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23 February 2004

TO: Distribution

FROM: David Lapsley

SUBJECT: 2 February 2004 e-VLBI telecon summary

Attendees:
Lee Foster, Pat Gary – GSFC
Dennis Baron - MIT
Tom Lehman - ISI-E
Kevin Dudevoir, Hans Hinteregger, David Lapsley, Arthur Neil, Alan Whitney – Haystack
Observatory

This telecon is one of an ongoing series of telecons to prepare for 10 gigabit/sec e-VLBI demonstrations between NASA GSFC and MIT Haystack Observatory using a combination of network facilities including all or part of Glownet, Bossnet, ISI-E, SuperNet, Max and GSFC/HECN.

ACTION ITEMS ARE HIGHLIGHTED IN RED.

Glownet/Bossnet

Changes in Status

Tom Lehman. BOSSnet is being reworked in the DC area. Integrating with ATDnet infrastructure at Qwest POP in Eckington. Connection being used for eVLBI to ISI-East is currently down, waiting for Jerry Sobieski to get DRAGON fiber in place. BOSSnet currently being used for ATDnet and other programs, but for eVLBI work will be offline for e-VLBI testing until Jerry gets DRAGON fiber in place. In the mean time, David Lapsley can use a host at ISI-E for testing. Jerry can talk more about the schedule. Still getting contract sorted out with Qwest. Once fiber is in place, should be stable for next four years.

Tom. Regarding BOSSnet status, major funding is coming from Transformation, Communications Architecture program, should be alright to use lambda for e-VLBI. Won't know for sure that OC48 problem is solved until DRAGON fiber in place.

David Lapsley. Regarding the OC48 upgrade of the e-VLBI wavelength on BOSSnet, need to get together to sort out details. At end of last year talked about one possible solution, using JDS Uniphase "Waveshifters". We did the pricing on these and have a solution we can use. Need to have a conference call over the next couple of weeks and look at moving forward. Spoke with Harvey Newman from Caltech about Juniper M10 router that he had promised to lend us. Should be able to get hold of it sometime soon after March 25th. Had been expecting it earlier, but their test partners who are currently using the router need to hold on to it for a bit longer to get their results. They finish

testing on the 25th of March and will ship to us after that. Should be able to terminate the OC48 wavelength at Lincoln Labs.

Tom. Terry has two OC48 cards one to connect to Haystack and the other to connect to Tom's M40 with OC48 interface at ISI-E. This will give us OC48 end to end.

Lee Foster. Do we have OC48 to Pluto at GGAO (at the antenna)?

Tom. Multiple gigE's from College Park to NASA GGAO. Not sure if they are aggregated. DRAGON has resources to connect GGAO at higher speeds (optical equipment). Need to get together to engineer how to do this. Have optical gear (includes transponders). Jerry had a meeting with Paul Lang, Bill Fink and a few other guys to discuss how to do this, but no conclusions drawn yet.

Pat Gary. From ISI-E North know exactly what to do with Juniper's and OC48, may need to revise the network diagram. Might be a good idea to further revise network diagram once DRAGON changes in DC area have been made.

Tom. Many things to do with DRAGON. David and Jerry spoke briefly in Hawaii last week to discuss some of the activities required to integrate e-VLBI. Jerry indicated it might be a good idea to have a follow up meeting to work through some of the details.

Alan. David and I will be traveling next week.

Tom. Concentrate on talking with NASA in next few weeks.

Alan. David and I will be down in Washington week after next. Get together with Jerry, Tom to discuss e-VLBI and some architecture components of DRAGON.

Pat. Only one fiber pair out to GGAO. Can run any one data rate, currently gigabit ethernet, could be OC48, also looking at 10 GigE technology. Can't do link aggregation. Would not cost a lot, but Bill Wiles would need to factor it in to his budget. Currently only 1 fiber pair between GGAO to Building 28. Today, have one fiber pair to Maryland, doing CWDM with several lambdas. Need to figure out how to do DRAGON things with only one fiber pair. Need to be creative using that pair, or put in another pair to bring up DRAGON without breaking anything else. Cost would be 6K-12K per year. Jerry had said maybe up to 25K per year. Currently all connections from Maryland touch down at Buliding 1, need to arrange fibers to get to Building 28 where they can use it.

Dennis Baron. Should be able to meet your request to do testing at MIT. Should be able to get a machine in to campus to give access via NOX to Internet2.

David. Looking for some experiments during March, so setup this month would be good.

Action item: Tom, Jerry, and Pat to get together to figure out options.

Action item: Tom, Jerry, Alan and David to get together sometime during 17th-19th.

e-VLBI Testing/Experiments

David. Working

Performance Testing

David. I went to a PipeFitters BoF at Internet2 meeting last week. Presentations on approaches to performance measurement. Internet2 has been developing automated performance testing tools across administrative domains. Looking at solving problem of automated performance testing without requiring individual accounts on machines in different administrative domains. A couple of tools

looked interesting, in particular, bwctl (wrapper around iperf). bwctl daemon is run on many different machines and automatically schedules tests and provides authentication. Most importantly allows partial path analysis. Demo showed performance of path from Hawaii through to servers on the East coast. It was possible to see delay and loss on each link. Internet2 is very keen to co-operate with us on this allowed us to start deploying this software.

http://e2epi.internet2.edu/bwctl/

Another tool of interest: OWAMP - one way active management protocol.

http://e2epi.internet2.edu/owamp/

Pat. Active measurement that Andy Germain has created showed no traffic between Haystack and GGAO. David had said that it was due to fiber at ISI-E.

e-VLBI Testing

David. Onsala telescope in Sweden recently connected at 1 Gbps. Start testing soon. Heavily booked for astronomy experiments. March 25th we can get telescope time and do some experiments. Look at doing a 512 Mbps experiment. Look at getting that sort of data rate from a few telescopes at a time. Want to run a couple of experiments before then to see if we can get that sort of throughput with Mark5 configured across our local network. Internet2 looking at deploying a node in Europe as part of their performance and measurement group. If I can tell them the path to the telescope, they can position their performance node at a point that will maximize the benefit they will get.

Two routes we can take to get from Onsala to Westford. One route through GEANT (European equivalent of Internet2's Abilene network), 10 Gbps backbone routed. Alternative is to go through SURFnet and switch wavelengths all the way to Chicago. Spoke with Erik Radius, network manager, happy to do this. Need to work out how to get from Chicago to Westford.

Alan. Antenna in Poland is connected at 1 Gbps.

Tom. Might want to explore some options from Chicago to Westford.

Westerbork, Jodrell Bank in the UK and Poland should be reachable via Chicago/SURFnet.

Pat. Question regarding Internet2 demo in Indianapolis all flows were over Abilene network. Did we connect over BOSSnet link at this time, or over NOX?

David. All connections across BOSSnet link.

Pat. Have you had a chance to follow up on the connection from Haystack to Internet via any other connection except BOSSnet.

David. Just started talking with Dennis about the possibility of connecting via NOX.

Pat. Looking forward to testing on DRAGON etc., but would it also be possible to get GGAO traffic to go through Haystack and then to NOX?

Alan. Connection between Haystack and Campus would likely need to go through Lincoln Labs. Fiber route goes through Boston and out to Lincoln Labs. Turns back around and then come back to MIT. Dennis might want to comment.

Dennis. NOX has a 2.5 Gbps OC48 connection in Boston. Fiber to Haystack goes through the same room on the way to Lincoln Labs, so we would need to do some reconfiguration.

Pat. Would it be a routing config change at Lincoln Labs to route traffic to NOX to Abilene rather

than down BOSSnet?

Dennis. Yes, basically. Dark fiber connects all places together, need to pick the place to tie them together. Currently, connection from Haystack to NOX has a 10 Mbps piece, so we could swap this out or do some change at Lincoln Labs.

Alan. Fiber up to Haystack is all Lincoln Fiber. They have been very generous to allow us to use it. We intend to pursue all of these things and we appreciate the offer, Dennis, to locate some of our equipment down at MIT, at least for an interim connection.

Kevin, Germany we're setup to do scans, they have a large storage capacity to buffer scans. Able to transfer about 28 Mbps, 16 Mbps in the worst case. Transferred several scans this morning to Kame at 28 Mbps. Can push the performance up a bit by running multiple streams (currently running only 1 stream). Can get up to 32 Mbps using 2/4 parallel streams. Had a lot of firewall problems over the last couple of weeks. Have a second mark5 machine located outside of the firewall and then physically move the disc between the Mark5's. Eliminated most of the problems.

Kokee, same status as last time. Since the OC3 microwave link has been up, 85 Mbps memory to memory from Hawaii to Haystack direction, in the reverse direction ~ 10 Mbps maximum. No further contact with Roger Hall, he is currently out with surgery. He is really busy with some other projects. He has briefly looked at asymmetrically performance, has confirmed the problem, but hasn't had a chance to look at it. In the mean-time we have tried to run TCP friendly protocols - currently running about 20 Mbps using TSUNAMI. Trying to run a transfer. Only have 45 minutes to get data off disc pack (as they are shipped). Looking at getting a correlation for this data. Still manually intensive, currently integrating some code from David from the Japanese transfers to automate the process. Should be able to do an intensive in 3 hours. An intensive is about 30 minutes of data at 128 Mbps.

David. AARNET (similar to Internet2 here) recently managed to lease some fiber from Southern Cross. Will have 2 x 10 Gbps wavelengths from the East Coast of Australia through Hawaii to the west coast of the US. Exciting development as far as being able to take advantage of that and use some of that bandwidth. Also rolling out 10 Gbps infrastructure within Australia to support connections to various research institutions that want to use that. Some of the fiber that they are rolling out is going to pass within 10-20 miles of some of the telescopes that we are interested in, e.g. Australian compact array, telescope at Parkes. The telescope in Tasmania that we currently do experiments with will hopefully be connected soon. Currently 155 Mbps to the city of Hobart, hopefully, will have the last mile connected soon. Talking with one of the guys from CSIRO, very keen to get some testing up and running to one of his sites.

Kevin, transfers are currently going to Kame. Then we need to get them up from Kame to Haystack.

Alan. We had a discussion on how to get USNO involved. Would it be possible to put disc storage (a Mark5) at some place like ISI-E or some place that is connected well to ISI-E that is physically close to USNO? Then data could be transferred there and then use "sneakernet" to move the data from their to USNO.

Tom. That should be fine. Jerry and Tom went to USNO to talk to Kerry Kingham. Saw the correlator and all of their activities. Kerry is really interested in getting connected to the network infrastructure. Made a bit of progress in terms of network infrastructure. Main thing missing is the 25K or so that is needed to get the dark fiber in. Jerry has some meetings as a follow up with Kerry's boss. Could be some positive movement to get USNO connected. Interim solution to locate a Mark5

at ISI-E should be fine.

Pat. George Washington University could be a possibility for locating the Mark5.

Tom, ISI-E is about 6 miles from USNO, across the river. GWU is about 1.5 miles from USNO. That is where the fiber run would go to connect USNO in to MAX, more than likely.

Alan. Would be a nice interim solution. Would allow them to get data in near real-time and demonstrate the value for doing this. Once they do this, it will be much easier for them to sell this to people at the higher level.

Tom, probably true. Seems like this is the situation, need a bit more justification for the higher level people.

Alan. We will see Kerry at the meeting in Ottawa next week.

Miscellaneous

David, presentations for the meeting in Honolulu are available online. About 50 % of the presentations are available from my personal website. For links to the agenda and some of the presentations, refer to: http://web.haystack.mit.edu/staff/dlapsley/index.htm). Two other things that would be interesting: IPv6 and multi-cast. Tom and I had talked about getting IPv6 and multi-cast running. Would be interesting to get up and running.

Tom. This would be good to get up and running once the network is up and running. Not sure if anybody is going to use it. Would like to use it for access grid and conference tools.

David. There may be a use for multi-cast in proof-of-concept. Also interested in getting BGP and OSPF routing up and running, as well as looking at LSPs, RSVP-TE etc. up and running.

Tom. Sounds good. Once M10 is installed in Westford, M20 at LL and M40 at ISI-E. Should do that and the full protocols uite.

Pat, question regarding e-VLBI. Will "man on the moon" program have an impact on the VLBI science program?

Alan. We are seriously concerned about this. It could have a serious impact. We will keep you informed as we learn more. A bit scary when $14 billion over 5 years is being asked for and only $5 billion going to be provided. Difference of $9 billion.

Next telecon
Next telecon is scheduled for Monday, 23rd February 2004 at 2 pm EST.

cc: Steve Bernstein, LL
        Jim Calvin, LL
        Rick Larkin, LL
        Lorraine Prior, LL
        Peter Schulz, LL
        Leslie Weiner, LL
        Herbert Durbeck, GSFC
        Bill Fink, GSFC
        Lee Foster, GSFC
        Pat Gary, GSFC

        Andy Germain, GSFC
        Chuck Kodak, GSFC
        Kevin Kranacs, GSFC
        Paul Lang, GSFC
        Aruna Muppalla, GSFC
        Mary Shugrue, GSFC/ADNET
        Bill Wildes, GSFC
        Dan Magorian, UMCP
        Tom Lehman, ISI-E
        Jerry Sobieski, MAX
        Guy Almes, Internet2

Charles Yun, Internet2
Richard Crowley, Haystack
Kevin Dudevoir, Haystack
Hans Hinteregger, Haystack
David Lapsley, Haystack
Arthur Niell, Haystack
Joe Salah, Haystack