HDW-750P /730S Intro

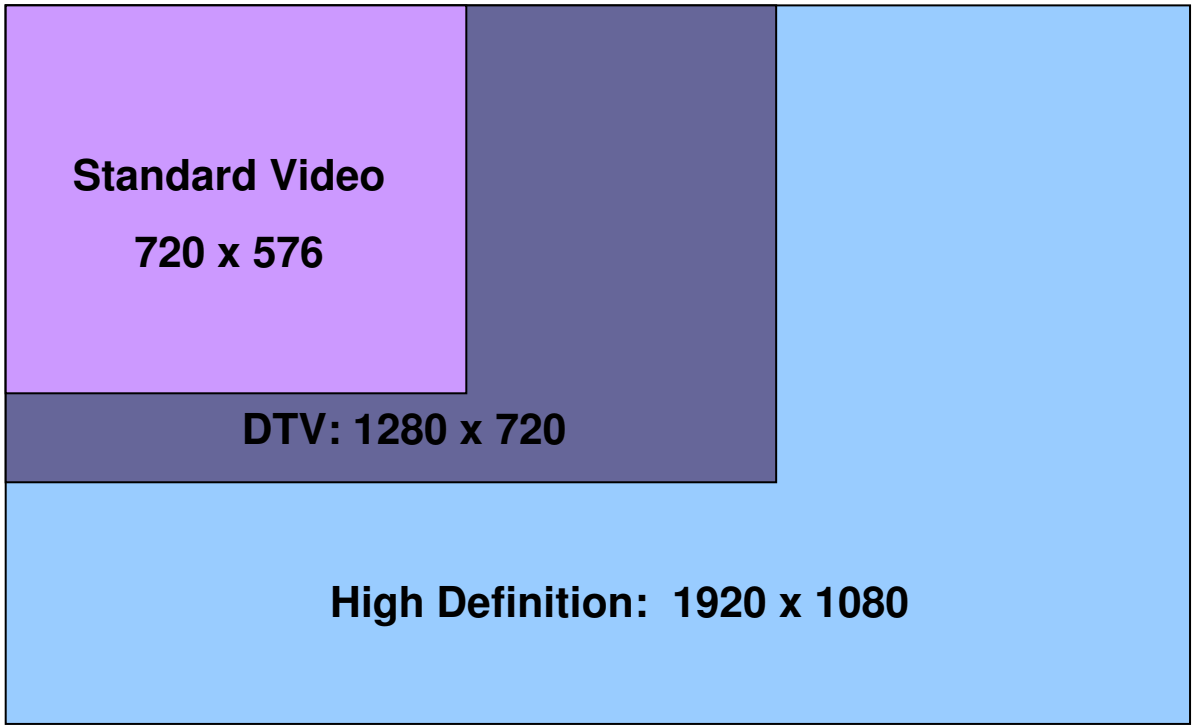
- Neil Thompson

HDTV….What is it?

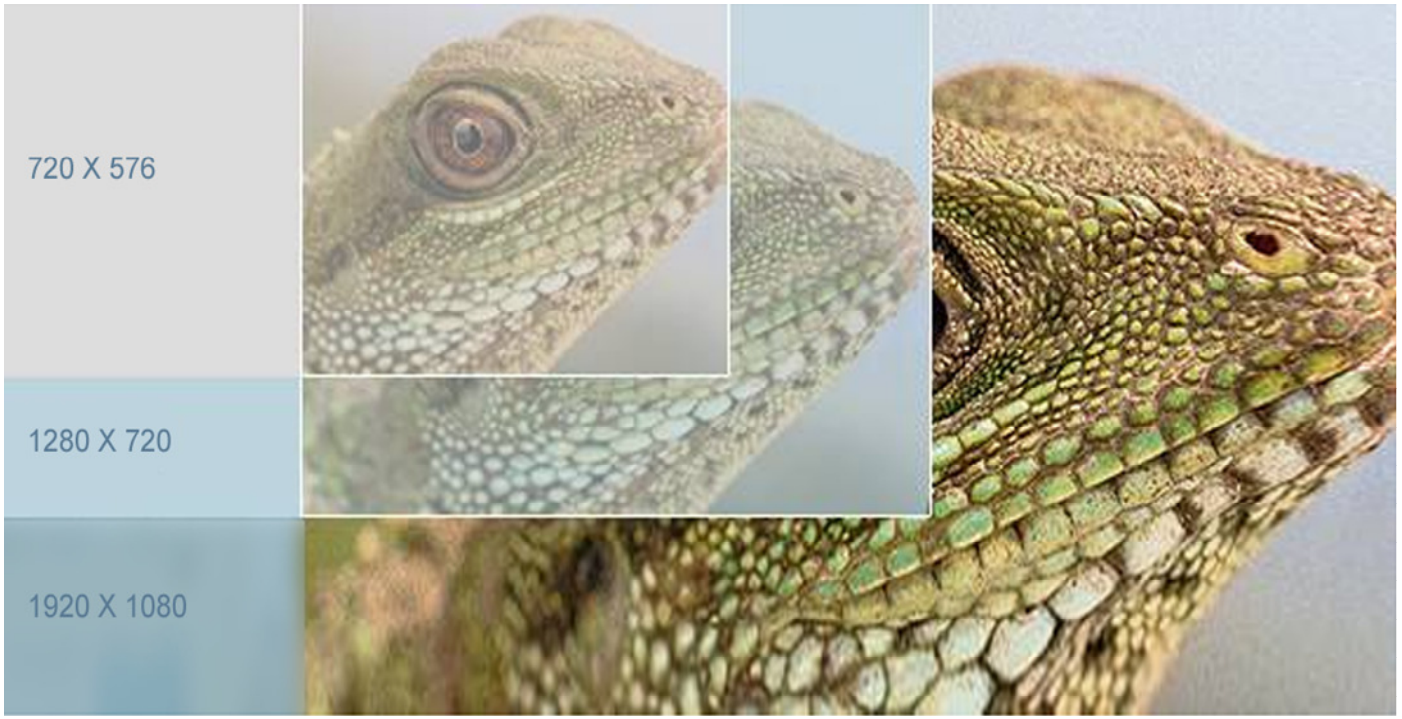
- A new way of making moving pictures
- Like standard definition TV...
- …but with a lot more resolution

- How much more resolution?

HDTV….How much definition?

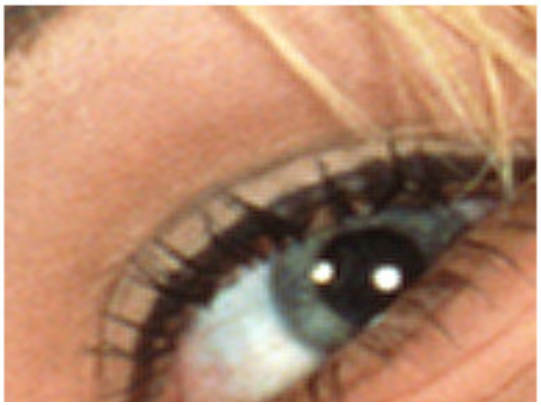


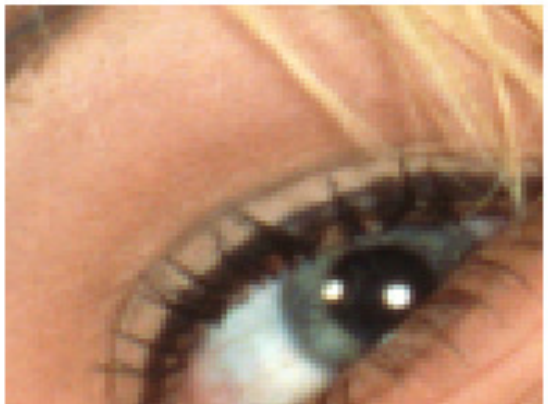
HDTV….How much definition?

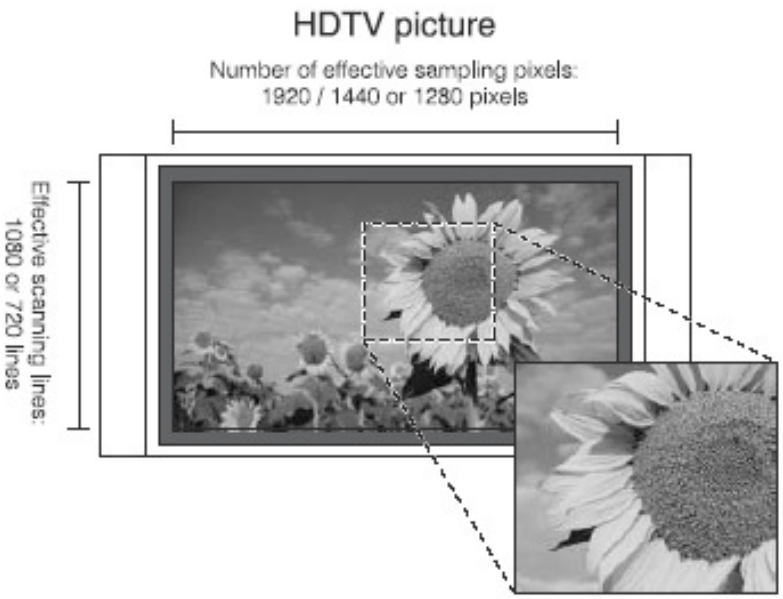


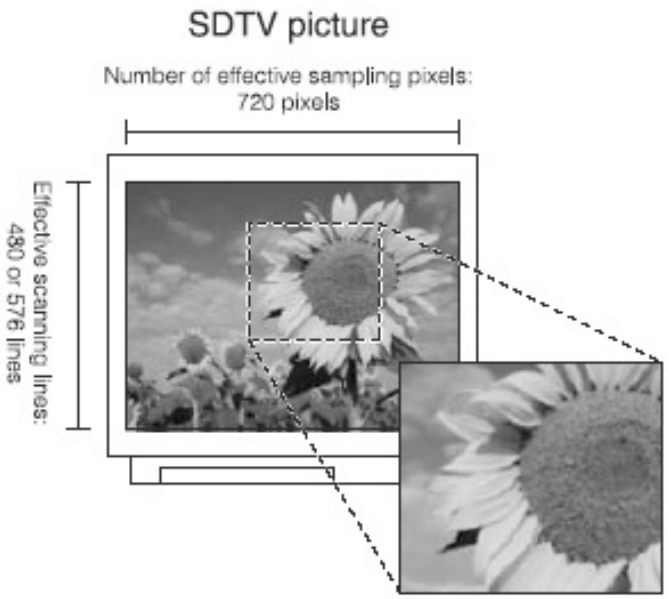
HDTV….Resolution

Why do we need more resolution?









HDTV….What's it for?

- Digital Television
  - Drama, Movies, Commercials, Wildlife
- Home Cinema
  - HDDVD, LCD, Projectors, Gaming
- Theatre Cinema
  - Distribution, flexibility, 4K projectors
- Presentation
  - Events, concerts, displays, exhibitions
- Science, industry and commerce
  - Medical, aerial, motion analysis

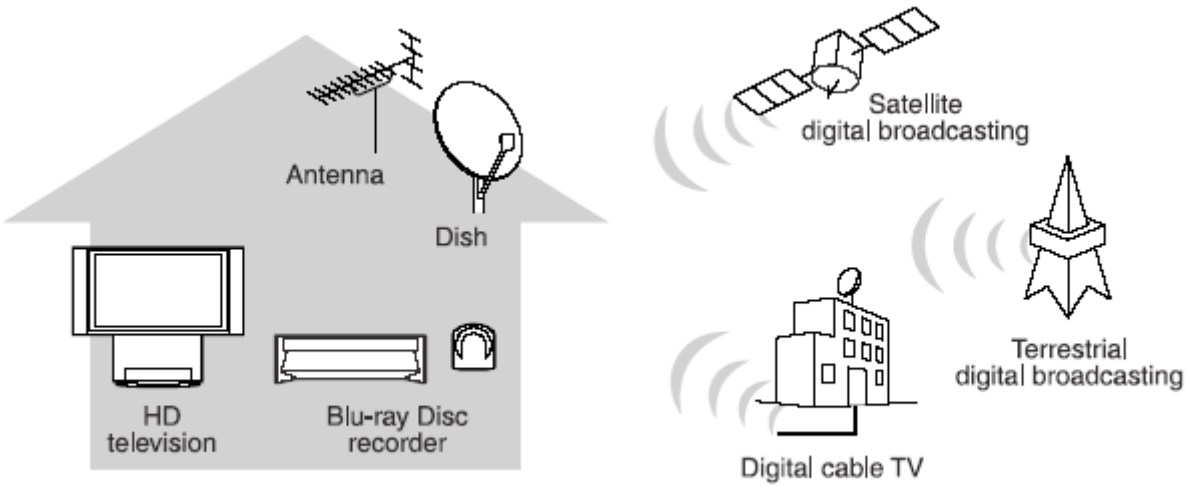
HDTV….Who needs it?

- We don’t need it
- But people will want it...
- …and we need to know about it.

- **All BBC production will be in HD by 2010**
- **BBC Satellite, freeview and terrestrial test transmissions 2006**
- **Sky will start HD transmission in 2006**
- **If you want to sell a programme in the US / Japan / Australia / China / Korea you need to know about HD right now.**

How does it get to the home?

- Blu-Ray DVD (HDDVD)
- Satellite
- HD1, Sky
- Cable
- Freeview
- Internet



Standard definition

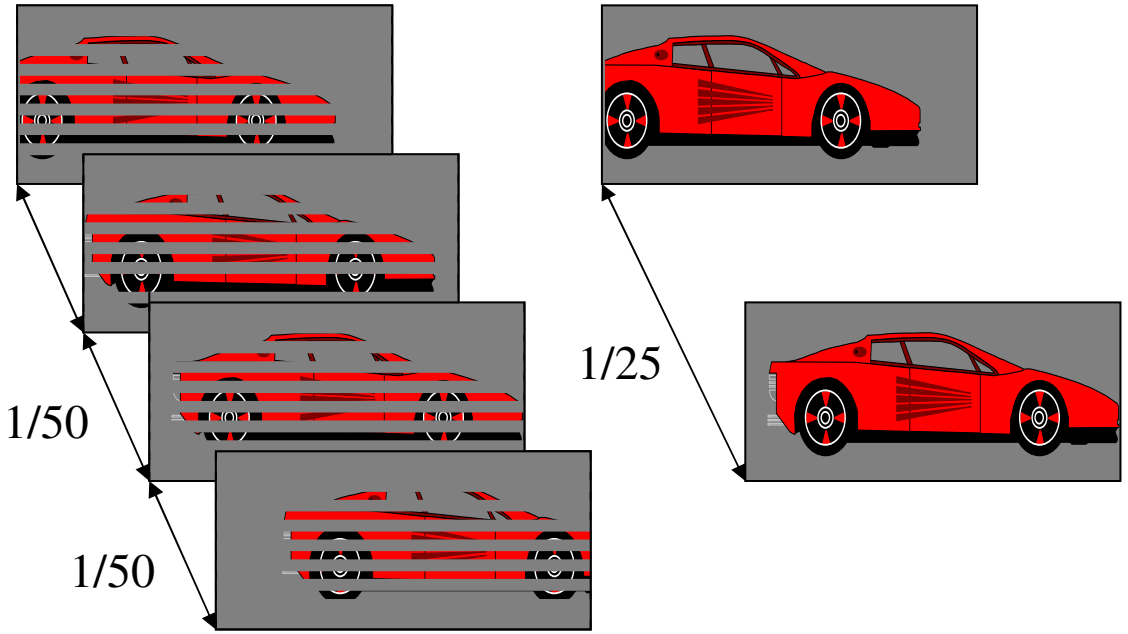
- Resolution:
  - 720x576
- Data Rate
  - 13.25 MHz luminance sampling
  - 6.625 MHz chrominance sampling x2
  - 10 bit words
- SDI
  - **270 Mbps**

HDSDI Data Rate

- 74.25 MHz Luminance Sampling
- 37.125 MHz Chrominance sampling
- 10 Bit word
- = 74.25 + (37.125 x 2) x 10 = **1.485 Gbps** @ 4:2:2 sampling
- =74.25 x 3 x 10 = **2.2Gbps** @ 4:4:4 sampling

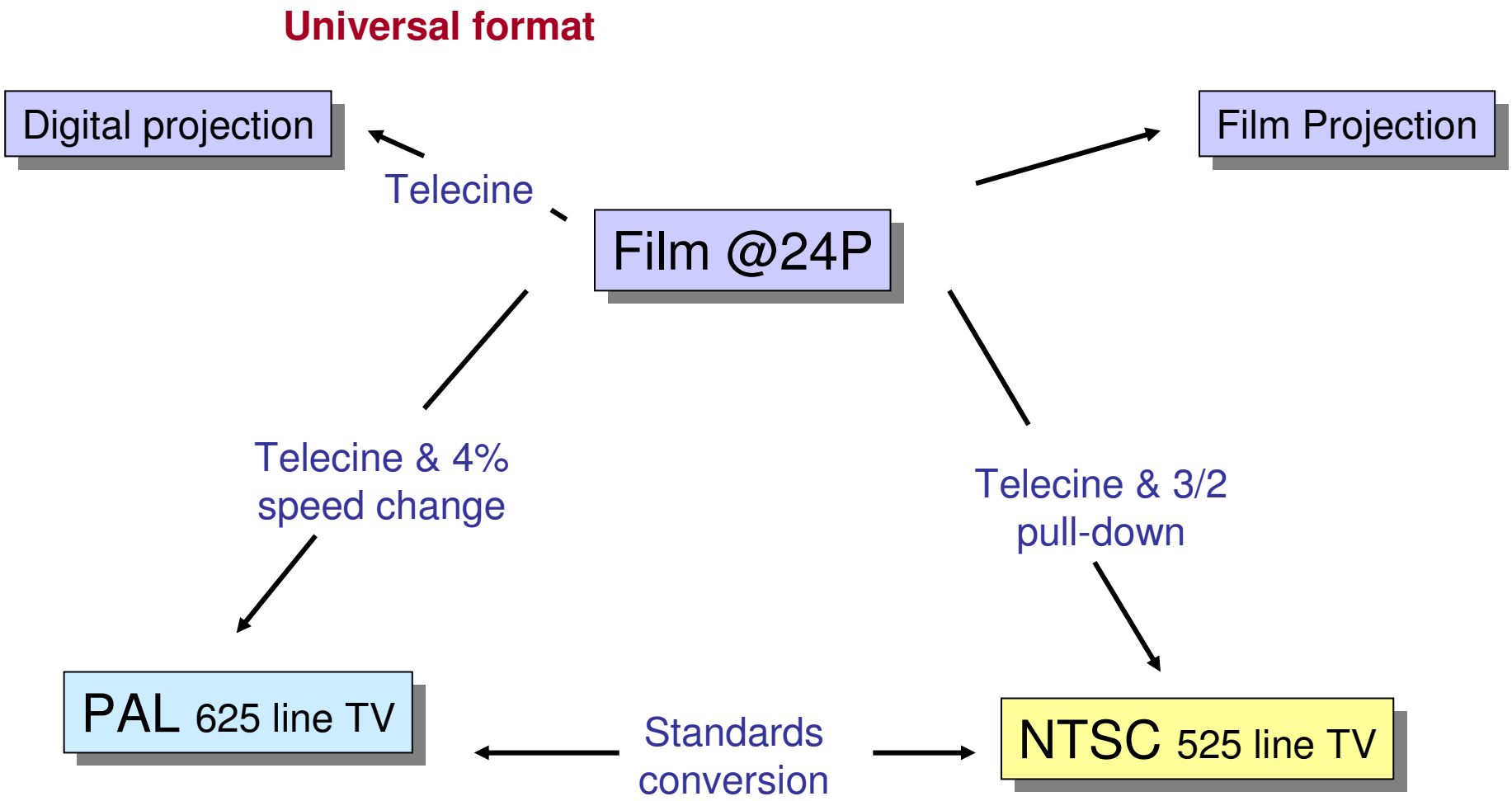
Standard Definition

- Frame rate
  - 25 Frames per second
  - 50 Interlaced fields per second

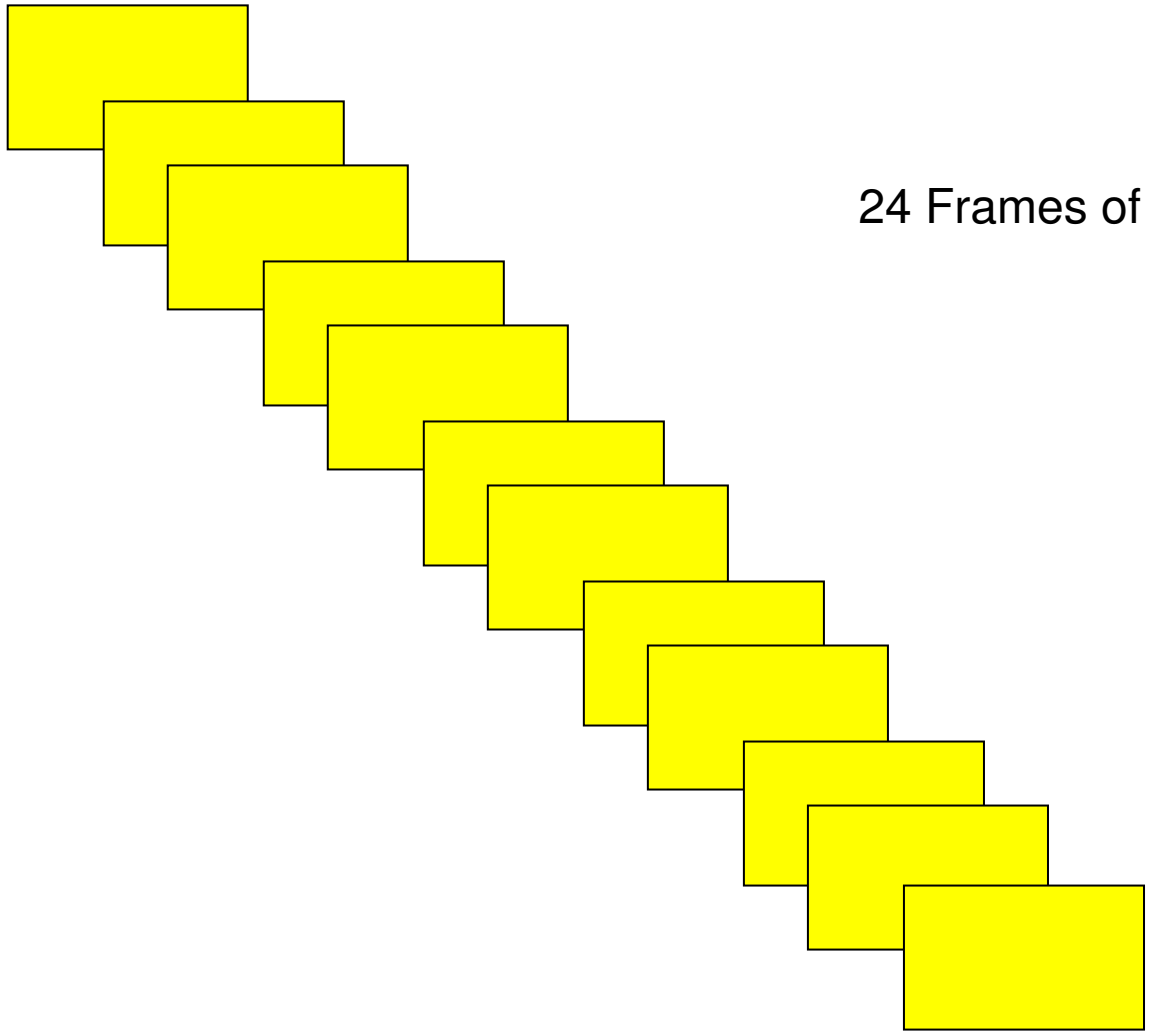


HD Frame Rates

23.98P	Drop frame version of 24P
24P	Progressive scan mode to match film frame rate
25P	Progressive scan to match 50Hz TV and 25P film
29.98P	Drop frame version of 30P
30P	Progressive scan to match 60Hz TV and 30P film
50i	Normal interlaced frame rate for Europe
(50P)	
59.94i	Same frame rate as NTSC
60i	Used in the 60Hz world where NTSC is not relevant
(60P)	

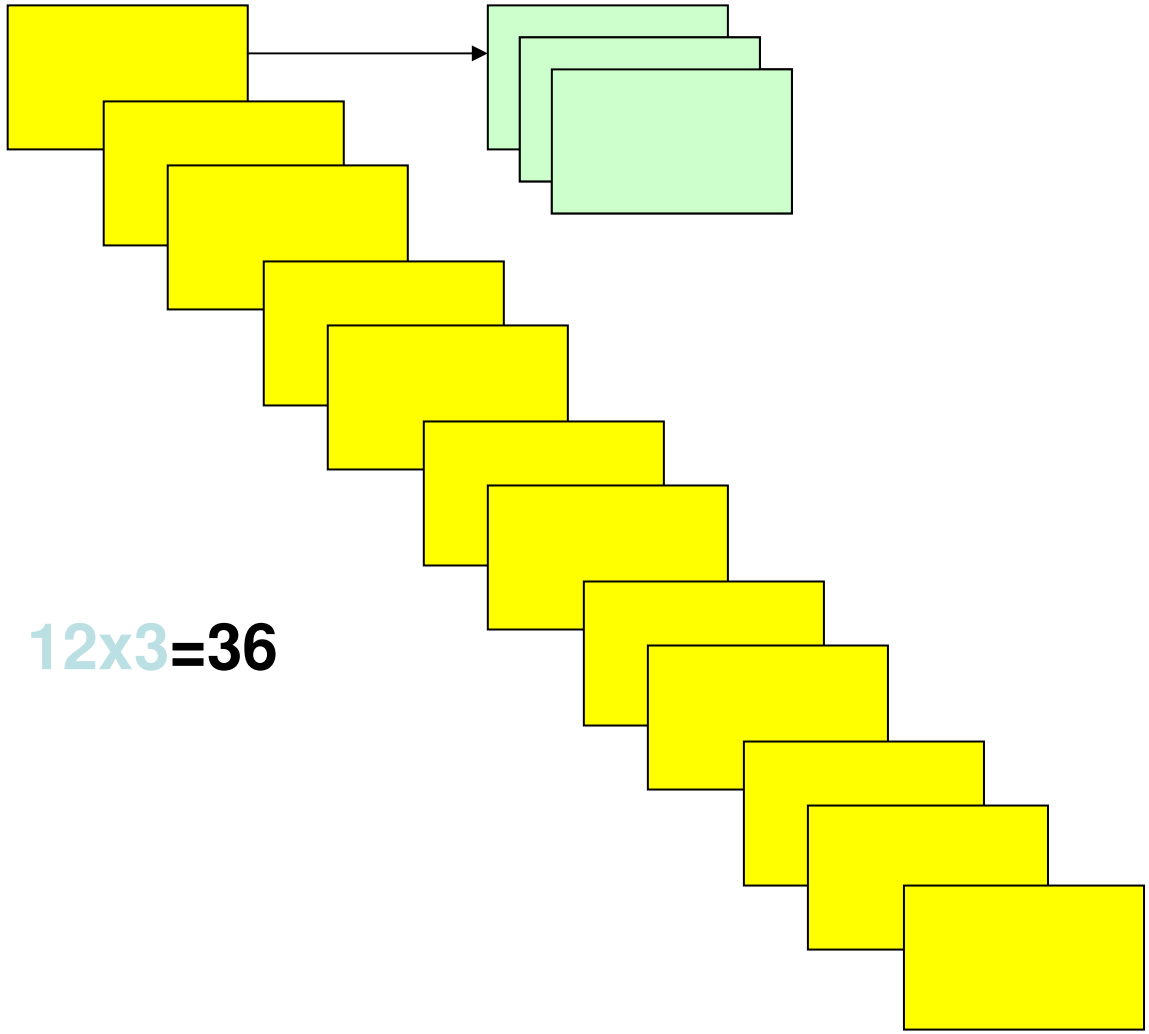

Universal format
Digital projection
Telecine
Film @24P
Film Projection
Telecine & 4%
speed change
Telecine & 3/2
pull-down
PAL 625 line TV
Standards
conversion
NTSC 525 line TV

3/2 Pulldown



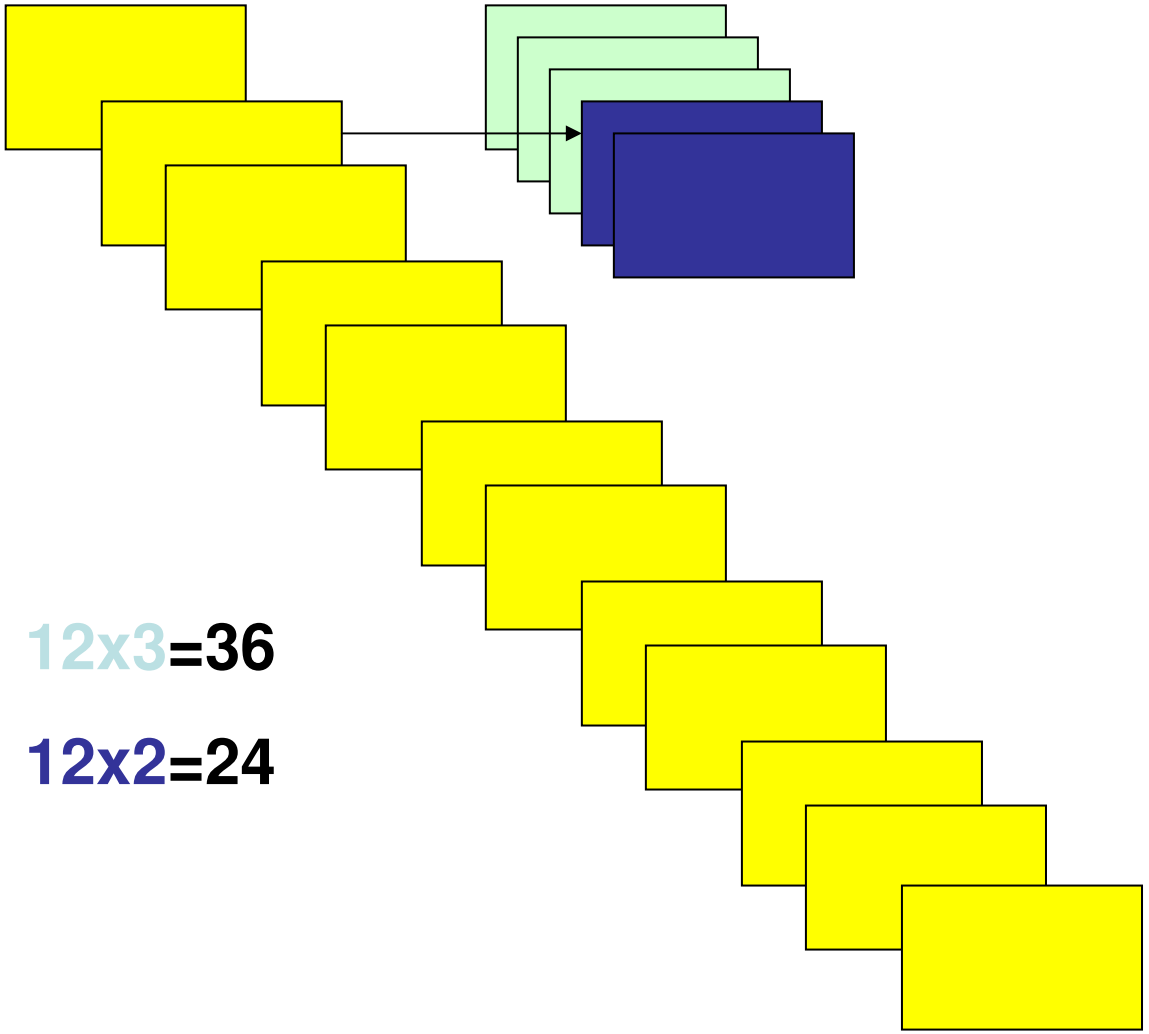
24 Frames of HD

3/2 Pulldown



12x3=36

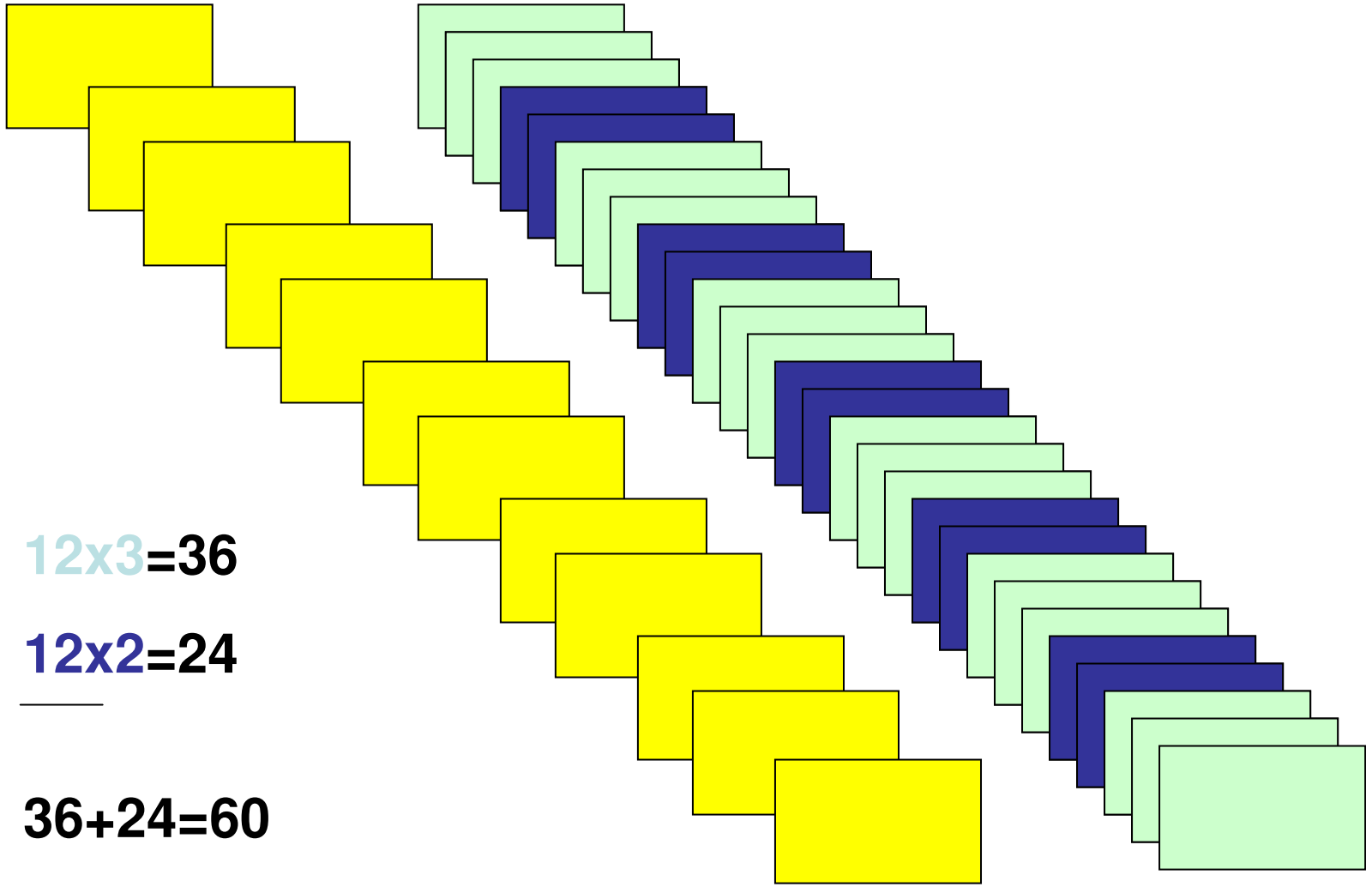
3/2 Pulldown



12x3=36

12x2=24

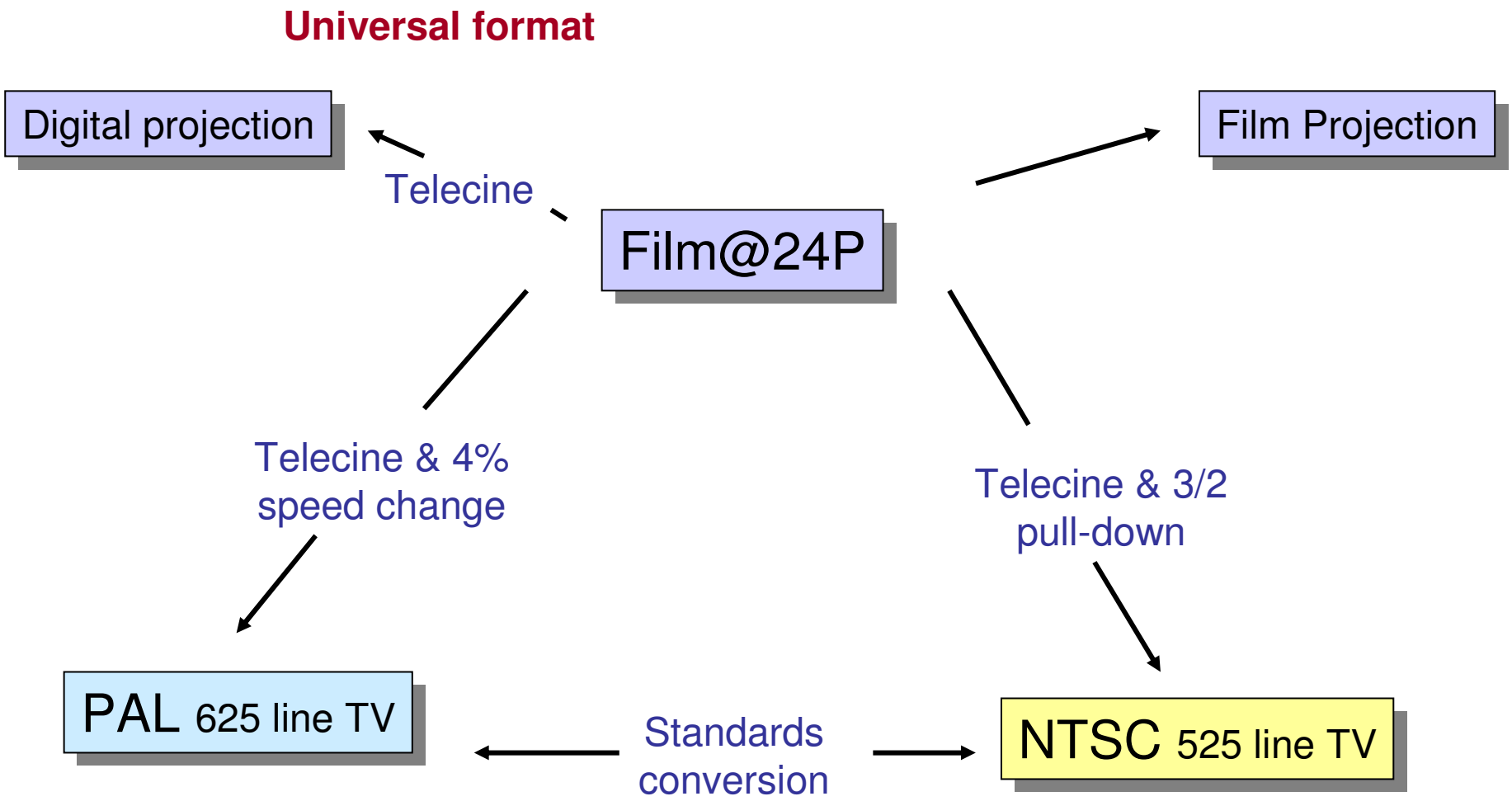
3/2 Pulldown



12x3=36

12x2=24

36+24=60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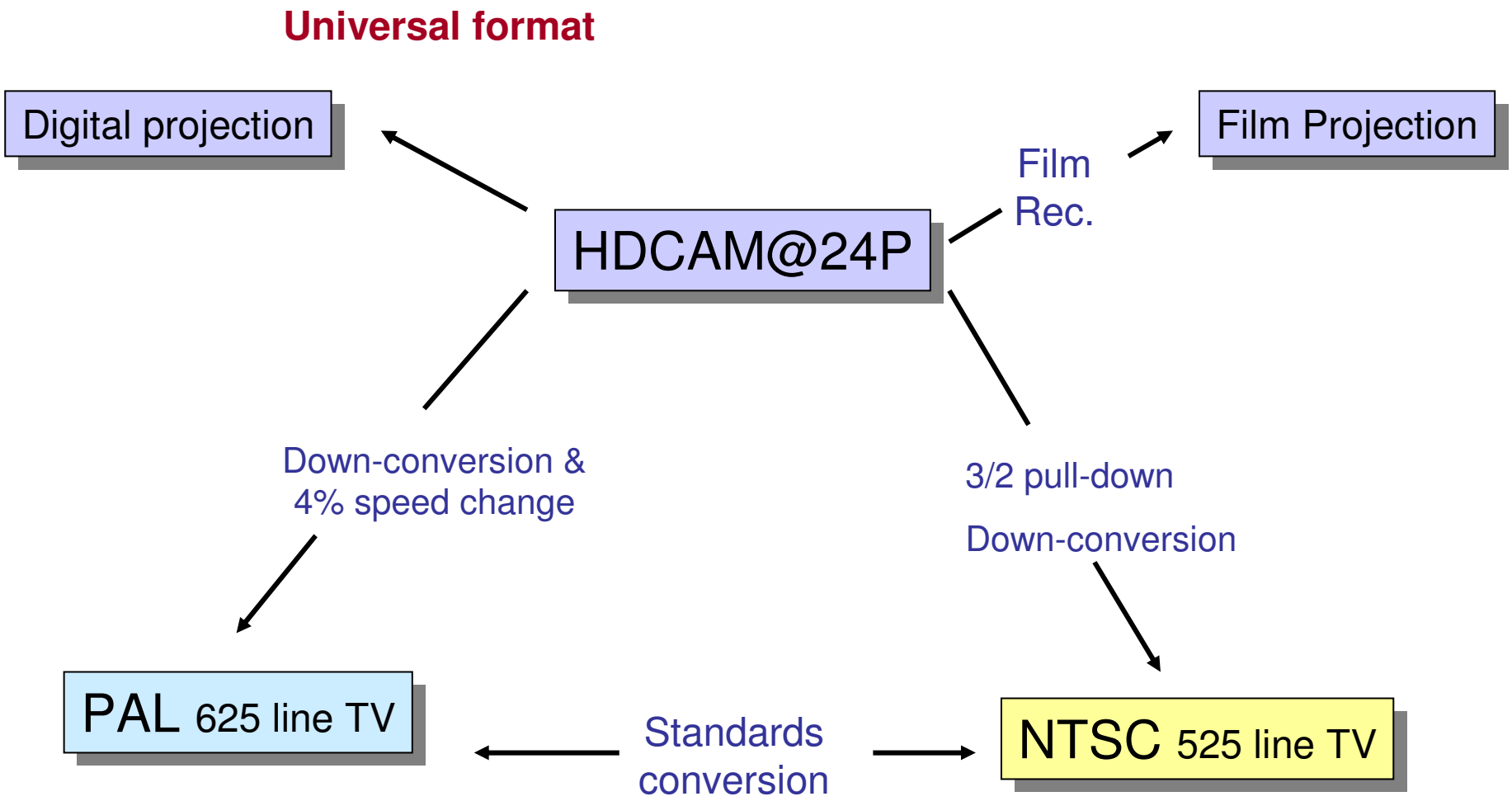
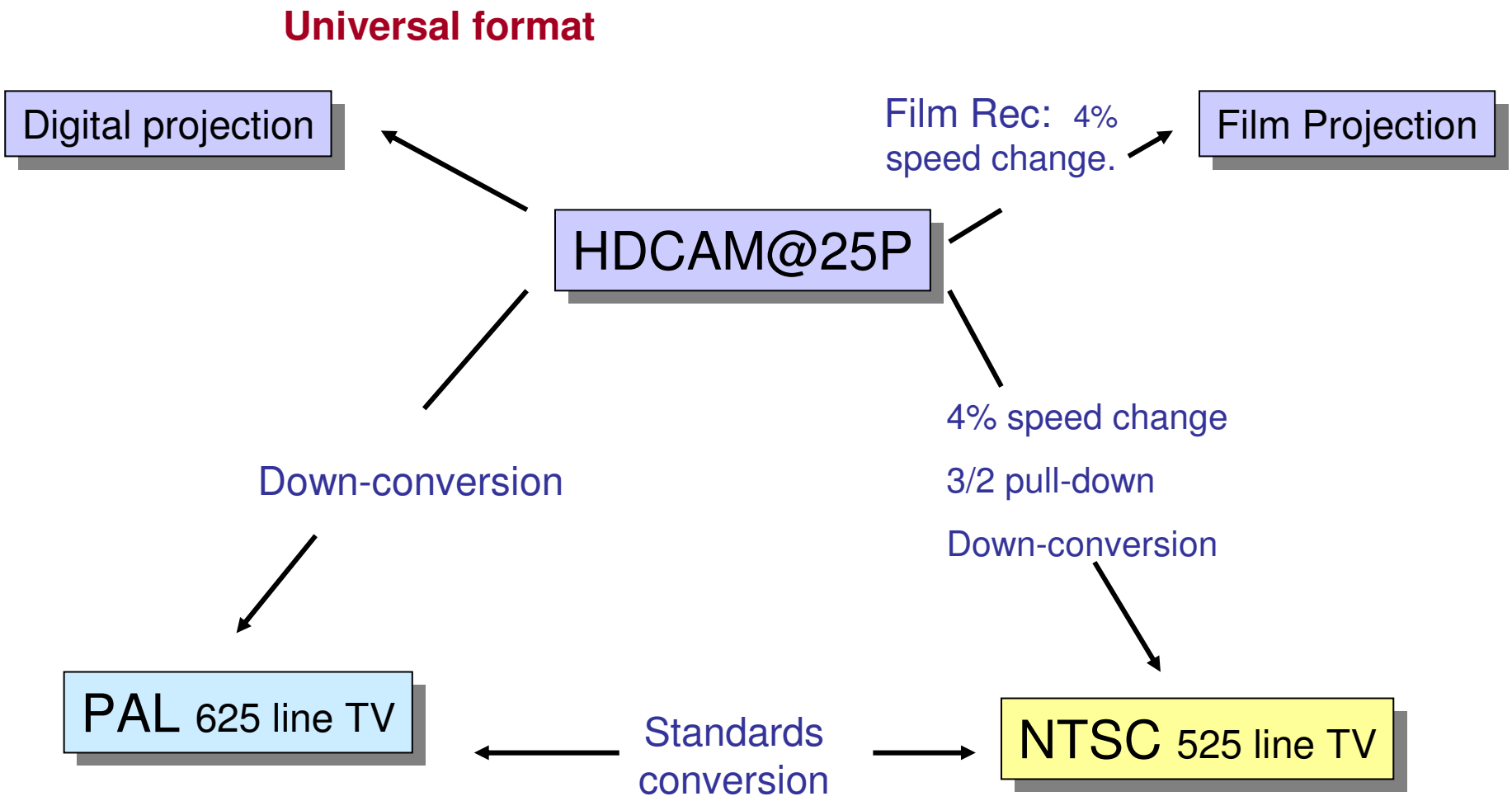
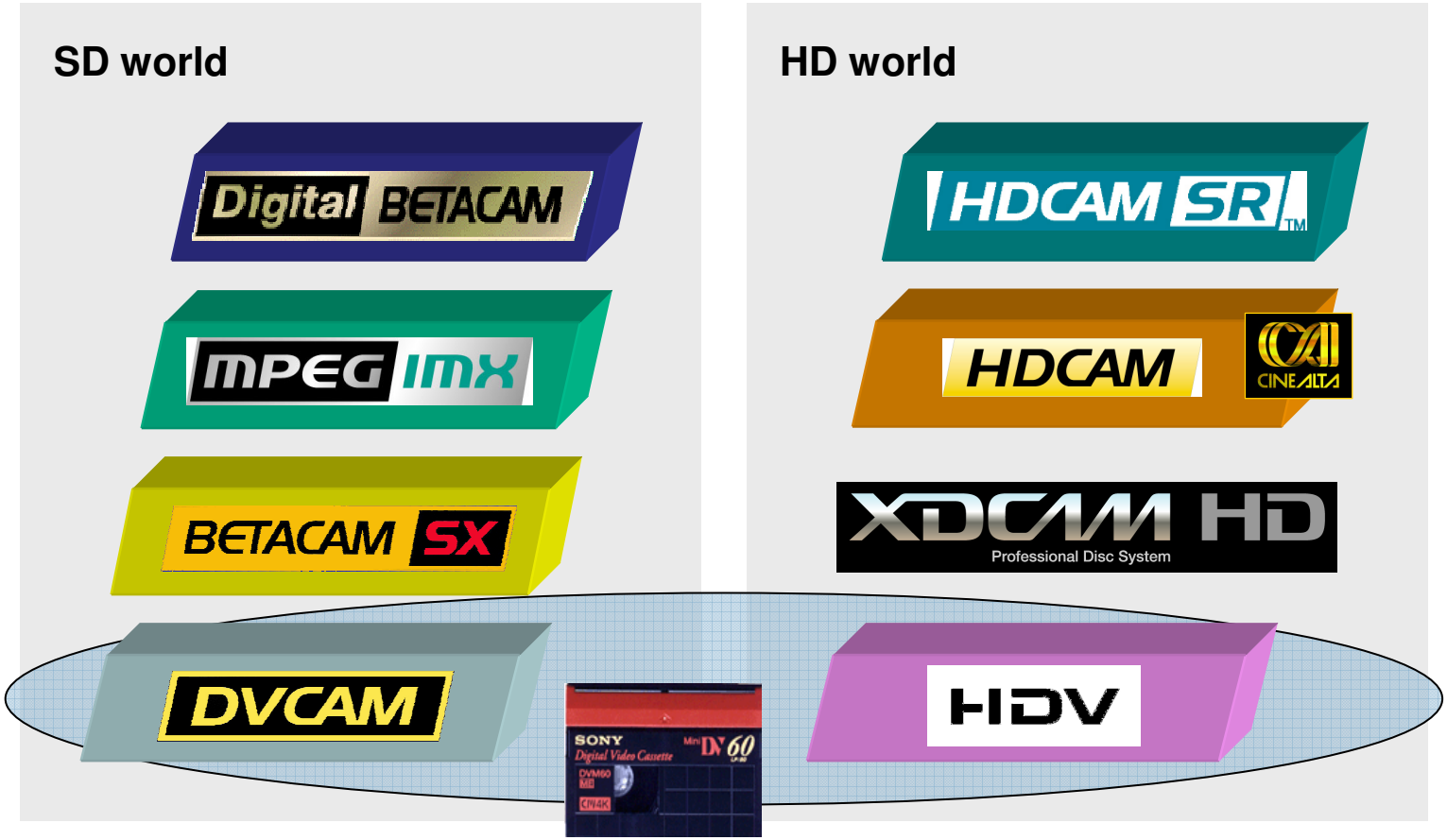

Universal format
Digital projection
Film Projection
Film
Rec.
HDCAM@24P
Down-conversion &
4% speed change
3/2 pull-down
Down-conversion
PAL 625 line TV
Standards
conversion
NTSC 525 line TV


Universal format
Digital projection
Film Rec: 4% speed change.
Film Projection
HDCAM@25P
Down-conversion
4% speed change
3/2 pull-down
Down-conversion
PAL 625 line TV
Standards conversion
NTSC 525 line TV

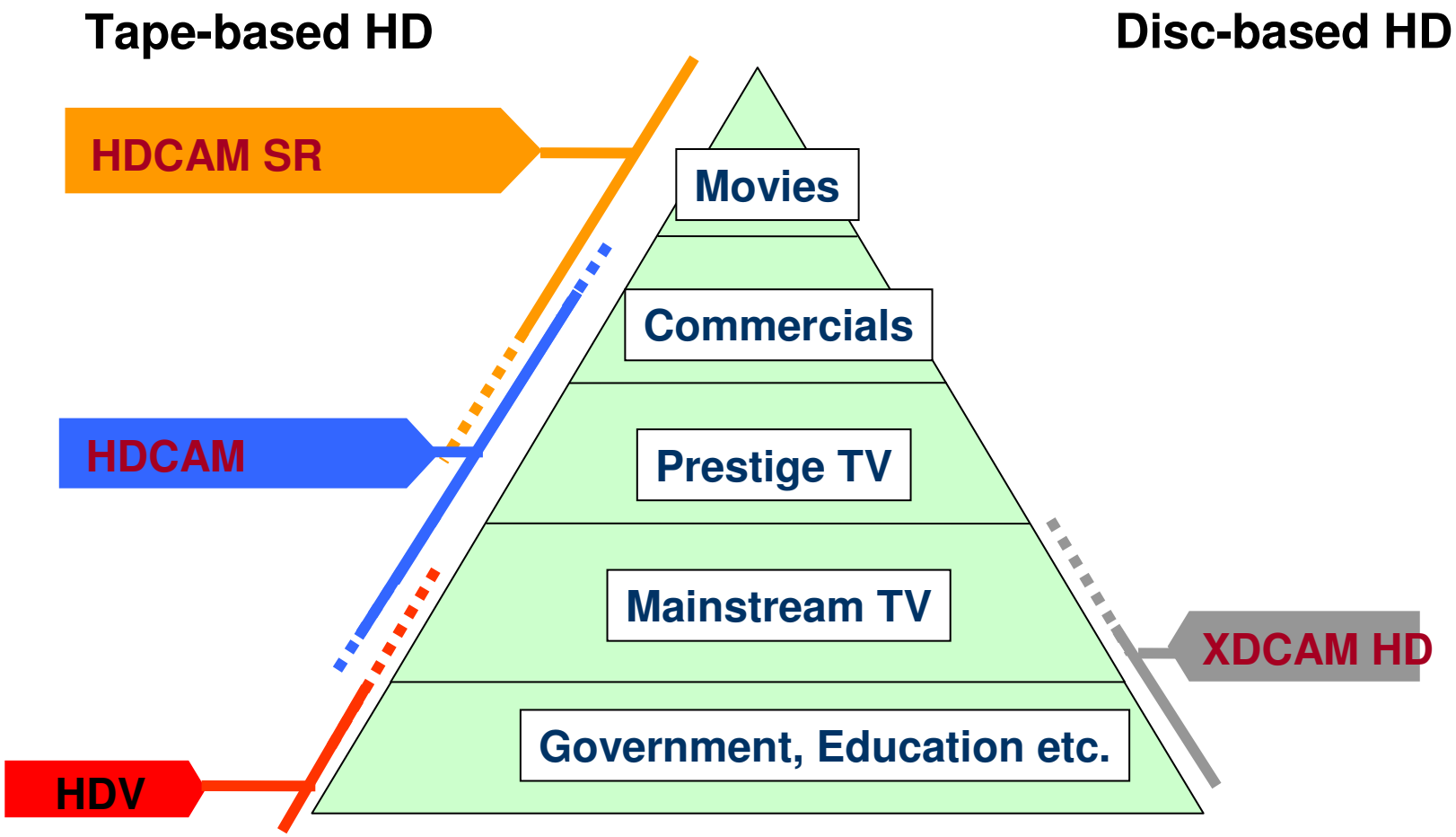
Which frame rate:

- Movies (big budget)
  - 23.98/24P
- Low / mid budget movies
  - 25P
- TV Drama
  - 25P
- TV Doc
  - 50i / 59.94i
- Wildlife
  - 25P / 50i / 59.94i
- Sport
  - 50+
- Slo-Mo
  - 50+

Format Positioning – All Sony Formats



Format Positioning



HD Compression

- **This is what you start with:**
- 4:2:2 10 bit uncompressed:
  1500Mbps
- 4:4:4 10 bit uncompressed:
  2200Mbps

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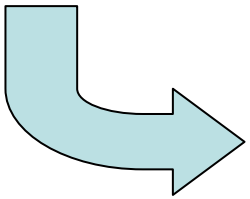
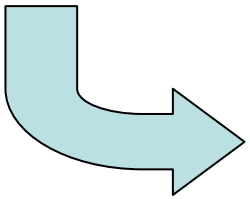


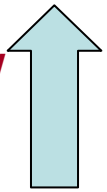
- **This is what you end up with on tape:**
- HDV **25Mbps** / 19Mbps
- XDCAM HD **18-35Mbps**
- HDCAM **140Mbps**
- DVCPro HD **100Mbps**
- HDD5 **235Mbps**
- HDCAM SR **440Mbps**

HD Compression

- **This is what you start with:**
- 4:2:2 10 bit uncompressed: **1500Mbps**
- 4:4:4 10 bit uncompressed: **2200Mbps**



- **This is what you receive at home:**
- MPEG-2 HD **10-15Mbps**
- MPEG-4 HD **5-12mbps**
- Blu-Ray **25Mbps**
- **DVD** **5-8 Mbps**
- **Freeview** **3-4 Mbps**



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What else is done to reduce data rates?

- Compression
  - DCT, MPEG, Wavelet etc.
- Truncation:
  - Reducing word size from 10 bit to 8 bit
- Colour sub-sampling:
  - 4:4:4, 4:2:2 and all that.

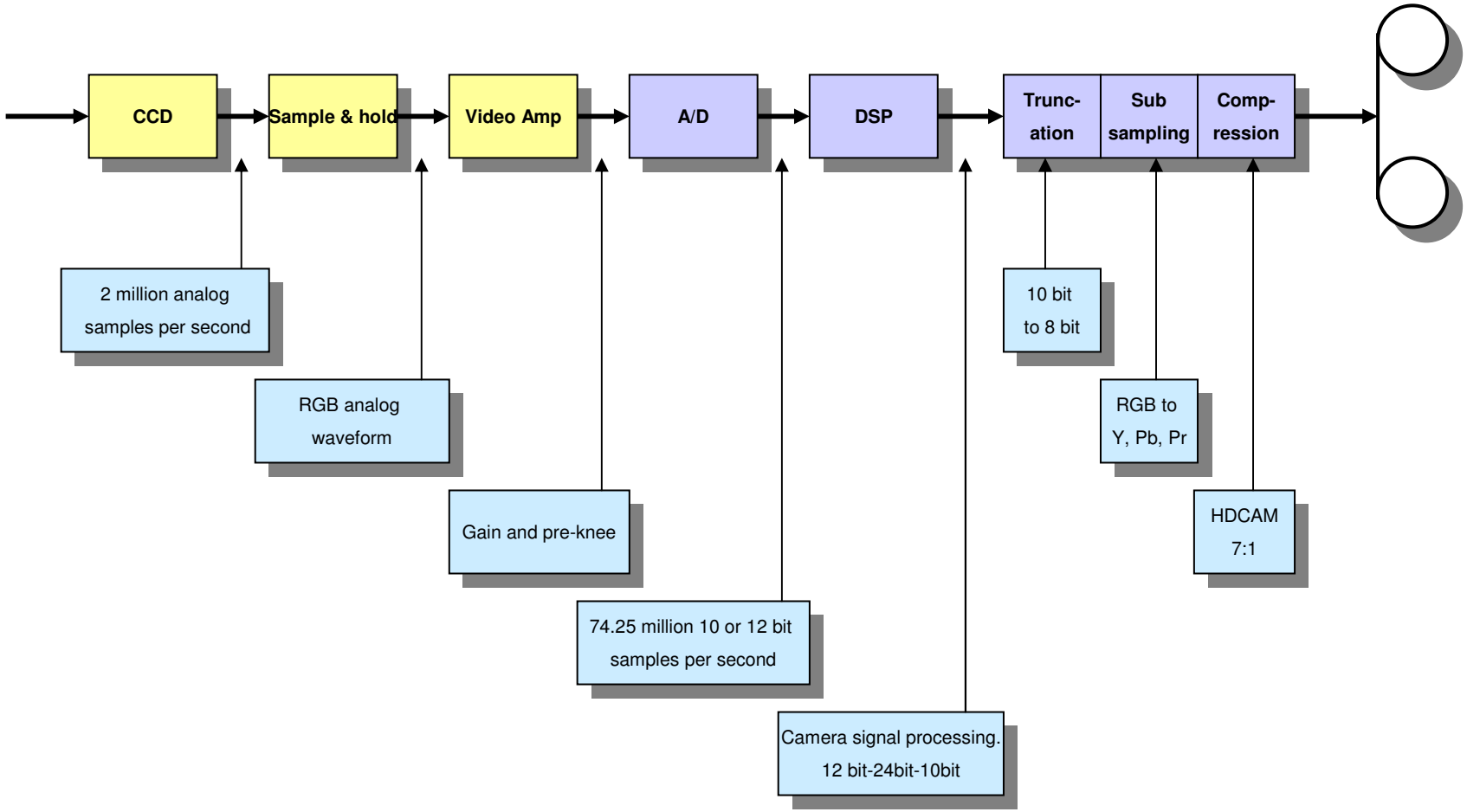
Connecting HD kit.

- SD
  - Composite / YC / Component / RGB / SDI / firewire
- HD
  - HDSDI — 1.5 Gbps digital signal. BNC cable
  - Component — 27MHz analog signal. 3x BNC cable
  - RGB — 27MHz analog signal. 4x BNC cable
  - Dual link HDSDI — 2.3 Gbps digital signal. 2x BNC cable

Bandwidth

- Fibre Optic

Camcorder block diagram



Differences from Film

- Depth of field
- Noise
- Highlight handling
- Lowlight handling
- Exposure
- Steadiness
- Workflow
- Cost
- Record Time
- Slow motion
- Lenses

Differences from film:

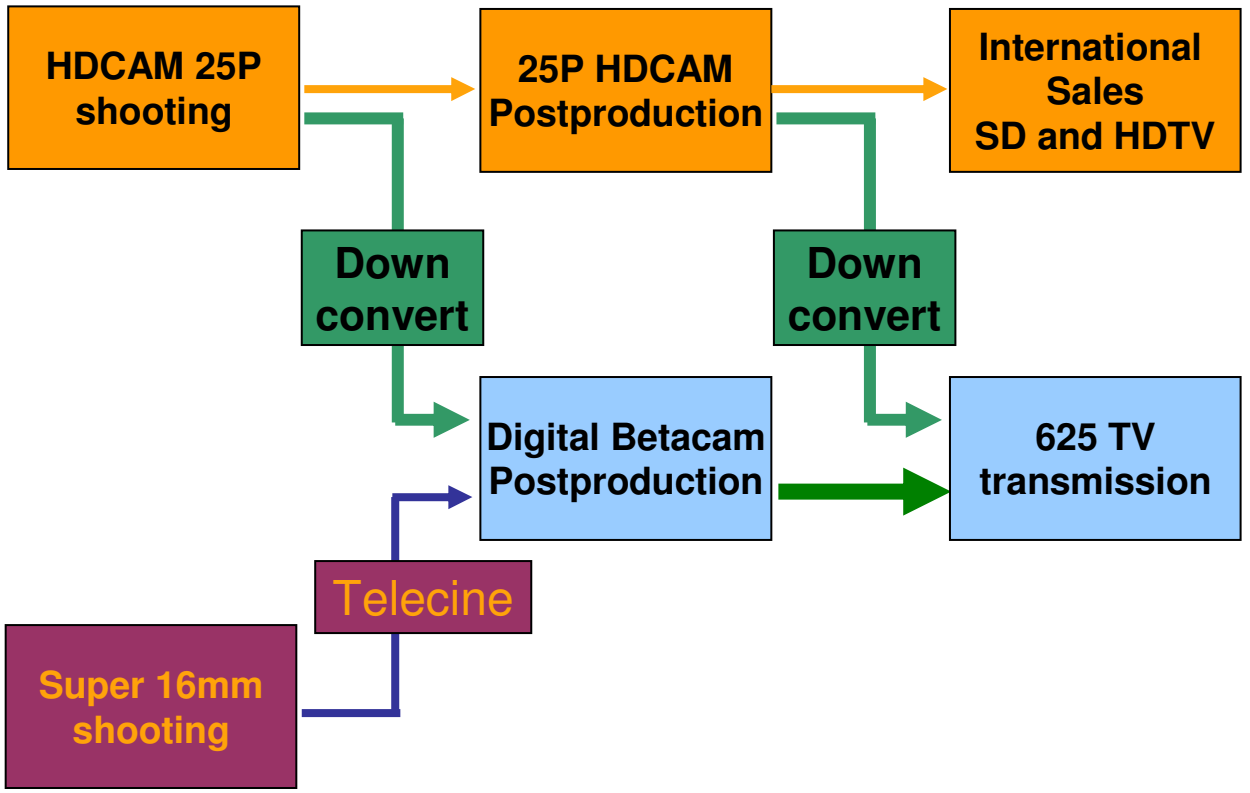
- HDCAM
  - The dynamic range of reversal film
  - The resolution of 35mm
  - The grain of 65mm

Differences between HDW-750P and 730S

- **HDW-750P**
- 25P or 50i
- 2 x optical filter wheels
- FIT CCDs
- Accessory comnnector at rear

- **HDW-730S**
- 50i or 59.94i
- 1 x optical filter wheel
- IT CCDs
- No connector

Workflow


HDCAM 25P shooting
25P HDCAM Postproduction
International Sales SD and HDTV
Down convert
Down convert
Digital Betacam Postproduction
625 TV transmission
Telecine
Super 16mm shooting

How much more does it cost to move from Digi Beta to HD?

- Well an HDW-730S is about the same price as a DVW-790…
- HDW-730S:
  - List price £32430 with a down-converter option
- DVW-790WSP:
  - £41750..street price £30K

The full story…

- Purchase / Rental
- Tape
- Lenses
- Accessories
- Maintenance
- Down-conversion
- Offlining
- On line
- Conforming and Grading
- Mastering

Example 1: 6 x 1 hour Documentary

- Standard definition lenses
- 50i
- No film effect
- No HD master
- 12 week shoot
- Shooting Ratio 20:1

6 x 1 hour Documentary: Production Costs

Tape cost = 6 episodes x 1 hour x 20:1= 120 hrs	£3000
Less cost of 120 hrs of DB stock (£1600)	-£1600
Down conversion to DB @ £75/ hr	£9000
Extra rental costs = £200 / week =	£2400
Process is then the same as for DB	
Extra cost:	**£12800**

- BBC doc. Budget: £100K / hour = £600K
- **2.2% extra to shoot in HD.**

Example 2: 6 x 1 hour Drama

- 2 x HD lenses
- 25P
- Grading
- HD and DB masters
- 12 week shoot
- Shooting ratio 15 : 1

6 x 1Hour Drama: Production costs

Tape cost = 6 episodes x 1 hour x 15:1 = 90hrs	£2500
Less cost of 90 hrs of DB stock (£1400)	-£1400
Extra camera rental costs = £500 / week	£6000
Extra lens costs (2x zooms) = £120 / day , 12 day month, 3 months =	£4320
Down conversion to DV (or direct to NLE) @£50 / hour:	£4500
Off line costs, same as DB, or less.	
Conforming 6 hrs to HD = 12 hours @ £275 / hour	£3300
Grading 6 Hrs HD = 20 hours x £350 (XPRI)	£7000
Less Grading 6 Hrs DB = 24 hours (inc. film effect) x £175 = £4200	-£4200
Down-conversion to DB master	£500
Extra cost:	**£22520**
BBC drama Budget: £400K / hour = £2M	
1.1% extra to shoot in HD.	

Plus: some added benefits…

- Higher quality pictures at SD.
  - Reduced aliasing owing to the high sampling frequency of the CCD.
  - Better resolution and less ‘edging’ as minimal detail correction is required
  - Better film effect processing from interlaced material. (If required)
- Excellent colour correction facilities in an XPRI suite. (Similar to Telecine suite)
- HD tapes on the shelf.
  - Re-conform from standard def EDL for international sales, or edit in HD and down-convert for an SD master.
- Investment in the quality of HD
- *The door is open for International Sales*

HDTV….Is it practical?

- It’s Affordable
- It’s Available
- It’s Usable