



International
Standard

ISO/IEC 18477-1

**Information technology — Scalable
compression and coding of
continuous-tone still images —**

**Part 1:
Core coding system specification**

*Technologies de l'information — Compression échelonnée et
codage d'images plates en ton continu —*

Partie 1: Spécification du système de codage de noyau

[ISO/IEC PRF 18477-1](https://standards.iteh.ai/catalog/standards/iso/470822ce-e1fc-41b2-9133-11d9b99ce0f4/iso-iec-prf-18477-1)

<https://standards.iteh.ai/catalog/standards/iso/470822ce-e1fc-41b2-9133-11d9b99ce0f4/iso-iec-prf-18477-1>

Third edition

PROOF/ÉPREUVE

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/IEC PRF 18477-1](https://standards.iteh.ai/catalog/standards/iso/470822ce-e1fc-41b2-9133-11d9b99ce0f4/iso-iec-prf-18477-1)

<https://standards.iteh.ai/catalog/standards/iso/470822ce-e1fc-41b2-9133-11d9b99ce0f4/iso-iec-prf-18477-1>



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

PROOF/ÉPREUVE

© ISO/IEC 2024 – All rights reserved

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols and abbreviated terms	3
4.1 Symbols.....	3
4.2 Abbreviated terms.....	3
5 Conventions	4
5.1 Conformance language.....	4
5.2 Operators.....	4
5.2.1 Arithmetic operators.....	4
5.2.2 Assignment operators.....	4
5.2.3 Precedence order of operators.....	4
5.2.4 Mathematical functions.....	4
6 General	5
6.1 General definitions.....	5
6.2 Functional overview on the decoding process.....	5
6.3 Encoder requirements.....	5
6.4 Decoder requirements.....	5
Annex A (normative) Component subsampling and expansion of subsampling	6
Annex B (normative) Codestream syntax	8
Annex C (normative) Multi-component decorrelation	15
Bibliography	17

[ISO/IEC PRF 18477-1](https://standards.iteh.ai/catalog/standards/iso/470822ce-e1fc-41b2-9133-11d9b99ce0f4/iso-iec-prf-18477-1)

<https://standards.iteh.ai/catalog/standards/iso/470822ce-e1fc-41b2-9133-11d9b99ce0f4/iso-iec-prf-18477-1>

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents and <https://patents.iec.ch>. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

This third edition cancels and replaces the second edition (ISO/IEC 18477-1:2020), which has been technically revised.

The main changes are as follows:

- the marker ID for the component decorrelation control marker was corrected.

A list of all parts in the ISO/IEC 18477 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

This document specifies a coded codestream format for storage of continuous-tone photographic content. JPEG XT is a scalable image coding system that builds on the legacy Rec. ITU-T T.81 | ISO/IEC 10918-1 coding system, also known as JPEG, but extends it in a backwards compatible way. This document specifies the commonly deployed components of the JPEG coding system. Additional parts of the ISO/IEC 18477 series extend on this baseline.

JPEG XT has been designed to be backwards compatible to legacy applications while at the same time having a small coding complexity; JPEG XT uses, whenever possible, functional blocks of Rec. ITU-T T.81 | ISO/IEC 10918-1, Rec. ITU-T T.86 | ISO/IEC 10918-4 and Rec. ITU-T T.871 | ISO/IEC 10918-5 to extend the functionality of the legacy JPEG coding system. It is optimized for good image quality and compression efficiency while also enabling low-complexity encoding and decoding implementations.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/IEC PRF 18477-1](https://standards.iteh.ai/catalog/standards/iso/470822ce-e1fc-41b2-9133-11d9b99ce0f4/iso-iec-prf-18477-1)

<https://standards.iteh.ai/catalog/standards/iso/470822ce-e1fc-41b2-9133-11d9b99ce0f4/iso-iec-prf-18477-1>

Information technology — Scalable compression and coding of continuous-tone still images —

Part 1: Core coding system specification

1 Scope

This document specifies a coding format, referred to as JPEG XT, which is designed primarily for continuous-tone photographic content. This document defines the core coding system, which forms the basis for the entire ISO/IEC 18477 series.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Rec. ITU-T T.81 | ISO/IEC 10918-1:1994, *Information technology — Digital compression and coding of continuous-tone still images — Part 1: Requirements and guidelines*

Rec. ITU-T T.86 | ISO/IEC 10918-4, *Information technology — Digital compression and coding of continuous-tone still images — Part 4: Registration of JPEG profiles, SPIFF profiles, SPIFF tags, SPIFF colour spaces, APPn markers, SPIFF compression types and Registration Authorities (REGAUT)*

Rec. ITU-T T.871 | ISO/IEC 10918-5, *Information technology — Digital compression and coding of continuous-tone still images — Part 5: JPEG File Interchange Format (JFIF)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

bitstream

partially encoded or decoded sequence of bits comprising an entropy-coded segment

3.2

block

8×8 array of samples or an 8×8 array of DCT coefficient values of one component

3.3

byte

group of 8 bits

3.4

coder

embodiment of a coding process

3.5

coding

encoding or decoding

3.6

compression

reduction in the number of bits used to represent source image data

3.7

component

two-dimensional array of samples having the same designation in the output or display device

Note 1 to entry: An image typically consists of several components, e.g. red, green and blue.

3.8

continuous-tone image

image whose components have more than one bit per sample

3.9

discrete cosine transform

DCT

either the forward discrete cosine transform or the inverse discrete cosine transform

3.10

downsampling

procedure by which the spatial resolution of a component is reduced

3.11

entropy-coded data segment

independently decodable sequence of entropy encoded bytes of compressed image data

3.12

marker

two-byte code in which the first byte is hexadecimal FF and the second byte is a value between 1 and hexadecimal FE

3.13

marker segment

marker and associated set of parameters

3.14

precision

number of bits allocated to a particular sample or DCT coefficient

3.15

procedure

set of steps which accomplishes one of the tasks which comprise an encoding or decoding process

3.16

sample

one element in the two-dimensional array which comprises a component

3.17

sample grid

common coordinate system for all samples of an image with the samples at the top left edge of the image having the coordinates (0, 0), the first coordinate increases towards the right, the second to the bottom

3.18

scan

single pass through the data for one or more of the components in an image

3.19

scan header

marker segment that contains a start-of-scan marker and associated scan parameters that are coded at the beginning of a scan

3.20

upsampling

procedure by which the spatial resolution of a component is increased

3.21

vertical sampling factor

relative number of vertical data units of a particular component with respect to the number of vertical data units in the other components in the frame

4 Symbols and abbreviated terms

4.1 Symbols

X width of the sample grid in positions

Y height of the sample grid in positions

N_f number of components in an image

s_{i,x} subsampling factor of component i in horizontal direction

s_{i,y} subsampling factor of component i in vertical direction

H_i subsampling indicator of component i in the frame header

V_i subsampling indicator of component i in the frame header

v_{x,y} sample value at the sample grid position x, y

4.2 Abbreviated terms

ASCII American Standard Code for Information Interchange

DC lowpass

AC highpass

LSB least significant bit

MSB most significant bit

DCT discrete cosine transformation

JPEG joint photographic experts group

5 Conventions

5.1 Conformance language

The keyword "reserved" indicates a provision that is not specified at this time, shall not be used, and may be specified in the future. The keyword "forbidden" indicates "reserved" and in addition indicates that the provision will never be specified in the future.

5.2 Operators

NOTE Many of the operators used in this document are similar to those used in the C programming language.

5.2.1 Arithmetic operators

- + addition
- subtraction (as a binary operator) or negation (as a unary prefix operator)
- × multiplication
- / division without truncation or rounding

5.2.2 Assignment operators

- = assignment operator

5.2.3 Precedence order of operators

Operators are listed in descending order of precedence. If several operators appear in the same line, they have equal precedence. When several operators of equal precedence appear at the same level in an expression, evaluation proceeds according to the associativity of the operator either from right to left or from left to right.

Operators	Type of operation	Associativity
(), [], .	expression	left to right
–	unary negation	
×, /	multiplication	left to right
+, –	addition and subtraction	left to right
<, >, <=, >=	relational	left to right

5.2.4 Mathematical functions

- $\lceil x \rceil$ Ceiling of x . Returns the smallest integer that is greater than or equal to x .
- $\lfloor x \rfloor$ Floor of x . Returns the largest integer that is lesser than or equal to x .
- $|x|$ Absolute value, is $-x$ for $x < 0$, otherwise x .
- $\text{sign}(x)$ Sign of x , zero if x is zero, $+1$ if x is positive, -1 if x is negative.
- $\text{clamp}(x, \text{min}, \text{max})$ Clamps x to the range $[\text{min}, \text{max}]$: returns min if $x < \text{min}$, max if $x > \text{max}$ or otherwise x .