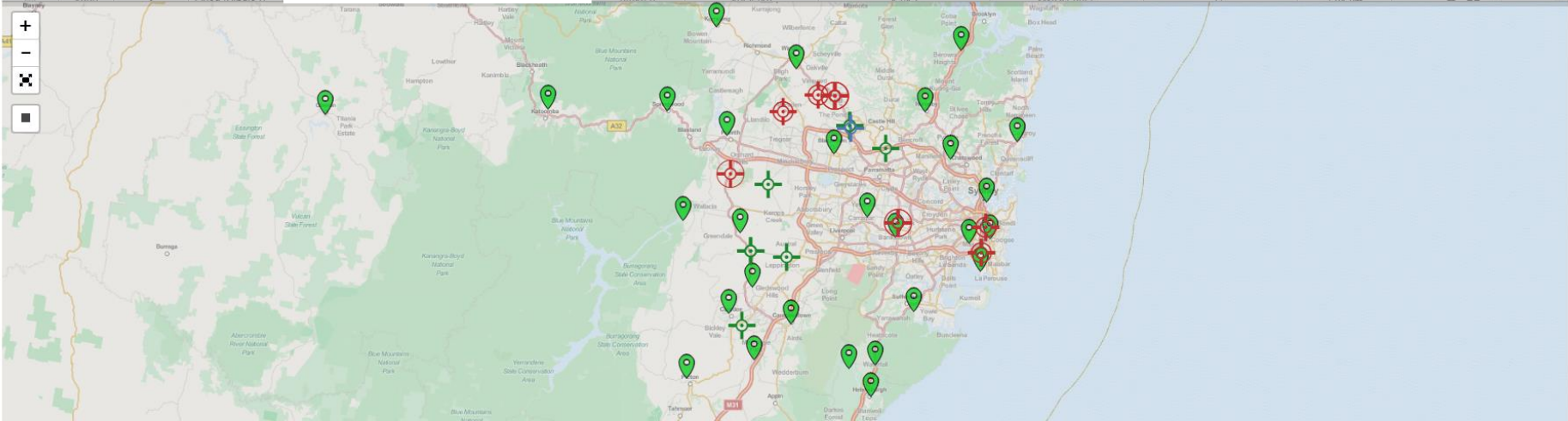
HxGN SmartNet Web and App Tools

- HxGN SmartNet web access
 - More transparency into your subscriptions (logins, rovers, status)

Live Usage

Total: 76, Fixed (Network): 19 (25%), Fixed (Single Base): 33 (43%)

Pin	No.	NMEA Quality	Fixing Status	User Name	Rover User Name	Duration	Last Received	Satellites Ref./Rover	RTCM Ref. Stn. ID	NMEA Ref. Stn. ID	Distance	
	1649		Fixed (Single B...			2:12:35	19:26:20	13/11	MNDH-0056	56	12.68 km	
	1460		Fixed (Single B...			3:21:39	19:26:20	13/12	ELBN-0010	10	10.46 km	
	163		Fixed (Single B...			10:23:03	19:26:20	13/11	MNDH-0056	56	12.52 km	
	44		Not fixed			8:18:46	19:26:19	18/8	NRMN-0042	-	10.29 km	
	108		Fixed (Single B...			9:30:04	19:26:18	13/10	WLTN-0085	85	11.87 km	
	1611		Fixed (Single B...			2:27:05	19:26:18	13/16	ULST-0079	79	3.86 km	
	1708		Fixed (Network)			1:47:33	19:26:18	12/10	BLMT-0005	-	8.19 km	
	1600		Fixed (Single B...			0:04:50	19:26:18	12/10	MNDH-0056	56	7.04 km	



HxGN SmartNet Web and App Tools

- HxGN SmartNet app
 - Ideal for checking Site Status & Rover Credentials in the field
 - Network Status & NTRIP port connectivity
 - NTRIP login (username, password)
 - Mount tables
 - Subscription status

HxGN SmartNet

Select your SmartNet location
Tap the country you are in



[Back to country selection](#)

Want to learn more about SmartNet?

Australia
 Tap here to select Australia

Please find below detailed information for your SmartNet subscription

2000801_AUS_SUI
LE-AHVGWBXUPN-1

Article Number

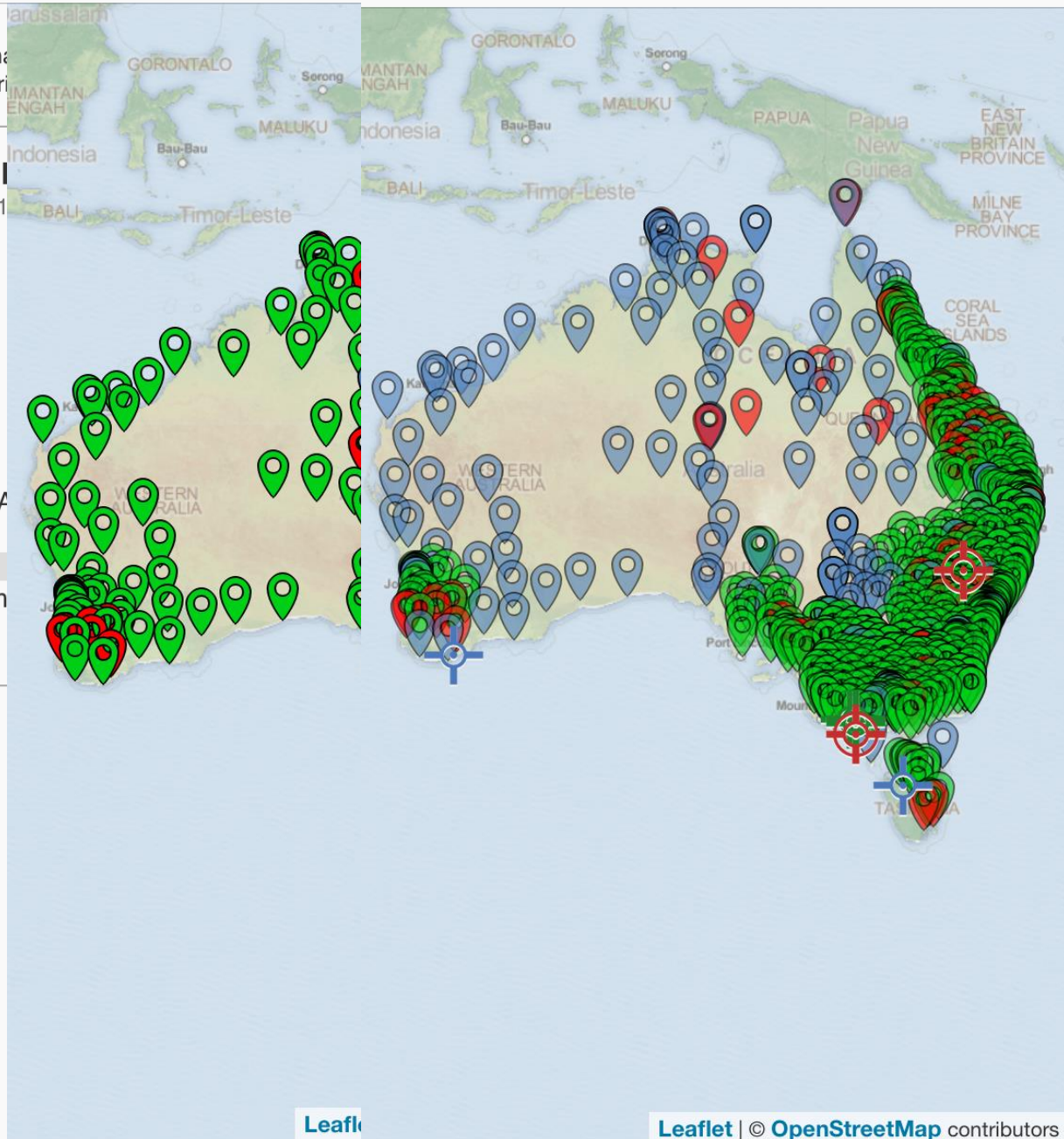
Status

Subscription period

Start Date

Renewal Date

Start date	Subscription A
2018-01-23	267 Days Rem



Thank you for your attention!
Vinaka!



Visit our web page: <https://au.hxgnsmartnet.com>
Email: Noor.Raziq@Hexagon.com