

## **Template for CORS Networks**

### ***TITLE: Singapore Satellite Positioning Reference Network (SiReNT)***

#### ***General description***

SiReNT is a nation-wide reference network developed to support real-time high precision land surveying and other positioning applications. An initiative by Singapore Land Authority (SLA), SiReNT provides Differential GPS (DGPS) services which supports the latest technology of Network-RTK.

#### ***Manager(s)/Organisation(s)***

SiReNT is owned and operated by the Singapore Land Authority (SLA) and is positioned as the national GPS reference network of Singapore. The maintenance of SiReNT is undertaken by a term contractor engaged by SLA while data is distributed by SLA through sale or free short term trial usage.

#### ***Type of equipment, description of a “typical” station***

SiReNT has 5 GPS Reference Stations. These GPS Reference Stations receive satellite signals 24 hours a day and transmit GPS data continuously to the Data Control Centre (DCC) for storage and processing. The main equipment at the reference station is a set of dual-frequency geodetic grade GPS receiver and antenna.

Each Reference Station consist of a pole-mounted antenna and a control box, inside of which are located the receiver, router, power-source, back-up batteries, fans amongst others. All the antennas and control boxes are weather-proof. Each of this setup is installed on the rooftops of buildings and power for each setup is drawn from these buildings.



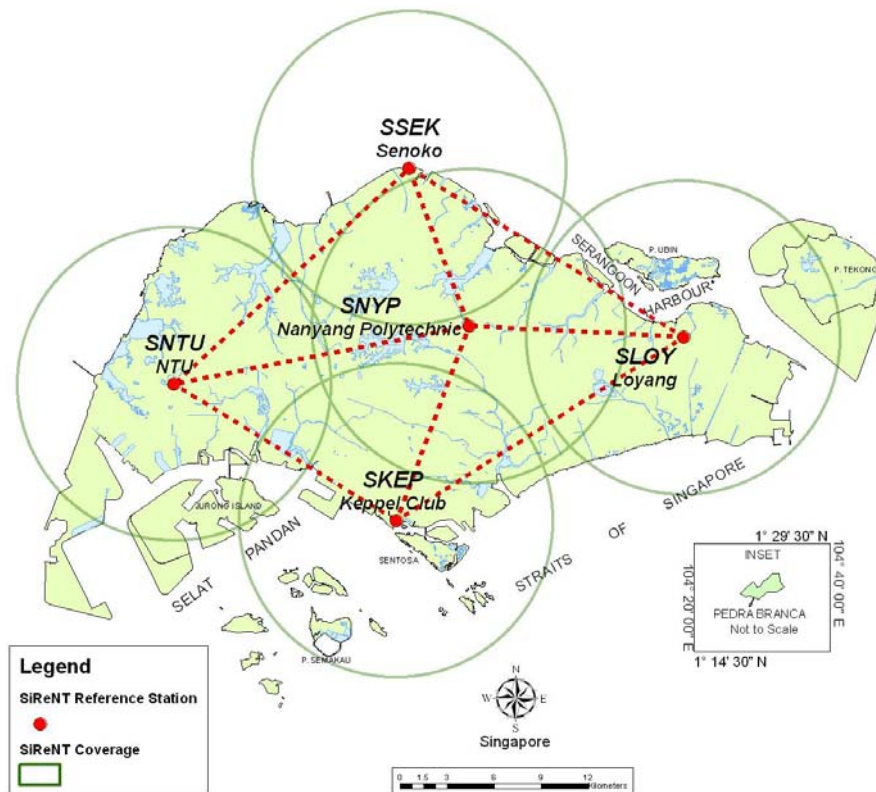
### ***Description of Control Centre***

Each Reference Station sends data to the SiReNT Data Control Centre (DCC) located at the Government Data Center (GDC) through dedicated fixed data lines. The GDC provides the most secured and reliable solution for housing SiReNT's Data Control Center. The servers at the GDC run GPSNet software as part of the SiReNT infrastructure. In turn the GPSNet software is remotely accessed from the office of the SiReNT Team in SLA for real-time monitoring and management.

### ***Stations***

There are currently five Reference Stations situated to provide a comprehensive coverage of the whole of Singapore. The stations are about 20km apart linearly from each other. The five reference stations are strategically located at extreme corners of Singapore Island - Senoko, Nanyang Technological University (NTU), Keppel, Nanyang Polytechnic and Loyang, so as to provide an island-wide coverage.

The GPS raw data observed at each reference station are transmitted directly to the SiReNT Data Control Centre (DCC) (located at the GDC) in real-time via 256Kbps ADSL communications link. A separate 56Kbps dial-up internet access is used as a back-up.



## Services

Currently, SiReNT offers GPS only correction services for users with the need for high accuracy GPS positioning, monitoring and navigation. Services provided are SiReNT DGPS, SiReNT RTK, SiReNT PP-on-Demand and SiReNT Archive data downloads. In addition, SiReNT also offers Virtual Reference Station (VRS) solution.

SiReNT DGPS offers sub-meter accuracy, SiReNT RTK offers centimeters accuracy and SiReNT PP-on-Demand offers millimeters accuracy.

All correction data can be streamed through the internet either in real-time or archived format. Users can access the SiReNT corrections through either direct connection to the internet or through NTRIP and wireless internet connections, e.g. GPRS, 3G, 3.5G, WIFI, etc.

## Users

Currently, SiReNT is used by government agencies, private organisations and academics, which is in-line with it being the national reference network of Singapore. We have around 100 users presently and with upcoming developments in the local positioning, monitoring and navigation industries, this number is expected to grow exponentially as more discerning users learn of the benefits of using SiReNT.

Areas in which SiReNT is deployed include land surveying, GIS applications, structural monitoring, navigation, fleet management amongst others.

***Issues to Resolve***

The SiReNT team is currently working on a new pricing model which will be more flexible alluding to the requirements and needs of the users.

***Future plans***

A community based methodology of densifying and growing the SiReNT network is being explored.

***Contact information***

The SiReNT website can be assessed at:

[www.sirent.inlis.gov.sg](http://www.sirent.inlis.gov.sg)