Network Issues
Position Paper

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January 29, 2004

1 Introduction

The IGS network today consists of 364 stations managed by about 100 different agencies worldwide. The RINEX observations are contributed (generally on a daily or hourly basis) to the IGS Data Centers, which permanently archive the data and make it freely available to all users. The primary customer of the data set is the IGS Analysis Centers, which acquire the data for generation of precise GPS products such as ephemerides, clocks, earth orientation parameters, and station positions and velocities. The IGS Network Coordinator at the Central Bureau acts as liaison between the station operators and the Analysis Centers, providing necessary station configuration metadata and ensuring the dataset meets the requirements of the analysis.

In this paper we examine several topics currently warranting attention. These issues will be discussed at the conclusion of the Network Issues session at the Berne Workshop, leading to recommendations for future directions. We have identified (1) effective notification of station status within the IGS framework of electronic communication, (2) the multiple sources of IGS station configuration metadata available to and used by analysts, and (3) the new suite of IGS station operation guidelines.

2 IGS Network Communication: splitting the IGSMail mailing list

The suggestion to have separate mailing lists for major announcements and station advisories has been made from time to time over the past years, but now the frequency of receiving this request has reached the point of confirming a clear need in the community.

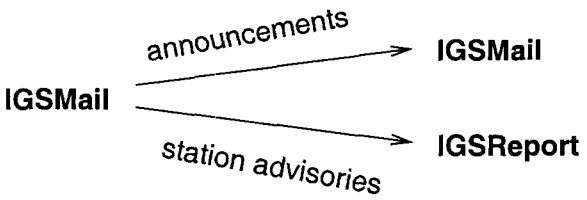
Four options identified for implementing this are described below. All aspects are open for discussion and any input is welcome.

In all cases we envision that "announcements" means messages such as IGS Workshops, new IGS stations, product-related announcements, major DC announcements, sessions at conferences, enhancements to web pages or services, etc.

"Station advisories" includes station configuration notices and outage or repair notifications. Although new procedures for RINEX data replacement notification are under discussion in the Data

Center Working Group, data replacement messages would be sent in this mailing list until a new system is in place.

Option 1



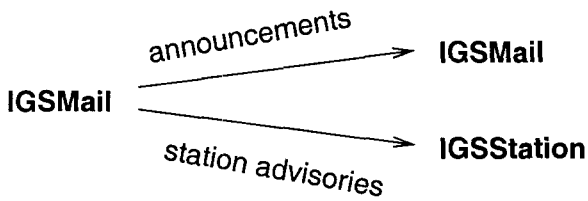
- Move station advisories to IGSReport
- Announcements stay on IGSMail
- Must advise IGSMail subscribers to subscribe to IGSReport to continue getting station advisories

Pro
- IGSMail is a good name for the announcement list.
- Does not increase total number of lists

Con
- Expect a transition period where some station advisories will be sent to IGSMail.
- CB will have to remind people to use IGSReport.
- Must update documentation and software.
- Burden is on station operators to update their procedures.
- IGSReport is perhaps a slightly unusual name for station advisories.

Note
- Current IGSReport users must indicate if this is acceptable.
- This possibility was raised by G. Beutler at the 14th Governing Board Meeting.

Option 2

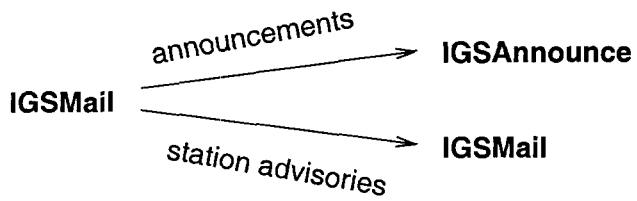


- Create new list "IGSStation"
- Announcements stay on IGSMail
- Must advise IGSMail subscribers to subscribe to IGSStation to continue getting station advisories

Pro
- IGSMail is a good name for the announcement list.
- IGSStation is a good name for the station advisory list.

Con
- Expect a transition period where some station advisories will be sent to IGSMail.
- CB will have to remind people to use IGSStation.
- Must update documentation & software.
- Burden is on station operators to update their procedures.

Option 3

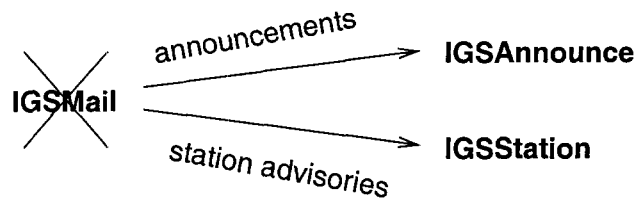


- Move announcements to IGSAnnounce
- Station advisories stay on IGSMail
- Subscribe all IGSMail subscribers to IGSAnnounce
- Advise IGSMail subscribers to unsubscribe if not wanting station advisories.

Pro
- IGSAnnounce is a good name for the announcement list.
- Will not expect stray station advisories on IGSAnnounce.
- Little if any software to be updated.

Con
- IGSMail is perhaps not the best name for a station advisory list.
- Expect some announcements to be sent to IGSMail.
- CB will have to remind people to use IGSAnnounce.
- Some documentation to be updated.
- Burden is on announcement senders to remember new procedures.

Option 4



- Move announcements to IGSAnnounce.
- Move station advisories to IGSStation.
- Decommission IGSMail (forward incoming messages to CB)
- Subscribe all IGSMail subscribers to IGSAnnounce.
- Advise all IGSMail subscribers to subscribe to IGSStation if wanting to receive station advisories.

Pro
- Good list names.
- No stray messages expected.

Con
- No more IGSMail?! ☹
- Expect some messages to be sent to IGSMail.
- CB has to remind people to use the new lists.
- Must update documentation and software.
- Everyone must update their procedures.

3 IGS Station Metadata

A brief poll of IGS Analysis Centers (AC's) and coordinators was undertaken to understand how they presently ingest station metadata into their analysis processes.

The responses differed in details, but the following can be deduced from the collection.

- Many ACs have internal databases which are compared automatically to some metadata source at the CB, but an operator examines the results and decides on updates manually.
- The site logs are used directly much more than (Angie) anticipated. In fact, all of the following are used operationally in IGS analysis: site logs, igs.snx, logsum.txt, igs_01.pcv, NGS ant_003.pcv. JPL AC preliminary considers using only the SOPAC SITe system in the future.
- The SINEX template is not used by all ACs and may have been not well advertised since the 1998 AC Workshop in Darmstadt. Additional factors are discussed below.
- The SINEX template has some shortcomings, notably A5 serial number field and absence of former sites (the latter easy to solve).
- Several analyze IGS sites simultaneously with other sets of sites, such as a regional network (SCIGN, EUREF). It is an issue how to acquire and combine metadata for different site sets. This is what motivates JPL to turn to SITe.
- Analyzing different site sets also makes it frustrating to figure out how to do phase center offsets & variations. If getting some from NGS and some from igs_01.pcv, there are differences since igs_01.pcv is not updated when new data is later taken. The antenna and analysis communities should address this.

Other comments included:

- it would be nice to know what periods of time had no data from the site log or SINEX template.
- it would be useful if the SINEX template had ITRF positions & velocities.
- full automation is not really desired, because it is preferable to have critical parameters under management by humans.
- changed or new log files should be available ASAP for ultrarapid analysis.
- machine readable/tabulatable codes for monument type, geology, other equipment types would be nice.

In order to understand how so many different approaches arose, we can trace the "timeline of confusion:"

Nov 1994 "Constructing the IGS Polyhedron by Distributed Processing" by Blewitt, Bock, and Kouba, presented at the Densification workshop (Darmstadt), says:

> The IGS Central Bureau will need to develop and enhance databases to assist AC's and AAC's. The goal should be to remove any necessity for AC's to go elsewhere for essential information. For example, it should be straightforward for T2's [now known as GNAACs] to check eccentricities in received SINEX files against official values kept by the IGSCB, and apply corrections as necessary. The IGSCB should consider a parallel set of files: one for human readability (like the station reports), and one for machine readability.

May 1995 NCL T2/GNAAC reports in the Special Topics workshop at Potsdam that it is developing its software around the use of a "SINEX Catalogue" which is a subset of SINEX blocks to "...give the expected attributes of those stations."

early 1996 "Status of the IGS Initiative to Densify the ITRF," by J. Kouba in the 1995 Annual Report, offers:

> ...not all ACs take the care to code antenna information correctly or even to include the mandatory SITE/ECCENTRICITY blocks. There are some persistent confusions about correct antenna heights for some stations. As already pointed out ... it is desirable that IGS CB take on the responsibility for keeping an official, electronically readable, antenna offset file. The most convenient and logical format would be the corresponding SINEX (SITE) blocks.

Oct 1997 in IGSMail #1698, W. Gurtner offers a new file, loghist.txt, from the CB. Privately he mentions to the CB it could be used to generate a "SINEX header."

Oct 1997 In IGSMail #1708, P. Davies announces he's making available loghist.snx, which is converted from loghist.txt.

Oct 1997 An internally-archived email indicates the CB agrees with P. Davies to offer loghist.snx from the CB.

Nov 1997 An internally-archived email indicates the CB has started to generate igs.snx.

What happened?

ACs originally had to implement internal collections of station parameters. Nobody likes to un-do long-standing functional software, so much of it is still left in place. In some cases, the SINEX template was partially implemented later to cover some instances where it makes some improvement over the other options.

4 Guidelines

At the 22nd IGS Governing Board meeting, a thorough update of the IGS site guidelines was identified as a pressing priority for a number of reasons. The Network Coordinator formed a first draft and sent it for review by

- G. Gendt (ACC)
- C. Bruyninx (EPN NC)
- R. Ferland (RF Coordinator)
- J. Ray (AC/RF expert)
- M. Schmidt (Site ops expert)
- W. Gurtner (Author of previous guidelines)
- C. Noll (DCWG Chair)

As appropriate, questions were also asked at an early stage of

- Z. Altamimi (ITRF expert)
- H. Drewes (Author ISGN guidelines)
- D. Stowers (Site ops expert)
- S. Schaer (AC expert)
- R. Weber (GLONASS coord)

- Y. Bar-Sever (Tropo chair)
- G. Mader (Antenna expert)
- M. Rothacher (Antenna expert)

This serves as an example of how the NC can utilize the expertise of usual and additional groups of advisers to assist in network matters. After several rounds of revision with these reviewers, the document was made available for comment from the entire IGS community.

The Governing Board approved (provisionally, and later officially) the document and a program of continuous review and improvement. Update authority is delegated to the NC, with the understanding that significant changes would be discussed with appropriate advisor's beforehand (ACC, RF Coord, station ops, WG Chairs, as needed for the topic), and a list of changes made in the preceding period will be made available to the GB at its regular meetings.

Although public comment on the new set of IGS guidelines was solicited, received, and utilized, the workshop provides another opportunity to discuss the guidelines. Since the Governing Board directed the Network Coordinator to maintain the document in a "continuous improvement" mode, comments are appropriate and welcome at any time. Here we point out a few guidelines that station operators may wish to think about. Now is the time to speak up if any are unreasonable. The guidelines are permanently available at http://igscb.jpl.nasa.gov/network/site/guidelines/guidelines.html or http://igscb.jpl.nasa.gov/network/site/guidelines/guidelines.pdf

Here are a few topics network operators may wish to particularly review.

Local survey requirements Can your organization arrange for such a survey? See 2.1.4, 2.2.17

Radomes Are you willing to not use them unless specifically necessitated at a site, and to really avoid conical radomes if not needed? See 2.1.6. Can you arrange for a calibration, if you were to use a new antenna+radome pair? See 2.1.8.

Data issues Do you/Can you check the integrity of file transfers to your DC? See 2.1.16. Do you/Can you arrange for the archival of the raw (native binary) GPS data? See 2.1.12. Is this a reasonable request? Should there be a time limit?

Reference Frame site operators is there anything in section 3.3 which you cannot abide by?

Hypothetically if you were asked to provide a commitment letter stating you agree to follow the guidelines for a period of (3? 5?) years, could you do so? If not, what are the problem points?

5 Recommendations

1. The IGSMail list should be split according to Option 2 discussed above.
2. The analysis community should identify the necessary level of standardization of metadata ingestion, and provide direction to the NC for future development of metadata products.

6 Acknowledgment

A. Moore's portion of this work was performed at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.