
**Information technology — JPEG 2000
image coding system —**

**Part 15:
High-Throughput JPEG 2000**

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

Partie 15: JPEG 2000 à haut débit



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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).

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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.

This document was prepared by ITU-T as ITU-T T.814 (06/2019) and drafted in accordance with its editorial rules. It was assigned to 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 15444 series can be found on the ISO website.

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.

INTERNATIONAL STANDARD ISO/IEC 15444-15
RECOMMENDATION ITU-T T.814

Information technology – JPEG 2000 image coding system: High-throughput JPEG 2000

Summary

The computational complexity of the block-coding algorithm of Rec. ITU-T T.800 | ISO/IEC 15444-1 can be a challenge in some applications.

Rec. ITU-T T.814 | ISO/IEC 15444-15 specifies a high-throughput (HT) block-coding algorithm that can be used in place of the block-coding algorithm specified in Rec. ITU-T T.800 | ISO/IEC 15444-1.

The HT block-coding algorithm increases decoding and encoding throughput and allows mathematically lossless transcoding to and from the block-coding algorithm specified in Rec. ITU-T T.800 | ISO/IEC 15444-1. This is achieved at the expense of some loss in coding efficiency and substantial elimination of quality scalability.

The HT block-coding algorithm adopts a coding pass structure like that of the block-coding algorithm of Rec. ITU-T T.800 | ISO/IEC 15444-1. No more than three coding passes are required for any given code-block in the final codestream, and arithmetic coding is replaced with a combination of variable length coding tools, adaptive run-length coding and simple bit-packing. The algorithm involves three passes: a significance propagation pass (HT SigProp coding pass), a magnitude refinement pass (HT MagRef coding pass) and a cleanup pass (HT cleanup coding pass).

The HT MagRef coding pass is identical to that of the block-coding algorithm of Rec. ITU-T T.800 | ISO/IEC 15444-1, operating in the bypass mode, except that code bits are packed into bytes with a little-endian bit order. That is, the first code bit in a byte appears in its LSB, as opposed to its MSB.

The HT SigProp coding pass is also very similar to that of the block-coding algorithm of Rec. ITU-T T.800 | ISO/IEC 15444-1, operating in the BYPASS mode, with the following two differences:

- code bits are again packed into bytes of the raw bit-stream with a little-endian bit order, instead of big-endian bit packing order; and
- the significance bits associated with a set of four stripe columns are emitted first, followed by the associated sign bits, before advancing to the next set of stripe columns, instead of inserting any required sign bit immediately after the same sample's magnitude bit.

The HT cleanup coding pass is, however, significantly different from that of the block-coding algorithm of Rec. ITU-T T.800 | ISO/IEC 15444-1, and most of ITU-T T.814 | ISO/IEC 15444-15 is devoted to its description.

Aside from the block-coding algorithm itself and the parsing of packet headers, the HT block-coding algorithm preserves the syntax and semantics of other parts of the codestream specified in Rec. ITU-T T.800 | ISO/IEC 15444-1.

Recommendation ITU-T T.814 (2019) is a common text with ISO/IEC 15444-15:2019, both in their first edition.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T T.814	2019-06-13	16	11.1002/1000/11830-en

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

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INTERNATIONAL STANDARD ITU-T RECOMMENDATION

Information technology – JPEG 2000 image coding system: High-throughput JPEG 2000

1 Scope

This Recommendation | International Standard specifies an alternate block-coding algorithm that can be used in place of the block-coding algorithm specified in Rec. ITU-T T.800 | ISO/IEC 15444-1. This alternate block-coding algorithm offers a significant increase in throughput at the expense of slightly reduced coding efficiency, while a) allowing mathematically lossless transcoding to and from codestreams that use the block-coding algorithm specified in Rec. ITU-T T.800 | ISO/IEC 15444-1, and b) preserving codestream syntax and features specified in Rec. ITU-T T.800 | ISO/IEC 15444-1.

Recommendation ITU-T T.814 (2019) is a common text with ISO/IEC 15444-15:2019, both in their first edition.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

- Recommendation ITU-T T.800 (2019) | ISO/IEC 15444-1:2019, *Information technology – JPEG 2000 image coding system: Core coding system*.

2.2 Paired Recommendations | International Standards equivalent in technical content

- Recommendation ITU-T H.273 (2016), *Coding-independent code points for video signal type identification*.
- ISO/IEC 23001-8:2016, *Information technology – MPEG systems technologies – Part 8: Coding-independent code points*.

2.3 Additional references

- ISO/IEC 15076-1, *Image technology colour management – Architecture, profile format and data structure – Part 1: Based on ICC.1:2010*.

3 Terms and definitions

For the purposes of this Recommendation | International Standard, the terms and definitions given in Rec. ITU-T T.800 | ISO/IEC 15444-1 apply.

4 Abbreviations

For the purposes of this Recommendation | International Standard, the abbreviations and symbols defined in Rec. ITU-T T.800 | ISO/IEC 15444-1 and the following apply.

AZC	All Zero Context
CUP	Cleanup coding Pass
CPF	Corresponding Profile
CxtVLC	Context adaptive Variable Length Code
EMB	Exponent Max Bound
FRAG	Fragmented
HT	High-Throughput
HTJ2K	High-Throughput JPEG 2000