U.S. International GNSS Activities Update

National Space-Based Positioning Navigation and Timing (PNT) Advisory Board: 21st Meeting

Baltimore, MD

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

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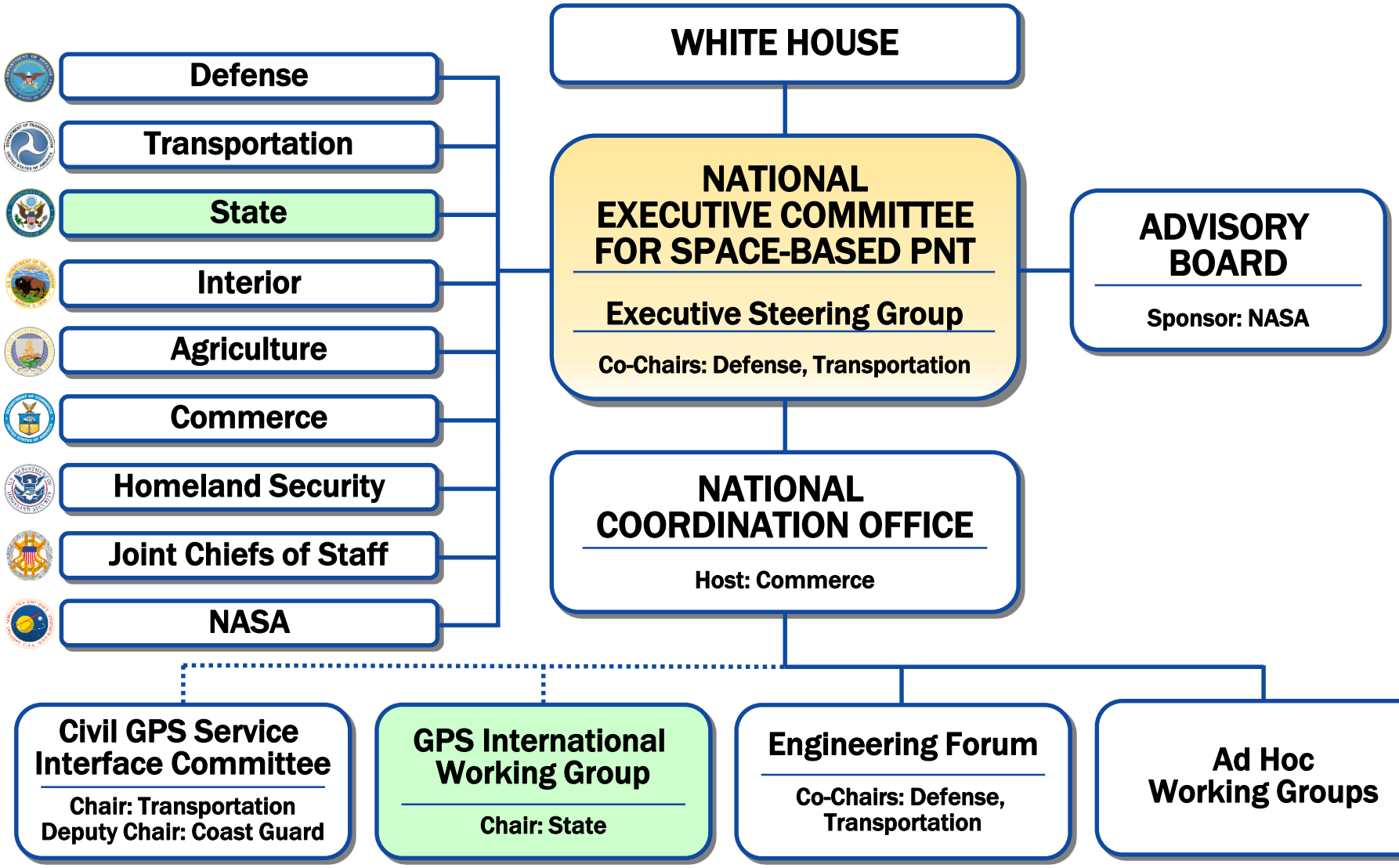
U.S. National Space Policy

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 augment and strengthen the resiliency of 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



GNSS: A Global Navigation Satellite System of Systems

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

- Regional Constellations
  - QZSS (4+3)
  - IRNSS/NAVIC (7)

- Satellite-Based Augmentations
  - **WAAS (3)**
  - MSAS (2)
  - EGNOS (3)
  - GAGAN (3)
  - SDCM (3)
  - BDSBAS (3)
  - KASS (2)

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

- Most recent civil GNSS Plenary meeting held June 2015 in Washington, D.C. – next meeting scheduled for May 24 in Harbin, China
- Working Group and Subgroups established – meet as needed
  - Sub-group on compatibility and interoperability met June 2017 in Los Angeles
  - Public Joint Statement on Cooperation signed in November 2017 (available at GPS.gov)

India

- U.S.–India Joint statement signed in 2007
- U.S.-India Civil Space Joint Working Group (CSJWG) met October 2017 in Washington
  - Agenda included GNSS discussions

Bilateral Cooperation (continued)

Europe

- GPS-Galileo Cooperation Agreement signed in 2004
- Working Group on Next Generation GPS/Galileo Civil Services meets twice per year – most recent meeting April 2018 in Spain
- EU request to waive FCC Part 25 rules discussed by Working Group on Trade & Civil Applications
- PRS access negotiations are ongoing

Japan

- Civil Space Dialogue held in Washington May 2017
- Technical Working Group (TWG) and Plenary-level meetings discuss GPS and QZSS compatibility and interoperability
  - TWG met most recently in December 2017 to discuss compatibility coordination

Additional Bilateral Dialogues

- *Canada:* Civil GNSS meeting held in Ottawa – November 2017
  - Also included meeting on space weather
- *Republic of Korea:* 2nd bilateral Civil Space Dialogue held in Seoul – April 2016
  - Discussion about Korea's development of their SBAS
- *Australia:* Joint Delegation Statement on Cooperation in the Civil Use of GPS in 2007
  - Regular discussions about Australia's plans for SBAS development
- *Other bilateral civil space dialogues:* Vietnam; United Arab Emirates; Ukraine

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.unoosa.org/oosa/en/ourwork/icg/icg.html

ICG Meetings

Past ICG Meetings

- ICG-1: UN Vienna, Austria – November 2006
- ICG-2: Bangalore, India – September 2007
- ICG-3: Pasadena, CA, USA – December 2008
- ICG-4: St Petersburg, Russia – September 2009
- ICG-5: Turin, Italy – October 2010
- ICG-6: Tokyo, Japan – September 2011
- ICG-7: Beijing, China – November 2012
- ICG-8: Dubai, UAE – November 2013
- ICG-9: Prague, Czech Republic – November 2014
- ICG-10: Boulder, CO, USA – November 2015
- ICG-11: Sochi, Russia – November 2016
- ICG-12: Japan – December 2017

Future Meetings

- **ICG-13: China – 2018**
- ICG-14: India – 2019
- ICG-15: UN Vienna, Austria - 2020

12th Meeting of the International Committee on GNSS (ICG-12)

- More than 200 participants
  - Representatives from 20 countries/organizations
  - Representation from 5 GNSS Providers
- Agenda included:
  - Meeting of the Providers' Forum
  - System Provider Updates
  - Applications and Experts Session
  - Meeting of all four Working Groups

ICG International Committee on Global Navigation Satellite Systems

12th MEETING KYOTO ICG 2017

PNT Advisory Board Participation in ICG

- Dr. Betz participated in ICG-12 and provided an update on Advisory Board Activities as part of the U.S. Program Update
  - Dr. Rashad also participated representing the Arab Institute of Navigation

ICG-13 will take place November 4-9 in Xi'an, China

Advisory Board Member participation is welcome and helps to underscore the importance of the advisory board concept!

GNSS Interference and Spectrum Protection

- Core Area of Focus of the International Committee on GNSS (ICG)
  - Primarily discussed within the Working Group on Systems, Signals and Services (WG-S)
  - Subgroup on Compatibility and Spectrum Protection established in 2010
  - Task Force on Interference Detection and Mitigation (IDM) established in 2013
  - Seven IDM Workshops have been held since 2012 – organized by the ICG
- Recent and Near Future Activities in the ICG
  - Three Seminars on Spectrum Protection (2015-2018)
  - Presentation to the UN Committee on the Peaceful Uses of Outer Space (COPUOS) Science and Technical Subcommittee on the importance of GNSS Spectrum Protection and IDM (February 2017)
  - 7th IDM Workshop took place 08 May 2018 as part of Baska GNSS Conference

Other Significant Accomplishments from ICG-12

- International Multi-GNSS monitoring (IGMA)
  - Recommendation for ICG workshop in 2018, to discuss the multi-GNSS monitoring trial project established in 2016 between the ICG and IGS
- Performance Standards
  - Recommendation for ICG workshop in 2018, focused on promoting common terminology and definitions in individual GNSS Open Service Signal Specifications by creating a template for providers to use to publish their performance standards
- Interoperability – Timing
  - Recommendation for 2nd ICG expert level workshop to be held in 2018 to further discuss GNSS system time offsets among the systems
- Space Service Volume
  - Completion of booklet on space service volume by GNSS Providers – published in 2018
  - Continued outreach effort on benefits of an interoperable space service volume
- Orbital Debris Mitigation
  - Discussion and exchange of information on debris mitigation plans by GNSS providers

Progress at ICG in GNSS Civil Service Provision

- ✓ Providers Forum
  - ✓ Providers Forum System Report
    - ✓ Principles of Compatibility, Interoperability, and Transparency
      - ➢ Templates 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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Summary

- U.S. policy encourages the worldwide use of civil GPS services and cooperation with other GNSS providers
  - **Compatibility, interoperability, and transparency in civil service provision** are priorities
  - Pursued through bilateral and multilateral dialogues
- The ICG, with strong U.S. participation, serves as a good mechanism for collaboration on spectrum protection, interference detection and mitigation, and interoperability

U.S. Federal Communications Commission (FCC) Part 25 Rules

- FCC rules require licensing of receive-only Earth stations (receivers) operating with Non-U.S. Licensed Space Stations
  [47 CFR § 25,131(j)(1), 25.137]
  - Established in 1997 when opened market for non-U.S. licensed satellites under WTO Basic Telecom commitments
    [IB Docket No. 96-11, 12 FCC Rcd 24094 (1997) (*DISCO II Order*)]
  - Applies to non-Federal users only
- NTIA (on behalf of Executive Branch) has outlined criteria it will apply in recommending waiver of these rules (2011)
  - Process for considering waiver request from foreign government initiated through consultation with U.S. Department of State
  - FCC could also consider non-gov't requests through established licensing/waiver procedures

No FCC licensing or waiver of Part 25 rules to date for use of multi-GNSS receivers in the U.S.

FCC Part 25 Rule Evaluation Criteria & EU Galileo Waiver Request

- Considerations (criteria):
  1. Grant of a waiver is in the public interest
  2. System complies with United Nations Space Debris Mitigation guidelines
  3. Grant of a waiver is consistent with U.S. international trade and other treaty obligations
  4. Waiver request is limited to receive-only RNSS (which includes positioning) and standard time and frequency satellite services
  5. Operation of the RNSS signals offered by the foreign RNSS system has been found compatible with U.S. government systems operating in the specified RNSS frequency bands
- EU Waiver Request Submitted to State **in 2013**
  - NTIA submitted the EC's request to the FCC, on behalf of the Executive Branch, **in 2015** and recommended granting the request
  - FCC issued a public notice on **06 January 2017** inviting interested parties to comment on the waiver request
    - 13 Comments - closed 21 February 2017
    - 4 Reply Comments - closed 23 March 2017