IP Video

Multicast Networks
Open Source Software
IP Set Top Boxes

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! Multicast

- **Unicast**
  - Traditional IP communications. Always point-to-point

- **Broadcast**
  - Destination of all ones, ie 192.168.0.255
  - Works in small “single switch” environments
  - Can do one-to-many, but floods all ports
Multicast Specifics

• Special
  - IP address, aka “group”
    • 224.0.0.0 through 239.255.255.255
  - MAC address
    • 01:00:5E:xx:xx:xx
    • NOTE: 1:32 mapping of IP to MAC
  - IGMP (Internet Group Management Protocol)
    • Allows routers and switches to be smart.
    • Snooping
Multicast Specifics

- Must use a protocol to pass through a router.
  - DVMRP (Distance Vector Multicast Routing Protocol)
    - Dense mode only, campus applications, high bandwidth, high interconnectivity
  - PIM (Protocol Independent Multicast)
    - Sparse or Dense mode
      - Sparse allows for WAN type applications where many want data from a few
Multicast Networks

• Many-to-Many or One-to-Many
  – Mbone
  – Symantec Ghost
• Allows one source (eg video server) to send to N clients with no more bandwidth used than to serve one client
• Contrast with Unicast (traditional TCP/IP communication, for instance); which is always one-to-one
Switch builds a forwarding table per group per port based on IGMP Join/Leave messages.
Many to many. It’s entirely possible to have a “farm” of systems listening and talking on the same multicast group.
Uses: autoconfiguration of clients... you don't care which client is which, just that a client is online and therefore usable for a purpose. The server “autodetects” new clients and can act accordingly.
Be the packet

- Client sends an IGMP Join for 225.1.1.1
- Switch receives Join, adds that port to its forwarding table for 225.1.1.1
- Client sends a packet, UDP port 1111
  - IP address will source from the client's outbound interface
  - Destination IP address will be 225.1.1.1
  - Destination MAC address will be 01:00:5E:xx:xx:xx
Be the packet

- The switch gets to forward based on its MAC forwarding table, receiving a packet destined for 01:00:5E:xx:xx:xx
- Any UDP port may be used. Clients must listen on both the correct IP and the correct port (as it is with unicast).
Popular Multicast Modes

- PIM (Protocol Independent Multicast)
  - Dense Mode
    - Everyone talks to everyone
    - Every router carries every group
  - Sparse Mode
    - One source talks to everyone else.
      - Eg, video source sends to 5,000 IP set tops.
    - Best for wide-scale data streaming, ala IP Video in a geographically diverse network.
    - Similar to DNS: if I don't have the requested stream, I ask my uppers for it, better known as the Rendezvous Point.
WAN Deployment
PIM Sparse Mode

Only one source at a time is allowed to send multicast on any given address.

Prevent these from sending multicast, otherwise you'll be 0wn3d.
Video Lan Client

- Open Source Software (yeah!)
- Complete solution for A/V distribution
  - vls
    - “server”, good for serving static content
  - vlc
    - “client” player, also can do streaming
  - vlm
    - “manager”, a special invocation of vlc, allows multiple vlc instances to be launched via a network socket.
Video Lan Client

• Compatibility (short list)
  - MPEG
  - AVI
  - MOV
  - DVD
  - Video4Linux
vls

- Streamer for static content
  - Write your config file, launch vls, done.
  - Cannot easily dynamically change content distribution at run time.

- Rigid configuration required with specifics about each content type and distribution options.
vlc

- Client player application
  - Xwindow support
  - Windows support
  - Mac support
  - ASCII support (yup!)
- Excellent CLI
- Excellent GUI, with advanced levels
**vlc**

- Anything it can play, it can output
  - As a new file format
  - As a network stream (multicast or unicast)
  - Transcode (think AVI to MPEG for an MPEG-only IP set top box)
- Is very good at taking a play list of items (even DVDs) and playing or sending them elsewhere.
vlc examples

- Play a file (list)
  - vlc file1 file2 file3

- Stream a file to another vlc instance
  - Vlc --sout udp:192.168.0.2 filename
  - vlc udp:

- Multicast a file to multiple vlc's
  - vlc --sout udp:227.1.1.1 --ttl 5 --loop filename
  - vlc udp:@227.1.1.1
vlm examples

• Invoke vlm mode vlc
  - vlc --ttl 5 --intf telnet

• Stream a file
  - telnet localhost 4212 (password admin)
    • new handle broadcast enabled
    • new handle input /filename
    • new handle output udp:227.1.1.1
    • control handle play
vlc gotchas

- In a router environment, don't forget TTL
- vlc takes a lot of CPU to transcode and then stream. Transcode first.
- vlc can stream just about anything to itself, but use MPEG2 for IP Set Tops.
- vlm offers an http interface, but it is immature at present.
- Interface needs an IP address and default or 224.0.0.0/4 route
Amino 110 IP Set Top Box

- Nice form factor
- Outputs
  - Composite
  - Svideo
  - RF
  - SPDIF
- Plays MPEG2 up to 8mbps
- Can decode AC3 5.1
Amino 110, hackability

- Runs Linux (yeah!)
- HTML4 browser
- Alpha blending of video vs html
- HTML control of video plays
- Telnet
- Console pins inside
- USB port
- Can mount NFS shares
Links, further info

- Video Lan Client
  - http://www.videolan.org/
- Google
  - Multicast
  - IGMP