

SUMMARY OF PRESENT AND EMERGING STANDARDS FOR CODING AND REPRESENTATION OF VISUAL INFORMATION

Standard	Standardization Body	Main Target bitrate	Main compression technologies	Main Target applications	Year
<u>JPEG</u> (10918 – 1,2) www.disc.org.uk/jpeg	ISO/IEC/ITU-T www.iijg.org software ftp://ftp.uu.net (JFIF: Public domain file format ftp://ftp.uu.net/graphics/jpeg/jfif/ps/gz ftp://ftp.cs.cornell.edu/pub/multimed	Compression ratios 2-30	DCT -Perceptual Q -Zig-Zag reordering -Huffman coding -Arithmetic coding -Independent lossless coding	-Internet imaging -Digital photography -Image and video editing -Medical imaging	1992
<u>JPEG Extensions</u> (10918 –3) public/jpeghomepage.htm http://www.cityu.edu.hk/demo/jpeg	ISO/IEC		DCT Variable Q A selective refinement provision for tiling SPIFF extension	Medical imaging Image processing & editing, archival & hidden compression functions, Image Interchange, satellite Imagery (post processing)	1996
<u>JPEG2000</u> http://www.jpeg.org/JPEG2000.htm (new image coding system) (15444) www.esat.kuleuven.ac.be/~konjin/jpeg2000.html	ISO/IEC jura.jpeg.org	compression ratios 2-50	Flexible compression Architectures process and/or formats arbitrarily shaped coding	-Internet imaging -Digital photography -Image & video editing -Printing -Medical imaging -Mobile applications -Color fax -Satellite imaging photo and art digital libraries	2000
Mpeg-4 SAOL http://sound.media.mit.edu/~eds/mpeg4 verification Tests: To check whether the standard delivers what it promises http://itswww.epfl.ch/~neximage/decoder/applets (JEPG2000)				www.ece.ubc.ca/~madams Jasper (source code)	

JPEG 2000

EUROSTILL <http://itswww.epfl.ch/~eurostill>

SPEAR: <http://spear.jpeg.org> JAVATM (JJ2000) <http://jj2000.epfl.ch> (NEW)

<ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz> SOFTWARE

<http://spmng.ece.ubc.ca> (Follow “software”) JPEG2000 in ‘C’

JPEG2000 Tutorial: <http://etro.vub.ac.be/~chchrist>

JPEG2000 software in C Jasper (implements BMP, JP2, JPC, JPG, MIF, PGX, PNM and RAS codecs)

<http://www.ece.ubc.ca/~madams/jasper>

link Jasper Project Home Page

<http://www.jpeg.org/software>

JPEG-LS Part 2 DIS 14495 (2) 1999.	http://www.ece.ubc.ca/image		Arithmetic coding More effective prediction Modified Goulomb code	Lossless and near lossless coding of continuous tone still images
JBIG (JBIG1) IS 11544 Rec. T. 82 1993.	ISO/IEC JTC1/SC29/WG1 ITU-T	Compression ratio 20:1 (3-5 times higher than Fax Group 3, 4/MMR)	Context based arithmetic coder (dynamically adaptive to the statistics of each pixel content) http://www.elysium.unet.com/fcd14492.pdf JBIG2 FCD (Pdf file)	Lossy, Lossless, Progressive (lossy to lossless) coding for fax apparatus.
Rec. T. 85 1995. MRC. (Mixed Raster Content) 1998. Rec. T.44 RFC 231	Pixel Magic www.pixelmagic.com/jbig.htm NOW Oak Technology JBIG – LSI chip by Fujitsu	(Application profile of JBIG1 for facsimile)	Uses multilayered, multiresolution imaging model for compression Compression of compound images (Binary text & Continuous tone images) for both natural color & palletized images	Image browsing Color fax over PSTN & Internet UTY-T Color fax IETF Internet Fax File format: (TIFF=Fx) TIFF for fax extended.

<http://disc.org.uk/jpeg> 2. R. De Querioz “on data-filling algorithms
for MRC layers,” ICIP 2000

1. R. de Queiroz, R. Buckley and M. Xu, “Mixed raster content
(MRC) model for compound image compression,” SPIE, vol.3653,
San Jose, CA, Jan. 1999. 3. “Optimizing block-thresholding segmentation for MRC
Compression,” ICIP 2000.

JBIG 2 WD 14492 2000.	ISO/IEC JTC1/SG29.WG1 http://www.jpeg.org/public http://spmng.ece.ubc.ca/ research/jbig/main.html	Compression ratio ratio 2-4 items higher than JBIG-1	Lossy, lossless & lossy to lossless image compressions. High quality progressive coding. Content progressive coding. Content based (text, halftones, line art, large characters) decomposition & coding Model based coding, soft pattern matching, pattern matching & substitution File formats to enclose the coded bi-level image Data (both sequential & random access)	Document storage & archiving. Coding images on WWW. Wireless data transmission. Print spooling. Facsimile. Teleconferencing. Interactive multimedia.
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IETF RFC 2301 File format for Internet Fax
<ftp://ftp.isi.edu/in-notes/rfc2301.txt>

MPEG-4
-Version 2

(Verification Tests)
www.csel.it/mpeg/quality-tests.htm

<http://www.m4if.org>
(if = Industry Forum)

- Additional tools and functionalities
- Improved coding efficiency, improved error robustness, coding multiple views
- Body animation
- Coding of 3D meshes
- Media integration of text and graphics

2000

<u>H.261</u>	ITU-T	Bitrates p x 64 Kb/s p is from 1 to 30	-DCT -Adaptive Q -Zig-zag scanning -Predictive MC -Integer-sample accuracy ME -Huffman coding -Error resilient coding	-ISDN video-conferencing	1990
4					
<u>H.263</u>	ITU-T	Bitrates 8kb/s up to 1.5 Mb/s	-Bi-directional MC -Half-sample accuracy ME -Advanced ME -Overlapping MC -Huffman coding -Arithmetic coding -Error resilient coding -3D-VLC	-POTS video-telephony -Desktop video telephony -Mobile video telephony	1996
<p>ftp://standard.pictel.com/video-site (http://standard.pictel.com)</p> <p>ftp://ftp.std.com/vendors/ www.icsl.ucla.edu/~wireless PictureTel/h324/h263 plus (H. 223 Multiplex Simulator), source code Links to Telenor H. 263 ftp://bonde.nta.no/pub/tmn/software/ Video Coder</p>					

Reference: T. Ebrahimi and M. Kunt, "Visual data compression for multimedia applications," Proc. IEEE, Vol. 86, pp. 1109-1125, June 1998.
(Some revisions have been made to this Table)

NOV
2000

H.263++

Near-term standardization of enhancements to H.263 video codec for real-time telecommunication and related non-conversational services. Packetization, error resilience, compatibility between MPEG-4 and H.263.

Technical areas being considered

1. Error resilient data partitioning
2. 4x4 motion compensation and DCT
3. Adaptive quantization
4. Reference picture selection enhancement
5. Scalability enhancement
6. IDCT mismatch reduction.
7. Deblocking and deringing filters (normative or informative)
8. Error concealment (normative or informative)

Meeting Report

ftp://standard.pictel.com/video-site/9807_Whi/q15e53.doc

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H.26L (Formerly H.263L)

<ftp://standard.pictel.com/video-site/http://standard.pictel.com>

Long term standardization based on new video coding technology, very low bit-rate.

Enhanced visual quality
Enhanced error robustness
Low complexity, low end-to-end delays (compared to H.263)
Video scalability, adaptable rate control mechanisms.

Applications Middle of 2002
Real-time conversational services. Internet video applications sign language and lip reading communication.
Video storage and retrieval services (eg. VOD)
Video store and forward services (eg. video mail)
Multi-point communication over heterogeneous networks.

<http://standard.pictel.com>

call for proposals:

ftp://standard.pictel.com/video-site/9801_Gen/9801q15r.doc

Future mobile communication (IMT-2000)

MPEG-21

Multimedia Framework To support delivery of Electronic content

WORKSHOP

www.cselt.it/mpeg
click on Hot news)

Noordwijkerhout
Netherlands
20-21, March 2000

JPEG-LS Part 1 ISO/IEC
(14495) T.87-

Software www.hpl.hp.com/loco

http://spmng.ece.ubc.ca/research/jpeg/jpeg_ls/jpegls.html

JPEG-LS Public Domain Code (LOCO - I)

JPEG-LS Part 2 ISO/IEC

codec: [ftp://dspftp.ece.ubc.ca/pub/jpeg-ls/ver-](ftp://dspftp.ece.ubc.ca/pub/jpeg-ls/ver-1.0/jpeg_ls_v1.1.tar.gz)

[1.0/jpeg_ls_v1.1.tar.gz](ftp://dspftp.ece.ubc.ca/pub/jpeg-ls/ver-1.0/jpeg_ls_v1.1.tar.gz)

context modeling
prediction
Golomb codes

Lossless and near lossless
coding of continuous tone
still images

1998

(LOW Complexity Lossless Compression for Images)

Arithmetic coding
more effective prediction
modified Golomb code

Lossless and near lossless
coding of continuous tone
still images

1999

MPEG-1

ISO/IEC

Bitrates up to about
1.5 Mb/s

(11172)

www.mpeg.org
<http://drogo.cs.cit.it/mpeg>

MPEG - 2 Encoder/Decoder Software

www.mpeg.org/MPEG/MSSG/#source

-DCT
-Perceptual Q
-Adaptive Q
-Zig-zag scanning
-Predictive MC
-Bi-directional MC
-Half-sample accuracy ME
-Huffman coding
-Arithmetic coding

-Storage on CD-ROM
-Consumer video
Video CD
- Storage of video/audio
on the www

1992

MPEG-2

ISO/IEC/ITU-T

Bitrates 1.5 Mb/s to
about 50 Mb/s

(13812)

(H.262)

<ftp://ftp.tnt.uni-hannover.de/pub/MPEG/audio/>

<http://www.tnt.uni-hannover.de/soft/info/ftp/>

<http://www.tnt.uni-hannover.de/proiect/mpeg/audio/>

-DCT
-Perceptual Q
-Adaptive Q
-Zig-zag scanning
-Alternate scanning
-Predictive MC
-Bi-directional MC
-Frame/field based MC
-Half-sample accuracy ME
-Spatial scalability
-Temporal scalability
-Quality scalability
-Huffman coding
-Arithmetic coding
-Error resilient coding

-Digital TV
-Digital HDTV
-High quality video
-Satellite TV
-Cable TV
-Terrestrial broadcast
-Video editing
-Video storage
-Stereoscopic video
-DVD, professional
studio/post-production
processing
DVB
-MPEG Camera

1995

MPEG video software decoder

http://bmrc.berkeley.edu/projects/mpeg/mpeg_play.html

Set-top boxes

H.263+ (H.263 Version 2)

<ftp://standard.pictel.com/video-site/>

<http://www.icsl.ucla.edu/~wireless/>

Current software revision numbers:

encoder:

<ftp://dspftp.ece.ubc.ca/pub/tmn/ver-3.2/tmn-3.2.0.tgz>

decoder:

<ftp://dspftp.ece.ubc.ca/pub/tmn/ver-3.2/tmndec-3.2.0.tgz>

mikeg@ee.ubc.ca

<http://spmng.ece.ubc.ca/h263plus/h263plus.html>

software <ftp://dspftp.ece.ubc.ca/pub/tmn>.

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- Negotiable coding options,
- Advanced Intra-coding mode,
- Deblocking filter, slice structure mode, supplemental enhancement
- Improved PB-frame mode,
- Reference picture Selection mode,
- Temporal, SNR & Spatial Scalability modes
- Backward compatible with H.263
- Horizontal/Vertical scanning
- Reduced resolution mode
- New VLC for intra/frames
- Alternate VLC for inter frames
- Modified Q
- Wider variety of input video formats
- Independent segment decoding mode

<u>MPEG-7</u>	ISO/IEC	To be defined	To be defined	-Visual retrieval systems -Auditory retrieval systems -Beyond-search applications -Education -Surveillance Multimedia search and retrieval	2001
(Multimedia content description interface)		Proposal package description Evaluation of proposals Test sets To standardize:			
		(i) a set of description schemes and descriptions (ii) a language to specify description schemes (ie., description definition language - DDL) (iii) a coding scheme for the description			http://www.mpeg-7.com http://www.cselt.it/mpeg/working_documents.htm
http://drogo.cselt.it/mpeg http://www.cselt.it/mpeg					
www.hhiam.de/mpeg-video/faq/faq_mpeg-7.htm			http://drogo.cselt.stet.it/mpeg/mpeg_7.htm		

MPEG-4
(14496)

ISO/IEC

Bitrates 8 Kb/s to about
35 Mb/s

1999

♦ Official MPEG web page

<http://drago.cseft.stet.it/mpeg>

♦ MPEG4 Video web page

<http://wwwam.hhi.de/mpeg-video>

♦ MPEG4 Systems web page

<http://garuda.image.fr/mpeg4>

♦ MPEG4 SNHC web page

<http://www.es.com/mpeg4-snhc>

"Overview of the MPEG-4
standard", ISO/IEC JTC1/SC29/WG11
N2995, October 1999/Melbourne

Mpeg - 4 SAOL

<http://sound.media.mit.edu/~eds/mpeg4>

Verification Tests: To check whether the standard
delivers what it promises

- DCT
 - Wavelet
 - Perceptual Q
 - Adaptive Q
 - Zig-zag scanning
 - Horizontal/vertical scanning
 - Zero-tree reordering
 - Predictive MC
 - Bi-directional ME
 - Frame/field based MC
 - Half-sample accuracy ME
 - Advanced ME
 - Overlapping motion compensation
 - Spatial scalability
 - Temporal scalability
 - Quality scalability
 - View dependent scalability
 - bitmap shape coding
 - Sprite coding
 - Face animation
 - Body animation
 - Dynamic mesh coding
 - Huffman coding
 - Arithmetic coding
 - Error resilient coding
 - Shape Adaptive (SA) DCT
 - SA wavelet
 - Object/content based coding (shape, motion and texture)
 - Synthetic and natural hybrid coding (SNIIC)
 - Feathering filter
 - Deringing filter
- Internet
 - Interactive video
 - Visual editing
 - Content manipulation
 - Consumer video
 - Professional video
 - 2D/3D computer
 - Graphics/animation
 - Mobile
 - Stereoscopic video
 - Surveillance video