



H.264/MPEG4-AVC

Application & Deployment Status

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Disclaimer

- § Purpose of this presentation is an overview of the application and deployment status of H.264/MPEG4-AVC
- § This presentation is not intended to be comprehensive
- § The contents is derived from publicly available documentation and is bound to be out-of-date at any point in time
- § No guarantee for correctness
- § For updates/corrections please contact me:
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Companies Publicly Known to be Doing Implementation Work/Products

- ⌘ ATEME, www.ateme.com, OEM, encode/decode, SW, PC & DSP, IP cores
- ⌘ Apple Computer, www.apple.com, Internet, Quicktime, encode/decode, SW
- ⌘ ATI, www.ati.com, Computer, GPU decoding support, High Profile @ Level 4.1 (available soon)
- ⌘ Broadcom, <http://www.broadcom.com>, broadcast & storage, decoding chip, High Profile @ Level 4.1
- ⌘ Conexant, www.conexant.com, broadcast & storage, decoding chip, High Profile @ Level 4.0
- ⌘ Cradle Technologies, <http://www.cradle.com>, mobile, encode/decode, HW, DSP, Baseline Profile @ Level 2.0
- ⌘ DG2L, <http://www.dg2l.com>, broadcast, encode/decode, HW, Main Profile @ Level 3.0
- ⌘ Dicas, <http://www.dicas.de>, OEM, encode/decode, SW, PC & DSP, Main Profile @ Level 3.0
- ⌘ DSP Research / W&W Communications, <http://www.dspr.com> / <http://www.wwcoms.com>, OEM, encode/decode, HW & SW PC/DSP, Baseline & Main Profile @ Level 3.0
- ⌘ Emblaze, <http://www.emblaze.com>, mobile, encode/decode, HW & SW, Baseline Profile @ Level 1b
- ⌘ Envivio, <http://www.envivio.com>, mobile & IPTV, encode/decode, SW & HW, Main & Baseline Profile @ Level 3.0
- ⌘ Equator, <http://www.equator.com>, encode/decode, HW & SW
- ⌘ FastVDO, <http://www.fastvdo.com>, mobile, encode/decode, SW, PC
- ⌘ France Telecom, <http://www.francetelecom.com>, videoconferencing, encode/decode, IPTV services
- ⌘ Hantro, <http://www.hantro.com>, mobile, decode, SW, DSP
- ⌘ Harmonic, <http://www.harmonicinc.com>, broadcast, encoding, Main Profile @ Level 3.0
- ⌘ Fraunhofer HHI, <http://ip.hhi.de>, OEM, encode & decode, SW, PC&DSP, chip design – IP cores, all profiles
- ⌘ i3 Micro Technology, <http://www.i3micro.com>, IPTV, decoding, HW, Main Profile @ Level 3.0
- ⌘ Intel, <http://www.intel.com>, OEM, encoding/decoding, SW (Integrated Performance Primitives)

Companies Publicly Known to be Doing Implementation Work/Products

- ⌘ KDDI R&D Labs, <http://www.kddilabs.com>, mobile, encode/decode, SW, PC & DSP, Baseline Profile
- ⌘ LSI Logic, <http://www.lsilogic.com>, broadcast, encode/decode, HW, Main Profile @ Level 3.0
- ⌘ LifeSize, www.lifesize.com, videoconferencing, encode/decode, Baseline profile, HW & SW
- ⌘ Mainconcept, <http://www.mainconcept.com>, OEM, encode/decode, SW, PC, Baseline & Main Profile
- ⌘ Mcubeworks, <http://www.mcubeworks.com>, mobile, encode/decode, SW, PC & DSP, Baseline Profile
- ⌘ Media Excel, <http://www.mediaexcel.com>, OEM, encode/decode, SW, PC, reference designs
- ⌘ Mobilygen, <http://www.mobilygen.com>, low-power ICs for mobile products, HW (under development)
- ⌘ Modulus Video, www.modulusvideo.com, broadcast, encode, HW, High Profile @ Level 4.0
- ⌘ Moonlight, <http://www.moonlight.co.il>, OEM, encode/decode, SW, PC & DSP
- ⌘ Motorola, <http://www.motorola.com>, mobile, IPTV, encode/decode, HW & SW
- ⌘ Neomagic, <http://www.neomagic.com>, mobile, decode, SW, DSP, Baseline Profile @ Level 1.3
- ⌘ Nero, www.nero.com, DVD/CD burning, encode/decode, SW, PC
- ⌘ Nokia, www.nokia.com, mobile, encode/decode, HW & SW, Baseline Profile @ Level 1.3
- ⌘ NVIDIA, www.nvidia.com, Computer, GPU decoding support, High Profile @ Level 4.1 (rumors - available soon)
- ⌘ Optibase, <http://www.optibase.com>, IPTV, encoding, HW, Baseline & Main Profile @ Level 3.0
- ⌘ Polycom, <http://www.polycom.com>, videoconferencing & MCUs, encode/decode, HW & SW, Baseline
- ⌘ Prodys, <http://www.prodys.com>, OEM, encode/decode, SW, DSP, Main Profile @ Level 3.0 (under development)
- ⌘ Radvision, <http://www.radvision.com>, videoconferencing & MCUs, encode/decode, HW & SW, Baseline
- ⌘ Samsung, <http://www.samsung.com>, mobile, IPTV, broadcast, HW & SW

Companies Publicly Known to be Doing Implementation Work/Products

- § Scientific Atlanta, <http://www.sciatl.com>, broadcast, encode, HW, Main Profile @ Level 3.0
- § SetaBox, <http://www.setabox.com>, IPTV, decode, HW, Baseline & Main Profile @ Level 3.0, IPTV
- § Siemens, <http://www.siemens.com>, IPTV, mobile, encode/decode, HW, Baseline & Main Profile
- § Sigma designs, <http://www.sigmadesigns.com/>, decoding chip, High Profile @ Level 4.0
- § Skystream Networks, <http://www.skystream.com>, IPTV, encode, HW, Main Profile @ Level 3.0, IPTV
- § Sony, www.sony.com, CE, PSP & videoconferencing systems, encode & decode, SW & HW, including BD ROM player
- § ST Micro, <http://www.st.com>, decoding chip, Main & High Profile @ Level 4.0
- § Tandberg, <http://www.tandberg.no>, videoconferencing, encode/decode, HW & SW
- § TandbergTV, <http://tandbergtv.com>, broadcast, encode, HW, High Profile @ Level 4.0
- § Tektronix, <http://www.tektronix.com>, test software, all profiles
- § thin multimedia, <http://www.thinmultimedia.com>, mobile, decode, SW, DSP, Baseline Profile @ Level 1.3
- § Thomson, <http://www.thomson.com>, broadcast, professional, encode, HW & SW
- § TI, <http://www.ti.com>, OEM, mobile, IPTV, encode/decode, HW & SW
- § Tuxia, <http://www.tuxia.com>, IPTV, decode, SW, Main Profile @ Level 3.0
- § UB Video, <http://www.ubvideo.com>, OEM, encode/decode, SW, PC & DSP, Main Profile @ Level 3.0
- § VCON, <http://www.vcon.com>, videoconferencing, HW & SW
- § Vqual, <http://www.vqual.biz>, test software, all profiles
- § Vsoft Vanguard Software Solutions, <http://www.vsofts.com>, OEM, encode/decode, SW, PC
- § ...
- § ...
- § ...

Related Systems Standardization

- § **ISO/IEC MPEG**: use in MPEG4 file format

- § **ITU-T SG16**: in H.241 specifies ITU-T standard use of H.264/MPEG4-AVC in the H.32x suite of videoconferencing/videotelephony standards (H.320, H.323, H.324, etc.)

- § **MPEG/SG16**: in H.262/MPEG2-Systems Amd. 3: use in MPEG2 transport stream

- § **IETF**: IETF AVT - RTP payload spec approved as RFC 3984

3GPP Standardization

Adoption of Baseline profile @ level 1b

§ **3GPP:** <http://www.3gpp.org>

§ Recommended codec for PSS, MMS, and PSC in Rel. 6

§ **3GPP2:** <http://www.3gpp2.org>

§ Optional codec for streaming service

Mobile TV standardization

Adoption of Baseline profile @ levels 1b – 2.0 in

- § **DVB**: mandatory codec (Annex B of TS 102 005: CBMS over DVB-H networks) – Trial in Berlin
- § **DAB**: mandatory/single codec in T-DMB (specified as a DAB application, originated in Korea)
- § **ARIB**: mandatory codec for mobile segment broadcast over ISDB-T
- § **3GPP**: recommended codec for MBMS in rel.6

Video conferencing products

Adoption of Baseline profile @ levels 1b – 4.0 by

§ **Polycom:** <http://www.polycom.com>

§ **Tandberg:** <http://www.tandberg.no>

§ **Sony:** <http://www.sony.com/videoconference>

§ **France Telecom:** <http://www.francetelecom.com>

§ **Radvision:** <http://www.radvision.com>

§ **Telesuite:** <http://www.telesuite.com>

§ **VCON:** <http://www.vcon.com>

§ **LifeSize:** <http://www.lifesize.com>

SDTV and HDTV standardization

Adoption of Main/High profiles @ levels 3.0 – 4.0

§ **DVB:**

- TS 101 154: Additional codec to H.262/MPEG2-Video in specification for services over MPEG-2 TS
- TS 102 005: Single codec in specification for services over IP

§ **ATSC:**

- Preliminary adoption for “robust mode” in ATSC

§ **SCTE:**

- Under consideration

§ **ISMA:**

- Adoption as mandatory codec in version 2

SDTV and HDTV Deployment

§ **Direct-broadcast satellite (HDTV):**

- DirecTV / News Corp. – Plans for “complete transition” to AVC for HD – Deployment in Sept. 2005
- BSkyB (UK and Ireland) – Deployment in early 2006
- Dish / Echostar / Voom – Deployment in early 2006
- Premiere (Germany) –Deployment in Nov. 2005
- Euro 1080 – HD1 and HD2 services starting June 2005

§ **Terrestrial broadcast television:**

- To be used for all HDTV pay DTV in France

§ **IPTV:**

- KPN in Netherlands (Siemens)
- Belgacom in Belgium (Siemens)
- SBC in USA (MSTV)

HDTV Products

Decoding Chips:

- § Broadcom BCM7411 (High Profile @ Level 4.1)
- § Conexant / Amphion CX2418x (High Profile @ Level 4.0)
- § Sigma Designs SMP8630 (High Profile @ Level 4.0)
- § ST Micro STB7100 (High Profile @ Level 4.0)

Decoding / STBs:

- § Motorola
- § Thomson
- § Samsung
- § PACE

Encoding:

- § Tandberg (High Profile @ Level 4.0)
- § Modulus Video (High Profile @ Level 4.0)
- § Harmonic (announced)
- § Thomson (announced)

Storage application standardization

Adoption of High profile @ levels 4.0 – 4.1

§ **BD ROM:** <http://blu-raydisc-founders.com>

§ Mandatory player video decoding capability for BD ROM format (level 4.0)

§ **HD DVD:** <http://www.dvdforum.org>

§ Mandatory player video decoding capability for HD-DVD format (level 4.1)

§ Players and discs for both formats are expected end 2005/ early 2006

§ **Non-standard storage application:** UMD playing in Sony PSP with multiple titles available

Other applications

- § **Internet streaming:** Apple Quicktime
- § **In-home networking:** DLNA (optional codec in ver. 1)
- § **DVD/CD burning:** Nero burning ROM
- § **Government uses:** US DoD NIMA / MISB, NATO
- § ...

Via Licensing Pool

- § <http://www.vialicensing.com>
- § Five companies (8x8 Inc., British Telecom, Dolby, Fraunhofer-Gesellschaft eV, Polycom, and UB Video) announced licensing terms
- § \$US 15K initial fee (hardship terms for small orgs; waived for small deployments as defined below)
- § No fees for small deployments (<50k devices & <0.5M\$ revenue/yr)
- § “Encoder/Decoder” fees
 - 25¢ *per device* for encoding and/or “permanent” decoding implementations (one price, even if multiple encoders and/or decoders implemented in the device); 0.25¢ for temporary decoder lasting no more than 30 programs/30 days
 - Enterprise device fee cap: \$2.5M for most products; *additional* \$4M for PC SW also installed by OEMs
- § “Replication” fees
 - 2.5¢ per 90+ minute title for permanent sale of content
 - 1.5¢ per 31 to 89 minute title for permanent sale of content
 - 0.5¢ per 30- minute title for permanent sale of content
 - 0.25¢ per (any length) title for temporary/pay-per-view content
 - Replication fees are not capped

MPEG-LA Licensing Pool

- § <http://www.mpegla.com>
- § 17 Companies (ETRI, France Télécom, Fujitsu Limited, Koninklijke Philips Electronics N.V., LG Electronics Inc., Matsushita Electric, Industrial Co., Ltd., Microsoft Corporation, Mitsubishi Electric Corporation, Robert Bosch GmbH, Samsung Electronics Co., Ltd., Sedna Patent Services, LLC, Sharp Kabushiki Kaisha, Siemens AG, Sony Corporation, The Trustees of Columbia University in the City of New York, Toshiba Corporation, Victor Company of Japan, Ltd.) announced licensing terms
- § MPEG-LA is a private company not to be confused with MPEG or MPEG-IF (there is no formal relationship between these three organizations)
- § No fees for small deployments (<100k “units”)
- § “Encoder/Decoder” fees:
 - 20¢ per “unit” for encoding and/or decoding (10¢ above 5M units/year)
 - Enterprise device fee caps approx \$3.5M for most products; *additional* approx \$4M for PC SW also installed by OEMs
- § “Participation” fees:
 - 2¢ per 12 minute+ title or 2% (whichever lower) for sale or pay-per-view sale
 - Subscription service use \$0k to \$100k depending on number of subscribers
 - Over-air free broadcast \$10k/yr per channel to 100k or more customers OR \$2500 per enc.
 - Free Television - one-time \$2,500 per transmission encoder or annual fee starting at \$2,500 for > 100,000 HH rising to maximum \$10,000 for > 1,000,000 HH
 - Internet free broadcast no fee (to at least 2010, not greater than free TV later)
 - Enterprise participation fee caps of approx \$4M/yr
- § Terms stated to be effective through 2010 (not more than 10% renewal increase after that)

Acknowledgements

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