

# **Playing Blu-ray Content on the Mac**

**Aerospace Mac Users Group  
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# Playing Blu-ray Content on the Mac

Dean E. Dauger, Ph. D.  
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# Blu-ray on the Mac?

**Blu-ray does not enjoy direct support like DVDs do**

- Steve Jobs says it's "a bag of hurt"
- Don't hold your breath for direct OS X Blu-ray support

## Is there another way?

- Can the Mac decode Blu-ray?
- Can it preserve 1080p quality and multichannel audio?
- Can the Mac play 1080p content without jitter?
- Can the Mac stream 1080p content over a network?
- Can the Mac send 1080p and multichannel content to a high-definition home theater system?



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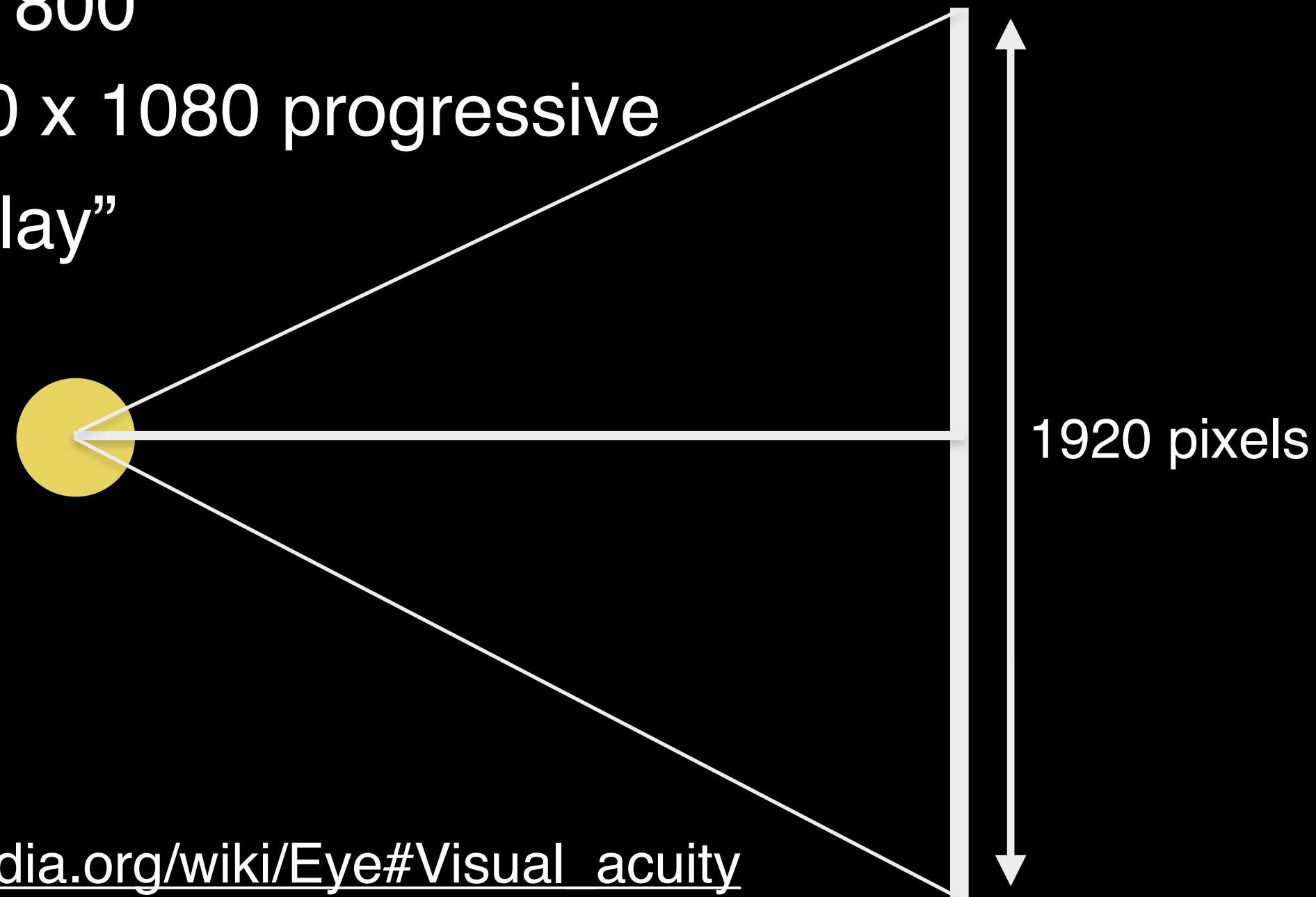


**Yes!**

# Why 1080p?

## Resolution limit due to cones of the human eye

- Those with excellent vision\*: 1 per arcminute = 60 / degree
- Good viewing angle is roughly 30 degrees, horizontal
- $60^\circ \times 30^\circ = 1800$
- 1080p  $\equiv$  1920 x 1080 progressive
- A “retina display”



\* [http://en.wikipedia.org/wiki/Eye#Visual\\_acuity](http://en.wikipedia.org/wiki/Eye#Visual_acuity)



# The First Mac Cluster - established 1998



**Profile:**  
UCLA's Project Appleseed  
(supercomputing for the rest of us).



## The Dawson Cluster





# Recipe for Basic Mac HD Video Jukebox

## Ingredients

- Hardware

- Mac mini - 2 GHz Intel or faster with 2 GB RAM
- BD-ROM External Drive (USB 2.0 or better)
- 1 TB drive or larger
- Long (> 3m) FireWire 800 cable
- Mini DisplayPort + USB to HDMI



- Software

- MakeMKV
- Plex or Boxee



# Legal Disclaimer

**This is for fun and entertainment**

- Please save legal discussion for the end
- No one “must have” a HD home theater system
- We’re enjoying figuring out what is possible



# How to Play Content

## Fundamental Actions

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# Steps to Play Content

What are the basic steps in a Blu-ray player?

Ingest	<ol style="list-style-type: none"><li>1. Load disc into player</li><li>2. Decode content</li><li>3. Skip past the trailers</li><li>4. Read the firmware warning</li></ol>	

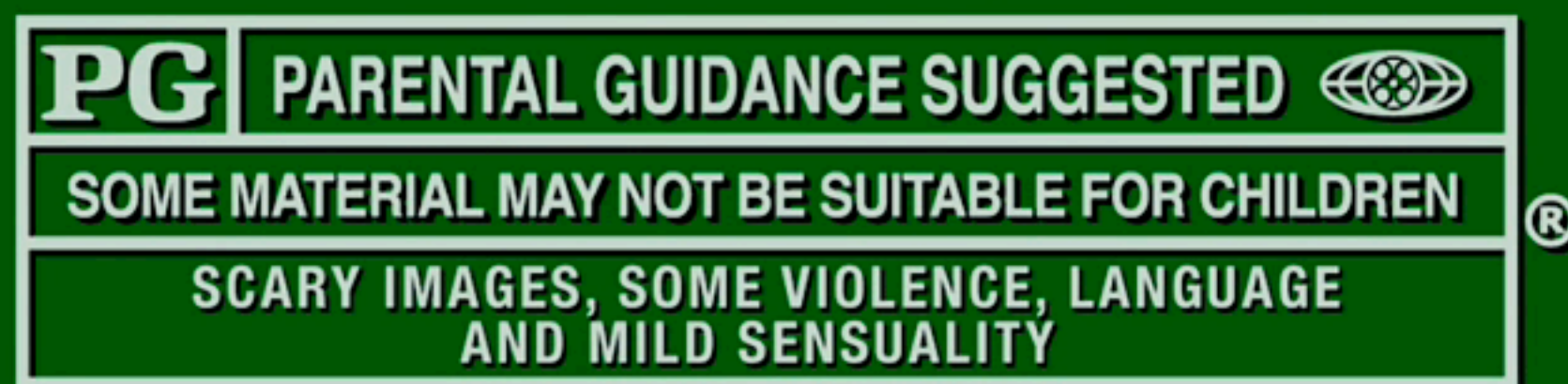
# Steps to Play Content

What are the basic steps in a Blu-ray player?

THE FOLLOWING **PREVIEW** HAS BEEN APPROVED FOR  
**ALL AUDIENCES**

BY THE MOTION PICTURE ASSOCIATION OF AMERICA, INC.

THE FILM ADVERTISED HAS BEEN RATED



[www.filmratings.com](http://www.filmratings.com)

[www.mpa.org](http://www.mpa.org)

# Steps to Play Content

What are the basic steps in a Blu-ray player?

Depending on the capabilities of your player, you may experience delays of 2 - 3 minutes while the content on this disc loads.

During that time, the screen may be blank.

Contact your hardware manufacturer or visit [Blu-raydisc.com/forbestresults](http://Blu-raydisc.com/forbestresults) to ensure you have the latest firmware for your player.

Perform these steps on each playback!



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"Ready to Play"	Ready to Click Play	

Perform these steps on each playback!



# Steps to Play Content



USS ENTERPRISE  
SYSTEM LINK/ICT USER LEVEL (COMMUNICATIONS)




- PLAY
- SETTINGS
- SCENES
- EXTRAS

Perform these steps on each playback!



# Steps to Play Content


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# Another Way to Play Content

## Separate the Actions

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# Ingest - Hardware

Once per *disc*, rather than once per playback

- BD-ROM drive
  - a 2x external USB 2.0 read-only BD drive purchased (\$140 at [fastmac.com](http://fastmac.com))
- Optional for more \$
  - faster BD drives
  - Blu-ray burner



# Ingest - Software



## To transcode...?

- DVD-style transcoding Blu-ray ripping Mac software
  - questionable performance unless using top-of-the-line hardware (600+% CPU-load on 8-core Mac Pro)
  - introduced video compression artifacts
  - multichannel audio transcoding problems
  - could not decrypt certain titles
  - choosing transcoding settings is an art
- The problem is not the destination format (such as QuickTime h.264) but in simply making a copy of a copy

# Ingest - MakeMKV



## Or not to transcode?

- Open-source MKV, like QT's MooV, is a container format
- Decrypts only
  - VC-1 or MPEG-4 compressed content merely placed in MKV
  - multiple formats of multichannel audio coexist in same MKV (DTS-HD, Dolby TrueHD, DTS, Dolby Digital, LPCM, etc.)
  - multilanguage subtitles also in MKV
- Does not transcode
  - preserves video quality perfectly - no added artifacts
  - low-end Mac performs like high-end Mac (30% CPU load)
  - fast, limited only by BD-ROM speed (2-hour movie in 1 hour)
- GUI is weak but simple - checkboxes
- 30-day trial, \$50 shareware



# Storing “Ready to Play” 1080p Content

1080p movies are big. Really big.  
Vastly hugely mindbogglingly big.



# Storing “Ready to Play” 1080p Content

## Use Large Hard Drive(s)

- Large single hard drive (e.g., LaCie)
  - 1 TB can store 30 to 40 movies at full 1080p quality
  - rare data loss is acceptable because the Blu-ray, that you purchased, is the archive
- Drobo
  - given \$, many TB volumes are possible today
    - 5.5 TB (165 movies) using classic Drobo
    - 12.48 TB (375 movies) using DroboPro
  - delivers sufficient bandwidth
  - data protection is overkill, but doesn't hurt
  - noisy for a home theater, so use longer cable



# Accessing “Ready to Play” Content

## Fast Connections

- Direct FireWire connection
  - FireWire relieves CPU load, unlike USB
  - use a long cable to isolate drive noise from home theater



- Gigabit Ethernet
  - requires a server or NAS to host the drive(s) and content
  - easy to separate drive and server noises from home theater
  - has plenty of bandwidth overhead for 4 MB/s data stream
    - other traffic plus 1080p stream may overwhelm 100BaseT and cause video stutter



# Playback of 1080p Content

## Hardware

- Mac mini, at least 2 GHz, is ideal
  - quiet
  - recommend at least 2 GB RAM
  - older mini can connect with DisplayPort + USB to HDMI
  - new Mac mini has HDMI built in (hint from Apple?)



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# Playback of 1080p Content

## Software

- VLC, Movist, & Perian plugin with QuickTime
  - too unstable, too many bugs
- Plex and Boxee
  - excellent solutions, close to ideal







Star Trek Wrath of Khan.mkv	30.7 GB
<b>Star Trek.mkv</b>	<b>31.3 GB</b>
Terminator 2.mkv	26.5 GB
Terminator.mkv	18.9 GB
Toy Story 2.mkv	20.8 GB
Toy Story.mkv	18.1 GB
Up.mkv	19.5 GB
Wall-E.mkv	17.7 GB
The Wizard of Oz.mkv	18.4 GB



# MY MOVIES

A TO Z (66 ITEMS)

- Ponyo
- Ratatouille
- Robotech: The Shadow Chronicles
- Serenity
- Sinbad
- Speed Racer
- Star Trek**
- Star Trek: The Wrath of Khan
- Surrogates
- Terminator 2: Judgment Day
- Terminator Salvation
- The Dark Knight
- The Fifth Element



## STAR TREK

RATING PG-13



On the day of James Kirk's birth, his father dies on his ship in a last stand against a mysterious alien vessel. He was looking for Ambassador Spock, who is a child on Vulcan at that time, disdained by his neighbors for his half-human nature. Twenty years later, Kirk has grown into a young troublemaker inspired by Capt....

RELEASE YEAR 2009

DIRECTOR J.J. Abrams



The Wizard of Oz.mkv

18.4 GB

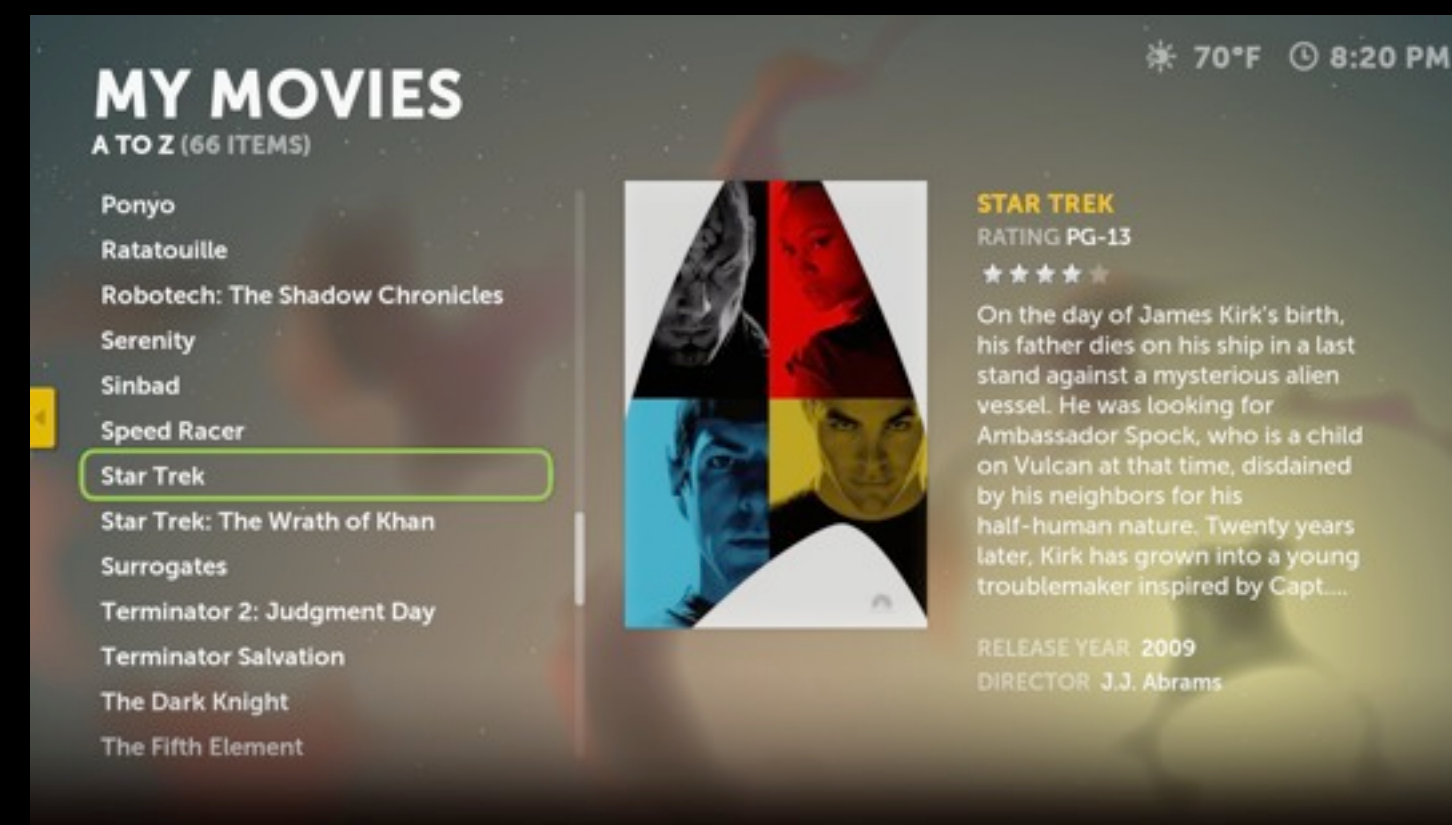
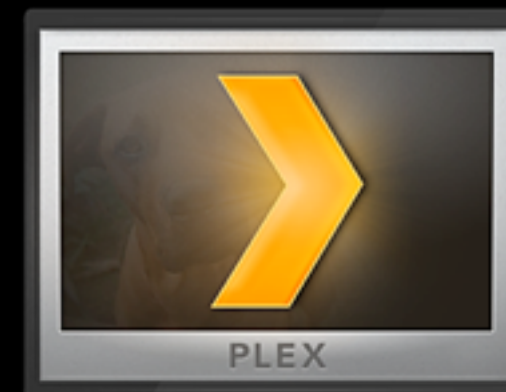
Files: 41



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# Playback of 1080p Content



## Plex and Boxee - similarities



- Based on XBMC, open-source Linux media software
- Recognize 1080p & multichannel audio in MKVs
- Play multichannel audio through optical digital out or USB
- Can be controlled by Apple IR remote
- Can quickly switch between different movies, other content
- Can match content against IMDB and TVDB to display cover art and synopsis data
- Download for free
- Bonus: Excellent extension support
  - streaming solutions like Hulu and Netflix streaming
  - video podcasts

# Playback of 1080p Content

## Plex and Boxee - differences

		
1080p Playback	Excellent and steady on all MKVs	Jitter on high-bit rate sections of certain movies, like Star Trek. Steadily improving with each Boxee version.
Graphical User Interface	Less than intuitive but functional	Visually pleasing with more user-oriented features

# Demonstration

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# What did I do?

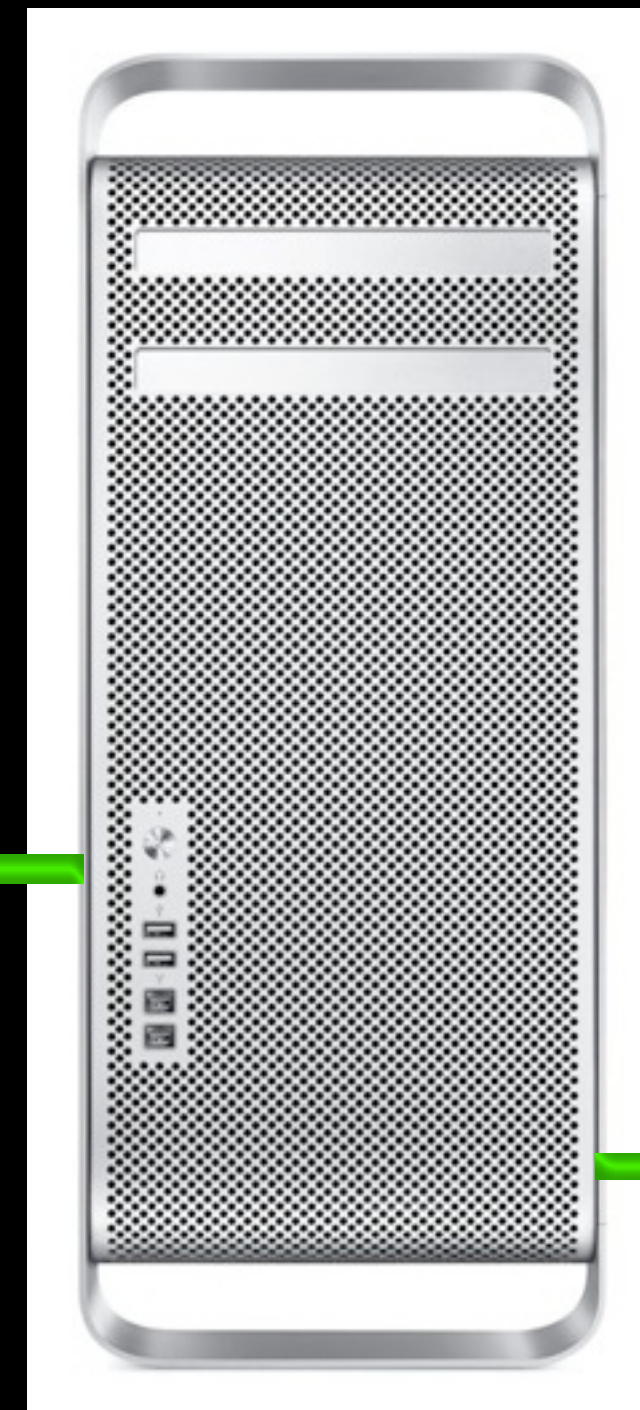
## Show and tell

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# What I did

## Ingest



# What I did

## Storage





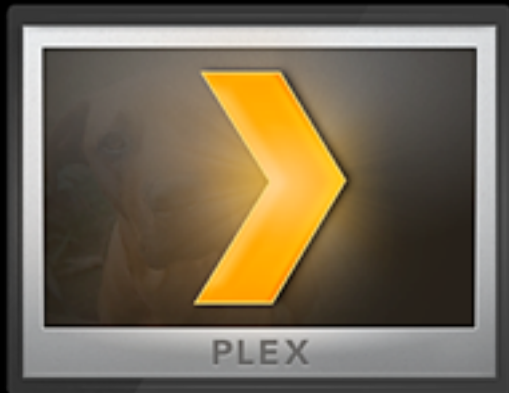
# What I did

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# What I did

## Playback





# Conclusion

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# Legalities

## Just say it's archiving

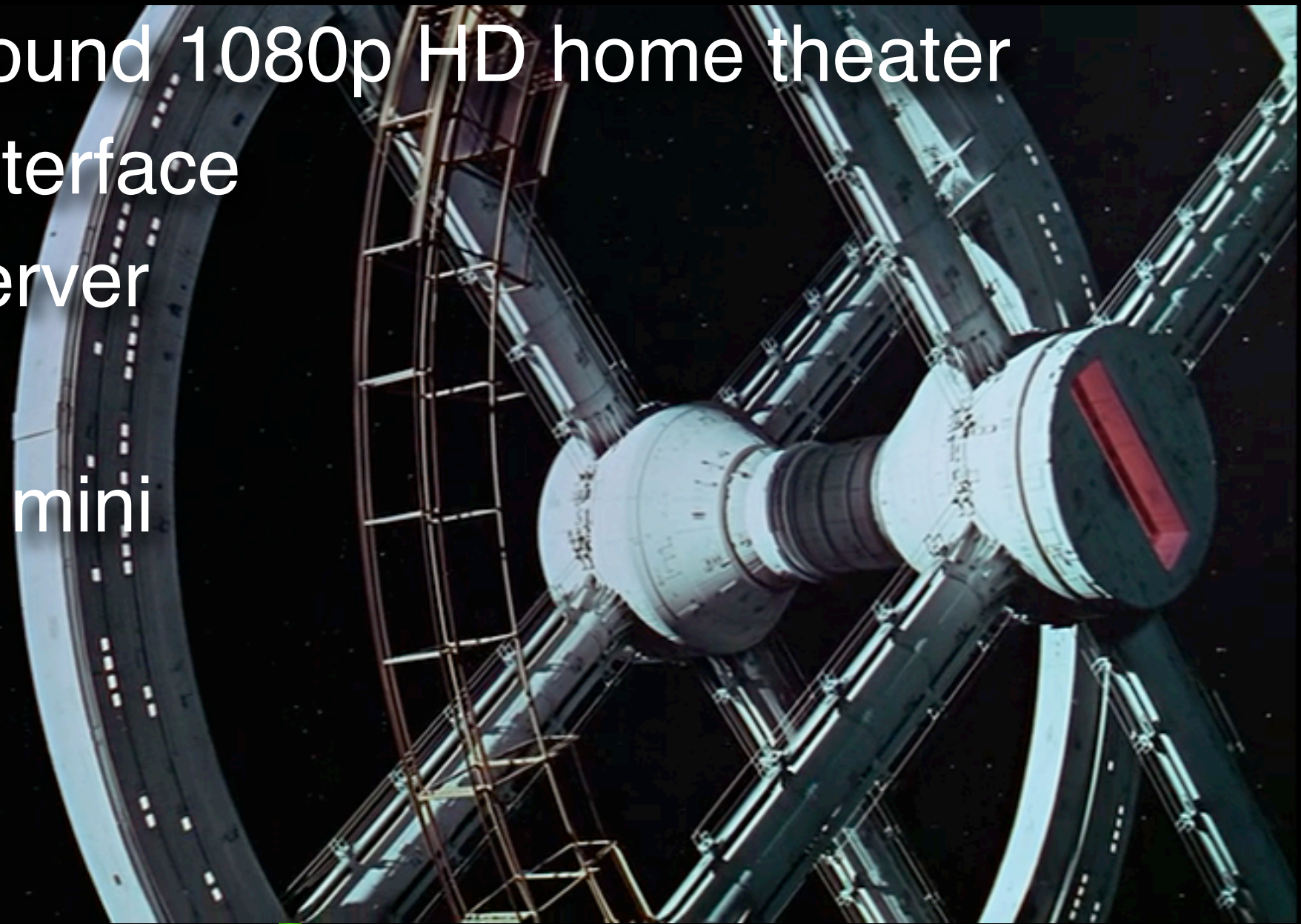
- The step in question is decrypting the Blu-ray disc
- From movies we have purchased, we are allowed to make backup copies
- So far it appears those that write decryption software are subject to scrutiny, hence they are overseas
- Users of such software are in the clear, so far
- MPAA, Hollywood appear to avoid cases that could clarify that distinction, perhaps because they would lose?
- This subject becomes “hush hush”, like in Prohibition

**Pst, pass it on!**

# Mac-based HD Movie Jukebox

## Enjoy

- Driving a surround-sound 1080p HD home theater
- Media Center user interface
- Gigabit-networked server
- Terabyte hard drives
- Controlled via a Mac mini

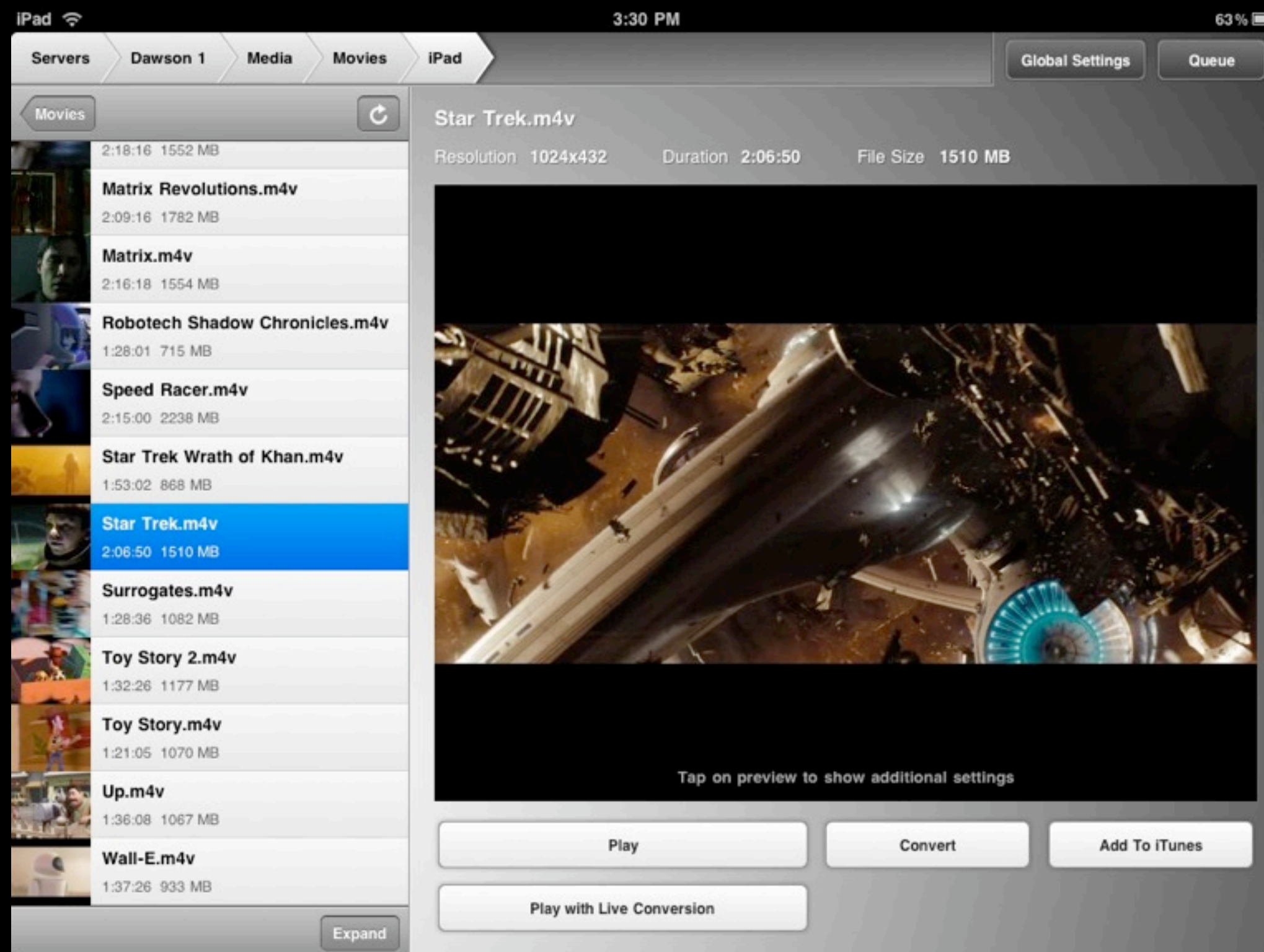




# Future Work

## Near-term

- Waiting for a Boxee version that doesn't stutter on Star Trek
- Setting up streaming to other devices, like iPad and iPhone





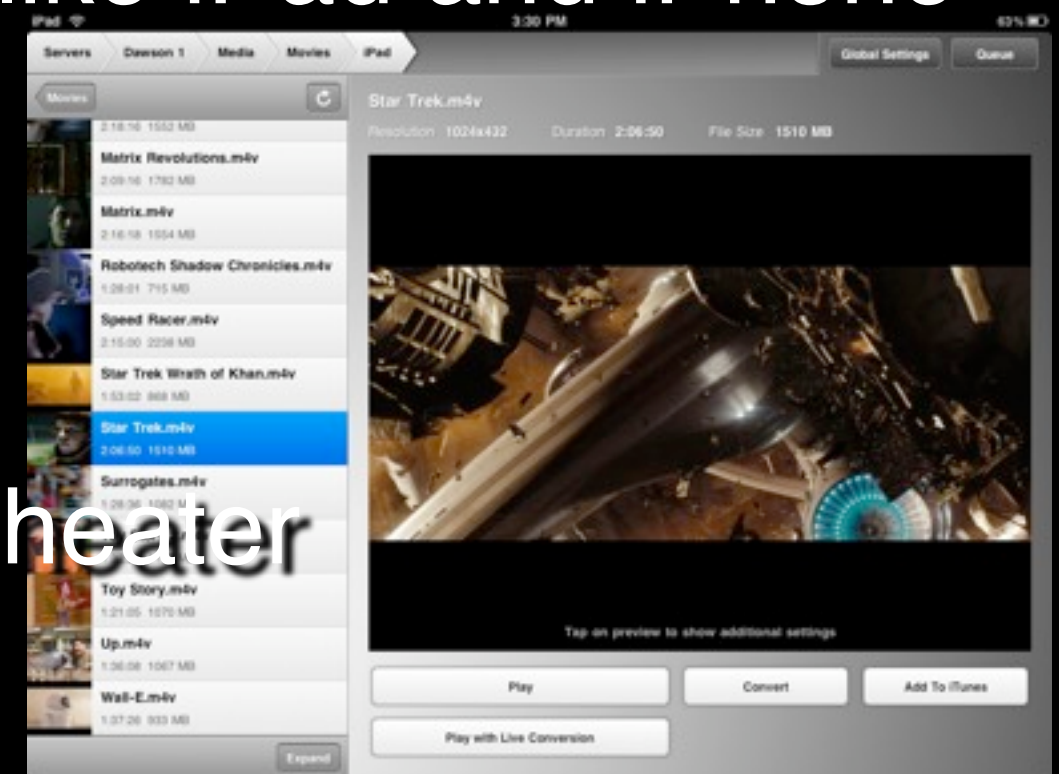
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## Long-term

- Using iPhone or iPad to control home theater
- Audio streaming
  - needs control without turning on HDTV
  - consolidation or synchronization of iTunes libraries
- Photo server
- After it's available on Mac OS X, 3D?



**For More Information**

# References

## Documentation and Download

### Home Theater - Hidden Site

<http://dauger.com/hobbies/hometheater.html>

### MakeMKV Site

<http://makemkv.com/>

### FastMac Site

<http://fastmac.com/>

### Plex Media Center

<http://plexapp.com/>

### Boxee Media Center

<http://boxee.tv/>

### Monoprice - for DisplayPort + USB to HDMI

<http://monoprice.com/>

# Q&A

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