



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

October 18, 2022, 12:00-2:00 p.m. ET

This meeting was held virtually

Participants

Nick Buraglio, ESnet

Todd Butler, NASA/GSFC

Dale Carder, ESnet

Rich Carlson, DOE/SC

Bobby Cates, NASA Ames

Basil Decina, NRL

Phil Dykstra, DREN

Bill Fink, NASA/GSFC

Kevin Kranacs, NASA/ESDIS

Michael Lambert, PSC/3ROX/ACCESS

Paul Love, NCO/NITRD

Joe Mambretti, StarLight/MREN

Linden Mercer, NRL

Edward Moynihan, Indiana University

Aruna Muppalla, NASA/GSFC

Mark Mutz, NOAA/N-Wave

Glenn Ricart, US Ignite

Frank Seesink, University of North Carolina

Steve Wallace, Internet2

Jim Williams, Indiana University

Proceeding: This meeting was chaired by Rich Carlson (DOE/SC).

I. Action Items:

- Planning for the JET's tasking for 2023 – discussion was concluded at the September meeting.

II. Review of the Minutes of the September 2022 meeting: No corrections were received via email.

III. Discussion of the JET's tasking on tools to help with inter-domain issues – Joe Breen (via email)

This is a community project to collect shared data from all who are willing to share.

- IU GRNOC has been working with the APOnet (<https://www.aponet.global/>) and adding to GRNOC [live map] <http://globalresearchmap.org>.
- GRNOC has added more detail to Asian Pacific circuits.
- Hopefully, we can schedule someone from the GRNOC to demo in future.
- Regrouping a bit after multiple people have had recent job shifts (NetSage and EPOC projects have gone with Jennifer Schopf to TACC, Dan Doyle gone from IU to ESnet).
- Trying to determine next steps and how collaborations may shift and continue.

IV. Routing Integrity and Assessments at Internet2 – Steve Wallace

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 purpose of Internet2's Routing Integrity Initiative: "...aims to improve the research and education (R&E) community's adoption of best practices that strengthen the resilience and reliability of data movement across the R&E network ecosystem to support our shared missions. Routing integrity is an end-to-end challenge that requires the participation of the entire Internet2-networked community and beyond."
- B. In protecting your network you in turn help protect other networks and improve the R&E networking community.
- C. The R&E networking community is pretty large.
 - a. Internet2 (I2) interconnects about 1,000 ASNs. As a reference point, there are about 70,000 ASNs that comprise the global internet.
 - b. Looking at asrank.caida.org, I2 is about the 53rd largest network in the world.
 - c. I2 has 37 Connectors (state and regional networks) who contract with I2 for connectivity.
 - d. I2 has over 350 Primary Network Participants (higher education, research centers, industrial affiliates) that use the Connectors.
 - e. And thousands of Sponsored Participants – K12, libraries, research hospitals, state government, etc.
- D. The elements of I2's Routing Integrity
 - a. Routing Security as defined by MANRS.
 - b. Hardening of network devices – reviewing on a regular basis firmware and logging, multi-factor authentication for core network devices, etc.
 - c. Detection and mitigation of DDoS attacks.
 - d. Cloud connectivity that is resilient. Users are used to the resiliency of I2's network, and the internet in general, but haven't arranged for the same when they move services into the cloud.
 - e. IPv6 deployment – something that I2 believes will become more critical over time.
- E. The Integrity Initiative does:
 - a. Measurement and Reporting: route reports, routing integrity assessments (currently a pilot program that's free).
 - b. Educations: online workshops (ex: IRR records, creating ROAs) and office hours (complements neatly with the route reports).
 - c. Coordination: Work with NRENS globally to improve R&E routing security.
 - d. Outreach and Advocacy: Promote the benefits of routing integrity in the community, work with American Registry for Internet Numbers (ARIN) and other stakeholders to make adoption of good routing security policies easier to do.
 - e. Make sure that Internet2 adopts Best Practices for its operated infrastructure.
- F. Progress
 - a. Several networks that peer with the regional/state networks and with I2's I2PX service, such as Google, said they were going to require traffic coming from settlement-free peers to fully and accurately publish their routing policies. A

strong motivator! Over about 18 months I2 worked with it community to get the communities' published routing information from approximately 50% to 95% of what Google required. Some other networks, such as Hurricane Electric, have stricter requirements so approximately 80% of the I2 community qualified.

- b. The communities' adoption of RPKI RPAs has doubled to nearly 7%. A big increase but way short on the internet as a whole. Today the global Internet is approaching 40%.
- c. One of the big barriers to a larger uptake of ROAs is the lack of ARIN RSAs for about 50% of the communities' address assignments. I2 has been able to reduce the barriers to obtain an RSA for some networks.
- d. More networks have become MANRS Participants.

G. Upcoming challenges

- a. Helping more of the I2 communities' networks under RPKI ROA protection thereby gaining access to an authenticated IRR and publishing a network's ROAs.
 - i. Much of this is due to these being legacy assignments – from before ARIN issued RSAs (or before ARIN).
 - ii. ARIN has recently taken steps to really encourage networks bringing their legacy assignments under RSAs.
 - 1. If you register your legacy resources before the end of next year (CY2023) the yearly fee, regardless of how many resources you register, will be \$150. And it can only increase by \$25/yr after that.
 - 2. If you miss this window a /16 might cost \$4-8k/yr (dependent on how many other resources you have)
 - iii. ARIN recently updated the RSA so that the “no property rights clause” no longer is part of the RSA.
 - iv. There is still an issue that prevents many states from signing due to conflicts with state law. ARIN has always been willing to change the agreement to accommodate state laws. I2 is putting together a state by state repository of existing RSAs with state networks to facilitate smoothly working with ARIN to resolve.
- b. Route Reports need additional capabilities such as alerting networks when routes may be dropped due to policy.
- c. Expand routing integrity assessments.

H. Routing Integrity Assessment workshops

- a. Done via a self-guided questionnaire.
- b. A pilot program – currently no fee.
- c. It captures a snapshot of an organizations routing integrity capabilities.
- d. These will help I2 discover common challenges so that I2 can improve information on the topic.
- e. The questionnaire can be viewed at:

<https://docs.google.com/spreadsheets/d/1u2uAMu9AYich12eJqOvk3SiL0MZLWbnJxXubC9UibDg/edit#gid=1248924277>

Or contact Steve Wallace at MANRS@internet2.edu if you are interested in doing a workshop. I2 will help walk you through the questionnaire.

- f. The workshop can be done by either connectors or participants.
- I. Route Reports
 - a. Published reports can be seen at:
<https://github.internet2.edu/ssw/IRR-report/tree/master/Connectors>
Note: GPN is a particularly good example to look at.
 - b. Among items listed are the AS set the network uses to announce its policy, the list of networks I2 accepts from the network, are the listed networks covered by a ROA, does the routing information match what is published, is it covered by a RSA, MANRS participation, etc.

V. Operational Security Round Table: No updates were given.

VI. Network roundtable

- A. ESnet (Nick Buraglio & Dale Carder):
 - a. ESnet held its first ever ESnet Annual Meeting (Confab22) preceded by the ESnet6 Unveiling last week which went pretty well – good participation. All of ESnet was pretty proud of the moment when ESnet6 was unveiled. The automation pieces that ESnet has been working on for a while were highlighted with a demonstration. It showed what goes on behind the scenes. Portion of the sessions were recorded and are on YouTube.
 - b. ESnet has been putting a lot of effort into testing various IPv6 scenarios. ESnet is also participating in the larger Department of Energy (DOE) effort. Lots of data calls to determine what ESnet and DOE have and what should be addressed first. The testing has developed a good amount of information for connected sites (vs transit networks) on what works and what doesn't when operating without IPv4.
 - c. Beginning this winter ESnet will start the process of retuning some of its transponders. This comes about as part of the migration a lot of new transponders were used to support 100G links for ESnet5. With ESnet5 turned down, over time those will adjusted to support 400G links and added to the pool used by ESnet6.
 - d. ESnet hopes that it can publically share updates on its trans-Atlantic 400G upgrade plans at the LHCOPN/LHCONE meeting next week.
- B. DREN (Phil Dykstra):
 - a. DREN is in the midst of its transition from DREN III (CenturyLink/Lumen) to DREN 4 (Verizon).
 - b. DREN had hoped to be mostly done with the migration by this time but only about 10% of the sites have completed the move. The sticking point has been the security accreditation of Verizon personnel for infrastructure services – NOC staff, etc. Once the accreditation is completed sites can be quickly moved over.
 - c. There are transition gateways in San Diego, CA, and Dayton, OH, where DREN 3 and DREN 4 interconnect. DREN's internet transit service is completely on DREN

4 so all traffic to the outside goes via DREN 4 and most go via one of these two transition gateways.

- d. DREN continues to run its management plane 100% IPv6-only. A few internal services have had IPv4 removed. Ron Broersma continues to enforce the policy that if a company's web site doesn't support IPv6 DREN won't consider it.
 - i. As a note, underneath DREN 4's infrastructure is a private MPLS network running segment routing, VPNs, etc. using Cisco gear. On Cisco's advice DREN is using IPv4 10. private addresses for the MPLS layer. (Everything above is IPv6).
- C. Indiana University/International Networks: (Ed Moynihan & Jim Williams):
- a. With Jennifer Schopf moving to TACC Jim Williams was asked to rejoin to aid in the leadership transition.
 - b. All circuits remain stable.
 - c. On the Atlantic side Indiana University/International Networks (IU/IN) is installing the NetSage monitoring tools on the project's partner links. NetSage was deployed on KAUST's pair of 200G links (Amsterdam<>Jeddah and Jeddah<>Singapore).
 - d. Last month NORDUnet held its conference in Reykjavik, Iceland. NORDUnet is a partner in NEA3R. Through this partnership IU/IN continues to track the trans-Arctic fiber project, Far North. NORDUnet also held a separate workshop on the project in early Oct. Far North's targeted completion date is the end of 2025.
 - e. In Africa there has been a recent CEO change at the UbuntuNet Alliance. IU/IN will be at the Alliance's conference in Nov to understand how this change may affect the project, access to networks, etc.
 - f. The TransPAC circuits are up and stable including the GUAM<>Singapore which was down most of the summer, coming back online in September. IU/IN continues to lead the APOnet consortium where the NetSage tools are being deployed on the partner links. The deployment is very close to having NetSage on all the APOnet links.
 - g. IU/IN is preparing for SC. APOnet & TransPAC links are supporting a number of demos. It is also preparing for PTC'23 in January where IU/IN expects to learn more about the trans-Pacific 400G market.
 - h. IU/IN attended the very informative Global Research Platform meeting last week in Salt Lake City, UT.
 - i. In Guam GOREX seems to be running smoothly with the University of Guam team and Chris Zane and Garrett Yoshimi at the University of Hawaii.
- D. NASA/ESDIS (Kevin Kranacs): Not many changes – still steady state. Seeing a bit of an uptick in traffic as more and more science data migrates into the cloud (AWS).
- E. NASA/GSFC (Bill Fink): Continuing to work with Joe Mambretti and Jim Chen at Starlight along with Linden Mercer at NRL and the SCinet WAN team in getting ready for our demos at SC in Dallas. The links up between McLean, VA, and Starlight include 2x400G. GSFC is getting the needed VLANs in place - very glad to have the extra time this year.

- F. NRL (Linden Mercer): Also ramping up SC22, getting the needed VLANs and cross connects in place. Excited to have some really long 400G paths to run over. Looking forward to measuring what NRL 200G flows will look like on those long paths.
- G. PSC/3ROX/Access (Michael Lambert):
 - a. PSC/3ROX: No update today.
 - b. ACCESS (XSEDE): XSEDE, which was a layer 3 VPN on top of Internet2, has wrapped up. The functionality is migrating to CONNECTnet, part of the ACCESS project. A significant difference: IU's GlobalNOC did the heavy lifting for XSEDE. For ACCESS each site does it themselves.
- H. US Ignite (Glenn Ricart):
 - a. At 11:00 eastern on Thursday (20 October 2022) Digital Around the World is having a session on vision for 6G services. Glenn will be moderating and presenting. Other presenters will be Erickson, Northeastern University and the European Commission. The entire virtual conference is 24 consecutive hours.
 - b. US Ignite is continuing to work with states on how they are handling the distribution of broadband funding based on the outcomes described at last month's meeting.

VII. Exchange Points Round Table

- A. Ames (Bobby Cates): Nothing significantly new.
- B. StarLight (Joe Mambretti):
 - a. The Global Research Platform (GRP) Workshop took place last week in Salt Lake City, UT, where it was co-located with IEEE's International Conference on eScience. It was focused on cyber infrastructure to support large scale science – Square Kilometer Array, the future High Luminosity LHC, the Bell2 project, the deep underground neutrino experiment among others. GRP is about general cyber infrastructure but with a bias towards networking – SDNs, SDXs, high performance transport, automated networks using AI, international test beds, etc.
 - b. Next week there will be an in depth look at LHC networking at an experts meeting at CERN of LHCOPN/LHCONE.
 - c. SL, as are many others, is preparing for SC22. There is 1Tb SL<>the Joint Big Data Testbed in McLean, VA. Soon an additional 1Tb SL<>SC. Finally, 800G between McLean<>SC that Linden Mercer and Bill Fink are working on.
 - d. SL is leading, participating in or supporting about 25 demos at SC.
 - e. SL is working with Verizon to help with DREN 4 with a node slated for SL. Hopefully the lawyers will wrap up their discussions on the node in SL and the gear can be shipped to SL.

VIII. Continued discussion of the JET's potential tasking for CY2023

For reference, v 1.1 of the JET's potential CY2023 tasking is in the Appendix at the bottom of these minutes.

Also for reference, the administration's current priorities are at:

<https://www.whitehouse.gov/wp-content/uploads/2022/07/M-22-15.pdf>

- A. After a summary of where the discussion on potential tasking stood the floor was opened for further comments. There being none, v1.1 was accepted to be the JET's proposed tasking to be presented to the LSN at its Annual Planning Meetings.
Note: It will be presented to the LSN at its 8 November meeting.
- B. There was additional discussion on possible consequences on the drop in the participation by state networks and the impacts of the JET connecting with MSIs and under- and un-served communities.

Meetings of Interest 2022-2023

Note: Meetings whose format has changed have been updated.

Oct 17-19	NANOG 86 , Hollywood, CA
Oct 20-21	ARIN 50 , Hollywood, CA
Nov 5-11	IETF 115 , London, UK
Nov 13-18	SC22 , Dallas, TX
Nov 15	IPV6 & IPV6-only BoF at SC , Dallas, TX
Dec 5-8	Internet2 Technology Exchange , Denver, CO
<u>2023</u>	
Jan 15-18	PTC'23 , Honolulu, HI
Jan 25-26	HIC, Maui, HI
Feb 13-15	NANOG 88 , Atlanta, GA
Feb 13-17	APAN55 , Nepal
Feb 27-Mar 2	Supercomputing Asia 2023 , Singapore
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

Next JET meetings

Note: With the exception of next month it is anticipated that JET meetings will remain virtual for the foreseeable future

Nov 16, 2022	10:30 a.m. – 12 p.m. CT, Room A309-310, Kay Bailey Hutchison Convention Center Dallas, 650 S Griffin St, Dallas, TX. <i>n.b.:</i> This is conjunction with SC22 and will be held in person with remote access.
Dec 20, 2022	12-2 PM ET, virtual (<i>n.b.:</i> Held only if needed)
Jan 17, 2023	12-2 p.m. ET

Appendix: v1.1 of the Potential JET Tasking for CY2023

Ongoing JET Tasks

- Assist in the planning of technology and application demonstrations of SDN & Big Data at SC23.
- Technology tracking: perfSONAR, SDN/SDX/SDI, Science DMZs, network automation & orchestration, and Segment Routing.
- Hold two meetings collocated with R&E networking community conferences:
 - Internet2 Community Exchange (8-11 May)
 - SC23 (November - tentatively 12-17)
- Continue to schedule meeting round tables of updates on members' networks, operational network security, exchange points and meetings of interest to the community
- Continue coordinating the development of tools to monitor cross-domain workflows and automate the detection of transport issues. Additionally facilitate the sharing of measurement data between networks - anonymized as needed.
- Encourage participation from diverse communities, including those from disadvantaged and underrepresented groups. This has the goal of creating awareness and opportunities for equity of access, inclusion and the benefits of science and technology to a diverse communities. This would be done by a combination suggested contacts from the JET's participants, by utilizing NITRD's Minority Serving Institutions (MSIs) data base and the Women in IT Networking at SC (WINS) participants.
- Encourage and support JET participants to use their networking knowledge to provide expertise to projects connecting the unconnected in the communities they serve and to enhance the connections of those who are under-served. This will help provide opportunities for inclusion and equality of access to the benefits of science & technology.
- Track members' steps on transitioning to IPv6-only over the next 3 years (end of FY2025).

Potential JET Workshop: TBD