INTERNATIONAL STANDARD

ISO/IEC
15444-1

Information technology — JPEG 2000 image coding system: Core coding system

AMENDMENT 2: Extended profiles for cinema and video production and archival applications

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AMENDEMENT 2: Profils étendus pour production au cinéma et vidéo, et applications d'archivage

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Amendment 2 to ISO/IEC 15444-1:2004 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*, in collaboration with ITU-T. The identical text is published as Rec. ITU-T T.800 (2002)/Amd.2 (03/2009).

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INTERNATIONAL STANDARD
RECOMMENDATION ITU-T

Information technology – JPEG 2000 image coding system: Core coding system

Amendment 2

Extended profiles for cinema and video production and archival applications

1)   Annex A

Add the following at the end of Annex A (i.e., immediately following Table A.46):

The profiles listed under profile indication numbers Rsiz = 5 to 7 are intended for archiving and production purposes. The two extended scalable profiles are intended to be used for easily accessible archives. The long-term storage profile is intended for original camera capture or post-production workflows.

Table A.46 (contd.) – Codestream restrictions for cinema and video production and archival applications

	Scalable 2k digital cinema profile	Scalable 4k digital cinema profile	Long-term storage profile
SIZ marker segment			
Profile Indication	Rsiz = 5	Rsiz = 6	Rsiz = 7
Image size	Xsiz ≤ 2048, Ysiz ≤ 1080	Xsiz ≤ 4096, Ysiz ≤ 2160	Xsiz ≤ 16384, Ysiz ≤ 8640
Tiles	One tile for the whole image: YTsiz + YTOsiz ≥ Ysiz XTsiz + XTOsiz ≥ Xsiz	One tile for the whole image: YTsiz + YTOsiz ≥ Ysiz XTsiz + XTOsiz ≥ Xsiz	One tile for the whole image or minimum tile size: YTsiz + YTOsiz ≥ 512 XTsiz + XTOsiz ≥ 1024
Image and tile origin	XOsiz = YOsiz = XTOsiz = YTOsiz = 0	XOsiz = YOsiz = XTOsiz = YTOsiz = 0	XOsiz = YOsiz = XTOsiz = YTOsiz = 0
Sub-sampling	$XRsiz^i = YRsiz^i = 1$	$XRsiz^i = YRsiz^i = 1$	No restriction
Number of components	Csiz = 3	Csiz = 3	Csiz ≤ 8
Bit depth	$Ssiz^i = 11$ (i.e., 12-bit unsigned)	$Ssiz^i = 11$ (i.e., 12-bit unsigned)	No restriction
RGN marker segment	Disallowed, i.e., no region of interest	Disallowed, i.e., no region of interest	Disallowed, i.e., no region of interest
COD/COC marker segments	Main header only	Main header only	Main header only
Coding style	Scod, Scoc = 0000 0esp, where e = s = 0, and p = 1 NOTE – e = 0: EPH marker shall not be used s = 0: SOP marker shall not be used p = 1: precincts defined in $SPcodI^i/SPcocI^i$	Scod, Scoc = 0000 0esp, where e = s = 0, and p = 1 NOTE – e = 0: EPH marker shall not be used s = 0: SOP marker shall not be used p = 1: precincts defined in $SPcodI^i/SPcocI^i$	Scod, Scoc = 0000 0esp, where e = s = 1, and p = 0 or 1 NOTE – e: EPH marker shall be used s: SOP marker may be used p: precincts with PPx = 15 and PPy = 15 or defined in $SPcodI^i/SPcocI^i$
Progression order	CPRL	CPRL	CPRL
Number of layers	L = 2	L = 2	L ≤ 5
Multiple component transform	All component transforms defined in this Recommendation | International Standard may be used.	All component transforms defined in this Recommendation | International Standard may be used.	All component transforms defined in this Recommendation | International Standard may be used.

**Table A.46 (contd.) – Codestream restrictions for cinema and
video production and archival applications**

	Scalable 2k digital cinema profile	Scalable 4k digital cinema profile	Long-term storage profile
Number of decomposition levels	$N_L \leq 5$ Every component of every image of a codestream shall have the same number of wavelet transform levels. The number of deployed decomposition levels shall be set accordingly in all COD and COC markers.	$1 \leq N_L \leq 6$ Every component of every image of a codestream shall have the same number of wavelet transform levels. The number of deployed decomposition levels shall be set accordingly in all COD and COC markers.	No restriction, with respect to: $(\text{Xsiz} - \text{XOsiz})/\text{D}(I) \leq 64$ $(\text{Ysiz} - \text{YOsiz})/\text{D}(I) \leq 64$ and $\text{D}(I) = \text{pow}(2,N_L)$ for each component I Every component of every image of a codestream shall have the same number of wavelet transform levels. The number of deployed decomposition levels shall be set accordingly in all COD and COC markers.
Code-block size	xcb = ycb = 5 The corresponding values shall be set accordingly in all deployed COD and COC markers.	xcb = ycb = 5 The corresponding values shall be set accordingly in all deployed COD and COC markers.	xcb ≤ 6, ycb ≤ 6 The corresponding values shall be set accordingly in all deployed COD and COC markers.
Code-block style	SPcod, SPcoc = 0000 0000	SPcod, SPcoc = 0000 0000	SPcod, SPcoc = 00sp vtra where r = v = 0, and a, t, p, s = 0 or 1 NOTE – a = 1 for selective arithmetic coding bypass, t = 1 for termination on each coding pass, p = 1 for predictive termination, s = 1 for segmentation symbols.
Transformation	9-7 irreversible filter The corresponding filter shall be set accordingly in all COD and COC markers.	9-7 irreversible filter The corresponding filter shall be set accordingly in all COD and COC markers.	9-7 irreversible filter 5-3 reversible filter The corresponding filter shall be set accordingly in all COD and COC markers.
Precinct size	PPx = PPy = 7 for N_LLL band, else 8 The corresponding values shall be set accordingly in all COD and COC markers.	PPx = PPy = 7 for N_LLL band, else 8 The corresponding values shall be set accordingly in all COD and COC markers.	PPx ≥ xcb, PPy ≥ ycb The corresponding values shall be set accordingly in all COD and COC markers.

**Table A.46 (contd.) – Codestream restrictions for cinema and
video production and archival applications**

	Scalable 2k digital cinema profile	Scalable 4k digital cinema profile	Long-term storage profile
Tile-parts	Each compressed image shall have exactly 6 tile-parts. Each of the first 3 tile-parts shall contain all data necessary to decompress one 2K color component compatible to 2k digital cinema profile. Each of the next 3 tile-parts shall contain all additional data necessary to decompress the rest of one 2K color component. The resulting codestream structure is shown in Figure A-26	Each compressed image shall have exactly 12 tile-parts. Each of the first 3 tile-parts shall contain all data necessary to decompress one 2K color component compatible to 2k digital cinema profile. Each of the next 3 tile-parts shall contain all additional data necessary to decompress one 4K color component. Each of the next 3 tile-parts shall contain all additional data necessary for the rest of one 2k color component. Each of the next 3 tile-parts shall contain all additional data necessary to decompress the rest of one 4K color component.	Each compressed image tile shall consist of exactly Csiz tile-parts. Each tile-part shall contain all data from one component of the considered tile.
Other markers			
Packed headers (PPM, PPT)	Disallowed	Disallowed	Disallowed
Tile-part lengths marker (TLM)	TLM segments are required in each image	TLM segments are required in each image	TLM segments are required in each image
Packet length, tile-part header (PLT)	For each tile-part, a complete list of packet lengths shall be provided	For each tile-part, a complete list of packet lengths shall be provided	For each tile-part, a complete list of packet lengths shall be provided
QCD, QCC	Main header only	Main header only	Main header only
SOP, EPH	Disallowed	Disallowed	Each packet in any given tile-part shall be prepended with a SOP marker segment and each packet header in any given tile-part shall be postpended with an EPH marker segment
POC marker	There shall be exactly one POC marker segment in the main header. Other POC marker segments are disallowed. The POC marker segment shall specify exactly two progressions having the following parameters: First progression: a. RSpoc = 0, CSpoc = 0, LYEpoc = 1, REpoc = N_L+1, CEpoc = 3, Ppoc = 4 Second progression: b. RSpoc = 0, CSpoc = 0, LYEpoc = 2, REpoc = N_L+1, CEpoc = 3, Ppoc = 4	There shall be exactly one POC marker segment in the main header. Other POC marker segments are disallowed. The POC marker segment shall specify exactly four progressions having the following parameters: First progression: a. RSpoc = 0, CSpoc = 0, LYEpoc = 1, REpoc = N_L, CEpoc = 3, Ppoc = 4 Second progression: b. RSpoc = N_L, CSpoc = 0, LYEpoc = 1, REpoc = N_L+1, CEpoc = 3, Ppoc = 4 Third progression: c. RSpoc = 0, CSpoc = 0, LYEpoc = 2, REpoc = N_L, CEpoc = 3, Ppoc = 4 Fourth progression: d. RSpoc = N_L, CSpoc = 0, LYEpoc = 2, REpoc = N_L+1, CEpoc = 3, Ppoc = 4	Disallowed

**Table A.46 (contd.) – Codestream restrictions for cinema and
video production and archival applications**

	Scalable 2k digital cinema profile	Scalable 4k digital cinema profile	Long-term storage profile
Application-specific restrictions			
Error protection	Disallowed	Disallowed	The use of marker segments defined in Rec. ITU-T T.810 | ISO/IEC 15444-11 for the detection, correction and protection against errors that may result from aging media is not mandatory but optional and recommended.
Max compressed bytes for any image frame (aggregate of all 3 color components)	1302083 bytes	2604166 bytes	No restrictions
Max compressed bytes for any single color component of an image frame including all relevant tile-part headers	1041666 bytes	2083332 bytes	No restrictions
Max compressed bytes for quality layer 0 of any image frame (aggregate of all 3 color components) shall include relevant headers and markers assuring Digital Cinema packages can be obtained by simply stripping some tile-parts	1302083 bytes for 24 fps 651041 bytes for 48 fps	1302083 bytes for 24 fps	No restrictions
Max compressed bytes for layer 0 of any single color component of an image frame including all relevant tile-part headers	1041666 bytes for 24 fps 520833 bytes for 48 fps	1041666 bytes for 24 fps for 2K portion of each component	No restrictions

Main header	Tile-part header	c0p*r*I1	Tile-part header	c1p*r*I1	Tile-part header	c2p*r*I1	Tile-part header	c0p*r*I2	Tile-part header	c0p*r*I2	Tile-part header	c0p*r*I2

Figure A.26 – Proposed codestream structure

Assuming N_L wavelet transform levels (N_L+1 resolutions), the rectangles labelled cip*r*l1 (i = 0, 1, 2) contain all packets for color component i, all precincts, resolutions 0 through N_L and layer 1. The rectangles labelled cip*r*l2 (i = 0, 1, 2) contain all packets for color component i, resolutions 0 through N_L and layer 2.

2)   Clause 2, reference

Add the following to clause 2:

–   Recommendation ITU-T T.810 (2006) | ISO/IEC 15444-11:2007, *Information technology – JPEG 2000 image coding system: Wireless*.

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