UPDATE ON MALAYSIAN GNSS INFRASTRUCTURE

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GNSS Applications in Malaysia

The Geodetic and mapping users:
- Geodetic Datum of Malaysia (GDM 2000)
- Coordinated Cadastral System (CCS)
- GIS database implementations & maintenance
- Engineering survey, hydrographic survey, photogrammetry, airborne gravity survey, etc.

The navigation users:
- **The Marine sector**
  - Marine Electronic Highway (MEH)
  - Automatic Vessel Identification System (AVIS)
- **The Aviation sector**
  - In progression with ICAO Implementation Plan
- **Land navigation sector**
  - Vehicle tracking, fleet management, intelligent transportation system, etc.

The Precise Time Users:
- Precise Time Keeping, Time Transfer & time dissemination
Policies and Strategies

- Future applications of GNSS in Malaysia will not be an isolated activities, rather, going along with the rest of the world.
- Malaysia need to put in necessary strategies to ensure the full benefits of GNSS implementations in Malaysia.
- Three strategic areas to be given attention, namely the:
  - i. GNSS infrastructure
  - ii. GNSS technology development
  - iii. GNSS applications
GNSS Infrastructure

Objective:

◦ Ensuring full coverage of GNSS services throughout the country

Strategies:

1. To participate with GNSS Core Service Providers
2. To develop sufficient Domestic GNSS Infrastructure
3. To participate in the Regional GNSS Augmentation System
4. To develop our own SBAS
Implementation Strategy:
2. Developing Domestic GNSS Infrastructure

Current:
- The MyRTKnet
- The SISPELSAT

Future:
- Malaysian SBAS
The MyRTKnet

i. Owned and Operated by Department of Survey and Mapping Malaysia (JUPEM).

ii. MyRTKNet Configuration:
   o Network of 50 dual frequency GPS reference stations in Peninsular Malaysia
   o Network of 28 dual frequency GPS reference stations in East Malaysia
   o Control Centre at JUPEM Headquarter, Kuala Lumpur.
MyRTKnet Reference Stations
The MyRTKnet

iii. Functions:
- Geodetic Infra. for GNSS Real-time Positioning.
- Monitoring of Tectonic Movement.
- Geodynamic Studies.

iv. Services:
- Subscription-based
The SISPELSAT

- Owned and operated by Marine Department of Peninsular Malaysia.
- The primary navigational-aid for vessels navigating within the shore of Peninsular Malaysia.
- Design based on International Association of Lighthouse Authorities (IALA) guidelines for the Performance & monitoring of a DGNSS Service in the band 283.5 – 325 kHz.
- Guarantees service performance of providing (positioning) accuracy of better than 5m at 95% reliability level.
SISTEM PELAYARAN SATELIT (SISPELSAT)
PERAIRAN SEMENANJUNG MALAYSIA

Rangkaian Pusat-Pusat SISPELSAT Dan Jarak Kawasan Liputan

Pusat Rujukan & Pemancar Lumut
- Kedudukan (WGS 84): 4° 15.075’ U
  100° 39.638’ T
- Frekuensi (kHz): 298
- Jarak liputan (km.): 250 @ 37.5 db µV
- Kadar bit (bit/sec.): 200

Pusat Rujukan & Pemancar Kuantan
- Kedudukan (WGS 84): 3° 48.912’ U
  103° 20.205’ T
- Frekuensi (kHz): 297
- Jarak liputan (km.): 250 @ 37.5 db µV
- Kadar bit (bit/sec.): 200

Pusat Pemantauan Keutuhan Jarak Jauh Langkawi
- Kedudukan (WGS 84): 6° 18.372’ U
  99° 51.065’ T
- Jarak dari Lumut: 250 km
- Memantau keutuhan isyarat pembetulan perbezaan (differential correction) SISPELSAT.

Pusat Kawalan, iau Pejabat Laut, Pelabuhan Kelang
- Mengawal dan memantau pergerakan pusat-pusat SISPELSAT
  i. Pusat Rujukan & Pemancar, Pelabuhan Lumut.
  ii. Pusat Rujukan & Pemancar, Kuantan.
- Perhubungan talian data melalui radio HF dan telefon.
The SISPELSAT

Current Updates (2008/2009):

- Master control station at Port Klang
- 4 DGNSS beacon reference stations.

- 2 monitoring stations at Port Klang and Kuala Terengganu.

- Expected to be completed in Feb 2009.

<table>
<thead>
<tr>
<th>Location</th>
<th>Coverage (nautical miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagan Datoh, Perak</td>
<td>160</td>
</tr>
<tr>
<td>Bandar Hilir, Melaka</td>
<td>120</td>
</tr>
<tr>
<td>Kuala Besar, Kelantan</td>
<td>180</td>
</tr>
<tr>
<td>Kuantan, Pahang</td>
<td>160</td>
</tr>
</tbody>
</table>
3. Participating in Regional GNSS Augmentation System

- Several regional SBAS with possible local coverage:
  - India - GAGAN, IRNSS
  - Japan - MSAS, QZSS
- Setup of several local monitoring stations
The Malaysian SBAS

- A space-based augmentation system that fulfills a range of user service requirements by means of an augmenting GNSS core systems.
- Planned implementation:
  2009-2010: Feasibility Study Phase
  2011-2015: Development Phase
Conclusions

• The country need to strategize its adoption of GNSS services in order to fully capitalized its benefits.
• Strategic international collaborations are to be initiated.
• Clear directions on GNSS adoption in the National Space Policy is needed.