

# TransPAC3- Asia US High Performance International Networking (Award #0962968) Quarterly Report 1-June-2013 through 31-August-2013

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(Prepared by John Hicks, Jennifer Schopf, Alice Jackson)

## **Summary**

During the quarter of June 1, 2013 through August 31, 2013, 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 hiring a new director, Dr. Jennifer Schopf, attendance at the Terena Meeting and APAN, and additional SDN experiments with JGN-X.

## **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**: a 10Gbps 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. Staffing

Prior to this quarter, project staff consisted of:

- Jim Williams, Director
- Brent Sweeny, primary TransPAC senior network engineer
- John Hicks, primary network research engineer
- Scott Chevalier, primary contact for GlobalNOC support desk
- Alice Jackson, administration
- Kyle Klyntline, REU Student
- George McLaughlin, Asia-Pacific network consultant
- Gabriel Iovino, REN-ISAC staff member
- Wesley Young, REN-ISAC staff member
- Doug Person, REN-ISAC staff member

Starting June 1, 2013, Dale Smith was hired on as a consultant at 1-2 days per week for the next 6 months. Smith was hired to assist with recruitment and interviewing for the new director, to assist in the transition from the old director to the new director, and to offer advice on work in Asia-Pacific and Africa. In general, the IU group is fostering closer ties to the Network Startup Resource Center (NSRC) going forward.

On August 1, 2013, Dr. Jennifer Schopf was hired to be the new director of International Networks. During the previous year, Schopf was a senior analyst for IEEE Computer Society. Prior to that, she was a program officer at the US National Science Foundation (NSF), where she jointly led programs focusing on deployed networks, geoscience data, distributed systems, and pragmatic software. She has also held positions at the Woods Hole Oceanographic Institution, the UK National eScience Center, Argonne National Laboratory, and Northwestern University. She will be doing an overview of the project over the coming quarters.

Kyle Klyntline finished his work as an REU student gathering information for the International Big Science List, which will help identify possible collaborators and projects that could use the ACE and TransPAC links. Internet2 will take over responsibility for keeping this list up to date ([https://www.internet2.edu/media/medialibrary/2014/01/22/The\\_International\\_Big\\_Science\\_List.pdf](https://www.internet2.edu/media/medialibrary/2014/01/22/The_International_Big_Science_List.pdf)).

## 3. Collaborations, Travel, and Training

TransPAC staff continued to grow collaborations in Asia over the quarter with the goal of better understanding collaborative science use of the TransPAC links and supporting use of emerging network technologies.

Williams and McLaughlin attended the Terena meeting in Maastricht, Netherlands. Meetings were held concerning the recently deployed ANA-100G trans-Atlantic circuit, as well as strategy meetings with APAN members about a possible 100G trans-Pacific link.

Williams, Schopf, Hicks, and Smith attended the APAN36 conference in Daejeon, Korea. Williams gave a presentation in the engineering session, entitled "Advanced North Atlantic 100G Pilot project (ANA-100G) Trans-Atlantic Network". This talk re-opened a discussion investigating 100G networks between the US and Asia. Ongoing discussion is expected on the application capacity need for trans-Pacific links, possible costs of links, and the strategies of various national funding agencies. This issue is expected to be an active topic in the future.

DaeYoung (DY) Kim, APAN board chairman, presented Jim Williams with a Lifetime Achievement award and commemorative plaque during the conference banquet. Kim thanked Williams for his years of work in the APAN community and congratulated him on his retirement.

Hicks gave a presentation in the engineering session, entitled “International Networking at Indiana University and 100G Networking”. This talk provided updated information about the IU program, both TransPAC and ACE, as well as information concerning the \$600,000 supplement to the ACE project to provide engineering and application support and service development for the use of a 100Gbps network connection between the US and Europe. Hicks also gave a presentation in the Future Internet Testbed session entitled “Interdomain OpenFlow ACE StarLight to NetherLight 10G TransPAC LA to Tokyo”. This talk described the current Software Defined Networking (SDN) setup on the TransPAC and ACE circuits as well as the demonstration planned for SC13. The demonstration will attempt to transfer data between Tokyo and Amsterdam across the US using OpenFlow and dynamic circuit technologies.

TransPAC engineers are coordinating with other APAN colleagues as well for additional SC13 activities, demonstrations, and tests.

Considerable time was spent this quarter in developing PerfSONAR training material. Hicks taught a one-day performance workshop for the InCENTRE Summer of Networking (SoN), a 10-week long series of courses targeted at undergraduate computer science majors held at Indiana University. The performance section covered perfSONAR as well as basic network measurement techniques. In addition, the Open Science Grid (OSG) has requested additional PerfSONAR training, and this meeting is scheduled for October. Hicks will also be leading the PerfSONAR training at an Network Startup Resource Center (NSRC) session tentatively scheduled for Rwanda in November. Presentation material and a hands-on virtual classroom environment to be used for both sessions were under development during this reporting period.

## **4. Software and Systems Work**

### ***A. Tool Development***

The development of GlobalNOC tools, funded in small part by TransPAC, continued this quarter with patches and upgrade to existing tools. No new tools were developed.

### ***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 the US and Asia to transfer data.

### ***C. Software Defined Networking (SDN) Activities***

One of the primary 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.

Last quarter there was a large-scale deployment SDN for TransPAC, including deployment of a JGN-X switch to connect TransPAC to RISE. This quarter only basic maintenance and simple upgrades took place.

Hicks setup the US side of an SDN demonstration scheduled for the Internet2 CANS meeting in September. The demonstration, designed by professor Jun Bi (CERNET/Tsinghua University), will attempt to transfer Genomics Data on Inter-domain paths set up by WE-Bridge software for CERNET-CSTNET-Internet2 SDN Peering. The setup consisted of a virtual OpenFlow switch, controller, and host. Data will be transferred through the virtual switch to the virtual host from China.

## ***D. Measurement Activities***

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

## ***E. Telepresence***

The Internet2 Video Services exchange is now operational, with Sweeny acting in a leading architectural, engineering, and operational role. This exchange emphasizes interoperability among all high-end video technologies including Cisco Telepresence and SIP and 'legacy' H.323 systems, and is connecting institutions to its new exchange in Washington DC (completed Fall 2012, co-located with WIX). Significantly for the APAN region, Internet2 also has created an additional Telepresence exchange in Singapore in connection, and is connecting Asian and US users and institutions there, with Duke University being the first full participant.

In order to increase this exchange's functionality, we have worked with regional R&E providers beginning with Singaren to provide R&E connectivity to North American R&E networks and TransPAC. We will continue to expand those connections in the next quarters to Gloriad and hopefully TEIN.

(Note this work is not funded by TransPAC but is included for informational purposes and relevance to Asia-Pacific networking projects.)

# ***5. Operational Activities***

## ***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 capabilities.

In connection with GlobalNOC operations with SDN-enabled Brocade switches, we have determined that the TransPAC Brocade core switch has some potentially serious data-integrity issues and will need a software upgrade as soon as the proper version is identified and tested. This should occur in the next quarter. We are also evaluating Juniper code for possible upgrades.

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.

The CERNET circuit between Los Angeles, California, and Beijing, China, saw increased usage, with several peaks above 1Gbs.

Work has also continued in the Internet2 Singapore POP with connection likely to TEIN, and through Singaren and Gloriad to APAN and TransPAC. We continue to try to get a better connection to Europe through TEIN. Additionally, a commodity-internet connection to Tata's network is provided, and a separate Tata connection to their international Telepresence exchange was completed in this quarter.

**B. Traffic Graphs**

Figures 2 and 3 show the traffic on the TransPAC circuit during the period of June 2013 through August 2013 for daily averages and daily maximums, respectively. The lack of data around the beginning of July was due to difficulties in the monitoring tool upgrade, not a circuit outage. The upgrade issue was resolved and normal monitoring continues.

Figure 4 shows aggregate traffic using maximum daily values for the CERNET circuit between Los Angeles and Beijing. This circuit saw increased usage, with sustained use above 1Gbs during this quarter, due to routing changes in the CERNET network. No other information is available concerning this change.

Monitoring data is not available for the JGN-X circuit.

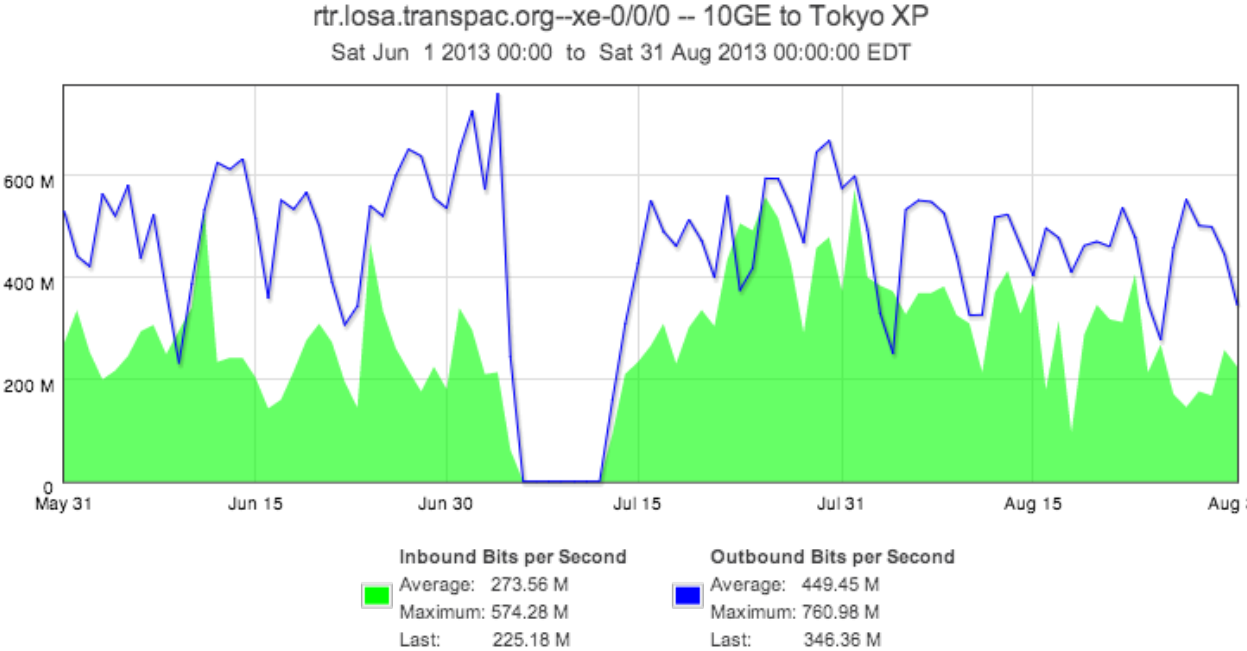


Figure 2: Aggregate traffic using smoothed daily averages on the 10Gbps TransPAC (NSF-funded) circuit between Los Angeles and Tokyo.

rtr.losa.transpac.org--xe-0/0/0 -- 10GE to Tokyo XP  
 Sat 01 Jun 2013 00:00:50 +0700 to Sat 31 Aug 2013 00:00:50 +0700

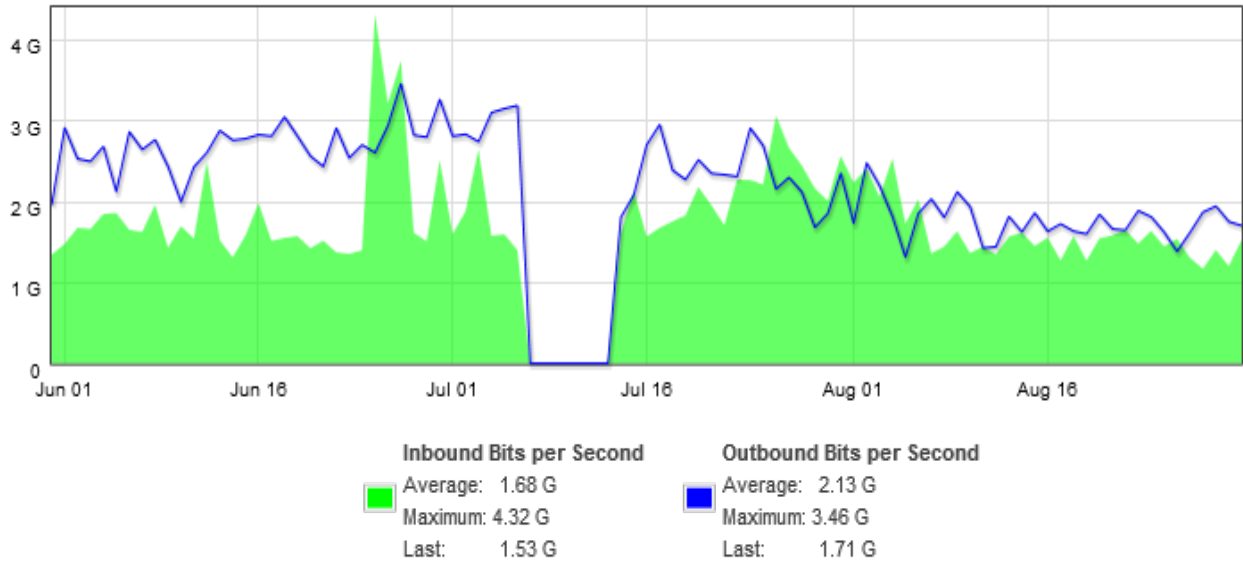


Figure 3: Aggregate traffic using maximum daily values on the 10Gbps TransPAC (NSF-funded) circuit between Los Angeles and Tokyo.

rtr.cernet.transpac.org--pos0/1/1/0 -- CERNET 10G CNGI-6IX, LA  
 Sat Jun 1 2013 00:00 to Sun 01 Sep 2013 00:00:00 EST

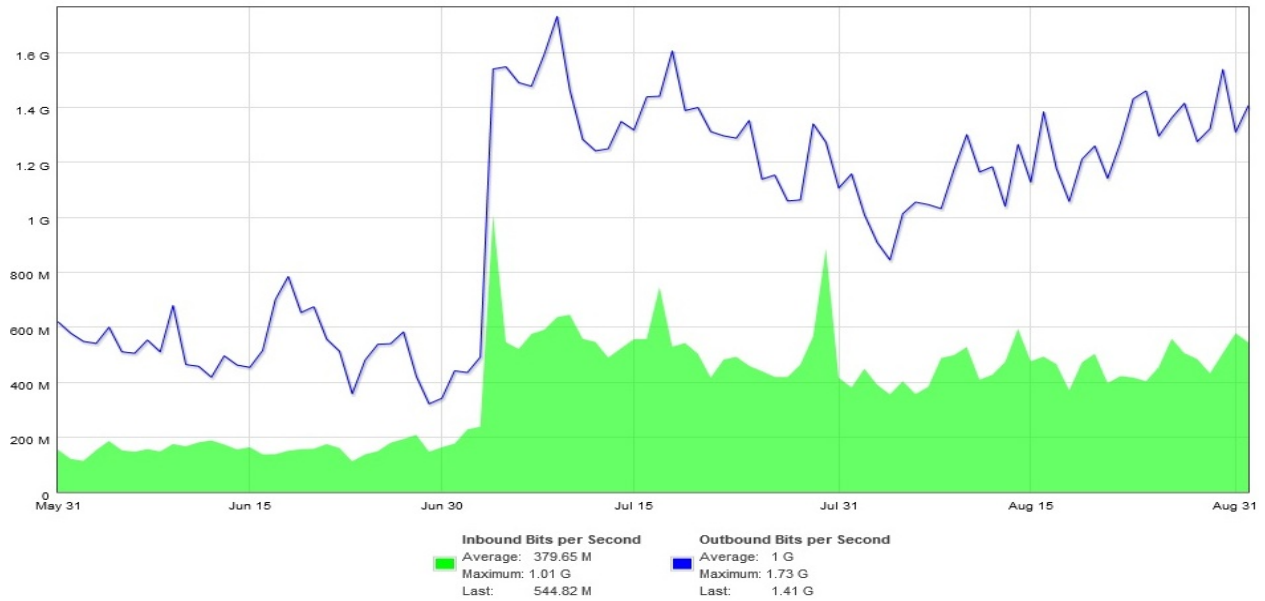


Figure 4: Aggregate traffic using the average daily values on the 10Gbps CERNET circuit between Los Angeles and Beijing.

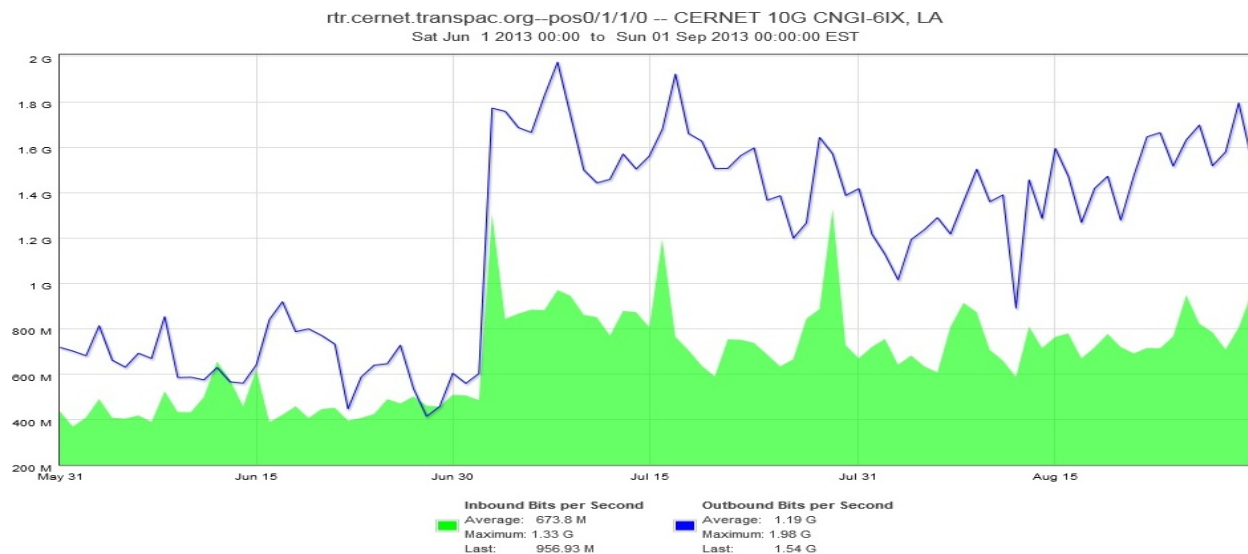


Figure 5: Aggregate traffic using maximum daily values on the 10Gbps CERNET circuit between Los Angeles and Beijing.

### C. Trouble Tickets

There were no trouble tickets for unplanned downtimes or maintenance during this reporting period.

### D. Downtime

TransPAC Core Nodes	Down Time	Reporting Period Availability	52 Week Availability
TransPAC MX480 - LA	0 hr 0 min	100.00%	100.00%
Brocade MLXe4	0 hr 0 min	100.00%	100.00%
3410 Ethernet Switch	0 hr 0 min	100.00%	100.00%
OOB Router	0 hr 0 min	100.00%	100.00%
<b>Aggregate TransPAC Core Nodes</b>	0 hr 0 min	100.00%	100.00%
TransPAC Backbone Circuits	Down Time	Reporting Period Availability	52 Week Availability
TransPAC LOSA-JGN2 LOSA 10GigE	0 hr 0 min	100.00%	100.00%
TransPAC LOSA-Pacific Wave LOSA 10GigE	0 hr 0 min	100.00%	100.00%
TransPAC TOKY-TransPAC2 LOSA	0 hr 0 min	100.00%	99.96%
<b>Aggregate All TransPAC Backbone Circuits</b>	0 hr 0 min	100.00%	99.99%

## **6. Security Events and Activities**

Basic security measures were maintained during this quarter and no security incidences were reported. RENISAC staff members had no items to report.

## **7. Reporting against Objectives March 2013-May 2013**

1. Attend TERENA conference (Done, See Section 3)
2. Attend APAN conference (Done, See Section 3)
3. Work on CANS OpenFlow demonstration (ongoing, See Section 4.C)
4. Work on PerfSONAR workshop material (ongoing, See Section 4.D)
5. Work with APAN colleagues in planning for SC13 (ongoing, see Sections 3, 4, 5)
6. Work on Internet2 routed path from Singapore through TransPAC (ongoing, see Sections 4E, 5A)

## **8. Plans for September-2013-November-2013**

1. Overall – new director to review activities and adjust as needed
2. Collaboration and Training
  - a. Attend SC13 conference
  - b. Attend CANS conference
  - c. Teach at performance workshop for OSG staff
  - d. Attend Operating Innovative Networks workshop
  - e. Teach at NSRC training in Rwanda
3. Systems and Software Work
  - a. SC13 coordination; provide support as needed
  - b. CANS coordination; provide support as needed
4. Operational Activities
  - a. SC13 coordination will intensify; provide support as needed
  - b. Continue full support of TransPAC circuit