

Report to CPG on CENIC Activities – 9/25/2008

1. Status of the "last mile" upgrades

Brian Court has gotten the final bill of materials from Cisco; CENIC is awaiting delivery of the new 15454 DWDM gear. Joseph Goodwin from CENIC Engineering has been assigned the project. CENIC expects to start the upgrades in late October/early November, starting with Berkeley.

Planned order of upgrades: Berkeley, UCLA, UCI, UCSF, UCDCMC, UCOP.

(Note: Cisco 15530s will be removed from service, not upgraded: the new 15454 gear provides functionality that makes the 15530s unnecessary. I think this affects UCD, UCSB, UCSD.)

2. Status of the HPRng Router RFP

Two proposals were received for CENIC's HPRng router RFP. The less expensive proposal was interesting as it came from a manufacturer not known for high-end router platforms. In addition to a lower "sticker price," the proposed routers required less power and less rack space than the routers in the higher priced proposal.

The RFP evaluation (composed of UC campus technical folks on HPR TAC, and Brian Court and Erick Sizelove from CENIC) team developed a test plan and performed two days of lab testing (in mid-April) and several weeks of field testing (finished in July) of the proposed routers. Overall, the evaluation was very favorable, although a few issues were discovered.

In July, the evaluation team learned that UCR, which uses the proposed model of router, was experiencing failures and had a case open with the manufacturer's technical support. The evaluation team decided to monitor the activities at UCR for a 4-week period, before coming to any final conclusion. 2 days before that end of the 4-week period, the manufacturer provided an updated image that fixed a deep-seated bug in the code that handles TCP connections to the router (*e.g.*: BGP, MSDP, remote access, to name a few).

The evaluation team has drafted a letter to the CENIC Board recommending acceptance of the lower-cost proposal, identifying several issues that must be dealt with. HPR TAC is currently reviewing the letter and will be asked to approve it for transmittal to the Board. The largest issue is the announcement that the manufacturer is being acquired by another company, also not known for routers. The letter of recommendation requests that the CENIC BAC consider the business and financial aspects of the acquisition and advise the Board on the soundness of the recommendation.

Assuming the HPR TAC approves the letter of recommendation (this seems likely at this time) , and assuming the BAC does not determine the recommendation to be unsound from a business and financial perspective, the Board's XD/HPR committee will be asked to accept/reject the recommendation on 10/22/2008.

3. HPR TAC activities

See the attached HPR status reports to the CENIC Board, 4 June 2008 and 27 August 2008. Significant activities:

- a. IPv6: campus deployments, IPv6 transit from Hurricane Electric, IPv6 peering and transit from Internet2 moving to CPS.
- b. Participation in Internet2: several UC folks have joined Internet2's Network Technical Advisory Council, and Internet2's Performance and DCN working groups.
- c. CalREN-HPR Performance Measurement and Testing Infrastructure deployment.
- d. Internet2 requests for capacity on CENIC networks.
- e. HPR "Forward-thinking" discussion: "IPv6 only" HPR, "circuits only" HPR, IPv4 CPS testing, LISP testing.

4. CENIC Board discussions

"Green" ICT – "green" considerations will be incorporated into future CENIC RFPs (starting with the HPRng RFPs for Ethernet switches and optical switches); Board has requested that the DC and HPR TACs consider how to do this.

Cloud computing – some researchers have expressed interest in using "cloud" resources such as "Amazon Web Services" and "Google Apps." CENIC needs to understand implications for bandwidth utilization and the relationship to TransitRail peerings with Amazon and Google.

Backup Data Center plans, Disaster Recovery plans – CENIC needs to understand bandwidth implications of campuses' plans for backup data centers and disaster recovery. Also, some interest (mostly from other CENIC Associates) in having CENIC operate a Data Center Collocation service.

National networking strategy – CENIC Board is considering what CENIC's strategy should be for national networking, in the post-merger-failure context.

5. CENIC XD/HPR Workshop 2008

Calit2 at UCSD hosted the first CENIC XD/HPR Workshop (9/15-16/2008), to promote researchers' awareness of the resources and services made available to them by CENIC's

XD services and HPRng network. A number of UC programs and researchers gave talks and/or demonstrated applications using XD or HPR resources. The program, along with slides from presentations, are available at <http://www.cenic.org/workshop/>; there is also a plan to make streaming videos available.

The original plan was to hold these workshops annually, at several campuses (the facilities and infrastructure requirements are significant); it has been suggested that scaled-down, more frequent “XD/HPR roadshows” be offered at all campuses.

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**HPR TAC Report
4 June 2008**

The HPR TAC met on 8 May 2008 at UC Davis. The following topics were discussed:

- **IPv6.**

Brian Court reported on the status of Internet2's activities to move commodity IPv6 routes into the CPS and remove them from the R&E peering, and the status of CalREN-HPR peering with CPS for IPv6. Brian also reported that CalREN-HPR is configured for IPv6 multicast routing, although there is not yet any external connectivity for this and no campus has brought up IPv6 multicast peering with CalREN-HPR.

ken conducted a quick and dirty survey of the state of IPv6 routing on campuses:

Routing IPv6 internally	Routing IPv6 at border (HPR peering)	Planning to start routing IPv6 in next 6 months
UCR UCLA SDSC USC UCB	UCR UCLA SDSC UCB Stanford UCSD	UCSD (interil & border) CSU SLO (border) CalTech (internal & border)

UCLA concluded the survey by observing that it would have "full service" (web and email access) during the IPv6-only hour during the next Joint Techs workshop (mid-July). No other campus could make the same claim.

- **HPR refresh.**

Brian Court reported on the status of the router RFP and, along with HPR TAC members who were present, summarized the results from the lab test at Foundry HQ.

- **PerfSONAR.**

Jeff Boote (Internet2) presented a detailed description of the perfSONAR project. perfSONAR is an architecture for collecting and archiving performance measurement data, and for sharing it between different network domains. (*E.g.* UC Berkeley, CalREN-HPR, Internet2 Network, NYSERnet, NYU.) HPR TAC is interested in perfSONAR not only for campus deployment, but also as a component of CENIC's performance measurement and reporting project.

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Software is being developed by an international consortium including Dante, GEANT, Internet2, and other research networks. The first post-beta version of the software has just been released; available for download. An Internet2 perfSONAR Working Group has just been created and is collecting members now; several HPR TAC members have joined the working group. perfSONAR project will release a knoppix CD in July, 2008, designed to be used by campus researchers for performance testing at their locations on campus networks. HPR TAC suggested that the perfSONAR project consider making a similar CD, but designed for use in locations in campus backbones and regional backbones.

- **Internet2 DCN.**

Tom Lehman (ISI-East) presented a detailed description of the Dynamic Circuit Network (DCN), in particular, the ongoing development of the distributed control plane. HPR TAC is interested in what is required to connect to DCN and to interoperate with the control plane. The control plane software is being developed by an international consortium called DICE (Dante, Internet2, CAnet4, ESnet), incorporating and integrating components developed by each participant. An Internet2 DCN Working Group has just been created and is collecting members now; several HPR TAC members have joined the working group.

ken lindahl
HPR TAC Chair

ATTACHMENT #B.

HPR TAC Report 27 Aug 2008

The HPR TAC met 7 Aug 2008 at Caltech. The following topics were discussed:

- **CENIC Budget Overview**

Jim Dolgonas presented an overview of the CENIC budget with emphasis on how different costs are allocated to Associates; this presentation was a highly condensed summary of the materials that Jim presented in the ExCom meeting 9 July 2008 (the day preceeding the 2008 Board retreat).

My intent in asking Jim to give this presentation was to increase HPR TAC members' familiarity with the overall structure of CENIC's budget, and in particular, which costs are shared by all Associates. Many of the newer TAC members are unfamiliar with how CENIC collects revenues from Associates and how those funds are applied to services. I think this is an area where additional education for TAC (DC and HPR) members will be beneficial.

- **CENIC Equipment Location Survey**

Dave Reese suggested that CENIC might conduct a survey of connected sites to collect latitude/longitude data for the locations of CENIC equipment at each site. He noted that a number of sites have equipment at locations that do not have street addresses, making it difficult for the CENIC NOC to send replacement equipment, installation/service personnel, *etc.* Latitude/longitude information can be easily determined from Google Maps.

HPR TAC was very supportive of this suggestion; several members volunteered to help develop the survey and "pilot test" it.

- **HPR Performance Measurement and Testing Infrastructure**

Sherilyn Evans reported that the piPEs servers specified in the HPR TAC proposal (approved by the Board in the 13 June 2007 meeting; see Exhibits N and N-2 for that meeting) are now connected to the CalREN-HPR network and will soon be available for use. TAC briefly discussed what needs to be done in order to make these tools as useful as possible, including interoperation with campus piPEs servers and with piPEs servers on the Internet2 and NLR PacketNet backbones. The HPR TAC chair asked the committee that developed the proposal (Mark Boolootian, Tom Hutton, Michael Sinatra, and Mike Van Norman) to develop a list of requirements and actions to achieve these goals. This list will be reviewed and refined by the entire HPR TAC membership and eventually accepted for implementation on campus and HPR piPEs servers.

- **Internet2 Requests.**

ken lindahl and Dave Reese briefed the HPR TAC on the two requests from Internet2: *i.* a request for a wave from SVL to PAIX so that CPS can peer at

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PAIX; and *ii.* a request that CENIC carry traffic for a “National Economic Research Big Organization” (NECBO) .

Wrt *i.*: HPR TAC supports leasing a wave to Internet2 for CPS. TAC wants to be cooperative with Internet2 projects that support the R&E community; does not want to appear obstructionist toward CPS. (Note: the TAC discussion did not include consideration of whether this extension of CPS might hinder or make more challenging the efforts to merge CPS and TransitRail. HPR TAC is broadly supportive of those efforts.)

Wrt *ii.*: HPR TAC is not favorably disposed toward providing capacity on either CalREN network, for entities that have no affiliation with CENIC. Comments included: “Why can’t they join [CENIC]?” “Isn’t this a classic case for using MPLS on the commodity Internet?” “Is this an R&E application?” Dave Reese raised the followup question: if CENIC is not able or willing to satisfy the request, can Internet2 bypass CENIC, i.e. sell a separate connection to the NECBO? HPR TAC is not opposed to this, but noted that Internet2 should not price the connection lower than what current connectors pay.

Generally, HPR TAC feels requests for capacity on the CalREN networks must be evaluated case-by-case; there should not be any notion of broad approval for requests of this kind. We are an R&E community; we do not want to become a common carrier.

Russ Hobby noted that one of his Internet2 assignments is to meet with the Executive Liaison from each California I2 member. HPR TAC requested that Russ inform the TAC representative(s) from each institution as these meetings are scheduled, to allow TAC members the option of briefing the Executive Liaison in advance of the meeting. Dave Reese requested that CENIC also be informed of the meetings. Russ agreed to do both of these.

- **Participation in ARIN.**

Michael Sinatra reminded HPR TAC that the NANOG/ARIN joint meetings are coming up soon (12-17 Oct 2008) and will be very easy to attend, since they will be hosted by USC/Los Nettos. ARIN is currently considering proposals that might have a profound impact on CENIC Associates’ (and higher education in general) use of IPv4 and IPv6 addresses, and it is in our best interests to become actively involved. Michael’s comments were echoed and supported by Lea Roberts (who is an ARIN Advisory Council member) and several others.

- **HPR “forward thinking” discussion**

This discussion considered some directions that future development of the CalREN-HPR backbone might take. Please note that these directions were offered as “wild ideas” intended to promote brainstorming and consideration of medium- and long-term strategies for CalREN-HPR development.

1 – “IPv6 only” HPR network: “Can we disable IPv4 routing on the CalREN-HPR backbone routers on July 1 2009, making CalREN-HPR the first IPv6 only regional backbone?” There was general agreement that the proposed date was too aggressive: even if all HPR-connected campuses were able to implement IPv6 routing on campus networks by that date (roughly half of the HPR-connected campuses have some IPv6 routing on campus today), that would not mean that all campus research traffic would be using IPv6. Researchers are reluctant to use IPv6 for their projects: they are concerned about delays caused by problems in the IPv6 host implementations, as well as the need to collaborate with colleagues at other campuses that likely do not have such aggressive plans to deploy IPv6. Most campus traffic, research and otherwise, would continue to use IPv4; this would simply move over to campuses CalREN-DC connections and the CalREN-DC backbone. The upgraded DC network could likely handle the additional load, perhaps with additional backbone links as was specified in the refresh requirements, although it was noted that the DC network does not generally provide the large amount of headroom provided by the HPR network. However, several campuses would need to upgrade their connections to the DC network to 10GE in order to accommodate the additional load; no campus currently has this in its budget plans.

There was general consensus that it is too early even to set a date for disabling IPv4 routing on CalREN-HPR. TAC agreed to continue to focus on campus deployments of IPv6, including IPv6-enabled core services (web, email, DNS, *etc.*) as well as routing. TAC also agreed to consider “IPv6 hour” experiments at future TAC meetings, during which IPv4 would be disabled (note that the “hour” would likely be much shorter than 60 minutes, at least initially.) IPv6 planning will be discussed at the combined DC+HPR TAC meeting in December of this year.

2 – “Circuits only” HPR network: “Can we envision a future HPR network consisting only of circuit services, *i.e.* switched Ethernet VLANs, optically switched lambdas, and no IP routing?” There was some (by no means complete) agreement that, as a long-term development, this is not so terribly far-fetched. To a large degree, researchers’ adoption of circuit services will determine how realistic this notion is and will drive the timing. TAC will therefore watch carefully and encourage researchers to adopt the new circuit services included in the HPR refresh (*i.e.* HPRng-L2 and -L1).

The next two ideas (numbers 3 and 4) are nowhere near as far-fetched as the preceding two ideas; they were “bashed” into the agenda during the meeting and included in this portion of the meeting as a matter of convenience.

3 – CPS testing: “Should we test/evaluate Internet2’s Commodity Peering Service?” Dave Reese proposed that CENIC begin limited testing of CPS, noting that this could be beneficial to campuses (increased peering and therefore reduced commodity service costs) and to CENIC management (demonstrate advantages of combining CPS and TransitRail). Care would be required to make sure this testing

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does not negatively impact R&E activities, in particular, perhaps start with only specific CPS routes and disable at times when increased R&E traffic can be predicted (e.g. SC08, I2 member meetings, Joint Techs workshops). CPS routes will be announced into CalREN-DC, benefitting all CENIC segments; therefore this proposal needs to be reviewed and accepted by the DC TAC. HPR TAC was generally supportive, though it was noted that this will effectively reduce the size of our Internet2 connection in terms of bandwidth available for R&E traffic.

4 – Routing table size issues: “Should we test/evaluate proposed architectures and protocols designed to address the problem of routing table bloat and churn in the default-free Internet, *e.g.* LISP?” Mike Van Norman suggested that HPR TAC consider ways to reduce the size of default-free Internet routing tables, in particular, the LISP (Locator/ID Separation Protocol, described in the Internet draft: [draft-farinacci-lisp-08.txt](#)). Perhaps there is a way in which we can test LISP on the HPR backbone. HPR TAC agreed that this is an interesting topic, and supported the suggestion that the author of the draft be invited to present and discuss this at a subsequent TAC meeting.

ken lindahl
HPR TAC Chair
27 Aug 2008