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3 August 2001

TO: Distribution  
FROM: Alan R. Whitney  
SUBJECT: Summary/Action items from 1 Aug 2001 e-VLBI/Bossnet meeting

Attendees: Steven Bernstein, Dave Martinez, Lee Upton, Jim Calvin, Jerry Jaeger, Lorraine Prior, Leslie Weiner Alger, LL; William Wildes, Lee Foster, NASA/GSFC, Alan Whitney, Kevin Dudevoir, Haystack

Brief summary:

Alan Whitney gave a short review of proposed e-VLBI demonstration between Haystack, Westford and GGAO antenna at NASA/GSFC:

1. Goal to demonstrate 2-station e-VLBI at 1 Gbps/station; Westford and GGAO antennas each feed 1 Gbps data to Haystack correlator. GGAO to Haystack connection will utilize Glownet/Bossnet to D.C., MAX/GSFC connections to GGAO.
2. Will connect to VLBI equipment with standard GigE. Recognize that full 1024 Mbps is probably not possible on single GigE connection, but can achieve perhaps 90% of that; VLBI equipment can support 2 parallel GigE connections if these can be accommodated on network.
3. Schedule: Starting 1 Oct 2001; 6-month prep; 3-month testing and shakedown; 3-4 month demonstration period.

Steve Bernstein reviewed Bossnet and Glownet capabilities and status:

1. Link from Haystack/HAX to LL has recently been exercised. One GigE is currently available from Millstone RPE building to LL; 2 GigE links supporting jumbo frames will soon be available.
2. In addition, there is an OC-48 (2.5 Gbps) link from Millstone RPE building to LL supporting twelve 10/100 Ethernet links.
3. e-VLBI will need to use 'jumbo' GigE frames in order to maximize data transfer rate. Only one router at LL in path to Bossnet not jumbo-capable; plan to upgrade within next few months at latest.

4. Single 8192 byte jumbo frame is about 100 usec in length. Light-travel time Haystack-to-GSFC is few msec; each switch in path will add ~100 usec; each router in path may add ~1 msec to latency. Worst case latency should be no more than ~10 msec, which is acceptable with the buffers of the Mark 4 correlator.
5. Two GigE connections may be multiplexed onto single  $\lambda$  with appropriate multiplexer.
6. LL has done investigations to maximize GigE performance, based on platform, OS and GigE interface card.
7. Bossnet is all optical from Boston to Washington (i.e. no electronic breakout and regen at any point), although there are 2 or 3 points along the way where an optical loopback can be configured, which may be valuable for testing.

Lee Foster reviewed status of connection from D.C. end of Bossnet to GGAO:

1. ISI-E is connected to Bossnet at (apparently) 2.5 Gbps and thence to Univ. of MD, though the path is throttled down to 1 GigE available from there to GSFC Bldg 28. However, this is an operational 1 GigE link and can probably be used only on an intermittent basis for short (maybe as short as a few seconds) tests for e-VLBI. Would cost estimated ~\$170K to upgrade to dedicated usage.
2. No jumbo frame support at U of MD.
3. Fiber in place between GSFC Bldg 28 and the GGAO antenna, but the electronic infrastructure has to be built at unknown cost.
4. There exists a DARPA-funded link (MONET) between ISI-E and GSFC Bldg 28 that is OC-48 on at least part of the path, but is throttled to OC-12 (655 Mbps) by switches at each end. However, this link is scheduled to disappear 30 Sep 01; estimated cost to resuscitate is ~\$230K/yr, which is probably not worthwhile if link through UMCP can be upgraded for one-time ~\$170K.
5. Bossnet is running 9 colors on Bossnet, 7 for experimentation, 1 operational plus and 'extra' OC-3.

Discussion

Jim Calvin suggested Haystack/GSFC should conduct local tests to determine actual maximum GigE transfer rates that can be achieved with chosen equipment. He indicated they had seen good results with Alpha chips running Debian Linux.

Leslie Weiner indicated LL will provide necessary GigE interfacing equipment for e-VLBI at Westford and Haystack. Alan Whitney to provide detailed requirements.

Situation between ISI-E and GGAO needs much clarification.

Questions/action items:

1. (Foster) What is cost for equipment to implement GigE with jumbo frame support from Bldg 28 to GGAO? Will GSFC network group fund? Time scale?
2. (Foster) Jumbo frame support from Bossnet termination to GSFC Bldg 28?
3. (Foster) Can existing GigE link support e-VLBI usage for slots of an hour at a time for demonstration? e-VLBI can use off-peak hours.

4. (Foster) Are there any other known weak links from ISI-E to GGAO? Jumbo frame support at UMD?
5. (Calvin) Provide to Haystack and GSFC available information on best GigE platforms and interfaces?
6. (Dudevoir) Calculate theoretical max bit rate (with all protocol overhead, etc) for e-VLBI goal.
7. (Calvin) Investigate details of Bossnet/ISI-E connection.
8. (Whitney) Provide detailed GigE requirements to Leslie Weiner.

Distribution:

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