Broadcasting over Internet-III

Yatindra Nath Singh
Electrical Engineering Department
http://home.iitk.ac.in/~ynsingh
Email: ynsingh@iitk.ac.in
Basic architecture for IPTV system

- Client set top box
  - Connecting to network through ADSL
  - Has built in application to join to IP multicast session for TV channel
  - Application receives the mpeg stream via IP and feeds into hardware to convert it to audio/video signal
  - Audio video signal passed to TV
IP TV System

Client

Authentication

Server

Video/Audio feed

IP Multicast network

Remote Controller

IR/RF

IP Phone

Ethernet

IP TV System

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- Set top box authenticates with IPTV authentication server
- Gets decryption key periodically after authentication
- The IP multicast stream is encrypted by the key
Whenever the key changes, signal received to discard and use new key already received from server

Billing done on basis of how many times the key update is taken by client

per hour basis or per half an hour basis billing can be done.
- Client set top box
  - Also acts as NATing router
  - Connection to VOIP phone
  - Optionally can act as media gateway device connecting to ordinary phone
    - Visible to outside world as IP phone
  - Interface to connect PC for Internet browsing
Video on demand

- Set top box can connect authentication server
- fetches the key to access the video on demand server
- Video on demand server load increases with number of access
Video on demand (contd.)

- One hour programme
  - Can be transmitted as twenty separate multicasts with starting staggered by five minutes
- Depending on time of joining of VOD, multicast address is informed
- Worst delay after initiating the VOD, five minutes
Reflector technology

- Unavailability of multicast network
- All users connecting to central server
  - Not efficient
- Have multiple servers
Reflector based system
- The transmission is passed from one server to another
- Clients connect to least loaded server
- Some clients can act servers, if permitted by master server.
Overlaid multicast

- If all clients can act as server – overlaid multicast
- Client act as router – virtual multicast tree creation
For each session one single virtual multicast tree

Clients are connected by virtual links (UDP/TCP tunnels)
Congestion control

- Congestion control – not present for UDP
- Congestion control – reduce the traffic injection rate on detection of congestion
- In case of congestion
  - TCP transmit window reduces
  - UDP – no transmit window
Layered media transmission

- All the transmission divided in layers
- Each layer transmitted on separate multicast group
  - If congestion control is not required, all layers can be transmitted on same group with different UDP ports
- Base layer – control layer
- Other layers (in a possible order) – signaling, audio, video.
Bandwidth estimation

- Source periodically transmits probe packets (a packet pair) on Base layer.
- Each receiver receives them.
- The time gap between them and round trip delay estimate – can give available BW estimate.
Leave, join of media layers

- If estimated available bandwidth less than required by all the subscriber media layers
  - leave the least important media layer multicast group
- If more
  - If join the media layer multicast group if available, in order
Layered video

- Video can be layered
- Base layer only – poor quality video
- More layers one gets – better quality video
- Synchronization – important
- Each video layer – on separate multicast group
A possible architecture for IPTV using overlaid multicast
Basic architecture of Brihaspati_sync

- Base layer – control layer
- Other layers (in a possible order) – signaling, audio, slides, chat, video.
- Other media types added – screen capture, desktop control, slides, chat, white board
Transmission can continue even if only audio and slides are there.
Challenges

- Reliability – what happens if a client node fails
- Every node maintains the list of all neighbors
- List send to all the neighbors
Challenges (contd.)

- Each neighbor looking at its position in list decides which client to connect in case, the node to which list corresponds, dies.
What happens if client behind NATing router, behind http proxy

- Anybody behind NATing router – cannot become forwarding node
- Behind http proxy – requires http tunneling for media transport

Clients have been provisioned with http tunneling server
For updates on Brihaspati initiatives

- brihaspati_iitk@yahooogroups.co.in
- brihaspati.sourceforge.net
- sourceforge.net/projects/brihaspati