Student Desktop TV

Safe and Secure Video Over IP

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What Has Been Deployed?

**NUTV Service**
(http://www.northwestern.edu/nutv)
- 23 channels of entertainment television
  - Combination of off-air and CATV channels
- IP Multicast to all undergraduate dormitories (4350 unique locations)
- MPEG2 encoding, 29.97 FPS, ~2Mbps per stream (128Kbps mono audio)

**Internet 2 Multicast Service**
(http://www.i2-multicast.northwestern.edu)
- 2 channels CSPAN and CSPAN2
- IP Multicast to all of Internet 2
- MPEG2 encoding
  - CSPAN - 2 Mbps
  - CSPAN2 - 4 Mbps

- No client software installed on machine
- Channel guide services – what’s on now and later?
Why Deploy This Type of System?

• No CATV in student dormitory rooms
  – Only in common areas/lounges
• Over 60 residence halls
  – Cost to wire with coax very high ($2-5Million)
  – Estimated time of completion: ~4 years
• CATV major issue for the student population
System Features

- Live encoding of television
- Additional pre-encoded video
- Small footprint viewer software
- Viewer downloaded as part of stream
- Viewer available for multiple operating systems
- http://www.videofurnace.com
- Program guide for content labeling
Operational Experiences

• Running since Fall of 2002
• Test phase problem
  – RP for multicast tree not distributed correctly
• Two deployment problems
  – IGMP snooping and CGMP fast leave
    • Switch table flush occurs prior to router flush, causing a flood condition on all switch ports
  – IP multicast TTL Threshold
    • Command causes all multicast packets to be route processed
What’s Watched?

• 3rd Week of Year
• On ABC
• On Sunday?
How Much is Watched?

2700 simultaneous Viewers - different channels

700 viewers in first week
Keeping it Secure

• Access Control
  – Unicast – network allowed to get client?
  – Multicast – is the stream available on the network?
• Client to Server - License Transaction
  – Can I get a client?
  – Encrypted transaction
• Encrypted Streams
  – Can I watch this stream?
  – Key exchange for stream being watched
  – 128-bit key with a 64-bit block cipher
Keeping it Legal

• Content licenses
  – Local cable provider treats us as a multi-dwelling unit
  – Limited right to re-transmit from the content owners themselves

• MPEG2 licenses
  – Well provision for student TV
  – Over provision for Internet 2-based distribution

• What’s missing from the player?
Links

• http://www.northwestern.edu/nutv
  – Campus Multicast of 23 channels
• http://www.i2-multicast.northwestern.edu
  – Internet 2 Multicast of CSPAN and CSPAN2
• tpw@northwestern.edu