

Live streaming with H.264 Digital Academic Television Network (DATN) University of Wisconsin—Madison

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What is H.264?

- Part of the MPEG (Motion Picture Experts Group) family of standards
 - ISO: MPEG-4 Part 10, MPEG AVC
 - ITU-T: H.264
- Includes all of the capabilities of MPEG-2
- Supports HD at 6-8 Mbps, SD at 1.5-2 Mbps, DVD quality video at under 1 Mbps
- Scales from 3G handheld devices to HD
- Included in QuickTime 7 and supported by QuickTime Streaming Server and QuickTime Broadcaster 1.5
- For more information, see:

http://www.apple.com/quicktime/technologies/h264/

Live streaming with H.264

- Live streaming with H.264 is very processor intensive
 - Requires about twice the processing power of MPEG-4
 - Delivers about twice the image quality at same datarate
- Standard definition TV quality streams are possible in under 1.5 Mbps
- Improvements in QuickTime Broadcaster 1.5 and QuickTime 7 also make much higher quality streams possible
 - Formerly, QuickTime Broadcaster discarded half of the vertical frames of DV input
 - QuickTime Broadcaster 1.5 with QuickTime 7 now supports full frame (720 x 480) DV
 - QuickTime Broadcaster 1.5 with QuickTime 7 now supports full frame (640 x 480) from Miglia AlchemyTV card

Requirements for H.264 live streaming

- Ideal streaming configuration
 - Dual G5 system (Power Mac G5, Xserve G5)
 - Mac OS X Server 10.4.x
 - QuickTime 7.x
 - QuickTime Broadcaster 1.5.x
 - DV or suitable capture card source
- This configuration can handle...
 - 720 x 480 (640 x 480)
 - 30 (29.97) fps
 - "Best" quality
 - 1-2 Mbps
- ...and consumes about 65% CPU on dual 2.0 GHz Xserve G5

Requirements for H.264 playback

- For standard definition content (1-2 Mbps)
- Mac OS
 - Mac OS X 10.3.x or 10.4.x
 - QuickTime 7.x
 - 1 GHz G4
- Windows
 - Windows 2000 or XP
 - QuickTime 7.x
 - 1 GHz PIII



IP Multicast

- Critical to deployment of services such as large scale live video delivery
- Allows for one or more hosts to "listen" to a stream, with no impact on the server or network beyond the initial stream; whether one client or one thousand is watching CNN, the impact on the overall network is the same
- Delivery scope can be inherently managed by the topology of the network
- For more information, see

http://multicast.internet2.edu

Why QuickTime?

- Open standards
 - MPEG-4, H.264
- Flexible content delivery
 - Using open standards allows us to reach widest range of clients and devices
- Cost
 - Hardware
 - Xserve less expensive than dedicated products
 - Multiple streams possible with single server
 - Software
 - QuickTime Player: Free for Mac OS and Windows key!
 - QuickTime Broadcaster: Free
 - QuickTime Streaming Server: Included with Mac OS X Server



Sample live streaming setup

- Xserve boots, and automatically logs in as the broadcasting user
- In the event of an anomaly, the machine will automatically reboot itself via watchdog. The machine can also monitored by Server Monitor and other tools.
- QuickTime Broadcaster is started via AppleScript upon login with the appropriate settings:

tell first document of application "QuickTime Broadcaster"
 start
end tell

Sample live streaming setup (Cont.)

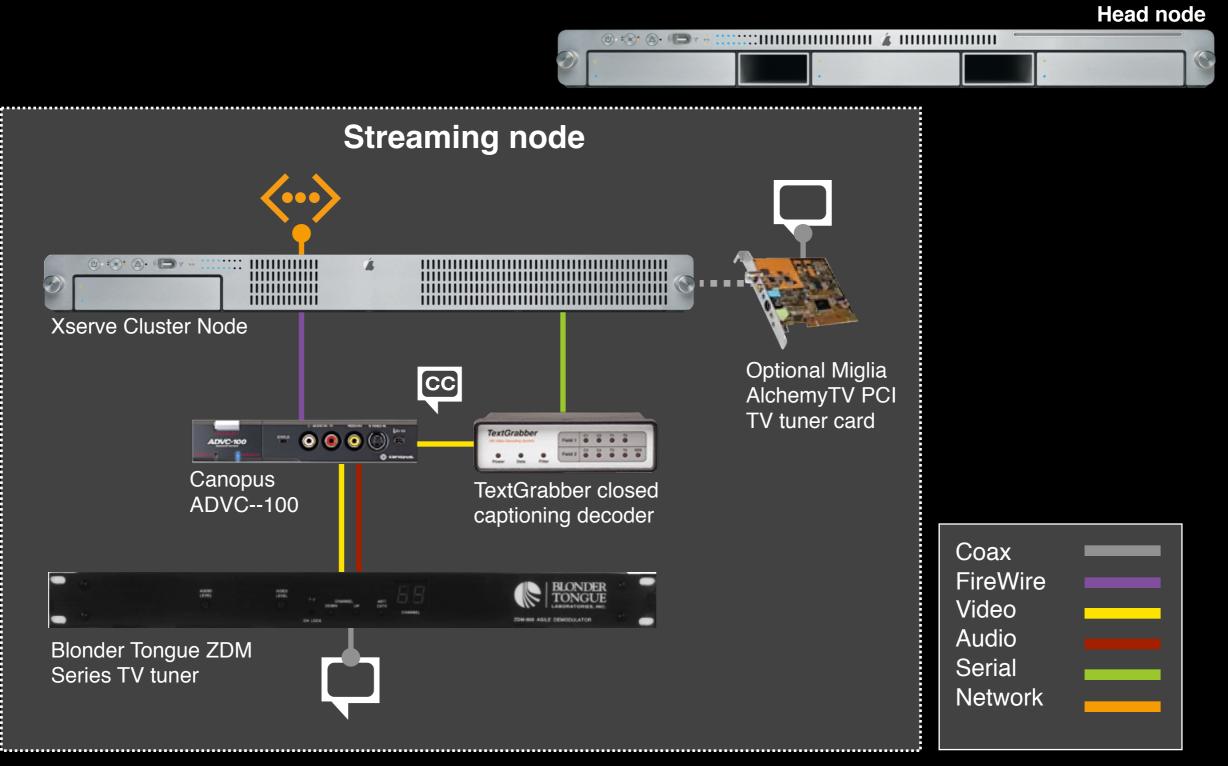
Entry in crontab spawns Broadcaster monitor

* * * * * /usr/local/sbin/qtbmon

Script relaunches Broadcaster if not running

```
#!/bin/sh
/bin/ps auxwww | /usr/bin/grep Broadcaster | /usr/bin/grep -v
grep > /dev/null 2>&1
if [[ $? = 1 ]]; then
            open -a /Applications/"QuickTime Broadcaster Start.app"
            echo `date` >> /Users/datn/Library/Logs/qtbmon.log
fi
```

Typical streaming node (DATN)



Interesting H.264 applications with iChat



- iChat in Tiger uses H.264 codec configuration optimized for lower datarates
- Use iChatUSBCam with iChat to allow other video sources
- iChat conferences can be combined with live sources (internal content, closed circuit video, television, other DV source, etc.)
- Other video such as television channels, satellite events, or live camera sources can be "invited" to multiperson conferences to support, e.g., collaboration during a Research Channel event, discussion of satellite imagery, etc.



For More Information

http://datn.wisc.edu/

