INTERNATIONAL STANDARD

ISO/IEC 8613-7

Second edition
1994-11-01

AMENDMENT 1
1998-12-15

Information technology — Open Document Architecture (ODA) and Interchange Format: Raster graphics content architectures

AMENDMENT 1

Technologies de l'information — Architecture de document ouverte (ODA) et format de transfert: Architecture de contenu graphique en points

AMENDEMENT 1

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Reference number
ISO/IEC 8613-7:1994/Amd.1:1998(E)

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Printed in Switzerland

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. 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.

Amendment 1 to ISO/IEC 8613-7:1994 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in collaboration with ITU-T. The identical text is published as ITU-T Rec. T.417/Amd.1.

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INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN DOCUMENT ARCHITECTURE (ODA) AND INTERCHANGE FORMAT: RASTER GRAPHICS CONTENT ARCHITECTURES

AMENDMENT 1

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1) Subclause 2.1

Add by numerical order:

- CCITT Recommendation T.81 (1992) | ISO/IEC 10918-1:1994, *Information technology – Digital compression and coding of continuous-tone still images: Requirements and guidelines.*
- ITU-T Recommendation T.82 (1993) | ISO/IEC 11544:1993, *Information technology – Coded representation of picture and audio information – Progressive bi-level image compression.*

2) Subclause 2.3

Add at the end of this subclause:

- ITU-T Recommendation T.42 (1994), *Continuous-tone colour representation method for facsimile.*

3) Clause 3

Replace the paragraph by:

For the purpose of this Recommendation | International Standard, the definitions given in ITU-T Rec. T.411 | ISO/IEC 8613-1 apply.

For the purposes of this Recommendation | International Standard, the following definitions also apply.

3.1 JPEG definitions

The terms defined in CCITT Rec. T.81 | ISO/IEC 10918-1 apply.

3.2 JBIG definitions

The terms defined in ITU-T Rec. T.82 | ISO/IEC 11544 apply.

3.3 Additional definitions

The following terms are defined in this Specification.

3.3.1 (adaptive) (binary) arithmetic decoding: An entropy decoding procedure which recovers the sequence of symbols from the sequence of bits produced by the arithmetic encoder.

3.3.2 (adaptive) (binary) arithmetic encoding: An entropy encoding procedure which codes by means of a recursive subdivision of the probability of the sequence of symbols coded up to that point.

3.3.3 baseline (sequential): A particular sequential DCT-based encoding and decoding process specified in CCITT Rec. T.81 | ISO/IEC 10918-1, and which is required for all DCT-based decoding processes.

3.3.4 block-interleaved: The descriptive term applied to the repetitive multiplexing in a specific order of small groups of 8×8 blocks from each component in a scan.

3.3.5 component: One of the two-dimensional arrays which comprise an image.

3.3.6 entropy decoding: A lossless procedure which recovers the sequence of symbols from the sequence of bits produced by the entropy encoder.

3.3.7 entropy encoding: A lossless procedure which converts a sequence of input symbols into a sequence of bits such that the average number of bits per symbol approaches the entropy of the input symbols.

3.3.8 hierarchical: A mode of operation for coding an image in which the first frame for a given component is followed by frames which code the differences between the source data and the reconstructed data from the preceding frame for that component. Resolution changes are allowed between frames.

3.3.9 Huffman encoding: An entropy encoding procedure which assigns a variable length code to each input symbol. The more probable symbols are assigned shorter codes.

3.3.10 Huffman table: The set of variables length codes required in a Huffman encoder and Huffman decoder.

3.3.11 interleaved: The descriptive term applied to the repetitive multiplexing of small groups of data units from each component in a scan in a specific order.

3.3.12 JBIG: The abbreviation of Joint Bi-level Image Experts Group. It is used as the synonym for ITU-T Rec. T.82 | ISO/IEC 11544.

3.3.13 JPEG: JPEG is the abbreviation of Joint Photographic Experts Group. It is used as a synonym for CCITT Rec. T.81 | ISO/IEC 10918-1.

3.3.14 lossless: A descriptive term for encoding and decoding processes and procedures in which the output of the decoding procedure(s) is identical to the input to the encoding procedure(s).

3.3.15 lossy: A descriptive term for encoding and decoding processes which are not lossless.

3.3.16 non-information preserving: See lossy.

3.3.17 non-interleaved: The descriptive term applied to the data unit processing sequence when the scan has only one component.

3.3.18 progressive (coding):

a) One of the DCT-based processes defined in CCITT Rec. T.81 | ISO/IEC 10918-1 in which each scan typically improves the quality of the reconstructed image. [T.81 | ISO/IEC 10918-1].

b) A method of coding an image in which the image may be segmented into stripes, and then the entire image is first coded as a lowest resolution layer image and then is successively increased in resolution by means of differential layer images. This is compatible, by stripe/layer data reordering with progressive coding. [T.82 | ISO/IEC 11544].

3.3.19 quantization (uniform): The procedure by which Discrete Cosine Transform (DCT) coefficients are linearly scaled in order to achieve compression.

3.3.20 quantization table: The set of 64 quantization values used to quantize the DCT coefficients.

3.3.21 sample: One element in the two-dimensional array which comprises a component.

3.3.22 sequential coding: One of the lossless or DCT-based coding processes defined in the JPEG standard in which each component of the image is encoded within a single scan.

3.3.23 stripe: A fixed vertical size region of an image which encompasses the entire horizontal width of that image.

4) Clause 4

Replace the existing abbreviations by:

AAH	Horizontal dimension of available area
AAV	Vertical Dimension of available area
BDH	Horizontal Block Dimension
BDV	Vertical Block Dimension
DL	Differential Layer
DP	Deterministic Prediction
EOFB	End-of-Facsimile-Block
JBIG	Joint Bi-level Image experts Group

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JPEG	Joint Photographic Experts Group
MSB	Most Significant Bit
NLC	Number of Lines of the Clipped array
NPC	Number of Pels per line of the Clipped array
PS	Pel Spacing
RTC	Return-to-Control
SR	Spacing Ratio
TP	Typical Prediction

5) Subclause 7.4

Change last paragraph to read:

The content of each tile may be encoded according to ITU-T Recs. T.4, T.6, T.4 – MSB, T.6 – MSB, JPEG, JBIG with bits per colour component = 1, JBIG with bits per colour component > 1 or bitmap encoded as specified by the coding attributes. Alternatively, it may be omitted if the pels within the tile are either all foreground or all background.

6) Subclause 9.1.1

Replace this subclause by:

9.1.1 Type of coding

CLASSIFICATION: Defaultable

APPLICABILITY: Formatted and formatted processable content architecture class.

STRUCTURE: ASN.1 object identifier or non-negative integer.

PERMISSIBLE VALUES: The permissible values for this attribute depend on the value of the attribute "bits per colour component" as follows:

"bits per colour component" = 1:

ASN.1 object identifier:

{ 2 8 3 7 0 } for 'Rec. T.6 encoding',

{ 2 8 3 7 1 } for 'Rec. T.4 one-dimensional encoding',

{ 2 8 3 7 2 } for 'Rec. T.4 two-dimensional encoding',

{ 2 8 3 7 3 } for 'bitmap encoding',

{ 2 8 3 7 5 } for 'tiled encoding',

{ 2 8 3 7 6 } for 'Rec. T.6 encoding – MSB',

{ 2 8 3 7 7 } for 'Rec. T.4 one-dimensional encoding – MSB',

{ 2 8 3 7 8 } for 'Rec. T.4 two-dimensional encoding – MSB',

{ 2 8 3 7 12 } for 'JBIG encoding with bits per colour component = 1',

non-negative integer:

1 for 'Rec. T.6 encoding'.

"bits per colour component" > 1:

ASN.1 object identifier:

{ 2 8 3 7 9 } for 'direct value encoding',

{ 2 8 3 7 10 } for 'octet run-length encoding',

{ 2 8 3 7 11 } for 'packed index encoding',

{ 2 8 3 7 13 } for 'JPEG encoding',

{ 2 8 3 7 14 } for 'JBIG encoding with bits per colour component > 1'.

NOTE – The use of 'Rec. T.6 encoding – MSB'; 'Rec. T.4 one-dimensional encoding – MSB'; and 'Rec. T.4 two-dimensional encoding – MSB' is applicable to ITU-T Rec. T.417 only.

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DEFAULT VALUE: The default value for this attribute depends on the value of the attribute "bits per colour component" as follows:

"bits per colour component" = 1:

'Rec. T.6 encoding',

"bits per colour component" > 1:

'JPEG encoding'

DEFINITION:

For the raster graphics content architectures, the possible values of this attribute are:

- 'Rec. T.6 encoding', for the two-dimensional encoding scheme defined in CCITT Rec. T.6;
- 'Rec. T.4 one-dimensional encoding', for the one-dimensional encoding scheme defined in ITU-T Rec. T.4;
- 'Rec. T.4 two-dimensional encoding', for the two-dimensional encoding scheme defined in ITU-T Rec. T.4;
- 'bitmap encoding';
- 'Rec. T.6 encoding – MSB', for the two-dimensional encoding scheme defined in CCITT Rec. T.6 and where the first bit of the encoded T.6 data is allocated to the most significant bit of the first octet;
- 'Rec. T.4 one-dimensional encoding – MSB', for the one-dimensional encoding scheme defined in ITU-T Rec. T.4 and where the first bit of the encoded T.4 data is allocated to the most significant bit of the first octet;
- 'Rec. T.4 two-dimensional encoding – MSB', for the two-dimensional encoding scheme defined in ITU-T Rec. T.4 and where the first bit of the encoded T.4 data is allocated to the most significant bit of the first octet;
- 'JPEG encoding' for the encoding scheme defined in CCITT Rec. T.81 | ISO/IEC 10918-1;
- 'JBIG encoding with bits per colour component = 1' for the encoding scheme defined in ITU-T Rec. T.82 | ISO/IEC 11544.
- 'JBIG encoding with bits per colour component > 1' for the encoding scheme defined in ITU-T Rec. T.82 | ISO/IEC 11544.
- 'tiled encoding' for the tiling scheme defined in this Specification, the bitmap encoding scheme, the two-dimensional coding scheme defined in CCITT Rec. T.6, or the one- or two-dimensional coding schemes defined in ITU-T Rec. T.4, the two-dimensional coding scheme defined in CCITT Rec. T.6 with MSB mapping, the one- or two-dimensional coding schemes defined in ITU-T Rec. T.4 with MSB mapping, the JPEG coding scheme defined in CCITT Rec. T.81 | ISO/IEC 10918-1, or the JBIG encoding schemes defined in ITU-T Rec. T.82 | ISO/IEC 11544;
- 'direct value encoding';
- 'octet run-length encoding';
- 'packed index encoding'.

An explanation of these coding schemes is given in clause 11.

The value 'tiled encoding' indicates that the tiles in the content portion description are each encoded per the value of the associated "tile types" attribute as defined in 9.2.8.

The value of the attribute "type of coding" of a content portion description, that conforms to this Specification, is an ASN.1 object identifier or an integer.

In coding, the relationship between the order of pels and the order of bits within an octet is such that the first pel in the order of bits is allocated to the most significant bit of an octet.

The relationship between the order of pels, the order of encoded bits and the order of encoded octets is the same for tiled, as for untiled bitmap, Rec. T.4, Rec. T.4 – MSB, Rec. T.6, Rec. T.6 – MSB, JPEG, JBIG with bits per colour component = 1 and JBIG with bits per colour component > 1 encoding.

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7) Subclause 9.2.8

Replace this subclause by:

9.2.8 Tile types

CLASSIFICATION: Defaultable

APPLICABILITY: Formatted processable content architecture class

PERMISSIBLE VALUES: A sequence of one or more data elements with one of the following values:

'null background', 'null foreground', 'bitmap encoded', 'Rec. T.6 encoded', 'Rec. T.4 one-dimensional encoded', 'Rec. T.4 two-dimensional encoded', 'Rec. T.6 encoded – MSB', 'Rec. T.4 one-dimensional encoded – MSB', 'Rec. T.4 two-dimensional encoded – MSB', 'JPEG', 'JBIG'.

DEFAULT VALUE: All tiles are Rec. T.6 encoded

DEFINITION:

This attribute indicates the type of coding of tiles in the content portion as a sequence of values. Each value specifies the type of coding of the corresponding tile (see Figure 6) in the content portion as follows:

- 'null background', indicating that all pels in the tile are known to be background and the tile has no encoded content;
- 'null foreground', indicating that all pels in the tile are known as foreground and the tile has no encoded content;
- 'Rec. T.6 encoded', indicating that the pels in the tile are encoded as a Rec. T.6 octet string;
- 'Rec. T.4 one-dimensional encoded', indicating that the pels in the tile are encoded as a Rec. T.4 one-dimensional octet string;
- 'Rec. T.4 two-dimensional encoded', indicating that the pels in the tile are encoded as a Rec. T.4 two-dimensional octet string;
- 'Rec. T.6 encoded – MSB', indicating that the pels in the tile are encoded as a Rec. T.6 octet string;
- 'Rec. T.4 one-dimensional encoded – MSB', indicating that the pels in the tile are encoded as a Rec. T.4 one-dimensional octet string;
- 'Rec. T.4 two-dimensional encoded – MSB', indicating that the pels in the tile are encoded as a Rec. T.4 two-dimensional octet string;
- 'bitmap encoded', indicating that the pels in the tile are encoded as a bitmap octet string;
- 'JPEG', indicating that the pels in the tile are encoded as a JPEG octet string;
- 'JBIG with bits per component = 1', indicating that the pels in the tile are encoded as a JBIG with bits per component = 1 octet string
- 'JBIG with bits per component > 1' indicating that the pels in the tile are encoded as a JBIG with bits per component > 1 octet string.

The number of values is equal to the number of tiles.

This attribute is only applicable if the value of the attribute "type of coding" is 'tiled encoding'.

8) Subclause 9.2.10

Replace this subclause by:

9.2.10 Interleaving format

CLASSIFICATION: Defaultable

APPLICABILITY: Formatted and formatted processable content architecture class

PERMISSIBLE VALUES: 'pel', 'line', 'plane', 'stripe'

DEFAULT VALUE: 'plane'

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DEFINITION:

This attribute defines the method of interleaving of the components of the image. The values are defined as follows:

'pel'	for each pel, the colour component values are contiguous (all);
'line'	for each colour component, all values corresponding to each pel on a line are contiguous (all);
'plane'	for each colour component, all values corresponding to that component are contiguous; (JPEG, JBIG);
'stripe'	for each colour component, all values corresponding to each pel on a stripe are contiguous (JBIG).

For JPEG coding, the interleaving format called block interleave shall use the value 'pel' and non-interleaved case shall use the value 'block'.

9) New subclauses 9.2.11 to 9.2.17

Add new subclauses 9.2.11 to 9.2.17:

9.2.11 Subsampling

CLASSIFICATION: Defaultable

APPLICABILITY: Formatted and formatted processable content architecture class

PERMISSIBLE VALUES: Octet strings chosen from the following table:

Semantic Meaning	JPEG notations	Octet strings
4:1:1	((2,2),(1,1),(1,1))	'221111'H
2:1:1 or 4:2:2	((2,1),(1,1),(1,1))	'211111'H
1:1:1	((1,1),(1,1),(1,1))	'111111'H

DEFAULT VALUE: '111111'H

DEFINITION:

This JPEG and JBIG attribute defines the horizontal and vertical subsampling ratio for each colour component.

9.2.12 JPEG coding mode

CLASSIFICATION: Defaultable

APPLICABILITY: Formatted and formatted processable content architecture class

PERMISSIBLE VALUES: One of two parameters: 'Huffman coding' and'arithmetic coding'

The permissible values of 'Huffman coding' are:

'baseline', 'extended sequential DCT', 'progressive DCT', 'spatial lossless';

The permissible values of 'arithmetic coding' are:

'extended sequential DCT', 'progressive DCT', 'spatial lossless'.

DEFAULT VALUE: The parameter 'Huffman coding' with value 'baseline'

DEFINITION:

This attribute defines the particular JPEG coding scheme used.

9.2.13 JPEG quantization table

CLASSIFICATION: Defaultable

APPLICABILITY: Formatted and formatted processable content architecture class

PERMISSIBLE VALUES: 'associated', 'default'

DEFAULT VALUE: 'associated'

DEFINITION:

This attribute defines the type of quantization table to be used by the JPEG coding scheme.

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9.2.14 JPEG Huffman table

CLASSIFICATION:	Defaultable
APPLICABILITY:	Formatted and formatted processable content architecture class
PERMISSIBLE VALUES:	'associated', 'preferred'
DEFAULT VALUE:	'associated'

DEFINITION:

This attribute defines the type of Huffman code table to be used by the JPEG coding scheme.

9.2.15 JBIG tp for base layer

CLASSIFICATION:	Defaultable
APPLICABILITY:	Formatted and formatted processable content architecture class
PERMISSIBLE VALUES:	'not-used', 'used'
DEFAULT VALUE:	'not-used'

DEFINITION:

This attribute indicates the use of typical prediction.

9.2.16 JBIG differential layer

CLASSIFICATION:	Defaultable
APPLICABILITY:	Formatted and formatted processable content architecture class
PERMISSIBLE VALUES:	'DL not present', 'DL encoded without TP and DP', 'DL encoded with TP', 'DL encoded with DP', 'DL encoded with DP and private DP table', 'DL encoded with TP and DP', 'DL encoded with TP, DP and private DP table'
DEFAULT VALUE:	'DL not present'

DEFINITION:

This attribute indicates the type of differential layer coding to be used by the JBIG coding scheme.

9.2.17 Number of lines per stripe

CLASSIFICATION:	Non-mandatory
APPLICABILITY:	Formatted and formatted processable content architecture class
PERMISSIBLE VALUES:	Positive integer

DEFINITION:

This attribute specifies the number of lines in a stripe in the JPEG and JBIG encoding schemes.

10) Subclause 10.3

Replace this subclause by:

10.3 Representation of coding attributes

```
Raster-Gr-Coding-Attributes { 2 8 1 7 3 }

DEFINITIONS                                ::= BEGIN

EXPORTS

    Raster-Gr-Coding-Attributes,
    Compression,
    Tile-type,
    Subsampling;
```

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```
IMPORTS
        Coordinate-Pair
    FROM
        Raster-Gr-Presentation-Attributes;

Raster-Gr-Coding-Attributes          ::=SET {
 number-of-pels-per-line             [0] IMPLICIT INTEGER OPTIONAL,
 number-of-lines                     [1] IMPLICIT INTEGER OPTIONAL,
 compression                         [2] IMPLICIT Compression OPTIONAL,
 number-of-discarded-pels            [3] IMPLICIT INTEGER OPTIONAL,
 bits-per-colour-component           [4] Bits-Per-Colour-Component OPTIONAL,
 interleaving-format                 [5] IMPLICIT INTEGER
                                       { pel(0), line(1), plane(2), stripe(3),
                                                          OPTIONAL }
 number-of-pels-per-tile-line        [6] IMPLICIT INTEGER OPTIONAL,
 number-of-lines-per-tile            [7] IMPLICIT INTEGER OPTIONAL,
 tiling-offset                       [8] IMPLICIT Coordinate-Pair OPTIONAL,
 tile-types                          [9] IMPLICIT SEQUENCE OF Tile-type
                                                              OPTIONAL,
 subsampling                         [10] IMPLICIT Subsampling OPTIONAL,

 jpeg-coding-mode                    [11] IMPLICIT INTEGER  {

                                     -- Huffman coding
                                        baseline                        (0),
                                        huffman-extended-sequential-DCT (1),
                                        huffman-progressive-DCT         (2),
                                        huffman-spatial-lossless        (3),

                                     -- arithmetic coding
                                        arithmetic-extended-sequential-DCT (9),
                                        arithmetic-progressive-DCT         (10),
                                        arithmetic-spatial-lossless        (11)
                                                                        },

   jpeg-quantization-table           [12] IMPLICIT INTEGER {
                                                    associated  (0),
                                                    default     (1)}
                                                    OPTIONAL,

 jpeg-huffman-table                  [13] IMPLICIT INTEGER {
                                                    associated  (0),
                                                    preferred   (1)
                                                            },

                                     -- basic and default value is "associated".

 jbig-differential-layer             [17] IMPLICIT INTEGER {
                                        dl-not-present                          (0),
                                        dl-encoded-without-tp-and-dp            (1),
                                        dl-encoded-with-tp                      (2),
                                        dl-encoded-with-dp                      (3),
                                        dl-encoded-with-dp-and-private-dp-table (4),
                                        dl-encoded-with-tp-and-dp               (5),
                                        dl-encoded-with-tp-dp-and-private-dp-table (6)}
                                        OPTIONAL,

 number-of-lines-per-stripe          [18] IMPLICIT INTEGER OPTIONAL}

Compression                  ::=INTEGER { uncompressed (0), compressed (1)}

tile-type                    ::=INTEGER {
                                    null-background             (0),
                                    null-foreground             (1),
                                    t6-encoded                  (2),
                                    t4-one-dimensional-encoded  (3),
                                    t4-two-dimensional-encoded  (4),
                                    bitmap-encoded              (5),
```

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```
                                t6-encoded-msb                  (6),
                                t4-one-dimensional-encoded-msb  (7),
                                t4-two-dimensional-encoded-msb  (8),
                                jbig-bits-per-component-eq-1    (9),
                                jpeg                            (10),
                                jbig-bits-per-component-gr-1    (11)
                                }

Bits-Per-Colour-Component       ::= CHOICE {

 single integer                                 INTEGER,
component-list                                  SEQUENCE OF INTEGER }

Subsampling                     ::= OCTET STRING

                    -- The value OCTET STRING shall be chosen from the
                    -- following table:
                    -- Semantic Meaning     JPEG notations      Octet strings

                    --  4:1:1               ((2,2),(1,1),(1,1))   '221111'H

                    --  2:1:1 or 4:2:2      ((2,1),(1,1),(1,1))   '211111'H

                    --  1:1:1               ((1,1),(1,1),(1,1))   '111111'H

END
```

11) Subclause 10.4

Replace this subclause by:

10.4 Representation of non-basic features and non-standard defaults

```
Raster-Gr-Profile-Attributes { 2 8 1 7 4 }

DEFINITIONS                     ::= BEGIN

  EXPORTS
      Ra-Gr-Presentation-Feature, Ra-Gr-Coding-Attribute,
      Raster-Gr-Content-Defaults;

  IMPORTS
            One-Of-Four-Angles,
            One-Of-Two-Angles,
            Pel-Transmission-Density,
            Measure-Pair,
            Clipping,
            Pel-Spacing,
            Spacing-Ratio,
            Image-Dimensions,
            Coordinate-Pair,
            Raster-Graphics-Attributes,
            FROM Raster-Gr-Presentation-Attributes,
            Compression,
            Tile-Type,
            Subsampling
            FROM Raster-Gr-Coding-Attributes;

  Ra-Gr-Coding-Attribute        ::= CHOICE {

  compression                       [0] IMPLICIT Compression

  bit-per-colour-component          [4] Bit-Per-Colour-Component,

  interleaving-format               [5] IMPLICIT INTEGER

                                        {pel(0), line(1), plane(2), stripe(3)},
  number of pels-per-tile-line      [6] IMPLICIT INTEGER,
  number of lines-per-tile          [7] IMPLICIT INTEGER,
  tiling-offset                     [8] IMPLICIT Coordinate-Pair,
  tiling-types                      [9] IMPLICIT Tile-Type }
```

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```
subsampling                [10] IMPLICIT Subsampling,

jpeg-coding-mode           [11] IMPLICIT INTEGER {

                           -- Huffman coding
                              huffman-baseline                (0),
                              huffman-extended-sequential-DCT (1),
                              huffman-progressive-DCT         (2),
                              huffman-spatial-lossless        (3),

                           -- arithmetic coding
                              arithmetic-progressive-DCT      (10),
                              arithmetic-spatial-lossless     (11)
                              }
                                    OPTIONAL,

jpeg-quantization-table    [12] IMPLICIT INTEGER { associated (0),
                                                   default    (1)},
jpeg-huffman-table         [13] IMPLICIT INTEGER { associated (0),
                                                   preferred  (1)},

jbig-tp-for-base-layer     [14] IMPLICIT INTEGER {
                                                   not-used   (0),
                                                   used       (1) }
                                                   OPTIONAL,

jbig-differential-layer    [15] IMPLICIT INTEGER {
                              dl-not-present                          (0),
                              dl-encoded-without-tp-and-dp            (1),
                              dl-encoded-with-tp                      (2),
                              dl-encoded-with-dp                      (3),
                              dl-encoded-with-dp-and-private-dp-table (4),
                              dl-encoded-with-tp-and-dp               (5),
                              dl-encoded-with-tp-dp-and-private-dp-table (6)
                                                   },

number-of-lines-per-stripe [16] IMPLICIT INTEGER }

END
```

12) New subclauses 11.8 and 11.9

Add the following new subclauses:

11.8 JPEG encoding schemes

The JPEG encoding schemes defined in CCITT Rec. T.81 | ISO/IEC 10918-1 specify two classes of coding processes: lossy (not information preserving) and lossless (information preserving). The lossy procedures are all based on the Discrete Cosine Transform (DCT) and the lossless are based on a predictive technique. Four modes of encoding are defined: the sequential DCT-based mode, the progressive DCT-based mode, the sequential lossless mode, and the hierarchical mode.

In the sequential DCT-based mode 8 × 8 blocks of pels are transformed. The resulting coefficients are quantized and then entropy coded (losslessly) by Huffman or arithmetic coding. The pel blocks are typically formed by scanning the image (or image component) from left to right, and then block row by block row from top to bottom. The allowed sample precisions are 8 and 12 bits per component sample. Of the DCT-based methods, the sequential DCT-based mode requires the least amount of storage as a file.

For the progressive DCT-based mode, the quantized coefficients for the complete image component are determined, stored, and processed by either spectral selection or successive approximation. These two techniques may be used separately or may be combined in various ways.

The sequential lossless mode is not based on DCT but is a predictive coding technique. The predicted value of each pel position is calculated from up to three of its nearest neighbours above and to the left, and the difference between the predicted value and the actual value is entropy encoded losslessly. For the lossless mode of operation, sample precisions from 2 bits per sample to 16 bits per sample are allowed.

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