

Joint Engineering Team (JET) Meeting Minutes

Colorado Convention Center
Room 711, 700 14th St, Denver, CO 80202
November 19, 2019, 10:00a.m.-12:00p.m. MT

Participants (* in person)

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| Celeste Anderson, Pacific Wave* | Kevin Kranacs, NASA/EOS |
| Celeste Banaaa, NASA/Ames* | Michael Lambert, PSC/3ROX |
| Abdella Battou, NIST* | Paul Lang, NASA/GSFC* |
| Robert Bonneau, OSD* | Joyce Lee, NCO* |
| Nick Buraglio, ESnet* | Tom Lehman, Virnao* |
| Rich Carlson, DOE/SC* | Paul Love, NCO/NITRD* |
| Bobby Cates, NASA/Ames | Joe Mambretti, StarLight/MREN* |
| Basil Decina, NRL* | Ralph M ^c Eldowney, DREN* |
| Patrick Dorn, ESnet* | Linden Mercer, NRL* |
| Phil Dykstra, DREN* | Amber Rasche, N-Wave* |
| Eric Estes, N-Wave* | Glenn Ricart, USIgnite |
| Bill Fink, NASA/GSF* | Anne Richeson, CenturyLink* |
| Dale Finkelson, Internet2 | Kamie Roberts, NITRD* |
| Jake Fries, NCO* | Robert Sears, NOAA* |
| Michael Gill, NIH | Kevin Thompson, NSF* |
| Greg Grimes, MissiON/MS State University | George Uhl, NASA/GSFC |
| Alex Hsia, NOAA* | Chris Wilkinson, Internet2 |
| Kevin Jones, NASA | Matt Zekauskas, Internet2* |
| Ann Keane, NOAA | |

Proceeding: This meeting was chaired by Kevin Thompson (NSF) and Rich Carlson (DOE/SC).

I. Action Items:

- Ongoing discussion of LSN's Strategic Plan and the JET's role in it.
- ESnet update on its operational network security use of Rapid7.
- Internet2 and ESnet updates on their respective optical rollouts.

II. **Review of the Minutes** of the October 2019 meeting: No corrections were offered during the meeting. (*Note:* One was received before this meeting and two subsequently.)

III. **Operational network security roundtable** (only those who had comments are noted)

- A. DREN (Phil Dykstra and Ralph M^cEldowney): For its Security Gateway Project DREN is making itself symmetric "just inside" the edges for proper firewall processing.

B. Robert Bonneau (LSN co-chair): Have folks been looking at ONS in relation to using the cloud? And SDN/SDX network infrastructure? How to link applications that are cloud resident? Need to understand where the gaps are in these multiple provider systems. How to manage this integrated risk to activities profile?

Answers: SDN is driven by the cloud providers – in some cases they are getting 90% utilization due to it. Google, for example, has over a million tenant networks. They provide the tenant network user with a set of security tools to allow the cloud network to be integrate into the user's enterprise network. SD LAN work lets edge sites make better use of the tenant network. Do need to have one model for cloud access, not one/provider.

C. Abdella Battou (NIST): NIST just published draft document related to this. Zero Trust Architecture, SP 800-207.

D. NRL (Linden Mercer): IETF and IEEE are working this week on the problem of flow security – of being able to extract improper information from a network's external traffic.

IV. Networks Round Table

A. DREN (Phil Dykstra and Ralph McEldowney):

a. DREN3 has increased some of its peering connections: San Jose, CA, at 10G (also a cloud access point); Equinix Chicago, IL, at 10G (with 10G from there to StarLight); Ashburn, VA, with a 3x10G lag. DREN is working on cloud connects – AWS and Azure with Google in process. Initially direct connects with a future boundary cloud access point. Needed hardware has been purchased and is being configured.

b. Ron Broersma is leading an effort to evaluate many commercial security devices. The best of breed will put at DREN's exchange points. The testbed uses Gigamon and as part of this a copy of all DREN traffic at its peering points is being backhauled to San Diego (up to a 25Gbps stream) to feed all the devices being tested. A lot has been learned (Ron may be able to do a brief on this down the road.) One constraint on vendors, if a device can't do IPv6 it's returned to the vendor.

As part of the project DREN is talking with CAIDA at UCSD (they operated a Dark Net network telescope). CADIA would like to look at DREN's dark address space. (Unfortunately, CADIA's Dark Net telescope doesn't do IPv6.)

c. DREN4: The PWS will be released very soon. 1GE will be the base service with up to 400G available. 400G is anticipated in the near future at the DREN4 core nodes. The core nodes will be located at provider locations where DREN can place other equipment (such as security devices). Until now DREN has always been MPLS in the core with everything else at the edge. For DREN4 it is bringing services into the core.

d. SC: Huge thank you to CenturyLink for providing NRL with circuits to the show this year and at past SCs. A great asset for NRL and the DOD research community.

e. Question: How does DREN support IPv4? DREN tries to make 100% of its control plane IPv6 but a few devices still can't do it. IPv4 traffic is still supported.

- B. ESnet (Patrick Dorn): ESnet has recently hired Tony Ferrelli as its new department head for networking.
 - a. ESnet6: The next large review, IPR, is scheduled for December. This will permit the start of construction. Open line system deployment is starting soon (see below). The router RFP is anticipated to be out in December - selection in 1H2020 with deployment in October 2020.
 - b. FABRIC Project: Primarily design effort at this point.
 - c. DOE OCIO partnership: ESnet is exploring with the OCIO using ESnet to backhaul DOE federal traffic at sites where both are located.
- C. FABRIC (Tom Lehman): A partnership between RENC1 and ESnet with many regional participants to build a research and experimental testbed. It will be a highly programmable network with lots of imbedded computing, storage resources, programmable switches, etc. Newly funded by NSF starting last month. Design work is just getting started. Its core nodes will be on the ESnet6 backbone. Edge nodes will be located at various exchange points and regional and campus networks. Tom will be working with the partners and participants on the design. New participants are welcome. See whatisfabric.net for more details. If you have questions please contact Tom Lehman [<tom.w.lehman@gmail.com>](mailto:tom.w.lehman@gmail.com).
- D. MissiON (Greg Grimes): Going well – the new vendor has been very good to work with over the last 18 months. New sites are coming online. There is a possibility that MissiON will be able to bring a circuit directly into NOAA’s Stennis, MS, facility thereby simplifying the path.
- E. Internet2 (Dale Finkelson): There will be several in depth sessions at next month’s TechEx in New Orleans, LA, on Internet2’s NexGen network. For immediate questions the Internet2 staff at SC can provide detailed answers.
- F. NASA/EOS (Kevin Kranacs): No changes this month.
- G. NIH (Mike Gill): Status quo - nothing significant to report.
- H. NOAA/N-Wave (Rob Sears):
 - a. N-Wave supports all of NOAA. It provides the network support for NOAA’s five TICAPs (Honolulu, HI; Seattle, WA; Denver, CO; Dallas/Ft Worth, TX; and the DC area). All are multiagency certified. N-Wave is currently supporting other Department of Commerce bureaus.
 - b. Most significant changes over the last year has been N-Wane’s capacity upgrades. Most of the backbone is now 100G. Its DC metro ring now has 800G capacity (McLean, VA; Suitland, MD; Silver Spring, MD). The ring is being extended to Ashburn, VA, which will become the new location for the DC area TICAP (now split between McLean and Silver Spring).
 - c. Since all of NOAA is behind the TICAPs N-Wave is leveraging them for its cloud connectivity. Three types of cloud services: VPN for quick turn-ups, cloud broker (for 1-5G needs) via a partnership with PNWGP and Megaport, and direct connections for flows 10G and up. NOAA has issued an enterprise cloud contract. This should facilitate determining if the number of cloud providers can be reduced. This in turn would permit transport consolidation. N-Wave currently has a 100G connections into two providers to be able to support all of NOAA.

- I. NRL (Linden Mercer): Its circuits are up to SC. (See below for the details.)
- J. Pacific Wave (Celeste Anderson): AP-REX (Atlantic Pacific Research and Education Exchange) is the new joint effort express route between the two coasts (Pacific Wave (PW) to DC and then to New York). Currently in trial – performance feedback would be greatly appreciated. A lot of fiber is being installed in the Pacific. One example of its use is a demo in the PW booth showing the link between Hawaii and American Samoa for remote 3D classes. PW is working with REANNZ to increase network capacity to the South Pole. PW is also part of the effort for smooth interoperability of AutoGOLE instances.
- K. 3ROX (Michael Lambert): No changes since last month.

V. Exchange Points Round Table

- A. Internet2 (Dale Finkelson):
 - a. AP-REX: Working to get some perfSONAR meshes setup. Internet2 and Pacific Wave are working to make AP-REX as seamless as possible.
 - b. MAN LAN and WIX: The hardware upgrades are completed. The long serving Brocades have been removed, replaced by QFXs. A few small configuration details remain to be corrected. CANARIE put in a temporary link to MAN LAN to support the NII round the world demonstration at SC (supported in part by ANA dedicating one of its trans-Atlantic circuits to this).
- B. NASA Ames (Bobby Cates): Working with cloud providers to get a multi-cloud exchange point up at Equinix at SV1.
- C. PNWGP (Celeste Anderson): Working on replacing its Brocades. Its lab is being setup to do configuration and testing.
- D. StarLight (Joe Mambretti, Bill Fink, Paul Lang, Linden Mercer, Basil Decina): (please see the November entry in <<https://www.nitrd.gov/nitrdgroups/index.php?title=JET-Meetings-2019>> for Joe’s slide deck)
 - a. StarLight (SL) organized and partnered on many demos at SC showcasing data intensive science around the world. The JET Big Data Tasking effort driven by Joyce Lee of the NCO has been instrumental in coordinating them.
 - b. SCinet and SL with its network & hardware partners provided 11 100GE circuits between SL and SC along with a 400GE circuit (longest R&E 400GE circuit at the time.) Additionally a pair of 100GE circuits were provisioned between DC (NRL & GSFC) and SL and six from DC to SC. Internationally, the GLIF fabric was also used along with some other existing circuits including Ciena’s 100G testbed.
 - c. Many of the demos involved SDNs and SDXs located around the world. Several US SDXs are funded by the NSF.
 - d. The AutoGOLE demonstrations among global exchange points were enhanced by using the RNP developed MACAN tool set for provisioning dynamic services across domains using NSI.
 - e. The LHC Open Network Environment (LHCONE) is an overlay network to link LHC Tier1 sites with Tier 2s and 3s. LHC is exploring the potential for using networking implementation developed for the Deep Underground Neutrino Experiment as a model for multiple science communities.

- f. The GSFC demos were facilitated by CenturyLink, Ciena, Internet2 and the Ciena testbed. The disk-to-disk transfers ran over 4x100G from GSFC to SC. This year GSFC is using MBME OS over TCP. This in newer Linux kernel using much more recent TCP versions that in the past. It is no longer NIC vendor dependent. In recent tests SL<>GSFC achieved 85G over a 100G circuit. GSFC is hoping to replicate at show with a doubled RTT. This year all devices are commercial off the shelf with the sole exception of the 400G server.
- g. NRL needs rapid and reproducible responses to changing needs anywhere in the world without large penalties caused by distances to locations half a world away. In the booth they have a 4k x 60fps camera. The data from it is sent to NRL for processing and then returned to a display in the booth. Errors are induced which are corrected (and obscured from the viewer) by SDNs/SDXs and the real time identification of where errors are and buffer management. The availability of these circuit resources are invaluable to NRL's research and problem solving.
- h. For the last three years SL and SCinet have implemented a SCinet DTN-as-a-Service which was used by many demonstrations and experiments. For SC2020 this will become a production service thereby allowing many to no long need to bring their own DTN to an SC. It is all open source, open architecture, and open interface.
- i. SL has been developing a Jupyter client for NSI Open NSA. Since scientist are already using Jupyter to manage their work flows these bits for Jupyter permit all to be tied together without the scientists needing to be aware of the underlying network.
- j. SL is working with Wenji Wu at FNAL on the Bid Data Express (BDE). BDE is a service to move extremely large files as well as collections of millions of files which is being demonstrated in the SL booth.
- k. Another SL supported demonstration, which was led by ANL, showed a prototype service for ANL's Advanced Photon Source (APS). As the APS is upgraded the amount of data generated will increase dramatically. This prototype was an experiment is to see if the data can be streamed directly from the beam lines into the memory of a supercomputer without using local storage at the light source. This demonstration won the top award in the SC Technology Challenge.
- l. Other projects include an international p4 testbed, partnership with the OSG to use the tools for dealing with big data science on the OSG, the Chameleon NSF funded distributed testbed, and the GENI 100G testbed.
- m. Future directions at SL include supporting the SupercomputingAsia Data Mover Challenge, a quantum communications/networking testbed under FNAL's lead, and FABRIC's terabit links (led by RENC1).
- n. SL is also assisting to develop the Global Research Platform – a global, large scale science DMZ.
- o. Linden Mercer and Bill Fink reemphasized the value of the resources an SC pulls together for their research and pushing of the envelope of advanced networking.

VI. 4) Update on the ESnet6's optical award and its related deployment plans – Patrick Dorn

- A. ESnet has selected Infinera's FlexILS to provide an open line optical system for ESnet6.
 - a. Transponders are disaggregated
 - b. Contractually ESnet is not restricted to using Infinera's transponders.
- B. ESnet6 will have O(300) nodes with approximately 40 add/drop sites.
- C. It will be FlexGrid and colorless, directionless, and contentionless.
- D. Initial deployment will be C Band only (system can be upgraded to C+L).
- E. All spans with greater than 20db will have Raman amplification
- F. It will have built in OTDR capability on any node that where a Raman span terminates. Also on all metro sections. Expected to help with Raman deployment as well as cuts, etc.
- G. In the initial procurement ESnet has bought a first round of Infinera Groove transponders. They'll be installed as the system is deployed. 100G clients, a few 10x10 muxes. Optical waves will be running at 200-500G. ESnet is looking forward to 400G clients.
- H. Gear is being installed in the ESnet lab at Berkeley. Deployment will start in December and run into March/April. The ESnet 5.5 will arrive where the current routing system is swung off the system shared with Internet2 onto the new optical system. It's anticipated that all will be on the new optical system by August 2020. Will start on the east coast and in the Chicago area and converge between them. Then moving west. Last two areas will be the Bay area and Chicago metro as these will have to be hot cuts. Eight Infinera teams in the field.
- I. A second transponder procurement is anticipated for 4Q20.
- J. ESnet took a page from DREN for all of their control plane to be IPv6. Mostly successful but there remain some challenges to all v6.
- K. The deployment schedule is being compressed as the new colocation spaces, fiber extensions into the space and span testing are behind schedule.

Meetings of Interest 2019

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| Dec 9-12 | TechEX19 , New Orleans, LA |
| Jan 15-16, 2020 | HIC , Hilo, HI |
| Jan 19-22 | PTC'20 , Honolulu, HI |
| Feb 10-12 | NANOG78 , San Francisco, CA |
| Feb 24-27 | SupercomputingAsia 2020 , Singapore |
| Mar 2-6 | APAN49 , Kathmandu, Nepal |
| Mar 3-4 | ESCC , Berkeley, CA |
| Mar 21-27 | IETF 107 , Vancouver, BC, Canada |
| Mar 29 – Apr 1 | Internet2 Global Summit , Indianapolis, IN |
| Apr 7-8 | US Ignite Application Summit , Denver, CO |
| Apr 26-29 | ARIN 45 , Louisville, KY |
| Jun 1-3 | NANOG 79 , Boston, MA |
| Jun 8-12 | TNC20 , Brighton, UK |
| Jul 25-31 | IETF 108 , Madrid, Spain |

Next JET meetings (in 2020)

Jan 21 12-2 p.m. ET, The office of the NCO
Feb 18 12-2 p.m. ET, The office of the NCO
Mar *nb*: The March & April meetings will be combined and held concurrent with
Internet2's Global Summit: 29 March – 1 April, Indianapolis, IN