Internet2, CalREN-2, & International Connectivity

David L. Wasley
University of California
Advancing Internet Technology

- Internet2
  - a Project of UCAID
- CalIREN-2
  - a project of CENIC
- International connectivity model
  - STAR TAP
  - maybe also gigaPOP
Internet2

- University Corporation for Advanced Internet Development – UCAID
- Internet2 is the first project of UCAID
  » to promote development of advanced Internet applications
  » to ensure availability of a testbed for these applications
- Abilene is the current testbed
Advanced Applications

- One-to-many broadcast, e.g. lectures
  - requires Internet “multicast”
- Many-to-many multicast
  - e.g. collaboration environments
- Differentiated data transport services
  - “real time” applications, e.g. video
  - telescience
  - telemedecine
The Abilene network

- IP only – IPv4 now; IPv6 soon
- Interconnects “gigaPOPs”
  » regional aggregation networks
- Very high capacity – OC-48 +
- Multicast is supported
- QoS later this year
- Peers with ESNET, NREN, STAR-TAP, etc.
Abilene Topology

Abilene Weather Map
GigaPOPs

- Regional aggregation networks
- Supports access to a variety of services for its members
  - commodity Internet access
  - research backbone access
  - possibly international connectivity
- Supports advances Internet services
Conceptual GigaPOP

Transit Services

End-user Networks

International Networks

Federal Networks

ISPs

Research Backbones

CalREN-2 GigaPOP

Campus

Research Lab

Technology Partner

Urban Network
CalREN-2

- Corporation for Education Network Initiatives in California – CENIC
  - UC, Stanford, Caltech, USC, CSU
- CalREN-2 is a project of CENIC
- Advanced services
  - multicast, QoS (soon)
  - OC-12 (622 Mb/s) to each campus
- Two gigaPOPs
International Connectivity

- STAR TAP is the focal point
  - coordinates installation & operation
  - supports transit among all networks
- GigaPOPs can play a role too
  - Access to local/regional networks
  - coordinates with local carriers
- Transit is the major problem
  - constrained by current financial model
STAR TAP

- Science, Technology, And Research – Transit Access Point
  - at the Ameritech NAP in Chicago
- Funded by National Science Foundation
  - run by University of Illinois at Chicago
- Supports peering among all international member networks, research backbone networks, and regional networks
“Transit” v.s. “Peering”

- Peering allows traffic flow between members of cooperating networks
- Transit allows traffic to pass through an adjacent network to reach other networks
- Current financial models don’t encourage “transit”
  - they do encourage “peering”
GigaPOP International Connectivity Services

- A NEW IDEA UNDER DISCUSSION
- Would support international peering as well as access to local or regional networks
- Could be cost effective if enough international networks join
- Would require a specific “international transit national network”
GPICS Model

- STAR TAP
- Commodity Internet
- Regional Networks
- ? International Transit Network
- Research Networks

International Network
Comments? Questions?

- Does the GPICS model address a real need of international advanced networks?
- Is it the right model?
- Are there additional issues that need to be considered?
- How would you like to be involved?
- . . .
Further information

- www.ucaid.org
- www.cenic.org
- www.startap.net
- David L. Wasley
  » david.wasley@ucop.edu