GPS and the International Committee on GNSS (ICG): Helping Build a Multi-GNSS World

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International Symposium on GNSS 2015
and
CGSIC Asia Meeting

Kyoto, Japan

Office of Space and Advanced Technology
U.S. State Department

16 November 2015

U.S. Policy Promotes Global Use of GPS Technology

- No direct user fees for civil GPS services
  - Provided on a continuous, worldwide basis
- Open, public signal structures for all civil services
  - Promotes equal access for user equipment manufacturing, applications development, and value-added services
  - Encourages open, market-driven competition
- Global compatibility and interoperability with GPS
- Service improvements for civil, commercial, and scientific users worldwide
- Protection of radio-navigation spectrum from disruption and interference

Planned Global and Regional Satellite Navigation Systems

- Global Constellations
  - **GPS (24+3)**
  - GLONASS (24+)
  - GALILEO (24+3)
  - BDS/BEIDOU (27+3 IGSO + 5 GEO)

- Regional Constellations
  - QZSS (4+3)
  - IRNSS (7)
- Satellite-Based Augmentations
  - **WAAS (3)**
  - MSAS (2)
  - EGNOS (3)
  - GAGAN (2)
  - SDCM (3)

Bilateral GNSS Cooperation

- *Japan:* Regular plenary and technical WG meetings
  - U.S. hosts QZSS monitoring stations in Hawaii and Guam
- *China:* Most recent civil GNSS bilateral held in June 2015
  - Sub-groups under a civil GNSS cooperation working group will address: compatibility and interoperability; augmentations and aviation applications; and civil service provision
- *Europe:* GPS-Galileo Cooperation Agreement signed 2004
  - ITU coordination agreement between GPS and Galileo: 2014
  - Current issues include pseudolite interference, spectrum
- *India:* Discussion on emerging IRNSS and spectrum use
  - ITU compatibility coordination completed
- *Russia:* No current bilateral GNSS related discussions
  - Engagement in multilateral fora such as ICG continues

International Committee on Global Navigation Satellite Systems (ICG)

- Emerged from 3rd UN Conference on the Exploration and Peaceful Uses of Outer Space July 1999
  - Promote the use of GNSS and its integration into infrastructures, particularly in developing countries
  - Encourage compatibility and interoperability among global and regional systems
- Members include:
  - **GNSS Providers:** (U.S., Japan, EU, China, India, Russia)
  - Other Member States of the United Nations
  - International organizations/associations

http://www.unoosa.org/oosa/en/ourwork/icg/icg.html

ICG Mission Statement

- Promote voluntary cooperation on matters of mutual interest related to civil satellite-based positioning, navigation, timing, and value-added services
- Contribute to the sustainable development of the world
- Encourage coordination among GNSS Providers to ensure greater compatibility, interoperability, and transparency
- Promote the introduction and utilization of GNSS services in developing countries, by assisting with the integration into their infrastructure
- Assist GNSS users with their development plans and applications, by encouraging coordination and serving as a focal point for international information exchange

ICG and the Providers' Forum

- Providers Forum Members include: U.S., EU, Russia, China, India, and Japan
  - Focused discussions on compatibility and interoperability, encouraging development of complimentary systems
  - Exchange detailed information on systems/service provision plans
- Consensus reached on Principles and general definition of *compatibility, interoperability* and *transparency* in civil service provision
  - Compatibility definition includes spectral separation between each system's authorized service signals (e.g. U.S. M-code) and other systems' signals
- ICG leading efforts to promote GNSS *radio-frequency interference detection and mitigation* efforts

Providers participate in, and are supported by, the ICG Working Group on Systems, Signals and Services

U.S. Hosted 10th ICG Meeting (ICG-10): 1-6 November 2015

- Meeting held in Boulder, Colorado at University Corporation for Atmospheric Research (UCAR)
- More than 200 participants
  - Representatives from 28 countries/organizations
  - Representation from all 6 GNSS Providers
- Panel of Experts Session
  - GNSS: Today and Preparing for the Future
- Applications and Experts Session
  - Observing Earth Processes using GNSS
- Local Tours Included:
  - National Space Weather Prediction Center
  - Time and Frequency Laboratory
  - UNAVCO (facilitates geoscience research and education using geodesy)

UCAR Center Green Facility

ICG-10: Significant Accomplishments and Recommendations

- Interference Detection and Mitigation (IDM)
  - Recommendation for Providers to promote the implementation of protection measures of GNSS operations around the world
  - Recommendation for ICG presentation to UN Committee on the Peaceful Uses of Outer Space (COPUOS) - Focused on National Efforts to protect RNSS Spectrum, and pursue Interference Detection and Mitigation in Member States
- Interoperability
  - Discussion about GNSS system time and signals, based on 5 system provider workshops held between 2013 and 2015
- International Multi-GNSS monitoring (IGMA)
  - Existing civil service centers working to establish a link to a new ICG web portal allowing users to easily find GNSS monitoring information and products
  - Recommendation to initiate a trial project between the ICG and IGS to demonstrate a global GNSS Monitoring and Assessment capability

ICG-10: Significant Accomplishments and Recommendations (continued)

- Space Service Volume (SSV)
  - Progress on developing definitions and assumptions for an interoperable SSV
  - Providers to report on new Spaceborne GNSS receiver developments within their region
- Space Weather
  - Presentation/discussion on new U.S. Space Weather Strategy (includes section on international cooperation)
- Orbital Debris Mitigation
  - U.S. presentation on orbital debris strategies in Medium Earth Orbit (MEO)
- Service Center Cooperation
  - Recommendation to develop a template for cooperation between GNSS provider user information centers

UN Workshops on the Use and Applications of GNSS

- Office for Outer Space Affairs (OOSA), through its Program on GNSS Applications:
  - Organizes regional workshops, training courses and international meetings focusing on capacity-building in the use of GNSS-related technologies;
  - Has developed an in-depth GNSS education curriculum for the training programs at all UN-affiliated Regional Centres for Space Science and Technology Education, also acting as the ICG information centres.
- These activities bring together a large number of experts, including those from developing countries, to discuss and act on issues that are also of high relevance to the ICG
- ICG Experts Meeting: December 2015, Vienna, Austria
  - Includes Seminar on Spectrum Protection and IDM

Summary

- U.S. policy encourages worldwide GPS/GNSS use
  - International cooperation to ensure compatibility, interoperability, and transparency is a priority
- The U.S. is actively involved in the ICG as a multilateral forum for multi-GNSS Cooperation
  - Good progress made during the 10th meeting hosted by the U.S. in 2015
- The work of ICG and UN OOSA through its Program on GNSS Applications, are important vehicles for helping build a multi-GNSS world

For Additional Information…

www.gps.gov