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Information technology — General video coding —

Part 4: Conformance and reference software for essential video coding

Technologies de l'information — Codage vidéo général —

Partie 4: Conformité et logiciel de référence pour le codage vidéo essentiel

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Foreword

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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).

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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 website 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 4: Conformance and reference software for essential video coding

1 Scope

This document specifies a set of tests and procedures designed to indicate whether encoders or decoders essential video coding (EVC), which contains tests and a reference software designed to verify whether bitstreams and decoders meet normative requirements specified in ISO/IEC 23094-1. An encoder can claim conformance to ISO/IEC 23094-1 if the bitstreams that it generates are conforming bitstreams. Characteristics of coded bitstreams and decoders are defined in ISO/IEC 23094-1. Decoder characteristics define the properties and capabilities of the applied decoding process. The capabilities of a decoder specify which bitstreams the decoder can decode and reconstruct. A bitstream can be decoded by a decoder if the characteristics of the bitstream are within the specified decoder capabilities.

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 23094-1:2020, *Information technology — General video coding — Part 1: Essential video coding*

ISO/IEC 9899, *Information technology — Programming languages — C*

ISO/IEC/IEEE 9945, *Information technology — Portable Operating System Interface (POSIX®) Base Specifications, Issue 7*

3 Terms and definitions

For the purposes of this document, the terms and definitions and symbols specified in ISO/IEC 23094-1 and the following 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
bitstream
sequence of bits, in the form of a NAL unit stream or a raw bitstream, that forms the representation of coded pictures and associated data forming one or more coded video sequences

3.2
decoder
embodiment of a process that operates on a bitstream and may conform to the decoding process requirements specified for conformance

Note 1 to entry: The decoder does not include the display process, which is outside the scope of this document

3.3
encoder
embodiment of a process that produces a bitstream

Note 1 to entry: The process is not specified in this document (except in regard to identification of the reference software encoder).

3.4
reference software decoder
software which may decode a *bitstream* (3.1) encoded according to the syntax structure

4 Abbreviated terms

ETM test model of essential video coding

HRD hypothetical reference decoder

5 Conventions

For the purposes of this document, relevant conventions are specified in Clause 5 of ISO/IEC 23094-1:2020.

6 Conformance testing for ISO/IEC 23094-1

6.1 Introduction

The following subclauses specify the tests for verifying conformance of video bitstreams as well as decoders. These tests make use of test data (bitstream test suites) provided as an electronic annex to this document and the reference software decoder specified in ISO/IEC 23094-1.

The electronic annex to this document is available at the following address:

— https://standards.iso.org/iso-iec/23094/-4/ed-1/en/

6.2 Bitstream conformance

Bitstream conformance is specified by Clause C.4 of ISO/IEC 23094-1:2020.

6.3 Decoder conformance

Decoder conformance is specified by Clause C.5 of ISO/IEC 23094-1:2020.

6.4 Procedure to test bitstreams

A bitstream that claims conformance with ISO/IEC 23094-1 should pass the following normative test.

The bitstream should be decoded by processing it with the reference software decoder. When processed by the reference software decoder, the bitstream should not cause any error or non-conformance messages to be reported by the reference software decoder. This test should not be applied to bitstreams that are known to contain errors introduced by transmission, as such errors are highly likely to result in bitstreams that lack conformance to ISO/IEC 23094-1.

Successfully passing the reference software decoder test provides only a strong presumption that the bitstream under test is conforming to the video layer, i.e., that it does indeed meet all the requirements for the video layer (except Annexes C, D and E) specified in ISO/IEC 23094-1:2020 that are tested by the reference software decoder.

Additional tests may be necessary to more thoroughly check that the bitstream properly meets all the requirements specified in ISO/IEC 23094-1:2020 including the hypothetical reference decoder (HRD) conformance (based on Annexes C, D and E). These complementary tests may be performed using other video bitstream verifiers that perform more complete tests than those implemented by the reference software decoder.

When testing a bitstream for conformance, it may also be useful to test whether or not the bitstream follows the informative recommendations specified in ISO/IEC 23094-1.

To check correctness of a bitstream, it is necessary to parse the entire bitstream and to extract all the syntax elements and other values derived from those syntactic elements and used by the decoding process specified in ISO/IEC 23094-1.

A verifier may not necessarily perform all stages of the decoding process specified in ISO/IEC 23094-1 in order to verify bitstream correctness. Many tests can be performed on syntax elements in a state prior to their use in some processing stages.

6.5 Procedure to test decoder conformance

6.5.1 Conformance bitstreams

A bitstream has values of profile_idc and level_idc corresponding to a set of specified constraints on a bitstream for which a decoder conforming to a specified profile and level is required in Annex A of ISO/IEC 23094-1:2020 to properly perform the decoding process.

6.5.2 Contents of the bitstream file

The conformance bitstreams are included in this document as an electronic attachment available at the following address:

— https://standards.iso.org/iso-iec/23094/-4/ed-1/en/

The following information is included in a single zipped file for each such bitstream.

— bitstream, and

— decoded pictures or hashes of decoded pictures (may not be present), and

— short description of the bitstream, and

— trace file (results while decoding the bitstream, in ASCII format).

In cases where the decoded pictures or hashes of decoded pictures are not available, the reference software decoder should be used to generate the necessary reference decoded pictures from the bitstream.

6.5.3 Requirements on output of the decoding process and timing

Two classes of decoder conformance are specified:

— output order conformance, and

— output timing conformance.

The output of the decoding process is specified in Clause 8 and Annex C of ISO/IEC 23094-1:2020.

For output order conformance, it is a requirement that all of the decoded pictures specified for output in Annex C of ISO/IEC 23094-1:2020 should be output by a conforming decoder in the specified order and that the values of the decoded samples in all of the pictures that are output should be (exactly equal to) the values specified in Clause 8 of ISO/IEC 23094-1:2020.