Reasonable Network Management

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Two Questions

- Does protection of free speech require us to abandon active management of network traffic?
- Is it legitimate to manage network traffic according to the application that generates it?

Communication Needs

- Live person-to-person:
  - low jitter, low bandwidth
- Machine-to-person:
  - medium jitter, high bandwidth for short time
- Machine-to-machine:
  - jitter doesn't matter, high bandwidth consumption
- Network maintenance:
  - importance trumps all other applications because it keeps the network running.

Application-Sensitive Networks

- Internet Protocol
  - TOS/DSCP field
  - UDP vs. TCP
  - IEEE 802.11e (WiFi with WME)
- Ethernet with 802.1D/Q VLAN tags
- Isochronous protocols
  - DOCSIS
  - WiMax
  - WiMedia UWB
- Capacity still important, but spikes can be tolerated more gracefully.

Laurel Lane used to be such a nice place to live...

Re-engineering the Internet

- “Save the Internet from FTP”
  - Congestion Collapse cured by Additive Increase/Multiplicative Decrease + capacity
- “Save the Internet from the Web”
  - World-Wide Wait cured by HTTP 1.1 + capacity
- “Save the Internet from BitTorrent”
  - Will be cured by P4P + capacity
  - Management transparency

The Virtual Network

- The Internet is less a network than an abstraction of the data links that are the real networks.
- As the data links change, so must the abstraction
- The dumb Ethernet of the 1970s has long been obsolete
- New data links support QoS and active management
- The Virtual Network needs to support its constituent parts.

Backup

- Supplementary slides

Meeting Communication Needs

- Flow-based quota
- User-based quota
- Application class quota
- Combination of User and Class
  - Each user has quota in each class
  - Excess traffic is demoted
- Wireless networks reckon quota in time, not data

Dangers of Traffic Management

- Degradation of a competitive service
  - Can be active or passive
  - Bandwidth demands of some applications have this effect.
  - Failure to manage can be discriminatory in effect.
- Over-management may reduce system throughput
  - Not a live problem any more due to advances in hardware
- Hard to explain to the user

Good vs. Bad Traffic Management

- An empirical question, not a philosophical one
  - What immediate purpose does it serve?
  - What are the network conditions?
  - Who benefits from it?
- Digital packet networks are unique
  - Providing appropriate service to applications is critical
  - Assigning bandwidth from a flexible pool is fundamental
  - Not just a series of fatter tubes

Dangers of Regulation

- Some proposed regulations make it impossible to have the enhancements we need:
  - Per-user quotas to manage bandwidth hogs
  - Truly competitive VoIP and Teleconferencing services enabled by Bandwidth-on-demand
- Proposed regulations break new ground
  - Internet **switching** has always been free of regulation
  - The Internet is more than telco lines
- There is no such thing as a “light touch” on a hair trigger

Flow Rate Fairness: Dismantling a Religion

- *Resource allocation and accountability keep reappearing on every list of requirements for the Internet architecture. The reason we never resolve these issues is a broken idea of what the problem is. The applied research and standards communities are using completely unrealistic and impractical fairness criteria. The resulting mechanisms don't even allocate the right thing and they don't allocate it between the right entities.* - Bob Briscoe, UCL and BT Research
- http://www.theregister.co.uk/2007/12/13/bennett_eff_neutrality_analysis/