

# **CIREN/TransPAC2 Annual Report 1-January-2007 thru 31-December-2007**

**James Williams, Principal Investigator, CIREN/TransPAC2 (SCI-0441096)**

## **Summary of Project Year 3 Activity**

Williams worked with Heather Boyles of Internet2 and others to develop a R/E Networking in South Asia Workshop to be held at the Spring Internet2 Member Meeting in DC. Presentations from this Workshop are available on the Indiana University South Asia page at <http://southasia.indiana.edu>. Williams is the chairman of the South Asia SIG.

The RENOG activities continued in 2007. See the RENOG page at <http://renog.org>. There were RENOG related presentations at the Fall 2007 Internet2 meeting and the APAN meeting in Xi'an, China.

TransPAC2 developed and submitted a funding request to the NSF to provide a network connection between the US and Pakistan. Details of this connection are presented later in this AR.

PerfSONAR tools were installed on the TP2 node in LA and on the APAN node in Tokyo (partially installed as of 31-December).

Williams attended the First GENI Engineering meeting in Minneapolis and is preparing a GENI funding proposal to define the interface between US and international network research test beds.

An RFP for the final two years of the TransPAC2 project was prepared and sent to interested service providers.

Workplans on the TransPAC2 web site <http://www.transpac2.net> have been updated to Version 8.0.

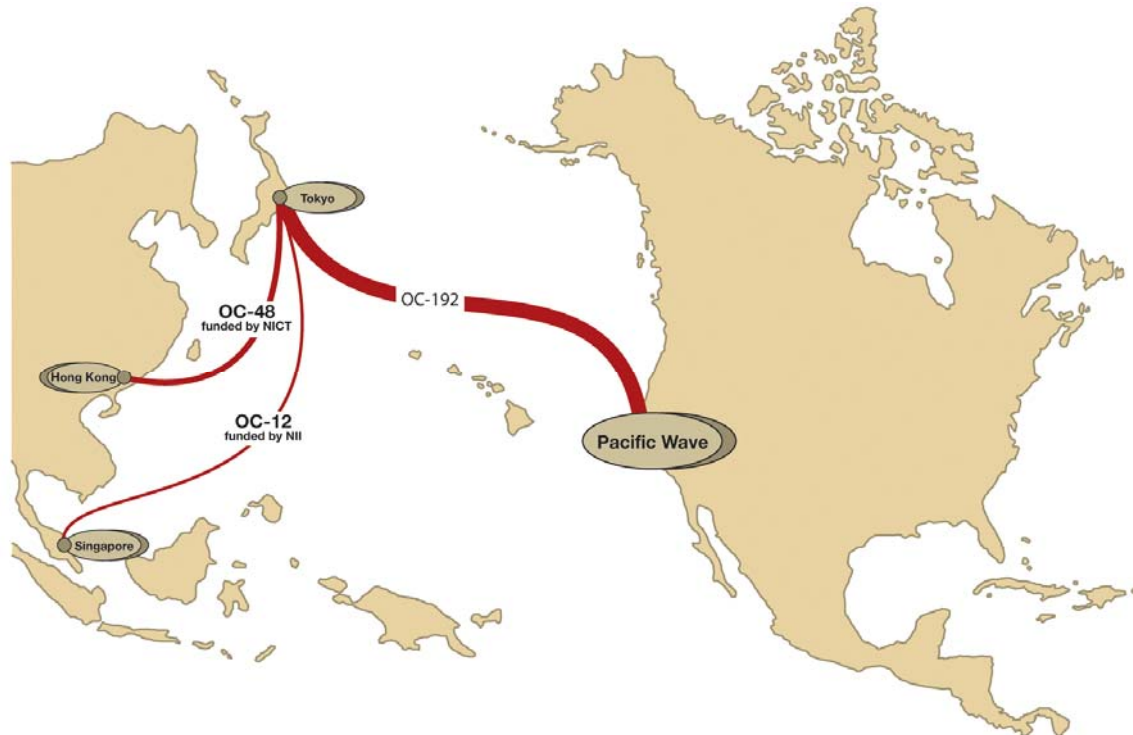


Figure 1: TransPAC2 Core Topology as of December 31, 2007

### Significant milestones and accomplishments for Project Year 3

January 2007

TransPAC2 participated in the APAN 23 meeting in Manila. Jim Williams and John Hicks gave various talks and chaired a session in the Network Engineering program. . See various presentations at <http://www.transpac2.net/presentations.php>

Williams worked with Heather Boyles of Internet2 and others to develop a R/E Networking in South Asia Workshop to be held at the Spring internet2 Member Meeting in DC.

February 2007

Williams attended the NSF Security Summit in Washington on February 22-23.

April -2007

TransPAC2 staff (Williams, Hicks and Robb) attended the Internet2 meeting in Washington, DC

Robb and Williams chaired a RENOG meeting at the Internet2 Members Meeting in Washington DC. Details on the RENOG web site at [www.renog.org](http://www.renog.org).

Williams worked with Heather Boyles of Internet2 and Michael Foley of the World Bank and others to present a R/E Networking in South Asia Workshop at the Spring Internet2 Member Meeting in DC. One outcome of this meeting was the formation of a South Asia Special Interest Group (SA-SIG). Williams is the chair of this group. See the website at: <http://southasia.indiana.edu>.

Robb and Williams met with representatives from PERN2 (Pakistan Education and Research Network) at the Internet2 Meeting in Washington DC. Based on this meeting and other discussions, Williams developed a proposal to extend the IRNC program to Pakistan. This proposal, which has complete Pakistan support, will be submitted to the NSF in July, 2007.

July-2007

Williams attended a meeting of the DICE consortium in Berkeley CA on July 10-13. Development of inter-network NOC and measurement services was discussed.

August-2007

Williams attended the CCIRN meeting in Xi'an, China and reported on RENOG activities.

Williams and Hicks attended the CANS 2007 meeting in Xi'an, China. Hicks presented a talk on network security.

Williams and Hicks attended the APAN meeting in Xi'an China, immediately following the CANS meeting. Hicks presented a talk on TransPAC2 and Internet2 perfSONAR activities.

Williams attended a NSF sponsored meeting in Beijing preceding the Xi'an meetings with representatives of other Asian networks and other US and NSF representatives. Williams gave a short presentation about TransPAC2.

September-2007

Williams and Hicks attended the PRAGMA meeting at the University of Illinois.

TransPAC2 began discussions with the National Institute of Informatics in Japan regarding TransPAC2 hosting an NII engineer for several weeks in 2008. Details will be finalized in early 2008.

A Supplemental Funding Request to provide an IRNC extension from Singapore to Karachi, Pakistan was completed and sent to the NSF for review and possible funding.

October-2007

Williams attended the GENI Workshop in Minneapolis and the IRCN Workshop in Washington.

Hicks attended the Internet2 fall members meeting in San Diego. Hicks chaired the TransPAC2 and SouthAsia SIG meetings. Hicks also took notes at the RENOG BOF and met with Japanese colleagues to discuss a possible visit from NII to Indiana University in the spring 2008.

Hicks traveled to LA with Japanese colleagues after the fall members meeting to tour the KDDI America, PacWav, and SINET collocation facilities. Plans for Supercomputing 2008 and other future activities were discussed.

PerfSONAR resources are deployed (SNMP, OWMP, and BWCTL) in LA and partially deployed (SNMP) in Tokyo on the TransPAC2 network.

NSF funding to provide a network connection to Pakistan was approved. This connection should be live in the first quarter of 2008

November-2007

Robb and Williams created and issued a RFP to continue TransPAC2 network services past the currently contracted service termination date of April 1<sup>st</sup>, 2008. RFP results will be due December 21 and a provider selection will be made early in 2008.

December-2007

TransPAC2 RFP responses are due on 21-December. A decision on a carrier for the final two years of TP2 will be made in January 2008.

## **Meetings and Presentations**

### **January – 2007**

Williams and Hicks attended APAN23 in Manila. Presentations are available on the APAN web site (<http://www.apapn.net>) and the TransPAC2 web site (<http://www.transpac2.net> )

### **February -2007**

Williams attended the NSF Large Systems Security meeting in Washington, DC. See the following recommendation:

**“(5) Develop an agenda for increasing international security cooperation to support international science.**

International science collaborations such as ITER and the HDC project require a tremendous degree of cooperation between the involved organizations. While organizational cooperation between the different research branches has advanced steadily, there has been little or no improvement in communications between the security groups of these different organizations.

An example of this is that security data from events at CERN tend to propagate to U.S. computational facilities via high-energy physics mailing lists. While this is useful, it would be much more efficient to have tools and agreements in place so that the computer security groups could exchange information without worrying about (for example) local privacy rule violations.

We propose that a workshop be funded that addresses the impact of security issues on global science. It would not only be designed to answer basic questions regarding how to respond to international security issues but also would be a platform to develop better relations and communications between the different organizations involved in these collaborative efforts.

Given the cross-departmental nature of this research, we suggest involvement by Internet2, ESnet, FIRST and their EU counterparts, and the OSG/HEP community, which seems to be grappling with many of these issues already.”

### **March – 2007**

Williams presented remotely at the Korean APII meeting March 20-23 in Seoul. Presentation is available on the TP2 website at <http://www.transpac2.net>.

### **April – 2007**

Williams, Hicks and Robb participated in an IRNC investigators meeting in DC, April 12-13.

Williams, Hicks and Robb participated in the Internet2 Spring Member Meeting in DC (April 23-26) and the follow-on South Asia Special Interest Group meeting (April 27).

See <http://transpac2.net> and <http://southasia.indiana.edu> for complete details and presentations.

### **July – 2007**

Williams participated in the DICE meeting in Berkeley, CA July 10-13.

### **August – 2007**

Williams participated in an NSF IRNC planning meeting at the NSF office in Beijing on August 23.

Williams and Hicks participated in CANS 2007 and the CCIRN meeting in Xi'an, China on August 25-26.

Williams and Hicks participated in APAN27 in Xi'an China.

### **September – 2007**

Williams and Hicks attended the PRAGMA meeting at UIUC in Urbana, Illinois on September 24-25.

### **October – 2007**

Hicks participated in the Internet2 Fall Member Meeting in San Diego on October 8-11. See the TransPAC2 web site <http://www.transpac2.net> for presentation details.

Williams participated in the first GENI Engineering meeting in Minneapolis on October 8-10.

Williams attended and participated in the NSF IRNC planning workshop in Washington, DC on October 23-26.

## **US-Pakistan Connectivity**

In January 2007, in preparation for the United States-Pakistan First Joint Committee on Science and Technology (Feb 13-14, 2007) Williams prepared a briefing on internal networking in Pakistan and the possibilities of a US-Pakistan network connection. Among the recommendations of the FJC report was... "and introduction of high speed connectivity between the two countries". With the assistance of Internet2, a cooperative project between TransPAC2 (US-IRNC initiative) and PERN2 (Pakistan-HEC initiative) was begun to develop this high speed connectivity.

A funding request was submitted to the NSF and funds allocated for US half of the project. A similar funding process was undertaken in Pakistan and the Pakistan-HEC approved and allocated funding for Pakistan half of the project. Some technical details within Pakistan remain to be worked out. However, these are expected to be completed around 1/1/2008 and the connection completed in 1st Quarter 2008.

Technically the connection will be from Singapore to Karachi where it will connect to the PERN2 network (see the following Figure XX). The connection will share the EU TEIN2 POP in Singapore. Pakistan and the US will split costs of the "wet" segment between Singapore-Karachi. Pakistan will be responsible for all networking costs within Pakistan.

Both NSF and NIH investigators have expressed direct interest in this connection. There is a planned US-Pakistan joint science meeting to be held in the US in 2008.

The following diagram outlines the PERN2 network in Pakistan. This network is expected to be completed in 2009.

# PAKISTAN

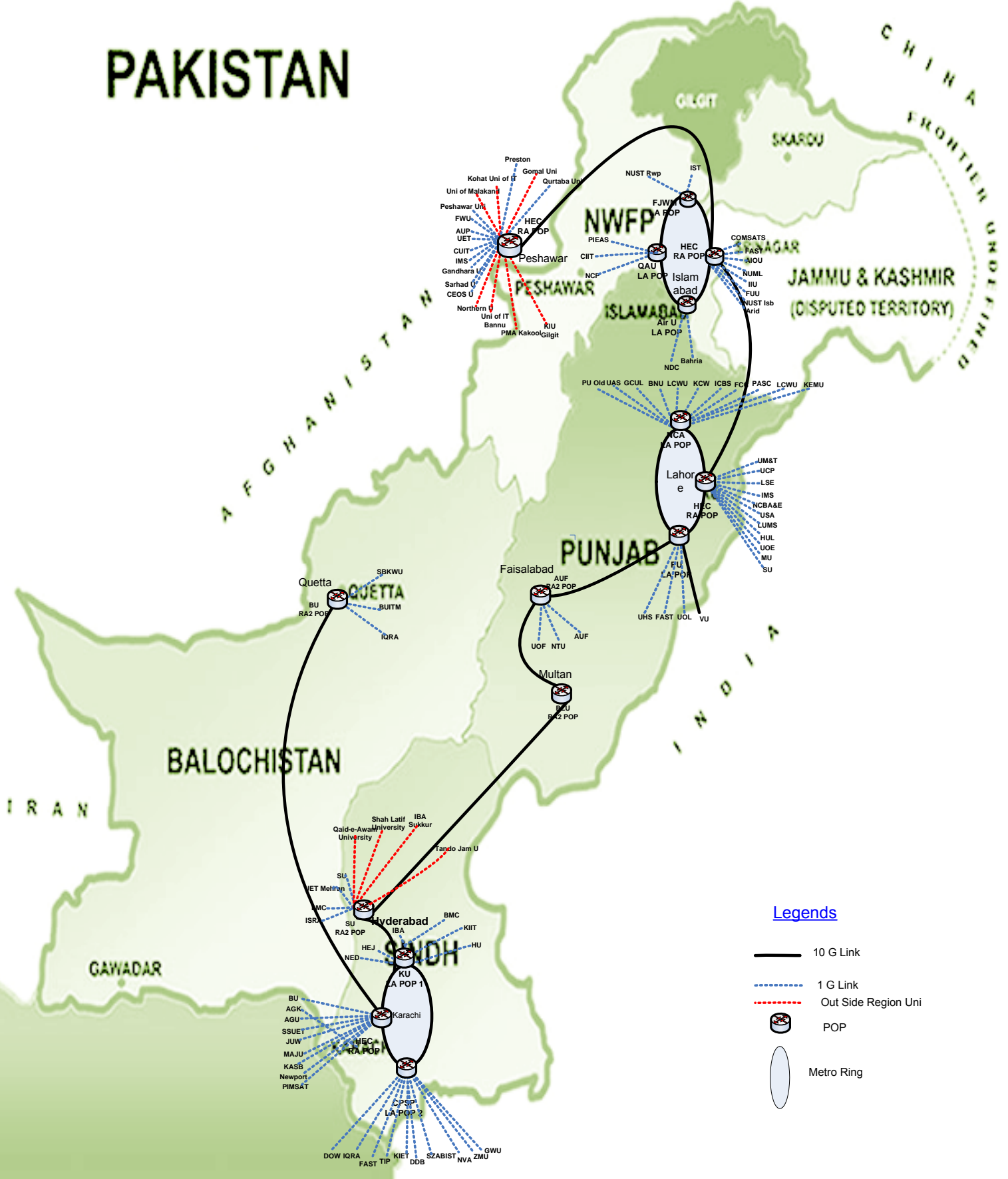


Figure 2 – PERN2 Planned Topology

### Engineering Summary over Project Year 3

Network topology has remained fairly consistent over the past year. Backup agreements with JGN2 and SINET have remained in place and have performed as expected over the past year. These relationships were especially important during the November severe weather on the west coast that severely damaged KDDI's trans-Pacific cable. During an extended outage, the backup arrangements with JGN2 and SINET provided for continued connectivity between the US and Asia with minimal impact to the community.

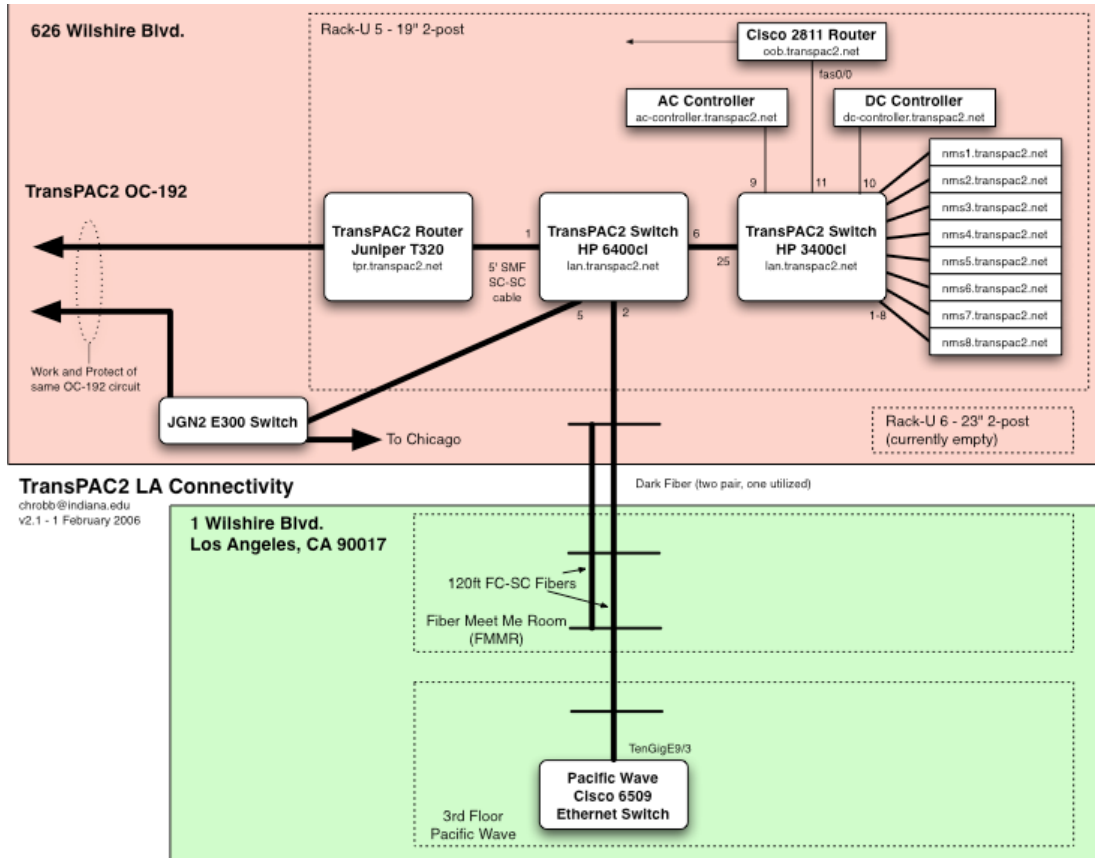


Figure 3 Los Angeles Node topology

The physical topology of the Los Angeles node remains unchanged from 2006. Although TransPAC2 engineers plan to augment TransPAC2's services with circuit-like services in 2008, this functionality will be added with little to no additional equipment cost. As the circuit services offering evolves, TransPAC2 may opt to investigate additional augmentation to the topology to support enhancements.



### **Usage summary and performance activities over Project Year 3**

Considerable time was spent this year installing perfSONAR tools in the TransPAC2 (LA) production facility and the Tokyo XP. In LA, BWCTL, OWAMP, and SNMP data are available via perfSONAR. TransPAC2 SNMP data is currently available from Tokyo via perfSONAR.

A new flash based TransPAC2 Weather-map was developed with data collection through perfSONAR. The new TP2 Weather-map was displayed at Supercomputing 2007.

TransPAC2 will continue to use the statistics and reporting capabilities of the Arbor Peakflow SP System to publish network data analysis. The Peakflow SP system has a rich set of statistics capability that provides detailed analysis for TransPAC2 traffic. The SP system implementation is made possible through the REN-ISAC also supported by Indiana University. A web services interface for the data concerning TransPAC2 was implemented on the TransPAC2 website (<http://www.transpac2.net/stats.php>). This interface provides data mining tools for TransPAC2 Netflow, SNMP, and BGP data. Development of these services is inline with our mission to provide better network usage information.

The goal is to provide a public interface to all available TransPAC2 data. We hope to combine Arbor data, data gathered with local tools, and data available through perfSONAR to present analysis and reporting results through the web. We have concentrated our efforts on building the low-level data collection infrastructure required to gather information. This evolving infrastructure is currently being used with presentation tools like the TP2 weathermap and Arbor soap portals. Efforts to develop web presentation of TransPAC2 traffic data will continue through the next reporting period.

Figure 5 shows TransPAC2 TCP traffic breakdown (top 5 applications)

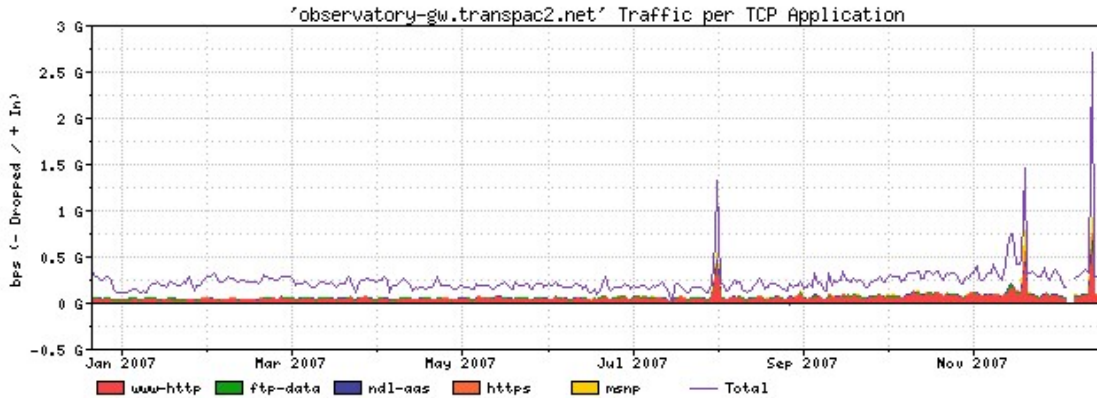


Figure 6 shows TransPAC2 UDP traffic breakdown (top 5 applications)

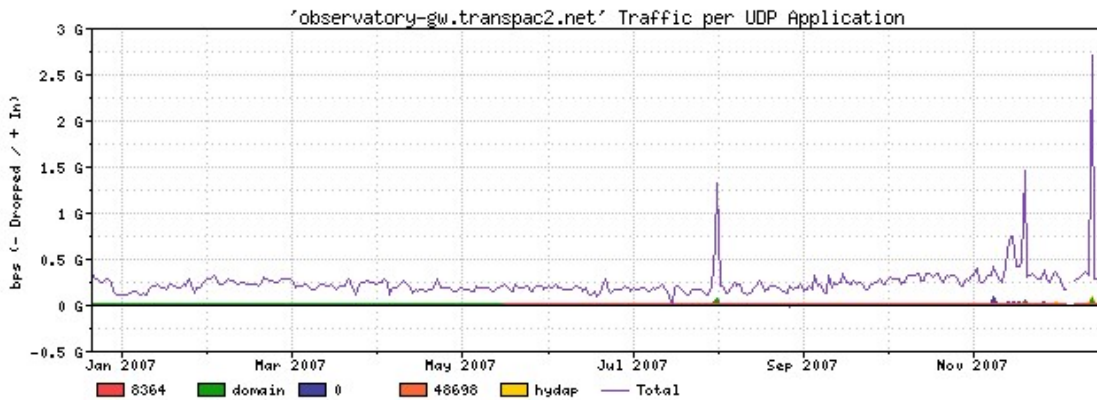
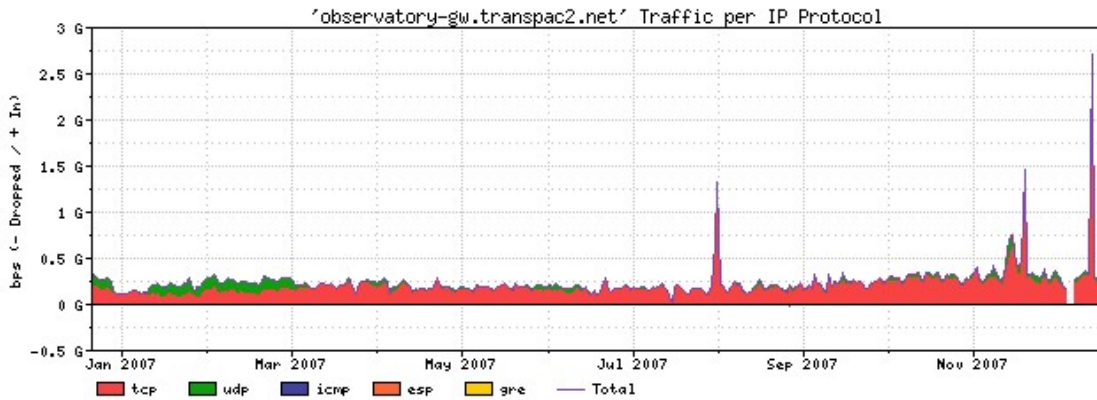


Figure 7 shows TransPAC2 traffic breakdown by protocol



Note: From left to right in the graph directly above, the legend indicates; UPD, TCP, ICMP,ESP, and GRE. The traffic is measured in Gbps.

### **Security events and activities over Project Year 3**

There were no security events associated with TransPAC2 over the course of Project Year 3.

TransPAC2 continues with basic security deployment

Basic security infrastructure was put into place on the TransPAC2 T320 router.

- a. The TransPAC2 router is protected against intrusions by packet filters applied to the control plane.
- b. Using the RANCID system, the Global NOC monitors the TransPAC2 router's event logs. The RANCID system automatically emails appropriate engineers. See the following for more details: <http://www.shrubbery.net/rancid/>

TransPAC2 is working with the APAN security list (t2-security-l@indiana.edu) to disseminate security information concerning the US and AP region.

Arbor Systems deployment on the TransPAC2 and Internet2 networks is complete. . The SP system implementation is made possible through the REN-ISAC also supported by Indiana University. TransPAC2 security issues are addressed using the SP peakflow system and the support from the REN-ISAC.

Arbor Systems Web Services development is currently available to TransPAC2 engineers in a limited fashion. After close consideration, it was determined that we should not publish live statistics concerning security events. Brief summary information is available below. Development of web services will continue but primarily to publish performance data.

TransPAC2 had 3 medium (ICMP misuse) and 440 low impact events reported by the Arbor SP peakflow system resulting in zero downtime due to security issues.

## TransPAC2 - Value to U.S. Science

The TransPAC program has provided high performance research and education (R/E) network connectivity between the US and Asian Pacific region for almost a decade. TransPAC2 has established itself as a well-respected voice in R/E networking issues in Asian. TransPAC2 provides connectivity and engineering support for a number of research communities including Grid, High Energy Physics, Earth Sciences, Astronomy, Bioinformatics, and Medical sciences. TransPAC2 is part of consistent Asian network picture including part of the TEIN2 project and support for intra Asian links.

TransPAC2 provides the “*glue*” for international collaborations. Application areas include:

- High Energy Physics
- Earth Sciences
- Astronomy
- Bioinformatics
- Medical sciences
- Remote access to major research instruments
- Data resources
- Community Grids
- Computing and storage Grids

## Leveraging to Date of Network Centric Investment

- Tokyo – Hong Kong OC-48 (delivered as 2 x 1Gb) connecting China (CERNET and CSTNET) to TP2. Funded by NICT. Estimated costs about \$50,000/mo or \$600,000/year plus equipment and POP space in HK.
- Tokyo – Singapore 622Mbps link connecting South Asia to TP2. Funded by NII. This is the TP2 South Asia link. It is also the connection that TEIN2 uses to send traffic to the US. It provides the basis for the current TP2-TEIN2 partnership. Estimated costs about \$50,000/month or \$600,000/year. This link is also critical in the US-Pakistan connection and a potential US-India connection.
- **EU TEIN2 leveraged investment:**
  - Use of TEIN2 POP and router in Singapore. Value is quite high. The investment required to put in place a complete POP is at least \$50,000 with \$2,500/month or \$30,000/year ongoing fees.
  - Partnership with TEIN2 allows for delivery of SA packets via a direct Singapore-Tokyo-LA route rather than a route through the Middle East-London-NYC. The TEIN2 program budget is about 3M euros per year which translates into about \$4,500,000/year.
- TP2 – (NICT-JGN2) joint secondary backup. TP2 provides backup for JGN2 and vice versa in LA. So, in theory, only an oceanic cable cut or a very unlikely (but possible as the past month indicated) catastrophic outage would require switching to our third level backup. Estimated costs of JGN2 link \$40,000/month or \$480,000/year (same as TP2 link). This backup capability is used quite regularly.
- TP2 – NII joint 3<sup>rd</sup> level backup. If the JGN2 link and the TP2 link both fail, then TP2 traffic switches to the NII links. There is an NII link into LA and one into NYC. Traffic is

split across these links based on destination. In the first three years of the TP2 Project this third level backup has only been used two times, once with a cable cut (extended outage) and once with an outage at a critical location in Japan (short outage). I don't have any realistic costs estimates here.

- APAN-TP2 landing site and connections in Tokyo. APAN provides a facility similar to the TP2 LA facility in Tokyo. Based on our costs for the TP2 facility in LA, I estimate that the APAN-TP2 facility has a fixed investment of at least \$400,000 and ongoing costs of \$2,500/month or \$30,000/year.

## Future Leveraging Opportunities

It is expected that current leveraged funding will continue in the following areas:

- Tokyo – Hong Kong OC-48.
- Tokyo – Singapore.
- EU TEIN2 leveraged investments.
- TP2 – (NICT-JGN2) joint secondary backup.
- TP2 – NII joint 3<sup>rd</sup> level backup.
- APAN-TP2 landing site and connections in Tokyo □

The new Pakistan connection will be cost shared 50%-US and 50%-Pakistan. This connection will also use the TEIN2 hardware located in Singapore for the "US" end of the connection.

The development of the TEIN2 continuation (called TEIN3) will present new opportunities for joint US-EU leverage in providing connectivity to South Asia.

It is hoped that closer cooperation among US government agencies (State Department, NIH, USAID) may allow further leverage of NSF funding.

## Communities benefiting from the network services

The following applications regularly benefit from the TransPAC2 networks:

### Astronomy

Very-Long-Baseline Interferometry (VLBI) is one of the most powerful techniques available for the high-resolution imaging of distant radio sources in the universe and for making accurate measurements of the motion of the earth in space. Multiple radiotelescopes scattered over the surface of the earth simultaneously record data from a radio source at streaming data rates as high as 1 Gbps for a 24-hour period. TransPAC2 provides high-performance network access to the VLBI facility in Kashima Japan.

e-VLBI won the [Internet2 IDEA award, 2006](#)

For more information about e-VLBI see: [Internet2 e-VLBI](#)

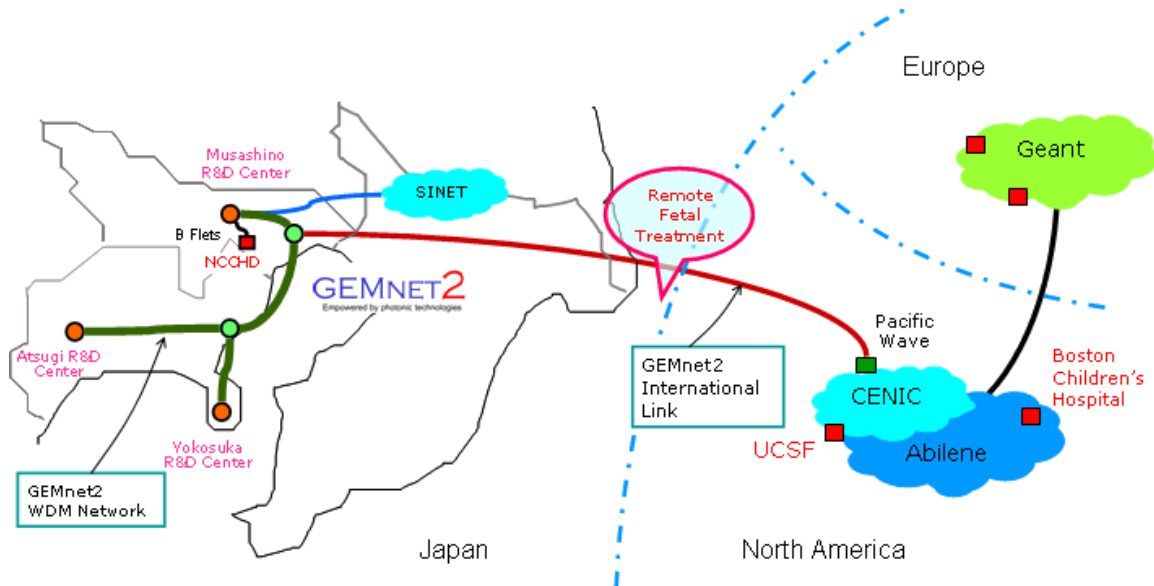
QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

### Tele-medicine

#### US-Japan telepresence and telemedicine in fetal care management

Nippon Telegraph and Telephone Corporation (NTT, headquarters: Chiyoda-ku, Tokyo) and the National Center for Child Health and Development (NCCHD, Setagaya-ku, Tokyo) tested the

feasibility of transmitting digitalized fetal medical images (including 3-dimensional ultrasound as well as fetoscopic images) between the US and Japan. The purpose is to implement the telediagnosis and prospective telesurgical treatment of fetal diseases on a global scale. These feasibility studies are to be conducted using ultrahigh-speed network technologies through interconnections of the GEMnet2 ultrahigh-speed experimental network operated by NTT Laboratories with overseas research and education (R&E) networks from March 1, 2006 through March 31, 2007.



This application is an example of the type of tele-medical activities going on between the U.S. and Asia. TransPAC2 is in a prime position to provide networking connectivity and support to these kinds of applications. TransPAC2 is currently working with the Barrow Neurological Institute, Internet2, and the APAN medical application group to use the TransPAC2 network to support this type of applications. Other applications include viewing remote surgical and diagnostic procedures. These applications are valuable teaching tools that connect experts to remote location. The goal is to move electrons not atoms. In these virtual classrooms, surgeons and OR staff can see and interact with an entire classroom of students as if they are there in the operating room. TransPAC2 will continue work with these groups to bridge the gap in the medical application space between the U.S. and the AP Region.

Information courtesy of Dr. Hisao Uose ([uose.hisao@lab.ntt.co.jp](mailto:uose.hisao@lab.ntt.co.jp)) of NTT laboratories.

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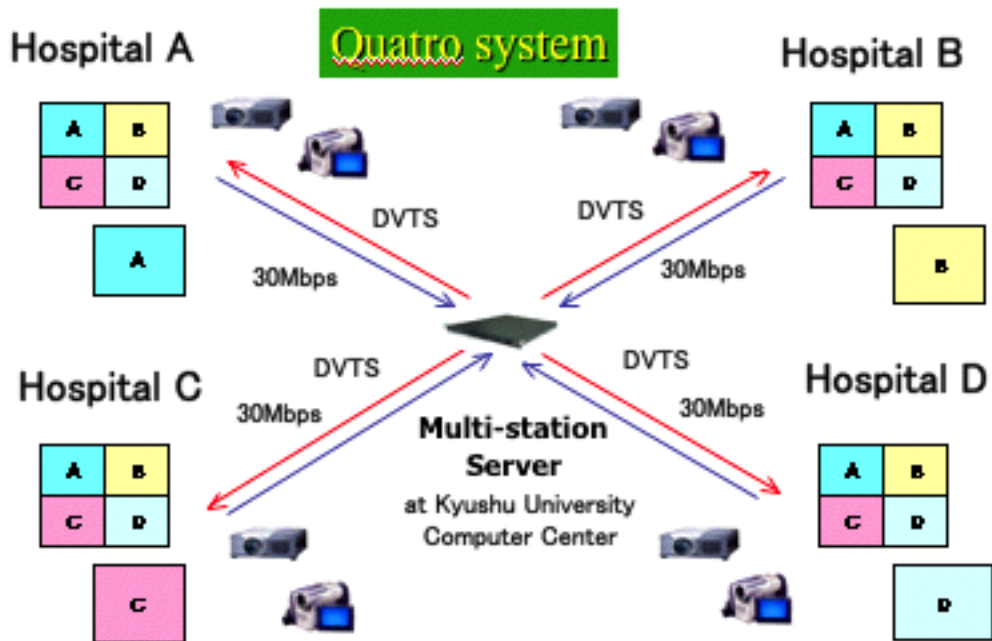
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## VDTS

### Remote medical activity in Asia-Pacific

Telemedicine requires high quality high speed multi-channel moving images to broadcast operating room procedures to remote location. Current projects include tele-mentoring for endoscopic and neurosurgery. Using 30Mbps DVTS streams, medical procedures are viewed from remote locations to aid in training and diagnosis.



A whole variety of medical content is current under investigation including:

- Surgery
- Endoscopy
- Medical informatics
- Robotic surgery
- Interventional radiology
- Regular teleconferencing
- Teleconsultation
- Bird flu, SARS, etc

Some of the advantages of telemedicine include:

For doctors and institutions

- **Learn new and different procedures by real watch**
- **Many people at once, and at anytime**
- **Reduce accidents and complications**
- **Deepen friendship by frequent communication**

For patients

- **Provide better and safer medical care**

For global health care

- **Standardization and globalization**

Information provided by Dr. Shuji Shimizu, MD, PhD  
Email: shimizu@surg1.med.kyushu-u.ac.jp

#### **Database**

Bio-Mirror public service for high-speed access to biosequence data



<http://bio-mirror.net/>

Don Gilbert - Department of Biology, Indiana University, Bloomington, IN 47405, USA

#### **ABSTRACT**

Summary: Timely worldwide distribution of biosequence and bioinformatics data depends on high performance networking and advances in Internet transport methods. The Bio-Mirror project focuses on providing up-to-date distribution of this rapidly growing and changing data. It offers FTP, Web and Rsync access to many high-volume databanks from several sites around the world. Experiments with data grids and other methods offer future improvements in biology data distribution.

#### **Description:**

This is a world-wide bioinformatic public service for high-speed access to up-to-date DNA/protein biological sequence databanks. In genome research, these databanks have been being growing tremendously. There is over 495 Gigabytes (compressed) total data. The Bio-Mirror project is devoted to facilitate timely access to important large data sets for this research. High speed access is provided by Internet2, TransPAC2, the Australian Academic Research Network (AARNet) and the Asia-Pacific Advanced Network (APAN). Bio-mirror has resources available in the following countries:

**Australia, Austria, China, Japan, Korea, Malaysia, New Zealand, Philippines, Singapore, Taiwan, Thailand, USA.**

#### **Grid technologies**

##### **PRAGMA**

The Pacific Rim Application and Grid Middleware Assembly (PRAGMA) was formed in 2002 to establish sustained collaborations and advance the use of grid technologies in applications among a community of investigators working with leading institutions around the Pacific Rim. Currently there are 29 institutions in PRAGMA, who meet twice a year at PRAGMA Workshops. In PRAGMA, applications are the key, integrating focus that bring together the necessary infrastructure and middleware to advance the application's goals. Working groups focus our activities. PRAGMA is governed by a Steering Committee.

TransPAC2 serves on the Steering Committee and supports PRAMGA applications using the TransPAC2 network connection.

For more information about PRAGMA see: [PRAGMA Home](#)

## OSG

The Open Science Grid (OSG) is a global Data Grid that will serve forefront experiments in physics and astronomy. Its computing, storage and networking resources in the U.S., Europe, Asia and South America provide a unique laboratory that will test and validate Grid technologies at international and global scales. The OSG demonstrated the capabilities with U.S, European, and Asia counterparts. The OSG and the OSG grid operations center (GOC) are supported by Indiana University. TransPAC2 is used as a primary network link to connect the US with the AP-region. TransPAC2 is continuously striving to meet the needs of the grid community by providing a reliable HP network and working with the NOC and GOC to improve services.

<http://www.opensciencegrid.org>

## Assessing Use

TransPAC2 consists of a single OC-192c connection between the west coast of the United States and the Tokyo XP Japan. SNMP, Flow, and BGP data are used to identify applications on the TransPAC2 network. Aggregated statistics can be obtained at <http://www.transpac2.net>.

The following table represents top applications on the transPAC2 network for most of 2007.

Institution 1	Institution 2	Protocol	Approx. Pkts
WWW-http, https, http-alt (approximately equal stat significance)			
San Jose State University	Tsinghua University, China	TCP	64774M
Dana-Farber Cancer Inst.	The Univ. of S & T of China	TCP	64245M
Wuhan University, China	DBCE1, AU	TCP	62923M
APNIC	Harvard University	TCP	60808M
University of Tulsa	Natl. Chengchi Univ., Taiwan	TCP	64642M
Korea Institute of S & T	Pacific Northwest Gigapop	TCP	68078M
FTP-data (approximately equal stat significance)			
Lawrence Livermore Natl Lab	Seoul National University	TCP	43623M
Chiyoda-ku, Tokyo	NASA	TCP	44945M
NIH	KRNIC-KR, Korea	TCP	42698M
IRDMI (a lot of activity toward the beginning of the year, but tapered off)			
FUJITSU, Japan	University of Maryland	UDP	52876M

## Contributions to Science

"The primary goal of TransPAC2 is to increase research and educational (R/E) collaboration between the United States and Asia. To increase R/E collaboration, TransPAC2 will deploy a secure, production-quality high-performance network infrastructure between Asia and the US and will assist our Asian partners in the deployment of high-performance infrastructure within Asia. TransPAC2 will enhance collaborations between US researchers and governments and Asian researchers and governments. TransPAC2 will also provide technical support for collaboration activities where requested." □ This section describes activities that TransPAC2 is involved in and/or groups that benefit from TransPAC2.

### Earth Science

- DIAL is a web-based distributed system to search, access and visualize satellite remote sensing data for Global Change research. In collaboration with NASDA and other institutions, NASA has DIAL servers set up to distribute satellite remote sensing data. NASA and NASDA also collaborate on the Tropical Rainfall Measurement Mission (TRMM); 3D data is transferred from NASA to NASDA using TransPAC/APAN, processed and visualized for the web.

- In 1993, the US/Japan Common Agenda for Cooperation in Global Perspective was established to facilitate cooperation in addressing pressing global problems, including natural hazards. In 1998, a new joint earthquake research program, called the US/Japan Cooperative Research in Urban Earthquake Disaster Mitigation, emerged out of this broad agreement. Under this five-year program, NSF provides funding for U.S. researchers, while collaborating Japanese researchers are being supported principally by the Japanese Ministry of Education, Science, Sports and Culture.

- The Space Physics and Aeronomy Research Collaboratory (SPARC) is an NSF-sponsored community resource for the upper atmospheric and space sciences; operating 24 hours a day for scientific collaboration and access to real-time and archival data.  
<http://sparc-1.si.umich.edu/sparc/central>

### High Energy Physics

- The BELLE detector is the state-of-the-art detector to investigate CP violating phenomena with unprecedented precision at the KEK B meson factory. The CP (C=Charge conjugation, P=Parity) violation is a key to explain why the universe is dominated by the matter, not by the anti-matter. The primary goal of the BELLE detector is to identify the origin of the CP violation. The BELLE collaboration consists of more than 40 institutions from Japan, Korea, China, Taiwan, India, Russia, USA, Australia, and Europe.

- The **GriPhyN (Grid Physics Network)** collaboration is a team of experimental physicists and information technology (IT) researchers who plan to implement the first Petabyte-scale computational environments for data intensive science in the 21st century.

- ATLAS is a general-purpose experiment for recording proton-proton collisions at LHC. The ATLAS collaboration consists of 144 participating institutions (June 1998) with more than 1750 physicists and engineers (700 from non-Member States). The detector design has been optimized to cover the largest possible range of LHC physics: searches for Higgs bosons and alternative schemes for the spontaneous symmetry-breaking mechanism; searches for supersymmetric particles, new gauge bosons, leptoquarks, and quark and lepton compositeness indicating extensions to the Standard Model and new physics beyond it.

### Life Sciences

- DNA data has accumulated more rapidly than compute power so researchers must often exclude potentially informative data to make statistical analysis practical. Utilizing the computationally intensive maximum-likelihood method of phylogenetic inference in a globally distributed collection of computational nodes, Indiana University, National University of Singapore and ACSys CRC in Australia have analyzed the DNA of cytoplasmic coat proteins, microsporidia, and cyanobacteria. <http://www.indiana.edu/~rac/hpc/cp.html>

### **Astronomy and Space Science**

- Sloan Digital Sky Survey (SDSS) is a project to carry out imaging and spectroscopic surveys of half the northern sky using a dedicated, wide-field, 2.5-m telescope. The imaging survey with a large mosaic CCD camera will produce digital photometric maps of the sky in five color bands. These maps will be used to extract the position and various photometric parameters of about 100 million galaxies and close to the same number of stars. The SDSS is a collaborative project between the US and Japan involving seven US institutions and the Japan Promotion group (JPG).

- The LIGO Scientific Collaboration (LSC) is a forum for organizing technical and scientific research in LIGO. Its mission is to insure equal scientific opportunity for individual participants and institutions by organizing research, publications, and all other scientific activities. It includes scientists from the LIGO Laboratory as well as collaborating institutions.

### **Tele-Sciences**

- Scientists at the Osaka University Research Center for Ultra High Voltage Electron Microscopy (UHVEM) and University of California San Diego National Center for Microscopy and Imaging Research (NCMIR) successfully use international advanced research networks to couple the world's largest and most powerful (3 million volt) transmission electron microscope at UHVEM to a remote-use computer pavilion set up at NCMIR. <http://www.npaci.edu/online/v3.10/telemicroscopy.html>

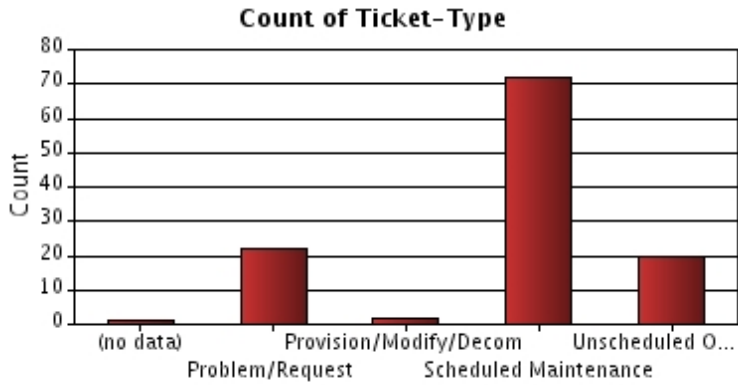
## Budget Summary

<b>CIREN/TransPAC2 Budget Year 3</b>						
<b>One-time costs</b>						Expended
						Year 3
Router/switch equipment in LA						
Juniper T-320 router						0
HP 3400 switch						0
HP 6400 switch 2						0
Total						
<b>On-going costs</b>						
Circuit costs and related expenses						
OC-192 Los Angeles - Tokyo						504000
PacificWave connection fee						21000
KDDI-America co-lo fee						18000
Juniper T-320 maintenance						28000
Personnel costs (including indirects)						
One-half network engineer						68250
One-half NOC support						39000
Student hourly						6000
Travel and other						
Travel						28500
Reporting						5000
Total						717750

# TransPAC2 Business Activity, Annual Report 2007

## TROUBLE TICKET TOTALS

This report contains data from 117 Tickets.



Count of Ticket-Type	
(no data)	1
Problem/Request	22
Provision/Modify/Decom	2
Scheduled Maintenance	72
Unscheduled Outage	20

## TransPAC2 Network Availability Statistics and Analysis Annual Report 2007

### DOWNTIME TOTALS

#### ROUTERS / SWITCHES

TransPAC2 T320 – Los Angeles  
TransPAC2 10G Ethernet Switch

#### OUTAGE

1 hr, 11 min  
0 hr, 0 min

#### MAINTENANCE

2 hr, 17 min  
0 hr, 00 min

#### TRANSPAC2 PEERING CIRCUITS

TransPAC2-Los Angeles OC-192

74 hr, 15 min

47 hr, 31 min

### UNSCHEDULED OUTAGES REPORT

<b>Total Number of TransPAC2 Outages</b>	<b>20</b>
Peer Networks	14
Circuits	4
Routers/Switches	2

### Circuit & Hardware Outages - Short Description

Ticket Number	Title	Outage Type	Duration	Actual Start Time (UTC)	Actual End Time (UTC)
610	TransPAC2-Los Angeles OC-192 Circuit Outage	Circuit-Other	0 hr, 10 min.	January 4, 2007, 10:02 UTC	January 4, 2007, 10:12 UTC
637	TransPAC2-Los Angeles OC-192 Circuit Outage	Circuit-Other	0 hr, 44 min.	May 15, 2007, 4:43 AM UTC	May 15, 2007, 5:45 AM UTC
676	TransPAC2 Core Node Outage	Hardware	0 hr, 5 min.	July 31, 2007, 9:12 AM UTC	July 31, 2007, 9:17 AM UTC
689	TransPAC2-Los Angeles OC-192 Circuit Outage	Circuit – Damaged Fiber	11 hr, 25 min.	August 28, 2007, 5:53 PM UTC	August 29, 2007, 4:58 AM UTC
715	TransPAC2 Core Node Outage	Hardware	1 hr, 6 min.	November 19, 2007, 2:19 AM UTC	November 19, 2007, 3:25 AM UTC
719	TransPAC2-Los Angeles OC-192 Circuit Outage	Circuit – Damaged Fiber	61 hr, 56 min.	December 3, 2007, 12:40 AM UTC	December 6, 2007, 2:36 AM UTC

## Circuit & Hardware Outages – Long Description

TICKET NO.: 610:62  
SUBJECT: TransPAC2-Los Angeles OC-192 Circuit Outage  
AFFECTED: TransPAC2-Los Angeles OC-192 Circuit  
START TIME: Thursday, January 4, 2007, 10:02 AM (1002) UTC  
END TIME: Thursday, January 4, 2007, 10:12 AM (1012) UTC  
DESCRIPTION: TransPAC2-Los Angeles OC-192 Circuit was unavailable. The circuit provider reports that the outage was due to maintenance by local network provider VSNL.

TICKET NO.: 637:62  
SUBJECT: TransPAC2-Los Angeles OC-192 Circuit Outage  
AFFECTED: TransPAC2-Los Angeles OC-192 Circuit  
START TIME: Tuesday, May 15, 2007, 04:43 AM (0443) UTC  
END TIME: Tuesday, May 15, 2007, 05:45 AM (0545) UTC  
DESCRIPTION: TransPAC2-Los Angeles OC-192 Circuit was intermittently unavailable. The circuit provider restored service.

TICKET NO.: 676:62  
SUBJECT: TransPAC2 Core Node Brief Outage Resolved  
AFFECTED: All TransPAC2 connectivity  
START TIME: Tuesday, July 31, 2007, 9:12 AM (0912) UTC  
END TIME: Tuesday, July 31, 2007, 9:17 AM (0917) UTC  
DESCRIPTION: TransPAC2 Core Node was briefly unavailable to the TransPAC2 community. TransPAC2 Engineers were notified and determined the cause to be hardware issues.

TICKET NO.: 689:62  
SUBJECT: TransPAC2-Los Angeles OC-192 Circuit Outage Available  
AFFECTED: TransPAC2-Los Angeles OC-192 Circuit  
START TIME: Tuesday, August 28, 2007, 5:33 PM (1733) UTC  
END TIME: Wednesday, August 29, 2007, 4:58 AM (0458) UTC  
DESCRIPTION: TransPAC2-Los Angeles OC-192 Circuit was unavailable to the TransPAC2 Community. Circuit Provider, KDDI America LANOC investigated and determined this to be a fiber cut near Santa Clara, CA. The carrier restored the fiber and the circuit.

Ticket No.: 715:62  
Subject: TransPAC2 Core Node T320 Outage Resolved  
Affected: Core Node T320  
Start Time: Monday, November 19, 2007, 2:19 AM (0219) UTC  
End Time: Monday, November 19, 2007, 3:25 AM (0325) UTC  
Description: TransPAC2 Core Node T320 was unavailable. TransPAC2 engineers rebooted the router and restored connectivity.

Ticket No.: 719:62  
Subject: TransPAC2 TOKY-TransPAC2 LOSA Circuit Available  
Affected: TransPAC2 TOKY-TransPAC2 LOSA Circuit  
Start Time: Monday, December 3, 2007, 12:40 PM (1240) UTC  
End Time: Thursday, December 6, 2007, 2:36 AM (0236) UTC  
Description: TransPAC2 TOKY-TransPAC2 LOSA backup is now available to the community via a backup path. The carrier is still working to locate all the damaged portions of the production fiber path. At this time there is no estimate for when temporary circuit will be switched back to the production path.

## **Plans for Project Year 4 (1-January-2008 thru 31-December-2008)**

### **Engineering**

- New TransPAC2 circuit agreement will be signed. This will enable planning for the next generation of TP2 services.
- The US-Pakistan connection will become operational.
- TransPAC2 will develop a close association with the GENI Project and will participate (Williams) in preparation of a funding proposal to develop more fully the GENI international relationship.

### **Measurement**

- Continue to work with perfSONAR groups to publish traffic data and deploy resources in the US and AP-region.
- Deployment of perfSONAR services in Tokyo will be completed.
- Continue development of weathermap and other visualization tools.

### **Security**

- Work with the REN-ISAC on TransPAC2 security issues.
- Continue to develop web services to access Security TransPAC2 data.
- Work with APAN security WG to disseminate information.

### **Applications**

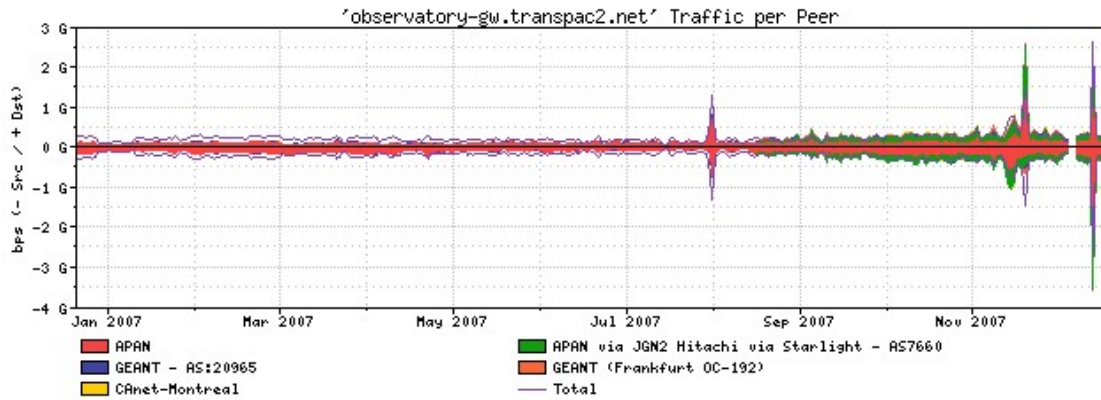
- Work with the APAN Medical WG to help bring together US and Asian doctors and medical researchers for meetings and demonstrations.
- Hicks and Williams will attend the next PRAGMA Workshop.

## Additional TransPAC2 Traffic Graphs

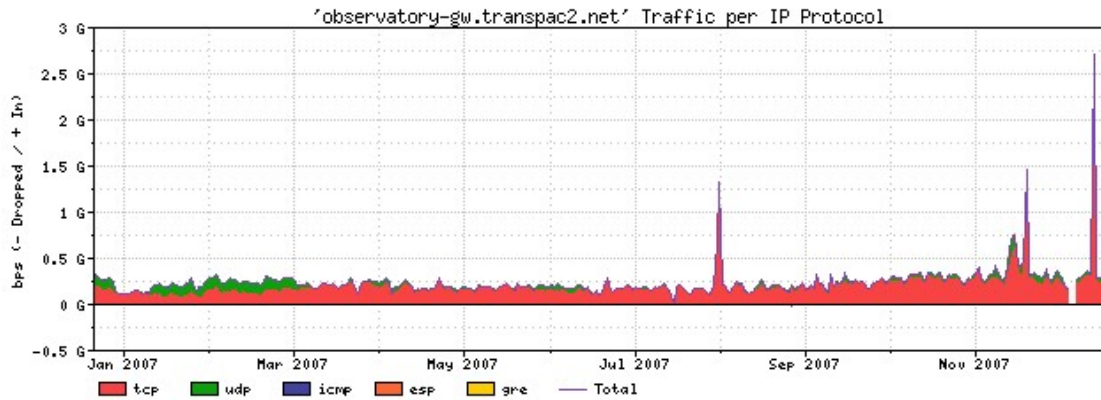
### Annual usage graphs

The following five graphs represent a simple breakdown of traffic behavior on the TransPAC2 network from the end of the fourth quarter of 2006 though the fourth quarter 2007 (approximately 52 weeks).

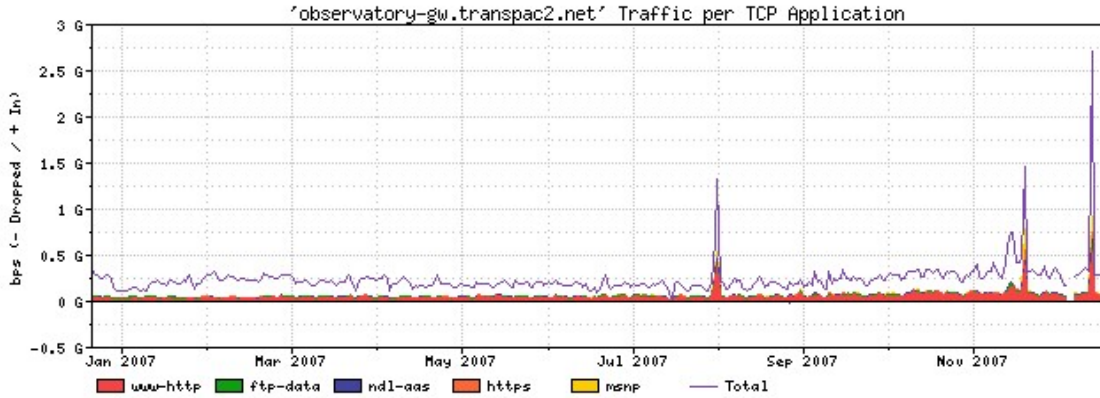
The figure below represents a list of peer contributions to the traffic load on the TransPAC2 network.



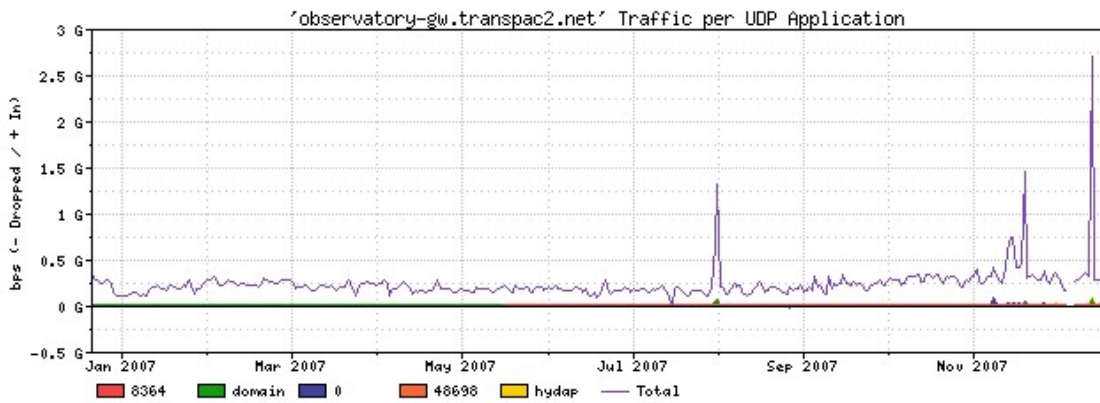
The figure below represents a simple breakdown of traffic by IP protocol.



The figure below represents a list of TCP application contributions to the traffic load on the TransPAC2 network.



The figure below represents a list of UDP application contributions to the traffic load on the TransPAC2 network.



The figure below represents the number of routes seen by the TransPAC2 router in LA during the reporting period

