

Deploying IPTV Inside the LAN

AHECTA 2009

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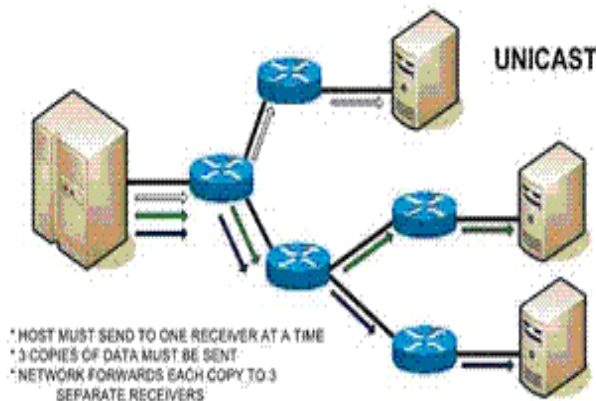
Director of Training and Installation



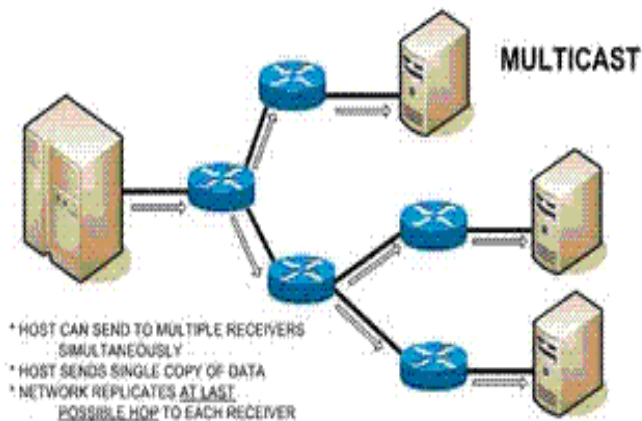
What is IPTV?

- IPTV = Internet Protocol TeleVision
 - Using the data network to transmit compressed video
- Live broadcasts
 - Includes cable TV as well as university events
- Scheduled Broadcasts
- Video on Demand
 - movies, course reserve material, training videos
- High quality including HDTV

- **Unicast:**
- **A network method and not a protocol**
- **One Source to One Destination**
- **Multiple Destinations require unique Multiple Unique Sources**
- **Public IP network support**



- **Multicast:**
- **A network method and not a protocol**
- **One Source to Multiple Destination**
- **Only possible using UDP or RTP Protocol**
- **Bandwidth friendly, when used with IGMP**
- **True Broadcast**



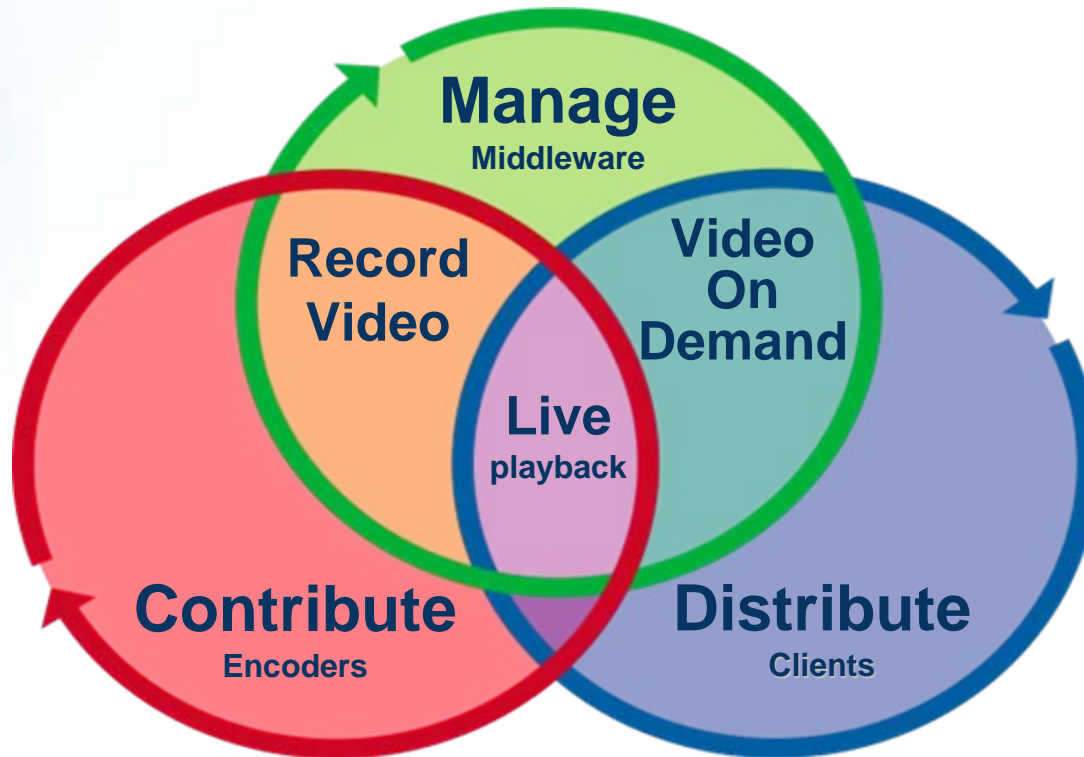
IPTV Terminology

- Internet Group Management Protocol (IGMP)
 - Used to manage and distribute Internet Protocol (IP) Multicast groups
- Video CODEC
- Motion Picture Experts Group (MPEG)
 - MPEG-1
 - MPEG-2
 - MPEG-4 (simple profile)
 - MPEG-4 part 10 (H.264)

Compatibility Challenges – CODECs

- **MPEG-2**
 - Provides high quality video at a high bandwidths
 - designed for HD video
- **MPEG-4 Simply Profile**
 - Provides high quality video at low bandwidths
 - Designed for internet streaming
- **WMP Codec**
 - Microsoft solution to solve limitations with MPEG-4 (SP)
- **H.264**
 - Provides high quality video at low bandwidths
 - Designed for low bandwidth HD video
 - Designed for internet streaming

Component Overview



Why - Objectives

- **Distribute Live Video**
 - Broadcast Live TV to Dorms, Desktops, Public Areas
 - Broadcast Classes and Events
- **Playback Recorded Video**
 - Rebroadcast Events
 - Establish Campus TV Stations
- **Video On Demand**
 - Access to Course Specific Content
 - Access to Recorded Classes

Functionality Requirements

- **Distribution**
 - Must provide a uniform user experience for set top boxes (TVs) and the desktop
- **Recording**
 - Must be able to schedule recording of broadcasts or events
- **Security**
 - Must have integrated conditional access to all assets and provide the fundamental technologies to protect those assets
- **Ease of deployment**
 - Must be able to address a large and diverse user base without over-burdening IT

Contribute – Encoders

- Translate video from Analog world to Digital world.
- Many commonly used formats
 - MPEG (including H.264)
 - QuickTime Streaming (typically H.264 using RTP)
 - Flash
 - Windows Media Player formats
- Often have capabilities such as:
 - Recording
 - Multiple simultaneous outputs
 - Manageable via the network

Manage – Middleware

- Encoder status updates and control functions
- Video asset management systems
- Video editing tools
- STB Management tools
- Software Client Management tools
- Virtual Learning Environments (VLEs)
- Class and course management software
- Emergency Alert software
- Digital signage applications
- Metadata tagging
- Multimedia asset integration (Video, text, images)
- Slide Presentation Integration
- Electronic Programming Guide information

Distribute

- Where do my assets go?
- Set Top Box (STB)
 - “Hard” endpoints for managed distribution
- Desktops on the LAN
 - Soft endpoints on a variety of platforms
 - Typically high bandwidth
- Streaming
 - Soft endpoints
 - Typically through web streaming
 - Variety of bandwidths & capabilities

Distribute – Set Top Box

- Set Top Box (STB)
 - Ethernet Input
 - Ethernet pass through (dual NICs)
 - Composite, S-Video, HDMI, Component, DVI, outputs
 - Live Television, Playback channels, Video on Demand
- Network Manageable
 - Usage statistics
 - Remote control for use as public displays
- Services offered on network based STBs include:
 - Video On Demand
 - Pay Per View
 - Games

Distribute – Client Software

- What open firewall ports will a given software player need?
- What are the steps a user must go through to watch video for the first time?
- Does the software solution require any ActiveX or browser plug-ins that the user must install?
- What browser versions and operating systems does the solution support?
- What important features such as a program guide, and close captioning does the player support?
- How does the software client protect content from unauthorized recording or viewing of material?
- What CODECs does the software player support?
- What restrictions on how and when content can be viewed does the player support?
- What are the system requirements to use the application? (SD verses HD)
- How easy is the desktop solution to upgrade?
- Is the software solution an installed media player?
- How easy is the solution to deploy and maintain?

Network Requirements

- Minimum Recommended Networking Requirements
 - **Backbone: 1 Gbps**
 - **End User: 100 Mbps**
 - **Multicast enabled across the network, IGMPv2 or later.**
 - **Access switches can be layer-2 but should be layer-3 aware.**
- Wireless IPTV
 - **Major vendors support multicast using 802.11n**
 - **Video on Demand is supported within bandwidth constraints**

User Challenges

- Client Installation Issues
 - Required Installed players
 - Active X or Plug-in requirements
 - Maintenance of client software versions
- Browser and Operating System compatibility issues
 - Often limited to specific browsers or browser versions
 - Often requires use of different applications on different Operating Systems
 - Very difficult in a University environment to mandate the use of specific operating systems or browsers.
- Personal Firewall issues
 - Use of non-standard streaming ports

Management Challenges

- Helpdesk costs
 - Costs to deploy the system to students/faculty
 - Costs to maintain and update the system
- Network management costs
 - Network upgrade costs
- Set Top Box deployment and Maintenance

Decision Criteria

- Where will the video go?
 - Desktop, STBs, Recording, Streaming,...Everywhere!!
- What fundamental technology decisions do we have?
 - Delivery – players, STBs, ...Really want simplicity!!
 - Management –system approach, ...End-to-end!!!
 - Format – video compressions standard, resolutions, ...Ideally encode once to reach everyone!!
- What is our internal capacity?
 - How much deployment and management time are we prepared to invest?

Northwestern University



NORTHWESTERN
UNIVERSITY

- Current deployment:
 - 36 channels of cable television content.
 - Up to 10 Playback channels
 - 'NUTV'
 - Portable Encoder for live broadcasts
 - More than 100 Mbps of Video on Demand
- Deployment Challenges:
 - Interface problems
 - Firewall problems
 - Cable signal problems
 - Several encoder cards have died over the years
- Deployment Successes:
 - Never needed to roll out coax
 - Successfully provided cable television to dorms for over 7 years using IPTV
 - Successfully ran own internal TV station
 - Provided course reserve material to professors in the classroom

University of California, Los Angeles



- Current Deployment:
 - 250 Mbps VOD
- Deployment challenges:
 - Firewall problems between LAN segments
 - NAT problems with personal wireless routers (big no, no for students)
 - Periodic server reboot needed due to memory buffer problems (was fixed in next software update)
 - Hard drive failure
- Deployment Successes:
 - Successfully provided course reserve material for students for over 5 years
 - Have seen significant growth of the use of video as part of the curriculum by professors
 - Have greatly increased the use of the Media Lab with a minimal capital expense.

University of California, Los Angeles

- Usage Statistics Winter '09 Quarter
 - Total Hits: 35,143
 - Courses Supported: 192
 - Titles Encoded: 925
- End User support requests
 - Average two to three requests a week
 - Majority of requests are related to VPN access to video

Dartmouth College

- Current Deployment:
 - 68 Channels of cable television
- Deployment Challenges:
 - Core router dropping multicast packets (never solved until core router was replaced)
 - Cable company dropping signal
 - Several encoders have failed
- Deployment Successes:
 - Successfully tested IPTV over wireless
 - Were able to abandon their legacy coax plant and switch to pure IPTV
 - Successfully deployed 1000 set top boxes for the delivery of video.

