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
May 9, 2023, 11:45a.m. – 1:00p.m. ET
This meeting was held as a hybrid in Atlanta, GA, at the
The Westin Peachtree Plaza, 210 Peachtree St NW

Participants

Shawn Armstrong, University of Alaska
Joseph Baczkowski, NOAA
Adrian Baranyuk, NCO/ NITRD
Joshua Cook, Texas A&M University
Steve Corbató, Link Oregon
Basil Decina, NRL
Jon Domen, OSHEAN
Phil Dykstra, DREN
Andrew Gallo, CAAREN/George Washington
        University
Forough Ghahramani, NJEdge
Chris Hibbs, Clemson/C-Light
Thomas Hutton, SDSC/UCSD
Jonah Keough, Pacific Wave/PNWGP
Scott Kohlert, Ciena
Kazunori Konishi, APAN-JP
Akbar Kara, LEARN
Michael Lambert, PSC/3ROX/ACCESS
Tom Lehman, ESnet
Paul Love, NCO/NITRD
Marc Lyonnais, Ciena

Joe Mambretti, StarLight/MREN
Brenna Meade, Indiana University
Dave McClain, NOKIA
Ralph McEldowney, DREN
David Nowoswiat, NOKIA
Bill Owens, NYSERNet
Linden Mercer, NRL
Miguel Ramlatchan, Old Dominion
        University
Aimee Rullo, NOKIA
Robert Sears – NOAA
Gauravdeep Shami, Ciena
Steve Smith, PNWGP
Jim Stewart, UETN
Hirouka Suv, APAN-JP
Kevin Thompson, NSF
Elon Turner, ARE-ON
Ron Verdi, OSHEAN
Steve Wallace, Internet2
Greg Weldon, Boston University
Xi Yang, ESnet

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 April 2023 meeting:** Received corrections were incorporated in the posted final minutes.

III. **FABRIC Research Infrastructure - Status, Features, and Use Cases – Tom Lehman**
The slides for this brief can be found at:
   https://www.nitrd.gov/coordination-areas/lsn/jet/jet-meetings-2023/
Past FABRIC briefs:
   January 2021: https://www.nitrd.gov/coordination-areas/lsn/jet/jet-meetings-2021/
   March 2020:   https://www.nitrd.gov/coordination-areas/lsn/jet/jet-meetings-2020/

A. FABRIC is an NSF mid-scale research project designed to enable a completely new paradigm for distributed applications, Internet protocols and services. With the advent of very inexpensive compute and storage, FABIC will have abundant, imbedded GPUs, FPGAs and NICs. All will be programmable by users permitting research in applications, protocols and services that can run on any node in the network. In a phrase "everywhere programmable".

B. FABRIC supports QoS and interconnects to HPC centers, cloud and wireless testbeds, commercial clouds, the Internet and edge nodes at universities and labs.

C. FABRIC is part of a computing continuum and itself is a scientific instrument as it is heavily instrumented within and outside a user's slice. NICs will provide accurate timestamps on captured packets, PDUs will provide measurements of power consumption. Most sites will have a GPS-disciplined clock and optical layer measurements.

D. FABRIC has been in its construction phase since September 2019. This September it will enter its production phase. That expected topology can be seen in the appendix to these minutes (as well as slide 6 the brief's slide deck). The map shows the resources that will be available, the FABRIC & FAB (FABRIC Across Boarders) nodes, and the interconnections. The blue lines represent dedicated 100G waves. The yellow lines, the Terabit Core, are 3x400G. The black lines connecting the FAB sites are shared, not controlled by FABRIC. Regardless, the FABRIC services are the same to the FABRIC user.

E. In addition to the imbedded compute and storage, each node has smart and reconfigurable NICs which are available to researchers for their projects. There is also a P4 programmable switch available to a user. Or an experimenter can bring their own switch. In the future P4 workflows will be possible on top of the FPGAs.

F. FABRIC has a rich set of network services at both layers 2 and 3. For layer 2 can be local at a site or between any two sites. Layer 3 are available using either IPv4 or IPv6. Both of the layer 3 services can have external connections. An additional network service is port mirroring (currently this service mirrors a specific physical port).

G. The external connection ports, available to any user's slice, besides being able to provide connections to the Internet (commercial and R&E) and public clouds, have/will have these connections (this list is extensible):
   a. Chameleon Chicago and TACC operational
   b. CloudLab and Powder at Utah operational
   c. Cryo-EM facility at Rutgers - operational
   d. CloudLab Clemson and Wisconsin - being configured
   e. ASU/Sun Corridor Network - being configured

H. How do you interact with FABRIC?
   a. Three ways: Portal, Jupyter Hub notebooks via an API and API libraries from your computer. Notebooks are the recommended way to start.
   b. All of FABRIC remains in active development:
      i. The infrastructure is being added to as new pieces become available.
      ii. The software is always being improved with updates released every three to four months. As much as is possible backward compatibility is retained.
I. About 300 early adopters with 40 projects (36 research, 4 education) are currently using FABRIC.
J. FAB sites provide these additional science use cases and (with thanks to Tom):
   a. Astronomy (Vera Rubin Observatory/LSST, Chile)
   b. Cosmology (CMB-S4)
   c. Weather (UMiami & CPTEC, Brazil) - Ben Kirtman, Atmospheric Science & Paolo Nobre
   d. High-Energy Physics (CERN) - Rob Gardner, FAB Co-PI, Physicist
   e. Urban Sensing/IoT/AI at Edge (UBristol) - Dimitra Simeonidou, Prof. of Networking
   f. 5G across borders, P4/SDN - (UTokyo) Aki Nakao, Prof. of CS; KISTI (Korea Institute of
   g. Science and Technology Information)
   h. Censorship Evasion - Richard Brooks, Prof. of ECE
K. Useful links:
   a. Visit https://whatisfabric.net
   b. Ask info@fabric-testbed.net
   c. FABRIC Software: https://github.com/fabric-testbed
   d. Beta Tester request form: https://whatisfabric.net/get-involved/beta-testers-request

Question: How can FABRIC scale to 80 or 100 nodes (as have past NSF networking projects)?
Answer: From a networking perspective there shouldn't be any issues as FABRIC is using very standard protocols. From an experimenters perspective it should also scale at least to doubling or tripling.
Question: What are the costs for joining FABRIC?
Answer: For a user – none. Just go the FABRIC website and request an account. To make resources available not located at a FABRIC node available then the needed connective will have a costs.

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. N-Wave (Rob Sears):
      a. A lot of site installs this year. Several have been on at Department of Defense bases with Vandenberg SFB just completed along with Fleet Numerical, both in Calif. These will augment and expand the weather date available at these sites.
      b. NOAA sponsors a group call the Alaskan Region Technology Interchange Consortium (ARTIC). It takes its cue from DREN's HIC (Hawaiian Intranet Consortium) to encourage the sharing of local knowledge, such as the options for broadband, between participants. Likewise resources could be shared where that makes sense. It's voluntary and made up of federal, state and tribal agencies along with research and higher education. ARTIC holds a monthly call as things ramp up. Its annual meeting will be the week of 11 Sep in Anchorage, AK.
      c. Testing is ongoing on Secure Segment Routing (SSR). The first SSR pilot will be deployed fairly soon.
      d. For small, hard to reach locations N-Wave is developing a package that can make use of whatever connectivity is available - Low Earth Orbit satellites, DSL, local broadband cooperatives, etc. Tests have been going well and will be added very soon to N-Wave's connectivity options.
      e. As the chair of the federal IP-v6 Task Force I want to mention that it has a summit coming up on 15 Jun from noon to 4:30PM EDT. It's focused on the federal mandate of migration to IP-v6 only and how that is progressing. The goal for this FY is 20% of an agencies devices to be migrated.
  B. OSHEAN (Jon Domen & Ron Verdi): OSHEAN is the Rhode Island network that provides connectivity for the R&E community, health care, K-12, non-profits and state & local governments.
  C. NRL (Linden Mercer): NRL is having interesting and good conversations with folks between Washington, DC, and StarLight regarding this year's SC. Planning to build on what was accomplished last year.
  D. NYSERNet (Bill Owens): No updates today.
  E. Pacific Wave (Jonah Keough):
      a. ESnet has upgraded its Los Angeles, CA, connection to 2x100G.
      b. DREN is connecting DREN 4 to Pacific Wave (PW).
      c. PW expects 400G to SC this year.
  F. Brenna Meade (SCinet/SC23): For those submitting NRE proposals please be sure to also submit a request for any additional network capacity you will need. Having those requests now will be a great help and ensure their completion. Late bandwidth requests will be filled if possible.
  G. ARE-ON & GPN (Elon Turner):
      a. GPN has completed 400G to Kansas City.
      b. ARE-ON is coming off an Open Science Grid project where we now have nodes in each of our research institutions. USGS's network is connecting.

H. 3ROX/PSC/ACCESS (Michael Lambert):
   a. PSC is working with FABRIC to deploy a node – only a few bumps along the way.
   b. 3ROX has worked with MAGPI to establish a cross-state link. 3ROX & MAGPI are now sharing their pair of 100G Internet2 connections giving both much improved resiliency.
   c. PSC is still working on the transition from the XSEDE layer 3 VPN to the CONNECT layer 3 VPN. The goal is to sunset the XSEDE connection by the end of June. PSC is looking into NetSage for its visualization.
I. DREN (Ralph McEldowmey & Phil Dykstra):
   a. DREN is in the final five weeks of the transition from its third generation network to its fourth. All its efforts are aimed at the transition and ensuring that no services are dropped in the process. DREN is working with both providers (Lumen, DREN III, and Verizon, DREN 4) to ensure the transition is smooth. To date about 170 sites have been transitioned.
   b. At about 5 of DREN's sites it's been hard to get new circuits brought up. To bridge the 15 June deadline for the turndown of DREN 3, Verizon worked with Lumen to continue to use the existing DREN 3 access circuits until the new circuits are up at these sites.
   c. DREN is in the middle of a network reaccreditation with a security control assessment in progress. The result will be an Authorization to Operate for up to three years. Lots of folks are working hard on this concurrent with the transition.
   Question: At the November JET in Dallas it was mentioned that DREN was again involved in network research. Are there any details you can share?
   Answer: One was the very interesting work going on with CAIDA at UCSD and at MIT on 100G packet capture with innovative security analysis.
J. Link Oregon (Steve Corbató):
   a. Link Oregon (LO) has about 2,500 miles of fiber lit.
   b. LO's current focus is on network development along the Oregon coast including Newport, OR, and further south. The result will be full service to institutions on the coast.
   c. LO's other focus is connecting exchange points and data centers.
K. Internet2 (Steve Wallace):
   a. Internet2 is holding a BOF on ASPA. ASPA is complementary to RPKI/ROAs and lets a customer state which ASs are allowed to propagate a route – who are your upstream providers.
   b. ARIN has a help desk onsite to answer question on getting LRSAs signed (or other matters). To help with an organization's getting a LRSA processed internally ARIN has eliminated the property rights clause from the agreement. For LRSA's signed before 2024 the yearly fees will be greatly reduced from what the fees become if signed after 31 December 2023.
L. University of Alaska (Shawn Armstrong): The university's supply chain issues seem to be clearing up as the cards it needs to upgrade its circuits to the lower 48 from 10G to 40G are now 90 days out.

M. SDSC/UCSD (Tom Hutton): Nothing new this month.
N. NJEdge (Forough Ghahramani): NJEdge (NJE) is a non-profit, state-wide network that supports K-12, non-profits, government and higher ed. NJE with its member Princeton University, is hosting a cyber infrastructure for research data management workshop 23-24 May. Globus and ESnet, among others, will be presenting at the workshop.
O. MANRS (Andrew Gallo): MANRS has just announced its next round of Fellows and Ambassadors. An announcement on some upcoming changes is expected in July.

VII. **Exchange Points Round Table**
A. StarLight (Joe Mambretti):
  a. StarLight (SL) has recently been involved in a number of workshops related to data intensive science:
    i. CESNET annual meeting in Prague, Czech Republic
    ii. LHCONE and LHC Optical private network meetings.
    iii. A GÉANT sponsored Next Generation Networking SIG on data intensive science.
    iv. A FABRIC workshop at TACC.
    v. A Chameleon meeting at the University of Chicago.
  b. The SCinet circuit solicitation for SC23 has gone out. SL responded by asking for 1.2 Tbps between SL and SC. Also between SL and the Joint Big Data Testbed (JBDT) facility in McLean, VA, which supports NRL and GSFC. SL and its research partners are also investigating a direct link between the JBDT and SC with capacity TBD.
  c. SL and its partners are working on about 2 dozen NRE proposals for SC23.
  d. SL is trying to develop a 400G DTN for the next generation wide area links with 400 or 800G. Previously to do 400G it was necessary to bond 2x200G circuits. The components are arriving and being assembled and configured.

Meetings of Interest 2023
Note: Meetings whose format has changed have been updated.

May 8-11	Internet2 Community Exchange, Atlanta, GA
Jun 5-9	TNC23, Tirana, Albania
Jun 12-14	NANOG 88, Seattle, WA
Jul 17-20	Routing Security Summit 2023, virtual
Jul 22-28	IETF 117, San Francisco, CA
Aug 21-25	APAN56, Colombo, Sri Lanka
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

Next JET meetings
Note: It is anticipated that most JET meetings will remain virtual for the foreseeable future
Jun 20, 2023   12-2 p.m. ET
Jul 18, 2023   12-2 p.m. ET
Aug 15, 2023   12-2 p.m. ET

Appendix: FABRIC - Production Topology (Sept 2023)