



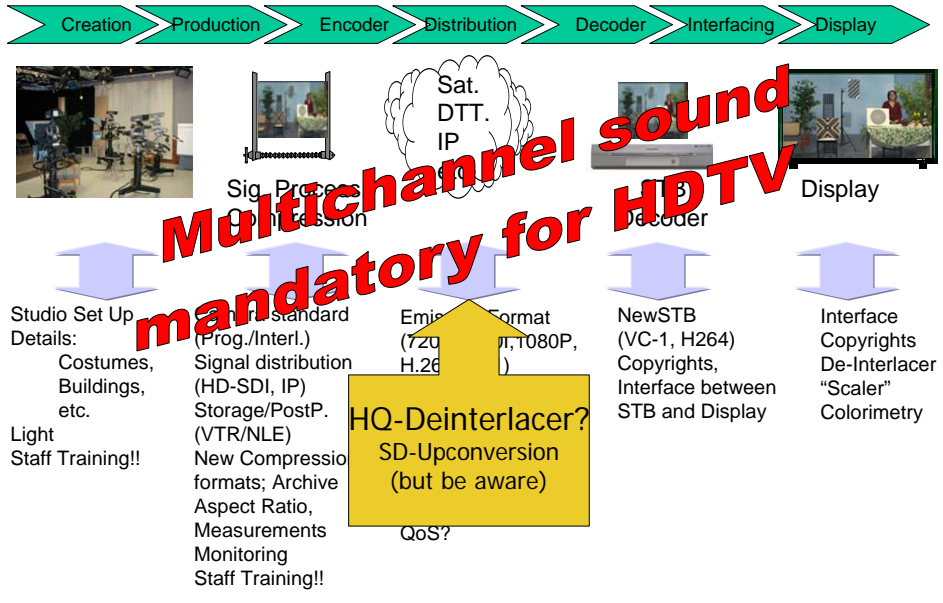
The European HD Studio – which equipment for which need?

Hans Hoffmann – Senior Engineer
EBU - Technical Department
(hoffmann@ebu.ch)

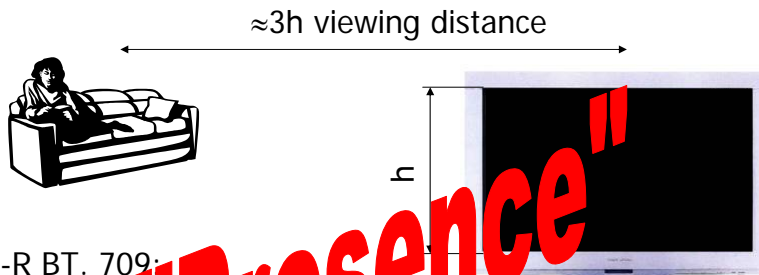


- What is HDTV
- Why should you care
- Today's options for production
- EBU role
- Summary

HD – Impact on the chain



Definition HDTV



ITU-R BT. 709:

„ A high definition system designed to allow viewing at about three times the picture height, such that the system is virtually, or nearly, transparent to the quality or portrayal that would have been perceived in the original scene or performance by a discerning viewer with normal visual acuity.“

HD in Production



- Why should you care?
 - Co-productions on the international market require HD (in various formats)
 - Multi-purposing of Content for DVD, HD-DVD, Cinema, etc.
 - To have Content in the archive including rights
 - New business concepts and competition to private broadcasters (announcements for Eurofoot 2006 etc.)
 - HD devices will continue to fall in price
 - Digital film
 - Gain quality headroom due to the impact of new, large displays

Conter arguments.....



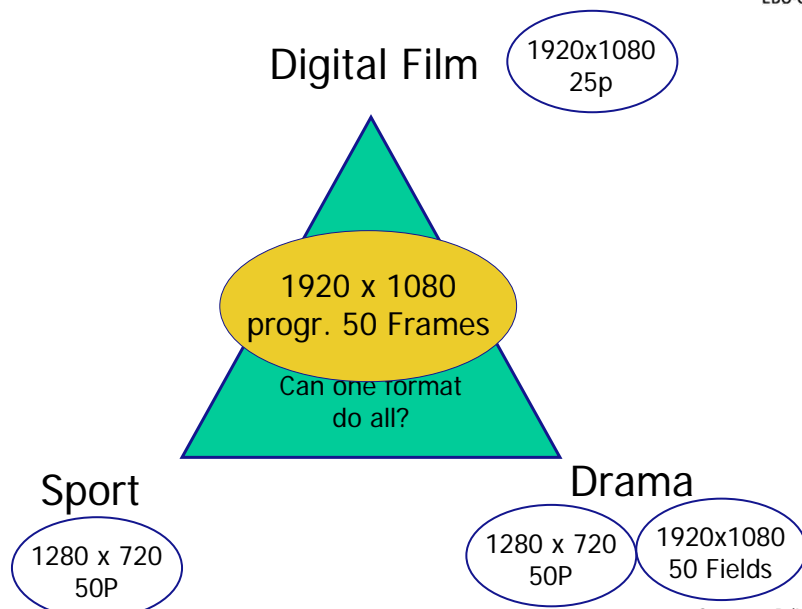
- Costs!
 - HDTV Studios by now => Outsourcing
 - Europe is advanced in IT based Productions
 - HD equipment focuses on traditional technologies
 - HD support for IT based production is limited (but increasing) and expensive
- What "income" will HD production generate?
- Optimise the SDTV chain
 - Step 1: Avoid transcoding
 - Step 2: Full digital transparent chain
 - Step 3: 16 x 9 production

User Requirements for Production



- Quality headroom should meet the “HD effect” requirement.
 - Impact on Compression, Interfaces, Storage
- Interoperability and availability of a variety of products
- Reasonable price policy for HD equipment
- Different Genre, in-house standards and co-production contracts will require that different production standards are supported:
 - See EBU Tech 3299 (www.ebu.ch)
 - can we have “one superior standard”?
- Migration path from SD to HD
 - Today's investment should be “HD-ready”
 - Island production areas
 - Upgrades for IT systems (possible?)

Genre dependent production ?



Source: P/HDTP

HD – Options in production



Capture

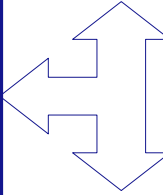
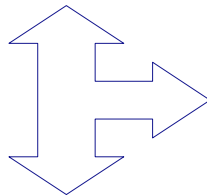
- HD-Lens
- HD-Sensor
- Compression/Uncompressed
- Sub-sampling
- Interlaced/Progressive

Storage/Archive

- VTR type
- IT based (tape)
- What compression and bit rate

Infrastructure

- HD-SDI (1.5Gbit/s)
- HD-SDTI (1 Gbit/s payload)
- New Networks (10Gig?)
- New SDI type interface (3 Gig?)
- New compression:
200-250 Mb for 1080i/720p
400-800 Mb for 1080/P/50?



Distri./Contri./Playout

- De-Interlacing
- Format Conversion (also SD, 4x3)
- Compression
- Rights

NLE

- Processing speed, Performance
- number of I/O channels
- Compression
- File Format

Future European HD Studio



Sensor
CCD/CMOS
Today's
cameras

Downconversion
Compression

Sensor
CCD/CMOS
1920x1080 P
50-60 Frames

Unc.
HSDI

New
Interf. Uncompressed
 Compressed

H-SDI Infrastructure

Supports uncomp. 720p
1080i
1080/25p

New mezzanine Compression
Maybe also 1080/P/50 with
new Compression

New Infrastructure

min. 3 Gbit/s.
likely 10Gbit/s??
No concrete suggestions,
EBU/SMPTE just started
on UR.
New compression (400Mb?)

HDTV – relevant 50 Hz Standards

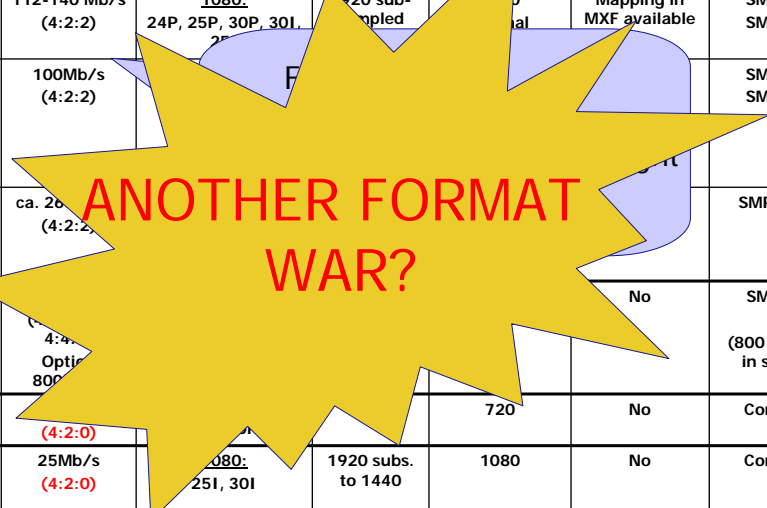


Use Case	System Abbreviation	Frame Rate [Hz]	Sample/Line	Active lines/Frame	Sampling Frequency [Hz]	Standard
"Sport"	"1080/I/25"	25 (50 Fields)	1920	1080	74.25 MHz	SMPTE 240 ITU-R 709
	"720/P/50" Not in ITU	50	1280	720	74.25	SMPTE 296M (incl.50Hz) ITU-R 1543 (no 50Hz)
Ideal Future	"1080/P/50"	50	1920	1080	148.5 MHz	SMPTE 274
News? (4:2:0)	HDV-1	24-60p	1280	720	74.25 MHz	No Standard; "Consortium"
	HDV-2	25i/30i	1440	1080	55.7 MHz	
"Film"	"1080/P/24-25"	24/25	1920	1080	74.25	SMPTE 274

HDTV – current storage standards



System Abb.	Compressed Bitrate	Frame Rates [Hz]	Sample/Line	Active lines/Frame	File Based	Standard
HDCAM	112-140 Mb/s (4:2:2)	1080: 24P, 25P, 30P, 30L, 25i	1920 sub-sampled	1080	Mapping in MXF available	SMPTE 367 SMPTE 368
DVCPRO HD	100Mb/s (4:2:2)	1080: 24P, 25P, 30P, 30L, 25i	1920 sub-sampled	720		SMPTE 370 SMPTE 371
HD-D5	ca. 200 Mb/s (4:2:2)	1080: 24P, 25P, 30P, 30L, 25i	1920 sub-sampled	1080		SMPTE 342M
HDCAM-SR	ca. 400 Mb/s (4:4:4) Optic 800 Mb/s	1080: 24P, 25P, 30P, 30L, 25i	1920 sub-sampled	1080	No	SMPTE xxx (800 Mbit/s not in standard)
HDV-1	100 Mb/s (4:2:0)	1080: 24P, 25P, 30P, 30L, 25i	1920 sub-sampled	720	No	Consortium
HDV-2	25 Mb/s (4:2:0)	1080: 25i, 30i	1920 subs. to 1440	1080	No	Consortium



HDTV – Investment issues



- **Equipment issues**
 - Where is equipment which supports 720/P/50: STB and Displays will do, but production equipment.....
 - Studio devices and infrastructures: HD-SDI and IT based need to be available for better price (currently 20% difference – at least)
- **Short term investment – what to do?**
 - Make infrastructure ready for high data rates
 - Use fibre where possible
 - Traditional technology replacement – use HD-SDI
 - Networks and Server have difficulties
 - Programme “making”: what is worth to be shoot in HD?

HDTV – 1080/P/50 Hype



- **Standards:**
 - How to handle 2.2 Gbit/s uncompressed?
 - Dual link HD-SDI is a “no-go” for complex studios
 - We need a new studio interface
 - We need a new mezzanine compression system!
 - Mainstream production systems need to be developed
- **Time Frame:**
 - Baseband standard available
 - SMPTE just started User Requirements on interface
 - EBU just started User Requirements
 - Maybe a chance for an IST project to focus here
 - We need close cooperation with vendors
 - Hans’ guess (based on SDTI and MXF experience): 2008

Progressive Emission – impact to production ?



- Interlaced footprint?
- Avoid low-cost de-interlacer in the display: better to place one HQ De-Interlacer at playout.
- Progressive more efficient compression at low bit rates, equal to interlaced at high bit rates
- Better motion portrayal
- Compatibility to the whole IT and Multimedia world.

EBU Activities



- Broadcast Management Committee (BMC)
 - Television Quality Evolution (B/TQE)
 - I34-2002: "The potential impact of Flat Panel home displays....."
 - I35-2003: "Further considerations on the impact of Flat Panel Displays...."
 - I39-2004: "Maximising the quality of conventional TV in Flat Panel Environments"
 - Tech 3298: "An EBU Route Map to High Definition"

EBU Activities



- Production Management Committee
 - High Definition in Television Production (P/HDTP).
 - Motivation for HDTV in Production
 - Training
 - Up/Downconversion, Formats, Interlaced/Progressive, Subjective Tests
 - EBU TECH 3299: System specification for HDTV Standards in Production
 - Watch for further documents.....

Summary



- 2006 - 2010: Increasing HD production activities of PB in Europe
 - Number of (test) productions in different formats
 - Increasing co-productions
 - Members start to become educated in HDTV
- For short term investments
 - make infrastructure HDTV-ready,
 - be careful with VTR investments,
 - consider upgrade options for HD for NLE systems during contract phase
- Economical and political pressure should not question scientific results.
- For production - first EBU output: Format spec. EBU Tech 3299.
 - A number of new work items on the Agenda: guidance for conversion, investigate 1080/P/50 etc.