Columbia’s Video on Demand Testbed and Interoperability Experiment

S.-F. Chang and A. Eleftheriadis
Dept. of Electrical Engineering
Columbia University
www.ctr.columbia.edu/advent
VoD Testbed Architecture

Network
- ATM
- Internet
- Wireless

Digital Set Top Box
PC/Work Station
Mobile Terminals

Connection setup

Video-pump

Video on Demand
VoD Testbed Architecture

- Video on Demand
- Digital Set Top Box
- PC/Work Station
- Mobile Terminals
- Application Server
- User Control
- Network
  - ATM
  - Internet
  - Wireless
- Video Packets
- Video-pump
- Distributed Server
- Connection setup
- xbind
VoD Testbed Architecture

Network
- ATM
- Internet
- Wireless

Video-pump

Distributed Server

Application Server

Digital Set Top Box

PC/Work Station

Mobile Terminals

Analyzer

Signalling Network

VoD Testbed Architecture

Video on Demand
DAVIC Interoperability Tests

July 1996 DAVIC 1.0 Tests

- Columbia University
- CSELT, Italy
- GCL, Japan
- GTE Laboratories
- NIST
- NTT, Japan
- DeTeBerkom, Germany
- Hewlett Packard, Canada
Testbed Components

- **Server**
  - SGI Onyx, 6 CPUs, 1GB RAM, 40GB Array
  - Fore ATM TAXI (100 Mbps) NIC

- **Encoders**
  - OptiVision (MPEG-1)
  - C-Cube (MPEG-2)
  - IBM (MPEG-2)

- **ATM Network:**
  - OC-3c, TAXI, DS-3
  - Fore, NEC, Scorpio switches
Testbed Components (cont’d)

- **IP Network**
  - Cisco AGS+ router with shared 10 Mbps segments (10-Base2 and 10-BaseT)

- **Wireless Network**
  - AirLAN bridge at 2 Mbps

- **Clients:**
  - Philips Set-Top Box (MPEG-2)
  - PCs with OptiBase VideoPlex (MPEG-2)
  - IBM Thinkpad 760CD (MPEG-2)
VoD Performance in ATM-WAN

- ATM-LAN vs ATM-WAN
- One of the First WAN-ATM VoD Trials
- Objective and Subjective QoS
VoD Performance in ATM-WAN

Interarrival - Server

Interarrival - Client
Video on Demand

Video Client Model

Reception
Demultiplexing
Decoding
Presentation

Error Concealment

Video Decoder
Audio Decoder

Video Signal
Audio Signal

PDUs
NTW Interface
Smoothing Buffer

Overflow
Underflow

Error & Delay

Mux Stream
Demux

Video Stream

PLL
Timebase Recovery

Video Signal
Audio Signal

Video Stream
Audio Stream

Video Decoder
Audio Decoder

Video Signal
Audio Signal

Video Stream
Audio Stream
Ongoing Research

- Wireless Video Transmission
  - Content-dependent FEC
  - Content-dependent ARQ + multiple copies

Diagram:

- Headers
- Frame Type: I, P, B
- Scene Change: sc, nsc
- Motion: lm, hm, hlm
- Data Type: mv, dct
Ongoing Research (2)

- Video Server Scheduling and Admission Control
- Video over Networks without QoS
  - Dynamic Rate Shaping
  - Rate Control using TCP flow control (but not error control)
Demonstration Video

Video on Demand

Network
- ATM
- Internet
- Wireless

Digital Set Top Box
PC/Work Station
Mobile Terminals
Analyzer

Application Server
Video-pump
Distributed Server

Video on Demand
For More Information


- For access to papers, the DAVIC Interoperability Experiment Report, etc., visit the ADVENT home page:

  http://www.ctr.columbia.edu/advent