Esnet in Context

Department of Energy Advanced Scientific Computing Advisory Committee
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Outline

- ESnet review – summary
- Trends in National Research Networks
ESnet review

- 10-11 Sep 01, co-incident with ESSC meeting in Santa Fe
- Review committee –
  - R. Kendall, DoE Ames Lab
  - E. P. Love, Internet2
  - G. Strawn, NSF
  - V. White, Fermilab
  - W. Turnbull, NOAA
  - S. Wolff, Cisco
ESnet is a small ISP

- Traffic volume, February 2001 –
  - ESnet – 45 TB
  - Abilene – 1057 TB
  - Uunet/Worldcom - ??
- New applications could add 1 Gb/s, 24x7
  - 1 Gb/s = 10.8 TB/day or about 328 TB/mo.
vBNS and Abilene
ESnet oversight

- User governance (ESSC, ESCC) appropriate for historical growth patterns
- Not well constituted to cope with the approaching step increase in capacity requirements
- Fragmentation is (again) a possibility
- UCAID HENP Working Group
ESnet performance

- Connectivity is adequate for most current users
- Good management tools and user services
- Lean, cost-effective operation
ESnet planning

- User governance is
  - risk averse
  - not well constituted for a strategic view
- Special programs (e.g., biotech, SciDAC) need to plan networking requirements and budget for needed capacity
ESnet planning for new services & technologies

- No central knowledge of networking research
- Establishment of ESRSC a good step, but needs wider scope
- ESnet is hard to defend as a commodity ISP
NRN trends
NRN trends

- Fiber – ownership or IRU
  - 39 million miles of fiber in continental US
  - 20-35% lit
  - 2% in use (Source: Merrill Lynch)
- Principal costs are trenching & terminating
- Economic parameters are unclear

- IPv6
  - GEANT (EU)
  - WIDE (Japan)
  - NoF (UCAID)
NRN trends (cont.)

- Collaboration emerging as driver
  - Access Grid – “group-to-group”
  - UC CITRIS center
  - …but it’s not easy
- Adoption of “Grid” paradigm
- Storage networks
- Optical networks
## Teleimmersion requirements

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<th>Latency</th>
<th>Bandwidth</th>
<th>Reliable</th>
<th>Multicast</th>
<th>Security</th>
<th>Streaming</th>
<th>Dyn QoS</th>
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<td>&lt; 30 ms</td>
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<td>No</td>
<td>High</td>
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<td>Text</td>
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</tbody>
</table>

Source: R. Stevens, ANL

(cf. also mini-essay by Valdis Kletnieks, VaTech)
Example: CA*net 4

- Predicated on a commodity market in lambdas
- Postulates a transition from the network as a set of services to a set of owned objects
  - “Object-oriented networking”
- End-user control
- Full mesh among administrative domains (initially regional nets)
  - No backbone network
  - Links are owned/leased
- GMPLS, OBGP, UCP,…
Example: DTF / Teragrid

- $53m NSF funding
- backplane first, a network second
- Qwest fiber IL <-> CA, SONET framing
- 4 * OC192 ~ 40 Gb/s
FINIS