Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Prepared by
J. Patrick Gary
Network Projects Leader
Earth and Space Data Computing Division/Code 930
NASA Goddard Space Flight Center
pat.gary@gsfc.nasa.gov
301-286-9539
September 25, 2001
Key Aspects of eVLBI Network Design
with Emphasis Between
BoSSNET’s POP at ISI-E and the GGAO at GSFC

Preface

- All info is essentially DRAFT; much more detailed planning is required
- This info makes many assumptions few of which are yet adequately described but all need to be
- Further planning needs to be based better on a clearer understanding of this project’s requirements, timetable, and actual funding support
- All references to UMCP-led Mid-Atlantic Crossroads (MAX) cooperation is assumed, but no MAX commitments have yet been negotiated; we just haven’t yet had time to discuss this more thoroughly with them
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Proposed eVLBI Phase 1 “Shared GE” Test Configuration

- Achieves approximately 1 Gigabit per second (Gb/s) end-to-end but can only be used for time-limited demos as it uses shared MAX and GSFC/High End Computer Network (HECN) project network infrastructure between ISI-E and GGAO.

Potential eVLBI Phase 1 “Dedicated GE” Test Configuration

- Builds on technical approach validated in Phase 1 replacing shared MAX and GSFC/HECN network infrastructure with eVLBI-dedicated network infrastructure.
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Actual as of 9/24/01 (independent of eVLBI)

Legend:
- 8x10Gbps/OC-192c
- 4x2.5Gbps/OC-48c
- 2.5Gbps/OC-48c
- 1 Gbps GE
- 622 Mbps/OC-12c
- 100 Mbps FE
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Expected as of 11/01/01 (independent of eVLBI)
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Proposed eVLBI Phase 1 “Shared GE” Test Config.
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Potential eVLBI Phase 1 “Dedicated GE” Test Config.

Legend
- 8x10Gbps/OC-192c
- 4x2.5Gbps/OC-48c
- 2.5Gbps/OC-48c
- 1 Gbps GE
- 622 Mbps/OC-12c
- 100 Mbps FE
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Phase 1 Notes

- At Haystack and MIT/LL
  - Info source is Haystack’s Alan Whitney and MIT/LL Steven Bernstein’s 5/1/01 “Lincoln Optical Fiber Network Infrastructure” ppt
  - Assumes a VLBI Mark 5 unit or a VLBI Correlator and at least one suitable workstation are Gigabit Ethernet (GE) connected to a Haystack local GE switch which is connected through MIT/LL (details not important here but are available from MIT/LL or Haystack) to BoSSNET
  - Workstation will be used for end-to-end checkout testing with a comparable workstation unit at GGAO
  - Questions/issues:
    - TBD
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Phase 1 Notes

- At ISI-E
  - Info source is ISI-E’s Tom Lehman
  - Leverages BoSSNET’s existing termination/CPE user interface which presently is essentially a GE to a local GE switch (and is planned to be replaced with a 2.4 Gbps POS user interface to the ISI-E’s M40 router)
  - Assumes Supernet/BoSSNet IP peering with MAX is pre-arranged (to be resolved between DARPA and MAX)
  - Assumes “simple” physical GE switch interconnection among BoSSNET, ISI-E GE switch, and MAX’s M160 router (until replaced by 2.4 Gbps POS interconnection among BoSSNET, ISI-E M40 router, and MAX’s M160 router)
  - Questions/issues:
    - Maximum MTU size of M160 supported frames - 4470 bytes?
Phase 1 Notes

At MAX’s UMCP site

- Info sources are GSFC’s Bill Fink and MAX’s Jerry Sobieski and Dan Magorian
- Leverages GSFC/HECN’s existing and planned GE interfaces to MAX’s M160 and GE switch over today’s existing (only) one fiber pair*. One GE link exists today to/from a Cisco 3508. GSFC/HECN-acquired Course WDM with two GE lambdas for this fiber pair is expected to be installed before 11/01/01.
  - *One other fiber pair exists but is dedicated to a semi-operational function
- Questions/Issues:
  - What is the UMCP host (M160 or GE switch) for each of the GE lambda?
  - Jumbo frames are not presently supported on existing GE switch, but MAX may be planning an upgrade soon. This need more investigation and discussion.
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Phase 1 Notes

- At GSFC/HECN’s Building 28 site
  - Info sources are GSFC’s Bill Fink and Paul Lang
  - Leverages GSFC/HECN’s existing and planned GE interfaces to MAX’s M160 and GE switch over today’s existing (only) one fiber pair*. One GE link exists today to/from a Cisco 3508. GSFC/HECN-acquired Course WDM with two GE lambdas for this fiber pair is expected to be installed before 11/01/01.
    - *One other fiber pair exists but is dedicated to a semi-operational function
  - Questions/issues:
    - What is the HECN host (GSR 12016 or GE switch) for each of the GE lambdas?
    - Jumbo frames are not presently supported on existing GE switch, but an Extreme Network Summit 5i with jumbo frame support should be installed before 11/01/01.
    - Need one LX/1000BaseT converter for the Summit 5i ~$ 2K
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Phase 1 Notes

- At GSFC/GGAO’s Trailer near Building 202 site
  - Info sources are GSFC’s Lee Foster, Herb Durbeck and Scott Douglas
  - Need fiber pair between B28/W220 (via B10) and GGAO trailer near B202
    - Douglas’ 7/2/01 email identified cost of a fiber pair between B28 and Area 200 ~$10K
  - Need GE switch with jumbo frame support at GGAO
    - Recommend Extreme Network Summit 1i with one LX and two 1000BaseT ports ~$ 6K
  - Proposes Mac G4 with 1000BaseT GE NIC as test workstation
    - Similar to Fink’s recent acquisitions ~$ 3K
  - Assumes a VLBI Mark 5 unit with 1000BaseT GE NIC
  - Questions/issues:
    - Need to confirm Mark 5”s GE NIC is 1000BaseT
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Potential eVLBI Phase 1 “Dedicated GE” Test Configuration
(Same as Phase 1 “Shared GE” Test Config except where noted were)

- At Haystack and MIT/LL: no change
- At ISI-E:
  - Need one additional GE port on M160 ~$13K
- Between MAX/ISI-E and MAX/UMCP:
  - Need additional fiber pair or lease a lambda from MAX TBD
- At MAX/UMCP:
  - Need two additional GE ports on M160 ~$25K
- Between UMCP and GSFC/HECN:
  - Need additional fiber pair or add a lambda ~$20K
  - Need additional LX GE port on HECN GE switch ~$5K
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET’s POP at ISI-E and the GGAO at GSFC

Backup Charts
MAX Fiber Infrastructure
Plant

NIH  HHMI  NLM  NOAA

UMBC  WDST  ETC

UMCP

QW  2  FG  2  QW  6  FG  6

QW

ADEL  ISIE  NCSA

QWST  CENS  NWS
Target Core Optical Network

ATM
NGIX
OC48c POS
Router
WDST
Router
VBNS
NISN
Qwest ISP
Abilene
QWST
OC48c POS
ISIE
OC48c POS
OC192c POS (future)
ADEL
OC48c POS
Router
UMCP
OC48c POS
Router
College Park
Washington
Northern Virginia
Baltimore