U.S. GPS/GNSS International Activities Update

Civil GPS Service Interface Committee Meeting

Tampa, Florida

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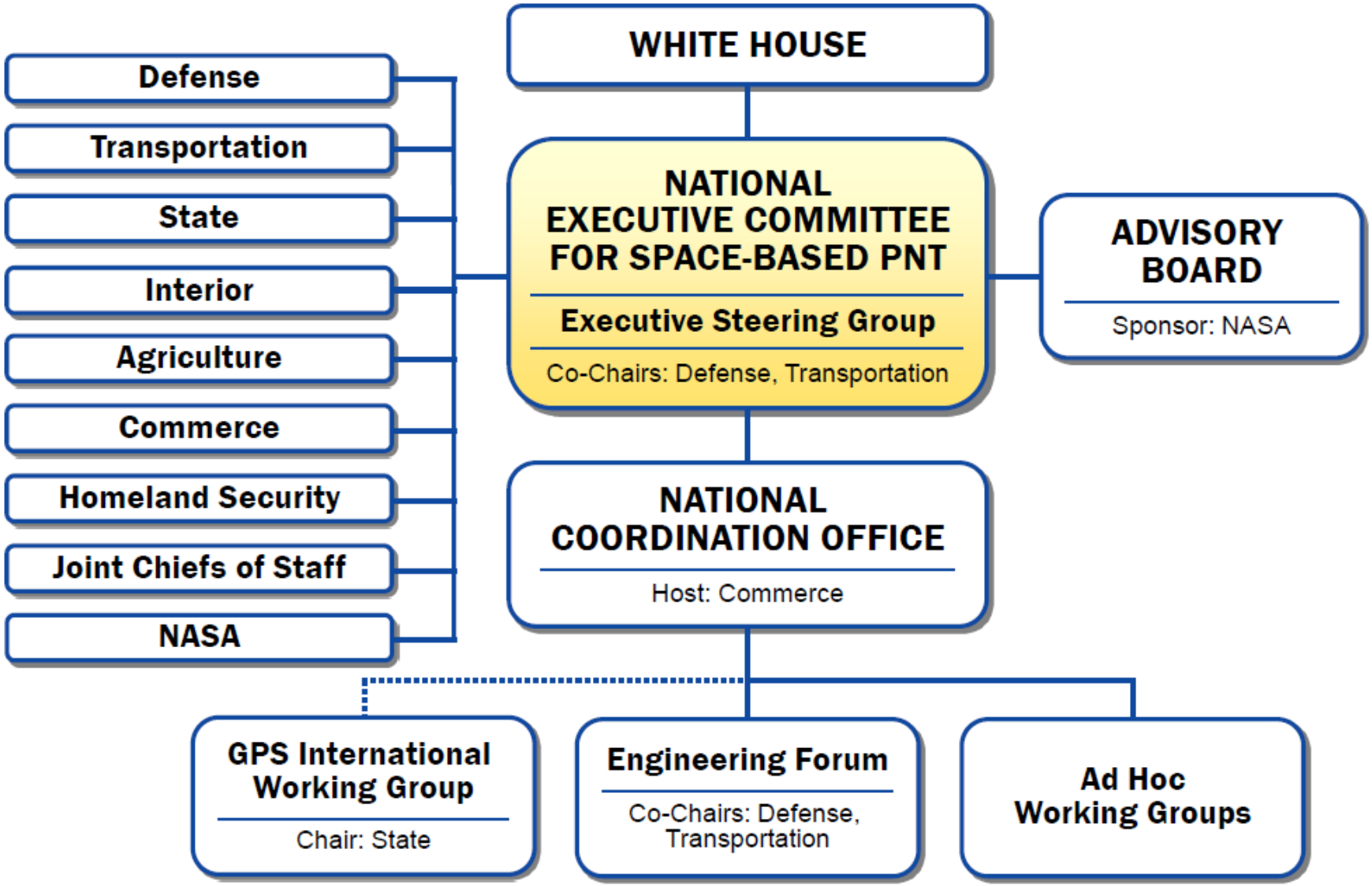
U.S. National Space Policy

Space-Based PNT Guideline: Maintain leadership in the service, provision, and use of GNSS

- Provide civil GPS services, free of direct user charges
  - Available on a continuous, worldwide basis
  - Maintain constellation consistent with published performance standards and interface specifications
  - Foreign PNT services may be used to complement services from GPS
- Encourage global ***compatibility*** and ***interoperability*** with GPS
- Promote transparency in civil service provision
- Enable market access to industry
- ***Support international activities to detect and mitigate harmful interference***

National Space-Based PNT Organization



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 radionavigation spectrum from disruption and interference

Planned GNSS

- Global Constellations
  - **GPS (24+)**
  - 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)

U.S. Objectives in Working with Other GNSS Service Providers

- Ensure **compatibility** — ability of U.S. and non-U.S. space-based PNT services to be used separately or together without interfering with each individual service or signal
  - Radio frequency compatibility
  - Spectral separation between M-code and other signals
- Achieve **interoperability** – ability of civil U.S. and non-U.S. space-based PNT services to be used together to provide the user better capabilities than would be achieved by relying solely on one service or signal
- Promote fair competition in the global marketplace

Pursue through Bilateral and Multilateral Cooperation

Bilateral Cooperation: China

- First bilateral space-based PNT related meeting to discuss civil cooperation topics held 19 May 2014 in Beijing
  - Topics of discussion included: interoperability, service monitoring, interference detection, spectrum protection, and civil aviation applications
  - Agreement to establish a civil satellite navigation cooperation working group for additional discussions on topics of mutual interest
  - Joint Statement signed
- China-U.S. Strategic and Economic Dialogue (S&ED)
  - Agreement on two items related to "satellite collision avoidance" and "establishing bilateral government-to-government consultation mechanisms and holding regular meetings on outer space activities."

Bilateral Cooperation: Europe

- GPS-Galileo Cooperation Agreement signed in 2004, ratified by EU in December 2011
  - Four working groups established under the Agreement
  - Working groups continue to meet regularly
- Third bilateral Plenary meeting held June 2014 in Torrejon, Spain
- ITU coordination agreement on compatibility between GPS and Galileo signed, July 2014
- Working Group A (compatibility and Interoperability) to meet Sep 15-16
  - Agenda includes pseudolite interference, timing offset and spectrum issues

Bilateral Cooperation: India

- U.S.–India Joint statement signed in 2007
  - Cooperation on GPS and augmentations
  - Expanded effort to ensure interoperability between GPS/WAAS and GAGAN
- ITU compatibility coordination – Meeting in early 2013
- U.S.-India Civil Space Joint Working Group (CSJWG) bilateral meeting held in Washington, DC in March 2013

Bilateral Cooperation: Japan

- Presidential/Prime Minister level Joint Statement signed in 1998
- Cooperation focuses on compatibility and interoperability between GPS and Japan's Quasi-Zenith Satellite System (QZSS)
- U.S. continues to host QZSS monitoring stations in Hawaii and Guam
- GPS-QZSS Technical Working Group met in May 2014 to discuss compatibility coordination under the ITU auspices
- Second U.S.-Japan Comprehensive Space Dialogue held in Washington, D.C., May 2014
  - Included GNSS discussions

Bilateral Cooperation: Russia

- GPS-GLONASS discussions since 1996, Joint Statement issued December 2004
- Working Group on search and rescue discussed next generation MEOSAR capabilities
- The U.S. is not currently engaged with Russia in any bilateral discussions regarding the potential placement of GLONASS monitoring stations in the United States
  - Current U.S. law requires DoD and ODNI certification or waivers before the installation of new foreign GNSS monitoring stations on U.S. soil can be pursued
  - We remain open to constructive discussions with Russia on civil space cooperation in the area of GNSS, in particular with regard to data from scientific stations currently in place in both the United States and Russia

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.**, EU, Russia, China, India, Japan)
  - Other Member States of the United Nations
  - International organizations/associations

http://www.oosa.unvienna.org/oosa/en/SAP/gnss/icg.html

ICG-8 Meeting in Dubai: Nov 10-14, 2013

- Interference Detection and Mitigation (IDM) Task Force established
  - Focus on developing a common set of information to be reported to GNSS civil service centers – U.S. and China are Task Force Leads
- Interoperability Task Force established – U.S. & China are TF Leads
  - Focus on analyzing the results of Interoperability Workshops
- Multi-GNSS monitoring: International GNSS Monitoring and Assessment (IGMA) Task Force to focus on:
  - Identifying what service parameters should be monitored
  - Defining the level and methods for carrying out the monitoring
- Consensus that achieving a fully interoperable GNSS space service volume would provide significant performance benefits that no single system could provide on its own

ICG-9 will be hosted by the EU in Prague, November 2014

ICG-10 to be hosted by the U.S. in Colorado, November 2015

Interference Detection and Mitigation

- Third ICG Workshop on IDM held July 2014 in Geneva
  - Result of Recommendation at ICG-8
- Actions and Recommendations included the following topics:
  - Critical Infrastructure
  - Adjacent Band Compatibility studies
  - Unwanted emissions limits
  - RDSS/RNSS allocations and regulatory changes
  - Interference detection, localization and characterization capabilities
  - Crowd sourcing interference detection and localization techniques
  - Legality of GNSS Jammers
  - Reaching out to governments of other ICG user community member nations

ICG Interoperability Workshops

- First Workshop held April 2013, hosted by the U.S. in Honolulu
- Three other workshops held in 2014
  - Russia hosted Workshop in April
  - China hosted Workshop in May
  - Japan hosted Workshop in August
- Workshops focused on getting industry/user feedback on GNSS Interoperability
- Task Force created under Working Group A
  - Future objective is to analyze data from the workshops and address what the results mean to each system

Progress at ICG in GNSS Civil Service Provision

- ✓ Providers Forum
  - ✓ Providers Forum System Report
    - ✓ Principles of Compatibility, Interoperability, and Transparency
      - ➢ Template for Performance Standards (and ICDs)
        - ➢ *Postulated Performance Standards for future services*
          - Service Assurances or Commitments
            - *Monitoring of service performance*
              - *Interference monitoring*

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APEC GNSS Implementation Team (GIT)

- Established in 2002
- Reports to Transportation Working Group (TPT-WG) through the ITS and Inter-modal Experts Group (IIEG)
- Adopted a GNSS Strategy designed to promote implementation and adoption of GNSS technologies, including regional augmentation systems, throughout the Asia Pacific region
  - Focus is on seamless intermodal transportation
- 19th GIT meeting held April 2014 in Christchurch, New Zealand
  - Much interest in Multi-GNSS demonstration for ITS applications and GNSS interference, detection, and mitigation

Summary

- U.S. policy encourages worldwide GPS use
- International cooperation to ensure compatibility, interoperability, and transparency is a priority
- Progress continues multilaterally through ICG workshops
- Policy stability, service transparency, and continuous improvement are the keys to success in GNSS Programs

For Additional Information…

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