

NEAAR

Award #1638863

Year 1 Annual Report

1 September 2016 through 31 May 2017

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Summary

During the first project year, the Networks for European, American, and African Research (NEAAR) project set up its initial link and established the starting collaborations for the project. This report outlines collaborations, science engagement, operational activities, and usage statistics for the project. It covers the period of September 1, 2016 to May 31, 2017.

1. NEAAR Overview

The Networks for European, American, and African Research (NEAAR) project supports circuits and network services between the US East coast and Europe, in addition to extensive training and science engagement activities to support US collaborations with researchers in Europe and Africa. The NSF funded network for this project is a 100G circuit between New York (ManLan) and London (GEANT Open Exchange). In addition, GEANT runs a sister circuit that is a 100G between ManLan and Paris. These circuits are used in production to support a wide variety of science applications and demonstrations of advanced networking technologies. In addition, the NEAAR award supports science engagement, measurement deployments, training workshops, and security activities.

2. Staffing

In Year 1, the NEAAR project supported the following staff members at IU:

- Jennifer Schopf, Director
- Andrew Lee, International Networks architect
- Predrag Radulovic, Science Engagement Specialist
- Scott Chevalier, perfSONAR specialist
- Ed Moynihan, Science Engagement Specialist

We are investigating the possibility of hiring a local, French speaking perfSONAR expert to assist with the perfSONAR training workshops, especially in French-speaking parts of West Africa.

3. Travel and Training

NEAAR staff participated in various meetings to support their role in collaborations in Europe and Africa. Most of these trips were funded by other sources. In Year 1, these included:

- Radulovic attended the LHCONE meeting held in Helsinki, Finland, on September 20 and 21, collocated with the Nordunet conference. The focus of this meeting included a push for IPv6 deployment and performance mesh, discussion of the approval process for projects joining LHCONE, and various evaluations of cloud services that could potentially be used by the community. NEAAR will support end-user LHC applications as needed. Radulovic spoke to Harvey Newman, Edoardo Martelli, Hsin-Yen Chen, Damir Pobric, and Michael O'Connor about ongoing projects and support. He followed-up with Rob Gardner from the University of Chicago (UC) about performance issue between UC and Italy.
- Schopf and Addleman attended the Internet2 Technology Exchange Meeting in Miami September 25-28. They participated in the Africa SIG meeting as well as side meetings with NEAAR collaborators.
- Lee attended the GLIF meeting September 27-30, 2016 in Miami.
- Schopf attended the UbuntuNet Connect meeting in Entebbe, Uganda, November 3-4. https://www.ubuntunet.net/uc2016_call_for_paper . She also attended several side meetings in order to put in place the planning and groundwork for the NEAAR project.
- Schopf, Lee, Radulovic and Chevalier attended SuperComputing 2016 in Salt Lake City November 13-18, 2016. They held several meetings with our partners including APAN-JP, Pacific Wave and others. Chevalier continued to support the perfSONAR analysis and use as a member of the SCInet measurement team.
- Schopf met with Christopher Whalen at NIH to discuss future collaborations with NIH-supported clinical work in Africa.
- Schopf and Radulovic attended the Winter ESIP meeting in Bethesda, Maryland on January 11-13. This meeting was in part to coordinate with geoscience researchers sharing data internationally who might be using the NEAAR circuit.
- In January, Schopf and Lee attended the Pacific Telecommunications Council meeting in Honolulu on January 15-18, 2017 <https://www.ptc.org/ptc17/> where they met with the AquaComm team, owners of the AEConnect cable which won the bid for the NEAAR circuit.
- Schopf and Radulovic, along with members of the ESNet Science Engagement Team, spent a day with Camille Crittenden at UC Berkeley to discuss future collaborations on science engagement.
- Schopf and Chevalier attended the January perfSONAR planning meeting held at LBNL on January 24-25.
- Schopf and Radulovic attended the Quilt Regional Networking winter meeting in San Diego on February 7-9 <http://www.thequilt.net/public->

[event/2017-winter-member-meeting-february-7-9-2017-la-jolla-ca/](#). Schopf and Jason Zurawski, ESNet, lead a half day session on engaging end user scientists.

- Schopf attended the WACREN annual meeting in Abidjan, Ivory Coast, on March 28-31. There, she met with project participants and gave an overview of the NEAAR project. Initial planning for some of the perfSONAR training workshops took place.
- Schopf and Moynihan attended the Internet2 Global Summit on Washington, DC, on April 23-27. This included a meeting of the IRNC PIs that Lee also attended.
- Chevalier and Jason Zurawski, ESNet, lead two perfSONAR training sessions for SANREN in South Africa on May 2-6. They also took this opportunity to reach out to SANREN staff to make links to assist with science engagement going forward.
- Schopf, Lee, and Moynihan attended TNC in Austria on May 29-June 1. A meeting of the NEAAR PIs were held, and some basic coordination for the year took place. Moynihan also met with the SANREN and GEANT science engagement teams.

One of the primary deliverables for the NEAAR project is that of perfSONAR training for the three African RENS. In Year 1, one session was held in South Africa, sponsored in part by SANREN, in a partial attempt to train some local trainers to assist with future work. Two additional workshops are planned for the first half of Project Year 2, one to be held in Accra, Ghana, in October to support WACREN, and a second single day introductory session to be held in conjunction with the Ubuntunet Connect meeting in Addis, Ethiopia, in November.

4. Science Engagement Activities

Our Science Engagement team began an effort to better understand and document the scope of relevant international science collaborations that are using or are potentially in need of NEAAR resources. This included building databases of international science initiatives, identifying and reaching out to prioritized researchers and scientists, and working with partners to begin addressing network performance issues. The team also worked with NEAAR partners to document the current state of advanced networking capabilities in Africa and to coordinate existing science engagement efforts underway in Europe and Africa. This initial outreach is helping us understand current network performance and allowing us to focus our future engagement efforts. Below are examples of year 1 engagements with international science collaborators.

Academic Model Providing Access to Healthcare (AMPATH) – AMPATH is a consortium of North American academic health centers working in partnership with the Government of Kenya to collaboratively improve health services, partake in health research, and develop leaders in health care in the United States and Kenya.

More information on the collaboration can be found at <http://www.ampathkenya.org/our-partners/consortium-members/>. Our Science Engagement team worked directly with the IT team at AMPATH and introduced them to the leadership of the Kenyan Research and Education Network (KENET). These discussions led to AMPATH becoming a member of KENET and moving most of their data transfers from commercial networks to KENET. Discussions continue on how to connect AMPATH sites in more remote areas of Kenya.

AgReach and Njala University - AgReach is a new, USAID-funded international agricultural extension program based at the University of Illinois-Urbana Champaign. Our team worked with AgReach and the Sierra Leone Research and Education Network (SLREN) to identify ways to improve connectivity to the AgReach facilities at Njala University in Freetown. We are also working with SLREN to develop use cases in Sierra Leone to help SLREN make the case for sustainable funding for their domestic research network and for their participation in the EC-funded AfricaConnect2 project.

Hydrogen Epoch of Reionization Array (HERA) and the University of California - HERA is an NSF-funded radio telescope located in the Karoo Desert in South Africa. Over the last year, our team has facilitated and participated in discussions between researchers at the University of California and networking engineers at the South African Research and Education Network (SANREN) and the Square Kilometer Array South Africa.

South African Tuberculosis Bioinformatics Initiative (SATBBI) - SATBBI is a new initiative led by Stellenbosch University in South Africa to foster bioinformatics support for collaborative tuberculosis research. We are working with our partners in South Africa to ensure that collaborating scientists are aware of the networking resources available to them and to look at data transfer performance to and from SATBBI and multiple universities in the US.

The Low-Frequency Array (LOFAR) and George Washington University (GWU) - LOFAR is a radio astronomy project operated by ASTRON (the Netherlands Institute for Radio Astronomy) with distributed sites around the world. A physics professor at GWU needed to move 40TB of data from ASTRON to his home campus in Washington, DC, but wasn't getting the expected performance. Our team brought together representatives from SURFnet (the Dutch NREN), ASTRON, and GWU to look at the current performance and to discuss ways it could be improved. We also worked with SURFnet to promote the use of Science DMZs at ASTRON and other LOFAR facilities.

5. Additional Collaborations

The primary collaborators for the NEAAR project are GEANT, representing European interests, and the three regional R&E networks in Africa. In Year 1,

the first priority was to put in place a 100G circuit to replace the existing ACE circuits as that project was ending, so the primary coordination has been with Stover, as GEANT representative. Leading into Year 2, we will be organizing bi-weekly calls across the 5 main partners to better coordinate projects.

Collaboration with the IRNC AMIS awardee, NetSage, is moving forward successfully. Data for the NEAAR circuit is archived in the NetSage framework, including SNMP, perfSONAR, and flow data. The New York exchange point site included rack space for monitoring equipment, and both a perfSONAR node and a Tstat collection device are up and running.

The IRNC NOC continues to provide Tier 1 support services including monitoring the state of the NEAAR circuit and the installed equipment in New York. Using NEAAR funding, the IU GlobalNOC supplies Tier 2 and Tier 3 services for the project.

6. Circuit Status and Performance

The RFP for a 100G circuit between the US and Europe took place in September 2016. Six bids were received, with the one from AEConnect coming in at the lowest price and with a route that was diverse from existing R&E routes across the Atlantic. The end points for the circuit are ManLan, New York, for the US end and the London Open Exchange, by way of Dublin, on the EU end. Per discussions with GEANT, when the GEANT 100G backbone extends between Dublin and London, the NEAAR circuit will change its termination point to Dublin.

Initial work to put this circuit in place took place in December, 2016, but it was not fully operational until April. In addition, full monitoring of the circuit did not come online until July 2017.

A. Traffic Graphs

Figures 1 and 2 show the traffic on the NEAAR 10G Circuit between ManLan and the London Open Exchange during the period that data is available for the circuit, March 1, 2017 – May 31, 2017. Figures 3 and 4 show the traffic on GEANT’s sister circuit for the NEAAR project, a 100G link between ManLan and Paris.

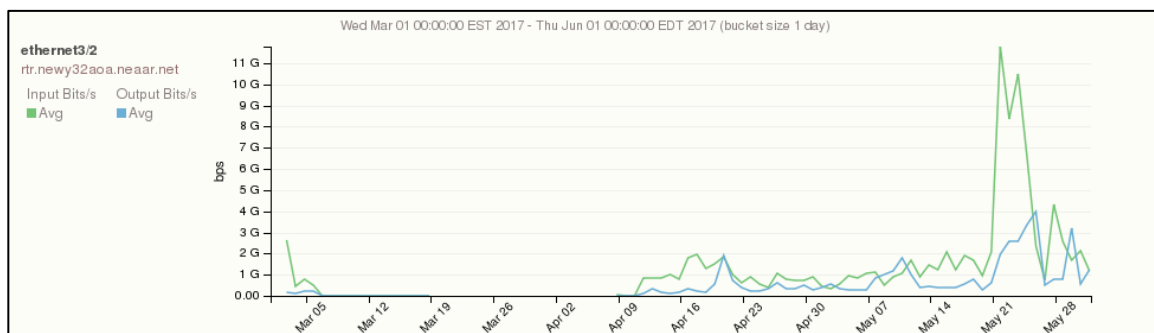


Figure 1: Aggregated traffic using smoothed daily averages on the 100G NSF-funded ManLan-London circuit for March 2017 to May 2017.



Figure 2: Aggregated traffic using smoothed daily maximums on the 100G NSF-funded ManLan-London circuit for March 2017 to May 2017.

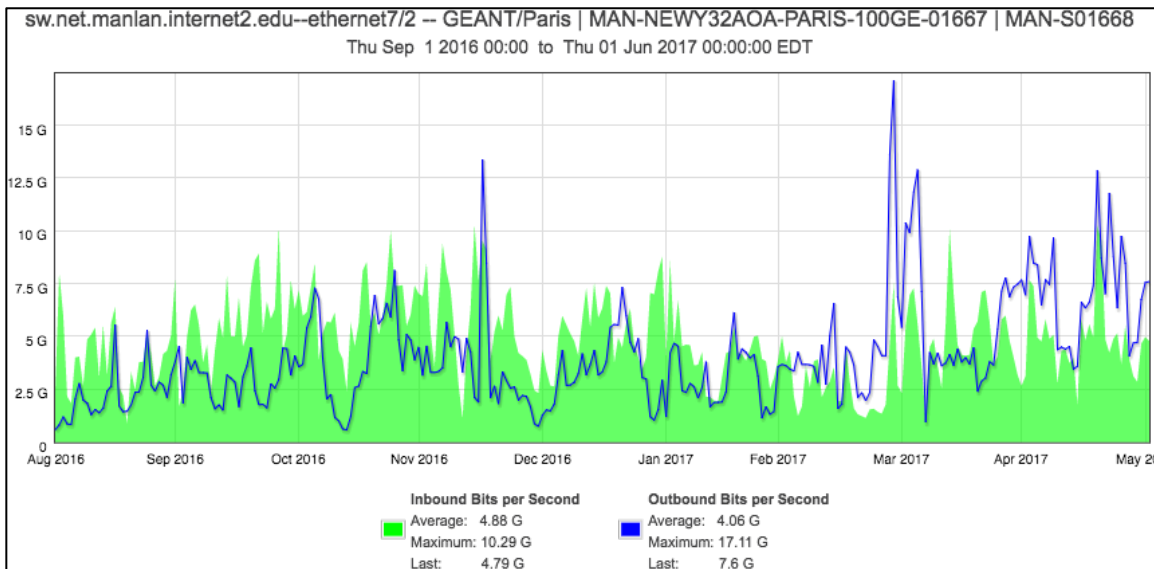


Figure 3: Aggregated traffic using smoothed daily averages on the 100G GEANT-funded ManLan-Paris circuit for August 2016 to May 2017.

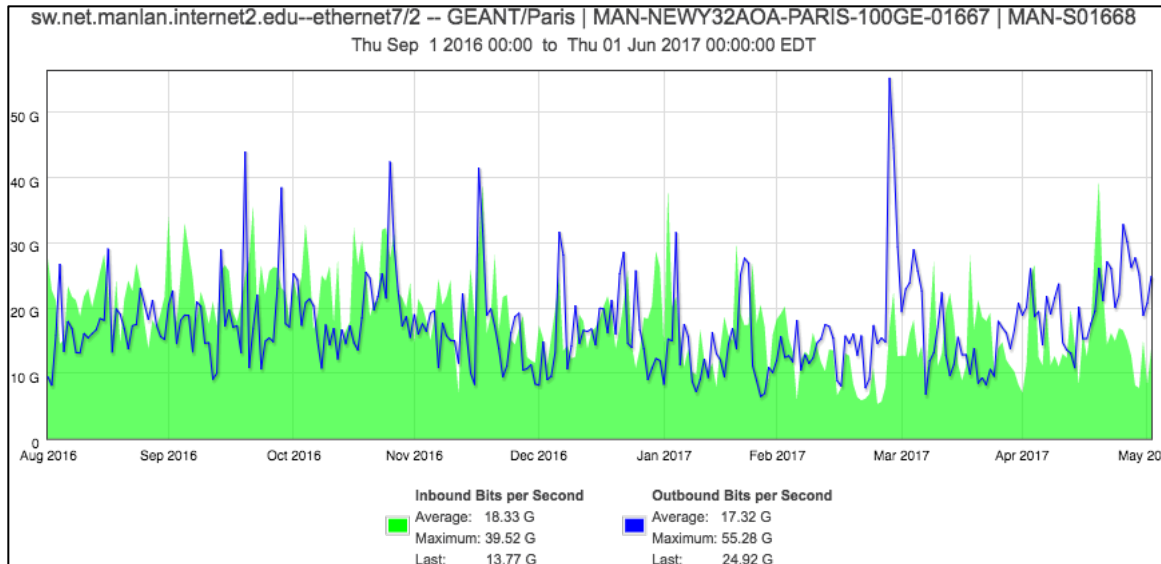


Figure 4: Aggregated traffic using smoothed daily maximums on the 100G GEANT-funded ManLan-Paris circuit for August 2016 to May 2017.

B. Trouble Tickets

During Year 1, there were two scheduled maintenances and sixteen unscheduled outages. Many of these had to do with the startup of the circuit costs. Details are given in Tables 1 and 2.

Table 1: Scheduled maintenance for NEAAR equipment and circuits, September 1, 2016 - May 31, 2017.

Ticket Number	Customer Impact	Network Impact	Title	Maint Type	Source Of Impact	Start Time (UTC)	End Time (UTC)
53	3-Elevated	2-High	Maintenance Completed - NEAAR Backbone NEWY32AOA-LOND	Circuit	Vendor	04/21/2017 2:20 PM	04/21/2017 2:35 PM
71	3-Elevated	2-High	Emergency Maintenance Completed 2 of 2 - NEAAR Backbone NEWY32AOA-LOND	Circuit	Vendor	05/18/2017 1:47 AM	05/18/2017 1:59 AM

Table 2: Unscheduled Outages for NEAAR equipment and circuits, September 1, 2016 - May 31, 2017.

Ticket Number	Customer Impact	Network Impact	Title	Outage Type	Source Of Impact	Start Time (UTC)	End Time (UTC)
13	2-High	2-High	Outage Resolved - NEAAR Backbone NEWY32AOA-LOND	Circuit - Damaged Fiber	Vendor	03/01/2017 10:29 AM	03/01/2017 9:20 PM

15	2-High	2-High	Instability Resolved - NEAAR Backbone NEWY32AOA-LOND	Hardware	Vendor	03/02/2017 12:03 AM	03/06/2017 5:18 PM
						03/06/2017 6:27 PM	03/09/2017 7:22 PM
18	2-High	2-High	Outage Resolved - NEAAR Backbone NEWY32AOA-NEW32AOA to MANLAN	Hardware	Internal	03/07/2017 3:41 PM	03/17/2017 10:33 PM
26	2-High	2-High	Outage Resolved - NEAAR Backbone NEWY32AOA-NEW32AOA to MANLAN	Unannounced Maintenance	Vendor	03/22/2017 4:13 AM	03/22/2017 6:23 AM
36	2-High	2-High	Outage Resolved - NEAAR Backbone NEWY32AOA-LOND	Hardware	Vendor	04/06/2017 11:06 PM	04/06/2017 11:21 PM
42	2-High	2-High	Outage Resolved - NEAAR Backbone NEWY32AOA-LOND	Hardware	Vendor	04/07/2017 5:56 AM	04/11/2017 7:58 PM
40	2-High	2-High	Outage Resolved - NEAAR Interconnect to MANLAN	Unannounced Maintenance	Internal	04/10/2017 4:17 PM	04/10/2017 6:16 PM
						04/10/2017 8:55 PM	04/10/2017 9:01 PM
49	4-Normal	2-High	Brief Outage Resolved - NEAAR Backbone NEWY32AOA-LOND	Unannounced Maintenance	Vendor	04/13/2017 3:50 PM	04/13/2017 3:51 PM
54	4-Normal	2-High	Brief Outage Resolved - NEAAR Backbone NEWY32AOA-LOND	Unannounced Maintenance	Vendor	04/24/2017 10:59 PM	04/24/2017 11:01 PM
55	4-Normal	2-High	Brief Outage - NEAAR Backbone NEWY32AOA-LOND	Undetermined	Undetermined	04/26/2017 2:46 AM	04/26/2017 2:47 AM
65	2-High	2-High	Availability - NEAAR Backbone NEWY32AOA-LOND	Undetermined	Undetermined	05/09/2017 5:05 AM	05/09/2017 5:16 AM
						05/10/2017 3:01 PM	05/10/2017 3:22 PM

66	4-Normal	2-High	Brief Outage Resolved - NEAAR Backbone NEWY32AOA-LOND	Unannounced Maintenance	Vendor	05/11/2017 9:27 PM	05/11/2017 9:40 PM
67	4-Normal	2-High	Brief Outage Resolved - NEAAR Backbone NEWY32AOA-LOND	Circuit - Bumped Fiber	Vendor	05/13/2017 2:58 AM	05/13/2017 3:04 AM
72	4-Normal	2-High	Brief Outage Resolved - NEAAR Backbone NEWY32AOA-LOND	Circuit - Damaged Fiber	Vendor	05/16/2017 11:07 AM	05/16/2017 11:26 AM
73	4-Normal	2-High	Brief Outage Resolved - NEAAR Backbone NEWY32AOA-LOND	Circuit - Bumped Fiber	Vendor	05/18/2017 4:45 PM	05/18/2017 4:50 PM
75	4-Normal	2-High	Brief Outage - NEAAR Backbone NEWY32AOA-LOND	Unannounced Maintenance	Vendor	05/20/2017 1:49 AM	05/20/2017 1:57 AM

C. Downtime and Availability

Table 3 shows the reported downtime for core nodes on the project. Table 4 lists the downtime for the projects circuits. There were significant outages of the core backbone as part of the startup process.

Table 3: Downtime and availability for NEAAR core nodes.

NEAAR Core Nodes	Down Time	Reporting Period Avail.	52 Week Avail.
rtr.newy32aoa.neaar.net	0 hr 0 min	100%	100%
Aggregate NEAAR Core Nodes	0 hr 0 min	100%	100%

Table 4: Downtime and availability for NEAAR circuits.

NEAAR Backbone Circuits	Down Time	Reporting Period Avail.	52 Week Avail.
NEAAR-NEWY32AOA-LOND-100GE-01500	309 hr 12 min	95.28%	96.48%
NEAAR-NEWY32AOA-NEWY32AOA-100GE-01501	251 hr 7 min	96.17%	97.14%
Aggregate All NEAAR Backbone Circuits	560 hr 19 min	95.72%	96.81%

7. Measurement Activities

A. PerfSONAR

The NEAAR project supports a perfSONAR deployment at the ManLan endpoint of the NEAAR circuit that provides periodic testing between several US and European sites. NEAAR participates in the IRNC mesh available at <http://data.ctc.transpac.org/maddash-webui/index.cgi?dashboard=IRNC%20Mesh>.

Separate from monitoring our own circuit, one of the goals of the NEAAR project is to support the use of perfSONAR broadly across Europe and Africa. PerfSONAR training is discussed in Section 3, above. We also participate in the production perfSONAR consortium, which oversees the production development and support of the perfSONAR toolkit. Chevalier leads the training group, and during Project Year 1 participated in several perfSONAR events as well as updated the perfSONAR training materials to be compatible with the most recent 4.0 release.

B. Flow Data

Going forward, NEAAR will be collecting both sampled and unsampled flow data regarding the use of the 100G link between MAN LAN and London. However, the equipment to collect this data was not fully operational during project Year 1, and so it is not included in this report. De-identified versions of the data will also be shared with the IRNC NetSage project.

8. Security Events and Activities

Basic security measures are being maintained, and there were no security incidents to report for this quarter. A security plan is being developed jointly with the IN@IU Security Officer, Hans Addleman. These documents will include a Master Information Security Policy and Procedures document, Network AUP, Netflow and Data Privacy statement, Information Classification and Inventory, and an Incident Response Document. We will be reviewing these documents with CACR over the next 6 months.

9. Reporting against Objectives for Year 1, Planning for Year 2

Below is the list of WBS items for Year 1 and 2, and their current status.

- 1 Planning for Technology
 - 1.1 Research best new paths and end points
Completed
 - 1.2 RFP for 100G US-EU circuit
Completed
 - 1.3 Contracts associated with circuit
Completed
 - 1.4 Exchange Point in Lagos-planning

- 1.5 Delayed until Year 2, due to delays with circuit procurement
Discussion of London Open Exchange connections
Ongoing
- 2 Operations
 - 2.1 Testing and acceptance of new 100G US-Eu link
Completed
 - 2.2 Exchange point
Delayed until Year 2 due to delays in circuit procurement
 - 2.3 Operate Infrastructure
Ongoing
 - 2.4 Coordinate with IRNC:NOC winner
Ongoing
 - 2.5 Coordinate with IRNC:AMI winner
Ongoing
- 3 Measurement and Monitoring- EU circuit
 - 3.1 PS nodes for 100G EU put into IRNC PS mesh
Completed - New York node added to IRNC PS mesh
 - 3.2 Flow data collection from 100G
Delayed due to equipment issues in New York, will begin in Year 2
- 4 Measurement and Monitoring- African Regional RENs
 - 4.1 Small PS node class for Ubuntunet Alliance- S. Africa
Complete May 2017
 - 4.2 Small PS node class for ASREN Early 2018?
Possible for Year 2 - current plan is for ASREN members to participate in other workshops in the meanwhile
 - 4.3 Small PS node class for WACREN- Ghana, Oct 2017
Planned
 - 4.4 Small PS node class for Ubuntunet Alliance - Ethiopia Nov 2017
Planned
 - 4.10. Help support UA PS mesh
To be discussed at November training
 - 4.11 Help support ASREN PS mesh
Possible topic for Year 3
 - 4.12 Help support Wacren PS mesh
Planned as part of October training
- 4 Outreach
 - 4.1 Attend domestic and international conferences for application identification and relationship maintenance
Ongoing
 - 4.2 Outreach to science applications based on NetFlow information
Planned for Year 2
 - 4.3 Outreach to science applications based on NSF funding data

- Started in Year 1
- 4.4 Coordination of science engagement
Ongoing

 - 5 Project Coordination
 - 5.1 Project Management
Ongoing
 - 5.2 Project Reporting
Ongoing
 - 5.3 Partner MOU process
MOUS may not be needed
 - 5.4 Form External Advisory Council
Ongoing