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
November 16, 2022, 10:30 a.m. - 12:00 p.m. CT
This meeting was held as a hybrid in Dallas, TX, at the
Kay Bailey Hutchison Convention Center Dallas

Participants

Celeste Anderson, Pacific Wave
Eric Blanco, NCO/NITRD
Dale Carder, ESnet
Rich Carlson, DOE/SC
Basil Decina, NRL
Phil Dykstra, DREN
Chris Everich, Verizon
Bill Fink, NASA/GSFC
Tammy Garcia, AT&T
Felton Hayes, AT&T
Byron Hicks, LEARN & SCinet
Kelly Hinderer, AT&T
Mallory Hinks, NCO/NITRD
Bradley Hook
Steve Huter, NSRC
Caren Litvanyi, Indiana University/N-Wave
Paul Love, NCO/NITRD
Joe Mambretti, StarLight/MREN
Ralph McEldowney, DREN
Brenna Meade, Indiana University/WINS & SCinet
Linden Mercer, NRL
Alex Moura, KAUST
Edward Moynihan, Indiana University
Aruna Muppalla, NASA/GSFC
Mark Mutz, NOAA/N-Wave
Bill Owens, NYSERNet
Kamie Robert, NITRD
David Rouse, AT&T
Hirotaka Sato, APAN-JP
Rob Sears, NOAA/N-Wave
Kimball Sekaquaptewa, Santa Fe Indian School/WINS
Michael Sinatra, ESnet
Antonio Stagnitta, AT&T
Kevin Thompson, NSF
Jim Williams, Indiana University
Chris Zane, University of Hawaii

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

I. **Action Items**: (none pending)

II. **Review of the Minutes of the October 2022 meeting:** No corrections were received.

III. **Women in IT Networking at SC (WINS): Brenna Meade**

A. Brenna Meade is from Indiana University, chair of WINS and co-chair of the SCinet WAN team. She was a 2018 WINS awardee. WINS' aim is not only to bring more women into SC but also into network engineering and IT in general. This year there are eight WINS awardees with 17 awardees returning this year.

This morning they were taken on a tour of the Network Research Exhibits. There was interest in the science involved. WINS is investigating have WINS women join some of the JET's meetings to understand more about this community and to describe their experiences.
WINS was a career changing experience for Brenna. It took her from a campus network engineer to R&E networks and SCinet. It brings some amazing women into SCinet and SC. When the program started there were less than 5% women in SCinet. Now there are 20-30% with the SCinet chair for 2024 having been a WINS awardee in 2016.
If you have questions about WINS or would like more information, please contact Brenna. Likewise, if you'd like to help with the funding of future WINS programs.
Question: What does it mean to be a WINS awardee?
An awardee receives funding to cover to travel to the SC venue along with lodging and per diem. For both the SCinet staging week (three weeks before SC) and then the show week and the week before for more work getting all working. There are also several gatherings of just current and past awardees. Applications are open to women in both R&E and industry.

B. Kimball Sekaquaptewa is from the Indian School in Santa Fe, NM, and is the co-chair of WINS this year. She attended the JET meeting at SC2019 and found the networks being operated very interesting and the ongoing conversations very helpful in her work.

IV. **Operational Security Round Table:** No updates were given.

V. **Network roundtable**

A. APAN-JP (Hirotaka Sato): APAN's next meeting, APAN55, will be held in Nepal 13-17 February 2023.
B. DREN (Ralph McEldowney):
    a. This is an update from my last brief to the JET in June on the transition from DREN III to DREN 4. Verizon is DREN's partner on the fourth generation DREN and the migration to it of over 200 sites.
    b. Verizon has been heavily involved in getting the backbone built out, connectivity out to the over 200 sites and needed authorizations through the Department of Defense process.
    c. With necessary first steps mostly completed, the actual migrations will take place over the next seven months, with a completion of no later than mid-June 2023 of the 213 sites that have been ordered to date.
    d. Concurrently with this transition, DREN is expanding in the Pacific region with new sites potentially for places such as Japan, Alaska and Guam.
    e. The Hawaiian Intranet Consortium (HIC) annual meeting has been virtual the last two years. For 2023 the intention is to have it as an in-person meeting in Maui this coming January.
    f. To conclude, a "Thank you" to Verizon. It provided a pair of circuits for SCinet this year and one of its team, Chris Everich, joined the SCinet WAN team to facilitate.

C. Indiana University/International Networks: (Ed Moynihan):
    a. A summary of what Indiana University's International Networks group is currently doing with Jennifer Schopf's move to TACC. There are two ongoing projects both of which are NSF IRNC awards.
        i. NEA^{3}R which faces Europe supporting traffic with European and African partners with a focus on supporting applications in the Arctic. It operates circuits between New York, NY, and Europe and coordinates with the Advanced North Atlantic consortium and the UbuntuNet Alliance.
        ii. TransPAC 5 which is Asia-Pacific facing with many partners. It operates a 100G circuit from Seattle, WA, to Tokyo and is part of the consortium that has a 100G circuit from Guam to Singapore.
    b. No circuit updates since last month. What has come from the leadership change is a better definition of some of the partnerships and what they may allow the program to do in the future. There are ongoing discussion with Internet2 and ESnet among others in areas including national productivity and monitoring. Additionally the program is working with the other IRNC's PIs to see if there are areas where better coordination between programs would be beneficial.

D. KAUST (Alex Moura):
The slides for this talk are posted on the JET's web page:
https://www.nitrd.gov/coordination-areas/lsn/jet/jet-meetings-2022/
    a. The King Abdulla University of Science and Technology (KAUST) is located in Thuwal, Saudi Arabia, just over 100km north of Jeddah. It has about 1200 students of which 80% are PhD candidates. It has 2200 alumni, 180 faculty, 476 post Docs and 400 research scientists and staff.
    b. On the networking side, KAUST operates 3 international POPs (Amsterdam, Singapore and Thuwal) with 2x100G to both Amsterdam and Singapore. It provides residential (~3500 homes) and commercial internet for its community and Wi-Fi (~4000 APs). Its core network is fully meshed 100G.
    c. KAUST hosts Shaheen II, the largest supercomputer in the Middle East. Shaheen III is scheduled to come online in 2023.
    d. With the connectivity to Europe and SE Asia, KAUST joined the Asia-Pacific Europe Ring (AER) in March 2022 to support the needs of its researchers. With the terrestrial circuit that is part of AER currently down, possibly due to the war in Ukraine, the KAUST circuits is providing redundancy.
    e. Its international circuits are split between two providers, AAE-1 and TGN, with each providing Amsterdam<>Thuwal<>Singapore. They are built on Cisco's NCS platform and use Segment Routing MPLS with QoS.
    f. KAUST is working with Indiana University's Global NOC to install NetSage for monitoring of its international circuits.
    g. For SC KAUST researchers are supporting demos with Caltech's Network Research Exhibit.

h. Next steps:
    i. Integrate NetFlow monitoring with NetSage.
    ii. Upgrade the campus network performance measurement to perfSONAR v5.
    iii. Bring up additional circuits to peering with StarLight and Pacific Wave in both Los Angeles, CA, and Seattle, WA.
    iv. Enabling AutoGOLE/SENSE and RARE/FreeRouter in Science DMZ.

E. LEARN (Byron Hicks): LEARN provides the research networking for the State of Texas connecting the research networks and institutions in the state.

F. N-Wave (Rob Sears):
    a. This year N-Wave's backbone has been upgraded from 100G to 400G.
    b. Cloud connective has been boosted to 100G. N-Wave continues to use Cloud Brokers as well.
    c. N-Wave has built an Alaskan 1G backbone of Seattle<>Anchorage<>Fairbanks and then back to Seattle with the backbone ports are all 10G to be ready to upgrade. Several National Marine Fisheries Service (NMFS) sites have been connected, joining the existing connections supporting NOAA's satellite organization and an atmospheric observatory in Utqiaġvik. The National Weather Service (NWS) has recently asked for connective for Alaskan offices. The Alaskan infrastructure was built on a shared cost model thereby reducing costs for all.
    d. N-Wave with NWS and NMFS organized and hosted an Alaskan federal networking consortium meeting last September. It's based on the HIC that DREN organizes in Hawaii. It's called the Alaska Regional Technology Interchange Consortium (ARTIC). At the meeting there were representatives from other federal agencies, the State of Alaska, native tribal organizations and the University of Alaska. As with the HIC, the goal is to come together to share local knowledge and ideas on how to connect in a very sparse region. And, wherever it makes sense, to share the very expensive intra- and inter-state resources.
    e. NOAA is planning on bring a multi-agency TICAP to Anchorage and, working with the ARTIC group, is exploring developing a peering point in AK.
    If any here have an interest in collaborating in Alaska please contact Rob Sears.
    f. Regarding IPv6, there was a SC BoF last evening on IPv6 and IPv6-only. The latter is required by the OMB mandate with the goal of 80% of all federal networking devices using IPv6 native by the end of 2025. The federal IPv6 task force is chaired by Rob and has the goal of helping all federal agencies meet the migration targets.
    Anyone who has an interesting story in migrating to IPv6 native please contact Rob.

G. Pacific Wave (Celeste Anderson):
    a. Pacific Wave (PW) is involved in supporting many of the SC demos at StarLight coordinates. *(Note: See StarLight report below.)*
    b. As a comment, over the years SCinet is getting better and better at having circuits up before SC starts, rather than engineers trying to get things up at the beginning of the conference and exhibits. Far better.

c. PW's web page has a refreshed set of maps including GOREX, PIREN, Pacific Wave, the Western Regional Network and AP-REX. There is also a link to the APOnet map.
d. Testing with CENIC is ongoing. The hope is for results by year's end.
e. PW is working with DREN in its migration form DREN III to DREN 4.
f. CENIC is running fiber into the San Diego Convention Center to support the Optical Fiber Communications Conference (OFC) in March. This addition to OFC will allow for demonstrations on its exhibit space.
Please contact Celeste if you have potential technology demonstrations for OFC.

H. Santa Fe Indian School (Kimball Sekaquaptewa):
a. The Santa Fe Indian School (SFIS) is building a middle-mile network which is anticipated to have about a 500 mile footprint in a couple of years.
b. SFIS connects to the Albuquerque GigaPoP (ABQG). Its network current has a footprint of 160 miles providing connectivity to the Pueblos of Cochiti, Santo Domingo, San Felipe, and Santa Ana.
c. In 2023, using a grant from NTIA's Tribal Broadband Connectivity Program, SFIS will add about 325 miles connecting the Pueblos of Zuni, Acoma, and Isleta and then looping back to ABQG.

I. SCinet (Brenna Meade and Byron Hicks):
(See network diagram in the Appendix below)
a. With its partners the WAN team built the wide area network connecting to SC and the networks at SC to support both the exhibits and demos and in the meeting rooms and SC public spaces.
b. The WAN partners were Arelion, DC CIX, ESnet, Internet2, LEARN and Verizon. Total capacity into SC was 5.01Tbps.
c. Particular thanks to Verizon with the 2x100G circuits to Seattle which allowed a connection to TransPAC and other trans-Pacific networks to connect with researchers in Japan, Korea and elsewhere in the Asia-Pacific region for demos at SC.
d. This year there were a total of 29 Network Research Exhibits.
e. Some interesting stats: SCinet had 175 volunteers from five countries, 30 states and 78 organizations. $70M of equipment was loaned by partners to make SCinet possible. To support Wi-Fi throughout SC 450 APs were installed by SCinet along with 6,674 ft. of fiber in the convention center.
f. There were 9,450 devices connected to SCinet this year – by far the largest number of any SC.
g. SCinet wouldn't have been possible without the donations of circuits, equipment, and the support to make the volunteers able to participate.

VI. **Exchange Points Round Table**

A. StarLight (Joe Mambretti):
The slides for this talk are posted on the JET's web page:
https://www.nitrd.gov/coordination-areas/lsn/jet/jet-meetings-2022/

a. SC is always a special conference for StarLight (SL). SL works with SCinet and other partners to build a national testbed with international extensions. This year there is 1Tb of capacity from SL in Chicago, IL, into SL's booth on the show floor. There is also 1Tb from SL to the Joint Big Data Testbed (JBDT) in McLean, VA, where the Naval Research Lab (NRL) and NASA's Godard Space Flight Center (GSFC) have equipment. Finally, there is 800G from the JBDT into the SL booth.
b. There are about 25 experiments and demonstrations using this infrastructure and its extensions. These are all aimed at developing the Global Research Platform in support of data intensive science such as the LHC, synchrotrons, radio telescopes, neutrino experiments and dark matter.
c. In addition to the continuing need for more capacity, network resources will need to be software controlled and configurable. One project in this area is NOTED which uses AI/ML to predict flows and provision the needed resources for those flows just in time.
d. Another important focal area consists of processes that transition innovations to production operations. SL has developed a pipeline that migrates research testbed innovations to prototypes to production..
e. SL is participating in several projects that are focused on designing and implementing 400 Gbps WAN and LAN services for data intensive science. Other demos involve P4, VME over fabric, DTNaaS, Janus Container Orchestration with ESnet, Named Data Networking, Open Science Grid SD distributed storage, FABRIC & FAB, and packet marking with scitags.

B. NRL demos at SC (Linden Mercer):
(See slides 24-25 & 36 in SL deck)
a. The work NRL does getting ready for SC and the demos at SC are very valuable to the work at NRL. A great amount of preparation and collaboration lead up to each November.
b. NRL's work this year has been about large, single stream data movement, using the 400G circuits.
c. NRL is also working on dynamic network control.

C. GSFC demos at SC (Bill Fink):
(See slides 35 in SL deck)
a. Many thanks for all the help from the SCinet WAN team, Joe and SL, Linden and NRL, ESnet and Internet2.
b. SCinet, working with partners, setup a 2x400G ring JBDT<>SC<>SL<>JBDT. GSFC has a pair of EPIC servers at JBDT. The demo uses NVMe-oF/TCP over the ring to disk to disk transfers with very high speed.
c. Final results aren't yet available as just got the network tuned up early this morning. In a live demo looping JBDT<>SL memory-to-memory 300Gbps were shown over TCP. Hopefully later today will be able to marry in the disk-to-disk portion and extend the path to Dallas.

VII. **Concluding comments**

A. Paul Love: Though a meeting is on the schedule for next month (20 December) unless something very unusual occurs it will be cancelled as most December meetings have been in the past. In that case the next meeting will on 17 January 2023. It will be virtual.
B. Rich Carlson: Going forward part of the tasking of the JET is to look at ways to increase participation in the JET by the state networks, the regionals, women in science, and others that can benefit from learning from the experiences that this community has developed. Commercial friends can also participate (as they are here today) as this is an open, public meeting. Everyone who plays in networking should get engaged, participate and share their knowledge and spirt. All will benefit – and the expanded attendance option is why it's great to Zoom.
C. Kevin Thompson: I think this is biggest meeting of the year – I very much wish I was there in the room. I want to remark on what a remarkable career Rich Carlson has had. This is his last JET meeting before he retires at the end of December. It's really impossible to capture all the impact I think Rich has had in the community over his career, wearing different hats and the one in the room is a very much a leadership hat. And not just for JET but also for MAGIC and the LSN. Rich, you're going to be sorely missed. Your leadership and your guidance towards me personally over the years I won't forget. So, I just wanted to mark that, and ask the room to join me in thanking Rich for his remarkable contributions over a fantastic career.

Meetings of Interest 2022-2023

Note: Meetings whose format has changed have been updated.

Dec 5-8	Internet2 Technology Exchange, Denver, CO
2023	
Jan 15-18	PTC'23, Honolulu, HI
Jan 25-26	HIC, Maui, HI
Feb 13-15	NANOG 87, Atlanta, GA
Feb 13-17	APAN55, Nepal
Feb 27-Mar 2	Supercomputing Asia 2023, Singapore
Mar 5-9	OFC, San Diego, CA
Mar 7-9	The Quilt Winter Meeting, virtual
Mar 25-31	IETF 116, Yokohama, Japan
Apr 16-19	ARIN 51, Tampa, FL
May 8-11	Internet2 Community Exchange, Atlanta, GA
Jun 5-9	TNC23, Tirana, Albania
Jun 12-14	NANOG 88, Seattle, WA
Jul 22-28	IETF 117, San Francisco, CA
Aug TBA	APAN56, TBA

Next JET meetings

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

Dec 20, 2022	12-2 PM ET, (*n.b.*: Held only if needed)
Jan 17, 2023	12-2 p.m. ET
Feb 21, 2023	12-2 p.m. ET

Appendix: Final SCinet 2022 network diagram