

Audio Visual Coding in DVB

Ken McCann
ZetaCast

Chair of DVB-AVC Group



Overview of the Presentation

Coding standards within DVB today

- | based on MPEG-2

Inclusion of new coding schemes in DVB in 2003

- | JVT video
 - u aka H.26L
 - u aka H.264
 - u aka MPEG-4 part 10
 - u aka MPEG-4 AVC
- | MPEG-4 audio compatible extensions
 - u AAC + SBR



Role of DVB in audio and video coding

DVB does NOT develop coding algorithms

DVB is a commercially driven activity that

- | Specifies commercial requirements
- | Evaluates coding algorithms against the commercial requirements
- | Selects appropriate trade-off between compression efficiency and implementation cost
- | Publishes Implementation Guidelines

DVB-AVC: Audio-Visual Content formats

MPEG-2

ISO/IEC 13818 (in 9 parts)

Generic coding of moving pictures and associated audio

- | Targeted at standard definition TV and HDTV

3 main parts published in 1995:

1. Systems - Transport Stream, PSI etc.
2. Video - common text with ITU-T Rec. H.262
3. Audio - closely based on MPEG-1

Non backwards-compatible audio published 1997

7. Advanced Audio Coding (AAC)



MPEG-2 in DVB

TR 101 154

- | First published in 1995 as DVB Blue Book 001
- | Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications
 - u Systems: MPEG-2 Transport Stream
 - u Video: MPEG-2 Main Profile (SDTV and HDTV)
 - u Audio: MPEG-1 Layer II (plus options)

TR 102 154

- | Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in contribution and primary distribution applications

Coding Efficiency

MPEG standards define bitstream syntax and semantics, not encoder implementation

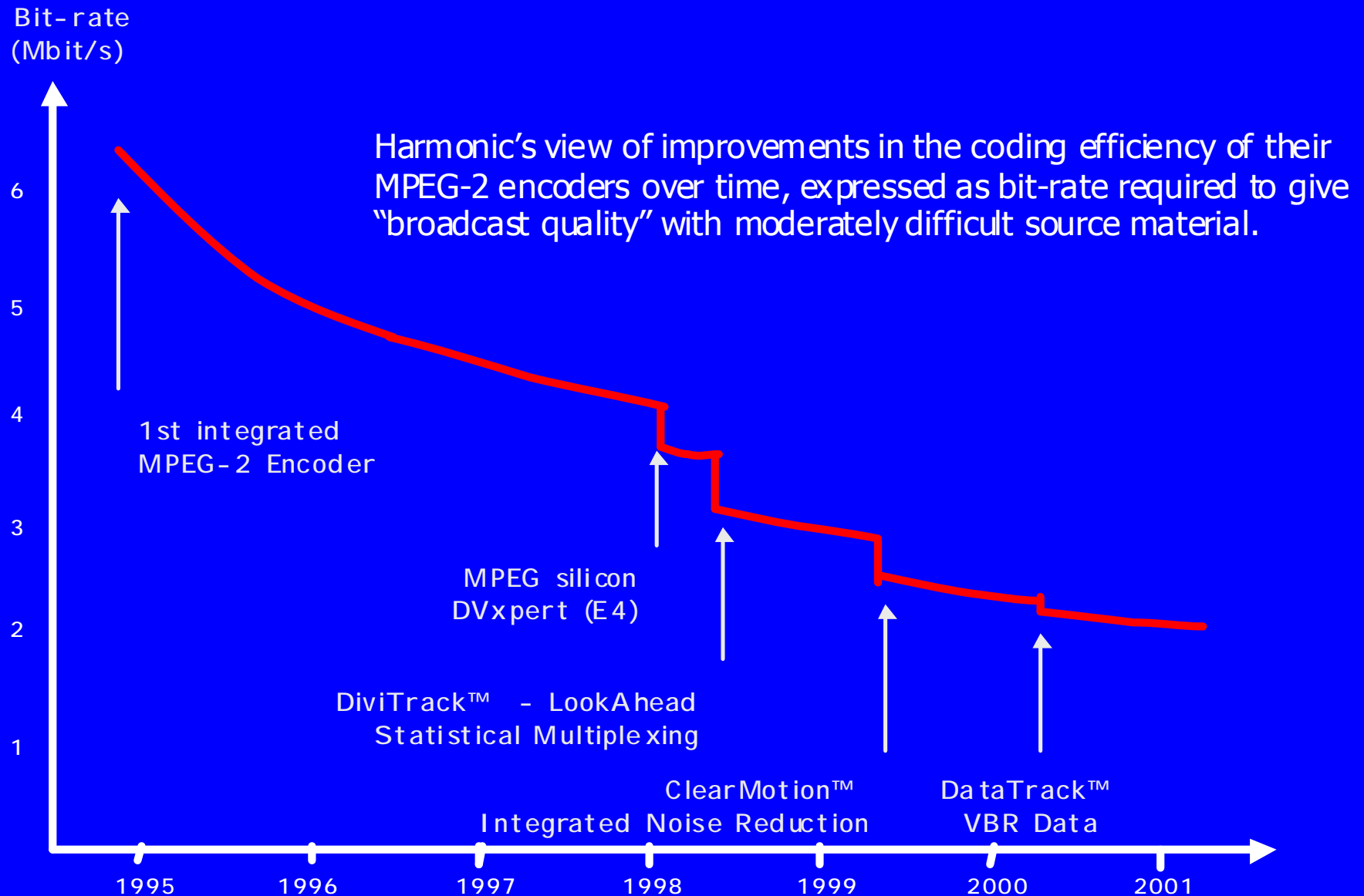
- more complex or better tuned encoders can give significant improvements within the same algorithm (working with the same decoder)

Health warning: encoder efficiency is difficult to measure!

- can make objective measurements such as picture signal-to-noise ratio (PSNR)
- but still no real replacement for subjective tests



MPEG-2 Video Encoding Efficiency in Practice



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MPEG-4 today

ISO/IEC 14496 (in 10 parts)

Coding of audio-visual objects

- | provides object-based structure that supports the integration of natural and synthetic elements
- | improved coding efficiency

MPEG-4 first published 1999

1. Systems
2. Visual
3. Audio – based on MPEG-2 AAC



Video Coding Efficiency Improvements

MPEG-4 part 2

Highly dependent on:

- | the source material
- | the MPEG-4 Profile (Main, ACE, ASP,)
- | details of the encoder implementation

Bit-rate reduction relative to MPEG-2 likely to be about:

- | 15 to 20% at full broadcast quality
- | 30 to 50% at under 1 Mbit/s

DVB decided that the benefits of MPEG-4 part 2 did not justify the risk destabilising the established standards

- | about 25 million existing DVB receivers
- | Concern over MPEG-LA licensing scheme



DVB-AVC

Audio-Visual Content formats

DVB-AVC group set up in September 2001

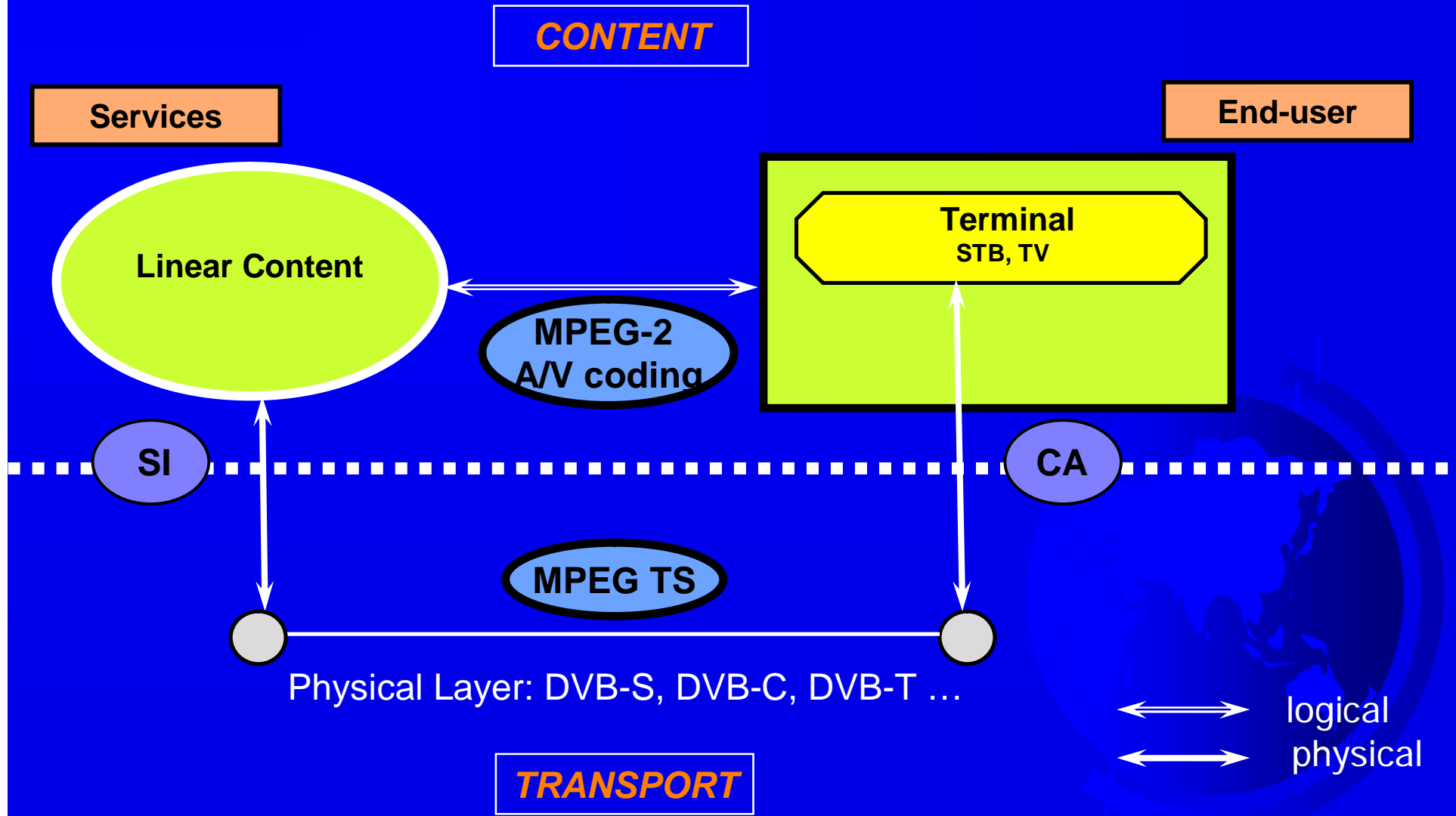
- to determine if the benefits of the newer compression algorithms were sufficient to justify destabilising the current specifications

Part of the DVB 2.0 Vision:

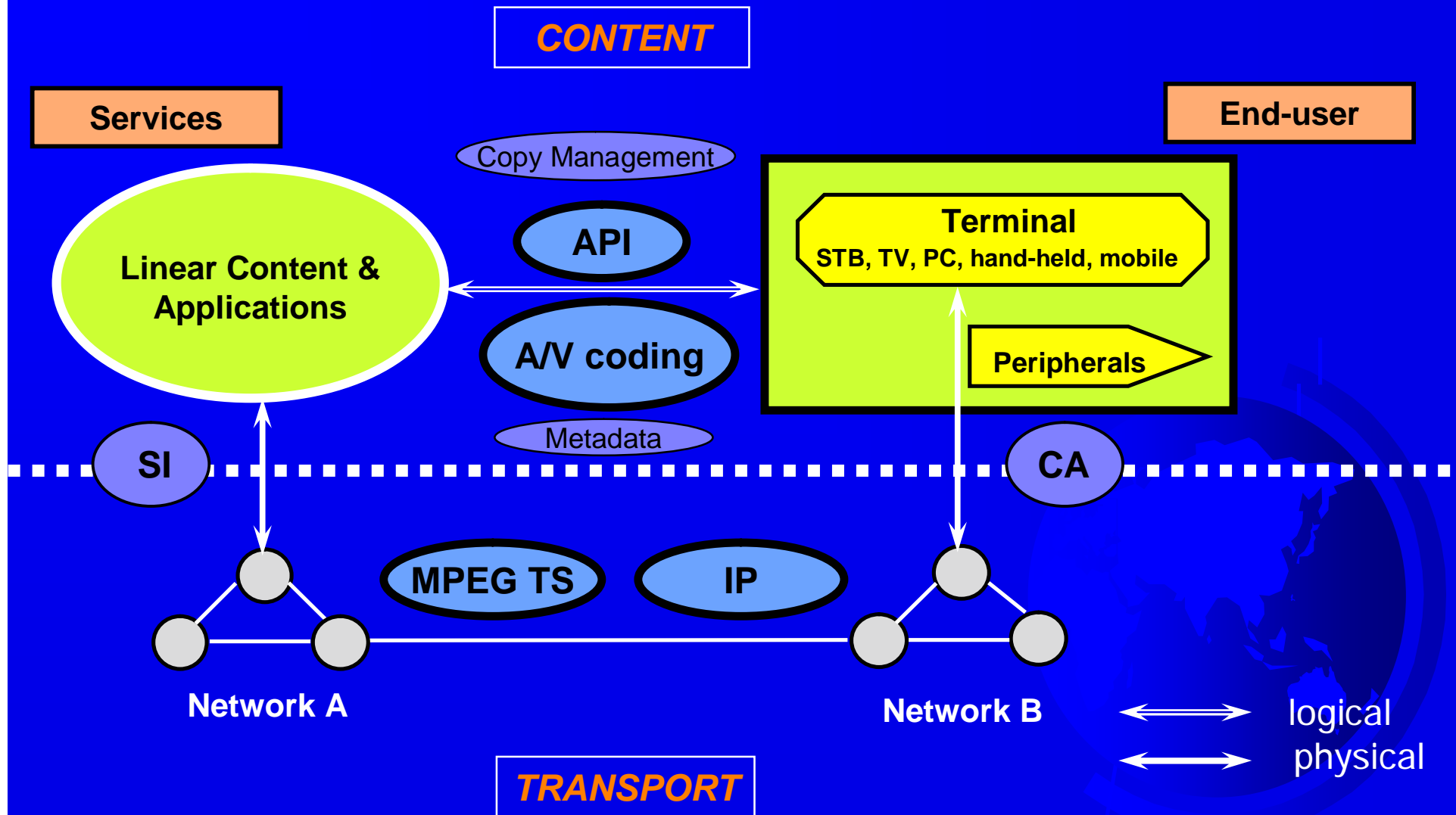
“DVB’s vision is to build a content environment that combines the stability and interoperability of the world of broadcast with the vigour, innovation and multiplicity of services of the world of the Internet”



DVB 1.0 Environment



DVB 2.0 Environment



Inclusion of new A/V coding schemes in DVB

DVB specifications will include MPEG-4 audio extensions and JVT video, both due for publication in early 2003

First priority is new Implementation Guidelines for audio-visual representation for DVB services delivered over IP

- | TR 102 005
- | final draft due in April 2003

Second task is revision of existing implementation guidelines for DVB services based on MPEG-2 TS

- | TR 101 154 - broadcasting applications
- | TR 102 154 - contribution and primary distribution



Categories of Application for DVB services delivered over IP

Application Category	Typical Bit-rate	Typical Implementation	Other Standards Bodies
QCIF	50 – 200 kbit/s	UMTS phone PDA	3GPP
CIF	0.25– 1 Mbit/s	mobile receiver PC	ISMA
SDTV	1 – 4 Mbit/s	Set-top box Integrated TV	
HDTV	5 – 20 Mbit/s	Projection TV Plasma screen	



Considerations

Trade-off between compression efficiency and implementation cost

- | decoder is particular concern
 - u MPEG-2 decoder was dedicated hardware
- | JVT decoder implementation could be:
 - u dedicated hardware
 - u pure software
 - u programmable video processor

Compatibility with other standards

- | ISMA
- | 3GPP



DVC-AVC Schedule

Work so far on TR 102 005

1. Sept 2001
Agreed terms of reference
2. Nov 2001
Reviewed work of other relevant bodies (e.g. 3GPP and ISMA)
3. Feb 2002
Top-level decisions on MPEG-4 audio and JVT video algorithm
4. May 2002
Indicative audio complexity analysis
Decided to base audio on MPEG-4 AAC LC including SBR
5. July 2002
Indicative video complexity analysis
Decided to base video on JVT Main Profile



DVC-AVC Planned Schedule

Remaining work on TR 102 005

6. Sept 2002
Review progress on final CD for JVT
7. Nov 2002
First draft of TR 102 005
8. Jan/Feb 2003
Second draft of TR 102 005
9. Apr 2003
Final draft of TR 102 005
↓
Approval by DVB Technical Module
↓
Approval by DVB Steering Board
↓
Publication by ETSI



DVC-AVC Work

Later in 2003

Second task is revision of existing implementation guidelines for DVB services based on MPEG-2 TS

- | TR 101 154 - broadcasting applications
- | TR 102 154 - contribution and primary distribution

Two slightly contradictory requirements

- | backwards compatibility to existing revisions
- | maximum commonality with representation of A/V content for DVB services delivered on IP networks

JVT video and MPEG-4 audio will be added as optional annexes to TR 101 154 and TR 102 154

- | no change to mandatory functionality of the decoder

Conclusions

“Commercial Goal” for new A/V coding

- | twice the coding efficiency
- | increased efficiency needs increased complexity
 - u about 2-3 times more computational resource
- | implementable with 2003 technology

DVB specifications will include these new compression algorithms in 2003

- | DVB services over IP will be a new specification
- | Revision of existing specifications for DVB over TS

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- | Nokia
- | Philips

