TransPAC3 update

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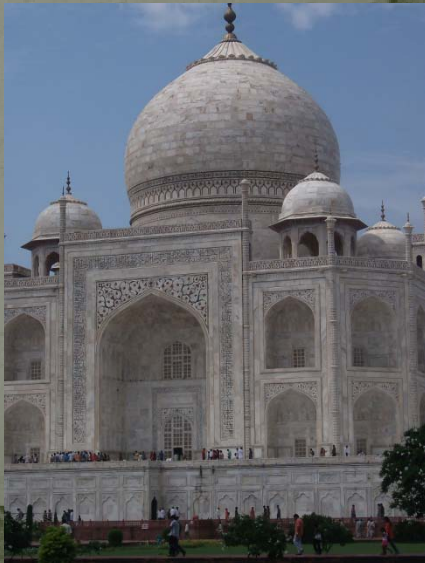
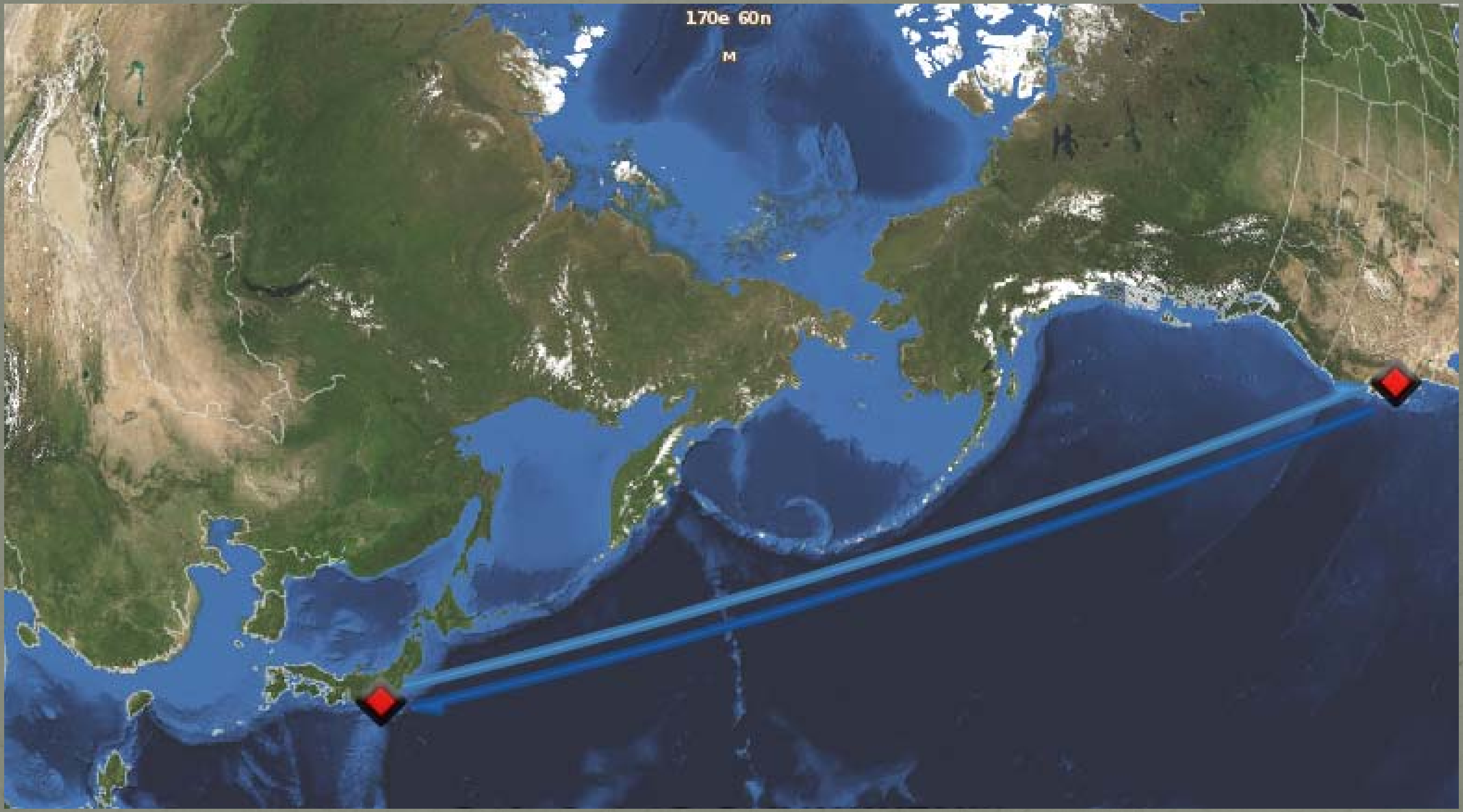
GlobalNOC
Global Research Network Operations Center



What is TransPAC?

- A high-performance connection between the North American research & education networks to the Asia-Pacific research & education networks in support especially of science research
- Partners are Global Research NOC at Indiana University (USA) and APAN-JP (Tokyo)
  - Joint, coordinated operation
  - Matching complementary circuits with mutual backup
  - Transparent measurement and monitoring
  - Lots of burstable capacity ("headroom") to support high-performance science flows
  - Support for leading-edge network technologies

TransPAC Tokyo-Los Angeles



What is TransPAC3?

- A high-performance (10Gb/s Ethernet) connection between the North American research & education networks to the Asia-Pacific research & education networks in support especially of science research
- Terminates in Tokyo and Los Angeles
- Tokyo end operated by APAN-JP
- Los Angeles end operated by Global Research NOC at Indiana University
- Funded by US National Science Foundation IRNC2 program (award OCI-0962973) for 2010-2014.

The new TransPAC3 circuit

- Circuit provided by KDDI-America
- Uses *TGN-Pacific* cable system
- Unprotected (pre-emptable)
- Complementary (and with mutual backup) with JGN2+ Tokyo-LOSA circuit
- Terminates in KDDI POPs in Los Angeles, Tokyo
- Testing in March 2011, full turnup by 1 April

The new TransPAC3 router

- TransPAC2 used a Juniper T-series router
- MX series allows native layer2 and layer3 functions, high-performance bridging or routing as needed
- A design goal for TransPAC3 was to integrate dynamic circuit functions more deeply into the service—MX allows that.
- More heavily-instrumented for data-gathering (see John Hicks talk for details)

What are the significant differences between TransPAC2 and TransPAC3?

Before 2011 (TransPAC2):

- Juniper T-series router
- OC192 (SONET)
- 'tunneled' dynamic circuits, static 'vlans'
- Dual-stack native ipv4, ipv6
- Netflow for ipv4, not ipv6

New for TransPAC3:

- Juniper MX router
- 10GE (LAN-PHY)
- option for added capacity (>10G) as use justifies
- Native dynamic circuits
- True dynamic circuit capability
- Dual-stack native v4/6
- Netflow for v4 *and* v6

Continuing services and functions

- Line-rate 10GE
- 10G Complementary backup connection to JGN2+
- 10G Connection to Pacific Wave exchange point
- 10G Connection to Internet, NLR, ESnet, other major R&E networks
- Continued connection to Internet "ION" DCN service
- Native, line-speed ipv4 and ipv6 routing and transport
- Monitoring and measurement of interfaces, traffic, flows (adding ipv6 netflow)

TransPAC connections

- 1. TransPAC connection to Tokyo
  - APAN (AS7660)
  - APAN path-matrix server
- 2. JGN
  - APAN (AS7660)
- 3. PacificWave exchange point

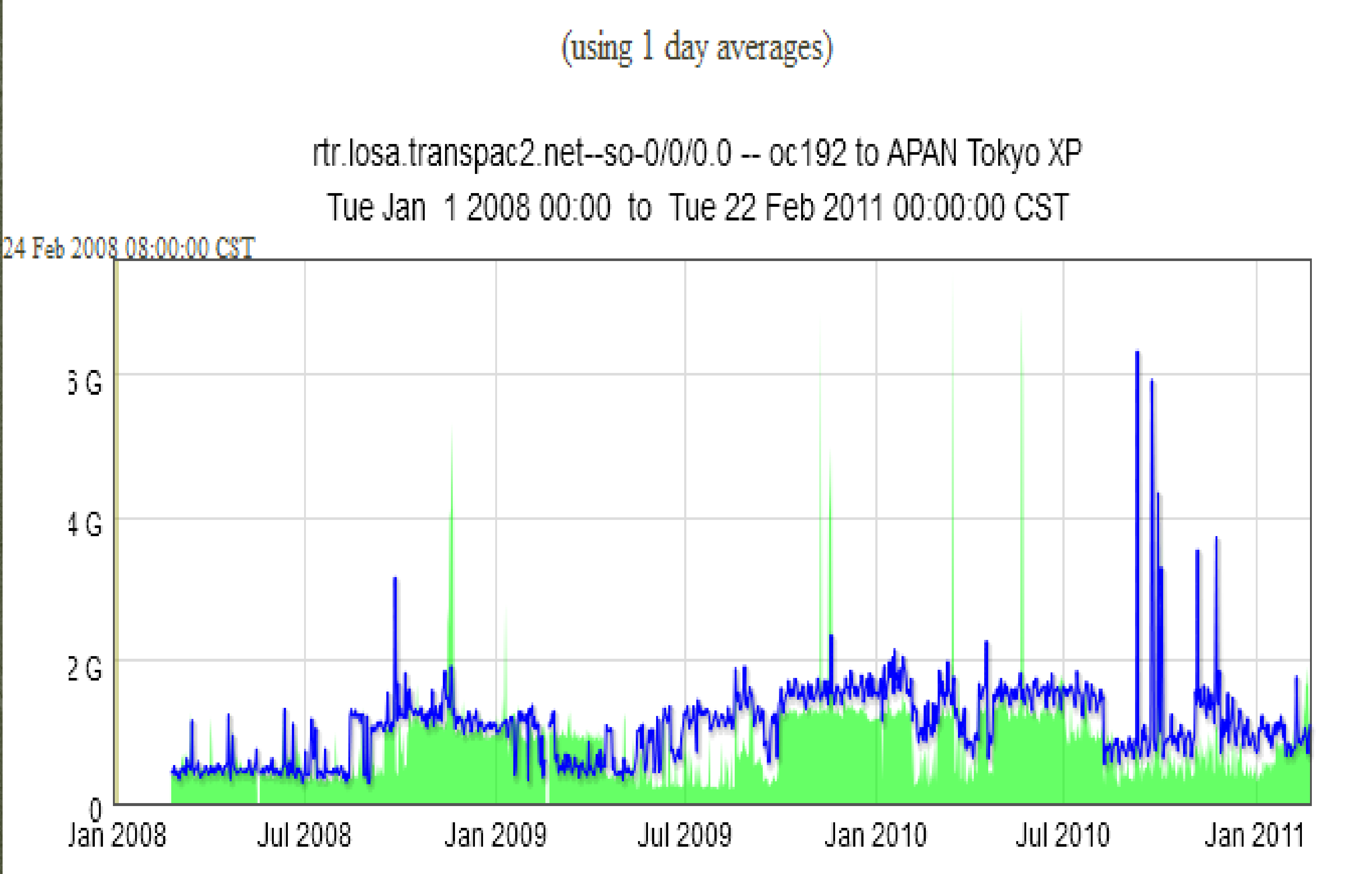
  North America:
  - CENIC (AS2153)
  - PNWGP (AS101)
  - Internet2 (AS11537)
  - NLR (AS19401)
  - Ultralight (AS32361)
  - NASA NREN (AS24)

  Other Asia-Pacific:
  - REANNZ (AS38018)

  Research tools:
  - Route-views (AS6447)
  - ARBOR (AS22388)

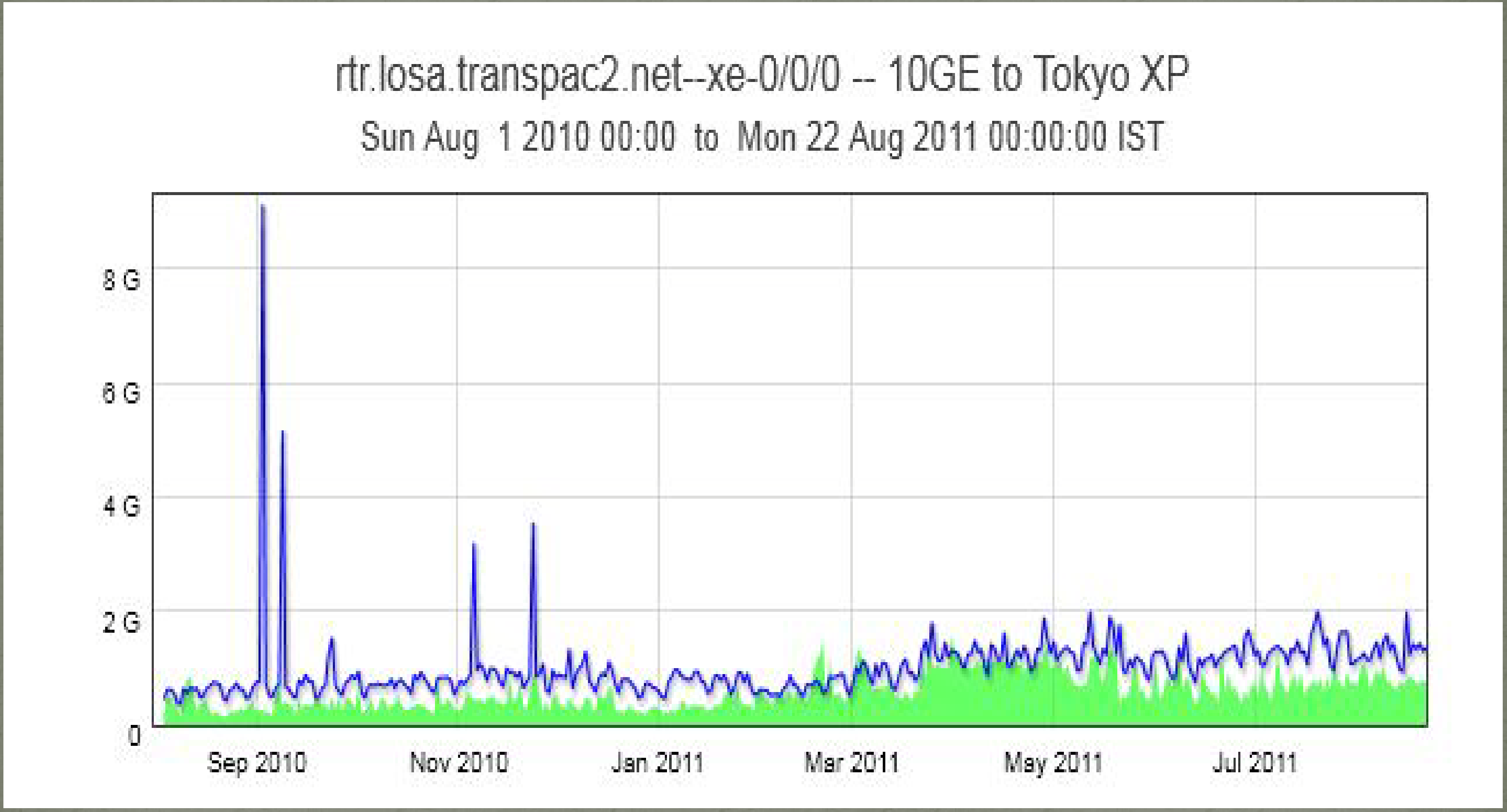
TransPAC2 traffic levels (2008-Feb 2011)

for 2010 (1-day samples): I/O max 7.4/6.3Gbs; avg 0.9/1.3Gbs



TransPAC2 traffic levels (last 12 months)

(1-day samples): I/O max 1.6/9.1 Gbs; avg 0.6/1.0 Gbs



Peakflow SP

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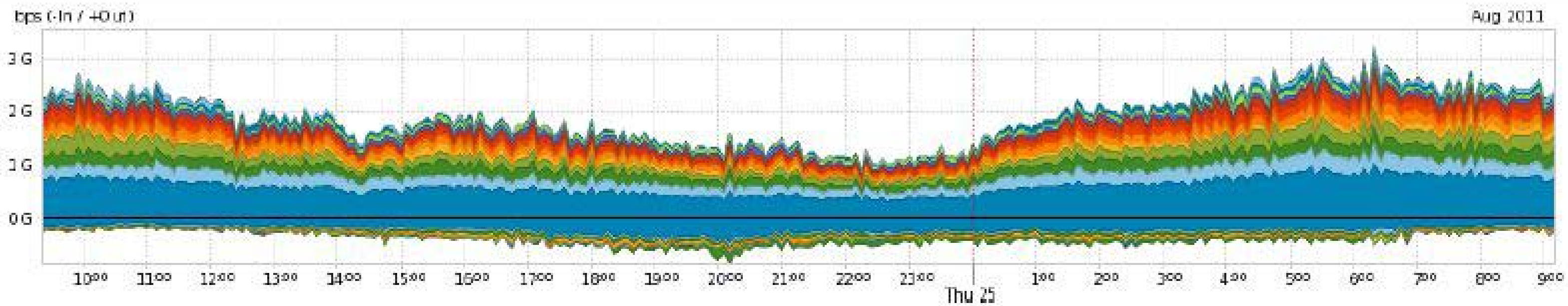
Peakflow SP Interface 'xe-0/0/0.259' ASNs (All)

This report shows the in, out, and total traffic for a selected interface, broken down by ASN. The traffic is a combination of peer and origin traffic.

Interface 'xe-0/0/0.259' ASNs (All)

DETAILS | **Period:** Today **Start:** 24 hours ago **End:** now | **Units:** bps | **Graph Type:** Stacked

Interface: xe-0/0/0.259



Showing: Current

AS NAME	ASN	INPUT	OUTPUT	TOTAL
X APAN-JP	7660	131.00 Mbps	755.00 Mbps	886.00 Mbps
X ASNET	9264	17.00 Mbps	228.00 Mbps	245.00 Mbps
X CNGI-BJIX-AS-AP	23911	23.00 Mbps	293.00 Mbps	316.00 Mbps
X TEIN2-JP	24287	5.23 Mbps	258.00 Mbps	263.23 Mbps
X ERX-CERNET-BKB	4538	23.00 Mbps	174.00 Mbps	197.00 Mbps
X TANET2-TW	7539	5.25 Mbps	139.00 Mbps	144.25 Mbps
X TEIN2-NORTH-AP	24489	1.60 Mbps	176.00 Mbps	177.60 Mbps
X CSTNET-AS-AP	7497	19.00 Kbps	126.00 Mbps	126.02 Mbps
X NCU-TW	18420	1.51 Mbps	77.00 Mbps	78.51 Mbps
X NTU-TW	17716	2.72 Mbps	59.00 Mbps	61.72 Mbps
X ERX-TANET-ASN1	1659	7.15 Mbps	50.00 Mbps	57.15 Mbps
X TEIN2-SG-AP	24490	2.63 Mbps	83.00 Mbps	85.63 Mbps

Dynamic circuits

- TransPAC, with our APAN-JP partners, has supported layer2 'pseudowire' circuits over the TransPAC circuit since 2008.
- 2008-now we provide statically-created vlans (no support for true *dynamic* layer2 on the trans-Pacific backbone)
- In TransPAC3, the MX router will interoperate with IDC and dynamic-circuit software allowing circuits to be built and torn down dynamically, on demand and as needed
- Layer2 and layer3 coexist across the same JP-US path

Looking forward…

- Continued support for high-performance production networking

Add:

- Improved integration with dynamic ‘lightpath’ protocols e.g. ION
- Support for OpenFlow and other GENI experimental networks (probably *not* logical routers)
- Support for other NGI protocols as needed
- Better interaction with DICE, GLIF and other NGI/FIT efforts

Transpac supplementary projects

- Some support for PERN (Pakistan NREN) connection to APAN
  - Karachi-Singapore-Tokyo
  - Starting in mid-2008
- Some support for CERnet-led connection to North America
  - Starting in late 2011
  - National Science Foundation support for US contribution
  - CERnet 10Gbs connection to Los Angeles, planned to include both CERnet and CSTnet traffic

Part II:
Telepresence technology introduction

Telepresence technology

- New technologies occasionally bring new network requirements
- Of growing interest to the R&E networks recently is Cisco TelePresence, with hundreds of sites in R&E, growing steadily
- How does its technology affect our networks?

Telepresence technology

- Hierarchical in nature
  - Codec ‘registers’ with call manager
  - Call manager manages end systems, arranges for trunking and call ‘routing’ decisions
  - SIP signaling: TCP (UDP) port 5060
  - UDP media flows on ports 16384 – 32768
  - Deterministic paths—always follows trunk hierarchy
- Hierarchy leads to ‘exchanges’
  - Several commercial exchanges
  - Only one exchange today (so far) for R&E

Cisco Telepresence characteristics

- Very high quality and production values
  - 1080p resolution
  - Large screens (67" [170cm] or larger)
  - High-quality audio
  - Super-simple intuitive operation
- Very high data-compression
  - ~4-5 Mbs per screen, so data *volume* not large
  - Therefore very sensitive to packet loss
    - QoS may be indicated if there is loss
  - Also sensitive to jitter and latency, working well in our high-performance networks

Cisco Telepresence in R&E

- APAN countries connected to R&E exchange:
  - China
  - Singapore
  - Thailand
  - Australia

- Other countries:
  - Austria, UK, Canada, Slovakia, Holland, Brazil, Portugal, UAE
- In US: 53 state systems/universities/schools/labs, ~230 systems connected
- 2 connections to 7 commercial exchanges

Additional R&E exchanges

- While Telepresence systems worldwide *can* connect to a central global R&E exchange and work with each other, both media flows and support/'community' relationships suggest local connections are better
- Logical locations:
  - Multiple locations in Asia, especially China
  - Australia—announced for late 2011 (*AARnet*)
  - Europe, multiple locations
  - Latin America
  - Africa
  - Middle East
- Leverage existing NREN relationships to federate TP, highest possible function, provide mutual support

Thank you!