

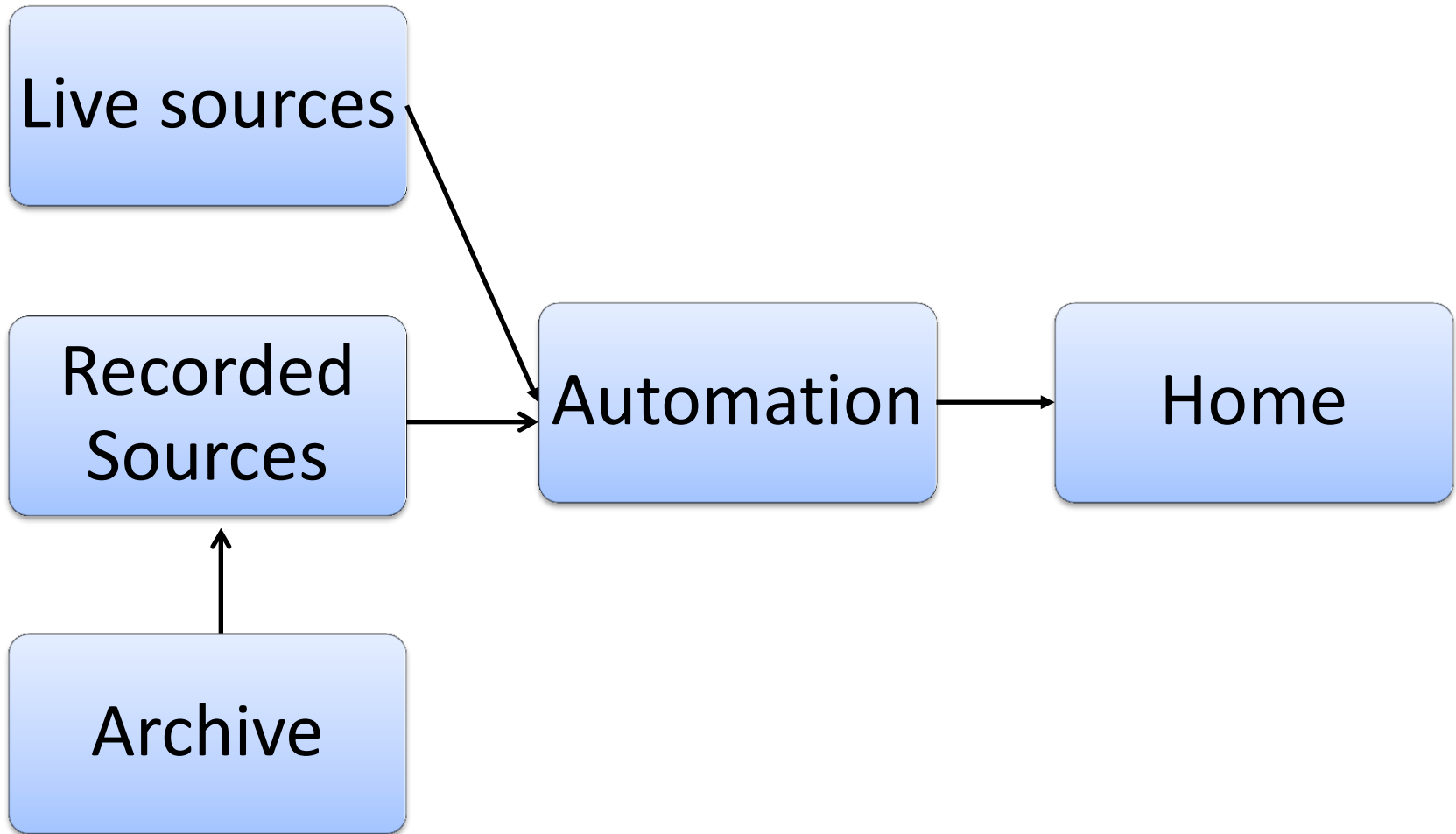
How to make professional media users about FOSS

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Structure

- Introduction to (live) broadcasting
- Technical issues
- Non-technical issues

Highly simplified Broadcast Chain



Why bother?

- Get FOSS used in mission-critical roles delivering to millions
- Make FOSS software reach a professional quality
 - And then better than proprietary alternatives
- Increased flexibility (reconfigurability)
- People interested in using FOSS

Why would a broadcaster look at FOSS?

- They have no money
 - Usually niche channels (e.g religious, ethnic, independent media)
- They have money but can't find anyone to give it to
 - Nothing available for their needs

Broadcast chain in the eyes of some

- Often using consumer grade interface (HDMI)
- Shaky design that might look good in their eyes
- Avoid these people setting agenda for project



Focus on the right audience

- In an ideal world broadcast FOSS will suit needs of everyone
 - Reality is need to focus on mainstream broadcast FOSS
- Make things that can be easily inserted into the broadcast chain

FOSS has the ingredients, but few recipes?

- FFmpeg has fast decoders (inc professional profiles), filtering. (de)muxing less good.
- x264 top class H.264 encoder (Blu-ray, broadcast etc)
- Most low-mid range products use FFmpeg
 - Often without correct licensing (let alone attribution)

Ticket	Summary	Status	Owner	Type	Priority ▲	Component
#2908	Blue Lucy Media Player violates GPL and has --enable-nonfree	new		license violation	normal	avcodec
#3157	Cinec Violates the GPL	new		license violation	normal	undetermined
#3325	CodecVisa violates GPL	new		license violation	normal	undetermined
#3454	Emotion Systems violates GPL	reopened		license violation	normal	undetermined
#3467	Sigala Media violates GPL	new		license violation	normal	undetermined
#3790	IP Video Transcoding violates GPL	new		license violation	normal	undetermined
#3802	Telestream Wirecast Violates GPL	new		license violation	normal	undetermined
#4050	Archimedia Master Player violates the GPL	new		license violation	normal	undetermined
#4114	Drastic Preview Pro violates the GPL	open		license violation	normal	undetermined
#4177	Digimetrics Hydra Player violates the GPL	reopened		license violation	normal	undetermined

Often so simple to provide recipes

Authoring a professional Blu-ray Disc with x264

Google Analytics

Navigation

Getting Started with x264

- 1080i
- 1080p**
- 480i (NTSC)
- 480p (NTSC)
- 576i (PAL)
- 576p (PAL)
- 720p

Issues with certain players/authoring applications

Issues with certain

[Getting Started with x264](#) >

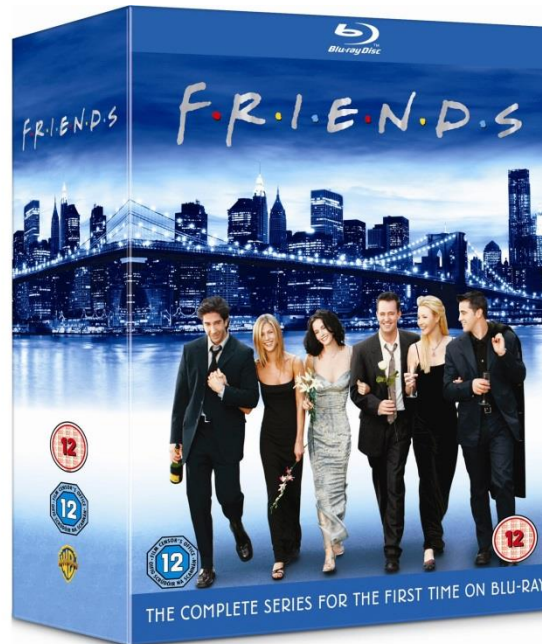
1080p

Primary and Secondary Streams

1080p23.976 / 1080p24

```
x264 --bitrate XXXXX --preset veryslow --tune film --bluray-compat --vbv-maxrate 40000 --vbv-buFSIZE 30000 --level 4.1 --keyint 24 --open-gop --slices 4 --colorprim "bt709" --transfer "bt709" --colormatrix "bt709" --sar 1:1 --pass 1 -o out.264 input.file
```

```
x264 --bitrate XXXXX --preset veryslow --tune film --bluray-compat --vbv-maxrate 40000 --vbv-buFSIZE 30000 --level 4.1 --keyint 24 --open-gop --slices 4 --colorprim "bt709" --transfer "bt709" --colormatrix "bt709" --sar 1:1 --pass 2 -o out.264 input.file
```



TECHNICAL ISSUES

Timestamps

- Broadcasting is constant framerate
 - One case of variable framerate is special cased
- Most (all?) FOSS tools are variable framerate
- VFR has a big problem
 - **What is the duration of the last frame?**
 - Splicing problems, adaptive streaming problems etc
- Loss of precision in timestamps
 - e.g NTSC 33.33... period in a millisecond timebase
 - 0, 33, 67, 100, 133, 167

Timestamps (2)

- In MPEG-TS timestamps are special
 - DTS = CPB Removal Time, PTS = DPB Removal Time
 - Few OSS programs implement this correctly
 - They assume arbitrary remuxing anything into MPEG-TS
- Timestamps can be negative
 - e.g PTS of zero with b-frames means negative DTS
 - `uint64_t pts = wrong!`
- **Should really be using PTS and duration**

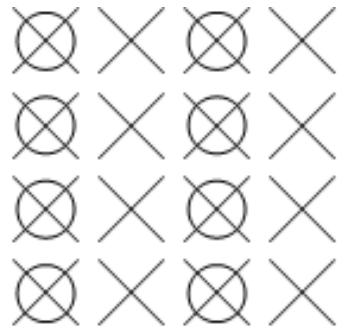
Analogue Legacies

- Analogue clocks derived from constant framerates
 - Can go black-and-white otherwise

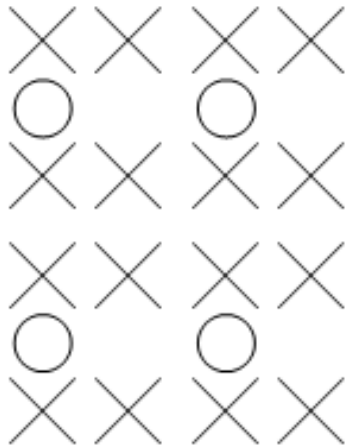
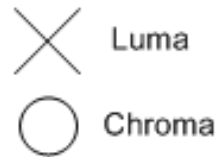


- (Whether you like it or not) most broadcasting is interlaced.
- Aspect ratio legacy
 - Aspect ratios apply to the **analogue** samples not the digital data (whether you like it or not)

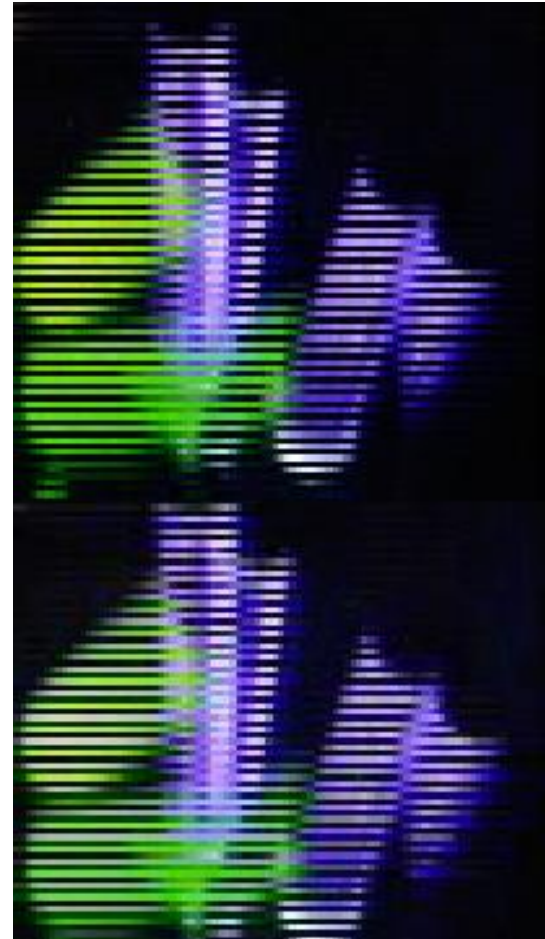
Wrong Interlaced Chroma Upsampling



4:2:2 - BT.601



4:2:0 - MPEG-2



NON-TECHNICAL ISSUES

Standards Bodies

- Broadcast is heavily standards based
- Standards can cost a lot of money
 - Require you to buy dozens
 - Corporate licences available but meaningless for OSS
- Lack of return path for reporting issues/ambiguity
 - MPEG has good return path (jvt-experts, mp4-tech mailing lists)
 - SMPTE has no way of reporting
 - Leads to major interoperability problems
 - No place to discuss edge cases

Patents

- Many processes may or may not be patented (IANAL)
 - Broadcasters assume worst and expect equipment to have royalties paid
 - Lots of FUD – sadly some spread by OSS orgs
- We know where we stand
 - Source code not patentable

Support

- Broadcasters need commercial support (and someone to blame when it goes wrong!)

The future

- FOSS broadcast lacks a “LAMP Stack”
 - Low level enough to have precise control
 - Simple enough that detailed knowledge
 - e.g zero understanding of HTTP to use LAMP
 - Reliable
- This is HARD