



Joint Engineering Team (JET) Meeting Minutes

National Coordination Office for Networking and Information Technology R&D (NCO/NITRD)
490 L'Enfant Plaza SW, Suite 8001, Washington, DC 20024

August 15, 2023, 11:45a.m. – 1:00p.m. ET

This meeting was virtually

Participants

Jeff Bartig, Internet2

Michael Blodgett, ESnet

Todd Butler, NASA/GSFC

Dale Carder, ESnet

Basil Decina, NRL

Bill Fink, NASA/GSFC

Sanford George, NRAO

Mark Johnson, Calif MMBI

Jonah Keough, Pacific Wave/PNWGP

Michael Lambert, PSC/3ROX/ACCESS

Paul Love, NCO/NITRD

Joe Mambretti, StarLight/MREN

Aruna Muppalla, NASA/GSFC

Ralph McEldowney, DREN

Linden Mercer, NRL

Ben Polsky, Calif MMBI

Glenn Ricart, US Ignite

Michael Sinatra, ESnet

Steve Smith, PNWGP

Kevin Thompson, NSF

Stephen Wolff, retired

Proceeding: This meeting was chaired by Kevin Thompson (NSF) and Ralph McEldowney (DREN).

I. Action Items: (none pending)

II. Review of the Minutes of the July 2023 meeting: Corrections were received and are reflected in the posted final minutes.

II. Update on SCinet's networking plans for SC23 – Mike Blodgett

- A. This year SC will be in Denver, CO. About 12,000 are expected to attend for its mixture of keynotes, technical program, student focused events and an exhibit floor.
- B. SCinet (SC's network) is run by approximately 200 volunteers divided into several teams focused on area such as routing, student volunteers, Network Research Exhibits, network security and WAN. The network for SC is commonly said to take a year to plan, a month to build, a week to operate and then a day to be torn down. It supports both a general connections network and an experimental network throughout SC. The WAN team has about 10% of the volunteers.
- C. The large amount of needed hardware to test and operate the network is all loaned by various vendors for about two months.
- D. SCinet volunteers will be at the conference site (Denver's Colorado Convention Center) in late Oct for a week preliminary prep work. They'll return on 6 November to finish

setup (6-11) and then operate the network during the conference plus the day for teardown (12-17).

- E. Last year's SC had a record WAN capacity of 5.01Tb. For this year it may reach 6Tb.
- F. Before COVID most circuits terminated at the conference location – pretty much a star topology. With the first COVID hybrid conference, SC21, there started to be some circuits between remote locations. Since these circuits can be brought up much earlier than the ones into the convention center. For example, the circuits between McLean, VA, and StarLight in Chicago, IL, are already up. This is big help for the WAN team as it spreads the work load out and a help for the experiments who can start testing much earlier. (A preliminary map of the WAN circuits is in the appendix at the end of these minutes.)
- G. Besides the circuits for demos inside the US some SCinet circuits connect with international circuits to enable demos from sites in Asia, Europe, etc. These cross connects typically happen in Los Angeles, Seattle and McLean. In some years there also in New York and Miami.
- H. This year most of the WAN circuits are 400G – the exceptions being 2x100 Seattle<>Denver plus a local 100G commodity provided by FRGP in Denver. The 400G circuits are:
 - a. Starlight and:
 - i. Ashburn (3)
 - ii. Seattle (1)
 - b. Denver and:
 - i. StarLight (4)
 - ii. Ashburn (1)
 - iii. Los Angeles (3)
 - iv. Berkeley (1)
 - v. Miami (1)
 - c. 400G local peering each with ESnet and Internet2. These will probably use ZR optics and be put over the SCinet DWDM system between the convention center and the Lumen POP.
- I. Besides the SCinet volunteers, the vendors who loan the equipment & circuits send engineers to the SC to help get all working. Some are onsite for the full time, some are there to get their setup and going and then are on call or available remotely.
- J. Before the show starts all hardware and circuits are tested. Where circuits end remotely SCinet works with folks at the other end, such as PNWGP in Seattle or StarLight in Chicago. Helping this testing is the loan of various pieces of test equipment to SCinet.
- K. As bandwidth has increased the need for fiber cleanliness has increased. The use of an optical switch the last few years has been a big help with as this permits the circuit to be broken out for testing with just a reconfiguration of the optical switch. The fibers don't need to be physically moved thereby reducing risk of introducing dust.
- L. With the loaned equipment from so many vendors SCinet tries to teach its volunteers how to use each as this is gear they may not been exposed to at their home institutions. This training benefits SCinet, the volunteer and the volunteer's institution.

III. California Middle-Mile Broadband Initiative – Mark Johnson and Ben Polsky

- A. As background, the California Middle-Mile Broadband Initiative (MMBI) has \$3.87B in funding: 83% from Congress (American Rescue and Recovery Act or ARPA), 15% from

the CA Legislature and 2% recently awarded by NTIA. It's the largest middle-mile project in the US. As a reference point, MMBI is approximately 30 times larger than any of the BTOP network awards of a decade ago.

- B. California passed the legislation two years ago with the bill signed in July 2021 to build an Open Access middle-mile network. One of the early decisions was that MMBI would be built along the CA highway system where the state already had the right of way.
- C. ARPA has some deadlines for the use of its funds. Contracts for construction and IRUs/leases must be signed by the end of 2024 with construction completed by the end of 2026. All of ARPA funds must be used for creation of the network - CAPEX, not operation.
- D. The administrative structure of MMBI has the CA Department of Technology (CDT) as the project owner and administrator. Under CDT are the CA Public Utilities Commission (CPUC), a Third Party Administrator (TPA) and Caltrans.
 - a. The CPUC is not only the telecom regulator in CA but the major planning partner for middle-mile – last mile coordination as it was awarded \$1.9B in BEAD funding.
 - b. The TPA is the private operator of MMBI. It's currently CENIC through its subsidiary, GoldenStateNet.
 - c. Caltrans is the lead construction agent to build MMBI using the Rights-of-Way along the state highways which it controls.
- E. Some project facts:
 - a. Public input and analysis resulted in 10k route miles – approximately 26% longer than the original estimate.
 - b. Construction costs for Caltrans is up by about 40% due to inflation.
 - c. MMBI is investigating some alternative development methods to try and reduce costs (leasing or purchasing existing networks or joint builds with industry).
- F. The project has been divided into two phases:
 - a. Phase one totals 8.3k miles with 4.5k being IRUs/leases, 3.3k of construction (1.8k Caltrans standalone, 1.5k joint-build with industry) and 500 miles purchased. Phase one also includes \$73M in NTIA grants to buildout spurs to rural communities.
 - b. Phase two is composed of approximately 1.7k miles.
 - i. The savings from Caltrans learned efficiencies and design changes are being directed to this phase.
 - ii. Under certain conditions some last-mile CPUC funding may be able to be used.
 - iii. Other funding sources are being explored.
- G. As of July 2023 full project is planning (all approximate) 45% IRUs/leases. 35% Caltrans builds, 15% joint builds and 5% purchased.
 - a. Some of the alternative agreements have been signed, others are in final negotiation.
 - b. Preconstruction planning and permitting are ongoing for the 10K miles

- c. Nearly all of MMBI will be 144 pair fiber with access points approximately every half mile.
 - d. California will own and manage the network.
- H. Operational guidelines:
- a. Any last mile entity or anchor institution can interconnect with MMBI.
 - b. MMBI will be priced at or below market rates for both lit and dark fiber.
 - c. MMBI's routes are optimized to reach the maximum the amount of un- and under-severed (i.e., currently more than five miles from an existing middle-mile).
- I. Design considerations
- a. MMBI will use a single conduit for its construction as a cost saving measure.
 - b. Electronics are being purchase and deployed immediately. Driving by the ARPA funding deadlines even when some may not be turned up for a year or more.
 - c. Even on leased and IRU portions of the network MMBI will have its own huts. MMBI is anticipating approximately 150 huts in a number of different configurations.
 - d. MMBI is a green field in two senses – much new construction but also a brand new business operation.
- J. Open questions for the JET
- a. How to generate a federal customer base for MMBN?
 - b. How to measure the impact of MMBI over the short, medium, and long term?
 - c. What other research activities and initiatives can be aided by MMBN?
- K. Q&A:
- a. There seems to be several spurs, paths that are not part of a ring, that lack redundancy?
 Answer: These are in areas that lack of much infrastructure today. In reaching the un- and under-severed we made a big step forward. MMBI's attachment rules have an attachment points every half mile. If somebody attaches at the very end of one of the spurs they may not have any MMBI options for redundancy and, if that's needed, would need to look for other means. The \$73M from NTIA is specifically for spurs. NTIA noted that spurs were one of the ways MMBI could reach un-severed community, a local last-mile ISP.
 - b. What is the long term goal of CENIC in this project?
 Answer: CENIC created a subsidiary, GoldenStateNet, to be the Third Party Administrator. CENIC buys services from other service providers. CENIC may buy capacity from MMBI to reach locations it has wanted to server, or has a new request to serve, that its current footprint doesn't reach.
 - c. Is MMBI having supply chain issues given the large amount of needed hardware?
 Answer: The state pre-purchased a large amount of conduit, fiber, huts, etc. – what is put in or on the ground. MMBI is drawing upon this inventory. In the areas being built in partnership with the private sector MMBI is going with whoever can get the infrastructure first - realistic in dealing with the supply chain issues.

- d. Are more detailed maps available?

Answer: The finer details are still being worked out. They should be resolved in the next couple of months. More specific maps will be available at that point.

IV. JET's tasking on tools to help with inter-domain problem resolution

- Remains on hiatus while Joe Breen is engaged with other matters.

V. Operational Security Round Table: No updates received.

VI. Network roundtable

A. DREN (Ralph McEldowmey):

- a. DREN is having its annual Technical Interchange Meeting (TIM) next week. At TIM the DREN site POCs, DREN staff and DREN vendors meet to discuss the current state of DREN and plans for the coming year. This year TIM will be in the Dallas, TX, area.
- b. Apologies to Jonah Keough and PNWGP for all the difficulties in getting DREN installed & connected at Pacific Wave.

B. ESnet (Dale Carder and Michael Sinatra):

- a. ESnet has organized a couple of tutorials at Internet2's TechEX: How to Use Fabric and Automation.
- b. ESnet has resolved its discussions with ARIN and is able sign RSAs & LRSAs. To date it has ROAs on its IPv6 routes with the LRSAs are extremely close to being completed. ESnet has in place all the needed internal tools to do route validation.
- c. Several of the Department of Energy's National Laboratories are very close to having their LRSAs/RSAs signed as well.
- d. ESnet's L3VPN migration is ongoing.

C. Internet2 (Jeff Bartig):

- a. With TechEX under five weeks away a lot of Internet2's (I2) effort is in getting ready. I2 staff are doing tutorials on Monday.
- b. I2 is wrapping up some planned equipment replacements now that NGI is two years old. One area is the replacement of the AOC cables used between its routers and optical hardware. There have been compatibility issues between the cables and both the Cisco and Ciena gear. Full replacement is very close.
- c. I2 plans to move to a new version of IOS XR by the end of the month across its entire network. This version has a couple of bug fixes along with some features I2 has been waiting for.
- d. Routing security continues to be a focus. I2 is working with its community members to promote RPKI adoption and getting LRSAs signed before ARIN's yearly fees jump the first of the year.

Question: Besides the cost savings are there other motivating factors for organizations to sign LRSA agreements?

Answer: CSPs are starting to require ROAs for bring your own address services.

- D. GSFC (Bill Fink):
 - a. GSFC is preparing for SC.
 - b. As was mentioned, there's now 1.2T between StarLight and the JBBDT facility in McLean, VA. GSFC has equipment to support its demos at SC and these circuits allow that testing to get started earlier than in past years.
 Question: Will the capacity between JBBDT and StarLight be up for SCs or year round?
 Answer: It's intended to be permanent
- E. Pacific Wave (Jonah Keough): Pacific Wave (PW) is upgrading the switches at all of its West Coast exchanges to Juniper PTXs to support 400G customer connections. All the PTXs are in hand and PW expects to have the upgrade completed in the next month or so on its existing West Coast back bone thereby offering an expanded resource for SC demos. While there was already some 400G connections in Los Angeles, CA, PW is contacting sites that had expressed interest in SC demos but needed larger bandwidth than PW could offer before this upgrade.
- F. 3ROX/PSC/ACCESS (Michael Lambert): Though the XSEDE project concluded a year ago the related VPN was recently decommissioned.
- G. US Ignite (Glenn Riker):
 - a. US Ignite (USI) has been working with a number of communities to help them use their funding for internet connectivity as wisely as possible. One way is, where possible, to work with existing state or federal networks.
 - b. The CIO in Columbus, OH, Sam Orth - who was at OARnet, is working to build out fiber that will complement & connect with OARnet's fiber thereby extending OARnet's reach as well as supporting the municipal community.
 - c. USI is also working in Utah; West Lafayette, IN; and other locales to try to get good municipal networks that are community based and severed and have capacity for future growth.
- H. NRL (Linden Mercer): With NASA/GSFC and StarLight NRL is getting ready for SC with the gear and new circuit at the JBBDT in McLean. Happy to be getting started and will build on it.

VII. Exchange Points Round Table

- A. MAN LAN, WIX and Boston (Jeff Bartig):
 - a. The upgrades at MAN LAN (ML) and WIX continue. Internet2 is reviewing existing connectivity and getting ready to be able automate the sites configuration (as it does with its network).
 - b. As Boston comes up it will be fully interconnected with ML & WIX.
- B. PNWGP (Jonah Keough): No update today.
- C. StarLight (Joe Mambretti):
 - a. StarLight (SL) is working with the SCinet WAN team on the circuit provisioning needed for the Network Research Exhibits (NRE). SL is supporting or involved in about 23 NREs this year. As was mentioned, the first piece of this is the 1.2T between the JBBDT in McLean, VA, and SL that's up and in use.
 - b. SL is working with SCinet to extend the connectivity to Denver, CO, at least 1.2T.

- c. Orders have been placed for some cross connects that will enable 400G circuits directly between McLean and Denver.
- d. One of the NREs is CERN's NOTED project. This is an AI based dynamic provisioning system. For this demo a 400G circuit is being put in place from TRIUMF in British Columbia to Seattle. This will be a good fit with the 400G upgrades Pacific Wave is doing. The 400G could either route to Denver via SL or via Los Angeles.
- e. SL is also working on the development of the Global Research Platform workshop that will be held in conjunction with IEEE's 19th International Conference on e-science. The final agenda will be completed in the next few days. There will be good slate of sessions having to do with large-scale global science and the infrastructure and ecosystem supporting that science.
- f. One of the network testbeds SL participates in managing is a joint project with FNAL and ANL exploring quantum communications and quantum networking. Experimental research is being conducted on the co-propagation of quantum and classical signals on the same fiber. This builds on demonstrations staged during OSC last March in San Diego, e.g., including adding 400G classical channels.

D. NASA Ames (Bobby Cates via email): No updates.

Meetings of Interest 2023

Aug 21-25	APAN56 , Colombo, Sri Lanka
Aug 23-24	DREN TIM , Dallas-Fort Worth, TX
Sep 18-21	Internet2 Technology Exchange , Minneapolis, MN
Sep 25-28	The Quilt Fall Meeting , Columbus, OH
Oct 8-9	GRP workshop at IEEE eScience , Limassol, Cyprus
Oct 16-18	NANOG 89 , San Diego, CA
Oct 16-18	ESnet Confab23 , Washington, DC
Oct 18-19	CANARIE Summit 2023 , Montreal, QC, Canada
Oct 19-20	ARIN 52 , San Diego, CA
Oct 19-20	ESCC , Washington, DC
Nov 4-10	IETF 118 , Prague, Czech Republic
Nov 12-17	SC23 , Denver, CO
Dec 12-14	AINTEC , Hanoi, Vietnam
2024	
Jan 21-24	PTC'24 , Honolulu, HI
Jan 30-Feb 1	HIC, Kauai, HI
Feb 5-7	NANOG 90 , Charlotte, NC
Feb 19-22	SupercomputingAsia 2024 , Sydney, Australia
Mar 4-7	Internet2's Community Exchange , Chicago, CA
Mar 16-22	IETF 119 , Brisbane, Australia
Mar 24-28	OFC , San Diego, CA
Apr 14-17	ARIN 53 , Bridgetown, Barbados

Next JET meetings

Note: It is anticipated that most JET meetings will remain virtual for the foreseeable future

Sep 19, 2023 12-2 p.m. ET
Oct 17, 2023 12-2 p.m. ET
Nov 14, 2023 1:00-2:30 p.m. MT This will be a hybrid meeting held in conjunction with SC23 in Denver, CO. The meeting will be in room 712 of the Colorado Convention Center, 700 14th St, Denver, CO 80202

Appendix: Preliminary SC23 WAN Map

