TransPAC3- Asia US High Performance International Networking
(Award #0962968) Quarterly Report
1-September-2014 through 30-November-2014

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(Prepared by Jennifer Schopf, Alice Jackson)

Summary

During the quarter of September 1, 2014 through November 30, 2014, the TransPacific Asia-US High Performance International Networking project (TransPAC) continued its collaborative and engineering activities to support international science. This report outlines collaborations, software and systems work, operational activities, and usage statistics for the project. Highlights include participation of a full time network engineer, several presentations at meeting, and a small amount of project refactoring due to budgetary information.

1. TransPAC Overview

The TransPAC project supports three circuits and a set of network services between the US West coast and Asia. In the current set up, these circuits are:

- The **TransPAC Circuit:** a10Gbps link between Los Angeles, California, and Tokyo, Japan. This is the primary, NSF-funded circuit for the project and used for the bulk of the production project network bandwidth.
- The **JGN-X Circuit:** a 10Gbps layer-2 circuit, largely used for experiments and Software Defined Networking (SDN) trials. The Japan Gigabit Network Extension (JGN-X) project is a testbed funded by the Japanese National Institute of Information and Communications Technology (NICT) (http://www.nict.go.jp/en). This link is not supported by NSF funds. A backup routed peering connection between TransPAC and APAN also runs across this link.
- The **CERNET circuit**: a 10Gbps link between Los Angeles, California, and Beijing, China, which is only partially funded by NSF. This is a layer3-only connection at this time.

These circuits are used in production to support a wide variety of science applications and demonstrations of advanced networking technologies. In addition, the TransPAC award supports tool development, SDN experimental work, measurement deployments, and security activities.

Please note that some of the activities (outreach to Africa, PerfSONAR training, etc.) are also included in the ACE quarterly report project, as appropriate, as joint funding supports these efforts.

2. Financials

This quarter, Schopf was finally able to get a fully updated accounting of the TransPAC3 project financials from the IU Finance office. This included not only being able to correct past errors but to get a ground truth of the state of the finances for the project as a whole. Assuming Year 5 expenses proceed on course, this project is estimated to be approximately $1,440,000 underspent at the project's current end date of May 31, 2015. Further investigation found a severe underspend in the first 2 years of the project, which the current PI was unaware of.

In order to address this issue, Schopf met with NSF PO Thompson September 30th to discuss future plans and alternatives. The project will request for a one-year No Cost Extension. At that time, the PO only permitted the project to continue forward with developing plans to upgrade the Los Angeles PoP, with further spend-down discussions to take place in November.

In November, another meeting took place and Schopf was informed that her proposal for a follow-on project, TransPAC4, was being recommended for funding, however at a reduced budget with the TransPAC3 underspend to cover the first year of expenses for the new award. Further discussions and negotiations will take place in the upcoming months, but a high level spend-down plan includes:

- Continue all staffing through May 2016
- Continue production LA-Tokyo circuit through December 2016
- Continue funding for GlobalNOC support through December 2016
- Fund production IU systems support through December 2016 (the accounting review this quarter discovered this had not been being properly billed and paid, although services have been rendered since the project start)
- Discontinue support for LA-Beijing circuit in May 2015, per prior agreed to MOU with Internet2
- Upgrade LA PoP to collect active and passive monitoring data
- Explore additional TransPacific circuits to be supported through TransPAC4
- Expand application support team and consider developing workshops to increase use of circuits

With these plans in place, the project should spend out its balance by the end of the sixth year, and insure a smooth transition to TransPAC4, should that be funded. Additional planning will be needed in the upcoming months.

3. Staffing

Prior to this quarter, project staff consisted of:

- Jennifer Schopf, Director
- Joe Lappa, Senior Engineer
- Scott Chevalier, primary contact for GlobalNOC support desk
- Alice Warner, administration
- Dale Smith, consultant

No staff changes were made during this quarter.

4. Collaborations, Travel, and Training

September 15-17, Lappa attended The Chinese American Networking Symposium (CANS 2014) in New York City where he gave a presentation on CERNET statistics and trends. Schopf had

planned to attend but could not due to a herniated disk. Jacob Farmer, IU, also attended on behalf of TransPAC and participated in the Federated Identity sessions.

PRAGMA 27 was hosted in Bloomington, Indiana this year. Schopf, a member of the organizing committee, ran a workshop on Experimental Networking and moderated the first session. Lappa attended as a member of the Experimental Networking Panel and delivered his presentation on CERNET. The project also supported Brent Sweeny returning to IU to participate in this meeting and speak at the networking workshop.

In October, at the Internet2 Technology Exchange meeting, Schopf, Lappa, and Lee attended. Staff members discussed SDN and measurement technologies going forward with Jin Tanaka and Kaichiro Ikeda of KDDI.

Schopf, Lee, and Lappa attended Supercomputing in New Orleans, November 16-2. Schopf co-organized the "Innovating the Network for Data-Intensive Science" INDIS workshop, , on Sunday, November 16th. Lapp and Lee met with representatives of the R&E networks of Philippines, Malaysia, and Singapore to discus collaborations and with JGN-X to discuss SDN roles for TransPAC.

5. Software and Systems Work

A. Tool Development

Tool development continued this quarter with expected patches and upgrades to existing tools.

Within the GlobalNOC Service Desk, the phone system supporting TransPAC NOC operations was upgraded from version 3.0 to 4.0 for better reporting and reliability. This upgrade enables reporting on specific calling queue numbers and logging of calls for historical reference.

B. Dynamic Circuits

The TransPAC project provides Dynamic Layer 2 Network services through the OSCARS software suite. This service peers with the Internet2 ION project and the JGN-X Dynamic network facilities. Researchers and scientists can interactively create a layer2 dynamic circuit between Asia and the US to transfer data.

C. Software Defined Networking (SDN) Activities

One of the research goals of the TransPAC project is to enable Software Defined Networking (SDN) using Open Flow to provide a mechanism to dynamically configure and control circuit behavior between the US and Asia. Support for JGN-X's RISE and Open Flow experiments was offered in this quarter.

D. Measurement Activities

The TransPAC project supports a perfSONAR deployment in Los Angeles that provides periodic testing between several US and Asian sites. A testing matrix is available at http://tp3-3.transpac3.iu.edu/maddash-webui/ .

6. Operational Activities

Planning began for an upgrade to the Los Angeles PoP to be able to have additional monitoring and measurement capabilities, as well as better supporting upcoming SDN activities. We also began conversations to explore the option of a 100G port with PacWave, in part to support use of the Ixia Tester.

A. Network Engineering

The TransPAC circuit between Los Angeles, California, and Tokyo, Japan, continues to function as designed with no unscheduled outages. It supports IPv4, IPv6, and dynamic-circuit functions, and is prototyping OpenFlow 1.0 capabilities.

The JGN-X circuit between Los Angeles, California, and Tokyo, Japan, operates in layer 2 between switches in Tokyo and Los Angeles, and is primarily used for experimental network research, particularly DCN, OpenFlow, GLIF, Optical testbeds, and OpenGOLEs.

B. Traffic Graphs

Figure 1 and Figure 2 show the traffic on the TransPAC network during the period of September 1, 2014 – November 30, 2014, and Figures 3 and 4 shows data for the CERNET connection for the same period. Monitoring data is not available for the JGN-X circuit.

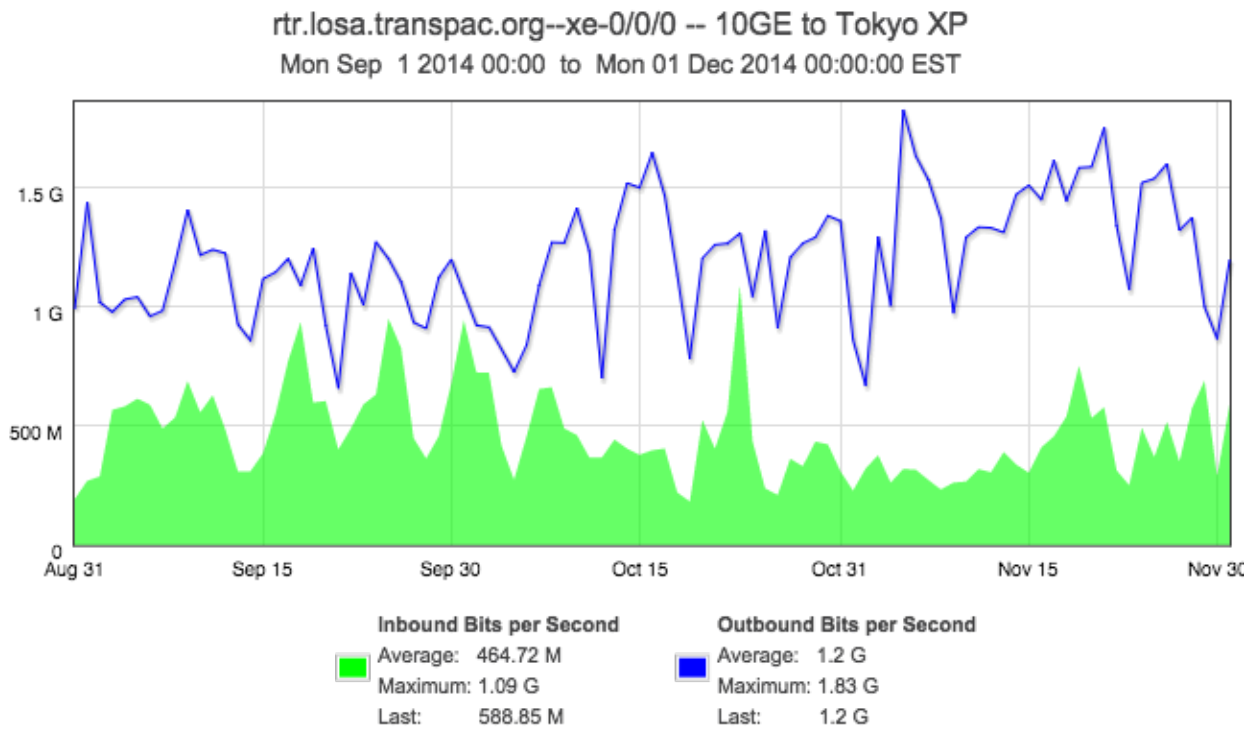

Figure 1: Aggregate traffic using average daily values on the 10Gbps TransPAC (NSF-funded) circuit between Los Angeles and Tokyo

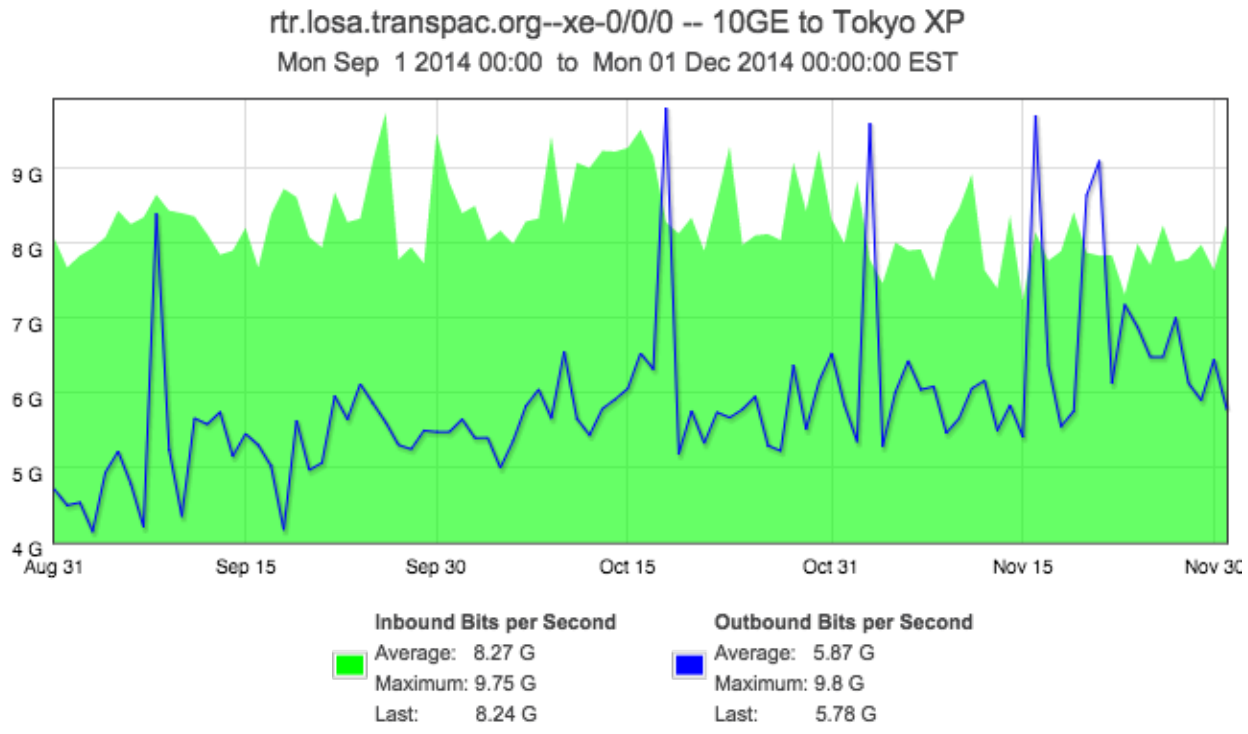

Figure 2: Aggregate traffic using maximum daily values on the 10Gbps TransPAC (NSF-funded) circuit between Los Angeles and Tokyo

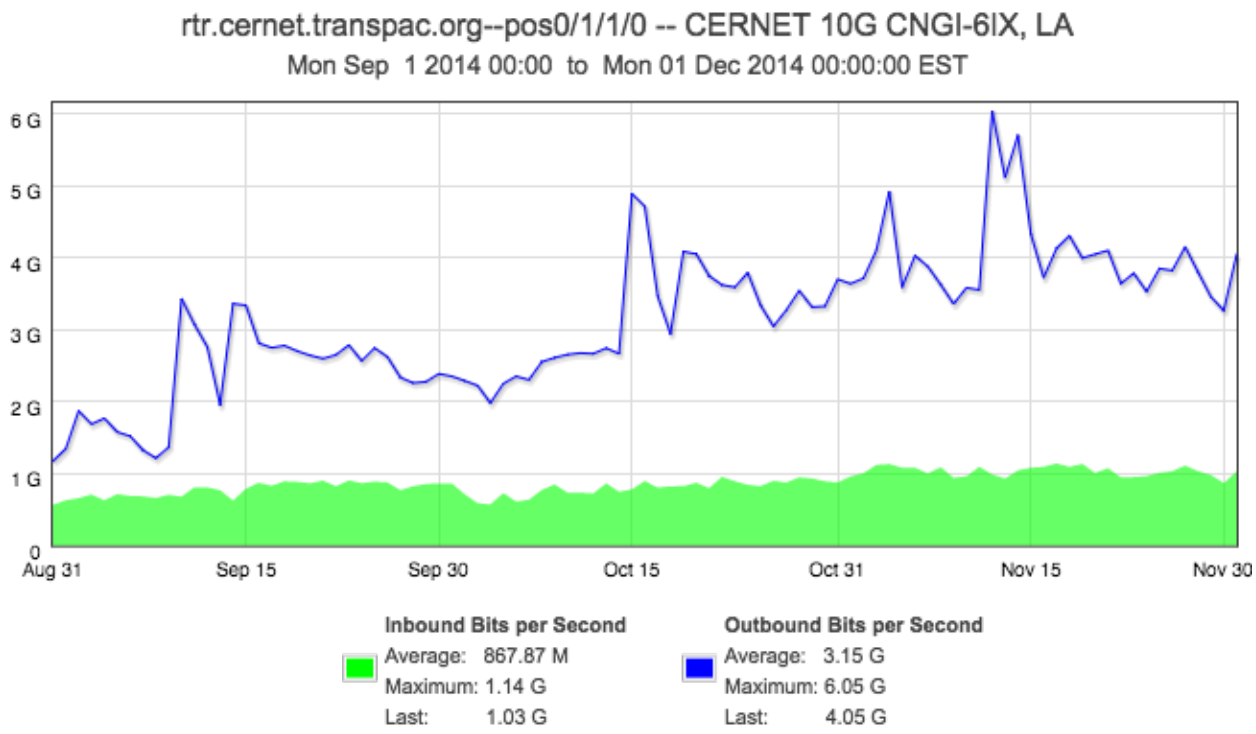

Figure 3: Aggregate traffic using average daily values on the 10G CERNET circuit between Beijing and Los Angeles

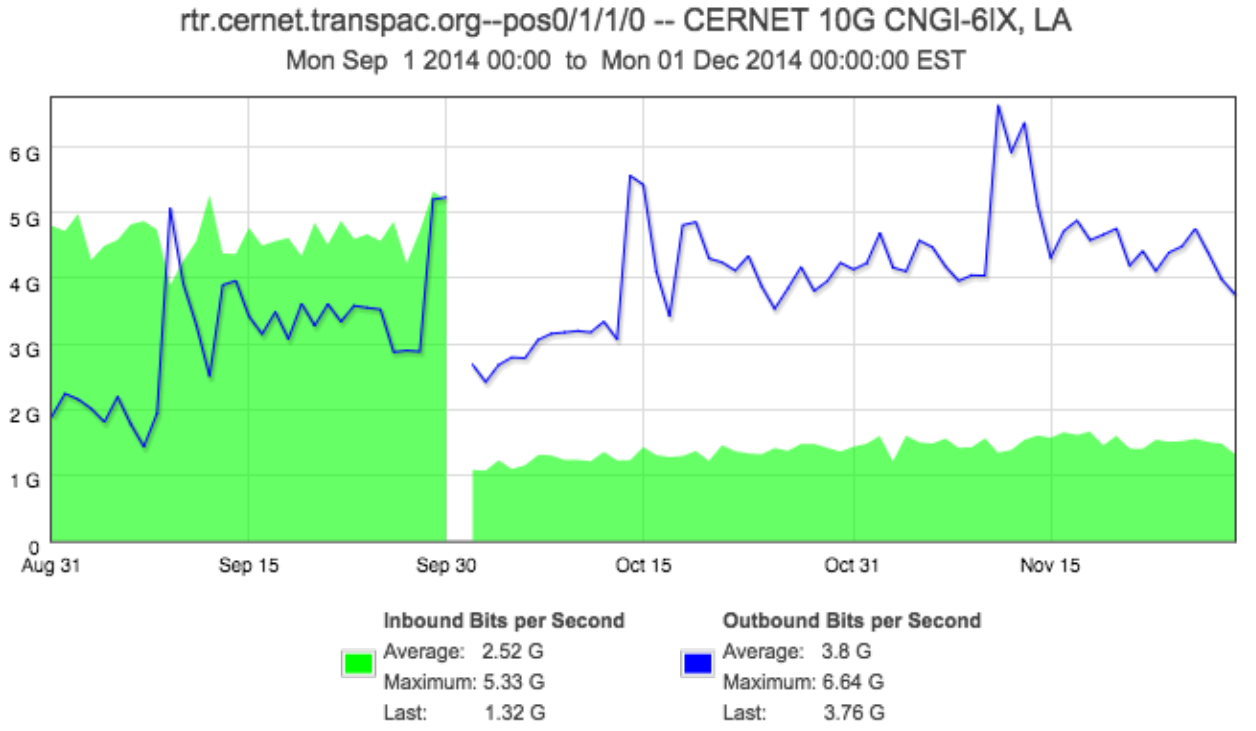

Figure 4: Aggregate traffic using maximum daily values on the 10G CERNET circuit between Beijing and Los Angeles. Gaps in data are periods where the polling server is unable to contact the switch to gather data.

C. Trouble Tickets

During this quarter, there were two reported downtimes, one scheduled and one unscheduled. Table 1 shows detail on the unscheduled downtime. Table 2 shows the detail on the scheduled downtime. Additional trouble ticket information is available at https://tick.globalnoc.iu.edu/fp_tools/public_ticket_viewer/index.cgi by entering the ticket number.

The unscheduled outage on October 31, 2014, (ticket 1499:62) on the TransPAC Core Node experienced was due to maintenance performed by Pacwave during which the buffering capability of the line cards was overwhelmed. This outage identified an issue with the core equipment that eventually resulted in an upgrade to minimize any potential re-occurrence.

Unscheduled Maintenances Detail

Ticket Number	Customer Impact	Network Impact	*Title*	Outage Type	Source Of Impact	*Start Time (UTC)*	*End Time (UTC)*
1499	1-Critical	1-Critical	Brief Outage Resolved - TransPAC Core Node LOSA	Unannounced Maintenance	Vendor	10/31/2014 7:26 AM	10/31/2014 7:42 AM

Table 1: Unscheduled maintenance tickets for the TransPAC this quarter

Scheduled Maintenances Summary

Ticket Number	Customer Impact	Network Impact	*Title*	Maintenance Type	Source Of Impact	*Start Time (UTC)*	*End Time (UTC)*
1507	4-Normal	2-High	Emergency Maintenance Completed - TransPAC Peer PacWave (All Connections via PacWave)	Hardware	Internal	11/13/2014 3:36 PM	11/13/2014 5:48 PM

Table 2: Scheduled maintenance tickets for the TransPAC circuits this quarter

D. Downtime

Table 3 shows the reported downtime for core nodes and circuits of the TransPAC project.

TransPAC Core Nodes	Down Time	Reporting Period Availability	52 Week Availability
TransPAC MX480 - LA	0 hr 16 min	99.99%	100.00%
Brocade MLXe4	2 hr 12 min	100.00%	99.97%
3410 Ethernet Switch	0 hr 0 min	100.00%	100.00%
OOB Router	0 hr 0 min	100.00%	100.00%
Aggregate TransPAC Core Nodes	2 hr 28 min	99.97%	99.99%

Table 3: Reported downtimes for core nodes of TransPAC this quarter

TransPAC Backbone Circuits	Down Time	Reporting Period	52 Week Availability

		Availability	
TransPAC LOSA-JGN2 LOSA 10GigE	0 hr 16 min	99.99%	100.00%
TransPAC LOSA-Pacific Wave LOSA 10GigE	0 hr 16 min	99.99%	100.00%
TransPAC TOKY-TransPAC2 LOSA	0 hr 16 min	99.99%	99.79%
Aggregate All TransPAC Backbone Circuits	0 hr 48 min	99.99%	99.93%

Table 4: Reported downtimes for circuits of TransPAC this quarter

7. Security Events and Activities

Basic security measures were maintained over the course of the quarter, and there were no security incidences to report. The project supported Jacob Farmer, IU, to attend CANS and participate in the Federated Identity sessions.

8. Reporting against Objectives June, 2014 – August, 2014

1. Overall – new director to review activities and adjust as needed
    a. Lappa getting up to speed as senior network engineer
    b. Financial review resulting in augmented plans for Year 5
2. Collaboration and Demonstrations
    a. Attend CANS, GLIF, Pragma, TechExchange, and SC 15
    b. Continue to seek additional collaborators for project going forward
3. Systems and Software Work
    a. Begin planning for upgrades to LA PoP
    b. Continue to define monitoring framework
    c. Identify and if possible implement flow-analysis tools
    d. Support SDN experiments for CANS, GLIF, GENI, and SC
4. Operational Activities
    a. Continue full support of TransPAC circuit

8. Plans for December, 2014-February, 2015

1. Overall
    a. New director to review activities and adjust as needed
    b. Continued additional financial oversight of project
    c. Put in place additional project tracking
2. Collaboration and Demonstrations
    a. Continue to seek additional collaborators for project going forward
3. Systems and Software Work
    a. Instantiate upgrade to LA PoP
    b. Continue to define monitoring framework
    c. Identify and if possible implement flow-analysis tools
5. Operational Activities
    a. Continue full support of TransPAC circuits