INTERNATIONAL
GNSS SERVICE

IGS Strategic Implementation Plan 2014

Compiled from 2013 Component Reports
February 19, 2014

As part of an annual strategic implementation planning cycle, at the year-end Governing Board meeting in December, each of the IGS components presents a year-end progress report and plan defining priority activities to be pursued in the year ahead. The following is a compilation of the plans that were presented at the year-end Governing Board Meeting in December 2013, laying out activities for 2014.

Governing Board/Executive Committee

- Support IGS Workshop in Pasadena
- Facilitate transition of RTS to FOC.
- Facilitate MGEX activities.
- Monitor implementation of recommendations.
- Continue engagement in ICG.
- Active search for candidates for new ACC.

Central Bureau

- Executive Support: Continue fulfilling the IGS executive responsibilities resulting in effective management and governance of the service. Provide local organization to 20th anniversary Workshop.
- Project Support, Committee and Working Group Participation: Continue supporting all WG activities. Emphasis on achieving RTS FOC.
- Develop funding: Seek additional sponsorship to build on the NASA sponsorship to supplement the CB. Develop industry sponsor program. Evaluate possible ways to partially recover costs of operating service.
- Monitor progress on Strategic Plan: Update IGS dashboard at least once during year. Continue monitoring defined service availability.
- Website/Marketing and Communications: Launch Phase I of modernized website. Initiate Phase II development to improve content and add 3rd party development workflows for WGs.
- User support: Improve efficiency in handling many user support requests by implementing Site Log Manager (SLM), Knowledgebase (KB) and trouble-ticketing technologies.
- Network and Infrastructure Coordination:
    - Work with Infrastructure Committee on convert selected RTS and MGEX stations to full status IGS stations.
    - Refine the network with more robust stations in key areas providing more GNSS coverage.

    - Accept more real-time stations to the CB RTS caster.
    - Launch the new IGS SLM to help mitigate site log updates and improve accuracy of information.
- Outreach: Emphasis on International GNSS Monitoring and Assessment (IGMA) and United Nations Global Geodetic Reference Frame (UN-GGRF-WG) activities.
- Challenges: Increase in responsibilities related to RTS, MGEX, IMAS, Strategic Progress monitoring, etc. have not come with commensurate funding.

Analysis Centers/Analysis Center Coordinator

- Maintain existing products, as usual.
- Coordinate ongoing reprocessing effort. Second reprocessing should be fully underway.
- Provide an IGS contribution to the IERS for ITRF2013.

Infrastructure Committee

- Ensure that all the 2012 recommendations are addressed.
- Continue to support transversally the IGS across all services, pilot projects and experiments in infrastructure issues as they are discovered or brought up to our attention.
- Prepare and coordinate a poster session for the 2014 Workshop and hold a dedicated meeting during that week.

Antenna Working Group

- Update of the ANTEX format ("ANTEX 2.0") considering the the following possible improvements:
    - Manufacturer-defined spacecraft body frames and attitude modes of new GNSS (Galileo, QZSS, Compass, SBAS).
    - Concretize RMS section (Only provide PCV RMS, but not PCO RMS. Allow fewer frequencies in the RMS section than in the section containing actual correction values?).
    - Corrections for the individual GLONASS frequencies.
    - Code calibrations.
    - Carrier-to-noise patterns CN0.
    - Near-and/or far-field effects.
    - Station-specific empirical biases.
- Supplement the IGS antenna files as follows:
    - antenna.gra: add definition of antenna northing ("north reference point").
    - igs08.atx: add conventional phase center offset values for new GNSS; integrate calibrations for new frequencies performed by the University of Bonn.
- Perform comparison of receiver antenna calibrations from different institutions:
    - Analyze differences in the position domain (including differences in the

tropospheric delay and receiver clock parameters); compare with "ground truth."
    - Converge on an agreed methodology and set of conventions to use when comparing calibration values between institutions.
    - Create shared "toolbox" of functions for comparison of calibrations?
    - Investigate estimation of satellite antenna corrections from combined processing of ground and LEO data (independent from ITRF scale); analyze azimuth-dependent satellite antenna PCVs.
- Finalize and publish a paper on the generation of igs08.atx.

Bias and Calibration Working Group

- Continuation of regular GNSS DCB (and GLONASS DCPB) retrieval.
    - Make available daily bias results as commonly computed at CODE.
    - Add time window information to combined (monthly) results in Bernese DCB format.
    - Support bias SINEX format.
- Complete review of IGS BCWG member list (just two members of the BCWG did attend the IGS Bias Workshop 2012).
- GNSS bias format issues (in particular GNSS bias SINEX format).
- GNSS bias monitoring for all available new systems (specifically for Galileo, QZSS, Beidou) and signals (using RINEX3 data).
- Further challenging tasks (somehow related to each other):
    - Long-term combination of GNSS DCB time series results.
    - Additional consideration of absolute GNSS bias calibrations.
    - Development from "DCB" toward observable-specific bias handling: i.e., from (linearly independent) P1-P2, P1-C1, P2-C2, etc. biases to a (self-consistent) set of biases for C1, P1, P2, C2, etc.

Clock Products Working Group

- New Chairman: The newly appointed Chairman of the Clock Products Working Group, Michael Coleman, of the Systems Analysis Section of the Space PNT Branch, US Naval Research Laboratory, will take over responsibilities for the IGS clock products in 2014.
- Timescale Improvements: improvements to the timescale may be introduced in order to improve the IGS timescale stability and offset to UTC. Ideally, we would like to do this while broadening the collection of IGS steering clocks.

Data Centers/Data Center Working Group

- The DCWG will work with the IGS DCs to implement the recommendations developed during the 2012 IGS Workshop.
- In particular, the DCWG will work on developing a structure and procedure for incorporating RINEX V3 data into the operational IGS data center archive directories.

- Challenges: Encourage involvement by more participants in addressing data center issues.

Multi-GNSS Working Group/MGEX

- Objectives:
  - Network extension (BeiDou/QZSS/IRNSS support).
  - Provision of BeiDou orbit and clock products.
  - Provision of a DCB product.
- Challenges:
  - MGEX network consolidation and merge with legacy IGS network.
  - MGEX data quality control.

Ionosphere Working Group

- The following actions to be considered:
  - Higher temporal resolution of IGS GIMs - 1 hour and less, combination conducted by UWM to be started as official/routine product (July 2014).
  - Predicted IGS GIMs – 1 and 2 days ahead, combination conducted by UWM to be started as official/routine product (July 2014)
  - Starting a new official/operational product – TEC fluctuation changes over North Pole to study the dynamic of oval irregularities (carried out by UWM to be started as official/routine product after performance evaluation period (July of 2014).
  - Include the new the IAAC from GNSS Research Center (GRC), Wuhan University, China (Hongping Zhang, July of 2014).
  - Cooperation with IRI COSPAR group.
- Future improvements are determined by users' requirements (number of users has significantly increased during the last 15 years).

Real-time Working Group/Real-time Service (RTS)

- GPS+GLONASS (IGS03) transitioning from experimental to official product:
  - Add GLONASS clock comparisons during first quarter and build a history of GLONASS clock statistics from the RT ACs and the IGS03 combination (reference batch clock product to be identified).
- Increase number of rtGNSS tracking stations in support of RTACs and MGEX:
  - Increase presence of MSM streams.
    - Existing streams to be integrated.
    - GLONASS stations in Russia.
- Coordinate development of real-time content for the IGS workshop in late June.
- Describe planned improvements to products and/or related infrastructure.
  - Complete the integration of core RTS-stations at the IGS CB caster (http://rt.igs.org:2101). The goal is two independent caster access points (BKG and CB) for core stations and official products.

    - Add at least one additional independent PPP engine to assess the quality of RTS clocks and orbits in position space. Currently one BNC/PPP is used.
- Anticipated challenges in the year ahead:
    - Convincing GNSS receiver manufacturers to integrate the open SSR standard into receiver PPP firmware.
    - Increased access to global GLONASS data, in particular increased access to GLONASS data in Russia.

Reference Frame Working Group

- Finalize repro2 RF solution contributing to the new ITRF solution (ITRF2013).
- When available, elaborate a new reference frame solution based on ITRF2013 used to align all IGS products, starting with RF solutions.
- When it is adopted, update the IGS RF web site.
- The RFWG will coordinate and contribute to a poster session covering repro2 and RF issues for the 2014 workshop. It will coordinate an oral session, possibly common with the repro2 (to be decided).

RINEX Working Group

- Ensure that GNSS vendor and IGS partner support of RINEX 3.02 continues to grow.
- Work with both IGS and RTCM partners to test interoperability between all RINEX 3.02 files. Verify that all 3.0X files contain properly defined signals, codes and phase aligned observations. IGS RINEX 3.02 testing and development will be done within the IGS MGEX project.
- The development of RINEX 3.02 QC tools has begun. Several basic QC tools (MP, cycle slip and percentage good data) will be available to IGS DC's in 2014.
- Continue to update the RINEX 2.11 and 3.0X documentation to provide a clear and concise description of the standard and also meet the needs of the GNSS community. Planned additions include GPS CNAV ephemeris.
- Work with RTCM-SC104 partners to develop messages to support IGS needs.

Space Vehicle Orbit Dynamics Working Group

- Implement and test the new class of solar radiation pressure/thermal re-radiation models with JPL.
- Coordinate the activities of the working group members with a clear scientific agenda.

Tide Gauge Working Group/TIGA Project

- Finish TIGA reprocessing with 4 contributions. Develop and evaluate TIGA combined products.
- Provide a product to the user community based on the most recent reprocessing, with:

    - Mean rate per TOS with reliable error estimate.
    - Time series of the weekly vertical coordinates with scaled formal errors.
- Work with GLOSS on the improvement of the GLOSS/GCOS network situation.
- Maintain and expand the current inventory of GNSS @ TG stations at www.sonel.org.
- Encourage station operators through GLOSS to provide regular leveling between benchmarks.
- Develop with GLOSS formalisms for documentation of leveling information
- Setup a data base for station discontinuities (IGS SINEX discontinuity file for non-IGS TIGA stations).
- Support GGOS, in particular Theme 1 ("WHS") and Theme 3 ("Sea Level").
- Work with the altimetry community to provide a data set for tide gauge calibration sites.

Troposphere Working Group

- Complete and launch on-line automated comparisons of troposphere estimates obtained using different techniques.
- Begin planning how to best use resulting statistics to assess accuracy of IGS Final (and other) Troposphere Estimates.
- Begin/possibly complete Repro 2 troposphere processing (requires prior completion of Repro 2 orbits, clocks, EOPs).
- Begin possible standardization of file format ("tropo_sinex") in which estimated troposphere values are distributed.
- Organize/conduct troposphere plenary and poster sessions for IGS 2014 Workshop.
- Organize/conduct WG meetings for 2014 IGS Workshop and AGU Fall Meeting.

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