

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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24 September 2001

TO: Distribution
FROM: Alan R. Whitney
SUBJECT: Notes on 24 Sep 2001 e-VLBI telecon

Attendees:

Steve Bernstein, Jim Calvin, Lorraine Prior - Lincoln Laboratory
Pat Gary, Lee Foster, Kevin Kranacs, Paul Lang, Bill Fink, Bill Wildes – GSFC
Tom Lehman – ISI
Kevin Dudevoir, Hans Hinteregger, Arthur Niell, Alan Whitney – Haystack.

Summary of network end-to-end requirements (A. Whitney)

Work is being sponsored by DARPA as a demonstration. Original goal is 1024 Mbps sustained payload data rate, but understand that may be too aggressive for available resources. e-VLBI can back down in increments of 64 Mbps. 896 Mbps chosen as current goal, which is about max that can be pushed through single GigE connection, but even that may be subject to further refinement as resources and costs become clearer.

Requirement for ~6-8 one-hour periods of continuous data for minimum demo. Beyond demo, Haystack may seek sponsors for making a more permanent connection.

First e-VLBI tests will be done using disc buffers in quasi-real-time demo, then work up to true real-time at sustained high data rates.

Network design from Bossnet POP at ISI-E to GGAO at GSFC (Pat Gary)

Pat presented a series of network diagrams showing present, near future (~1 Nov 2001), 'shared GigE', and possible future 'dedicated' GigE (updated versions attached). Here we will note the salient points and problems of each:

Actual as of 9/24/01

1. Haystack/Lincoln: **No GigE connection currently in place**, but planned soon (contrary to diagram).
2. At ISI-E: **Air gap between Juniper M160 and M40 routers**. Agreement is expected soon to connect these at OC-48 (Pat/Tom).
3. **ATDNet/MONET connection will disappear 30 Sep 2001** unless ~\$300K/yr can be found to keep it intact, which seems unlikely at the moment (Pat).

4. Due to lack of ATDNet, **connection must go through MAX/UMCP**.
5. **UMCP-to-GSFC link is single shared-use GigE**, which is likely to be bottleneck.
6. No high-speed connection yet available from GSFC Bldg 28 to GGAO (need \$10K to 'buy' existing fiber pair and workstation- Bill to supply money).

Expected as of 11/01/01 (independent of e-VLBI)

1. Haystack/Lincoln: Juniper M20 router in place (packet over SONET on Bossnet). **GigE connection to Haystack done or well along** (requires purchase of GigE switches).
2. At ISI-E: **Connect Juniper M160 and M40 together**.
3. UMCP-to-GSFC: **WDM equipment on order** to support e-VLBI on separate λ .
4. Question: **Can Juniper M160 support jumbo frames?** (may be limited to MTU of 4470B) (TL). M20 and M40 apparently can.
5. **GSFC Bldg 28 GigE switch to be updated** to Extreme Networks 5i which supports jumbo frames, but switch will still be shared usage.
6. GSFC28-to-GGAO: May still be no high-speed connection.

Proposed e-VLBI Phase 1 'Shared GigE'

GSFC28-to-GGAO: Fiber pair in place, **including GigE switch, test workstation and local connection to Mark 5** at GGAO (Pat Gary/Lee Foster/Bill Wildes will coordinate).

Potential e-VLBI Dedicated

At UMCP: **Dedicated λ to bypass shared circuits** (question of coarse WDM [~\$20K/link] or DWDM [rough ~\$40K]).

GigE Performance

LL tests over Bossnet at LL with single-stream GigE TCP have reached 750 Mbps (980 Mbps is theoretical max). This sort of speed requires a very clean low-noise line.

Motherboards need to support 64-bit/66-MHz for good GigE performance. Haystack has ordered Supermicro 370DE6 boards for testing. LL has done testing with dual-Alpha boards.

Latency

Number of switches, routers needs to be minimized to minimize latency. Haystack can tolerate latency of ~50 msec (Note from Alan: we are **investigating strategies to significantly increase this tolerance, perhaps to as much as 2-3 seconds.**)

Action Items

1. Complete agreement and connect Juniper routers at ISI-E (Tom/Pat).
2. Procure GigE-capable workstation and start near-end-to-end testing ASAP to examine performance issues (Many involved).
3. Bill Wildes to release funds for necessary GSFC upgrades and purchases.
4. Check on Juniper Networks M160 jumbo frame support (Pat/Tom).
5. Implement Haystack-to-LL GigE link (Alan/Hans/Steve). Mark 5 NIC will be 1000BaseSX.

In addition, the following questions from Pat Gary's 24 Sept 01 e-mail are repeated here for completeness (some are same or similar to Action Items above):

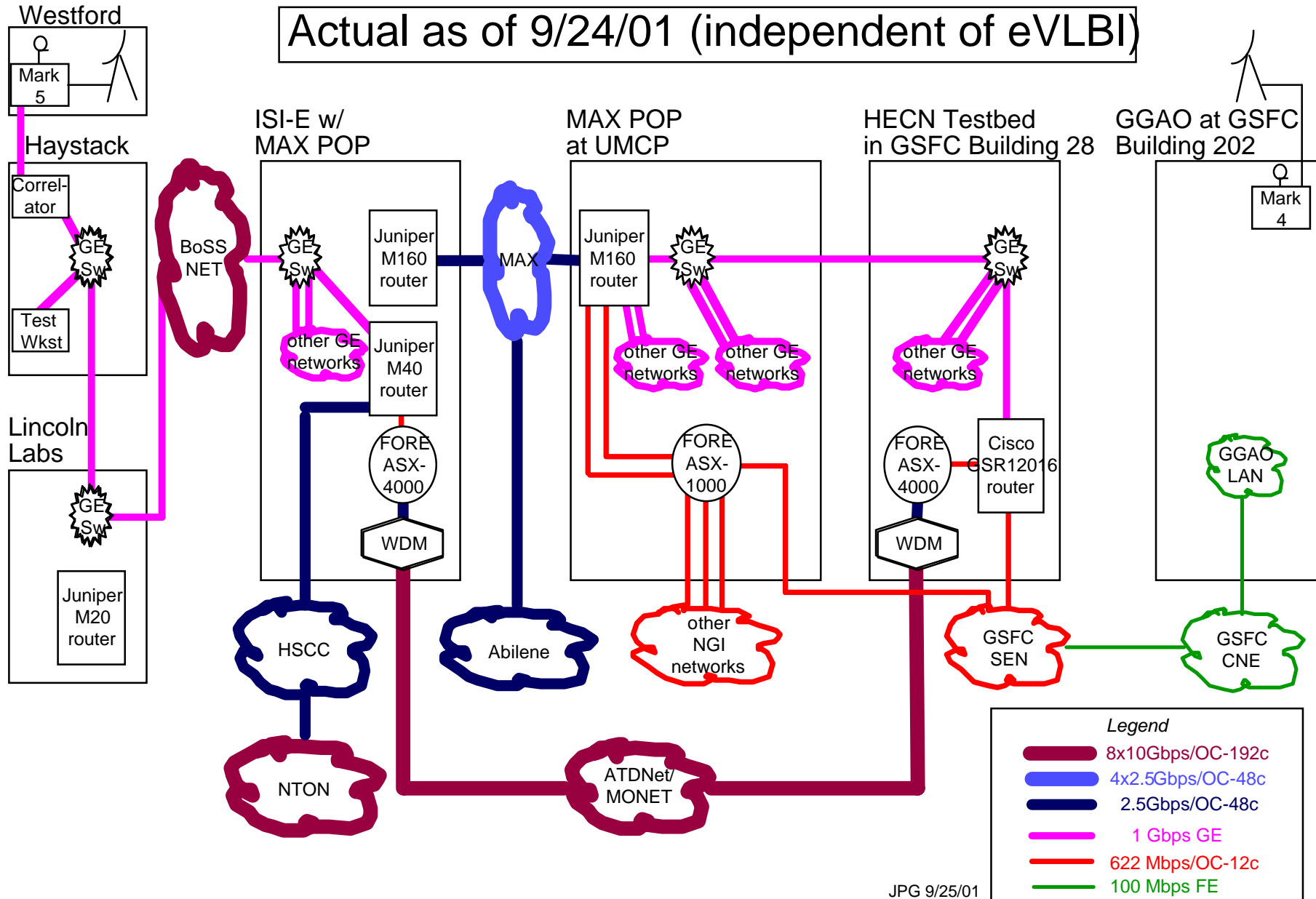
1. Is 4470 bytes the maximum MTU frame size supported by the M160's? And if so, what effect will that have on end-to-end throughput performance for the eVLBI Phase 1 demos?
2. Exactly which switches and routers at both UMCP/MAX and GSFC/HECN will be used to support the two GE lambdas to be enabled by the GSFC/HECN-acquired LuxN Coarse WDM equipment?
3. If UMCP/MAX has any GE switches in the eVLBI Phase 1 data path, will they support jumbo frames and by when?
4. What are exact specs and better cost estimates for:
 - a. One LX/1000BaseT converter to enable a useable port for e-VLBI use on the GSFC/HECN Extreme Network Summit 5i GE switch? (Alan here: not sure what this is?)
 - b. The GE switch and test workstation to be deployed at GSFC/GGAO's trailer?
 - c. For the above referenced GE switch, we need to know from Haystack whether the Mark 5's GE NIC is 1000BaseT (i.e. copper), SX (i.e., short reach optics), or what.
(Answer from Alan: SX)

Additional telecons

Agreed to hold telecon every two weeks on Monday at 2 pm. However, conflict with 8 Oct causes next telecon to be 15 Oct at 2 pm. Someone from UMCP should attend if possible (Pat will inquire). Alan will arrange telecon details.

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

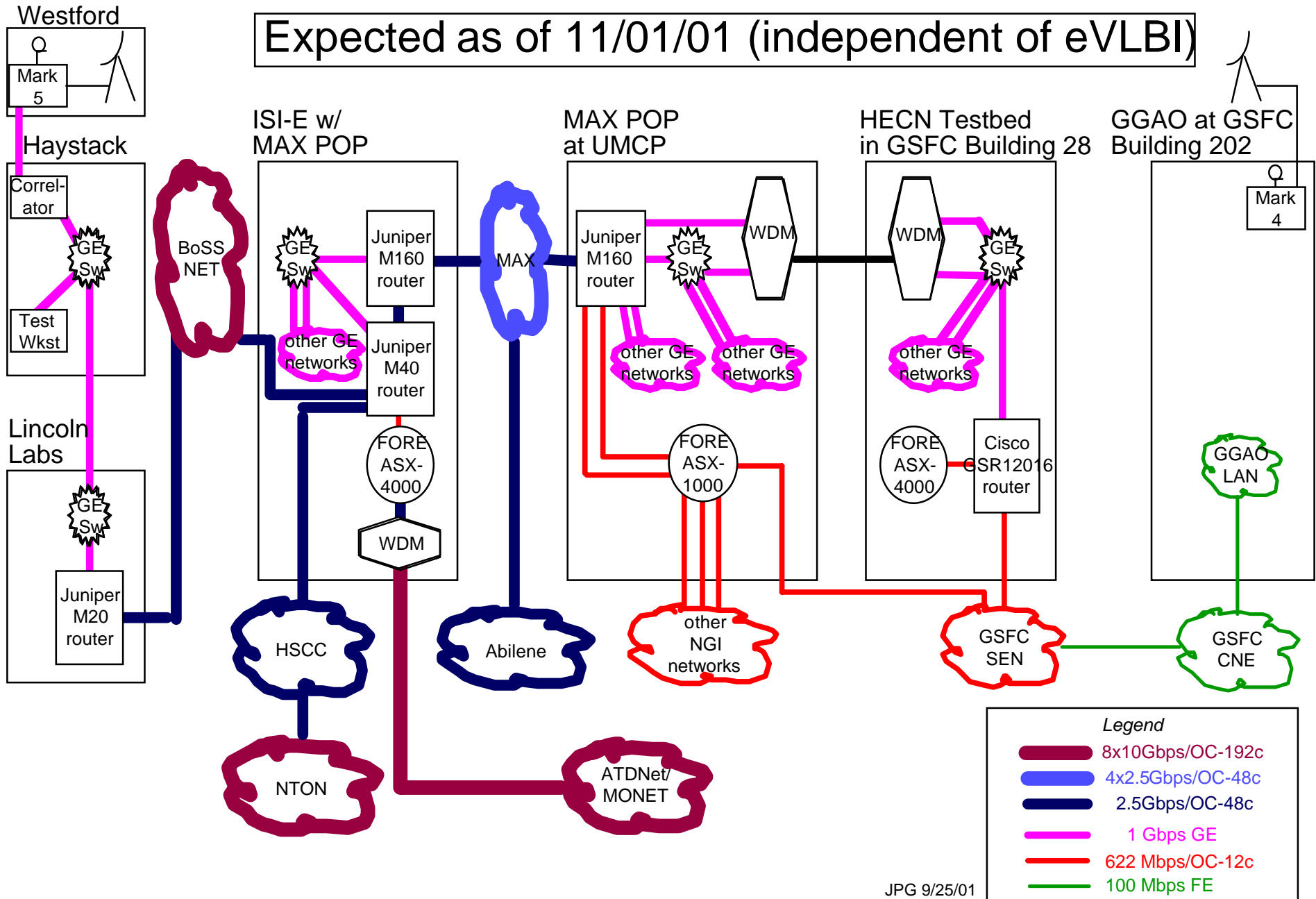
Actual as of 9/24/01 (independent of eVLBI)



JPG 9/25/01

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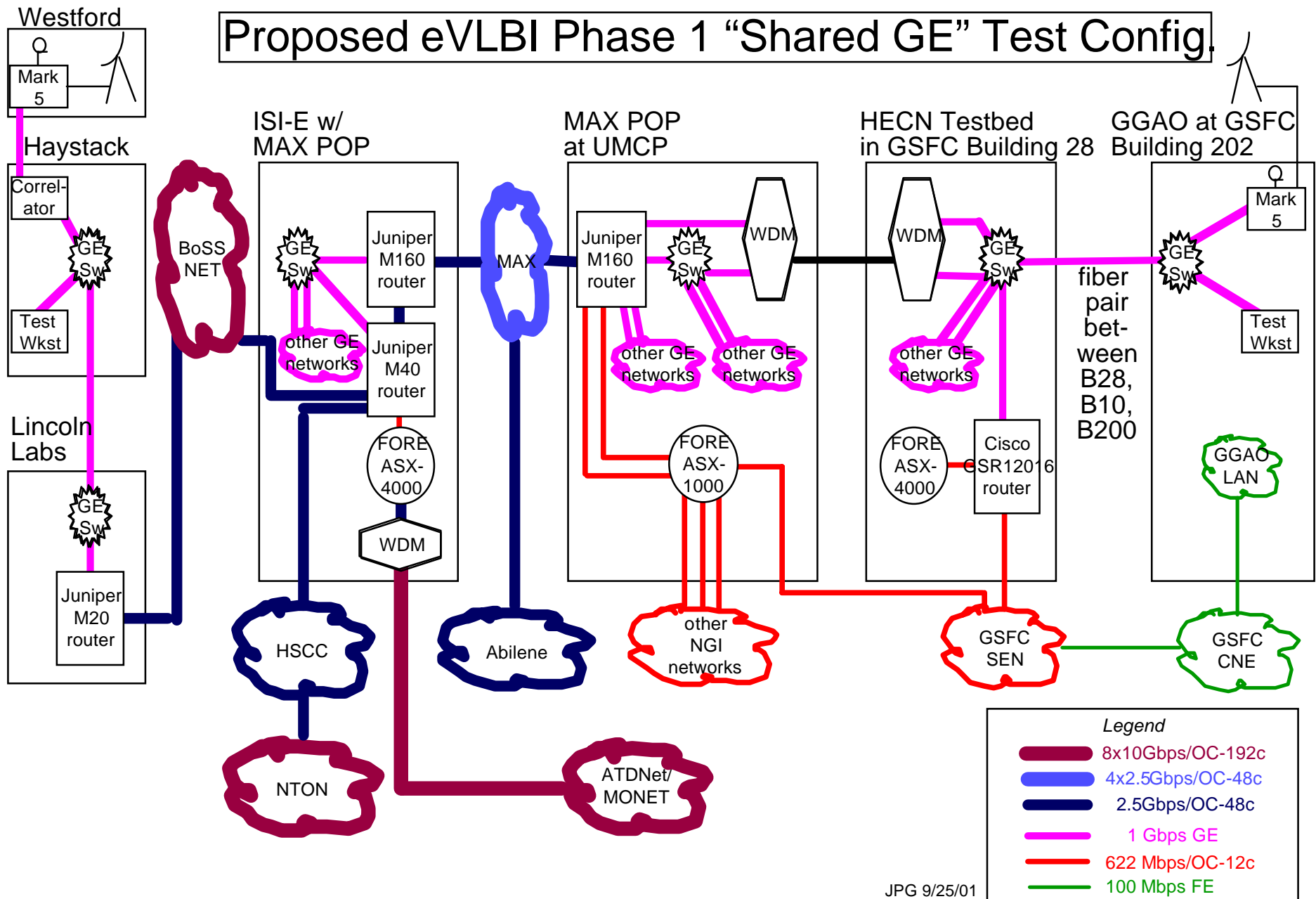
Expected as of 11/01/01 (independent of eVLBI)



JPG 9/25/01

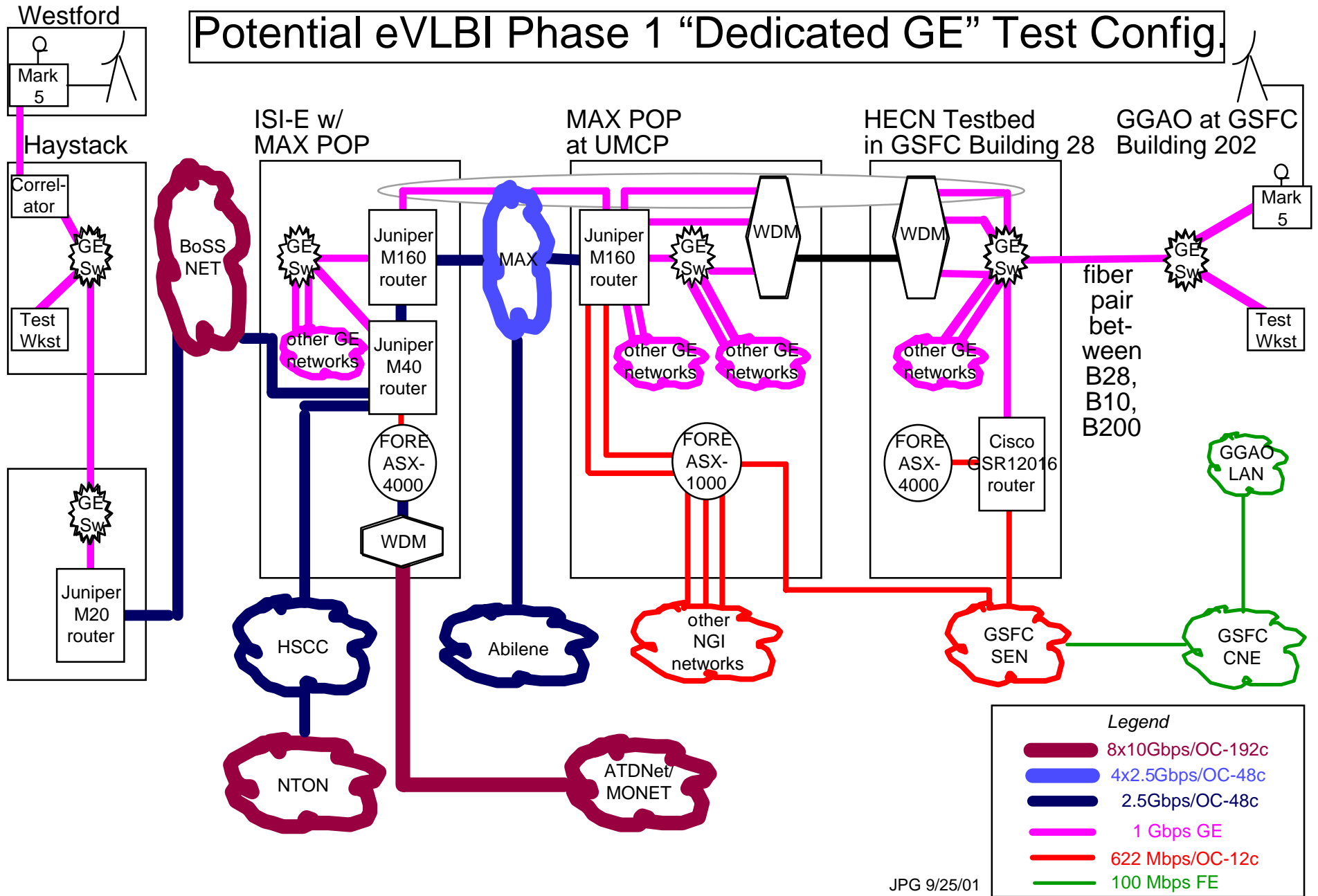
Key Aspects of eVLBI Network Design with Emphasis Between BoSSNET's POP at ISI-E and the GGAO at GSFC

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.



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