SYSTEM TIME INTEROPERABILITY

WG-S BACKGROUND AND PREVIOUS DISCUSSIONS

Work Plan - Interoperability

- As with the *principle of compatibility, the principle of interoperability and its definition was adopted at the first Providers Forum meeting and updated at the third meeting*. Consistent with this principle and its definition, the working group, through a subgroup co-chaired by the United States and China, will consider the perspective of various user applications and equipment manufacturers, and will:
  - *Continue efforts to interact with industry experts and user community representatives in order to solicit input* on improving the overall open service provided by global and regional navigation satellite systems in a manner that allows for effective multi-GNSS use at the user level;
  - *Maintain a focus on the open service signal development* and broadcast plans of the system providers; and,
  - **In cooperation with Working Group D*, consider the role of system time and geodetic reference frames in enabling interoperable* multi-GNSS service**

ICG-12 RECOMMENDATION 12S-3
2nd System Time Workshop

- The workshop participants concluded that all System Providers should continue to improve the alignment of their individual system times with UTCk to benefit users
- It was also recognized that currently, the only GNSS to GNSS system time offsets (G2GTOs) that are being broadcast are relative to GPS system time
- The participants identified a number of possible approaches for system time interoperability, including:
  1. System time offsets are calculated at the user receiver level – No Action from System Providers
  2. System Providers broadcast additional GNSS to GNSS system time offsets (G2GTOs)
  3. The development of a GNSS Ensemble time, such as the MGET proposal, with the broadcast of individual system time offsets relative to the ensemble time
- ***Recommendation: Conduct a second System Time Workshop in 2018 in coordination with WG-D***

2nd workshop held in Vienna, June 20, 2018

International Committee on Global Navigation Satellite Systems

WORKING GROUP ON SYSTEMS, SIGNALS & SERVICES (WG-S)
and
WORKING GROUP ON REFERENCE FRAMES, TIMING AND APPLICATIONS (WG-D)

JOINT TIMING WORKSHOP

Wednesday, 20 June 2018
1000-1800 CET
United Nations Vienna International Centre
Room M7, Ground floor, M-building
Vienna, Austria

Final Agenda

1. Opening Remarks

   Co-Chairs: Xiaochun LU, Jeff AUERBACH

2. Review Background and Workshop Recommendation

   Co-Chairs: Xiaochun LU, Jeff AUERBACH

3. Presentations
   a. Specific Proposals
      i. Presentation: "Multi-GNSS Time Offset – Concept and Initial Analysis Results"

         D. BLONSKIi, European Space Agency

      ii. Presentation: "GNSS Time Offsets and Interoperability"

         I. SESIA, Istituto Nazionale di Ricerca Metrologica (IT)
         and Royal Observatory of Belgium

      iii. Presentation: "*ESA/ESOC Proposal for Multi GNSS Ensemble Time – MGET*"

         W. ENDERLE, European Space Agency

      iv. Presentation: "Analysis of GNSS Time Interoperability Methods Suggested by ESA Specialists"

         A. DRUZHIN, Russia

      v. Presentation: "The BIPM support to the GNSS interoperability"

         G. PETIT, BIPM

   b. Reports on GNSS System Times
      i. Presentation: "The Current State of Studies on the Issue 'The Future of the UTC Time Scale' within the ITU"

         E. ZHELTONOGOV, Russia

   c. GNSS to GNSS System Time Offsets (G2GTOs)
      i. Presentation: "VNIIFTRI Proposals for GGTO Traceability and Uncertainty"

         A. NAUMOV, Russia

      ii. Presentation: "Update of GNSS Time Offsets Monitoring and BDS Time Transfer Experiment"

         H. YUAN, China

4. Discussion

   All Subgroup Members

5. Review Potential Recommendations/Actions and Presentation to WG-S

   All Subgroup Members

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Analysis of Workshop Results – Input from Russia

The participants of the 2nd Timing Workshop have agreed to the following.

As it was accepted that

- GNSS Time interoperability is really important and the proposals of ESA on the methods based on broadcasting corrections relative to MGET and xGTO are of considerable interest;

- not all implementation issues of the proposed methods have been developed, including technical issues;

- implementation of the proposed methods require additional efforts of the providers

It is reasonable to find out the opinion of GNSS Providers and Users on the proposed methods.

ICG-13 Multi-GNSS Time Interoperability Session with WG D

1. Review outcomes and actions from 2018 Intersessional Meeting and Timing Workshop - Jeff AUERBACH, U.S. & Xiaochun LU, China
2. xGTO Multi-GNSS Timing Offset - J. HAHN/W. ENDERLE/ D. BLONSKI, ESA
3. The BIPM support to the GNSS interoperability - G. PETIT, BIPM
4. GNSS Time Scales Referencing based on Broadcast Data - T. Primakina, RIRT, Russia
5. The update of GNSS time offsets monitoring and BDS time transfer experiment - GUANG Wei, YUAN Haibo, National Time Service Center, China
6. GGTO Determination - J. DELPORTE, CNES, France

Post 2018 Workshop Time Interoperability Actions

- ESA is invited to consolidate their MGET and xGTO concepts into one proposal for consideration by System Providers **– One presentation covering both proposals**
- System Providers are invited to consider the ESA MGET and xGTO proposal **– some feedback provided by China and Russia and other ideas presented by BIPM and CNES**
- Additional Actions discussed by WG-S for possible future consideration:
  - Prepare a proposal for the testing of Multi-GNSS time interoperability
  - Incorporating Multi-GNSS time monitoring into the ICG-IGS IGMA Trial Project is an option to consider
  - Possible future recommendation to BIPM Consulting Committee for Time and Frequency for national time laboratories to improve the accuracy of synchronization of UTC-UTC (k) and to reduce the publication delay of UTC-UTC (k) data