



Audio and Video Codecs for HDTV

Is there life after MPEG-2 ?

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ZetaCast

Who is ZetaCast?

Independent technology consultancy company

- Specialising in digital TV

ZetaCast directors have each over 15 years experience of digital TV, including

- Leading development of the world's first broadcast-quality MPEG-1 decoder
- Leading design team for the world's first real-time MPEG-2 encoding system
- System integration and project management for digital terrestrial, cable and satellite systems

Overview of the Presentation

DVB audio-visual codec Toolboxes

Planned HDTV Deployments

What bit-rate is needed?

Predictions for the future



One Size Fits All ?

10 years ago DVB had a one-codec approach

- | MPEG-2 video
- | MPEG-1 Layer II audio

A single codec no longer meets the market needs of all DVB applications

- | A/V codecs are included in DVB specifications based on commercial and/or technical benefit

Multi-Codec World

In addressing the multi-codec world, DVB had to balance two contradictory requirements

- | Provide optimum solution for each DVB application
- | Maximise commonality between DVB applications

Compromise was to adopt a “toolbox” approach

- | Applications can use most appropriate tool from the toolbox
- | Common generic toolboxes for all DVB applications

The DVB Toolbox Approach

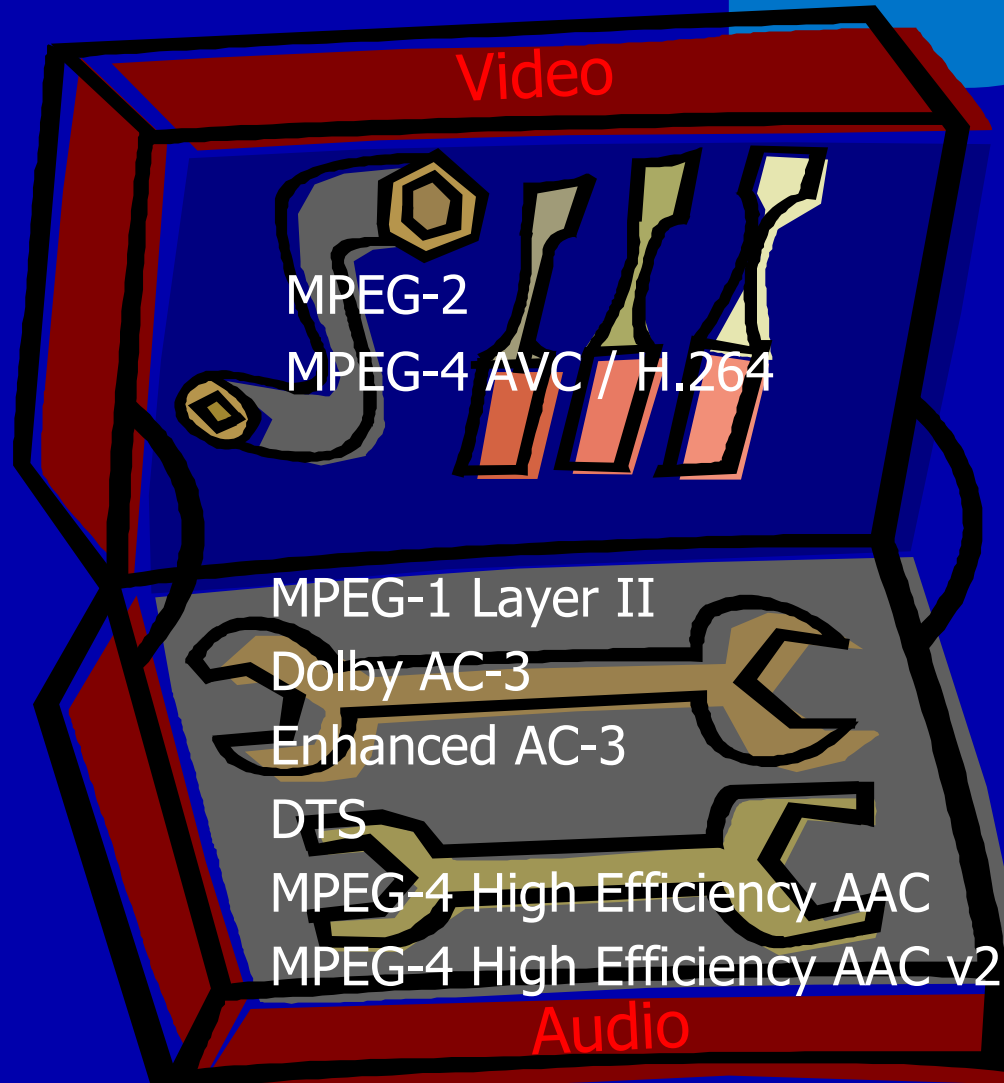
Direct IP
Applications

TS 102 005

TS-based
Broadcasting

TS 101 154

Transport Stream Based Broadcasting

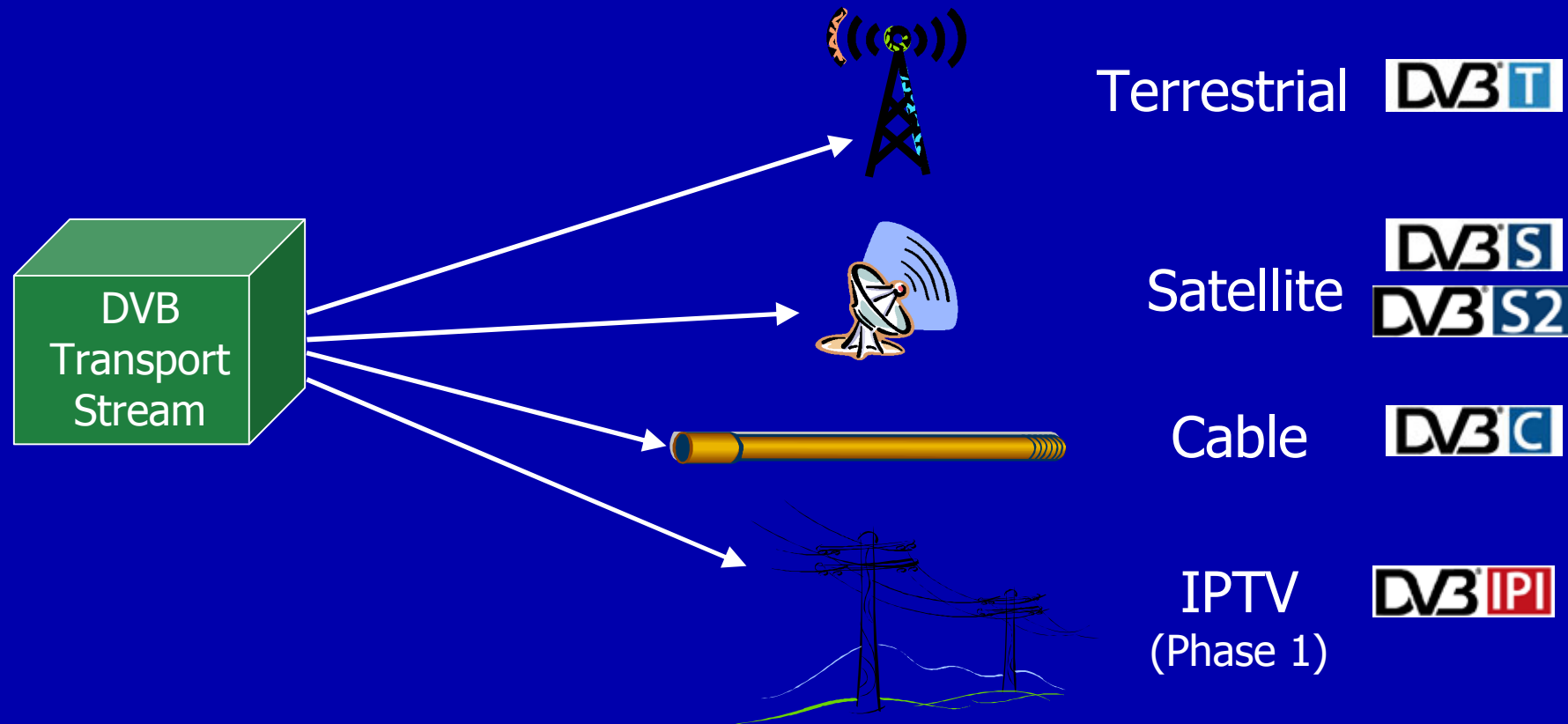


TS 101 154



DVB Delivery Choices

Baseband specifications are generic, channel coding and modulation is specific to the delivery medium



HDTV via Terrestrial

HDTV in the DVB World was first launched in Australia in 2001 using terrestrial transmission

- | MPEG-2 video coding

In Europe, main focus has been on multi-channel SDTV

- | No MPEG-2 legacy problem with terrestrial HDTV
- | HDTV would use advanced compression coding

Spectrum is key limiting factor for terrestrial HDTV

- | Major deployment of HDTV likely to wait until after analogue switch-off
 - u Competition for released spectrum from other uses

HDTV via Satellite

Satellite delivery will lead the way in the launch of HDTV in Europe

Major European satellite broadcasters have launched in late 2005 or announced HDTV services for 2006

- | Germany: Premiere launched in 2005
- | France: Canal+ and TPS
- | UK and Ireland: BSkyB

All plan to use a “second generation” DVB satellite system

- | DVB-S2 transmission
- | H.264/AVC video compression coding



HDTV via Cable

Cable is not far behind satellite

Major European cable operators have plans to launch HDTV services in 2006

- | Netherlands: UPC
- | UK: Telewest

Most are likely to use a "second generation" DVB cable system

- | 256 QAM mode of DVB-C
- | Advanced compression coding



HDTV via IPTV

DVB IPTV specifications are developed in two phases:

- | Phase 1 uses MPEG Transport Stream on top of IP

Several major European telcos have performed trials of HDTV services based on DVB IPTV Phase 1

- | France: France Telecom
- | UK: NTL

IPTV services are likely to use advanced delivery and coding technology

- | ADSL2+, VDSL and DOCSIS 3
- | Advanced compression coding



What Bit-rate is Needed?

Many factors affect the required bit-rate

- | Coding Specification
- | Encoder implementation
- | Nature of content
- | Interlaced or progressive video
- | Use of Statistical multiplexing
- | Quality expectations

Encoder development has

- | periods of evolution within a specification
- | moments of revolution caused by change of algorithm
 - u Needs new decoders
- | The primary enabler for improvement is that more complex processing becomes practical with time



“McCann’s Law”???

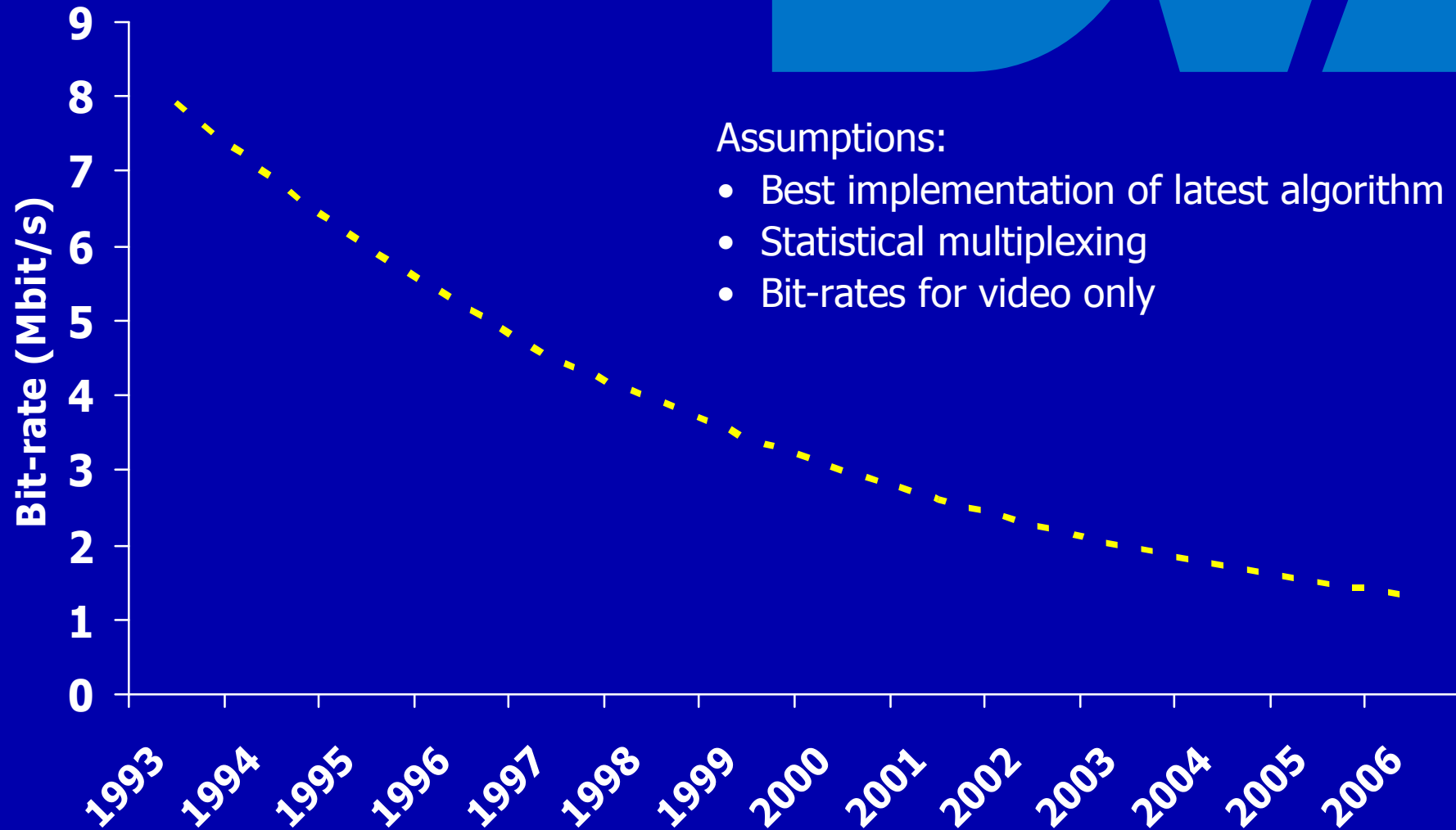
Bit-rate required to achieve a given audio or video quality halves every five years

- | Ken McCann, DVB World 2003

Assumes best implementation of latest techniques

- | Average 15% annual improvement in coding efficiency
- | But real-world improvements do not follow a smooth curve

SDTV Coding Evolution and Revolution

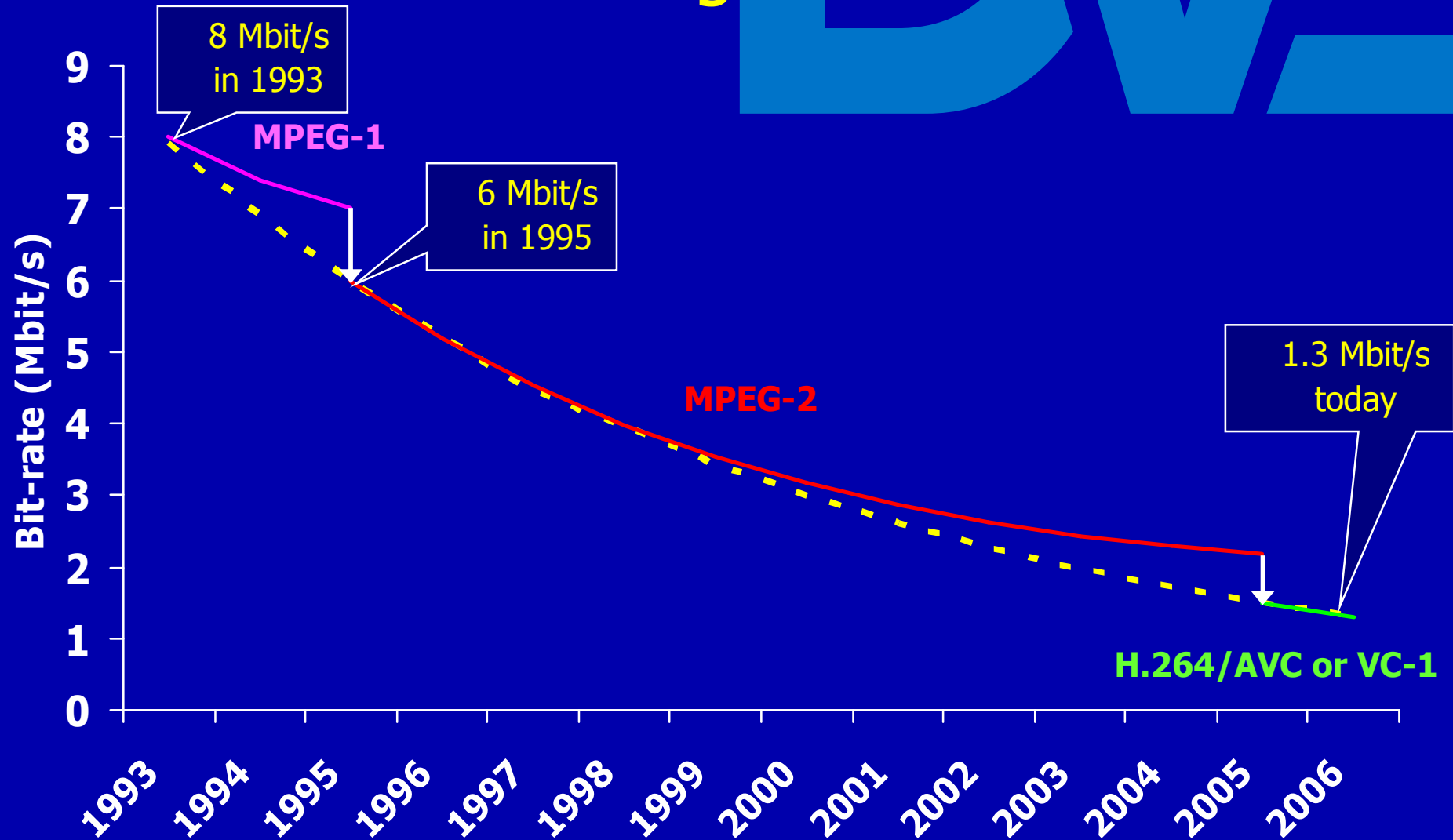


Assumptions:

- Best implementation of latest algorithm
- Statistical multiplexing
- Bit-rates for video only



SDTV Coding in Practice



HDTV compared to SDTV

HDTV and SDTV need approximately the same number of bits per pixel

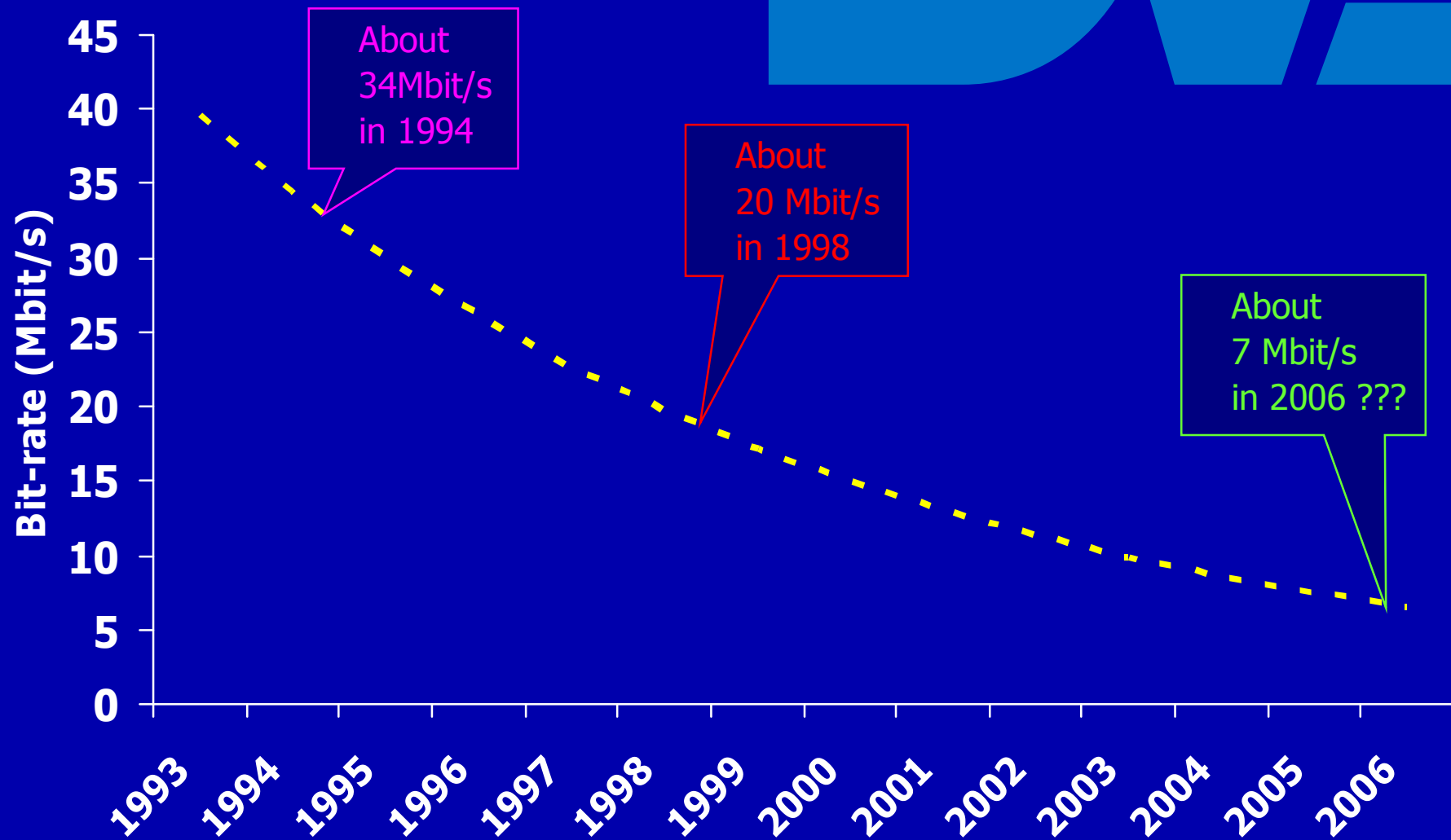
- | HDTV has higher correlation between adjacent pixels
 - u More efficient compression
- | Expectation of quality is greater for HDTV
 - u Need reduction in compression artefacts

HDTV has roughly 5 times the pixel rate of SDTV

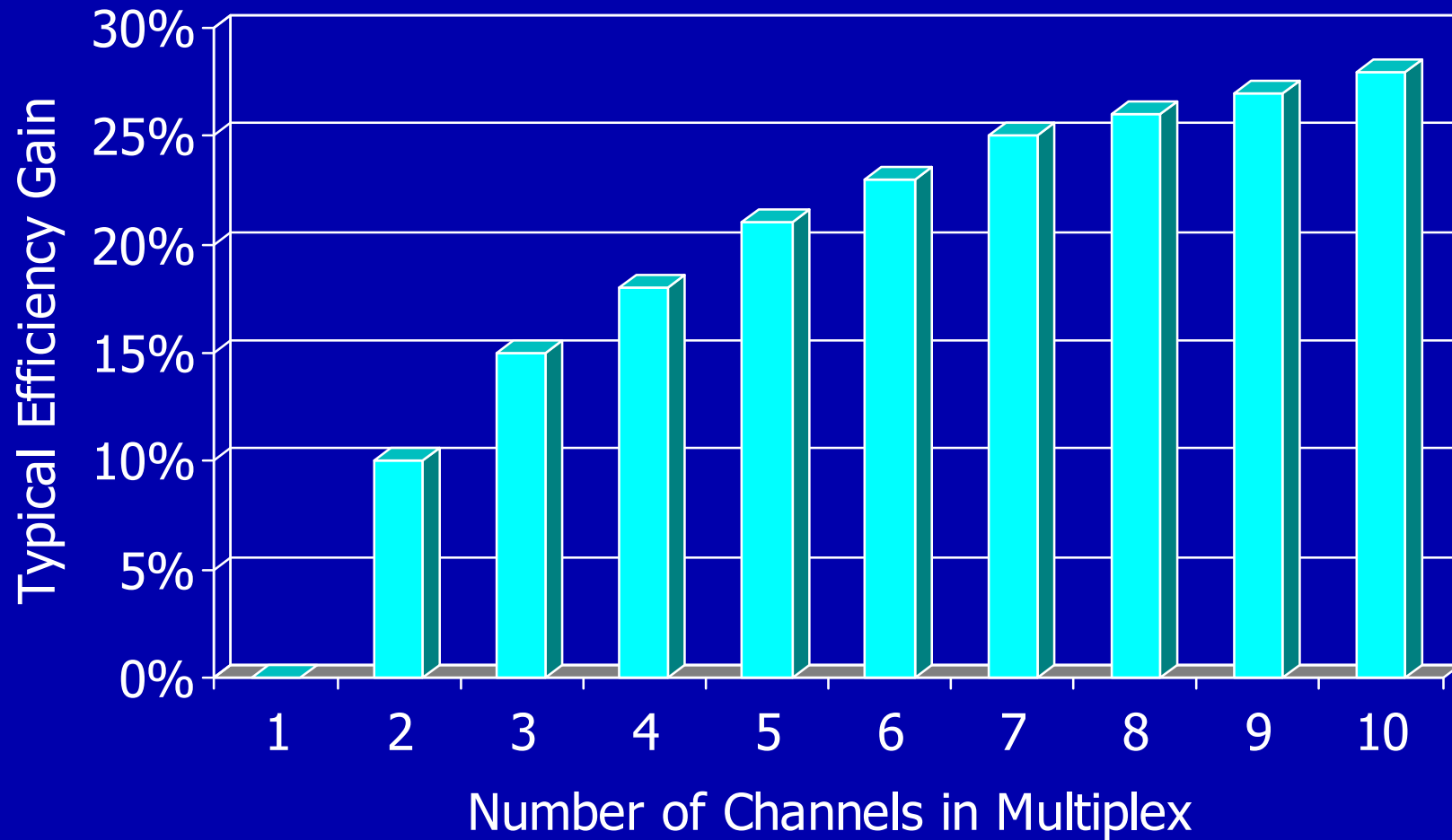
- | Implies about 5 times the bit-rate



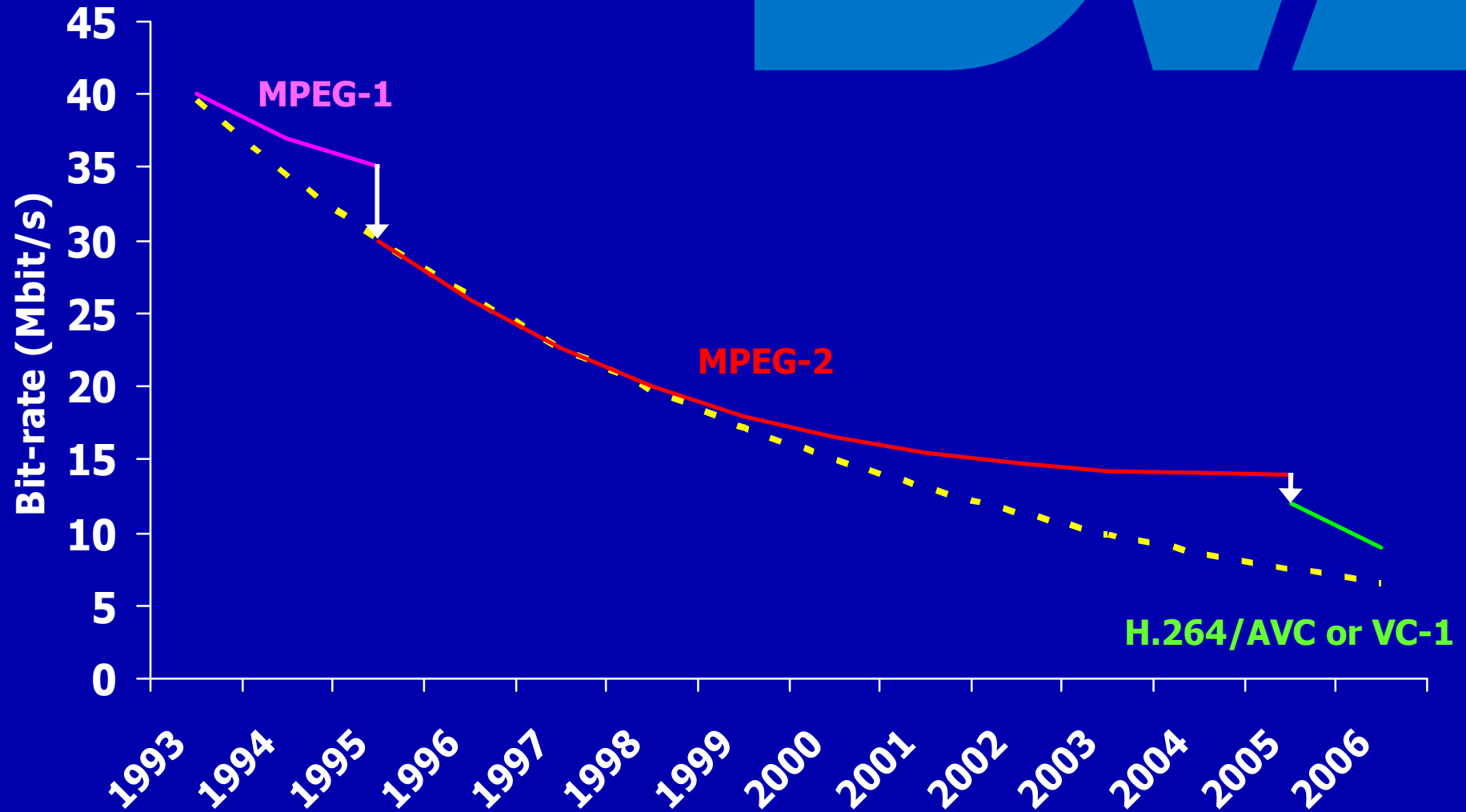
HDTV Coding Evolution and Revolution



Statistical Multiplexing



HDTV Coding in Practice



Predictions for the Next Year

Bit-rates required for advanced compression of HDTV will improve significantly in the coming year

- | More of the new tools in the compression algorithms will be implemented in encoding hardware
- | Better understanding of the new algorithms allows the encoders to be better tuned
- | Virtuous circle of statistical multiplexing

Bit-Rates for HDTV by DVB World 2007

- | About 8 – 10 Mbit/s for 1080i
- | About 6 – 8 Mbit/s for 720p



Conclusions

DVB standards have supported HDTV since 1998

- | But Europe has been slow to embrace HDTV

Satellite is leading HDTV delivery in Europe with a “second generation” broadcast system

- | Advanced compression combined with DVB-S2
- | Cable is not far behind, followed by IPTV
- | Terrestrial is likely to be the last and most challenging

Bit-rates required for advanced compression of HDTV can be expected to improve significantly in the coming year

- | Don't give HDTV a bad name by rushing to cut the bit-rate

Content is King

- | Availability of suitable content is a critical issue