Real Time Pilot Project

Minutes of Teleconference

IGS RTPP

28 September 2010

1 Meeting Summary

This teleconference was held on 28 September 2010 and was hosted by NRCan and chaired by Loukis Agrotis.

Participants were:

BKG:	Georg Weber
CDDIS:	Carey Noll
DLR:	André Hauschild, Norbert Jakowski
ESOC:	Loukis Agrotis, Drazen Svehla, Pedro Alfaro, Ignacio Romero (representing the IC)
Geo++:	Gerhard Wübbena, Martin Schmitz,
GFZ:	Maorong Ge, Markus Ramatschi
GMV:	Guillermo Tobías González, Daniel Rodríguez Porcheron
JPL:	Ruth Neilan
NGS:	Jim Ray
NRCan:	Mark Caissy, Ken MacLeod, Michael Schmidt (representing the IC)
TUP:	Leos Mervart
UPC:	Manuel Hernandez-Pajares

The meeting agenda items are listed below:
1. RTCM meeting issues and IGS vote on SSR formats (Ken, Georg)
2. Station Network Issues
3. RT AC status (AC representatives including Manuel on ionosphere)
4. IGS Workshop Recommendations and Implementation Planning
5. AOB

2 Briefing on RTCM meeting

Ken briefed the participants on the meeting of RTCM SC104, which took place in Portland in September during ION. It was attended by Ken and Georg. The subject of most interest was the GNSS Multi-Signal Messages. These include standard and High Precision formats and are on their way to being approved. The IODS was proposed and it was decided to add it to the header. The concern was on the additional proposed messages for RINEX generation, where the manufacturers were not completely convinced on need. The recommended direction is to pull back from complete change control to critical change control and Ken will revise the messages with this objective in mind.

The RTCM has received the IGS position on phase alignment. Some manufacturers are against this and a splinter session was organised where Gleb collected points of view (for and against) to present. After this there will be a vote. Nacho will compile a list of arguments supporting the phase alignment request for dissemination to the RTCM (M7-1).

Martin summarised the discussion on GLONASS biases. These have presented problems for a long time. Every manufacturer considers techniques as proprietary and will not discus them in public. Geo++ gave 3 possibilities:
1. Individual receivers mapped to a bias class table
2. Theoretical description and solution.
3. Physical reference with provision of measurements at zero reference e.g. by a lab.

Georg mentioned the timetable for MSM messages. They will become “proposed” messages by November. He also reported a concern about manufacturers’ voting intention for the SSR messages. One mentioned to him that he was disappointed that there was no IGS SSR-based service. He suggested that there should be an IGS mail to advertise the IGS’s intention to provide a service based on the SSR messages. Mark will compose this IGS mail and send it to the GB prior to dissemination (M7-2).

On the subject of the voting intention for SSR, Loukis explained that the RTCM deals with each vote as it is coming from an independent expert and expects people to vote according to their judgement. The consensus among the teleconference participants was that the SSR formats are essential for the IGS RT products and they should be supported in the vote. The 3 people entitled to vote are Ruth, Steve Fisher and Loukis. Ruth mentioned that Steve is coming back to work for the CB on a part-time basis. The vote deadline is 3 November.

Ken announced that the RTCM had received requests to nominate a representative to the Galileo Geodetic Reference Interface Working Group and that Loukis has been nominated. Loukis said that he received the notification from the RTCM president.

3 Station Network Issues

Georg briefed everyone on the network status at BKG. The NRCan stations have now transitioned away from udpRelay and are using RTCM. They are available from the BKG NTRIP caster as well as the NRCan caster. He highlighted a problem with a number of stations not transmitting GLONASS data and also the absence of stations in Russia and the Far East. Ruth mentioned that there is an initiative in the CB to get some involvement from these countries. Georg also suggested that there is an increase in the latency at some data nodes where raw data are received and converted to RTCM. He proposed that it would be better if the data was transmitted in RTCM format from the stations. Loukis suggested that due to the deficiencies of the current formats, the recommendation to switch to RTCM should be made after the MSM HP formats become available. This will also allow the transmission of GLONASS data from the ESA stations.

A discussion followed on redundancy of data. Georg mentioned that the outage of reference stations is a serious deficiency. With NTRIP, each station can stream to two remote casters. Retransmission casters or client software should be able to switch automatically between these casters to receive the streams.

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Ken briefed on NRCan’s infrastructure. The NRCan stations already include redundancy in their data provision. In distributing the global data, NRCan retrieves directly from the regional providers. The biggest issue could be outage of the Australia region, but the presence of several New Zealand stations is now reducing the impact of such an outage.

Loukis suggested that we should start a more serious discussion of the backup strategy by first documenting the existing functionality and providing initial suggestions on how to improve it (M7-3).

4 RT AC Status and Developments

Several people expressed concerns (Jim, Ruth, Mike) that the Pilot Project’s activities are not advertised widely and there would be a great deal of interest if more information was made available. Ruth mentioned that the workshop presentations related to Real Time are the ones that receive the most hits on the Internet. There is also some confusion about the RTPP web site.

Loukis explained that the PP site is kept up to date by NRCan but it can easily be confused with the Working Group website, which is very similar in structure but is out of date. Ruth briefed everyone on recent activities at the CB to implement state-of the-art web presence for the IGS. She would like to include the PP in a more easily accessible way. A short status update on the PP will be compiled (M7-4). Loukis will also create a template for capturing the most relevant internet links related to the PP and send it to everyone to update (M7-5).

The individual organisations that are participating in the Real Time PP were polled to report on their status.

Ionosphere:

UPC: Manuel sent an email just prior to the teleconference announcing the generation of a new preliminary Real Time ionospheric product. This is updated every six minutes, with an overall latency of 12-18 minutes), consisting on a partial global VTEC map, from the available worldwide distributed RT-IGS receivers (typically around 50, vs the typical coverage of 200+ for final product). It can be accessed at: http://g1.upc.es/tomion/real-time/quick/ .

DLR: Norbert said that at DLR they were previously using only European stations. Now they are using global data and producing TEC maps with a 5-minute resolution (see http://swaciweb.dlr.de/index.php?id=279&L=1) .

Loukis suggested that Manuel and Norbert should try to instigate a coordination activity for the ionospheric products with the PP. They agreed to work on making a joint proposal to the RTWG (M7-6).

Georg asked about the plans for incorporating iono information in the SSR messages. Gerhard gave a brief outline of the plans to add more functionality to the SSR messages. The first phase of orbits, clocks and biases is complete. The original idea was to have a second phase of vertical ionospheric delay to support single-frequency users and a third phase of slant TEC and phase biases to provide RTK performance. The current thinking is to have a revised second phase with VTEC and phase biases, to allow ambiguity resolution in a few minutes and to follow in several more years with addition of tropo and slant TEC (ambiguity resolution in seconds). So the discussions on vertical iono delays need to start soon. Manuel said that he would be happy to participate and Gerhard welcomed this and said that the first step is to define the content of the iono messages. An email was sent by Manuel during the telecon, describing his thoughts on the content of these messages (preference for voxel option than for spherical harmonics due to the fact that at this stage a fully populated model cannot be obtained).

Orbits and Clocks:

BKG/TUP: Georg gave the status from BKG/TUP where the work is continuing on producing a GPS and combined GPS+GLONASS stream, maintaining the BNC and BNS software, maintaining a PPP monitor page for all the product streams and keeping ahead of developments in the RTCM formats.

CDDIS: Carey agreed to send periodic updates of the download histories for the RT products.

DLR: André said that DLR are continuing to generate a GPS and a GPS+GIOVE product stream. These are running on two independent servers and a new server will be procured in two months. The CONGO network is being expanded and is proving to be a great asset for multi-GNSS work.

ESOC: Loukis gave the ESOC status. There are two ESOC solutions running at the moment, at ESOC and in the UK. The combination is currently performed in the UK. The intention is to provide an independent combination stream from ESOC. The UK system will also be upgraded to get better performance and reduce the latency. RT and batch combinations now include 5 ACs – BKG, DLR, ESOC, GMV and NRCan participate in the combination. NRCan is not yet available in RT, so the ESOC2 solution is used instead. Looking at including GFZ and TUW (need discussion to ensure stability of solutions is ensured).

GFZ: Maorong said that at GFZ they are continuing in their RT activities. They have encountered a problem with BNS and also noticed that their solution has a high RMS for some satellites. They are working to correct these problems. Loukis suggested to Maorong to start an activity on ambiguity fixing with PPP, after the agreement at the workshop for him to lead a small group on the topic. It was suggested that Denis (CNES) should also be invited to participate. Maorong will get in touch with Denis to discuss.

Geo++: Martin said that Geo++ are running a GPS+GLONASS solution using a global network of 50-60 stations. At the moment they are not performing ambiguity fixing. They are testing the short-term performance by restarting the solution at frequent intervals. The next step is to include ambiguity fixing. Martin and Loukis will endeavour to include the Geo++ results in the routine comparisons and RT combination.

GMV: GMV are currently producing two GPS streams. They are working on a GPS+GLONASS solution and on procuring a new platform for redundancy. They are also working on increasing robustness as they see some issues with PPP performance. Georg requested that GMV reduce their bandwidth as the streams now contain 1-sec updates. It was agreed to reduce that to every 5 sec.

JPL: Ruth asked if JPL had participated in previous teleconferences. Loukis said that they had not, but would welcome JPL participation in the future.

NGS: Loukis congratulated Jim on starting to produce an experimental GLONASS ultra combination. Jim mentioned that the data centres will start sending two new files, an sp3 file and a combination report, starting tomorrow. He advised everyone to look at the combination report. He also highlighted some quality issues with the recent AC results from PRN-25.

NRCan: Ken apologised for some recent outages of the NRCan streams, which were caused by a power shutdown at NRCan. The SSR software is now being tested and will be ready next month, allowing NRCan to send out their product stream. The desired update rate is 5 sec, although 10 sec will be acceptable for the combination. NRCan are also building their infrastructure for GLONASS and Galileo. They are also willing to host a combination server (this could be operated remotely by Loukis). Some discussion on

sharing coordinates followed. NRCan are willing to process RT station streams for PPP solutions and use the averaged coordinate results. It was agreed to highlight the stations that are not part of the reference network and request that they are included by some of the ACs in order to get accurate station coordinates and velocities (M7-7)

5 IGS Workshop Recommendations and Implementation Planning

LA went through the recommendations presented at the IGS workshop (see below). A number of people expressed concern that the timescale towards a Real Time service offering is too long. Jim cautioned that aiming for a fully formed product may not be the way forward and it may be better to release an experimental product in a much faster time frame. It was agreed to aim to have a phased plan for the GB meeting with a first phase requiring the approval of the SSR formats, plans for improved station availability, redundancy in the combination centre and basic alarms. These pre-requisites could lead to the release of an experimental service next year, with public distribution of the combination solution. Georg indicated that he had enough capacity in the NTRIP casters to satisfy a large number of users.

On the subject of GLONASS, the current steps towards including GLONASS in the ultras are a very positive development and will help in meeting the multi-GNSS objective.

On the subject of PPP software, the idea of hosting a set of monitoring pages for the different software packages was advanced, using data from a selection of geographically distributed stations. Georg will look into this.

The recommendations will be discussed in a further teleconference in the next 3-4 weeks with a smaller participation (minimum Georg, Mark, Ken, Loukis) and anyone who expressly requests to participate.

IGS Workshop Recommendations:
Focus on User Requirements and in particular on:
Recommendation 1. Roadmap and schedule to transition to full IGS product line
What needs to be done:

- Robust data distribution
  - Commitment from operators
  - Critical stations sending data to two casters
- Combination to be performed in several places
- Alarms and internal checks
- Disclaimer on usage (best efforts)
- Approval of RTCM formats
- To be incorporated in the RTPP
  - Possible Schedule 1.5-2 years

Recommendation 2. Work towards GLONASS and Galileo processing

- GLONASS processing possible now
  - Some GLONASS streams available
    - More stations needed
  - Needs development of AC infrastructure
    - BKG/TUP already available
    - Others have plans for imminent development
  - GLONASS in ultras will help

- Galileo
  - Lack of stations/data is main issue
  - Regarded as a longer-term objective

Recommendation 3. Promote development and use of freely available positioning software and standards

- Continue to work through RTCM
  - Close to reaching agreement on SSR and RTCM HP
- Promote Positioning Software
  - Ambiguity fixing support
    - Reduce PPP convergence time / increase accuracies
    - Working group to define requirements for PP (M. Ge)
  - Software Packages
    - RTKLIB, BNC, NRCAN

6 AOB

Loukis thanked everyone for a very productive teleconference (especially those who lasted the full 3-hour session)!

7 Action Item List[1]

Action Item	Status	Submit Date	Due/Close Date	Title	Description	Actionee	Response
M4-1	Closed	25/02/09	14/03/09	PP Status	Summarise the main points of PP and RTCM as an IGS mail.	Mark Caissy, Loukis Agrotis	First draft written by Loukis and sent to Mark to finalise. Mark has sent it out.
M4-2	Closed	25/02/09	14/03/09	RTCM Liaison	Request the appointment of an IGS liaison person from the IGS Governing Board and formalise rules for communicating RTCM documentation.	Georg Weber	Jointly managed between Infrastructure Committee and RTPP.
M4-3	Closed	25/02/09	14/03/09	RT product dissemination	BKG, DLR and Geo++ to publish their RT streams on NTRIP and provide details on how to receive those streams.	Georg Weber, André Hauschild, Gerhard Wuebbena	Broadcaster: www.igs-ip.net Port: 2101 Mountpoint: CLK10 (GPS-only) Reference System: ITRS2005 Authorization: none Engine: RTNet, TU Prague Encoder: BNS, v1.0 Decoder: BNC, V1.7 Format: RTCM message type 1060 Broadcaster: www.igs-ip.net Port: 2101 Mountpoint: CLK11 (GPS+GLONASS) Reference System: ITRS2005 Authorization: none Engine: RTNet, TU Prague Encoder: BNS, v1.0 Decoder: BNC, V1.7 Format: RTCM message types 1060 and 1066 Note: Mountpoint CLK00 is used to transmit the broadcast ephemeris information for all satellites. Broadcaster: gnss.gsoc.dlr.de Port: 2101 Mountpoint: CLKR0

[1] Greyed-out entries have been confirmed as closed

Action Item	Status	Submit Date	Due/Close Date	Title	Description	Actionee	Response
							Reference System: ITRS2005 Authorization: none Engine: RETICLE, DLR/GSOC Encoder: RETICLE Format: Premature, RTCM 026-2008-SC104-429 Broadcaster: gnss.gsoc.dlr.de Port: 2101 Mountpoint: CLKS0 Reference System: ITRS2005 Authorization: none Engine: RETICLE, DLR/GSOC Encoder: RETICLE Format: Plain ASCII SP3c Broadcaster: wox.geopp.de Port: 2101 Mountpoint: RTCMSSR Reference System: ITRS 2005 Authorization: basic Username: IGSRTPP Password: gppstream Engine: Geo++ GNSMART Encoder: Geo++ GNSMART Format: RTCM message types 1057, 1058, 1059, 1063, 1064, and 1065
M4-4	Closed	25/02/09	14/03/09	RT Product Directories	Provide the directory structure for the RT products (report and combination solution) to be stored at CDDIS	Pedro Alfaro	Carey and Pedro have now set this up in ftp://cddis.nasa.gov/gps/products/rtpp/
M4-5	Open	25/02/09	14/03/09	Data Centres	Approach the remaining Data Centres to ask for contributions in hosting the RT products.	Carey Noll	
M4-6	Open	25/02/09	14/03/09	User Community	Develop plan to involve the user community in processing the RTPP products	Mark Caissy, Loukis Agrotis	IGSmail from M4-1 will be the starting point for this. Some use by Newcastle and University of New Brunswick. Mark to send Questionnaire to RTPP participants.
M4-7	Closed	25/02/09	14/03/09	RTPP Web Site	Discuss with Mark about contributing to the effort for updating the web site	Loukis Agrotis	Brian Donahue from NRCan is now leading this activity.
M4-8	Closed	25/02/09	14/03/09	NTRIP links	Provide the links to be included in the	Georg Weber	On top of www.rtigs.net we currently have a table of links to the

Action Item	Status	Submit Date	Due/Close Date	Title	Description	Actionee	Response
				for Web Site	RTPP web page		UDP topics "Stations, Protocol, Products, Architecture, Software, Network, FAQ". For a quick solution my suggestion would be to turn this table of links into a pull-down-menue offering equivalent links to both, the UDP and the NTRIP approach. Best regards, Georg ========== List of links with RTIGS contents not included in www.rtigs.net ========== Monitoring: http://www.igs.oma.be/real_time/ Operation: http://www.igs.oma.be/real_time/station_operation_details.php RTIGS, FAQ: http://www.igs.oma.be/real_time/ntripfaq.php Highrate RINEX: http://www.igs.oma.be/highrate/ NTRIP Broadcast: http://www.igs-ip.net/home NTRIP Streams, Map: http://igs.bkg.bund.de/root_ftp/NTRIP/maps/casters/IGS-IP.png NTRIP Stream Table: http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm NTRIP Contributors: http://igs.bkg.bund.de/ntrip/contributors.htm NTRIP User Registration: http://igs.bkg.bund.de/ntrip/ntrip_register.htm NTRIP Provider Registration: http://igs.bkg.bund.de/ntrip/ntrip_register_provider.htm NTRIP Streams, Notice Advisories: http://igs.bkg.bund.de/root_ftp/NTRIP/nabu/igs NTRIP Streams, Outages: http://igs.bkg.bund.de/root_ftp/NTRIP/outages/igs NTRIP Software: http://igs.bkg.bund.de/ntrip/ntrip_down.htm

Action Item	Status	Submit Date	Due/Close Date	Title	Description	Actionee	Response
M6-1	Closed	21/10/09		Weekly Telecons	Organise weekly teleconferences between a small core of people, to advance RTPP issues.	Mark Caissy	
M6-2	Closed	21/10/09		Iono Workshop	Send a short paper with a proposal and gauge interest for a workshop to discuss RT ionospheric product formats.	Georg Weber	
M7-1	Open	28/09/10	12/10/10	Phase alignment	Compile a list of arguments supporting the phase alignment request for dissemination to the RTCM.	Nacho Romero	
M7-2	Open	28/09/10	12/10/10	IGS Mail	Send IGS mail to advertise the IGS's intention to provide a service based on the SSR messages.	Mark Caissy	
M7-3	Open	28/09/10	12/10/10	Network Redundancy	Document the existing functionality for network and station data redundancy and provide initial suggestions on how to improve it.	Ken MacLeod and Georg Weber	
M7-4	Open	28/09/10	12/10/10	RTPP Status	Provide a short status update on the RTPP to add to the IGS web site.	Loukis Agrotis	
M7-5	Open	28/09/10	12/10/10	RTPP Web Links	Create a template for capturing the most relevant internet links related to the PP and send it to everyone to update.	Loukis Agrotis	Template and submissions from Georg and Loukis sent on 4 October with these minutes.
M7-6	Open	28/09/10	12/10/10	Iono Coordination	Work towards making a joint proposal to the RTWG between UPC and DLR for iono product coordination.	Norbert Jakowski, Manuel Hernandez-Pajares	UPC and DLR are considering rotation of this function between their two organisations on an annual basis.
M7-7	Open	28/09/10	12/10/10	RT Station Coordinates	Highlight the stations that are not part of the reference network and request that they are included by some of the ACs (via Jim Ray) in order to get accurate station coordinates and velocities.	Loukis Agrotis, Pedro Alfaro, Ken MacLeod, Georg Weber	