
**Information technology – General
video coding —**

**Part 2:
Low complexity enhancement video
coding**

Technologies de l'information – Codage vidéo général —

Partie 2: Codage vidéo d'amélioration de faible complexité

This document is a preview generated by EUS



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2021

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

Contents

Page

Foreword	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Abbreviated terms	6
5 Conventions	7
5.1 General	7
5.2 Arithmetic operators	7
5.3 Logical operators	8
5.4 Relational operators	8
5.5 Bit-wise operators	8
5.6 Assignment operators	9
5.7 Range notation	9
5.8 Mathematical functions	9
5.9 Order of operation precedence	10
5.10 Variables, syntax elements and tables	11
5.11 Text description of logical operations	12
5.12 Processes	13
6 Bitstream and picture formats, partitioning, scanning processes and neighbouring relationships	13
6.1 Bitstream formats	13
6.2 Source, decoded and output picture formats	14
6.3 Partitioning of pictures	17
6.3.1 Organization of the hierarchical structure	17
6.3.2 Partitioning of residuals plane	17
7 Syntax and semantics	18
7.1 Method of specifying syntax in tabular form	18
7.2 Specification of syntax functions and descriptors	19
7.3 Syntax in tabular form	20
7.3.1 Syntax order	20
7.3.2 NAL unit and NAL unit header syntax	20
7.3.3 Process block syntax	21
7.3.4 Process payload – sequence configuration	22
7.3.5 Process payload – global configuration	22
7.3.6 Process payload – picture configuration	24
7.3.7 Process payload – encoded data	25
7.3.8 Process payload – encoded tiled data	26
7.3.9 Process payload – surface	28
7.3.10 Process payload – additional info	28
7.3.11 Process payload – filler	29
7.3.12 Byte alignment syntax	29
7.4 Semantics	29
7.4.1 General	29
7.4.2 NAL unit semantics	30
7.4.3 Data block unit configuration semantics	32
8 Decoding process	41
8.1 General decoding process	41
8.2 Payload data block unit process	41
8.3 Picture enhancement decoding process	42
8.3.1 General enhancement decoding process	42
8.3.2 Decoding process for picture enhancement encoded data (payload_ encoded_data)	42

8.3.3	Decoding process for picture enhancement encoded tiled data (payload_	45
	encoded_tiled_data)	
8.3.4	Decoding process for enhancement sub-layer 1 (L-1) encoded data	50
8.3.5	Decoding process for enhancement sub-layer 2 (L-2) encoded data	52
8.4	Decoding process for the temporal prediction	53
8.4.1	General decoding process for temporal prediction	53
8.4.2	Tiled temporal refresh	54
8.5	Decoding process for the dequantization	54
8.5.1	Decoding process for the dequantization overview	54
8.5.2	Scaling process for transform coefficients	54
8.5.3	Derivation of dequantization offset and stepwidth modifier	55
8.5.4	Derivation of quantization matrix	56
8.6	Decoding process for the transform	59
8.6.1	General upscaling process description	59
8.6.2	Transform inputs and outputs, transform types, and residual samples	
	derivation	63
8.6.3	2x2 directional decomposition transform	64
8.6.4	4x4 directional decomposition transform	65
8.7	Decoding process for the upscaling	66
8.7.1	Nearest sample upsampler kernel description	66
8.7.2	Bilinear upsampler kernel description	68
8.7.3	Cubic upsampler kernel description	71
8.7.4	Modified Cubic upsampler kernel description	73
8.7.5	Predicted residual process description	74
8.7.6	Adaptive Cubic upsampler kernel description	75
8.8	Decoding process for the residual reconstruction	75
8.8.1	Reconstructed residual of each block derivation	75
8.8.2	Residual reconstruction for L-1 block	76
8.8.3	Residual reconstruction for L-2 block	76
8.9	Decoding process for the L-1 filter	77
8.9.1	L-1 residual filter overview	77
8.9.2	Decoding process for filtering L-1 block	77
8.10	Decoding process for base decoder data extraction	79
8.11	Decoding process for dither filter	79
9	Parsing process	79
9.1	Parsing process inputs and outputs, process overview	79
9.1.1	Parsing process for entropy encoded transform coefficients	79
9.1.2	Parsing process for entropy encoded temporal signal coefficient group	82
9.2	Prefix Coding decoder	83
9.2.1	Prefix Coding decoder description	83
9.2.2	Prefix Coding decoder table generation	84
9.2.3	Prefix Coding decoder for tile data sizes	88
9.3	RLE decoder	89
9.3.1	RLE process inputs and outputs	89
9.3.2	RLE decoder for coefficient groups	89
9.3.3	RLE decoder description	90
9.3.4	RLE decoder for temporal signal coefficient group	91
9.3.5	RLE decoder for tile entropy_enabled_flag fields	93
9.4	Parsing process for 0-th order Exp-Golomb codes	94
	Annex A (normative) Profiles and levels	96
	Annex B (normative) Byte stream format	98
	Annex C (normative) Hypothetical reference decoder	101
	Annex D (normative) Supplemental enhancement information	108
	Annex E (normative) Video usability information	115
	Bibliography	119

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see patents.iec.ch).

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*.

A list of all parts in the ISO/IEC 23094 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.

Information technology – General video coding —

Part 2:

Low complexity enhancement video coding

1 Scope

This document specifies low complexity enhancement video coding.

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.

ISO/IEC 11578:1996, *Information technology — Open systems interconnection — Remote procedure call (RPC)*

ITU-T H.273 | ISO/IEC 23091-2:2019, *Information technology — Coding-independent code points — Part 2: Video*

ITU-T Recommendation T.35:2000, *Procedure for the allocation of ITU-T defined codes for non-standard facilities*

3 Terms and definitions

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

ISO and IEC maintain terminological 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

access unit

AU

set of *NAL units* (3.35) that are associated with a particular output time, are consecutive in *decoding order* (3.20), and contain exactly one *coded picture* (3.9)

3.2

bitstream

sequence of bits, in the form of a *NAL unit stream* (3.36) or a *byte stream* (3.6), that forms the representation of *coded pictures* (3.9), and associated data forming one or more coded video sequences (CVSSs)

3.3

block

MxN (M-column by N-row) array of samples, or an MxN array of *transform coefficients* (3.57)

3.4

byte

sequence of 8 bits, within which, when written or read as a sequence of bit values, the left-most and right-most bits represent the most and least significant bits, respectively