ITU-R Study Group 6 Seminar - Spectrum Usage and
User Requirements of Terrestrial Electronic News Gathering

MPEG Audio and Video Technology for ENG: Parameters and Capabilities

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Scope

- MPEG Audio
  - MPEG-4 High-Efficiency AAC
    … good stereo (and surround) sound at very low bitrates
  - MPEG Surround
    … good surround sound at even lower bitrates
  - MPEG-4 Scalable Lossless Audio Coding
    … new format for archiving and distribution
- MPEG Video
  - MPEG-4 AVC/ ITU-T Rec. H.264
- Applications

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MPEG Audio: Towards Higher Compression: Stereo

"Will we continue to get better compression?"

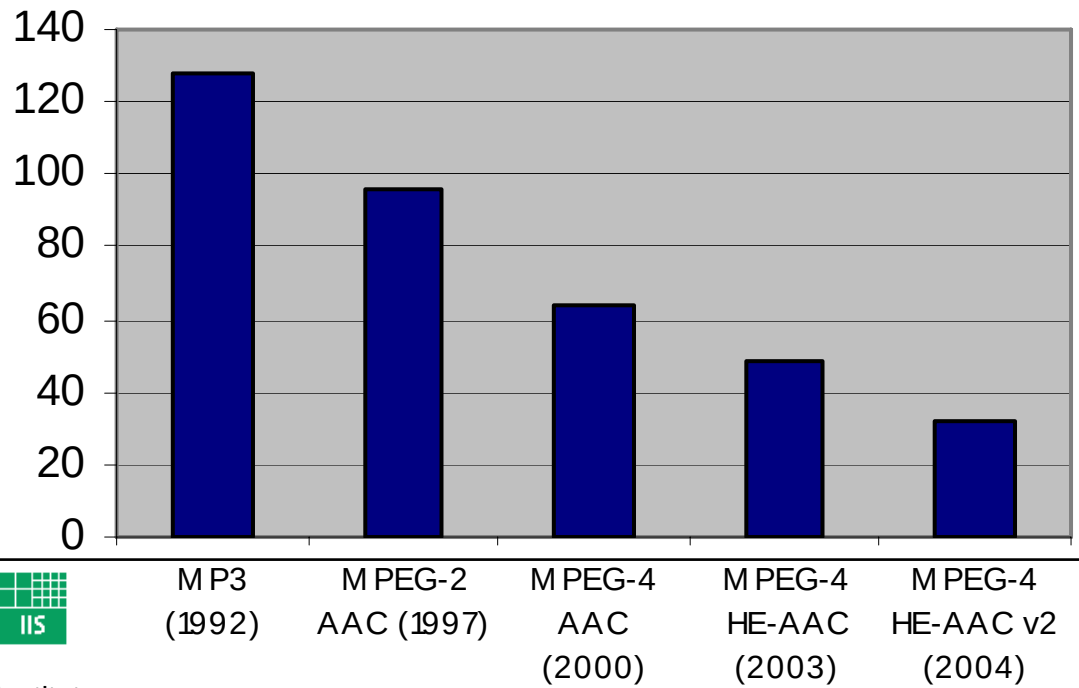
"EBU Broadcast Quality"

- no indication for further increase in efficiency (around 128 kbps stereo, AAC)

"Good Quality"

- considerable progress over the years

Bitrates for "good quality" stereo coding [kbps]



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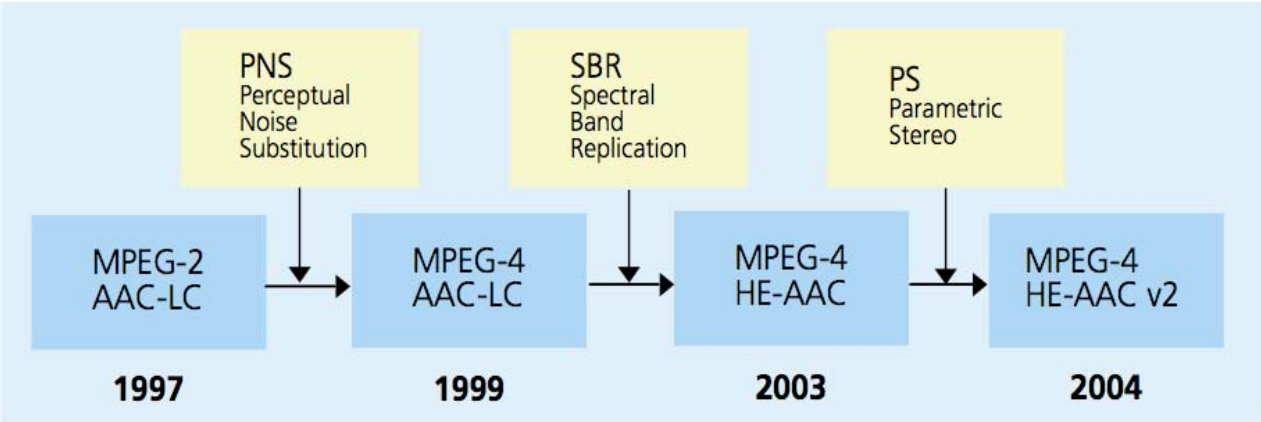
MPEG-4: High Efficiency AAC Profile (HE-AAC)



MPEG-4: HE-AAC

Important extension of the operation range of AAC to lower bit rates

- examples for useful bitrates with good quality:
  - mono @ 32 kbps,
  - stereo @ 48 kbps,
  - 5.1 @ 128 kbps

HE-AAC as a superset includes AAC-LC

- addresses applications from good quality @ very low bitrates up to perceptually transparent quality
- HE-AAC = leading-edge perceptual audio coding scheme for good quality at very low bitrates

MPEG Audio: Towards Higher Compression: 5.1

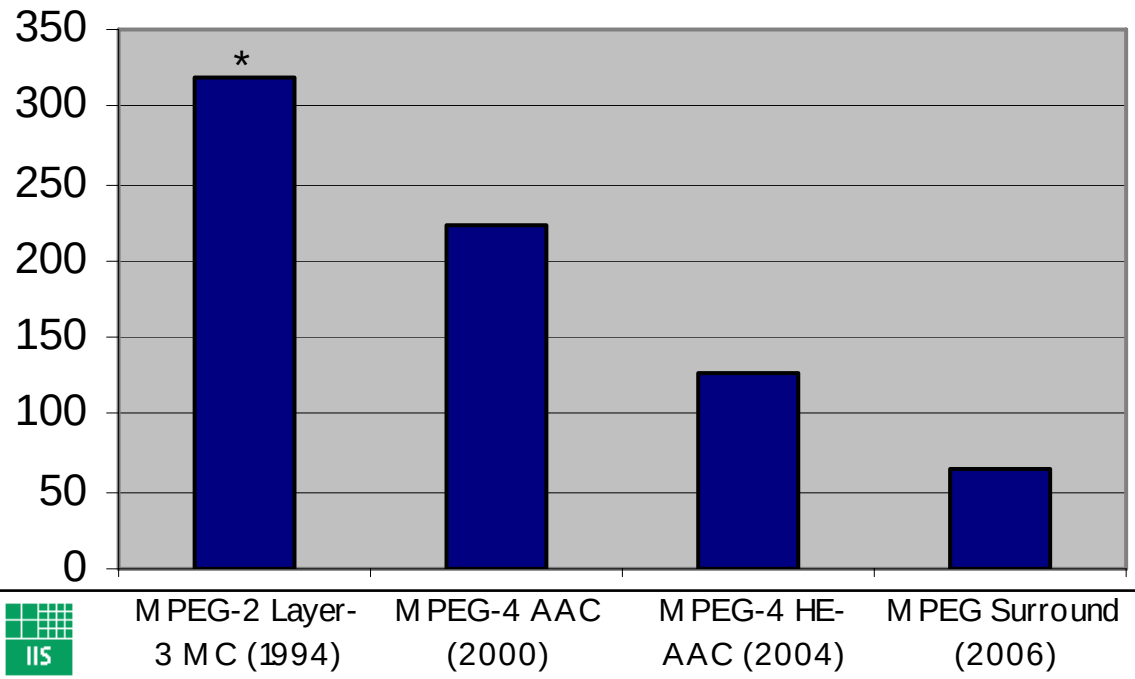
"Will we continue to get better compression?"

"EBU Broadcast Quality"

"Good Quality"

- no indication for further increase in efficiency (ca. 320 kbps 5.1, AAC)
- considerable progress over the years

Bitrates for "good quality" 5.1 coding [kbps]



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MPEG Surround

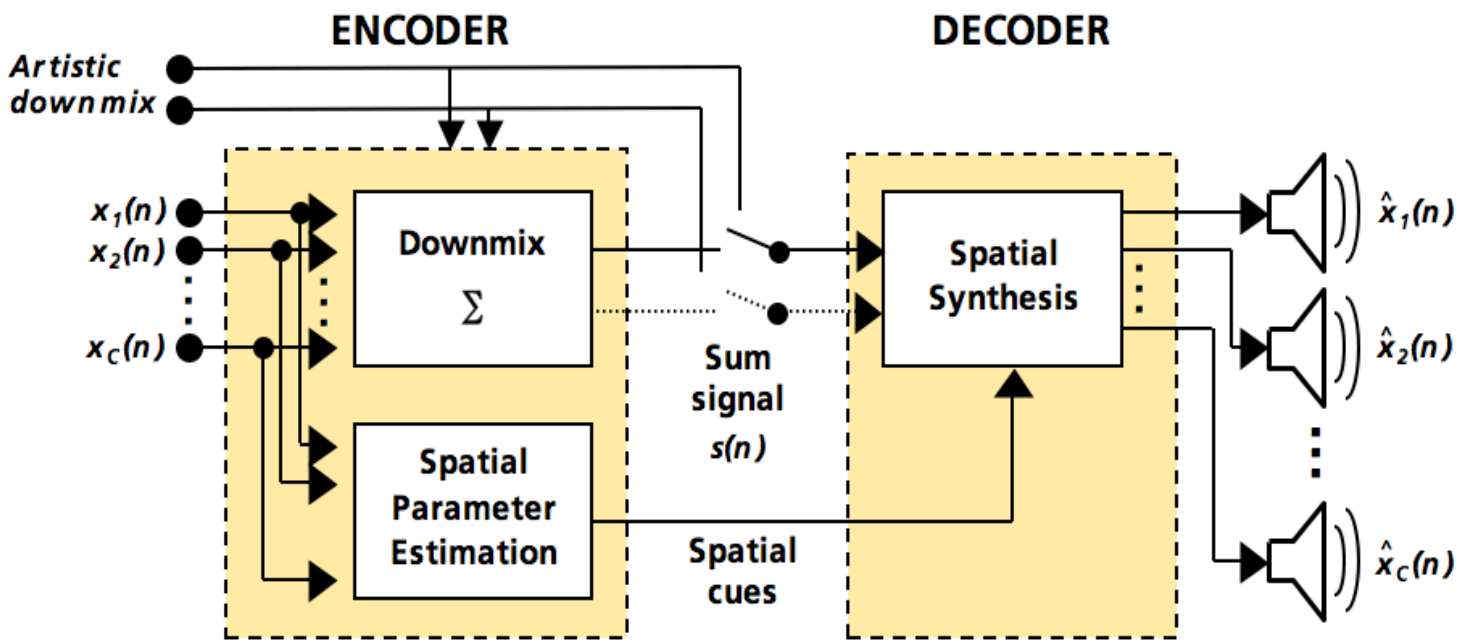
representation of multi-channel audio via:

- Mono or stereo channel (e.g. HE-AAC encoded)
- small amount of additional side information (e.g. 5 to 32 kbps) for the “spatial cues”

stereo down mix of multichannel audio:

- can be generated
  - either by the spatial audio encoder
  - or by some external device

MPEG Surround: Concept



MPEG Surround

combination of spatial audio coding with AAC and HE-AAC:

- fully backwards compatible to AAC/HE-AAC
- excellent surround sound quality at very low bit rates

Standardization in MPEG to be completed within this year

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MPEG-4: Scalable Lossless Coding (SLS)

motivation

- large gap between bitrates required for:
  - perceptually transparent coding (128 kbps stereo)
  - lossless coding (e.g. 750 kbps stereo)

scalable approach

- lossy core layer: perceptual audio coder (AAC)
- lossless enhancement layer: residual signal
- Lossless bit stream can be truncated for near-lossless operation (constant rate possible)
- Average compression approx. 2:1 for Lossless operation

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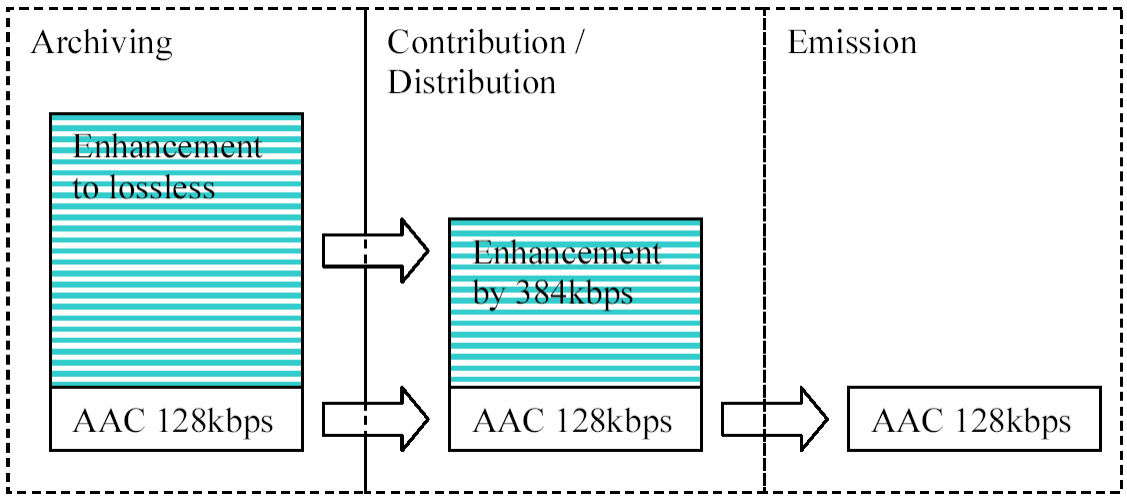
MPEG-4: SLS Applications

Lossless representation of music signals in archives

Transmission with selectable quality/data rate



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MPEG-4 AVC/H.264

MPEG-4 p. 10 = H.264 = AVC (Advanced Video Coding)

- most efficient MPEG Video format
- for Mobile Applications, DVD, DVB, …
  - 15 Mbit/s for HDTV
  - 1,5..2 MBit/s for digital TV
  - 250..400 kBit/s for “PDA Movies” (QVGA, 25 fps)
  - 100 kBit/s for mobile phones (QCIF, 25 fps)

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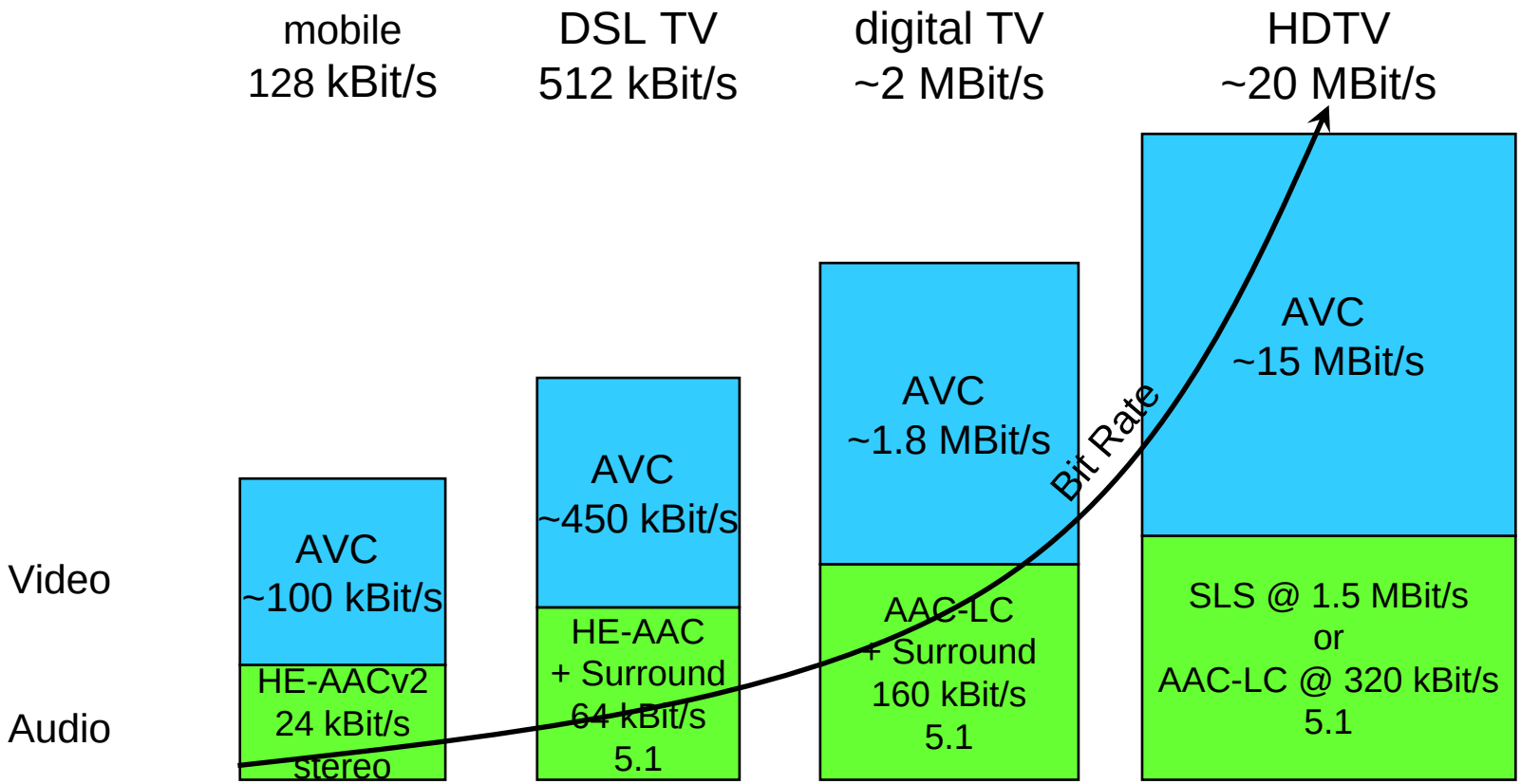
Applications for MPEG Audio and Video



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Conclusion

MPEG Audio Technology:

- Offers Coding Tools for a broad range of bitrates and applications
- Good Stereo Quality at 32 kBit/s
- Good 5.1 multichannel Quality at 64 kBit/s
- Near Lossless Mode guarantees for a fixed bit rate

Combination with MPEG-4 AVC

- Effective Audio/Video Compression covers a broad range of bit rates and quality levels

Well suited for contribution with varying bandwidth and quality requirements

Some Literature

HE-AAC

- “SBR, a novel approach in audio coding”, M. Dietz et al, 112th AES Convention, Munich, Germany, May 2002
- “A closer look into MPEG-4 High Efficiency AAC”, M. Wolters et al, 115th AES Convention, New York, USA, October 2003

Spatial Audio Coding

- “Binaural Cue Coding Applied to Stereo and Multi-Channel Audio Compression”, C. Faller et al, 112th AES Convention, Munich, Germany, May 2002
- “Why Binaural Cue Coding is better than Intensity Stereo Coding”, F. Baumgarte et al, 112th AES Convention, Munich, Germany, May 2002
- “MPEG Spatial Audio Coding / MPEG Surround: Overview and Current Status”, J. Breebart et al, 116th AES Convention, Berlin, Germany, May 2004

SLS

- “Scalable Perceptual and Lossless Audio Coding based on MPEG-4 AAC”, R. Geiger et al, 115th AES Convention, New York, USA, October 2003
- “A Scalable Lossy to Lossless Audio Coder for MPEG-4 Lossless Audio Coding”, R. Yu et al, ICASSP, Montreal, Canada, May 2004

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