



### 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

June 21, 2022, 12:00-2:00 p.m. ET

This meeting was held virtually

#### Participants

Shawn Armstrong, University of Alaska  
Rich Carlson, DOE/SC  
Basil Decina, NRL  
Eric Estes, NOAA  
Alex Hsia, NOAA  
Jonah Keough, PNWGP/Pacific Wave  
Bill Fink, NASA/GSFC  
Yatish Kumar, ESnet  
Michael Lambert, PSC/3ROX

Paul Love, NCO/NITRD  
Joe Mambretti, StarLight/MREN  
Ralph McEldowney, DOD/DREN  
Brenna Meade, Indiana University  
Linden Mercer, NRL  
Aruna Muppalla, NASA/GSFC  
Mark Mutz, NOAA  
Amy Philipson, PNWGP/Pacific Wave  
Steve Wallace, Internet2

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

#### **I. Action Items:**

- Final updates from Internet2 and ESnet on their respective new networks.

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

#### **III. DREN 4 Overview and Implementation Status – Ralph McEldowney**

- A. DREN Mission & Vision is to support the Department of Defense's (DOD) Research, Development, Test and Evaluation (RDT&E) and Acquisition Engineering communities with a versatile, low-latency and high-throughput communications network by removing the impact of distance.
- B. Why a DOD RDT&E network?
  - a. Evaluate prototypes & new concepts that may occasionally cause outages while retaining high availability (completely separate from operational networks).
  - b. The Defense Research and Engineering Network (DREN) is easily reconfigurable.
  - c. Performance characteristics are visible.
  - d. High bandwidth for very large file transfers (100s of GB).
  - e. Low latency and jitter for test events.
  - f. DREN connects the DOD science & technology community to DOD's supercomputer centers. It also serves to interconnect that community.

- C. Comparisons between DREN III and DREN 4
  - a. Backbone:
    - i. DREN III has a 100Gbps MPLS backbone over shared circuits.
    - ii. DREN 4 will initially have a 100Gbps backbone over dedicated circuits. It is able to grow to Nx400Gbps.
  - b. User connections:
    - i. DREN III provides 50 Mbps to 40 Gbps.
    - ii. DREN 4 will provide 1 Gbps to Nx400 Gbps. Initially there will six sites at 100G.
  - c. DREN 4 will provide approximately 3x the aggregate bandwidth as DREN III.
  - d. Both fully support IPv6 and multicast.
  - e. Both are described as an “IPv6 network with support for legacy IPv4”.
  - f. Both have an IPv6-only management network.
  - g. Services offered:
    - i. Both provide IP and Ethernet services.
    - ii. DREN III offered optical services, DREN 4 does not.
    - iii. Neither offers ATM.
    - iv. DREN 4 uses MACsec encryption for all traffic in transit over the backbone.
  - h. Pricing:
    - i. DREN III is a firm fixed price (FFP) contract for over 260 locations worldwide.
    - ii. DREN 4 has FFP bandwidth based pricing for all CONUS and Hawaii locations, and unique FFP pricing for other worldwide locations.
  - i. DREN 4 has approximately doubled the number of sites where it has peering and internet transit.
- D. DREN 4 Performance Work Statement
  - a. Completely rewritten for DREN 4.
  - b. Architecture designed around an intelligent core.
    - i. With the intelligent core DREN can now control the core of the network, not just the edge as in previous DRENs using DREN Core Nodes.
  - c. Increases in bandwidths, security and encryption.
  - d. New functions for compute/storage, firewalls, and virtualization and orchestration.
  - e. Greatly reduced install times yielding increased agility for installations that are time sensitive or unique.
- E. Cloud connectivity
  - a. DREN provides high performance transport to cloud service providers (CSP) for RDT&E enclaves. It is CSP agnostic. It isn’t a compute/storage cloud broker.
  - b. CSPs must support DOD and DOD’s High Performance Computing and Modernization Program’s (HPCMP) security requirements.
  - c. Current connectivity:
    - i. AWS Direct-Connect supports all GovCloud regions.
    - ii. Azure ExpressRoutes supports all GovCloud and DOD regions.

- d. Cloud access options:
  - i. Layer 2 extension of accredited enclaves into Virtual Private Cloud containers. Extends the enclave's DNS domain, address space and security accreditation.
  - ii. Layer 3 for newly created enclaves within the cloud across a Boundary Cloud Access Point (BCAP). The enclave must follow all of DISA's cloud architecture and security guidelines. The BCAP is to protect DREN rather than the assets in the cloud.
- e. DREN may add additional CSP connections once DREN 4 is operational.
- F. Current status: Verizon has built out nearly all of the backbone sites. The required Initial Performance Capability testing is expected to complete in the next two-three weeks.
- G. Target for completion of cutover from DREN III to DREN 4: December 16, 2022.
- H. Discussion:
 

Question: Where does quantum networking/security fit into DREN's plans?

Answer: All DREN contracts have a provision for a Technical Insertion Proposal. If DREN or Verizon comes up with something related to quantum networking/security this would be the mechanism to add that capability to the contract and network.

#### V. 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.

The related, live map is at: <https://www.globalresearchmap.org/>

- A. The project continues to have slow progress. KAUST is now reflected in the Global Research Map.

#### VI. Operational Security Round Table

- A. Internet2 (Steve Wallace): Internet2's (I2) experience with RPKI ROAs and signing ARIN agreements for its legacy resources. For reference, please see this page: <https://docs.google.com/document/d/1iUp5NftBgCih9dNFFED95545bpTXQWBtQpUPmKn3h90/edit>
  - a. The I2 community has about 2,200-2,300 direct allocations from ARIN. About 55% of those are legacy addresses without an ARIN agreement. That means they can't take advantage of RPKI ROAs, ARIN's authenticated IRR, or reverse DNSSEC.
  - b. I2 found that of these 1000 or so legacy allocations the owner for a couple of hundred had a current agreement (RSA v12) with ARIN for something else.
  - c. I2 has worked with ARIN so that holders of a current agreement can add their legacy allocations to the existing agreement by way of an addendum.
  - d. A question for agencies with legacy allocations: Do you have a strategy for addressing this so that RPKI, etc. becomes available? Can we work together on this as the I2 community has many members in the same situation?
    - i. A related item. ARIN has agreed that if I2 organizes a community discussion on the agreement using language that is more accessible public sector it'll participate.

- e. Discussion:
  - i. N-Wave has been working to get all the legacy allocations under the N-Wave allocation into compliancy. Initial agreement was a bit of a challenge but with the initial agreement in place handling subsequent allocations became much easier. N-Wave is now embarking on getting all of its downstream customer allocations into compliance.
- f. In looking at prefixes the use of RPKI ROAs within the academic community is about 5-6%. For the commercial internet about 35-36%.
- g. Question: Is there any reason to create ROAs if your upstream provider doesn't validate?  
 Answer: The creation of a ROA is the responsibility of the resource owner. Even if a network's up-streams aren't doing route origin validation. Even if a direct upstream isn't doing validation, most Tier 1 providers are so having a ROA will give protection.
- h. Question: How many providers are doing route dropping based on validation?  
 Answer: See <https://isbgpsafeyet.com/> for a current listing. About a year ago I2 posted a question to the NANOG list about it starting to drop based on a ROA resolving as invalid – should they allow it to be exceptioned? The Tier 1 replied no as they didn't permit exceptions. (I2 hasn't yet implemented this.)

## VI. Network roundtable

- A. NASA/GSFC (Bill Fink): Continuing to work with Joe Mambretti and Jim Chin at StarLight and Linden Mercer, et al at NRL on how to use the 800G ring the SCinet WAN is planning (see VI. F below). It is also working with Joe and Linden on the early available of 100G circuits between the Joint Big Data Testbed space in McLean, VA, and StarLight for testing before SC22.
- B. NOAA (Mark Mutz): N-Wave is wrapping up its 400G backbone upgrade. All installations are complete. Several of the Internet2 provided 400G circuits are tested and up. A couple remain to be accepted. Target for completion is early July.
- C. NRL (Linden Mercer): As Bill mentioned, Supercomputing preparations are going forward.
- D. Pacific Wave (Jonah Keough):
  - a. Pacific Wave (PW) is continuing to work on route server deployments. TransPAC is the initial partner to test.
    - i. Question: What software is PW using for the route servers?  
 Answer: Juniper's software.
  - b. PW is also doing some prep for SC22 as two circuits will have an end point in Seattle.
- E. PSC/3ROC/XSEDE (Michael Lambert): Nothing new to report this month.
- F. SC22/SCinet WAN (Brenna Meade):  
 For reference see map below. Note: Map has been updated and is current as of July 12.
  - a. Approximately 3.22T aggregate is currently planned into SC this year. (Update: as of July 12 the total is approximately 4.1T.)

- b. Current WAN providers are Internet2, ESnet and Verizon. There are ongoing talks with two other possible providers.
  - c. Of particular note is a planned 800G (2x400G) ring between SC22, StarLight, and the Joint Big Data Testbed in McLean, VA, provided by ESnet and Internet2
  - d. Also planned are WAN connections to Los Angeles, CA, (1x400G), Seattle, WA, (2x100G) and University of Texas, Dallas/LEARN (2x100G).
  - e. There will be three commodity connections (2x10G, 1x100G). ESnet and Internet2 are each providing 1x400G on their routed services.
  - f. The Network Research Exhibits (NRE) team has received 28 proposals have been submitted with more still coming in.
  - g. Question: Where is the IP space and ASNs coming from?  
Answer: SCinet has its own ASN. Part of the NRE process is facilitating the needed VLANs and IP space from the researchers.
- G. University of Alaska (Shawn Armstrong): Hope to be able to give an update next month on the plans for the new Intra- and inter-state WAN circuits for the university.

#### VII. Exchange Points Round Table

- A. Ames (Bobby Cates via email): Slow progress with both the DREN transition and the USGS migration.
- B. PNWGP (Jonah Keough): No update today.
- C. StarLight (Joe Mambretti):
  - a. As mentioned, StarLight (SL) is working with the SCinet WAN team and the folks from GSFC and NRL to build the testbed.
  - b. SL is also working with various groups on experiments making use of the WAN infrastructure. One of SL's focus for SC is 400G switching and 400G DTNs.
  - c. Working with Tom Lehman, SL is having good success building out the AutoGOLE/SENSE global ring. Good discussions about this during TNC with KAUST and Singapore.
  - d. Working with DREN on its transition from DREN III to DREN 4 at SL.

#### **Meetings of Interest 2022**

*Note: Meetings whose format has changed have been updated.*

Jul 23-29	<a href="#">IETF 114</a> , Philadelphia, PA
Aug 22-26	<a href="#">APAN54</a> , Jinan, China, primarily virtual with possibly limited local attendance
Sep 19-21	<a href="#">National Science Foundation Campus Cyberinfrastructure PI Workshop</a> , Minneapolis, MN
Sep 20-22	<a href="#">The Quilt Fall Meeting</a> , Minneapolis, MN
Oct 10-11	<a href="#">Global Research Platform Workshop</a> , Salt Lake City, UT
Oct 11-14	<a href="#">ESnet Annual User Meeting</a> , Berkeley, CA
Oct 17-19	<a href="#">NANOG 86</a> , Hollywood, CA
Oct 20-21	<a href="#">ARIN 50</a> , Hollywood, CA
Nov 5-11	<a href="#">IETF 115</a> , London, UK

Nov 13-18	<a href="#">SC22</a> , Dallas, TX
Dec 5-8	<a href="#">Internet2 Technology Exchange</a> , Denver, CO
<b>2023</b>	
Jan 15-18	<a href="#">PTC'23</a> , Honolulu, HI
Feb, dates TBA	<a href="#">APAN55</a> , Nepal
Feb 13-15	<a href="#">NANOG 88</a> , Atlanta, GA
Mar 25-31	<a href="#">IETF 116</a>

**Next JET meetings**

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

Jul 19, 2022	12-2 p.m. ET
Aug 16, 2022	12-2 p.m. ET
Sep 20, 2022	12-2 p.m. ET

# Preliminary WAN Bandwidth Map

