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Information technology — JPEG 2000 image coding system: Extensions

AMENDMENT 2: Extended capabilities marker segment

Technologies de l'information — Système de codage d'images JPEG 2000: Extensions

AMENDEMENT 2: Segment de marqueur à capacités étendues

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Foreword

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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 15444-2:2005 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 ITU-T Rec.T.801/Amd.2.

Introduction

The JPEG 2000 specification is structured in several parts: Part 1 is defined in ITU-T Rec. T.800 | ISO/IEC 15444-1 ("Core coding system"). Part 2 is defined in ITU-T Rec. T.801 | ISO/IEC 15444-2 ("Extensions"). Part 3 is defined in ITU-T Rec. T.802 | ISO/IEC 15444-3 ("Motion JPEG 2000"). Part 4 is defined in ITU-T Rec. T.803 | ISO/IEC 15444-4 ("Conformance testing"). Part 5 is defined in ITU-T Rec. T.804 | ISO/IEC 15444-5 ("Reference software"). Part 6 is defined in ISO/IEC 15444-6 ("Compound image file format"). Part 7 has been withdrawn. Part 8 is defined in ISO/IEC 15444-8 ("Secured JPEG format"). Part 9 is defined in ITU-T Rec. T.808 | ISO/IEC 15444-9 ("Interactivity tools, APIs and protocols"). Part 10 is defined in ISO/IEC 15444-10 ("3-D and floating point data"). Part 11 is defined in ISO/IEC 15444-11 ("Wireless"). Part 12 is defined in ISO/IEC 15444-12 ("ISO base media file format").

The need for this amendment arises from a lack of sufficient codespace in the Rsiz capabilities parameter in the SIZ marker segment. The Rsiz parameter contains 16 bits, which are used to signal decoding capabilities required by the encoded codestream. According to Table A.10 of ITU-T Rec. T.800 | ISO/IEC 15444-1, the only values used in Part 1 codestreams are:

Rsiz = 0000 0000 0000 00xx

where:

xx = 00 indicates a generic Part 1 codestream

xx = 01 indicates a profile 0 codestream

xx = 10 indicates a profile 1 codestream

In Table A.2, the first bit of Rsiz is used to indicate the presence of Part 2 features, and the bit values assigned to specific Part 2 capabilities are:

Rsiz = 1000 yzzz zzzz zzzz

where y = 1 indicates a codestream using Part 2 (precinct-dependent quantization) and bits 6-16 (the z-bits) indicate extensions defined in the Part 2 annexes. In particular, note that there are only 3 unused bits (bits #2, 3, and 4) remaining in the Rsiz field.

Signalling Part 2 capabilities requires a full bit per capability because Part 2 features can be selected independently (i.e., in arbitrary combinations) by encoders, and this situation can be expected to continue for extensions defined in subsequent Parts of the JPEG 2000 family or in future Part 2 amendments. This includes extensions presently under development in JPEG 2000 Parts 8 (JPSEC), 10 (JP3D), and 11 (JPWL), many of which will be used in conjunction with other extensions from different Parts of JPEG 2000. Consequently, the three remaining unused bits in Rsiz are far from sufficient for signalling future JPEG 2000 codestream capabilities.

Rather than forcing future JPEG 2000 extensions to invent their own methods of signalling required codestream capabilities, this amendment defines a unified, scalable, semantically flexible framework for capabilities signalling that can be used by all future JPEG 2000 Parts and amendments. Moreover, it is fully backwards-compatible with the present capabilities signalling employed in the Rsiz parameter. The key idea is to define a new variable-length Part 2 marker segment (the CAP marker segment) that indicates the Parts and the specific extended capabilities used to encode the codestream in question. Use of the CAP marker segment is indicated by the second-most-significant bit in the Rsiz parameter.

The second bit in the Rsiz parameter can also optionally be used to indicate that a CAP marker segment is used. To a baseline decoder, this will appear as the indication of an unknown capability, which generally prevents the decoder from further decoding the codestream.

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Amendment 2
Extended capabilities marker segment

1) Table A.2

In Table A.2:

– *replace all occurrences of "1000" in the four most significant bits of the index values with "1x00"; and*

– *add the following entries immediately preceding the entry describing variable DC offset capability:*

0100 0000 0000 00xx	Capabilities specified in ITU-T Rec. T.800 | ISO/IEC 15444-1 and at least one extended capability indicated in the CAP marker segment
1100 xxxx xxxx xxxx	Extended capabilities defined in this Recommendation | International Standard as indicated in this parameter, and at least one other extended capability indicated in the CAP marker segment

so that Table A.2 will now read:

Value (bits) MSB LSB	Capability
0000 0000 0000 0000	Capabilities specified in ITU-T Rec. T.800 | ISO/IEC 15444-1 only
1x~~0~~00 xxxx xxxx xxxx	At least one of the extended capabilities specified in this Recommendation | International Standard is present
0100 0000 0000 00xx	Capabilities specified in ITU-T Rec. T.800 | ISO/IEC 15444-1 and at least one extended capability indicated in the CAP marker segment
1100 xxxx xxxx xxxx	Extended capabilities defined in this Recommendation | International Standard as indicated in this parameter, and at least one other extended capability indicated in the CAP marker segment
1x~~0~~00 xxx0 xxxx xxx1	Variable DC offset capability is required to decode this codestream[a) b)]
1x~~0~~00 xxxx xxxx xx1x	Variable scalar quantization capability is required to decode this codestream[a)]
1x~~0~~00 xxxx xxxx x1xx	Trellis coded quantization capability is useful to decode this codestream[c)]
1x~~0~~00 xxxx xxxx 1xxx	Visual masking capability is useful to decode this codestream[c)]
1x~~0~~00 xxxx xxx1 xxxx	Single sample overlap capability is required to decode this codestream[a)]
1x~~0~~00 xxxx xx1x xxxx	Arbitrary decomposition style capability is required to decode this codestream[a)]
1x~~0~~00 xxxx x1xx xxxx	Arbitrary transformation kernel capability is required to decode this codestream[a)]
1x~~0~~00 xxxx 1xxx xxxx	Whole sample symmetric transformation kernel capability is required to decode this codestream[a)]
1x~~0~~00 xxx1 xxxx xxxx	Multiple component transformation capability is required to decode this codestream[a)]
1x~~0~~00 xx1x xxxx xxxx	Non-linear point transformation capability is useful to decode this codestream[c)]
1x~~0~~00 x1xx xxxx xxxx	Arbitrary shaped region of interest capability is required to decode this codestream[a)]
1x~~0~~00 1xxx xxxx xxxx	Precinct-dependent quantization is required to decode this codestream[a)]
	All other values reserved

a) "Required to decode" implies that no useful data or image can be reconstructed without the use of this capability.

b) Shall not be used with the multiple component transformation.

c) "Useful to decode" implies that use of this capability would improve the quality of the reconstructed data or image; however, the data or image may be decoded without its use.

2) New clause A.3.13

Add the following A.3.13:

A.3.13 Extended capabilities (CAP)

Function: Signals that extended capabilities were used to create (and are recommended or required to decode) a codestream.

Usage: Optional. If present, must be included anywhere in the main header after the SIZ marker segment. The second-most-significant bit in Rsiz may optionally be set to 1 to indicate the presence of the CAP marker segment.

Length: Variable.

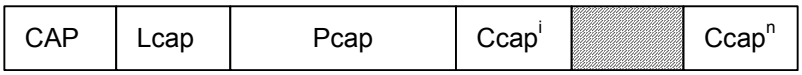

Figure A.13 – Extended capabilities syntax

CAP: Marker code. Table A.49 shows the size and values of the symbol and parameters for the extended capabilities marker segment.

Lcap: Length of the CAP marker segment (not including the marker). Length is given by the following formula:

$$\text{Lcap} = 6 + 2n \text{ bytes}$$

where n is the number of 1-bits occurring in Pcap.

Pcap: 32-bit field indicating the Parts containing extended capabilities that are used to encode the image. A value of 1 in the kth-most-significant bit of Pcap indicates the use of capabilities from Part k (ISO/IEC 15444-k). The first non-zero bit in Pcap corresponds to the first Ccap^i field (i = 1); the second non-zero bit in Pcap corresponds to the second Ccap^i field (i = 2), etc. Table A.50 shows the usage of the Pcap parameter.

Ccap^i: 16-bit field indicating capabilities specified in Part p_i where bit $\#p_i$ is the ith non-zero bit in Pcap. If p_1 = 2, the bits in Ccap^1 shall indicate capabilities defined in Part 2 amendments; the MSB of Rsiz may be set to the value 1 in this case. For other Parts, the bits in Ccap^i may be used to indicate capabilities defined in Part p_i. The precise meaning of the bits in Ccap^i shall be specified in Part p_i (ISO/IEC 15444-p_i).

Table A.49 – Extended capabilities parameter values

Parameter	Size (bits)	Value
CAP	16	0xFF50
Lcap	16	80-560
Pcap	32	See Table A.50
Ccap^i	16	Value and meaning specified in ISO/IEC 15444-k, where the ith non-zero bit in Pcap occurs in its kth most significant bit

Table A.50 – Part parameter values for the Pcap parameter

Values (bits) MSB LSB	Part parameter
1xxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx	Extended capabilities from ISO/IEC 15444-1 were used to encode the image
x1xx xxxx xxxx xxxx xxxx xxxx xxxx xxxx	Extended capabilities from ISO/IEC 15444-2 were used to encode the image
…	…
xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxx1	Extended capabilities from ISO/IEC 15444-32 were used to encode the image