

INTERNATIONAL GNSS SERVICE
CALL FOR PARTICIPATION
June 26, 2007

**INTERNATIONAL GNSS SERVICE REAL-TIME PILOT PROJECT
2007 – 2010**

Prepared by IGS Real-time Pilot Project Committee

Opening Remarks from the IGS Governing Board Chair

Preparing the move towards real-time GNSS data and derived products has been a strategic objective of the IGS for several years, and this is being reaffirmed in the IGS Strategic Plan for the years 2008-2012. A key step in this process is the establishment of a Pilot Project, for which the Governing Board asked the IGS Real-time Working Group to prepare this Call for Participation. The members of the Pilot Project Committee set up by the Working Group for this purpose are listed below. We look forward to a wide acceptance of this invitation to participate and to a successful Pilot Project over the coming years.

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1. IGS-RTTP: Description of the Pilot Project

The International GNSS Service Real-time Pilot Project (IGS-RTTP) is a pilot project of the International GNSS Service (IGS). This pilot project will provide an opportunity for the IGS to further expand and refine its existing real-time infrastructure, and upon successful completion, potentially initiate an official real-time service. The pilot project will gather and distribute real-time data and products associated with GNSS satellite constellations. The primary products envisioned for the project are multi-frequency observation data and precise satellite clocks and orbits made available in real-time. These products will be freely available to participants for any purpose in accordance with the IGS open data policy. An important theme of the pilot project will be to support and promote the development of real-time applications. The pilot project will operate for a period of up to 3 years. Annual reviews will be conducted by the IGS Governing Board for the purpose of assessing the project's progress towards achieving its goals and objectives.

This call for participation is non-exclusive. It is an open call for participation with the only restriction being that participants adhere to IGS standards found at the following links:

<http://igscb.jpl.nasa.gov/organization/bylaws.html>
<http://igscb.jpl.nasa.gov/network/guidelines/guidelines.html>
<http://igscb.jpl.nasa.gov/network/guidelines/checklist.html>
<http://igscb.jpl.nasa.gov/network/monumentation.html>
<http://igscb.jpl.nasa.gov/organization/dccharter.html>
<http://igscb.jpl.nasa.gov/organization/acccharter.html>

All participants will be required to provide periodic feedback on their experience with the project.

The following timelines have been established:

June 26: Call for Participation released
August 17: Deadline for first submissions
September 24th: Applicants are notified
October 29th: Official start of the pilot project

New participants will be encouraged to join the project at any time following the official start date. All new participants will be required to submit proposals.

The following home page has been setup for the project.

<http://www.rtigs.net/pilot>

This site will be used to convey further information about the project as required and as the project develops.

1.1 Background

The International GNSS Service (IGS) has been preparing for the introduction of real-time processes that will enhance the service it currently offers the international community. Through the efforts of the IGS Real-time Working Group (RTWG), <http://www.rtigs.net>, real-time infrastructure and processes have been developed and tested. The prototype network has grown to more than 60 globally distributed real-time stations. Applications have been developed which facilitate the gathering, distribution and archival of real-time data and several agencies with membership in the RTWG have been active in the development of real-time products.

By initiating this open call for participation, we are moving the IGS closer to an official real-time service. The vision is that IGS real-time products will facilitate real-time access to the global reference frame. Further, it is envisioned that the availability of these products will spur on developments within communities currently making use of classical IGS products.

1.2. Goals and Objectives

The IGS will work towards the incorporation of real-time infrastructure and processes into its day-to-day operation with the goal of offering improved services to its user community. Latencies associated with current products will be shortened and new real-time products are envisioned.

Real-time access to the global reference frame will be facilitated through the availability of real-time IGS products including GNSS data, clock and orbit information. Based on an evaluation of this proof-of-concept project, the IGS Real Time Service may be initiated.

Key objectives include:

1. Manage and maintain a global IGS real-time GNSS tracking network.
 - a. Upgrade IGS stations to real-time. An emphasis will be placed on reference frame stations.
 - b. Augment existing IGS network management procedures addressing the unique requirements of real-time infrastructure and processes.
2. Enhance and improve selected IGS products.
 - a. For selected real-time stations, 1-second high rate, 30-second hourly and 30-second daily GNSS data files will be made available at IGS global data centers using real-time streams.

- b. High rate GNSS data streams will be made available to participants. An emphasis will be placed on ultra rapid ACs to assist in their efforts to reduce the latency of the ultra rapid products.
3. Generate real-time products.
 - a. IGU predicted orbits will be made available in real-time.
 - b. Real-time ACs will generate real-time GNSS clock information. A strategy for combining these solutions will be investigated.
4. Investigate standards and formats for real-time data collection, data dissemination and delivery of derived products. Formats including RTCM 3.0, BINEX and RTCA will be investigated. The objective is the development of an open standard that will meet the needs of a future IGS Real-time Service. This objective will be pursued during the pilot project through the work of the RTWG. GNSS standards organizations such as RTCM (SC 104) will be consulted and encouraged to address the needs of the IGS community.
5. Monitor the integrity of IGU predicted orbits and GNSS status.
6. Distribute real-time observations and derived products to real-time users. Both the RTIGS and the NTRIP protocols will be assessed for this purpose.
7. Support Network DGPS/RTK
 - a. Encourage participants who operate DGPS/RTK to use IGS real-time streams in their networks.
8. Encourage cooperation among real-time activities, particularly in IGS densification areas.

1.3. Organizational Aspects

The pilot project will be based on the existing IGS prototype real-time infrastructure together with the institutes and agencies contributing to <http://www.igs-ip.net/home>, including the bidirectional interface between the RTIGS and NTRIP protocols. The Call for Participation is being issued to officially enlist the participation of current RTIGS and IGS-IP network stations, analysis centers, and global data centers, as well as to solicit the participation of new stations, analysis centers, and data centers. As the pilot project progresses, the RTWG, assisted by the IGS Central Bureau, will ensure that operational aspects of the project form the core of the future service and become integrated into day-to-day IGS operations.

1.4. Project Committee

An IGS Real-time Pilot Project Committee is responsible for managing the pilot project. The members are:

Mark Caissy, Natural Resources Canada (NRCan), Chair
Georg Weber, Bundesamt für Kartographie und Geodäsie (BKG)
Roman Galas, GeoForschungsZentrum (GFZ)
Carlos Garcia, European Space Agency (ESA)
Bob Twilley, Geoscience Australia (GA)
Yoaz Bar-Sever, Jet Propulsion Laboratory (JPL)
Robert Weber, Vienna University of Technology
Ken Senior, Clock Products Coordinator, U.S. Naval Research Laboratory (NRL)
Carey Noll, Data Center Coordinator, Goddard Space Flight Center
Gerd Gendt, Analysis Center Coordinator, GeoForschungsZentrum (GFZ) (ex officio)
Angelyn Moore, Network Coordinator, IGS Central Bureau (ex officio)
Ruth Neilan, Director IGS Central Bureau (ex officio)
Carine Bruyninx, Head EUREF Permanent Network Central Bureau (ex officio)

The Pilot Project Committee will review proposals and provide a summary report to the IGS Governing Board. The summary report will include recommendations for acceptance or rejection of proposals. The IGS Governing Board will decide which proposals are accepted, provisionally accepted, or declined.

2. Call for Participation

The IGS Real-time Pilot Project Committee is seeking participants for the International GNSS Service- Real-time Pilot Project in the following categories:

Real-time Tracking Stations
Real-time Data Centers
Real-time Analysis Centers
Real-time Associate Analysis Centers
Real-time Analysis Center Coordinator
Real-time Network Management and Monitoring
Real-time Users for Assessment, Evaluation and Feedback

For those wishing to cooperate in any of the categories, joint agency proposals are encouraged. Respondents should know that there are a number of IGS Coordinators for these key components who can offer advice and information as needed.

2.1. Real-time Tracking Stations

This call for participation goes out to operators of existing real-time IGS stations and those IGS station operators interested in participating by converting their stations to real-

time operations. The call also goes out to operators of thematic networks not currently contributing to the IGS. The role that the tracking stations will play in the success of this project cannot be overemphasized. Data quality, reliability and availability will impact the real-time products generated in this project. For this reason, all IGS station operators are strongly encouraged to become involved in the Pilot Project.

2.1.1. Station Operation Guidelines

The stations participating in the IGS Real-time Pilot Project must follow IGS site guidelines. Guidelines and checklists can be found at:

<http://igscb.jpl.nasa.gov/network/guidelines/guidelines.html>
<http://igscb.jpl.nasa.gov/network/guidelines/checklist.html>
<http://igscb.jpl.nasa.gov/network/monumentation.html>

For non-IGS stations, a Site Information Report (SIR) must be completed and sent to the following: rtigs1@storm.ca The SIR form is available at:

<http://igscb.jpl.nasa.gov/igscb/station/general/blank.log>

Station operators will be required to follow network management guidelines including change management procedures. These procedures will be developed over the course of the pilot project.

2.1.2. Receivers

Only geodetic-type receivers that meet IGS standards are allowed. These standards are described at the following link:

<http://igscb.jpl.nasa.gov/network/guidelines/guidelines.html>, section 2.1.2.

In order to assist station operators to upgrade to real-time, specific instructions will be placed at:

<http://www.rtigs.net/pilot/howto.html>

2.2. Real-time Data Centers

Two types of real-time data centers are included in this call for participation. The first type is an extension of the global data center model in which real-time streams will be used at the data center to generate high-rate and 30-second files. The second type of data center is a real-time stream supplier where users will have access to both real-time data and/or real-time product streams.

2.2.1 Real-time Data-file Center

The existing IGS Regional and Global Data Centers as well as agencies now using or considering using real-time data streams for the purpose of generating station data files are invited to participate in assessing the feasibility of generating high-rate data files, and/or 30-second hourly files and/or 30-second daily files. Interested data centers are asked to respond with their intentions to extend their current activities to include this category of pilot project activity. The standard data files now available at participating data centers will continue to be collected according to current IGS protocols.

Data centers and agencies that take on this role will be provided with applications designed to perform the necessary operations including both data stream capture and data file creation.

Proposals for participation should describe the maximum number of data streams that will be accommodated as well as the resources available to make this successful. Bandwidth requirements may be estimated based on the safe assumption that each data stream will consume 3-kilobits/s of available bandwidth.

2.2.2 Real-time Data/Product Distribution Centers

Agencies are asked to submit proposals for becoming real-time data and product distribution centers. These centers will be required to install applications uniquely designed to receive and distribute real-time data and products using either the RTIGS or NTRIP protocols. Distribution centers using the RTIGS model will be required to install the RTIGS UDPRelay application. Centers using the NTRIP model will be required to install the NTRIP Caster application.

Data distribution centers will require sufficient bandwidth to accommodate their clients' needs. Bandwidth resources needed for data and product distribution will depend on the number of clients being served and the size of data and product streams. Bandwidth requirements may be estimated based on the following assumptions:

Data streams: 3-kilobits/s per station request.

Product streams: [Satellite clocks and satellite orbits] 2-kilobits/s per client request.

The proposal should describe the maximum number of data streams from which data can be received and made available to real-time users as well as the maximum number of simultaneously listening clients that can be supported. The proposal should also identify which application the agency wishes to support, either UDPRelay or NTRIP or both.

2.3. Real-time Analysis Centers (RTAC)

Real-time Analysis Centers will process real-time data from the global network for the purpose of generating real-time products. Proposals are solicited for the generation of any GNSS based real-time product. This includes but is not limited to real-time GNSS clocks and orbits, ionosphere, troposphere, and station coordinate and clock products. Agencies are asked to consider submitting proposals pertaining to real-time station clock comparisons. Proposals must describe the product being proposed in detail.

The following precision goals have been proposed for several real-time products.

- Real-time orbits: equivalent to or more precise than IGS – predicted orbits
- Real-time satellite clocks: 0.5 ns
- Real-time station clocks: 0.5 ns

Precision estimates will be based on comparisons with one or a combination of the IGS final, rapid and ultra rapid products.

2.4. Real-time Associate Analysis Centers (RTAAC)

Real-time Associate Analysis Centers will be involved in real-time product comparisons, real-time product combination strategies and real-time product integrity monitoring activities. Proposals are solicited from those agencies wishing to become involved in these important AAC activities. Submissions must clearly describe the proposed activity.

2.5. Real-time Analysis Center Coordinator

The Real-time Analysis Center Coordinator (RTACC) will be responsible for coordinating and managing the development of real-time products. The RTACC will coordinate and manage the adoption and use of standards among the RTACs and RTAACs. The RTACC will be proactive and consult with the IGS Analysis Center Coordinator on issues of standards and compatibility of real-time products and classical products.

2.6. Real-time Network Management and Monitoring

Network management and monitoring will be essential for the effective operation of the global real-time network. Information will be required by real-time users and analysis centers so they can customize their activities when needed, depending on station performance and both planned and unplanned changes. Agencies interested in playing this critical management and monitoring role in the operation of the network are invited to respond to this call for participation. Submissions should clearly articulate an understanding of the role and how it will be carried out in cooperation with the existing IGS network coordination. Because of the distributed nature of the network operations, it is suggested that joint agency proposals be considered.

2.7. Real-time Users

Participation is solicited from the real-time user community to ensure that the pilot project has a direct mechanism whereby feedback from the user community is assured. It is envisioned that feedback will most likely be solicited through periodic questionnaires. One measure of success for the project will be the ease of use experienced by users. Real-time users are asked to submit proposals describing their intended use of the real-time observations as well as the products offered by the pilot service.

3. Instructions for Submitting Proposals

Proposals submitted in response to the Call for Participation must contain:

1. The completed proposal form signed by an authorized official of the organization.
2. A detailed plan describing the activities proposed by the organization, not to exceed ten pages.

Send proposals to:

Mark Caissy
Geodetic Survey Division
Natural Resources Canada
615 Booth Street
Ottawa, Ontario, Canada, K1A 0E9
caissy@nrcan.gc.ca

and

Ruth Neilan
Director, IGS Central Bureau
Jet Propulsion Laboratory MS 238-540
4800 Oak Grove Drive
Pasadena, CA 91109, U.S.A.
ruth.neilan@jpl.nasa.gov

For proposals submitted by e-mail, please include the completed proposal form (see below) and note that the original signature page must be sent by regular mail to the IGS Central Bureau at the address above.

If answers to questions cannot be found at the following

<http://www.rtigs.net/pilot/faq.php>

then questions can be addressed to:

Mark Caissy – Chair IGS Real-time Working Group

caissy@nrcan.gc.ca

4. Proposal Form

PROPOSAL SUBMITTED IN RESPONSE TO THE CALL FOR PARTICIPATION -
INTERNATIONAL GNSS SERVICE - REAL-TIME PILOT PROJECT (IGS-RTPP)

Proposing Organization:

Point of Contact:

Name:

Address:

Telephone:

FAX:

E-mail:

Authorizing Official:

Name:

Address:

Telephone:

FAX:

E-mail:

Signature:

Proposal for:

RT Observing Station

RT Data Center

RT Analysis Center

RT Associate Analysis Center

RT Analysis Center Coordinator

RT Network Management and Monitoring

RT Users

For Joint proposals:

Collaborating institutions:

Contacts:

Detailed Proposal: