Multimedia Overview

谈话关于连续媒体
– RealAudio, RealVideo, Internet Phone

通常被认为是高带宽
– 原始视频 30 Mbps
– 但不完全是这样
  * 压缩音频 8 Kbps
  * 压缩视频 2 Mbps

新计算机是“多媒体准备”的
– 大量的CPU功率
– 特殊设备（MMX, 视频芯片等）

那么... 问题是什么？
Internet Shortcomings

- Designed for “text-based” applications
  - without strict timing constraints
  - with strict loss constraints
- “Bursty” traffic
  - high variance in delay
  - periods of heavy packet loss
- Limited network protocols for applications

Internet Protocols

- **TCP**
  - delivers every byte
    - unbounded delay!
    - stream semantics
    - fixed flow control
    - unicast
    - … big bleah!
- **UDP**
  - “best-effort” delivery
    - unbounded loss!
    - packet semantics
    - no flow control
    - multicast add-on
    - … bleah!

“Sigh. I guess I’ll use UDP since it is better than TCP. Or … not?”

The Internet Today

- Mostly TCP traffic
  - 96%: ftp, telnet, nntp, smtp… (tcplib’92)
- Optimized for TCP
  - “Thinner” OS protocol stacks
  - Vegas, Reno, Tahoe …
- Punish “non-responsive” flows
  - UDP
  - RED, ECN

Receiver-driven Layered Multicast

Steven McCanne, Van Jacobson and Martin Vetterli

*ACM SIGCOMM, Stanford CA, August 1996*

Problem

- Network heterogeneity
- One output to multiple users with varied capabilities
- Who decides the rate?
- What is the network capacity?

Solution?

- Multiple levels of quality across multiple network channels
- Receivers decide their own rates of reception
- Note, requires layered media streams
**Layered Stream**

- High level abstraction
  - on congestion, drop a layer
  - on spare capacity, add a layer

**Q**: How does the receiver decide?
- detection time
- capacity inference

**Event Sequence**

- At a well-chosen time conduct a join experiment
- If congestion is experienced, leave the new group
- If no congestion, try to join next higher group

**Tiny Movies**

- Text-based frames
- One frame per second
  - sleep! alarm! setitimer!

**The RLM Protocol**

- **Q**: How does the receiver decide?
  - detection time
  - capacity inference