IVS Newsletter

Issue 9, August 2004

IVS Web Site Redesigned

– IVS Web Team

The redesign of the IVS web site was announced on June 9. The new site offers much improved navigation, updated content, and a logical structure. The IVS Web Team was lead by Nancy Vandenberg (NVI/GSFC) and included Hayo Hase (BKG), Yasuhiro Koyama (NICT), Zinovy Malkin (IAA), Dan Smythe (Haystack), Christoph Steinforth (UBonn). The site design and initial site construction were done by web designer Doug League of the Technical Information Services Branch at NASA's Goddard Space Flight Center.

The team collaborated via e-mail beginning in September 2003, with some pauses in the action while the designer did his part of the work. The heaviest e-mail discussions went on during the month prior to the release of the site as we did a detailed review and update of the site structure and content and constantly checked for broken links.

One discussion topic was about privacy. We decided that the full list of Associate Members would appear on the web as a PDF file so that it would not be easy for spammers to harvest the addresses. We retained mailto links for contacts and IVS officials. We plan to have a search facility for addresses which will return a mailto link upon request.

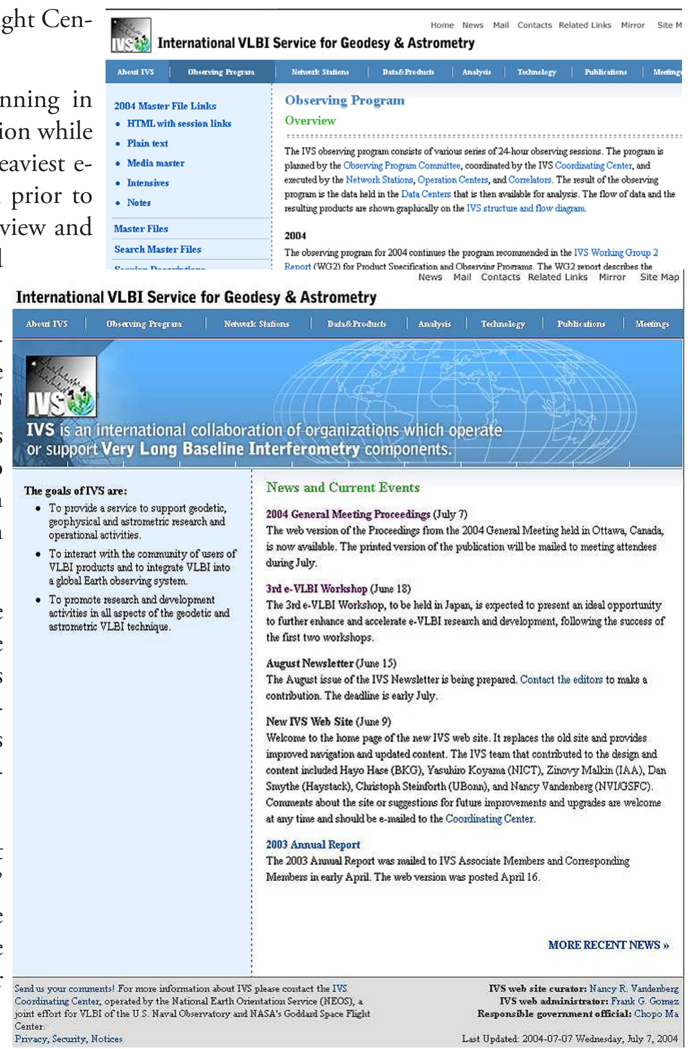
A major upgrade that is planned for the site is to establish a set of station pages in the Network Stations section. These new pages will present station information in a consistent manner. They will include items such as photos, contact and staff information, capabilities, observing configurations, and more.

The new home page now has a prominent section labelled "News and Current Events" which will highlight updates to the website and provide IVS news items. Users of the site should check the home page frequently for the latest information.

Comments about the site or suggestions for future improvements and upgrades are welcome at any time and should be e-mailed to the Coordinating Center

The IVS web site contains many links to VLBI web resources, which are often changed by their owners. It's not so simple to keep a link collection up to date. We encourage everyone who maintains a web site to inform the Coordinating Center about any changes in e-mail and internet addresses.

The site's home address is http://ivscc.gsfc.nasa.gov. Mirror addresses are http://ivscc.leipzig.ifag.de at BKG in Germany and http://ivs.nict.go.jp/mirror/ at NICT in Japan.



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International VLBI Service for Geodesy & Astrometry

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2004 Master File Links
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Observing Program

Overview

The IVS observing program consists of various series of 24-hour observing sessions. The program is planned by the Observing Program Committee, coordinated by the IVS Coordinating Center, and executed by the Network Stations, Operation Centers, and Correlators. The result of the observing program is the data held in the Data Centers that is then available for analysis. The flow of data and the resulting products are shown graphically on the IVS structure and flow diagram.

2004

The observing program for 2004 continues the program recommended in the IVS Working Group 2 Report (WG2) for Product Specification and Observing Programs. The WG2 report describes the

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International VLBI Service for Geodesy & Astrometry

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IVS is an international collaboration of organizations which operate or support Very Long Baseline Interferometry components.

The goals of IVS are:
- To provide a service to support geodetic, geophysical and astrometric research and operational activities.
- To interact with the community of users of VLBI products and to integrate VLBI into a global Earth observing system.
- To promote research and development activities in all aspects of the geodetic and astrometric VLBI technique.

News and Current Events

2004 General Meeting Proceedings (July 7)
The web version of the Proceedings from the 2004 General Meeting held in Ottawa, Canada, is now available. The printed version of the publication will be mailed to meeting attendees during July.

3rd e-VLBI Workshop (June 18)
The 3rd e-VLBI Workshop, to be held in Japan, is expected to present an ideal opportunity to further enhance and accelerate e-VLBI research and development, following the success of the first two workshops.

August Newsletter (June 15)
The August issue of the IVS Newsletter is being prepared. Contact the editors to make a contribution. The deadline is early July.

New IVS Web Site (June 9)
Welcome to the home page of the new IVS web site. It replaces the old site and provides improved navigation and updated content. The IVS team that contributed to the design and content included Hayo Hase (BKG), Yasuhiro Koyama (NICT), Zinovy Malkin (IAA), Dan Smythe (Haystack), Christoph Steinforth (UBonn), and Nancy Vandenberg (NVI/GSFC). Comments about the site or suggestions for future improvements and upgrades are welcome at any time and should be e-mailed to the Coordinating Center.

2003 Annual Report
The 2003 Annual Report was mailed to IVS Associate Members and Corresponding Members in early April. The web version was posted April 16.

MORE RECENT NEWS »

Send us your comments! For more information about IVS please contact the IVS Coordinating Center, operated by the National Earth Orientation Service (NEOS), a joint effort for VLBI of the U.S. Naval Observatory and NASA's Goddard Space Flight Center.
Privacy, Security, Notices

IVS web site curator: Nancy R. Vandenberg
IVS web administrator: Frank G. Gomez
Responsible government official: Chopo Ma

Last Updated: 2004-07-07 Wednesday, July 7, 2004

Image of the new IVS home page and the second level page for the "Observing Program" section. The home page displays the IVS logo, mission statement, and goals. Navigation is accomplished with the section links "About IVS", "Observing Program", "Network Stations", etc. which appear on every page.

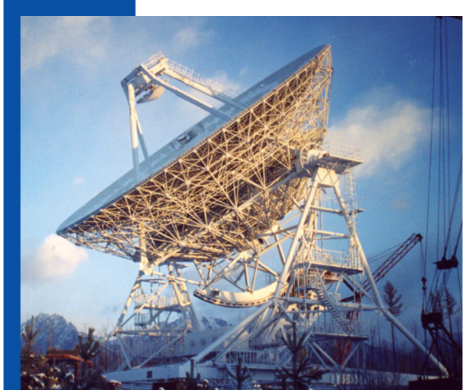
The Institute of Applied Astronomy, St. Petersburg Russia

The Institute of Applied Astronomy in St. Petersburg, Russia, supports four IVS components: the Network Station Svetloe, an Analysis Center, a Technology Development Center, and a Correlator. The head of IAA, Prof. Dr. Andrej Finkelstein, was interviewed via e-mail by editor Hayo Hase.

Russia is the largest country on Earth and ideal for domestic VLBI networks. When did Russia begin VLBI observing?

Russia (formerly the Soviet Union) began VLBI investigations at the end of the 1960s. At that time Russian scientists together with American colleagues conducted the first transatlantic VLBI experiment. However all our VLBI experiments were conducted as astrophysical programs and were concerned with investigations of cosmic masers. The Institute of Space Research, the Crimean Astrophysical Observatory and the Special Astrophysical Observatory of the USSR Academy of Sciences were participants in these programs.

(above) Zelenchukskaya in Karachaevo-Cherkesiya Republic (2002); (below) Badary in Buryatiya Republic (2004).



What are the aims of the most recent VLBI programs?

The interest in VLBI applications for astrometry arose in Russia at the beginning of the 1980s and in 1988 the Institute of Applied Astronomy (IAA) began to design and to construct a domestic VLBI network called QUASAR, dedicated to astrometry, geodynamics and space geodesy.

What is the status of QUASAR?

As of the present time three observatories of this network have been put into action -- Svetloe in Leningrad province (2000), Zelenchukskaya in Karachaevo-Cherkesiya Republic (2002) and Badary in Buryatiya Republic (2004). The main element of the instrumentation at each observatory is a fully steerable radio telescope with a homologous 32-meter main mirror and a 4-meter secondary mirror, equipped with five low-noise cooled receivers for wavelengths of 1.35, 3.5, 6.0, 13 and 18/21 cm, which allow observations in two orthogonal circular polarizations to be carried out. S/X-band receivers with a single horn are used mainly for astrometry, geodynamic and geodetic programs, and the other receivers are used for astrophysical studies. The different bands are rapidly changed by rotating the remotely controlled secondary mirror, enabling multi-wave observations.

What kind of instrumentation are you operating at Svetloe observatory?

Svetloe in Leningrad province (2000)

The observatory Svetloe ("Svetloe" means "Light"), the first site of QUASAR Network, is equipped with Mark 3, Mark 5 and S2 terminals. It has four H-masers with long-term stability not worse than 5x10E-15 for 1000 seconds. One of these masers is always operational, while any of the others can be activated within one hour and can reach nominal technical parameters within another 24 hours. The sky frequencies are converted to the video band by synchronized local oscillators with frequencies 1.26, 2.02, 4.5, 8.08 and 22.92 GHz. The phase calibration of the system is provided by a pulse generator with duration of 25-50 ps. Time comparison is made with an error of 30-50 ns by using GPS and GLONASS receivers. The measurements of meteorological parameters (atmospheric pressure, wind direction and strength, temperature and humidity) are provided by a high-precision system.

All of the systems of the radio telescope were united into a single complex using a central computer. The Mark IV Field System is installed on a central computer and is supplemented with a station-oriented interface for control of the antenna, receivers and the radiometric recording system. The observatory has a local geodetic network which is supported by permanent GPS measurements. A dual-frequency 24 channel Leica SR520 receiver is used for geodetic measurements in the frame of IGS programs.

How is Svetloe scheduled and when did Svetloe start observing IVS schedules?

The first regular VLBI observations for IVS programs R4, T2, EURO, E3 were carried out beginning on March 6, 2003. These programs have employed about 30% of total observational time. The rest of the time is used for such astrophysical programs as observations of quasars and micro quasars, close double stars, cosmic gamma-ray bursts, supernova remnants, Sun and major planets and also for technical support of observatory implementations.

Who is in charge of the operation?

The observatory is operating 24 hours every day and is served by four 12-hour shifts of operators. Technical service of the most complicated systems is provided by a group of engineers in the day time. The head of the observatory is Prof. Ismail Rakhimov.

What about correlation of VLBI-data in Russia?

At the present time our S2/Mark3 correlator has been used for processing of domestic VLBI experiments. This correlator is capable to process 3 stations of tape-based VLBI data in Mark3 format with the data rate per station up to 383 Mbps. Two years ago IAA began to design Altera FPGA-based correlator PARSEC with Mark4 specification. The correlator unit uses a PCI-bus correlator board, standard CompactPCI hardware with a single board Intel Pentium control computer and standard Linux operating system. It will be capable to process 4-station VLBI data simultaneously with data rate per station up to 1 Gbps. Now we have developed and tested the prototype for two stations. The analysis of VLBI data is carried out with the IAA software ERA, OCCAM-Revised and QUASAR.

From left to right: Svetlana Khakimova (operator), Larisa Bulkina (operator), Tatyana Andreeva (engineer), Yurij Chernikov (engineer), Yuliya Shumilova (engineer), Andrej Zborovskij (engineer), Prof. Ismail Rakhimov (head of observatory), Anatolij Berkushin (operator), Irina Stepanova (engineer), Marina Gorbacheva (operator), Evgenij Smirnov (engineer).

Equipment in the control room at Svetloe.

What are the next steps of development associated with the Russian QUASAR Network?

In the near future we are anticipating the following technical events:

- connection in 2004-2005 of observatories with optical fiber lines providing data transmissions with the rate of severa Gbps and giving the opportunity to move to on-line VLBI;
- installation in 2005 of 7-mm receivers at radio telescopes for study of possibility to use K/E range for astrometry and geodesy,
- unification in 2005 of the Network with the 70-m radio telescope in the Far East (at Ussurijsk).

What is the group in St. Petersburg doing? Who is working at IAA headquarters in St. Petersburg?

The observatories of the QUASAR Network are branches of IAA and their main task is to provide the technical exploitation of the radio telescopes. Planning, processing and analysis of any observations and also technological development of observatories are provided by scientists and engineers of IAA working at headquarters in Saint-Petersburg. Key figures in the radio astronomy technique are Prof. Aleksandr Ipatov and Dr. Vyacheslav Mardishkin (receivers), Prof. Michail Kajdanovskij and Dr. Eduard Korkin (antenna), Prof. Nikolaj Koltsov, Dr. Leonid Fedorov and Mr. Andrej Mikhajlov (registration systems), Dr. Sergej Smolentsev and Dr. Dmirij Ivanov (H-masers), Dr. Valerij Grachev, Dr. Igor Surkis and Mr. Leonid Kuptsov (correlator). Key figures in the analysis of VLBI, GPS/GLONASS, SLR, LLR, DORIS and radar observations are Prof. Vadim Gubanov, Prof. Georgij Krasinskij, Dr. Zinovy Malkin, Dr. Elena Skurichina, Dr. Iskander Gayazov, Dr. Nadezhda Shujgina and Dr. Elena Piteva.

What do you think about the IVS?

IVS is a reasonable community raising very deep technological ideas and very interesting observational programs. This community united the people of different colors - engineers, observers and theoreticians - and gave them the strong motivation for joint activity. In Russia only IAA makes a noticeable contribution to IVS, supporting its components as network station, technology development center, correlator and analysis center. Besides IAA, Saint-Petersburg State University takes part in the calculations of EOP in the frame of IVS.

What are the scientific challenges in VLBI?

This requires a lot of space; therefore I limit myself to a short list. Technological challenges: on-line VLBI, space VLBI, millimeter VLBI. Natural challenges: predictions of earthquakes, study of continental motion, development of the Earth structure, construction of super high-precision dynamical model of the Solar System ("physical laboratory for the poor") for tests of fundamental physical theories, investigations of the energy sources of galactic nuclei and of quasars, search for extraterrestrial intelligence.

On Unbiased Air Pressure Loading Predictions

—Hans-Georg Scherneck, Onsala Space Observatory

There is a general preparedness among the IVS analysis groups to take atmospheric loading into account to get rid of yet another systematic source of error. The IERS recommendation to do so reflects the outcome of early studies in the 1980s. Basically there are two different methods to predict surface displacement due to air pressure loading, the first one taking a local approach, the second one a global. The local method is based on a local barometer, the global one is based on global air pressure grids from met services.

The significance of atmospheric loading lies in that pressure deforms the earth surface, and thereby a site is displaced by up to several centimeters in the vertical and millimeters in the horizontal. This displacement is many times the present resolving power of VLBI. Since air pressure changes during the course of a VLBI experiment, we would like to implement a method that helps reduce this perturbation already in the data analysis stage. Moreover, the site offsets may be persistent for weeks and beyond, and variations of mean pressure (and thus the site offset) may be significant even on inter-annual time scales.

It has been found that the global grids might not preserve the necessary temporal consistency on the long run. Thus, while global grids may be useful to predict fully 3-D displacement components with good accuracy over short to medium timescales, it is potentially safer to predict the very-long-term vertical component of station position from a high-quality series of local barometer readings. The local method, however, does have problems with the horizontal components, and it is notorious for overestimating the effect of spatially small pressure disturbances.

Each method needs to refer to a state of zero displacement from a reference site position under average pressure conditions. This is difficult to establish. We don't want to introduce jumps. The problem reminds me of the case of the permanent tide – we are hesitant to change the convention because solutions for station positions are affected. Thus, the reference state should be carefully selected.

In the following I present some recommendations. They are the bottom lines of some detailed considerations that can be read at http://www.oso.chalmers.se/~hgs/Apload/unbiased.pdf.

The IVS Newsletter is published three times annually, in April, August, and December. Contributed articles, pictures, cartoons, and feedback are welcome at any time.

Please send contributions to ivs-news@ivscc.gsfc.nasa.gov. The editors reserve the right to edit contributions. The deadline for contributions is one month before the publication date.

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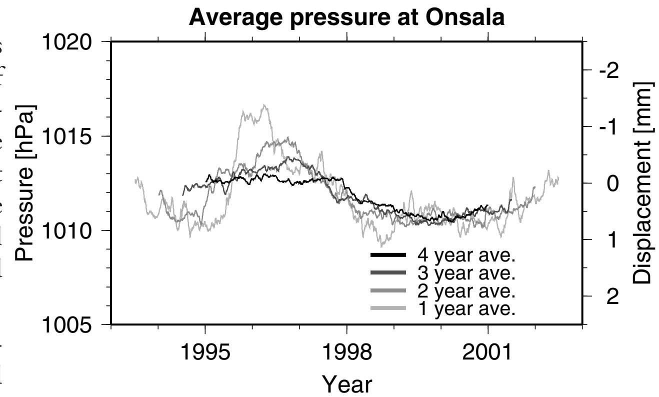
The newsletter is published in color with live links on the IVS web site at http://ivscc.gsfc.nasa.gov/.



Mean pressure from the Onsala barometer series using different averaging intervals. The ordinate range for this plot is worth perhaps 5 mm of displacement. An ultimate target level for maximum excursion is 0.2 mm, but 0.5mm (~2 hPa) might still be acceptable. A minimum averaging interval of 4 to 5 years seems to be required.

1. *The reference position (alternately the prediction bias) should be determined over a five year interval.* The temporal location, e.g. symmetric to important epochs 1997.5 to 2002.5 or 1994.5 to 1999.5 or one-sided before 2000.0 (1997.0), would have to be investigated, looking at which interval would harvest the best and most complete data record. A rough justification as to the duration of the reference period at each site is as follows. Starting with the aim to be consistent within 0.1 mm (so our contract can be blessed with a long lifetime) the average pressure must be constant to within 0.1 mm divided by 0.5 mm/hPa, which equals 0.2 hPa. Sitting here at Onsala and holding my thumb outside the window I gather that we need a five year period. The figure shows temporal sliding averages of our barometer over various time windows. To get some generality out of this figure, imagine that air pressure variations could be 50 percent stronger and the loading effect would peak at 0.5 mm/hPa. I think it supports the five years recommendation.

2. *Every station must keep a barometer, calibrated and tied to the same location.* If you have to move it, you need to establish and monitor the pressure tie. So it would be good to have a running backup. The objective: obtain a long-term stable reference and be able to monitor eventual slow drift due to change in weather patterns (a.k.a. climate).

3. *IERS should create a service for atmospheric loading.* The major objective would be to provide us with scientifically sound information and with redundant information so we can do research and we are not all forced to incorporate the same inadvertent mistakes. Volunteers are needed to do the routine work (not very attractive).

4. *The IERS service should communicate with the analysis groups for feedback.*

5. *Finally, think globally, act locally!*

EVN TOG Meeting held at Wettzell

– Gerhard Kronschnabl, Wettzell

For the first time an EVN Technical Operations Group (TOG) Meeting was held at the Geodetic Fundamental Station Wettzell. More than 53 participants from European countries, North America, Asia and South Africa representing the astronomical and geodetic VLBI communities attended this meeting. The overwhelming interest in this TOG meeting was the result of the fact that VLBI is now incorporating several new technologies, which opens new potentials for scientific research in geodesy and astronomy.

Michael Wunderlich with hands-on tips for MK5 modules.

The meeting consisted of a sequence of presentations on Thursday and a workshop with practical lectures on Friday. The organization committee, Walter Alef (MPIfR), Thomas Kluegel and Gerhard Kronschnabl (BKG), divided the workshops into parallel sessions in order to accommodate the large number of participants with the limited facilities at the Wettzell.

Guiseppe Maccaferri at his lecture about the CHCHK program.

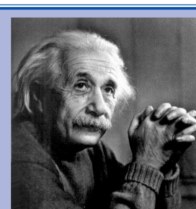
The focus of the first meeting day was the development and maintenance of the Mark 5 system, which has now almost completely taken the place of the ancient tape recorders. Other topics were: Ed Himwich demonstrating the new features of Field System version 9.6.12, Gino Tuccari reporting about the status of the digital baseband converter development, and C. Reynolds explained improvements in amplitude calibration. Moreover there were reports covering the latest eVLBI tests, improvements in VLBI technologies and station reports as well.

On Friday Michael Wunderlich's lecture about the handling of the Mark 5 modules gave a lot of practical hands-on tips for the participants. There were lots of questions and comments about the do's and don'ts. Furthermore Dan Smythe showed in his session Mark 5 tests in detail for a better understanding of the data recording and reproducing. Guiseppe Maccaferri introduced in his workshop a very useful program, called "chchk" to check the data quality of Mark 5 recordings. The program allows also phasecal extraction and searches for spurious signals in the Mark 5 data stream.

Participants at the TOG meeting.

The dinner on Thursday provided a good conversation platform for all participants and some of them forged valuable contacts to other stations in this evening. The feedback about this TOG meeting was very positive and the Wettzell team was encouraged to repeat it in the future.

A common opinion shared by the participants at the end of this workshop was the usefulness of this type of technical VLBI operations oriented meeting in which operators have a chance to learn from each other. This is valuable if not necessary for the cooperative distributed work in obtaining VLBI data. Therefore the VLBI community should continue with meetings like the EVN TOG and the IVS TOW.



A quote by
Albert Einstein....

"Science is a wonderful thing if one does not have to earn one's living at it."

Experience with the First 16-station T2 Sessions

–Arno Mueskens, Alessandra Bertarini & Alexandra Hoefer, Bonn Correlator, Kerry Kingham, USNO

Alexandra Hoefer hefts a 8-kilo Mark 5 disk module at the Bonn correlator

The first 16-station geodetic session, T2028, was observed on April 13, 2004. The purpose of the monthly "T2" sessions is to monitor the terrestrial reference frame (TRF). Each geodetic station participates several times per year in T2 sessions. The IVS Observing Program Committee (OPC) decided to enlarge the T2 sessions from 8 or 9 stations to 16 to 20, for a stronger and more robust measurement of the TRF.

T2028 was processed at WACO and T2029 was processed at Bonn. The following is a composite of the experiences at the two correlators.

Thanks to the introduction of the Mark 5 recording system, the processing factor (i.e. the ratio between the observing and the processing time) has diminished, leaving more time to the correlators to process experiments with a large number of participant stations. The newly introduced T2 series with 16 or more stations requires the correlators to run in several passes, since the number of playback units varies between nine (at Bonn) and eight (in WACO and Haystack), but this can be handled in the time available.

Unfortunately, the program (*tgen*) that creates the correlator transfer files does not optimize the tape and disc changes. So, for example, in the case of scans with 13 stations, as are present in both T2028 and T2029, the transfer file created would try to schedule the scan six times with the consequent waste of time in changing the tapes or disks within each scan.

To avoid this, we applied the following method to create the passes: we grouped the stations in four blocks of four stations each, and ran *tgen* on all the non-repetitive permutations of pairs of blocks, as if we had six experiments each with eight stations.

Although this procedure left duplicate baselines in the schedule files, scans with four or less stations, where all the stations belonged to the same block, could be easily removed by hand, which saved a lot of time in rewinding and tape changes.

At WACO, for T2028 (observed 13, April 04), we expected that, for efficient processing, the stations would naturally fall into four geographical groups:

ASIA, PACIFIC, AMERICAS and EUROPE. This mental picture was spoiled by Fortaleza, which ended up in EUROPE. Also, Gilcreek ended up in PACIFIC, but TIGO ended up in AMERICAS which is logical but confusing. In the end, we settled for the unimaginative block names of A, B, C, and D.

The processing proceeded by trying to maximize the number of scans completed in the first pass through the 4 groups, by first doing A against B, then C against D. Subsequent passes did AC and BD, and finally AD and BC. After the first 2 passes, any scan that only contained stations within one group was removed. The success of this scheme is shown by the fact that the first 2 passes averaged 520 scans, the second 2 passes averaged 345 scans and the final 2 passes averaged 210 scans. The total time taken by the 6 passes that completed all baselines was 160 hours or a processing factor of 6.67 (time processing/time observed).

It was during the reprocessing that chaos set in! WACO had a lot of recorrelation required, mostly due to scans missed during the intial passes (we are still studying why this happened). The software tools are not yet ready for this size experiment, which is an exceedingly tricky thing to set up efficiently. It took as long to do the recorrelation as it did to do the 6 initial passes leading to a processing factor of 12.9. T2028 was completed 4 June 04.

T2029 (observed on 11 May 04), the first 16-station geodetic experiment ever correlated in Bonn, was also done in six initial passes, but they ran much more smoothly than at WACO. An additional seventh pass, of only 100 scans, was created for recorrelation. The total processing factor was 10.67. T2029 was successfully correlated and exported 4 July 04.

The experience from the processing of these experiments has confirmed that the Mark 4 correlators, with mostly Mark 5 recordings, can efficiently handle large, multi-pass experiments. The Bonn and Washingtion Correlators anticipate that experiments using more than 8 stations will become even more efficient and routine as the Mark 5B will eventually allow us to expand to full 16-station correlators.

Upcoming Meetings...

Journees 2004, Fundamental Astronomy: New concepts and models for high accuracy observations,
Paris, France
September 20-22, 2004

3rd e-VLBI Workshop
Kashima, Japan
October 6-7, 2004

12th IVS Directing Board Meeting
Kashima, Japan
October 8th, 2004

7th European VLBI Network (EVN) Symposium "New Developments in VLBI Science and Technology",
Toledo, Spain
12-15 October

Pan Ocean Remote Sensing Conference 2004 (PORSEC)
Concepcion, Chile
Nov 29-Dec 3, 2004

http://ivscc.gsfc.nasa.gov/meetings

e-VLBI Network “Weather Map” Introduced

–*David Lapsley, Jason Soohoo & Alan Whitney, MIT Haystack Observatory*

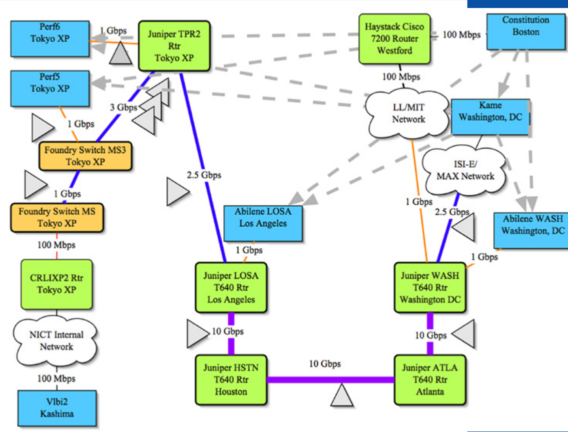
We have developed and deployed an automated system for monitoring the quality of e-VLBI transport networks. This new system allows users to view current network usage statistics on a link-by-link and segment-by-segment basis using a combination of passive and active monitoring. Statistics include current link load over various timescales, as well as current TCP throughput between nodes in the network and between various performance monitoring servers throughout the US Abilene network and the TransPAC/APAN networks. Passive monitoring statistics are provided courtesy of Abilene/TransPAC APAN network monitoring sites, while active monitoring statistics are provided through the use of Internet2’s Bandwidth Control tool (http://e2epi.internet2.edu/bwctl/) and Haystack’s Network State Database (NSDB) tool.

Currently, Tokyo XP, Abilene, Washington ISI-E and Haystack are participating in this network monitoring.

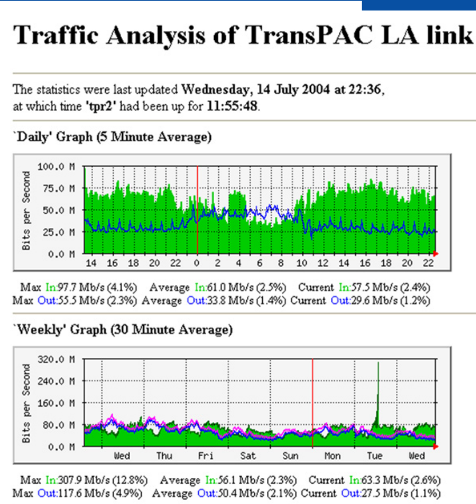
Any of the triangles may be ‘clicked’ to show the performance details of that segment. For example, the figure right shows a portion of the statistics for the TransPAC link between Los Angeles and Tokyo XP.

This website marks the first time passive and active network performance statistics have been integrated for use with e-VLBI. This is also the first time that it has been possible for network servers at the edge of the network to test into servers located within the core of the network to allow partial path analysis (the ability to determine throughput on a link-by-link basis). These statistics help to provide an overall view of the current network state, track changes in network throughput over time, and detect and isolate network/end system faults. Indeed, it was instrumental in helping to isolate and correct network faults in recent network transfers.

In the near future, we plan to extend the e-VLBI ‘Weather Map’ to include Onsala, Wettzell, Kokee, Westford and GGAO. If you would like to add your site to the Weather Map, we would be happy to co-operate with you in doing so. The software used is freely available (although some is still in alpha stage). If you would like to add your sites or servers to this network, please contact David Lapsley at Haystack (dlapsley@haystack.mit.edu).



(top) Clickable e-VLBI ‘Weather Map’ for Haystack to Kashima, which can be viewed at http://web.haystack.mit.edu/staff/dlapsley/tsev7.html; (below) (Partial) Traffic history on Los Angeles - Tokyo XP segment



UT1 Result in 4½ hours!

–*David Lapsley, MIT Haystack, Yasuhiro Koyama, NICT*

Researchers at Kashima Space Research Center and MIT Haystack recently conducted an experiment in which UT1-TAI estimates were achieved 4 hours, 27 minutes and 58 seconds after the recording of the last scan for an observing session had finished. The ‘tsev8’ experiment was conducted on 29/30 June 2004 and involved the Kashima and Westford telescopes. Data were recorded at Kashima in K5 format and at Westford in Mark5 format. The data were then transferred from Westford to Kashima using high-speed research and education networks that included Internet2’s Abilene network, the APAN/TransPAC and JGN2 networks. The data were then translated into K5 format and correlated using software correlation at Kashima. The new elapsed time of 4 hours, 27 minutes and 58 seconds is a significant improvement over the previous record of 21 hours that was set a year ago with the ‘tsev6’ experiment.

The e-VLBI ‘Weather Map’ (see above) was instrumental in helping us track down an elusive problem in the Haystack/Kashima connection, which turned out to be a bad NIC card in one of the servers along the path!

Many thanks to Hirabaru-san and colleagues at the National Institute for Information and Communications Technology, Brian Corey, Mike Poirier and Jason Soohoo at MIT Haystack Observatory, the staff of the APAN Tokyo XP NOC and Tom Lehman from the University of Southern California, Information Sciences Institute East for their hard work in support of this experiment.

VLBI How To...

One Year in the Field with a Mark 5A

–*Michael Porier, MIT Haystack Observatory*

The Westford Antenna has been using the Mark 5A system for more than 90% of operations for one year as of June 2004. The permanent implementation of the Mark 5A system has had a positive reaction from all operators on the site. By using the Mark 5A we have eliminated any loss of data caused by the tape drive. We have all struggled with parity errors during a playback check, dropped loops and blown servo fuses. With Mark 5A there is no more trying to rush to thread a thin tape while the hot air blower kit is pushing it in all directions. There are no more broken tapes during a session which seem to be always in the middle of the tape. There are no more pre-passing tapes only to sometimes discover the tape still has a bumpy pack and is unusable. There is no more cleaning heads with cotton swabs, no more guessing whether it is a write problem or a read problem. There is no more trying to reposition the tape during the restart of a session and no more trying to get a tape to stick to a reel that is without static. As most of you know the Mark 5A system consists of two 8-disk packs which slide into a rack mounted main data recording system. Loading and unloading is effortless with very little risk of damage. The system has had very few software problems since implementation. Any problems during operations have been solved by a reboot of the Mark 5A system and then a re-start of the PCFS and schedule. The connections to the formatter are a simple pair (two pair for gigabit/second recording) of ribbon cables that are the same for the tape drive. Disk monitoring during the session is done by the postob_mk5a procedure which monitors each disk performance. By watching this during the session you can identify a possible bad disk before it fails. Automated disk pack switching is working well. This program monitors the remaining space left on the active disk pack it then switches to the new disk pack when the space remaining is below a certain threshold. The shipping boxes for the disk packs seem to be working well and are not too bulky to handle.

From a field operations perspective the implementation of the Mark 5A system has greatly reduced the risk of data loss in the field. The operators have adapted to the system easily and we have had very few failures. Disk pack switching has worked well and the handling of the disk packs has not been an issue.

I am confident that the Mark 5A system will continue to develop and improve the ability of the stations to provide quality data.

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